

Data Collection Survey on Urban Building Safety in the People's Republic of Bangladesh

Final Report (Main Report)

April 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

**OYO International Corporation
Mohri Architect and Associates Inc.**

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Executive Summary

1. Background and Purposes

Bangladesh is located at the collision boundary between Indo-Australian and Eurasian plates. This geographical location makes Bangladesh very vulnerable to the potential danger of earthquake disaster resulting huge building collapse and human casualties. The Dhaka metropolitan area is the centre of politics, economy and cultural activities. In recent years construction of high-rise buildings is progressing rapidly in the name of urbanization. In fact, most of these buildings have not complied with the national building code-BNBC, and have not considered any threat of earthquake or fire. The tragic event of Rana Plaza in 2013, has opened the eyes of the government and building owners in Bangladesh. Therefore, promotion of building safety enhancement and reduction of risks due to disasters in urban areas have become urgent issues.

On the other hand, in Japanese Country Assistance Policy for Bangladesh (June 2012) and JICA's country analysis paper it is clearly stated that assistance should contribute to the measures against disasters such as earthquakes and measures against adverse effects of climate change.

Following the policy, support has been extended to the Public Works Department (PWD) under the Ministry of Housing and Public Works (MoHPW), through the JICA's technology transfer project, titled "Project for Capacity Development on Natural Disaster-Resistant Technique of Construction and Retrofitting for Public Buildings in the People's Republic of Bangladesh (2011-2015)" (hereinafter referred to as "CNCRP"). The project is at its final stage and all deliverables are in the process of completion

In the meantime the MoHPW has considered to construct a disaster-resilient city to support the stable economic activities in a fast-growing manner. The idea also includes construction of seismic resistant buildings and establishment of disaster management bases that will be used for conducting governmental and administrative functions even after disasters. In order to establish functionalities of these concepts, several plans and appropriate measures are necessary. However, basic data/information necessary for consideration of Japanese support are insufficient.

Under the above circumstances, JICA extended its cooperation by sending an expert team to Bangladesh for a 7 month study in 2014 with the aims to grasp the current situation and to find out the supportive needs for both construction of seismic resistant buildings and development of disaster resistant bases including review of plans and policies of the government while keeping in mind the significance and rationale of Japanese support scenario, and direction of survey that JICA should support in the future.

(i) Natural Disasters in Bangladesh

Major natural disasters in Bangladesh are floods and tropical cyclones. Since 1970, Bangladesh experienced many natural disasters which caused huge economic loss and killed many people. The recent disaster records reveal that cyclones in 1970, 1991 and 2007 killed about 300,000, 138,868 and 3,363 people respectively. On the other hand floods in 1998, 1998 and 2004 killed 2,373, 1,050 and 704 people respectively.

Although Dhaka has never had any experience of big EQ in last 100 years, records show that there were big EQ occurred in and around BD before 100 years. Among them Assam EQ 8.0 scale in 1897, Srimangal EQ of scale of 7.14 in 1918 and 8.6 scale EQ in 1950 in Himalaya are mention worthy. All these EQs caused damages to houses and human lives. Again recent small tremors have made the people very scary and to think that these are certainly an indication of earthquake source and vulnerability. The earthquake disaster risk index has placed Dhaka among the 20 most vulnerable cities in the world.

(ii) Necessity of measures for buildings

Buildings of Dhaka are not strong enough to withstand any medium size EQ. Most of the buildings were constructed before the establishment of any strict guidelines for maintaining quality. Therefore buildings are very vulnerable. There is no comprehensive study on the strength of Bangladeshi buildings but CDMP (2009) carried out a study and estimated damages to buildings in three major cities of BD including Dhaka city. According to the estimation, if an EQ of 7.5 M occurs in Dhaka due to Madhupur fault, 72,316 buildings of Dhaka city will be damaged beyond repair, of which 53% are of concrete and 30% are of masonry buildings. The study also estimated that number buildings which will be at least moderately damaged as 158,634, 49% of total number of buildings of 326,000. It was also estimated that if the EQ occurs at 2am, 88,503 people will be killed. Therefore, enhancing of building safety and maintaining of quality of construction is a must for Bangladesh.

CNCRP also carried out concrete core tests on buildings. Most buildings fell short of the design strength, it is approximately 10N/mm². Such being the case, the buildings may be categorized structurally problematic even if the structural design is proper. From these kind tests and calculation, it was concluded that only 25% of buildings satisfy the EQ resistance as stipulated in BNBC.

(iii) Concept of the survey

It is an established fact that measures to enhance the safety of vulnerable buildings in Bangladesh against disasters such as earthquake is of urgent importance. The degree of vulnerability of Bangladeshi buildings was systematically studied and made known through the project activities of CNCRP, a Japanese technical assistance project targeting capacity development of PWD engineers in the area of retrofitting technology.

In Bangladesh, the processes for the construction of public buildings and private buildings are different. Public buildings are managed by DoA, PWD of MoHPW. On the other hand, the private buildings in Dhaka are controlled by RAJUK and the city corporations manage in other regions. Therefore, it was decided to consider the subject of public and private buildings in this survey separately.

Private Buildings

In the recent years, many high rise apartment buildings have been constructed or in the process of construction, however, considering the enormous economic and social impacts, factory buildings of Ready Made Garment (RMG) sector are considered as candidates for this survey. The reasons are huge contribution to the economy of Bangladesh, which cover more than 3 quarters of the total export of the country, and an on-going RMG project using Two Step Loan (TSL) by JICA through CNCRP's technical support. The number of these private RMG factory buildings would be over 5,000 and all these buildings should be the target of this survey.

Public Buildings

Since the absence of a national master plan for disaster management it is difficult to identify the urgent public buildings to be strengthened. Therefore, under this Data Collection Survey for Urban Building Safety, a set of evaluation criteria based on CNCRP activities such as availability, cost required, construction suitability were established and used. Finally, the buildings of Fire Services and Civil Defence (FSCD) were selected as candidates for Japanese assistance as public buildings.

As a conclusion, the Urban Building Safety Project will focus on RMG factories as private buildings, and buildings used by FSCD as public buildings.

(iv) Survey items

The team dispatched by JICA to Bangladesh for a four months field survey where the team collected data/information, reviewed, confirmed and analyzed those data/information so that JICA can make its policy

to extend support in the area of disaster reduction enhancing the building safety both in private and public sectors. The long list of the survey items was:

- data / information related to disaster management (earthquake engineering field of government policies, laws and regulations, government plans and programs in order to formulate an upper level plan.
- implementation and role sharing systems in the areas of disaster management (earthquake engineering field) by the government and the related organizations.
- financial budget allocated for seismic resistance measures of both central and local government, and financial services provided by public and private financial institutions.
- consistency with the JICA's assistance, corresponding results and issues (if any) to be solved
- existing socio-economic conditions, disaster management and natural conditions in the study area.
- status of private and public buildings in the study area.
- current status and challenges of community based disaster management system in the study area.
- implementation status and issues to be solved for disaster risk assessment considering natural disasters in the study area.
- requirements for prioritization of private and public buildings that need to be seismically resistant and to prepare a list of public buildings of such buildings.
- financial needs related to seismic resistant of private and public buildings, and cooperation and support schemes for Japan.
- important influential items of environmental and social considerations, and capacity of the executing agency which deals environmental and social considerations.
- proposal for safety enhancement support policy for public buildings and private buildings and important bases at public buildings in the study area.
- support system/status and future direction of major donor's / NGO's cooperation policies.

Again those above items were divided into four main tasks as follows.

Task 1: Information gathering survey (EQ engineering field) for Urban Disaster Mitigation

Task 2: Study on support for private buildings seismic safety

Task 3: Study on support for public buildings seismic safety as disaster management base

Task 4: Refinement of the priority programs and examination of the support direction

2. Factors considered for project formulation

In field, the team, apart from the data/information collection, visited various sites including ongoing project sites, exchanged views with the government policy makers, international donors, financial institutions, other stakeholders both in public and private sectors. A brief description of factors considered for survey formulation is presented below.

(i) CNCRP activities

The CNCRP (2011~2015) activities includes creation of an building inventory, study on suitable seismic resistant methods, development of new construction and seismic retrofitting design manuals complying with BNBC, improvement of construction management and quality control, training of engineers in earthquake engineering fields are important. Since Bangladesh does not have data of concrete strength of existing public

and private buildings, laboratory tests (of core samples) were carried out to get an idea of concrete strength. Various retrofitting methods were also tested in the field together with PWD engineers. Several types of structural tests at BUET laboratory were also carried out so that more data related to strength of the buildings can be generated. Finally a pilot project at Tejgaon fire station was implemented which created a chance for the PWD engineers to implement their gained knowledge in the field.

(ii) Building permit / issues, why buildings are vulnerable

In Bangladesh, the main rules/regulations for building permit is Dhaka-BCR (Dhaka Metropolitan Building Construction Rules (2008) to regulate urban development which is based on BCR-Building Construction Rules (2006). With the view of bringing in control and ensuring uniform standard of building construction practice in the country, BNBC was prepared in 1993 by HBRI and BSTI. The latest edition of BNBC is BNBC-2006

Public buildings are designed by DOA and PWD. After Consultation with the clients, DOA prepares the architectural drawings whereas PWD does the structural and building services drawings. The architectural drawings finally checked by Chief Architect (CA) and authorize it. In case of structural drawings, Superintendent Engineer (SE) of PWD check and give authorization.

All private buildings and the buildings that are not designed by DOA and PWD need approval of RAJUK before construction. The responsible department for building permit in RAJUK is called Department of Development Control (DC). There are eight regional offices under RAJUK and each office is equipped with one Authorized Officer (AO) who has full responsibilities of building permit. The process takes about 45 days from application submission until the permission is approved.

In both, private and public constructions, site inspections are not done properly. Sometimes Field Engineers (FE) are not well trained and do not follow any checklist for quality control of construction materials or construction itself. Therefore even if the designs are done according to the BCR and BNBC, the lack of monitoring of site works and absence of standardized material quality are thought to be the main causes for bad quality construction.

It should be also mentioned that limited inter-ministerial coordination, insufficient guidance in compliance with the legal framework, limited capacity of the concerned officials on building permission and construction have also something to do with the building vulnerability. Limited education to the technical people also hinder the appropriate planning and implementation of building construction. The other identified causes for vulnerable buildings are lack of awareness, stimulant financial system for private sector and so on.

(iii) How to address this issue

Information of CDMP report, results of CNCRP's structural tests, field investigations carried out suggest that buildings of Bangladesh are not strong enough against disasters such as earthquakes. This is the time to take measures to enhance the strength of buildings thus reducing the damages of properties and lives.

For existing buildings, assessment of design concrete strength is necessary, for which design drawings are needed. Unfortunately many buildings do not have those drawings and calculation sheets. As a first step, preparation of missing drawings and then calculation of design concrete strength should be performed and categorize buildings whether they have followed BNBC standard or not. As the second step, buildings should be categorize into two categories. One which are beyond application of retrofitting should be demolished or relocated. Another category should be taken up for retrofitting with suitable methods.

In any case, new construction must be monitored so that they comply with the BNBC. It should be noted that BD does not have any experience in retrofitting of nay building, however, a pilot project under CNCRP

has set an example of retrofitting in Bangladesh and about 30 PWD engineers are now familiar with the technology.

(iv) RMG loan project

After the Rana plaza incident, JICA extended its help so that BD can start to enhance the safety of RMG factories and launched a loan project using the seismic retrofitting technology of the CNCRP in response to the request from joint associations of RMG sector i.e. BGMEA and BKMEA. In October 3, 2013, JICA concluded a MOU for a RMG project. Certain criteria were set for factories eligible to apply for the loan and an invitation to the interested factory owners announced. In total 218 factory owners showed interest for the loan. However, after a thorough screening process only 12 owners remained for seismic design. Finally, two factories, namely DK and Purple were selected for first stage of RMG loan project implementation.

The conditions and work flow of the RMG loan are shown below.

First, all applicants must meet the five conditions as mentioned below.

- 1) A plant located around Dhaka
- 2) A building owned by the factory owner.
- 3) A factory with not more than 2,000 employees (because the loan targets small- to medium-sized enterprises),
- 4) RC structure building
- 5) Existence of architectural drawing

Flow of works that were followed by the PWD engineers are as follows.

- (1) Screening of documents
- (2) Simplified soundness diagnosis
- (3) Seismic capacity evaluation/design
- (4) Seismic retrofitting works

After the completion of seismic design, seismic retrofitting will be performed using the loan obtained by the owner from the bank. To that end, the PWD will supervise the construction works as the top supervisor. Besides, for field-work management and quality management will be taken care by the selected builders from a list prepared in advance.

On the other hand, if the owner considers reconstruction or relocation, and hires a designer to implement new building design and construction by his own initiatives, in that case also the PWD will take the role of the top supervisor.

v) Activities of other development partners

In earthquake disaster management WB is another key development partner for Bangladesh. Recently WB has initiated a new project named as “Urban Resilience Project “with a budget of 173 million USD. The project has five main components with many sub-components. The main components are: i) Reinforcing the countries emergency management response capacity, ii) Vulnerability Assessment of critical and essential facilities, iii) Improved construction, urban planning and development, iv) Project implementation and v) Contingent emergency response component.

3. Proposal for the future project

Due to its geographic location, BD is one of the most EQ disaster prone countries. The risk of EQ is gradually increasing in the country. Therefore reconstruction of important and vulnerable buildings, and for enhancement of buildings safety retrofitting should be considered at an early date for both public and private sectors.

Taking into consideration the weakness in enforcement, education, technical capability, finance, emergency response, awareness raising and coordination issues, knowledge gained from the CNCRP and JICA's Data Collection Survey on Urban Building Safety, and policy of Japanese government, it is recommended to implement the following projects.

No	Project name	Financial mode	Main C/P	Rationale	Main activities
1	Project for Urban Resilience Master Plan (URMP)	Technical Cooperation	Ministry of Disaster Management and Relief	To fine tune the coordinated arrangements	-Law & Regulation establishment -Human resources development -DM Info System
2	Urban Building Safety Project (UBSP)	Japanese ODA Loan	Ministry of Housing and Public Works Ministry of Finance	To mainstream DRM approach for public & private sectors	-Construction of new FSCD HQ -Retrofitting of existing FS in Dhaka -Retrofitting of RMG factories by TSL
3	Building Safety Promotion Project for Disaster Risk Reduction (BSPP)	Technical Cooperation	Ministry of Housing and Public Works	Institutional reform and boosting the engineers' capability	-Establishment of BRA & BCC -Assessment of Tech. Capacity of RAJUK -Establishment of better building permit system

Under Urban Building Safety Project, target buildings are of two categories and for both categories two financial arrangements are considered as described below.

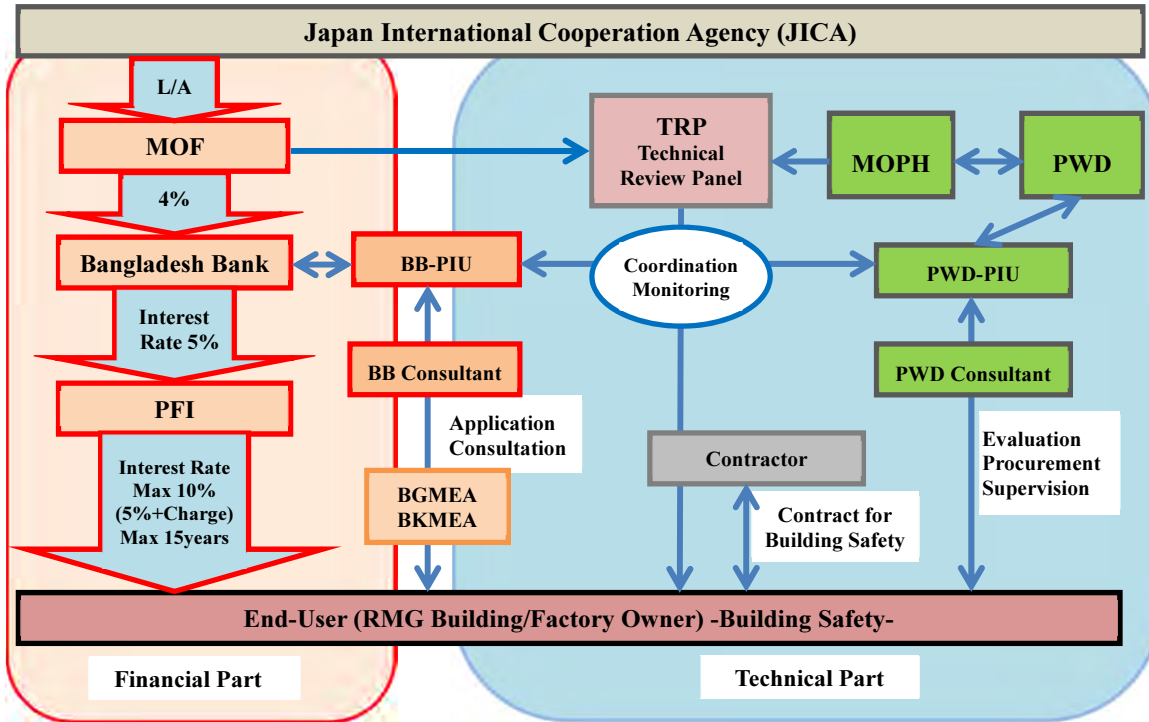
(i) Private buildings (TSL)

In the recent years, many high rise apartment buildings have been constructed or in the process of construction. However, considering enormous economic and social impacts, RMG factories have been considered as candidates for Two-Step-Loan (TSL) in this survey.

It is not easy to conduct construction works necessary for building safety (seismic retrofitting) by funds borrowed from a financing institution in Bangladesh. It is also true that safety and earthquake resistance improvement buildings are urgently needed without waiting for the establishment of stronger financial system. The Bangladesh Bank (BB) intends to solicit all financing institutions for participation in the new JICA/TSL after setting selection criteria for participating financial institutions from those who wish to participate.

When considering the preferential interest rate for TSL, it is likely needless to consider an interest higher than 10%. Study revealed that it will be appropriate to leave the determination of the loan period on the financing institutions depending on the construction amount and details with 15 years as the upper limit. It may be appropriate to set the grace period to the construction period. Security will be set by the financing institution depending on the value of the property targeted for financing, but land, a building, or a third-party's guarantee is usually adopted.

Expected JICA TSL Scheme



(ii) Public buildings

From the perspective of disaster prevention, emergency and effectiveness hospitals and fire stations are priority structures. In terms of work feasibility, it is adequate to view fire stations as the primary candidate. They are highly expected by people to work adequately as they are defined as the “first responder” and core of rescue activities during a disaster in the National EQ Contingency Plan of Bangladesh. Therefore, from the view point of firefighting and rescue activities in a disaster, reconstruction of existing HQ of FSCD at Mirpur and 14 existing fire stations in Dhaka city are proposed for this Japanese ODA loan project.

In general, there are three structural types (EQ resistant, vibration control and seismic isolation) for protecting a building from earthquake damage. For the HQ of FSCD it is desirable to implement seismic isolation from the view point of ensuring the safety of the entire building because HQ must be not only safe during an EQ, but also able to maintain a system that can start firefighting and rescue activities immediately after the EQ and also because the building is to be relatively large (10 stories) and have an irregular shape. A design drawing of the HQ building is presented below.

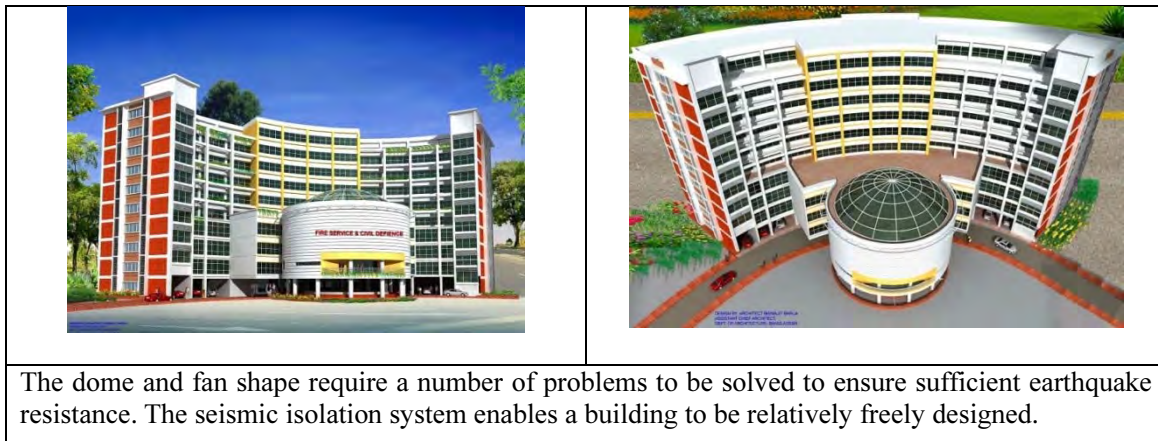


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Abbreviation and proper name

Abbreviation	Proper Name	Abbreviation	Proper Name
A/C	Account	°C	Degree Centigrade
AA	Account Agreement	CA	Chief Architect
ACCORD	The Accord on Fire and Building Safety in Bangladesh	CAAB	Civil Aviation Authority of Bangladesh
ACE	Additional Chief Engineer	CAGR	Compound Annual Growth Rate
ADB	Asian Development Bank	CAMELS	Credit, Assets, Management, Earnings, Liquidity and Sensitivity
ADP	Annual Development Plan	CAR	Capital Adequacy Ratio
ADPC	Asian Disaster Preparedness Centre	CASBEE	Comprehensive Assessment system for Built Environment Efficiency
AE	Assistant Engineer	CBL	City Bank Limited
ALLIANCE	The ALLIANCE for Bangladesh Workers Safety, Inc.	CDMP	Comprehensive Disaster Management Programme
AML	Anti-Money Laundering	CDR	Cash-to-Deposit Ratio
AO	Authorized Officer	CE	Chief Engineer
ASE	Advanced Simplified Evaluation	CEO	Chief Executive Officer
BB	Bangladesh Bank	CFL	Compact Fluorescent Lamp
BB/A	Bangladesh Bank's Revenue Account	CIB	Chartered Insurance Broker
BB-PIU	Project Implementation Unit of Bangladesh Bank	CNCRP	Project for Capacity Development on natural Disaster Resistant Techniques of Construction and Retrofitting for Public Buildings
BBTA	Bangladesh Bank Training Academy	CNG	Clean Natural Gas
BC	Brick in cement mortal with concrete floor building	CORFU	Collaborative Research on Flood Resilience in Urban Area
BCA	Building Construction Act	CRM	Credit Risk Management
BCC	Building Construction Committee	CRR	Cash Reserve Ratio
BCR	Building Construction Rules	CS	Communication System
BDDL	Bangladesh Development Bank Limited	CSE	Chittagong Stock Exchange
BDT	Bangladesh Taka	CSR	Corporate Social Responsibility
BEMS	Building Management System	CY	Calendar Year
BEPZA	Bangladesh Economic Zone Authority	D/D	Detail Design
BEZA	Bangladesh Economic Zone Authority	DAP	Detailed Area Plan
BF	Brick in cement mortal with flexible roof building	dB	Decibels (unit of noise, ratio between two values of physical quantity, power or unit of sound level)
BFID	Bank and Financial Institution Division (MoF)	DCC	Dhaka City Corporation
BGMEA	Bangladesh Garment Manufacturers' Export Association	DD	Deputy Director
BIA	Bangladesh Insurance Academy	DD	Detail Design
BIBM	Bangladesh Institute of Bank Management	DDM	Department of Disaster Management
BICM	Bangladesh Institute of Capital Market	DEA	Digital Engineering Assessment
BIFFL	Bangladesh Infrastructure Finance Fund Limited	DEG	German Investment and Development Company
BKMEA	Bangladesh Knitwear Manufacturers' Export Association	DESA	Dhaka Electric Supply Authority
BMD	Bangladesh Meteorological Department	DESCO	Dhaka Electric Supply Company Limited
BNBC	Bangladesh National Building Code	DF/R	Draft Final Report
BO	Building Official	DFID	Department For International Development
BRA (BBRA)	Bangladesh Building Regulatory Authority	DFIs	Development Finance Institutions
BSB	Bangladesh Shilpa Bank	DFQF	Duty Free Quota Free
BSEC	Bangladesh Securities and Exchange Commission	DIFE	Department for Inspection of Factories and Establishments
BSRS	Bangladesh Shilpa Rin Sangstha	DMC	Disaster Management Centre
BUET	Bangladesh University of Engineering and Technology	DMDP	Dhaka Metropolitan Development Plan
BWDB	Bangladesh Water Development Board	DMP	Dhaka Metropolitan Police

DOA	Department of Architect	HBFC	House Building Finance Corporation
DoE	Department of Environment	HBRI	House Building Research Institute
DPP	Development Project Proposal	HCRO	Head Office Credit Officer
DSE	Dhaka Stock Exchange	HOBUS	Head of Business Unit
DU	Dhaka University	HOCD	Head of Credit Risks
DWASA	Dhaka Water and Sewage Authority	hPa	hecto-Pascal
EBL	Eastern Bank Limited	HQ	Head Quarter
ECA	Environment Conservation Act	HVRA	Earthquake Hazard, Vulnerabilities and Risk Assessment
ECC	Environmental Clearance Certificate	IAB	Institute of Architects Bangladesh
ECR	Environment Conservation Rules	IBBL	Islami Bank Bangladesh limited
EDD	Environmental Due Diligence	IBD	Axial Stress Ratio
EE	Executive Engineer	IBS	An EQ Resistance Index obtained from seismic capacity evaluation
EFTA	European Free Trade Agreement	IBSO	An EQ Resistance Index required by BNBC
EIA	Environment Impact Assessment	ICB	Investment Corporation of Bangladesh
EMS	Energy Management System	ID	Index
EOC	Emergency Operation Centre	IDCOL	Infrastructure Development Co. Ltd.
EOI	Expression of Interest	IDEB	Institute of Diploma Engineers Bangladesh
EPS	Earning per Share	IDRA	Insurance Development and Regulatory Authority
EPZ	Export Processing Zone	IEB	Institute of Engineers Bangladesh
EQ	Earthquake	IEE	Initial Environmental Examination
ERD	Economic Relations Division	IFC	International Financial Corporation
ERM	Environmental Risk Management	IFI	Impact Factor Index
ERMG	Environmental Risk Management Guideline	ILO	International Labour Organization
ESMS	Environmental and Sustainability Management System	IMF	International Monetary Fund
ETP	Effluent Treatment Plan	IPDC	Industrial Promotion of Development Company Bangladesh Ltd.
EU	European Union	ISO	Seismic Demand Index of Structure
E-W	East West	IT	Information Technology
EZs	Economic Zones	IUCN	International Union for Conservation of Nature
F/R	Final Report	IWM	Institute of Water Modelling
FAP	Flood Action Plan	JICA	Japan International Cooperation Agency
FAR	Floor Area Ratio	JPY	Japanese Yen
F _c	Concrete (Compressive) Strength	JTU	Jackson Turbidity Unit
FCBs	Foreign Commercial Banks	KII	Key Informants Interview
FD	Finance Division	KOICA	Korea International Cooperation Agency
FDI	Foreign Investment	L/A	Loan Agreement
FE	Field Engineer	LC	Lightly Reinforced Concrete
FGD	Focus Group Discussion	LDA	Lower Division Assistant
FIs	Financial Institutions	LDC	Least Developed Country
FRSP	Financial Sector Reform Programme	LED	Light Emitting Diode
FSCD	Fire Service and Civil Defense	LGED	Local Government Engineering Department
FSPDSME	Financial Sector Project for the Development of Small and Medium Scale Enterprises	m	Meter
FY	Fiscal Year	M	Magnitude
G	acceleration of gravity (980 gal)	M/D	Minutes of Discussion
GBC	Green Banking Cell	M/M	Man-month
GDP	Gross Domestic Product	Mg/l	Milligram per Litre
GEDDC	General Environmental Due Diligence Certificate	MIS	Management Information System
GNI	Gross National Income	MLSS	Member of Lower Subordinate Staff
GNP	Gross National Product	MMI	Modified Mercalli (Seismic) Intensity
GOB	Government of Bangladesh	MoDMR	Ministry of Disaster Management and Relief
GOB/A	Government of Bangladesh's Revenue Account	MoE	Ministry of Education
GSB	Geological Survey of Bangladesh	MoF	Ministry of Finance
GTZ	German Technical Cooperation	MoH	Ministry of Health

Abbreviation	Proper Name	Abbreviation	Proper Name
MoHA	Ministry of Home Affairs	RAKUB	Rajshahi Krishi Unnayan Bank
MoHPW	Ministry of Housing and Public Works	RC	Reinforced Concrete
Mol	Ministry of Industry	RFA	Revolving Fund Account
MoLE	Ministry of Labour and Employment	RHWL	Recorded Highest Water Level
MoP	Ministry of Planning	RID	Request for Initial Disbursement
MoPH	Ministry of Public Health	RMG	Readymade Garments
MOU	Memorandum of Understanding	ROA	Return on Assets
MPa	Mega Pascal	ROE	Return on Equity
MRA	Micro-credit Regulatory Authority	RPC	Review Panel Committee
Mw	Moment Magnitude	RPM	Request for Replenishment
N Value	blow counts per 30 cm penetration by Standard Penetration Test	RRO	Relaxation Route of Origin
NBFIs	Non-bank Financial Institutions	RWA	Risk Weighted Assets
NCBs	Nationalized Commercial Banks	SA	Special Account
NEMAP	National Environmental Management Action Plan	SC	Steering Committee
NGOs	Non-governmental Organizations	SCBs	State-owned Commercial Banks
NHFIL	National Housing Finance and Investment Limited	SDBs	Special Development Banks
NIP	National Industrial Policy	SDE	Sub-divisional Engineer
NOC	No Objection Certificate	SDF	Social Development Foundation
NP	National Park	SE	Superintendent Engineer
NPL	Non-performing Loan	SEZ	Special Economic Zone
NTAP	National Tripartite Action Plan	SL/A	Sub-Loan Agreement
O&M	Operation and Maintenance	SME	Small and Medium Scale Enterprises
OCHA	Office for the Coordination of Humanitarian Affairs	SMESPD	Small and Medium Enterprise and Special Programmes Department
ODA	Official Development Assistance	SOE	Statement of Expenditure
OLL	On-Lending Loan	SPT	Standard Penetration Test
OSH	Occupational Safety Health	TC	Training Centre
p.a.	per annum	TIB	Transparency International Bangladesh
P/A	Participation Agreement	Tk	Bangladesh Taka
P/R	Progress Report	TMU	bank of Tokyo Mitsubishi UFJ
PA	Participant Agreement	TRC	Technical Review Committee
PBF	Plate Boundary Fault	TREES	Towards Resource Efficiency and Environmental Sustainability
PCBs	Private Commercial Banks	TRP	Technical Review Panel
PCR	Project Completion Report	TS	Tin Shed
PD	Project Director	TSL	Two Step Loan
PFI	Participating Financial Institution	TTBC	Textile Technology Business Centre
PGA	Peak Ground Acceleration	UAP	University of Asian Pacific
PH	Power of Hydrogen	UBSP	Urban Building Safety Project
PIU	Project Implementation Unit	UDA	Upper Division Assistant
PKSF	Pallikarma-Sahayak Foundation	UDRI	Urban Disaster Risk Index
PM	Project Manager	UDUP	Utilization Declaration and Utilization Permission
PMC	Project Management Committee	UFIL	Uttara Finance and Investment Limited
POA	Project Operation Account	UNDP	United Nation Development Program
PPE	Personal Protective Equipment	USA	United States of America
PPP	Public Private Partnership	USAID	United State Agency for International Development
PRI	Physical Risk Index	USD	United State Dollar
PS Logging	Method to measure Shear Velocity (Vs) and Compressional Wave Velocity (Vp)	VAT	Value Added Tax
PSR	Project Status Report	WASH	Water Sanitation ad Hygiene
PVC	Polyvinyl Chloride	WB	World Bank
PWD	Public Works Department	WS	Wildlife Sanctuary
PWD-PIU	Project Implementation Unit of Public Works Department	WTO	World Trade Organization
RAJUK	Rajdhani Unnayan Kartipakha	ZCRO	Zonal Credit Risk Officer

Chapter 1 Background and Objectives of the Survey

1.1 Background

Bangladesh is located at the collision boundary between Indo-Australian and Eurasian plates. It contacts with the Himalayan region, the most seismically active areas in the world. This geographical location makes Bangladesh very vulnerable to the potential danger of earthquake disaster and huge building collapse. The Dhaka metropolitan area including Dhaka city, the centre of politics, economy and culture, where in recent years construction of high-rise buildings and high density of buildings are progressing rapidly in the name of urbanization. In fact, most of these buildings have not complied with the building code, and have not considered any threat of fire or earthquake. Therefore, they are in vulnerable situation against large-scale disasters, like earthquakes. The tragic event of a large scale collapse of a tenant building of several garment factories in 2013, has opened the eyes of government and building owners in Bangladesh. Therefore, promotion of building safety enhancement and reduction of risks due to disasters in urban areas has become urgent issues. Bangladesh must address them properly and solved.

Under these circumstances, the government of Bangladesh formulated its Sixth Five-year Plan (2011-2015) in 2011, where "disaster management measures" is placed as one of the priority tasks. In accordance with this policy, Bangladesh enacted the Disaster Management Operation Regulation (2010), and Disaster Management Act (2012), and now Bangladesh is in the process of developing a National Disaster Management policy. However, there are several issues such as insufficient governmental mechanisms for compliancy with building codes and seismic resistance of buildings, shortage of data for the vulnerability assessment, for example, many buildings do not have structural and design drawings without which assessment can't be performed. Moreover, the government staffs do not have sufficient technical capabilities which have hindered the process of institutionalization of the building safety and/or seismic resilient buildings. Thus, the efforts for building safety enhancement and seismic resistance are not progressing in the country as it should be.

According to the Japanese Country Assistance Policy for Bangladesh (June 2012) and JICA's country analysis paper, "Overcoming social vulnerability" is listed up as one of the key objectives. The importance of the supports that contribute to the measures against disasters such as earthquakes and measures against adverse effects of climate change are clearly stated in those papers.

Following the policy, support has been extended to the Public Works Department (PWD) under the Ministry of Housing and Public Works (MoHPW), through the JICA's technology transfer project, titled "Project for Capacity Development on Natural Disaster-Resistant Technique of Construction and Retrofitting for Public Buildings in the People's Republic of Bangladesh (2011-2015)" (hereinafter referred to as "CNCRP"). The contents of CNCRP are; creation of an inventory of public buildings of around 2,000 buildings in Dhaka city, study on seismic resistant construction methods suitable for Bangladesh, development of new construction and seismic retrofitting design manuals that would comply with building standards of Bangladesh (BNBC: Bangladesh National Building Code), improvement of systems regarding construction management and quality control, training of engineers in earthquake engineering fields, and disaster awareness raising activities among urban residents. Also, in relation to the collapse accident of a tenant building took place in April 2013, supportive activities to ensure safety of both private and public buildings are carried out in the form of seismic inspection and seismic resistance of garment factory buildings etc.

Based on the above mentioned facts, Ministry of Housing and Public Works of Bangladesh has considered to construct a disaster-resilient city to support the stable economic activities in a fast-growing status. The idea also includes construction of seismic resistant buildings and establishment of disaster management bases that will be used for conduct governmental and administrative functions even after

disasters. In order to establish functionalities of these concepts, several plans and appropriate measures are necessary. They are; disaster management master plan of urban areas taking a detailed risk assessment into account, overall evacuation action plan during the disasters, and practical measures aiming safety enhancement of buildings, and establishment of the priority list of seismic resistance of buildings. However, basic information necessary for consideration of support is insufficient.

Under the above circumstances, it is necessary to collect and organize the basic information considering how JICA can extend cooperation and support Bangladesh in the future. It should be noted that Bangladesh is considering to construct seismic resistance buildings and to develop disaster management bases in the metropolitan area, while utilizing the past achievements gained from the supports of Japan. The main items for information collection should relate to overall plan, current status and challenges, safety enhancement of buildings, priorities related to seismic resistance that Bangladesh wants, and various standards practiced in Bangladesh. In addition, it is necessary to confirm and review the plans and policies such as the mechanism of government to ensure the safety of the building. ,

<Note: “safety enhancement” includes seismic resilience enhancement in structural and fire safety of hardware, as well as in functional safety. >

1.2 Objectives

Targeting the Dhaka metropolitan area of Bangladesh, various existing data and basic information are to be collected, organized and reviewed. The aims are to grasp the current situation and to find out the practical supportive needs for both construction of seismic resistant buildings and development of disaster management bases. In order to reduce urban disaster risks, the contents of the government plans and the latest support trends of other donors are also to be known. In addition, the ultimate object of this survey is to examine the significance and rationale of Japanese support in future, the support scenario, and the directions of projects that JICA should support in the same field in future.

1.3 Concept for Survey Formulation

In order to achieve the goals of this survey, the JICA expert team consisting of various experts was dispatched for collecting data/information in the field. Although the time allocated for the field work was very limited, the team made its utmost efforts to collect necessary data/information, made extensive field visits and discussed with other development partners. Then all information/data were reviewed, analyzed for coming up with the ideas for formulation of projects which can be supported by the Japanese government.

It is well known that measures to enhance the safety of vulnerable buildings in Bangladesh against disasters such as earthquake is of urgent importance. It should be noted that the degree of vulnerability of Bangladeshi buildings was systematically studied and made known through the survey activities of CNCRP, a Japanese technical assistance project targeting capacity development of PWD engineers in the area of retrofitting technology. According to CNCRP carried out prior to this survey, the following facts were clarified. The public buildings managed by PWD as well as the garment factory buildings evaluated under the activities of CNCRP, at least 30% of the buildings are unsafe due to the reasons of noncompliance of BNBC, and 30% of rest of the buildings are doubtful whether they followed BNBC or not. The above data justify to make a conclusion that the most of the buildings in Bangladesh are vulnerable and if an earthquake of moderate scale attacks the country, a miserable situation can't be avoided.

In Bangladesh, the processes for the construction in public buildings and private buildings are different. Public buildings are managed by DoA, PWD of MoHPW. On the other hand, the private buildings in

Dhaka are controlled by RAJUK and the city corporations manage in other regions. Therefore, it was decided to consider the subject of public and private buildings in this survey separately.

1) Private Buildings

In the recent years, many high rise apartment buildings have been constructed or in the process of construction, however, considering the enormous economic and social impact, factory buildings of Ready Made Garment (RMG) sector are considered as candidates for this survey. The reasons are huge contribution to the economy of Bangladesh, which cover more than 3 quarters of the export of the country, and an on-going RMG project using Two Step Loan (TSL) by JICA through CNCRP's technical support. Therefore more than 5,000 RMG factories should be the target for private buildings in this survey.

It should be noted that after the tragic incident of Rana Plaza Collapse in April 2013, "Ready Made Garment (RMG) Sector Safe Working Environment Program" supported by TSL from JICA through Bangladesh and local banks has been commenced in October, 2013. The main stakeholders are PWD, BGMEA, BKMEA, JICA and BB. The main components of the program are retrofitting, rebuilding and relocation of RMG factories within the amount of 1 billion Bangladesh Taka (BDT).

2) Public Buildings

Bangladesh is a natural disaster prone country. No large disastrous earthquake has attacked Bangladesh in recent 100 years, many buildings have been constructed disorderly, became old and vulnerable to earthquakes. Once a big earthquake occurs, a national catastrophe would be inevitable. Therefore, enhancing building safety is very important. However, as buildings are different in functions, management system and construction materials, it is necessary to prioritize the buildings for which immediate measures should be undertaken. Generally speaking, public buildings include hospitals, schools, administrative buildings, fire stations, and government staff quarters, sometimes called as colonies.

Since the absence of a national master plan for disaster management to identify the urgent public buildings to be strengthened, under Urban Building Safety Project the following concept is used.

During emergency such as earthquakes or fire incidents, immediate disaster management activities mainly include victim related operations. Again, victim related operations include search and rescue of the victims, provision of medical services to the victims, provision of evacuation guidance and provision of temporary shelters. Since the Fire Service and Civil Defence personnel act as the first responders for any disaster including the earthquakes, for a steady and sustainable operation before, during and after the disasters, their headquarter and scattered fire stations in the Dhaka city, hospitals, clinics, schools (for temporary evacuation shelter) could be the potential candidates for government buildings for JICA assistance.

For selection of priority buildings, a set of multiple evaluation criteria was outlined and they include i) Robustness of the building, ii) Cost of the building safety, iii) Data availability and iv) Constructability. The criteria are based on the lesson learned from CNCRP activities related to public buildings. After using the multiple criteria, it was found that hospitals/clinics could not make their way to the final list of prioritized public buildings. Finally, the buildings for Fire Services and Civil Defence are selected for Japanese assistance as public buildings.

As a conclusion, the Urban Building Safety Project will focus on RMG factories as private buildings, and buildings used by FSCD as public buildings.

1.4 Survey Area

The main target area of this study is Dhaka metropolitan area and its surroundings, corresponding to the jurisdiction range of RAJUK (Capital Development Authority of Bangladesh), i.e. Dhaka, Gazipur, and Narayanganj districts, as well as Chittagong city. The survey area is shown in the Figure 1.4.1 below.

The Survey Area in this survey consists of Dhaka district with an area of 1497.17 sqkm, Gazipur district with an area of 1741.53 sqkm and Narayanganj district 759.57 sqkm. The area is a part of Dhaka division, which has 17 districts. The total area of the survey is 3,998.27sqkm.

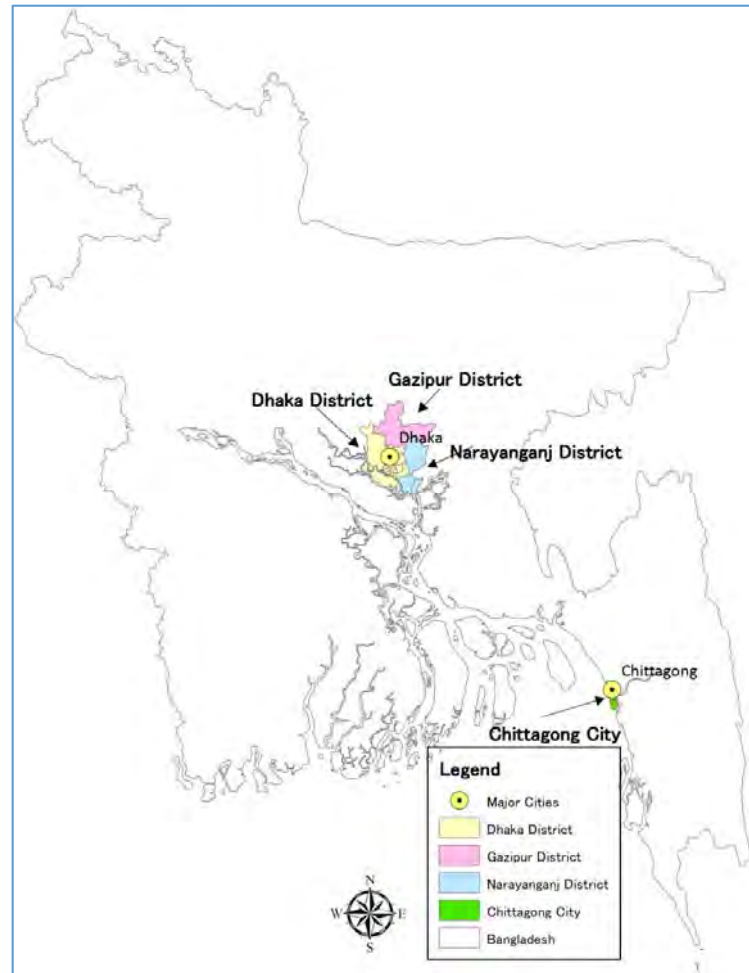


Figure 1.4.1 Survey Area

1.5 Relevant Organizations

The main organizations those are assumed to be involved in this study are as follows; Ministry of Housing and Public Works (MoHPW), Public Works Department (PWD), Department of Architecture (DoA), Capital Development Authority of Bangladesh (Rajdhani Unnayan Kartipakkha: RAJUK), Ministry of Disaster Management and Relief (MoDMR), Department of Disaster Management (DDM of MoDMR), Department of Fire Service and Civil Defence of Ministry of Home Affairs (FSCD), Bangladesh Bank (BB), other cooperation agencies, various financial and research institutions.

1.6 Major Survey Items

Main items of this survey are as follows;

- To collect and organize data/information related to disaster management (earthquake engineering field), government policies, laws and regulations, government plans and programs in order to formulate an upper level plan.

- b) To confirm laws, regulations and operational procedures related to seismic resistant buildings and to find out the challenges.
- c) To confirm the implementation and role sharing systems in the areas of disaster management (earthquake engineering field) by the government and the related organizations.
- d) To confirm the financial budget allocated for seismic resistance measures of both central and local government, and financial services provided by public and private financial institutions.
- e) To confirm the consistency with the JICA's assistance, corresponding results and issues (if any) to be solved
- f) To confirm the existing socio-economic conditions, disaster management and natural conditions in the study area.
- g) To check the status of private and public buildings in the study area.
- h) To confirm the current status and challenges of community based disaster management system in the study area.
- i) To confirm the implementation status and issues to be solved for disaster risk assessment considering natural disasters in the study area.
- j) To examine various requirements for prioritization of private and public buildings that need to be seismically resistant and to prepare a list of public buildings of such buildings.
- k) To study financial needs related to seismic resistant of private and public buildings, and cooperation and support schemes for Japan.
- l) To confirm important influential items of environmental and social considerations, and capacity of the executing agency which deals environmental and social considerations.
- m) To study the proposal for safety enhancement support policy for public buildings and private buildings and important bases at public buildings in the study area.
- n) To confirm the support system/status and future direction of major donor's / NGO's cooperation policies.

For implementation purpose, this study is divided into five stages, namely; (1) Preliminary survey in Japan, (2) Field survey in Bangladesh, (3) Work in Japan after return from the field survey, (4) Preparation of Draft Final Report (DF/R), and (5) Preparation of Final Report (F/R). Of these, the Field work in Bangladesh is the main task and it is divided into four tasks as shown below.

[Task 1: Information collection survey (earthquake engineering field) for Urban Disaster Mitigation]

[Task 2: Study on support for private buildings seismic safety]

[Task 3: Study on support for public buildings seismic safety at disaster management important base]

[Task 4: Refinement of the priority programs and examination of the support direction]

1.7 Duration of the Survey

The working period of this study is assumed to be about seven months from August 2014 to February 2015. Within that period, the length for the main work in the field, is about four months, from August 2014 to December 2014.

1.8 Direction of the Survey

This study has the goal to obtain basic data/information to examine the direction of future support by JICA. The support will concentrate on seismic resistance of buildings in Dhaka metropolitan area, focusing on two important components of 1) safety enhancement support for private buildings, 2) safety enhancement support for public buildings which will be used as disaster management base.

Since seismic resistance is a part of disaster preparedness and reduction, it should include not only the simple building strengthening, but also disaster management equipment and other activities. For example, as a part of disaster management equipment, establishment of a disaster information system and a disaster management centre where human resources development for the system operation will be carried out. In addition, in case of a seismic resistance of disaster management base, provision of system facilities and its operations, provision of other facilities so that the base is equipped for all disaster management activities needed in the neighbouring communities. The items for training at the base should include disaster management, fire safety, emergency response training, human resource development etc. Consideration should be given to enrich the content of such comprehensive disaster management.

1) Supporting Survey for safety enhancement of critical bases of public buildings

Public buildings will be surveyed, from the point of view of disaster management, search for seismic resistance of public buildings should be done in such a way that they can be used as disaster management base. Among the government buildings managed by PWD includes administrative buildings, fire stations, schools, educational institutions, hospitals and so on, they can play an important function as a base for disaster management during disasters and they need safety enhancement. In Dhaka metropolitan area, number of public buildings of non-residential are said to be around 1,000 or a bit more. Investigations on status of public buildings as a disaster management center, disaster management, required administrative mechanism focusing on seismic resistance with priorities, and funding requirements will be made.

2) Supporting Survey for safety enhancement of private buildings

Since the trends of the garment industry, which accounts for about 80% of the major exports of Bangladesh, can rule the fate of the country's economy, it is an important element of the economic point of view in this study. Thus this study supports the strengthening of safety of garment factories which are an important base on the export strategy. Around 3,000 factories are said to exist in Dhaka metropolitan area, even without the example of the accident last year, the majority of them have fragile buildings. Therefore, to organize measures to the safety enhancement of the future based on gathering information about the safety measures on related buildings, the needs for support, the funding requirements, and the issues related to seismic resistance the buildings should be grasped. During the study, the experience and knowledge learned during the RMG (Ready Made Garment) project of the same type in CNCRP will be taken into consideration.

Referring to the above, the information that will contribute to the development of the cooperation program in the future will be collected and analyzed. During the study, BNBC (Bangladesh National Building Code) should be the base of the study. In addition, the existing earthquake damage estimation results in Bangladesh by CDMP (Comprehensive Disaster Management Programme) will be referred. Further, while considering the structure of disaster management in general in Bangladesh, the measures should be considered effectively and concretely as much as possible,

3) Utilization of existing projects

In CNCRP, both training of technical engineers related to public buildings construction and development of manuals are the most important components. Though technical transfer has been progressing, issues to be solved are still remained in the dissemination of technology and the continuation / development inside of PWD. On the other hand, during the RMG project, supporting the renovation of garment factories, a lesson is learnt. Though technical aspects such as seismic inspection and seismic design are necessary, the confirmation is important for smooth implementation of the study. A lesson is recognized that it is critical confirmations of the applicability of two-step loans (TSL) as well as the consensus on TSL necessary between building owner and candidate banks which will provide loans to the

building owner. The study will be pursued taking into account the status and results of activities like above.

4) Study on finance support scheme

Since issues to be solved still remains for implementation of TSL to the private sector mentioned above, careful consideration is necessary for the scheme of financial support. Therefore, according to the investigation of the funding scheme as shown in 2.2 7) described later, the smooth investigation activities will be recommended. The investigation will be conducted to improve up to the possible extent also for the financing of public buildings.

5) Cooperation with related donors and organizations and consistency with the assistance policy by Japanese government etc.

This survey should be proceed keeping in mind the effective promotion of disaster management all over Bangladesh considering information sharing and mutual support, with other donors conducting disaster management related activities in Bangladesh, such as World Bank, UNDP, ADB, DFID, IFC, etc., and NGOs which are conducting community based disaster management activities, as well as all organizations which are involved in the financial field. In particular, as in the renovation support for garment factories, ILO, ACCORD, ALLIANCE, etc., thus sharing information with them is taken into account.

On the other hand, in May 2014, the International Cooperation Bureau of Ministry of Foreign Affairs of Japan announced "2014 fiscal emphasis policy on international cooperation" intending to expand ODA strategically. At the same time, the priority areas for cooperation by JICA should be also taking into account during conducting the survey.

Chapter 2 Detail of the Survey Area

As mentioned in paragraph 1.3 Concept of survey formulation, this survey is focusing on RMG factories as private buildings and FSCD's fire stations as public buildings. Therefore it should be mentioned that the descriptions made in the following chapters have emphasized on the structures and relevant organizations which are the subject matters of this survey. However, to have a better understanding, country wide general information is also presented.

2.1 Natural Conditions

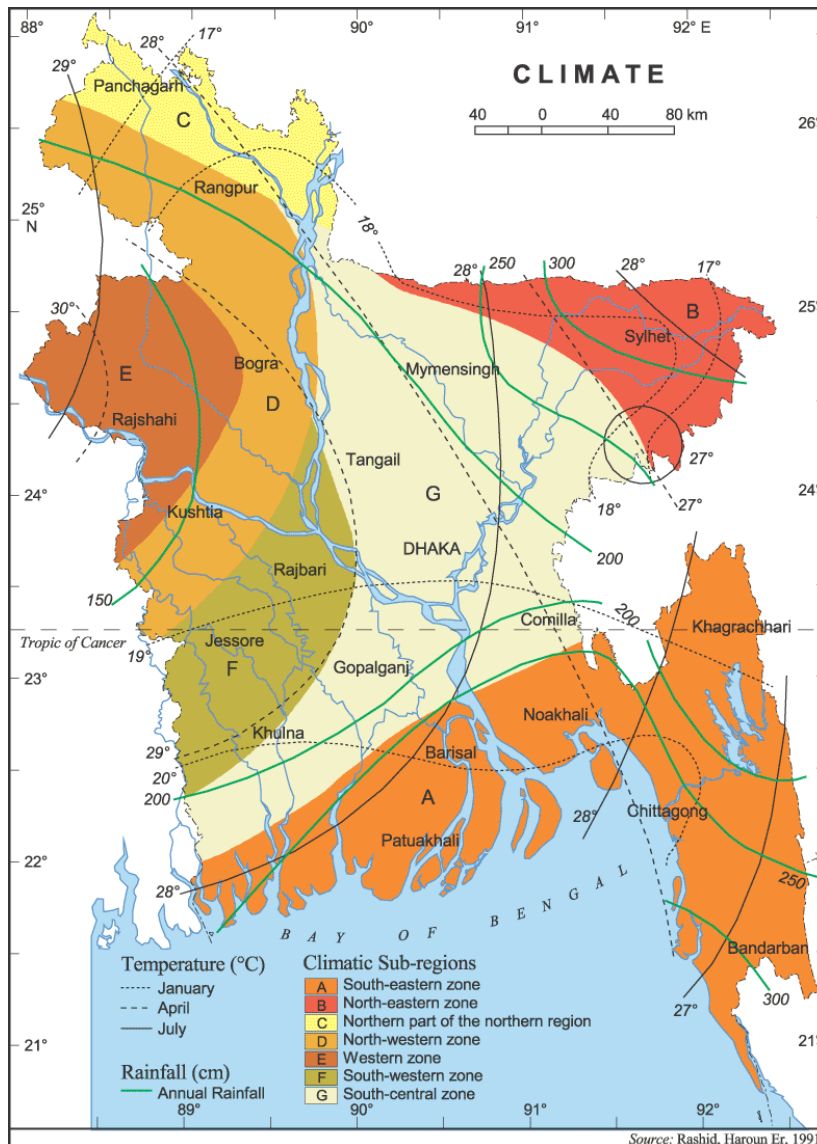
2.1.1 Overview of Natural Condition

a) Bangladesh

Bangladesh locates in tropical regions adjoining India in the West, North and North East, Myanmar in the South East, which is between 20 degree 34 min and 26 degree 38 min in North, 88 degree 1 min and 92 degree 41 min in East. The country consists of one of the largest delta area formed by three big international rivers, the Ganges (Padma in Bengal), the Brahmaputra (Jamuna in Bengal) and the Meghna. It has a long coastline along Bay of Bengal.

Total area of the country is about 147,570 square kilometer, which consists of 80 percent of flood plain, 8 percent of terrace and 12 percent of hill. Hill regions distributes in relatively narrow area mainly in Chittagong Hill with its highest elevation of 1230 meters at Mt. Keokuradon in the South East, and Sylhet division in the North East. Most of the country is filled with fertile soil with plentiful water resources. It fits agriculture, rice farming in particular. Meanwhile it is also exposed with risk of flood.

The climate of Bangladesh is monsoon humid weather of the subtropics with high temperature, much rainfall and very much humidity. The weather is separated in three seasons; calm and dry winter from November to February, steamy summer from March to June, warm and rainy season from July to October. The coldest season is from the end of December to January with the average temperature of 17 to 21 degree Celsius in the northern region. After that, it is gets warmer up to April with the average temperature of 27 to 30 degree Celsius. The hottest region in the country is Rajshahi and Kushtia districts with the temperature over 40 degree Celsius. Figure 2.1.1 presents the distribution of climate in Bangladesh.



(Source: Geography of Bangladesh, Haroun er Rashid, 1991)
<http://www.poribesh.com/Maps/Climate.htm>

Figure 2.1.1 Climate in Bangladesh

b) Dhaka

Dhaka City, the metropolitan of Bangladesh, locates at the central region of the country, which is mid location of Ganges delta and eastern bank of Buriganga river. The area of the city is 153.84 square kilometers. The geological features are characterized by the deposits in the period of Holocene and Pliocene with its elevation from 2 to 12 meters. The climate feature is characterized by heavy rain and tropical cyclone causing flood in rainy season. The season of frequent cyclone attack is two seasons, April to June and August to November. It is South-central zone in Figure 2.1.1, and Aw in the climatic division of Köppen.

Dhaka City is surrounded by Tongi Khal in the northern side, Turag-Buriganga river in the western side, Balu river in the eastern side, and Sitalakhya river in the southern side. Figure 2.1.2 portrays the photos of two main rivers, Balu river and Buriganga river. These rivers belong to the Brahmaputra drainage system. In the monsoon season, flood from the watershed of Jamuna river occurs frequently. Regarding elevation in the city, especially 60 to 70 percent of the city in low land, river channel or depression area is lower than 5 meters.



[Photos taken by JICA Expert Team, 16 November 2014]

Figure 2.1.2 Photo of Balu river (Left) and Buriganga river (Right)

The characteristic feature of the temperature in Dhaka presents its average 25 degree Celsius, varying 18 in January to 32 in May. Table 2.1.1 presents the statistics of temperature for past ten years, which are maximum, minimum and average in every month. From this table, the maximum temperature is found mostly in April at about 36 to 39 degree Celsius. Meanwhile, the minimum one is found mostly in January at about 8 to 11 degree Celsius. Annual average is about 26 to 27 degree Celsius.

Table 2.1.2 presents the statistics of precipitation of Dhaka for recent ten years of 2002 to 2011. Annual rainfalls vary between 1500 and 2800 mm. About 80 percent of total precipitation occurs from May to September, and monthly maximum rainfall is mostly July, August or September. Meanwhile, months with no rain are mostly December and January.

Table 2.1.1 Statistics of Temperature in Dhaka (2002 - 2011)

Year	Maximum Temperature (°C)		Minimum Temperature (°C)		Annual Average Temperature (°C)
	Temp.	Month	Temp.	Month	
2002	35.5	March	11.2	January	25.9
2003	36.7	June	8.1	January	26.0
2004	38.1	May	10.4	February	26.2
2005	36.6	June	11.4	January	26.6
2006	37.1	April	10.4	January	26.9
2007	37.5	May	9.6	January	26.2
2008	36.9	April	10.5	January	26.4
2009	39.6	April	11.1	January	27.1
2010	37.9	April	9.6	January	27.1
2011	36.2	September	8.2	January	26.3

(Source: Bangladesh Meteorological Department, Climate Division, Agargaon, Dhaka-1207)

Table 2.1.2 Statistics of Precipitation in Dhaka (2002 - 2011)

Year	Maximum Precipitation (mm)		Minimum Precipitation (mm)		Annual Precipitation (mm)
	Precipitation	Month	Precipitation	Month	
2002	446	July	0	December	1795
2003	473	June	0	January	1693
2004	839	September	0	January	2347
2005	542	July	0	December	2637
2006	663	September	0	January	1919
2007	753	July	0	January	2885
2008	577	June	0	November	2385
2009	676	July	0	December	1931
2010	340	August	0	January	1523
2011	409	August	0	January	1776

(Source: Bangladesh Meteorological Department, Climate Division, Agargaon, Dhaka-1207)

2.1.2 Geology, Geomorphology and Ground Condition

a) Geological Features

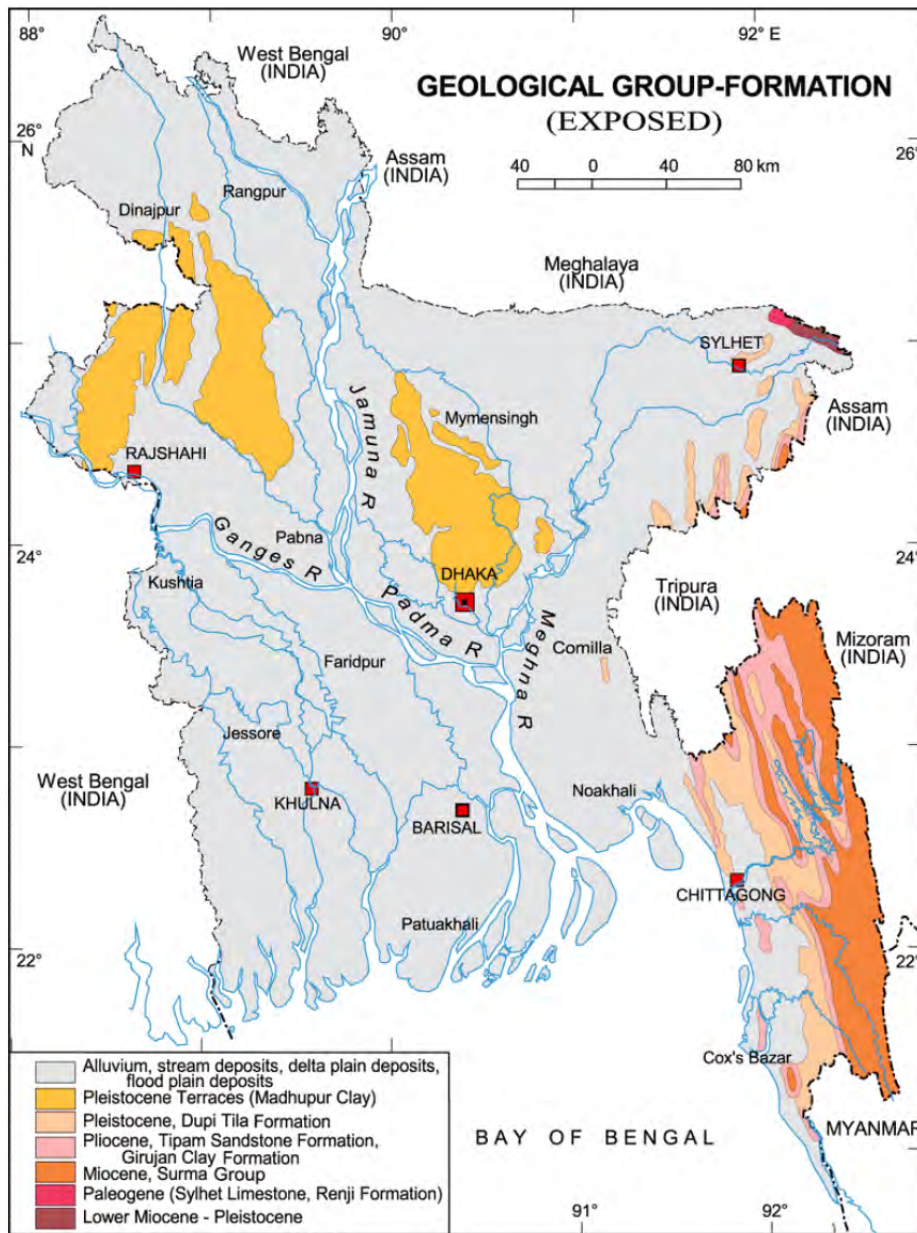
1) Surface Geology

Based on surface geology, whole Bangladesh can be subdivided into seven (7) formations. Table 2.1.3 summarizes the major units of surface geology in Bangladesh. A map of geological group-formation is presented at Figure 2.1.3

Table 2.1.3 Major Formation of Surface Geology of Bangladesh

Formation	Explanation
Alluvium, stream deposits, delta plain deposits and flood plain deposits	Almost whole of Bangladesh, except the folded belt in the eastern and north-eastern parts, is covered with Quaternary deposits. The Holocene fluvial and brackish water sediments are fine grained moderately consolidated or in the coastal region the Holocene Series are unconsolidated deposits, containing several intercalated or inter fingering peat layers.
Pleistocene Terraces (Madhupur Clay)	The Madhupur Clay is almost composed primarily of mottled, red, brown, gray and orange sticky clay containing ferruginous and calcareous nodules as well as laterite. Outcrops of Madhupur Clay are confined to the Madhupur Tract, Barind tract and to the Lalmai Hills comprising a total of 12800 km ² . The Madhupur Tract is situated in the east of the Barhmaputra River. It looks like a chain of isolated circular to elongated low hillocks standing at a higher level than the surrounding flat alluvial plain and is affected by a series of faults. In Madhupur Tract the landmass reaches a maximum height of 17 m from sea level.
Pleistocene Dupi Tila Formation	The Dupi Tila sandstone spreads all over Bangladesh excepting probably the southern two third of the delta south of the Ganges where its presence remains to be explored. It crops out in most of the areas of the hilly regions of Sylhet, Chittagong and Hill Tract districts. Lithological description of Dupi Tila Formation is mostly sandstone, gray to yellow, medium to course grained massive with clay galls and quartz pebbles and granules and very subordinate clay stone, siltstone and ferruginous bands.
Pliocene, Tipam Sandstone Formation, Girujan Clay Formation	The Tipam Sandstone Formation typically consists of gray-brown to pale-gray, course grained, cross bedded, massive sandstone. Coaly fossil wood fragments and silicified tree trunks are often found in this formation. Outcropping Tipam Sandstone deposits occur throughout the Frontal Fold Belt from the southernmost portion of the Chittagong Hill Tracts to Surma Basin. Girujan Clay formation develops conformably and gradationally from the underlying Tipam Sandstone. Red, broen, purple and pale blue mottled clay is the principal constituent. The Girujan Clay Formation represents lacustrine, flood plain and over bank deposits.
Miocene Surma Group	The Surma Group is divided into two Formations: Bhuban and Boka Bil Formation. The Bhuban Formation is composed mainly of sandstones, siltstones, shaly sandstones, shale and lenticular intra formational conglomerates. The Boka Bil Formation is composed of shale, siltstones and sandstones. A limited number of areas exist in Sylhet, Chittagong and Hill Tract districts where the sediments of the Surma Group outcrop or rest concealed beneath shallow alluvium or weathered soil.
Paleogene (Sylhet Limestone, Renji Formation)	Deposits of Renji Formation of Late Paleogene lithostratigraphic unit are exposed long the foothills of the Shillong Massif from the vicinity of Jaintapur in the east to the Dauki Nala in the west. The Renji Formation consists of course grained sandstone, carbonaceous shale intercalations, lenses of coal and of a few horizons of conglomeratic sandstone.

(Modified from Reiman, Klaus-Ulrich, 1993)



Modified from Reimann, Klaus-Ulrich, 1993

(Banglapedia, Modified from Reiman, Klaus-Ulrich, 1993)

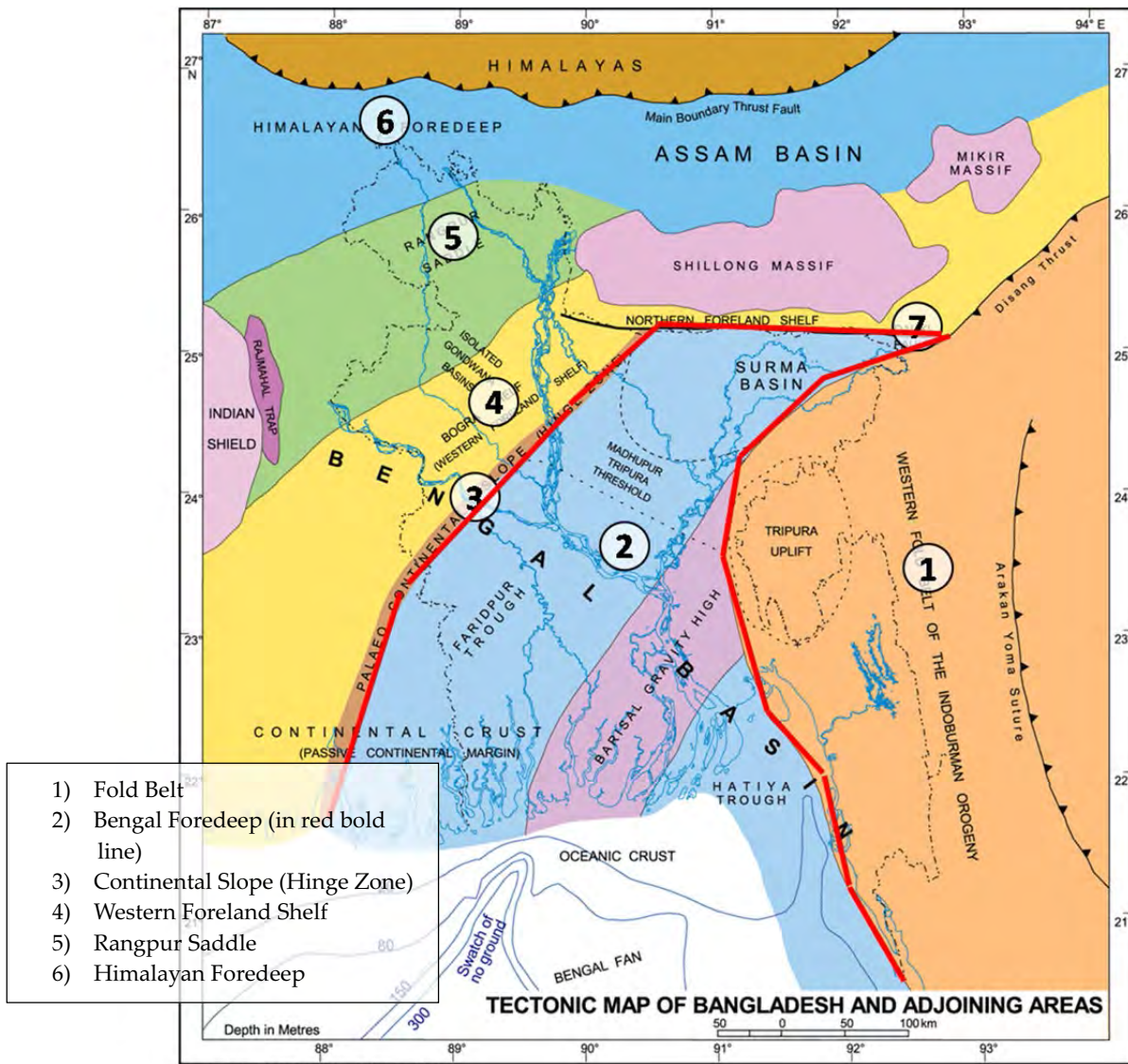
(http://en.banglapedia.org/index.php?title=Geological_Group-Formation)

Figure 2.1.3 Surface Geology of Bangladesh

More detailed surface geology map prepared by Geological Survey of Bangladesh (GSB) is shown in Appendix 1.

2) Structural Elements and Fault

Figure 2.1.4 shows geologically structural elements of Bengal Basin. Major seven types are described as follows, 1) Fold Belt, 2) Bengal Foredeep, 3) Continental Slope, 4) Western Foreland Shelf, 5) Rangpur Saddle, 6) Himalayan Foredeep, 7) Dauki Fault Zone.



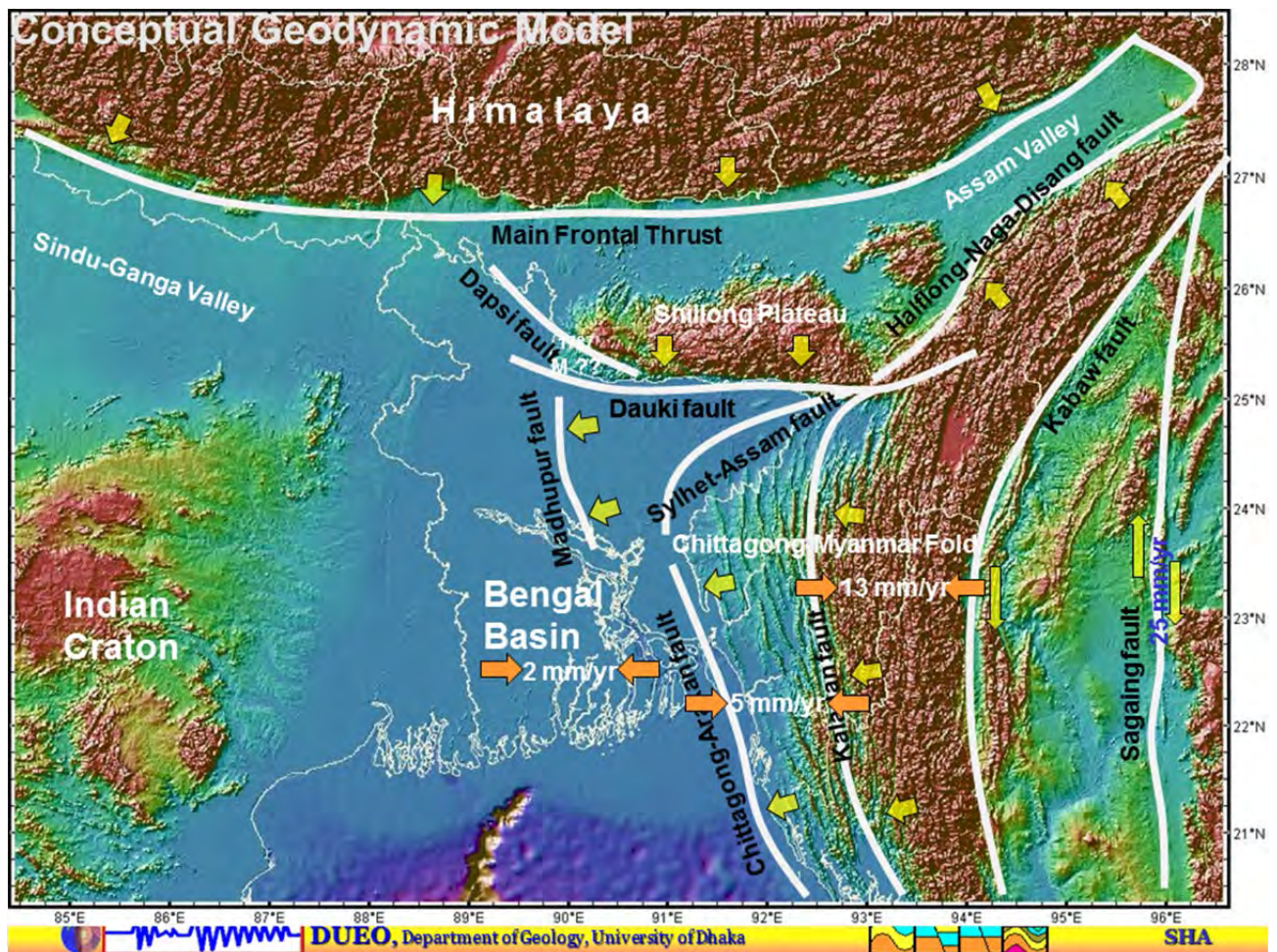
Source: Guha (1978), GSB (1990), Reimann (1993)

(Source: Banglapedia, after Guha, 1978 and Reimann, 1993) (http://www.bpedia.org/T_0104.php)

Figure 2.1.4 Structural Elements of the Bengal Basin

Figure 2.1.5 shows distribution of fault in Bangladesh. Eastern area called Chittagong Myanmar Fold has the feature that faults are densely distributed. The velocity gradients indicate 13 mm/year in E-W shortening. The Hinge Zone in Figure 2.1.4, western part of the Madhupur fault is characterized by a series of step faults across its length and a seismically active zone. Madhupur fault was assumed as the most severe scenario event for seismic assessment in Dhaka in CDMP (Comprehensive Disaster Management Programme, Ministry of Disaster Management and Relief).

However, study on active faults still in the progressing stage, such as CDMP's works during 2006 -2009 and 2010-2015. These studies have revealed several important findings.



(Source: Syed Humayun Akhter, Dhaka University Earth Observatory, 2012)

Figure 2.1.5 Distribution of Fault in Bangladesh

b) Ground Condition

Ground conditions are studied by field investigation of subsoil profiles and from boreholes and soil tests. Not only lithological sampling test at laboratory, but value of Standard Penetration Test (SPT, N value) are important to estimate average shear wave velocity related to seismic ground amplification. N value features are classified by two soil types, cohesive soil or no cohesive one. The classification is summarized at Table 2.1.4.

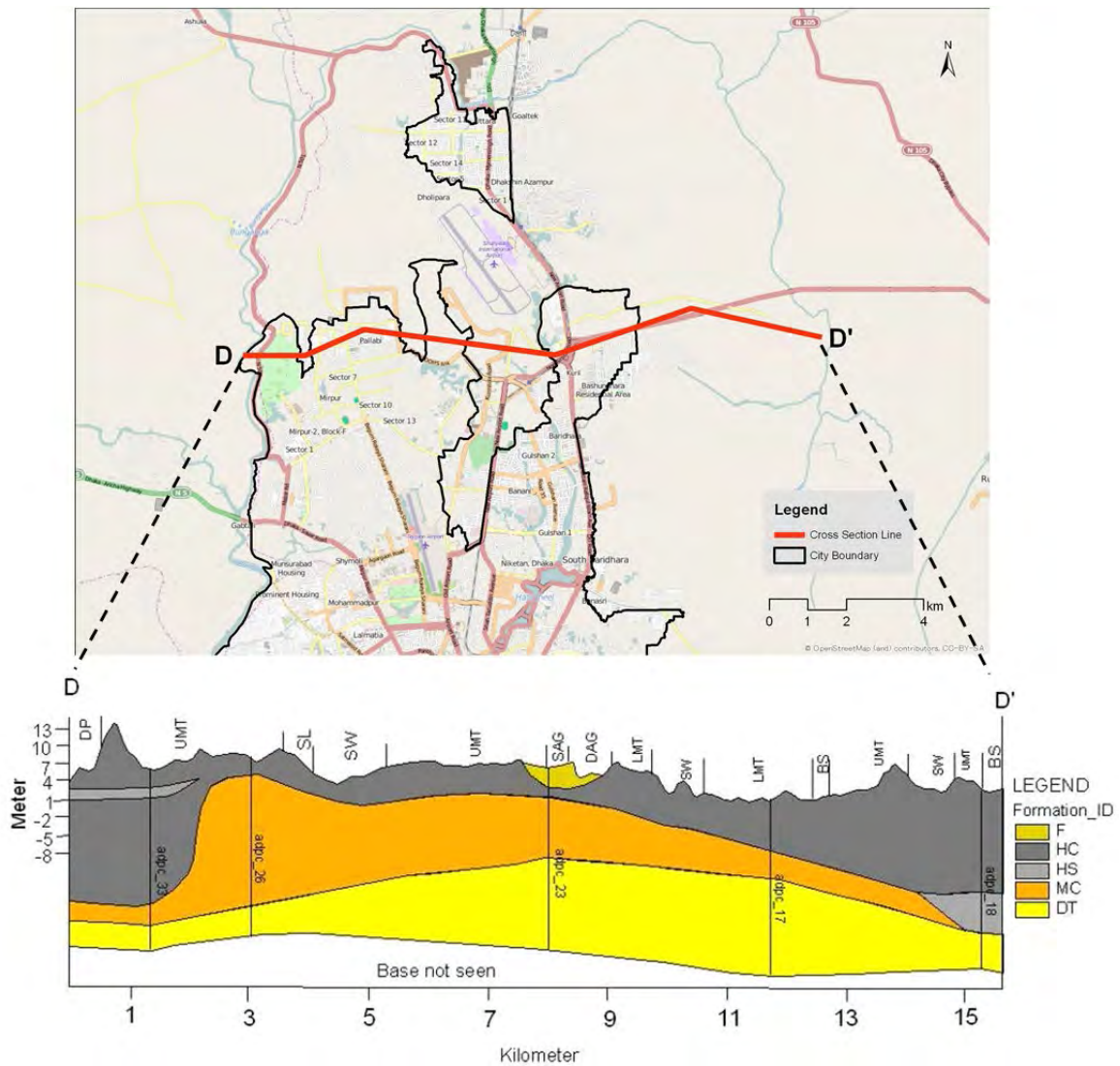
In this survey, 53 subsoil profiles, at some of which PS-logging to detect shear wave velocity distribution at borehole were conducted, were confirmed in the project CDMP (2009). Figure 2.1.6 is a model cross section of Dhaka city, and Figure 2.1.7 presents distribution of such boreholes with geomorphic map as background.

General feature of ground condition in Dhaka is that cohesive soil layer exists at 4 to 15 meters depth from the ground surface. Medium dense to dense sand layer underlies the clay layer. In some area, plastic silt and non-plastic silt layers are encountered underlying the upper clay layers.

Table 2.1.4 Classification of SPT (N value)

(A) Cohesive Soil		
SPT Value	Type	Remarks
0-2	Very soft	Not suitable for civil structures, good for park.
2-4	Soft	Not suitable for civil structures, good for park.
4-8	Medium	Good for very light structure using proper methods
8-15	Stiff	Good for low load bearing structures
15-30	Very Stiff	Good for moderate load bearing structures
>30	Hard	Good for high load bearing structures.
(B) Non Cohesive Soil		
SPT Value	Type	Remarks
0-4	Very loose	Not suitable for civil structures, good for park.
4-10	Loose	Good for very light structure using proper methods
10-30	Medium dense	Good for low load bearing structures
30-50	Dense	Good for moderate load bearing structures
>50	Very dense	Good for high load bearing structures.

(Terzaghi and Peck, 1967, and BS 5930, 1981)



F: Fill, HC: Holocene Clayey Soil, HS: Holocene Sandy Soil, MC: Modhupur Clay, DT: Dupi Tila layer

Figure 2.1.6 Schematic Geological Cross Section of E-W direction in Dhaka

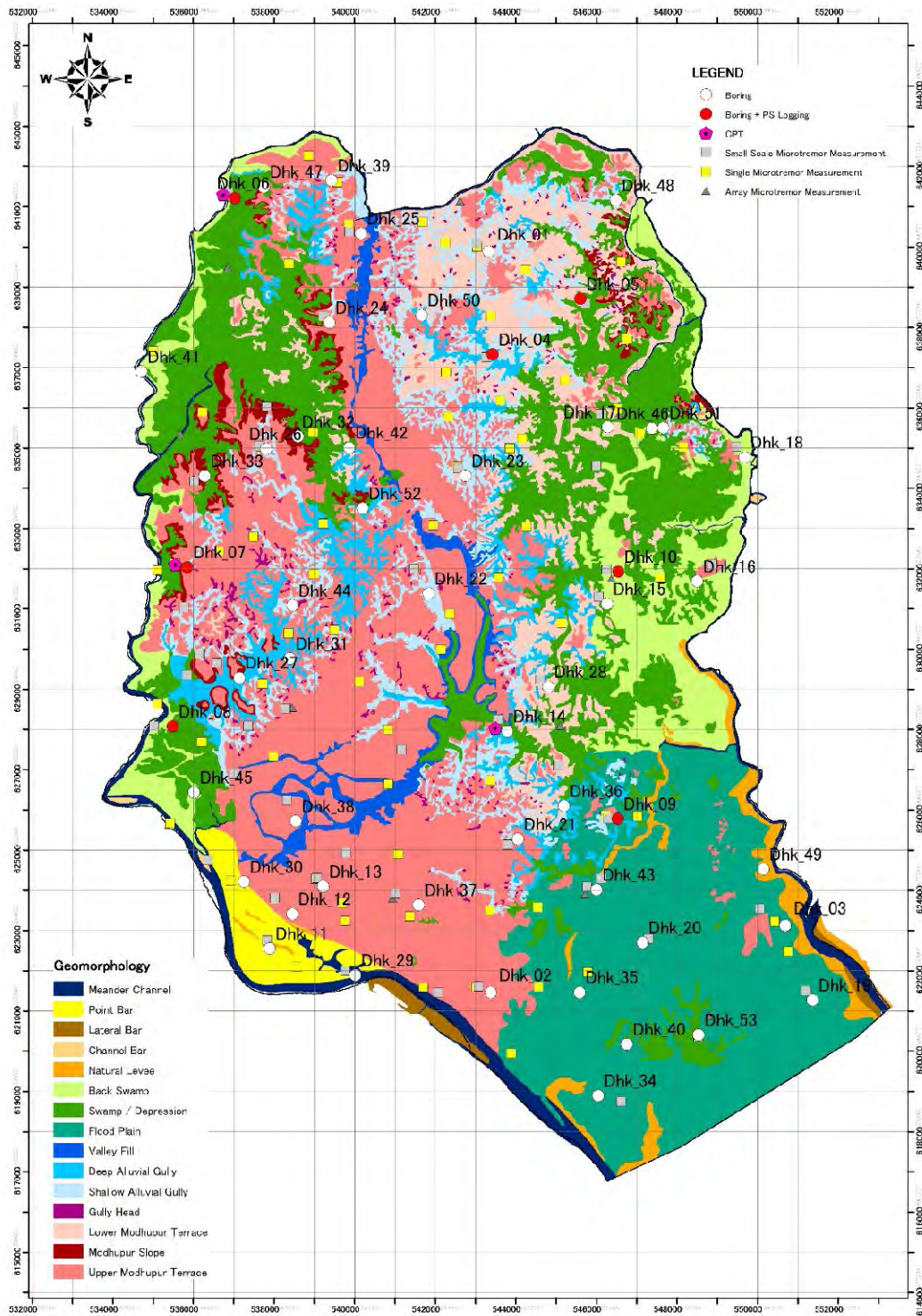


Figure 2.1.7 Distribution of Borehole in CDMP(2009) (on geomorphic map edited by GSB)

c) Geomorphology

1) Geomorphology of Bangladesh

Topographically, Bangladesh is a plain land except the hills regions of east and northeast. The plain land mainly consists of fluvio-deltaic sediments deposited by the Ganges, the Brahmaputra and the Meghna river systems.

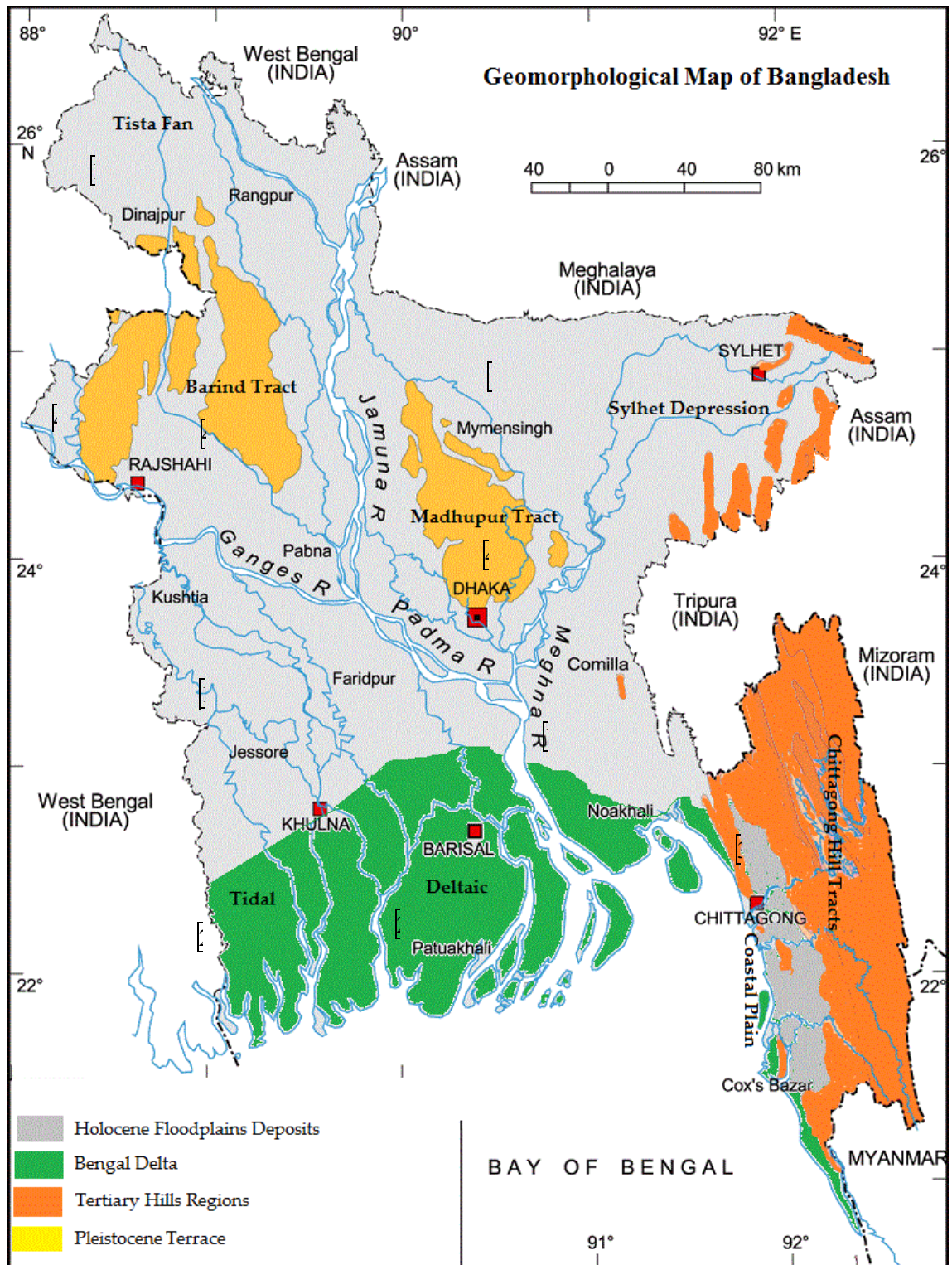
According to geomorphic consideration, Bangladesh can be divided into four distinct regions each having distinguishing characters of its own. The overview of the geomorphological classification is presented at Table 2.1.5. Figure 2.1.8 shows the geomorphological map for Bangladesh.

- i) The Holocene Floodplains of the three major river systems
- ii) The Bengal Delta
- iii) The Eastern and Northeastern Tertiary* Hills Regions
- iv) The Pleistocene Terrace or the Pleistocene Uplands

Table 2.1.5 Major Geomorphological Classification in Bangladesh

Name	Percentage of Area (%)	Elevation (meters)	Geomorphological Characteristics
1] Holocene Floodplains	40	3 – 14	It consists of a large alluvial basin floored primarily with Quaternary sediments deposited by the Ganges, Meghna and Brahmaputra rivers. The land is fertile and many swamps are distributed. Soft clay, silt or silty clay layers are deposited.
2] Bengal Delta	32	0 – 3	It is southern coastal low land. The present Delta appears to be a combination of three deltas, namely the Ganges delta, the Old Brahmaputra-Meghna delta and the Ganges-Jamuna-Meghna delta. The sediments of nearly four-fifth of the delta have been deposited by the Ganges.
3] Eastern and North eastern Tertiary* Hills Regions	18	– 61	It consists of hills of Lalmai and north-eastern Sylhet district and a narrow strip of a series of low hill ranges and isolated circular and elongate hillocks. High north-south striking hill ranges occupy wholly the districts of Chittagong and Hill Tract and extend to the northern frontier of districts of Sylhet and Mymensingh.
4] Pleistocene Terrace or the Pleistocene Uplands	10	– 55 (average: 15)	It is composed of low hills and terraces. The land has a bit higher elevation than flood plain. Lithological feature is primarily of mottled, red, brown, gray and orange sticky clay containing ferruginous and calcareous nodules as well as laterite.

* Tertiary is a period including two geological eras, Miocene and Pliocene.



(Source: Banglapedia, modified from Reiman, Klaus-Ulrich, 1993, Alam et al, 1990)
 (Numbers are added in this survey)

Figure 2.1.8 Geomorphological Map of Bangladesh

2) Geomorphology of Dhaka City Corporation

Rahman and Karim (2005) have described the details of the above geomorphological units from the following geological-geotechnical point of view. Table 2.1.6 summarizes these zones.

Table 2.1.6 Geomorphology of Dhaka City Corporation (Rahman and Karim (2005))

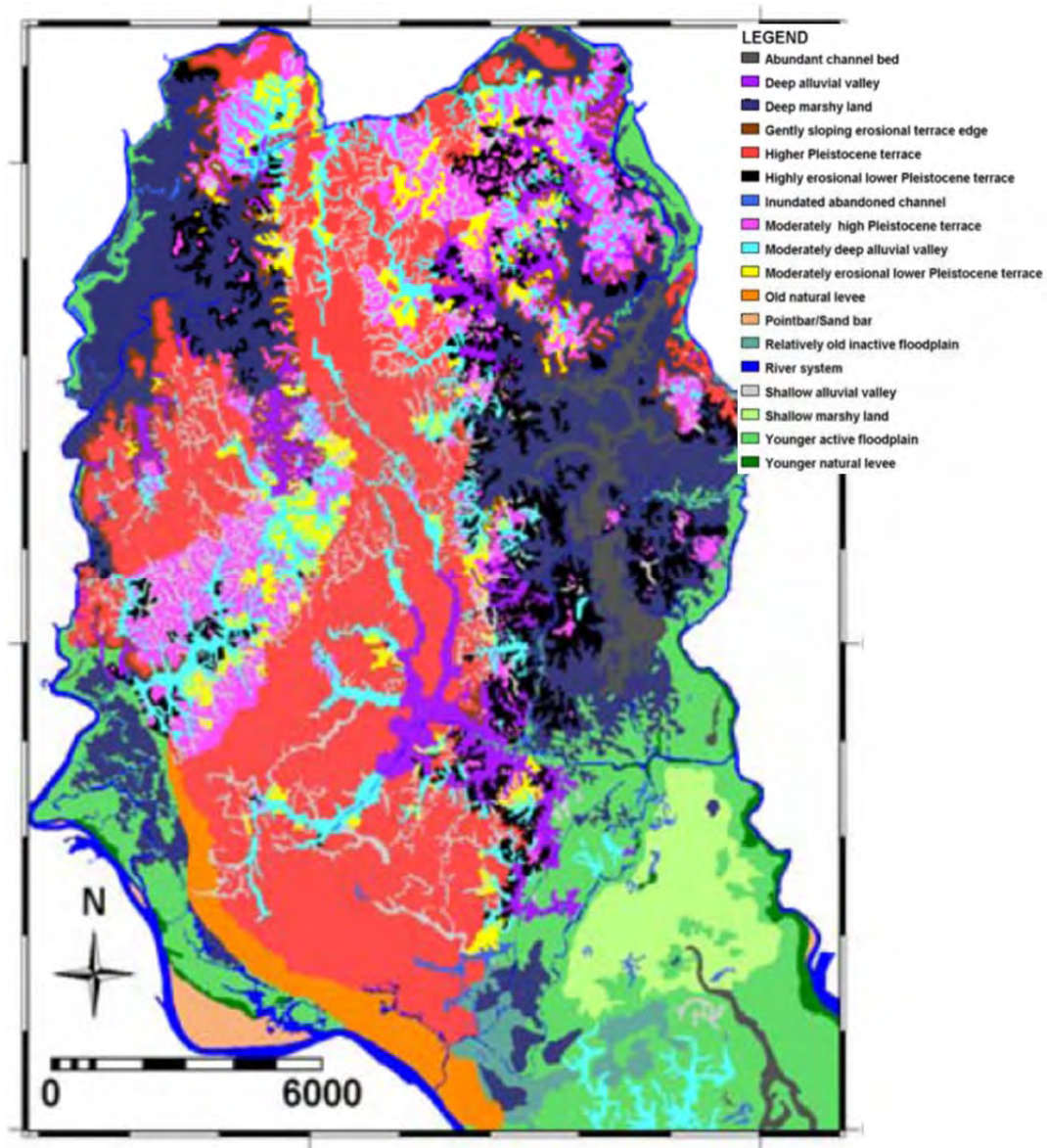
Zone	Name	Explanation
Zone 1	Central High Area	The Central High Area forms the axial zone and extends northward up to Gazipur and beyond. The Madhupur Clay Formation is well exposed throughout the zones. This zone has been rated as Class 1 type ground condition, which is composed of very stiff to hard reddish brown clay to silt and sand (complete Madhupur Formation), having better engineering properties of the materials and considered to produce less ground motion than the other two zones.
Zone 2	Complex of High and Low Areas	The Complex of High and Low areas consists of small domes of nodes of the Madhupur Clay Formation which is exposed at lower elevation or buried under thin cover of young alluvium or fill materials. The zone is rated as Class 2 type. The elevation of this zone is below the central zone. The materials are moist and have lower shear strength than the elevated materials. The inter-depressions of this zone are sometimes filled up with very soft clay, organic clay and peat deposits (sometimes Mangrovs). The materials are often compressible and suffer strong ground motion to severe destruction.
Zone 3	Complex Low Areas	The complex of Low Area is located in the eastern and western periphery of Dhaka City. This zone is formed of very soft clay-silt in the east and flood plain of silty sand in the west. This zone has been rated as Class 3 type. The general elevation of this zone is below the Complex of High and Low areas. The materials are very soft and susceptible to compression and liquefaction.

Recently some geomorphological maps were prepared by Kamal (2004) and Atlas of Urban Geology, vol. 11. Those detailed environmental subdivisions of Quaternary sediments are the pioneer works in Bangladesh. Figure 2.1.9 presents the geomorphological map. The units in GSB map are classified into two landforms, Denudation Landform and Fluvial Landform. (See Table 2.1.7)

Table 2.1.7 Geomorphic Units in Dhaka (GSB)

Topographic Unit	Geomorphic Units
Denudation Landform	Modhupur High, Modhupur Low, Slope and Gully head
Fluvial Landform	Active Channel, Abandoned Channel, Natural Levee, Crevasse Splay, Point Bar, Ridge, Swel, Channel Bar, Flood Plain, Depression, Shallow Aluvial Gully, Deep Valley Fill

(Source: Urban Geology vol.11, Geological Survey of Bangladesh, 2009)



(ASM Maksud Kamal, Final Report on Quaternary Geological Mapping of Dhaka, Chittagong and Sylhet Cities, CDMP)
 (Kamal, A.S, and S. Midorikawa, International Journal of Applied Earth Observation and Geoinformation 6, 2004)

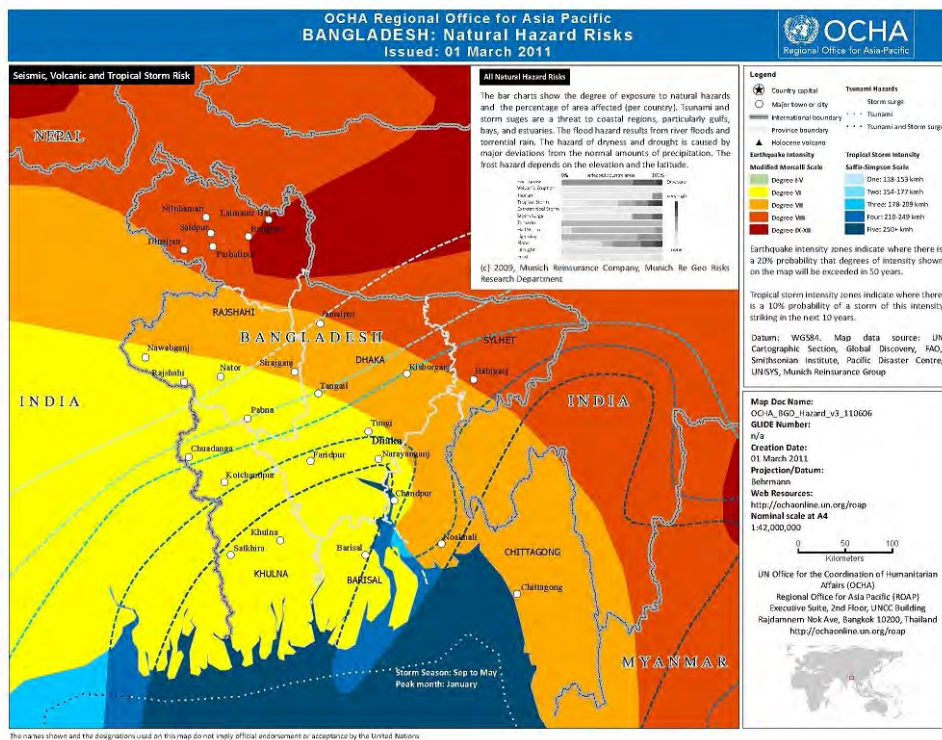
Figure 2.1.9 Geomorphological Map of Dhaka

2.1.3 Natural Disaster and Estimation of Natural Hazards and Risks

a) Natural Hazards in Bangladesh

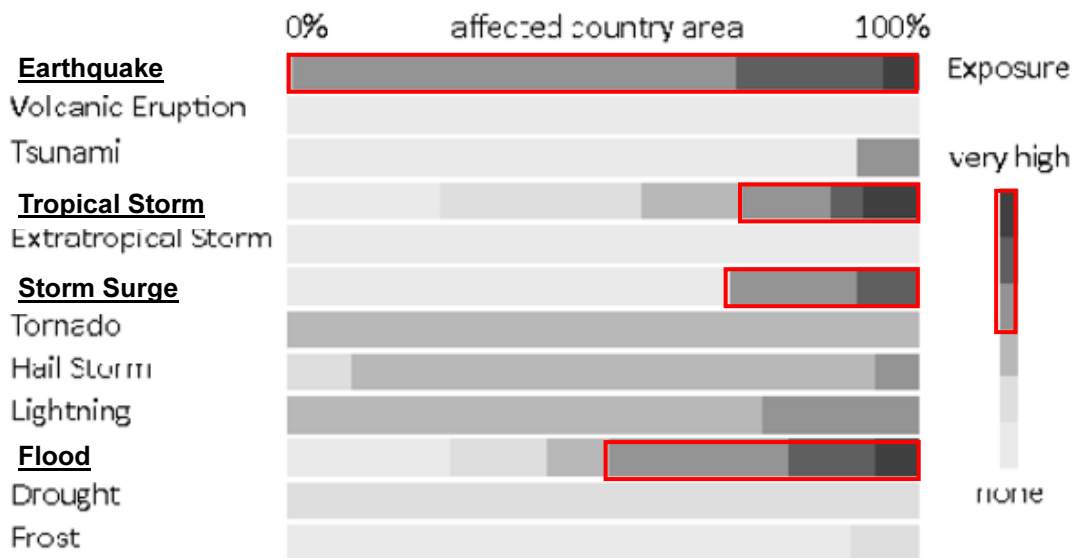
Major natural disasters in Bangladesh are floods and tropical cyclones in the aspect of frequency. Although its frequency is relatively low, earthquakes affect in large area in the country once it strikes. Figure 2.1.10 presents natural disaster risk map of Bangladesh prepared by OCHA (2011), which shows statistical seismic intensity with 20 percent in return period of 50 years and statistical wind speed of tropical cyclone with 10 percent in return period of 10 years. From this map, seismic risk of MMI six or seven level is estimated in most of the country and MMI eight or higher level is estimated in northern region. Regarding wind speed, Saffir-Simpson Scale 4 is estimated in southern region including Dhaka.

Figure 2.1.11 is the expanded bar chart comparing affection of natural hazards to the country area, from which relative index can be calculated by multiplying the relative value with ratio of the affecting area to the country. From this bar chart, it is confirmed that earthquake and flood affect in higher level, followed by tropical cyclone and storm surge in second level. Red lines are added in the figure for better understanding.



(Source: OCHA, 2011)

Figure 2.1.10 Natural Hazards in Bangladesh



(Source: (c) 2009, Munich Reinsurance Company, Munich Re Geo Risks Research Department)

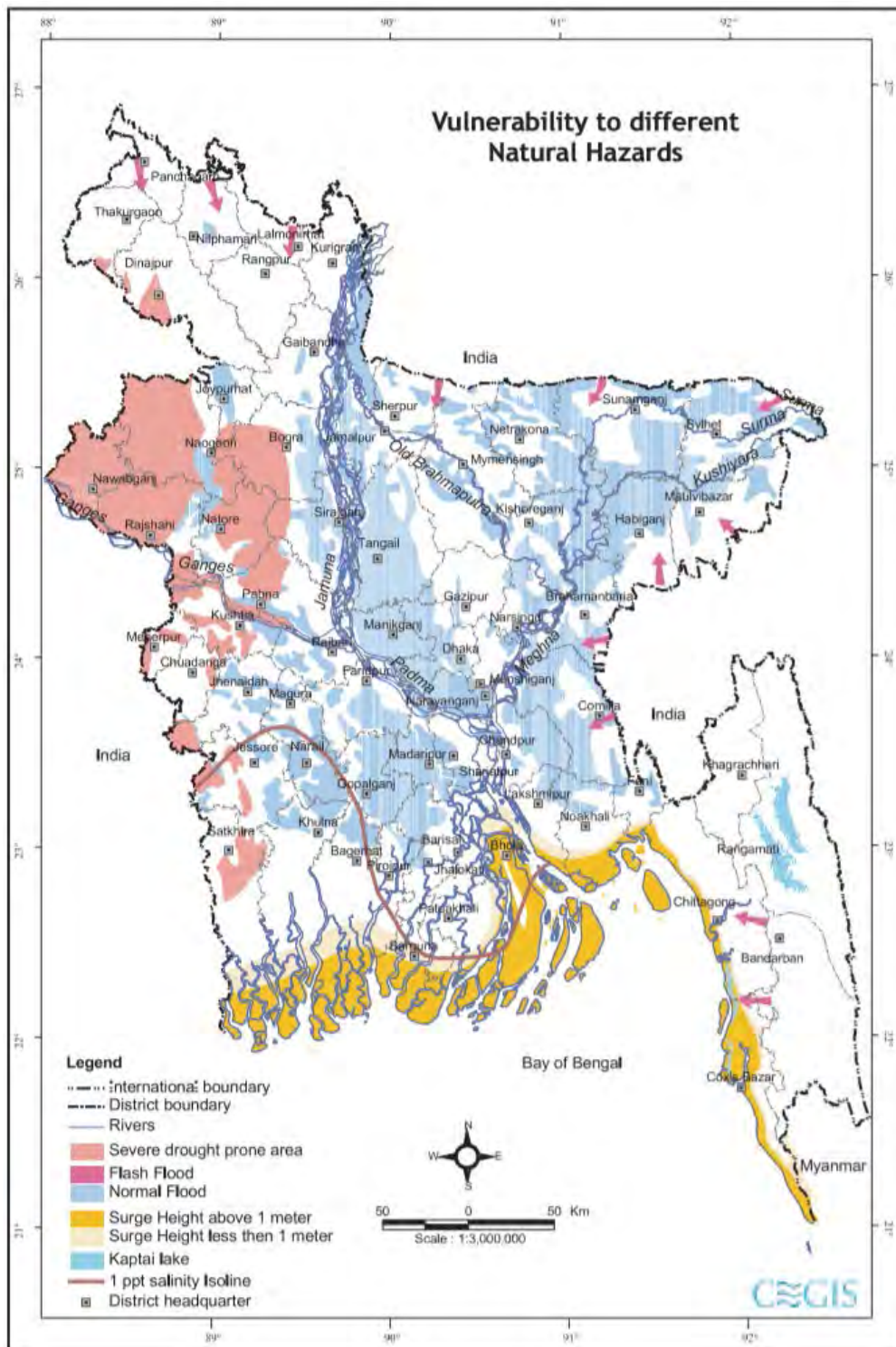
Figure 2.1.11 Comparison of Affection to the Country by Natural Hazards

In Figure 2.1.11, flood and tropical cyclone and storm surge are in relation with climate change. In the future, Bangladesh will be affected by such worldwide climate change as fluctuations of temperature, sea level or precipitation. Increase of natural disasters in Bangladesh is concerned due to climate change.

Figure 2.1.12 presents vulnerability of flood, storm surge and drought in Bangladesh. From this figure, storm surge is seen in the southern coastal region facing the Bay of Bengal and drought is seen in a part of western region.

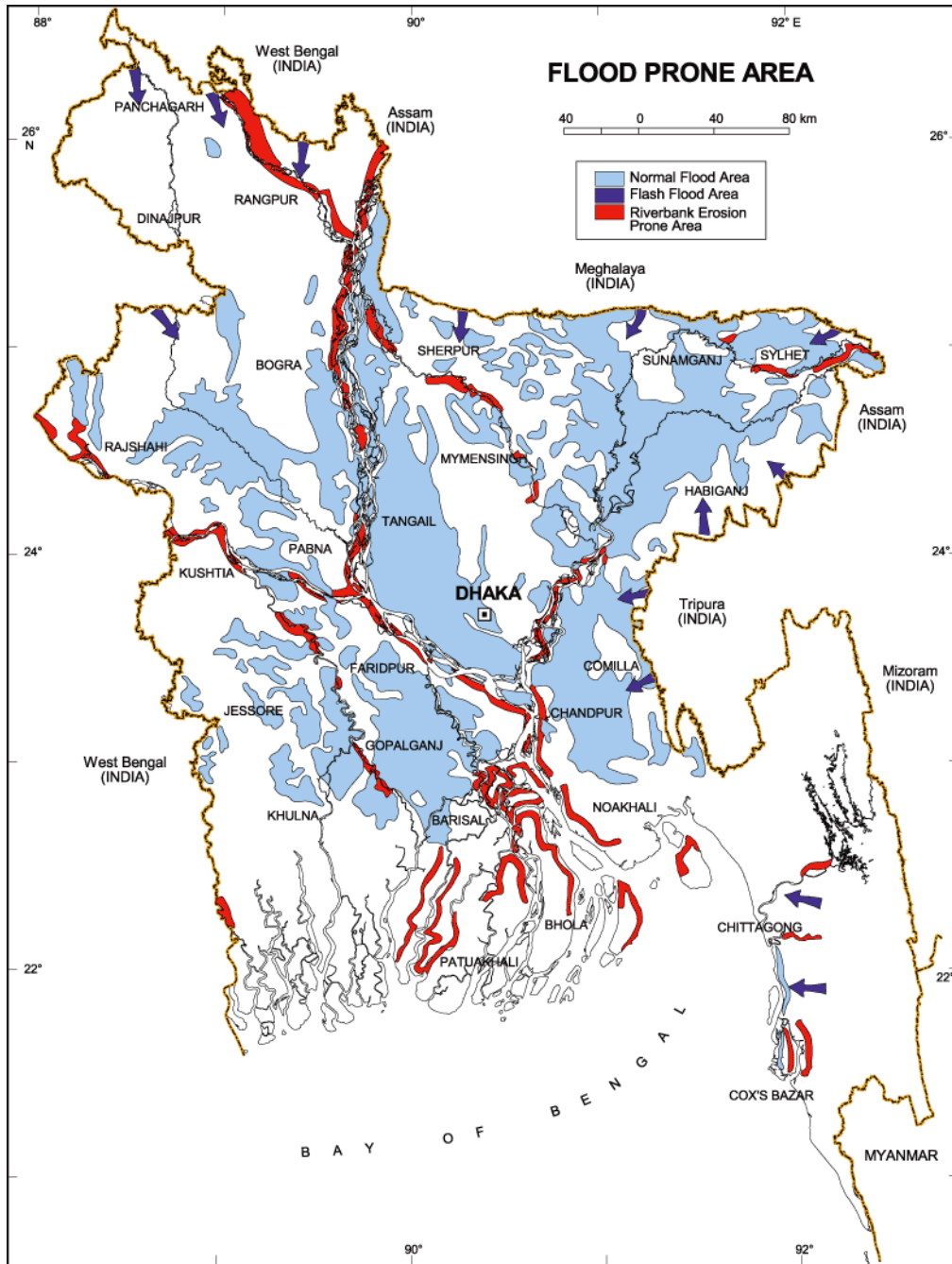
Flood is classified in two types; flash flood and normal flood. Flash flood prone area is limited in mountain side. Meanwhile, normal flood hazardous area distributes all over the country including Dhaka.

Figure 2.1.13 shows hazard map of bank erosion which occurs along major rivers' embankments. From this map, it is seen that Dhaka and around area is less affected by bank erosion risk. It may be because Dhaka city doesn't adjoin directly major three rivers or doesn't have such large embankment as being eroded by rivers.



(Source: Bangladesh Climate Change Strategy and Action Plan, MoEF, 2009)

Figure 2.1.12 Vulnerability of Natural Hazards in Bangladesh



(Web site: <http://www.poribesh.com/Maps/Flood.htm>)
 (Source: Disaster Management Bureau, 1992)

Figure 2.1.13 Map of Flood Prone Area and Riverbank Erosion

b) Major Natural Disasters occurred recently in Bangladesh

1) Overview

After 1970 up to now, Bangladesh experienced many natural disasters killing a lot of people. The recent disaster records are summarized in Table 2.1.8. From this table, it is obvious that most of the disasters are floods or tropical cyclones. On the other hand, Dhaka has not experienced earthquake disasters over four decades.

Table 2.1.8 Recent Major Natural Disasters

Year	Disaster Type	Number of Killed
1970	Tropical Cyclone	300,000
1988	Flood	2,373
1988	Tropical Cyclone	5,704
1989	Drought	800
1991	Tropical Cyclone	138,868
1996	Tornado	545
1997	Tropical Cyclone	550
1998	Flood	1,050
2004	Flood	747
2007	Tropical Cyclone	3,363
2007	Flood	554

(Source: ADRC web site, 2010)

2) Tropical Cyclone

From Table 2.1.8, most affecting natural disaster in Bangladesh is tropical cyclone. Especially 1970 and 1991 disasters experienced large number of fatalities. From this point of view, tropical cyclone affects the country area of Bangladesh as well as floods.

Table 2.1.9 presents a list of tropical cyclone that landed Bangladesh from 1960 up to 2013. It is observed that number of death is getting smaller.

While it was reported that some outcome of construction of cyclone shelters supported by foreign donors was effective during the disaster, it was pointed out that the height of tide by the cyclone was reduced at low tide by chance. (Source: Kusakabe 2011, <http://repository.cc.sophia.ac.jp/dpace/handle/123456789/33965>)

Table 2.1.10 summarizes the two major tropical cyclone disasters. Although 1970 cyclone was not so strong in pressure and wind speed as 1991 one, its number of fatalities is the largest in the world's cyclone history.

Table 2.1.9 Tropical Cyclone landed Bangladesh (1960 - 2013)

Date of Occurrence	Nature of Phenomenon	Landfall Area	Max Wind Speed in km/hr.	Tidal Surge Height in ft.	Central Pressure (hPa)	Death Toll
11.10.60	Severe Cyclonic Storm	Chittagong	160	15	-	
31.10.60	Severe Cyclonic Storm	Chittagong	193	20	-	
09.05.61	Severe Cyclonic Storm	Chittagong	160	8-10	-	
30.05.61	Severe Cyclonic Storm	Chittagong (Near Feni)	160	6-15	-	
28.05.63	Severe Cyclonic Storm	Chittagong- Cox's Bazar	209	8-12	-	
11.05.65	Severe Cyclonic Storm	Chittagong-Barisal Coast	160	12	-	
05.11.65	Severe Cyclonic Storm	Chittagong	160	8-12	-	19,279
15.12.65	Severe Cyclonic Storm	Cox's Bazar	210	8-10	-	873

01.11.66	Severe Cyclonic Storm	Chittagong	120	20-22	-	850
23.10.70	Severe Cyclonic Storm of Hurricane intensity	Khulna-Barisal	163	Mode-rate	-	
12.11.70	Severe Cyclonic Storm with a core of hurricane wind	Chittagong	224	10-33	-	300,000
28.11.74	Severe Cyclonic Storm	Cox's Bazar	163	9-17	-	
10.12.81	Cyclonic Storm	Khulna	120	7-15	989	
15.10.83	Cyclonic Storm	Chittagong	93	-	995	
09.11.83	Severe Cyclonic Storm	Cox's Bazar	136	5	986	
24.05.85	Severe Cyclonic Storm	Chittagong	154	15	982	11,069
29.11.88	Severe Cyclonic Storm with a core of hurricane wind	Khulna	160	2-14.5	983	
18.12.90	Cyclonic Storm (crossed as a depression)	Cox's Bazar Coast	115	5-7	995	
29.04.91	Severe Cyclonic Storm with a core of hurricane wind	Chittagong	225	12-22	940	138,882
02.05.94	Severe Cyclonic Storm with a core of hurricane wind	Cox's Bazar-Teknaf Coast	278	5-6	948	
25.11.95	Severe Cyclonic Storm	Cox's Bazar	140	10	998	
19.05.97	Severe Cyclonic Storm with a core of hurricane wind	Sitakundu	232	15	965	155
27.09.97	Severe Cyclonic Storm with a core of hurricane wind	Sitakundu	150	10-15	-	
20.05.98	Severe Cyclonic Storm with core of hurricane winds	Chittagong Coast near Sitakunda	173	3		
28.10.00	Cyclonic Storm	Sundarban Coast near Mongla	83	-	-	
12.11.02	Cyclonic Storm	Sundarban Coast near Raimangal River	65-85	5-7	998	
19.05.04	Cyclonic Storm	Cox's Bazar Coast between Teknaf and Akyab	65-90	2-4	990	
15.11.07	Severe Cyclonic Storm with core of hurricane winds (SIDR)	Khulna-Barisal Coast near Baleshwar river	223	15-18	942	3363
25.5.2009	Cyclonic Storm (AILA)	West Bengal-Khulna Coast near Sagar island	70-90	4-6	987	190
16-05-2013	Cyclonic Storm (CS) 'MAHASEN'	The cyclonic storm Mahasen completed crossing Noakhali-Chittagong coast .	100 kph, NW'ly	-	-	

(Source: Bangladesh Meteorological Department, Climate Division)

Table 2.1.10 Two major Tropical Cyclone severely having affected Bangladesh

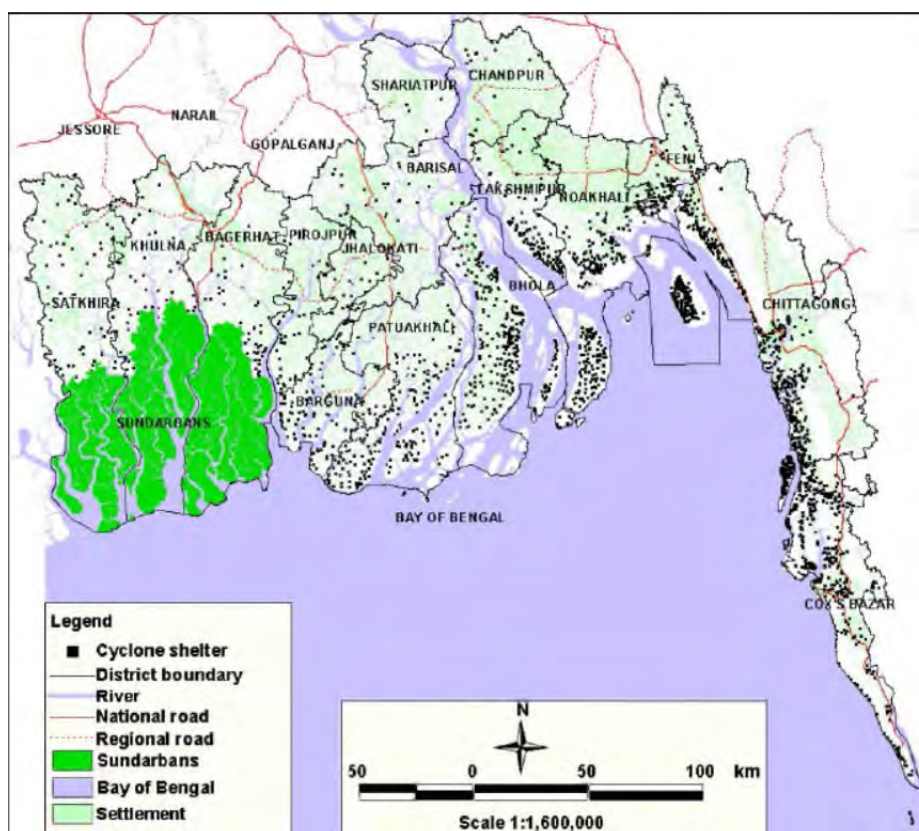
Name	1970 Bhola cyclone	1991 BOB 01
Category	Very severe cyclonic storm Category 3	Super Cyclonic storm Category 5
Period	November 3 - 13, 1970	April 24 - 30, 1991
Economic loss (USD)	86.4 million	1.7 billion
Fatalities	300,000	138,866
Affected Area	East Pakistan (Bangladesh) India	Bangladesh
Highest winds (km/h)	205	260
Lowest pressure (hPa)	966	918

(Source: BMD, NOAA web site)

3) Measures to Tropical Cyclone

For the purpose of evacuation of people living in the southern coastal area to prevent Tsunami and Tropical Cyclone, many cyclone shelters have been constructed in the area. The survey of the cyclone shelters implemented by CDMP (2009) revealed the distribution of the shelters, condition and utilities of the facilities. Figure 2.1.14 shows the distribution of the shelters by Ministry of Disaster Management and Relief (MoDMR, 2013). There exist 3751 cyclone shelters in the coastal 15 districts along the Bay of Bengal. [Emergency Preparedness Plan for Cyclone] On the other hand, 85 rescue boats for 25 to 30 people were equipped in 37 Upazilas.

The Cyclone shelter construction Plan by Japanese loan fund cooperation was implemented in 2008 to support the damage by 2007 tropical cyclone Sidr.



(Source: Emergency Preparedness Plan for Cyclone Bangladesh, 2013, Department of Disaster Management, Ministry of Disaster Management and Relief)

Figure 2.1.14 Distribution of Cyclone Shelters in the Coastal Area

4) Flood

Flood is the most frequent disaster for Bangladesh. Table 2.1.11 summarizes major flood disasters affected Dhaka city since 18th century. The flood inundation map of 1988 September disaster which is one of the largest flood disaster recently is overviewed in Figure 2.1.15 and 2.1.16.

Table 2.1.11 A List of Flood Disasters in Bangladesh (1781 - 2007)

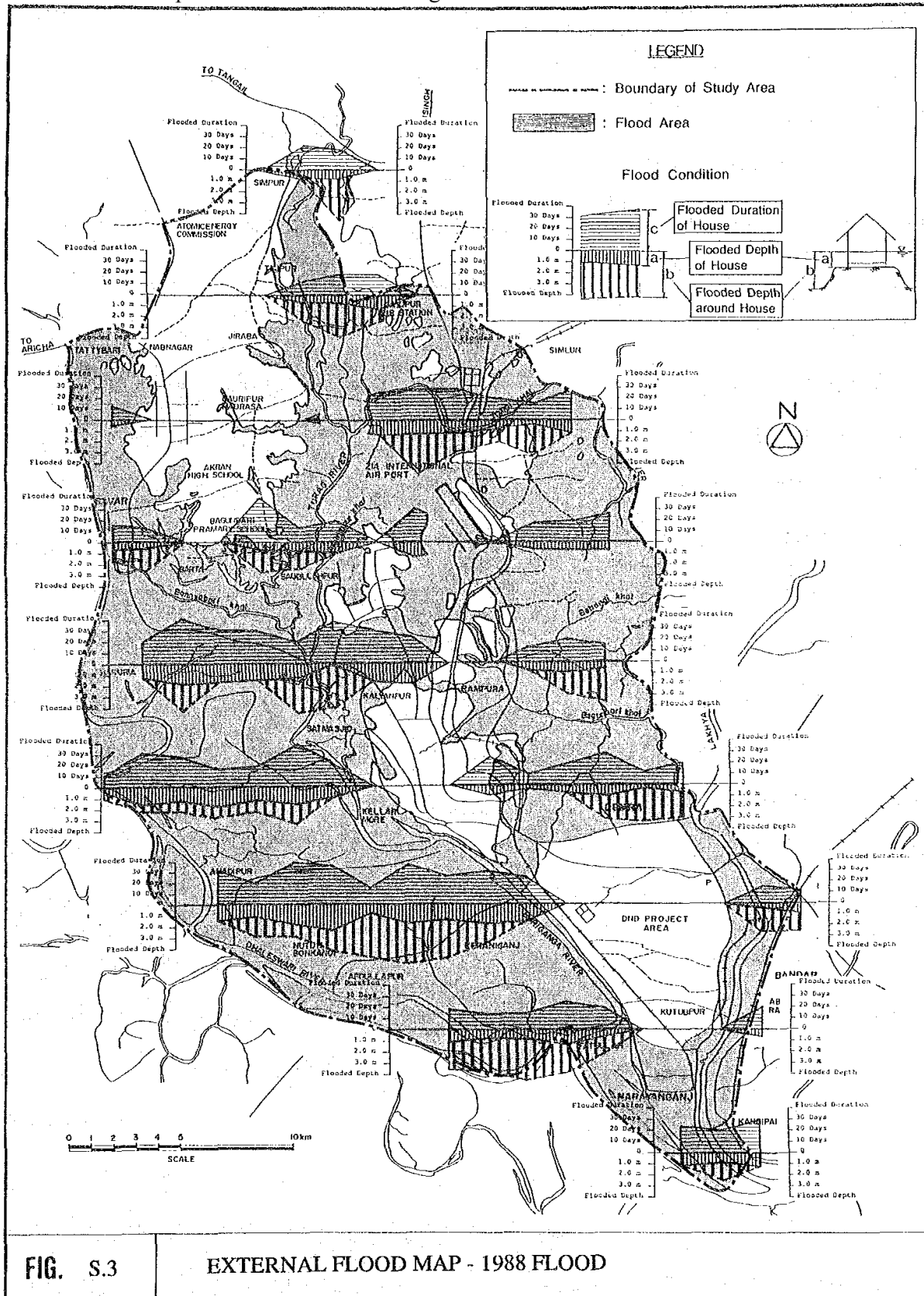
Year	Damaged Area	Number of Death	Summary of Damage and property lose
1781	Sylhet	---	Western part of Sylhet district inundated. The cattle suffered much from the loss of fodder.
1786	Sylhet, Bakerganj, Tippera	---	Floods in the Meghna caused destruction to the crops and immense destruction of the villages on the banks. It was followed by a famine, which caused great loss of life at Bakerganj. At Tippera the embankment along the Gumti gave way. At Sylhet the Parganas were entirely under water, the greater part of the cattle drowned and those surviving were kept on bamboo rafts.
1822	Bakerganj, Patuakhali, Barisal, Bhola, Manpura	39940	Bakerganj division and Patuakhali subdivision were seriously affected, 39,940 people died and 19,000 cattle perished and properties worth more than 130 million taka were destroyed. Barisal, Bhola and Manpura were severely affected.
1838	Rajshahi, Pabna, Kustia, Faridpur	---	Heavy rainfall caused extensive inundation at Rajshahi and a number of other districts. The cattle suffered much from loss of fodder and the people were greatly inconvenienced when driven to seek shelter on high places and when the water subsided cholera broke out in an epidemic form.
1864	Rajshahi	---	Serious inundation when the embankment was breached and the water of the Ganges flooded the greater part of Rajshahi town. There was much suffering among the people who took shelter with their cattle on the embankment.
1871	Rajshahi, Kustia, Pabna	---	Extensive inundation in Rajshahi and a few other districts. Crops, cattle and valuable properties were damaged. This was the highest flood on record in the district. Cholera broke out in an epidemic form.
1876	Barisal, Patuakhali, Galachipa, Bauphal	215000	Barisal and Patuakhali were severely affected. Meghna overflowed by about 6.71m from the sea level. Galachipa and Bauphal were damaged seriously. A total of about 215,000 people died. Cholera broke out immediately after flood.
1902	Sylhet	---	At Sylhet the general level of the river went so high that there was terrible flood. Crops and valuable properties were damaged.
1904	Cox's Bazar, Kutubdia Island, Mymensingh	---	The crops in some parts of Cox's Bazar subdivision and Kutubdia Island were damaged due to an abnormally high tide. This flood was exceptional in severity in Mymensingh. The distress caused on this occasion is probably the nearest parallel to that which resulted from the flooding of the Tista in 1879, when the change in the course of Brahmaputra began.
1954	About 25% area including Dhaka	112	About 36920 square km area (25% area) inundated, about 0.7 million tons crops were damaged. Dhaka district went under water. On August 1 flood peak of the Jamuna river at Sirajganj was 14.22m and on August 30 flood peak of the Ganges river at Hardinge bridge was 14.91m.
1955	About 34 % area including 30% of Dhaka district	129	About 50700 square km area (34% area) inundated, more than 30% of Dhaka district was flooded. The flood level of the Buriganga exceeded the highest level of 1954.
1956	About 24% area	---	About 35620 square km area (24% area) inundated, about 0.7 million tons crops were damaged.
1962	About 25% area	117	About 37440 square km area (25% area) inundated, about 1.2 million tons crops were damaged. The flood occurred twice, once in July and again in August and September. Many people were affected and crops

			and valuable properties were damaged.
1966	Dhaka, Sylhet	39	One of the most serious floods that ever visited Dhaka occurred on 8 June 1966. About 25% of houses were badly damaged, 39 people died and 10,000 cattle were lost, and about 1,200,000 people were affected. On September 15 Dhaka city became stagnant due to continuous rainfall for 52 hours, which resulted in pools of water 1.83m deep for about 12 hours.
1968	About 25% area	126	About 37300 square km area (25% area) inundated, about 1.1 million tons crops were damaged.
1969	Chittagong	---	Chittagong district fell in the grip of flood caused by heavy rainfall. Crops and valuable property were damaged
1970	About 28% area	87	About 42640 square km area (28% area) inundated, about 1.2 million tons crops were damaged
1971	About 25% area	120	About 36475 square km area (25% area) inundated,
1974	About 35% area	1987	About 52720 square km area (35% area) inundated, about 1.4 million tons crops were damaged. Famine come after the flood and more than 30 thousand people was dead of starvation.
1984	About 19% area	553	About 28314 square km area (19% area) inundated, about 0.7 million tons crops were damaged.
1987	About 38% area	1657	About 57491 square km area (38% area) inundated, about 1.5 million tons crops were damaged, and 2.5 millions houses were damaged.
1988	About 60% area including Dhaka.	2379	About 82000 square km area (52% area) inundated, about 3.2 million tons crops were damaged, and 7.2 millions houses were damaged. Catastrophic flood occurred in August-September. Rainfall together with synchronization of very high flows of all the three major rivers of the country in only three days aggravated the flood. Dhaka, the capital of Bangladesh, was severely affected. The flood lasted 15 to 20 days. More than 40% of houses were badly damaged,
1989	Sylhet, Sirajganj, Maulavi Bazar	---	Flooded Sylhet, Sirajganj and Maulavi Bazar and 600,000 people were trapped by water.
1993	28 districts	---	Severe rains all over the country, thousands of hectares of crops went under water.
1998	About 68% area including Dhaka	918	About 100000 square km area (68% area) inundated, about 4.5 million tons crops were damaged, and 0.5 millions houses were damaged. Over two-thirds of the total area of the country was flooded. The flood lasted for more than two months. More than 30% of houses were badly damaged.
2000	Jessore, Magura, Khulna, Bagerhat, and Satkhira	---	Five southwestern districts of Bangladesh bordering India were devastated by flood rendering nearly 3 million people homeless.
2004	39 district including Dhaka	628	About 39311 square km area (26% area) inundated, house destroyed 858202, damaged 3159235, crops destroyed acres 1448816. In total 39 out of 64 districts and 36 million people (25% of the total population) were affected. The worst impact of this rain-fed flooding were in Comilla and Feni to the east, where the Meghna River breached embankments already weakened by the earlier floods, and in the southwest border districts of Jessore, Satkhira, and Magura and parts of three others.
2007	46 districts out of 64 including Dhaka	649	Initially affected Nilphamari, Lalmonirhat and Kurigram, Sherpur, Jamalpur, Sylhet, Sunamgonj districts, Rangpur Gaibandha, Bogra, Sirajgonj inundated. A total of 46 districts were affected. The flood inundated about 32000 sqkm including the char areas of 6000 sqkm affecting almost 16 million people in around 3 million households. Thousands of people also suffered from flood related health hazards. Eighty five thousand (85,000) houses were completely damaged, while almost one million suffered partial damages.

(Source: edited by ADPC)

5) Flood Inundation Maps

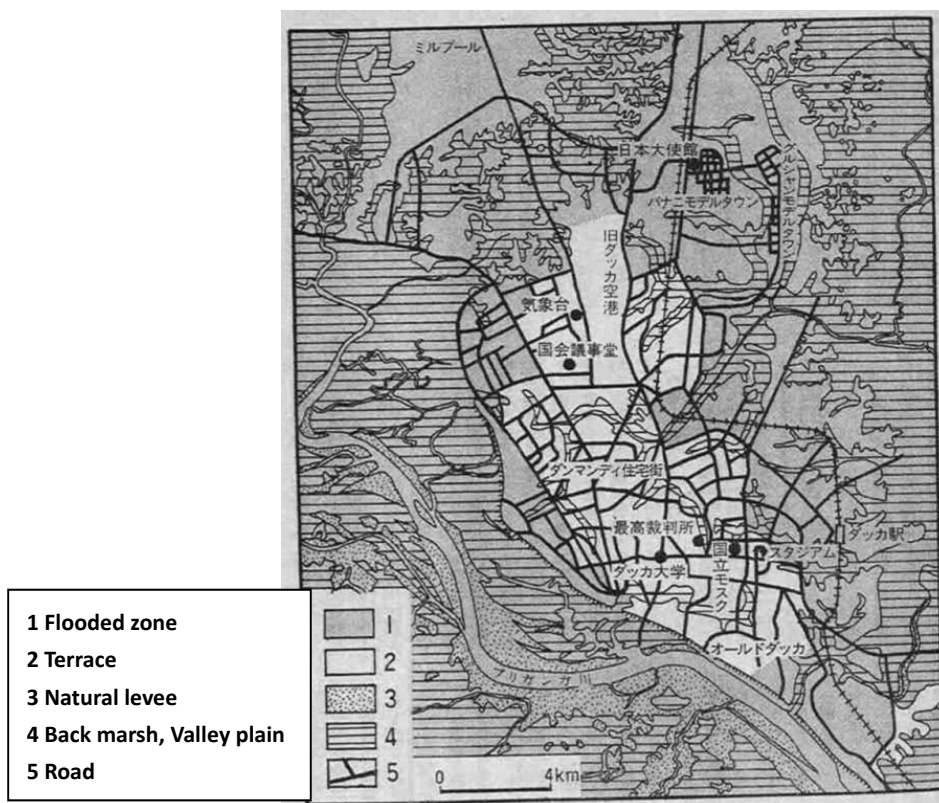
The 1998 flood maps are found as the followings.



(a) External Flood Map by FAP 8A (JICA, 2001)

Figure 2.115 Distribution of Flood Inundation in Dhaka due to 1988 flood disaster

(Source: Master Plan for Great Dhaka Protection Project of Bangladesh Flood Action Plan No.8A, 1991)



(b) Result of Survey by Umitsu
 (Source: Masatomo Umitsu, Chiri, 34-3, 1989 (in Japanese))

Figure 2.1.16 Distribution of Flood Inundation in Dhaka due to 1988 flood disaster

6) Measures to Flood Disasters

(1) Storm Water Drainage System

Table 2.1.12 summarizes major development to prevent flood disasters. Some action plans of flood prevention and water drainage system were implemented by JICA, ADB and WB from 1980s. Dhaka Metropolitan Development Plan (DMDP) in 1997 by UNDP presented some action plans including population, economic development, buildings, local government facilities, transportation, flood water drainage system and public services.

Figure 2.1.17 illustrates master plan of Flood Action Plan (FAP, 1991), in which plan embankment to the west of central Dhaka, drainage pipes and pumping stations were planned. Now, central Dhaka is protected by these measures.

Table 2.1.12 Development on Flood Disaster Measures in Dhaka

Project Name	Period	Main Organization	Survey
The Study on Storm Water Drainage System Improvement Project in Dhaka City	1986-1987	DWASA	JICA
Badda Urgent Project to Remove Water Logging		DWASA	DWASA
Dholai Khal Rehabilitation and Area Development Project	1987-1996	DCC	WB
Study on Greater Dhaka Protection Project (Study in Dhaka Metropolitan Area) of Bangladesh (FAP-8A, 8B)	1991-2001	BWDB, DWASA	JICA ADB
The Project for Improvement of Storm Water Drainage System in Dhaka City (phase II)	2007-2008	DWASA	JICA

DWASA: Dhaka Water Supply and Sewerage Authority, DCC: Dhaka City Corporation, WB: World Bank, and ADB: Asian Development Bank

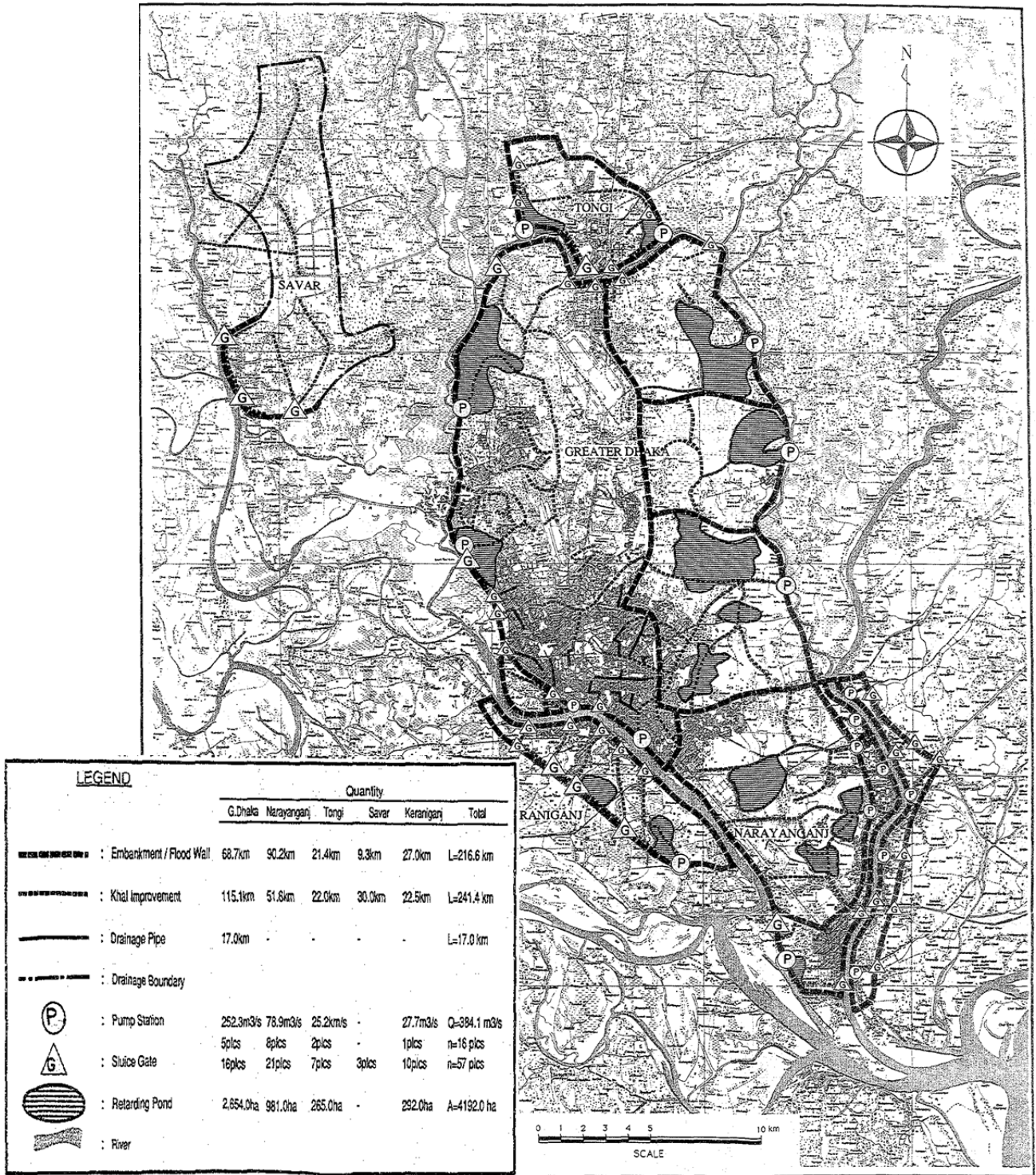


Figure 2.1.17 Proposed Master Plan in FAP 8A

(Source : Master Plan for Great Dhaka Protection Project of Bangladesh Flood Action Plan No.8A, 1991)

(2) Monitoring System of River Water Level

Flood Forecasting & Warning Centre in Bangladesh Water Development Board (BWDB) has an important role of early warning by monitoring major river water level every day and publish the result to the public on their web site. Though the legacy system to receive the monitoring data from observation stations has already gone down, the staff is working to update the website by inputting data manually after receiving the data using cellphone.

Around Dhaka Metropolitan Area, BWDB has four observation stations of river water level. Figure 2.1.18 is the geographical distribution of the four stations. Table 2.1.13 summarizes the past records of highest water level (RHWL) and danger level and embankment level, but embankment level was confirmed only at the Mirpur station.

Figure 2.1.19 (a) and (b) show some examples of trend graphs of river water level such as Current 2014 level, Danger level, Recorded Highest Water Level (RHWL), and as well as average levels of several cases such as normal, wet and dry seasons, although observation duration is unknown. Current water level can be compared with past high level records and other levels easily in the graphs.

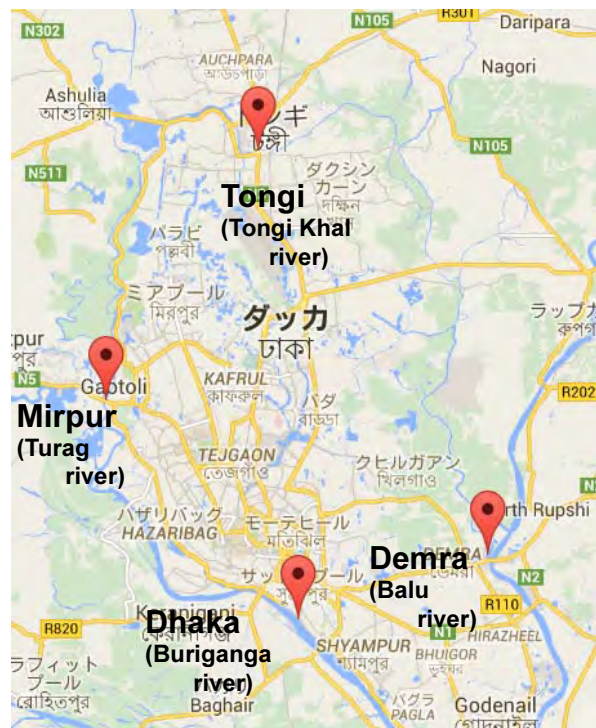


Figure 2.1.18 River Water Level Monitoring Stations Around Dhaka

(Source : Flood Forecasting & Warning Centre, BWDB website)
(<http://www.ffwc.gov.bd/index.php/googlemap?id=20>)

Table 2.1.13 Highest and Danger Water Levels at Stations

Station Name	Recorded Highest Level (m PWD)	Danger Level (m PWD)	Embankment Altitude (m PWD)
Tongi	7.84	6.08	Not Available
Mirpur	8.35	5.94	9.0*
Dhaka	7.58	6.00	Not Available
Demra	7.13	5.75	Not Available

*Based on hearing to BWDB

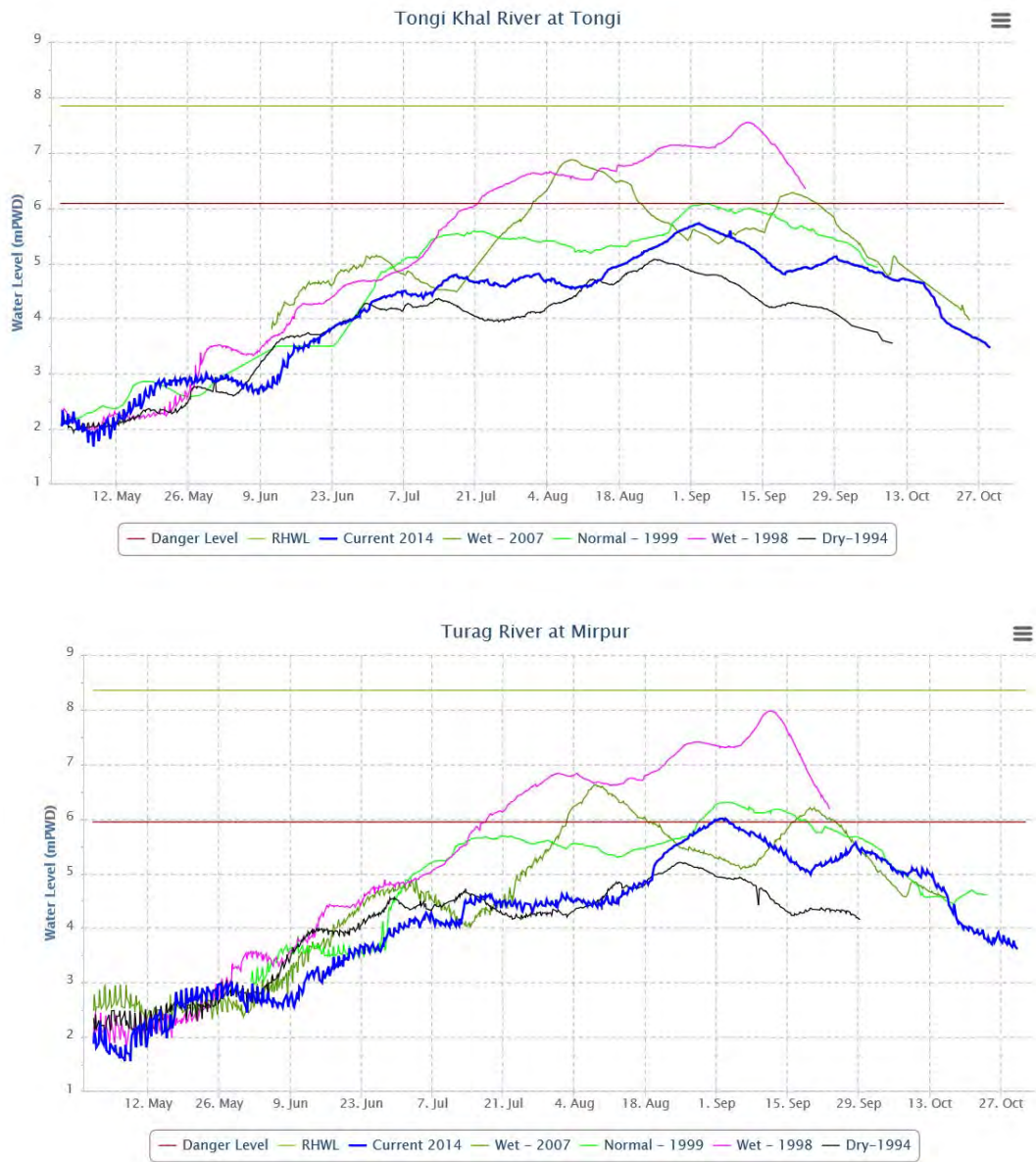


Figure 2.1.19(a) Water Level Chart around Dhaka City [Tongi, Mirpur]

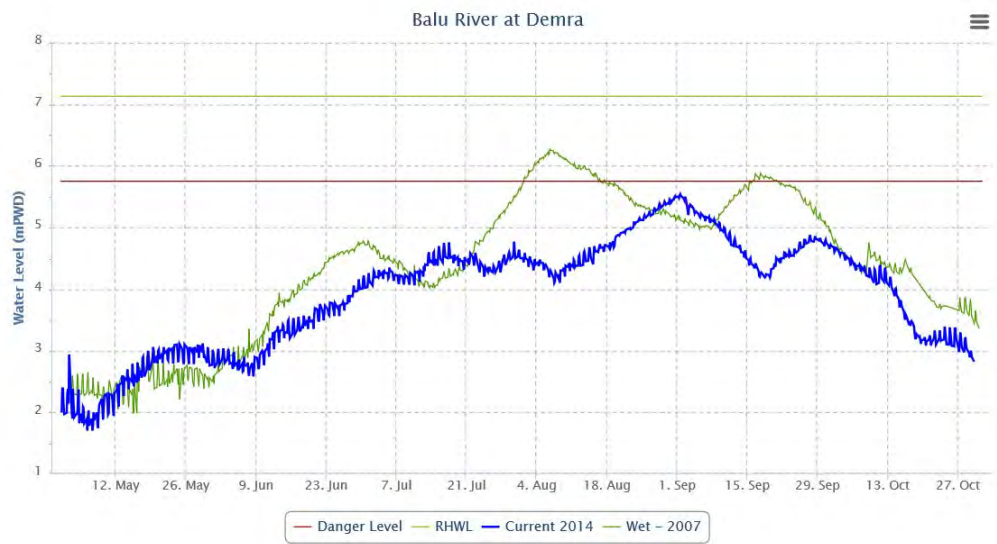
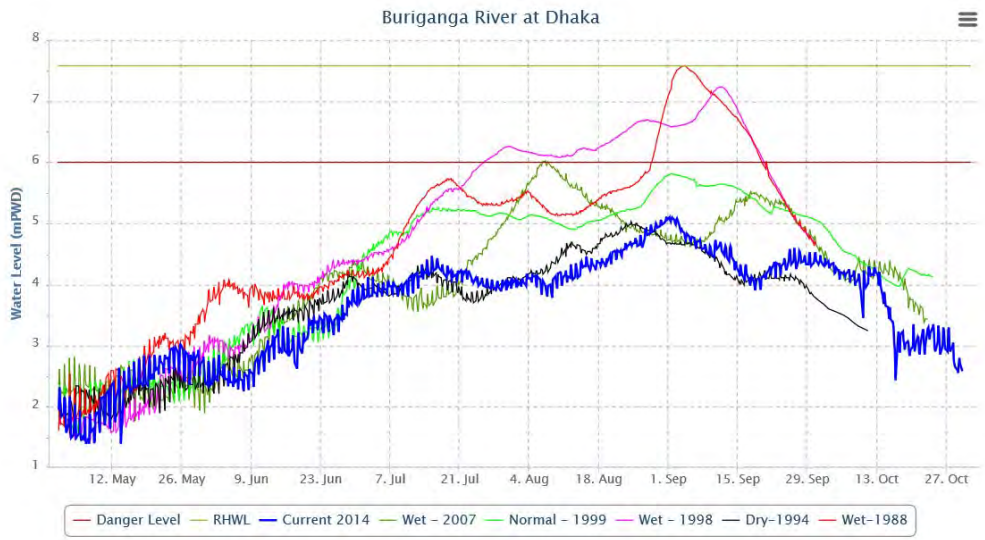


Figure 2.1.19 (b) Water Level Chart Around Dhaka City [Demra, Dhaka]
 (Source : Flood Forecasting & Warning Centre, BWDB website)

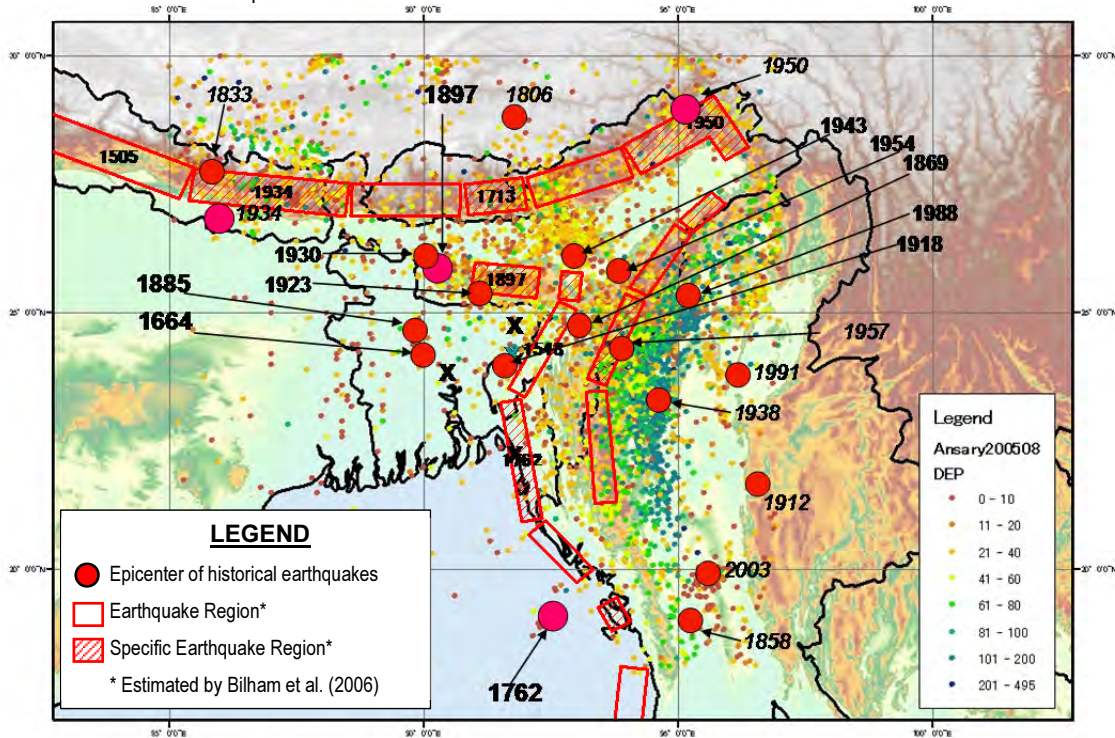
7) Earthquake

Table 2.1.14 shows the list of historical earthquakes in and around Bangladesh for a couple of hundred years. The reference map below the table shows distribution of their epicenters.

Table 2.1.14 Historical Earthquake in and around Bangladesh
(Ms>6.9, after the Historical Earthquake Catalogue by Ansary, BUET, 2008)

Year	Ms	Lat(deg)	Lon(deg)	Source Area	Maxumum MMI			
					Dhaka	Chittagong	Sylhet	Bangladesh
1548	8?			Sylhet?				
1664	7.8	24	90	Shillon Plateau?				
1762	8.5?			Chittagong-Arakan	3?	8?	2?	8?
1806	7.7	28.5	92	Bhutan				
1833	7.65	27.7	85.7	Nepal				
1858	7.66	18.72	95.27	Sandway, Myanmar	-	5?	-	6
1869	7.42	24.79	93.17	Cacher, India	5	4	8	8
1885	6.91	24.7	89.55	Sirajganj, Bangladesh	7	3	4	8
1897	8	25.84	90.38	Assam, India	8	6	8	9
1912	7.9	21.75	96.38	Mandaley, Myanmar	?	2	?	?
1918	7.14	24.16	91.75	Srimangal, Bangladesh	5	5	7	8
1923	7.06	25.25	91	Shillon Plateau				
1930	7.13	25.95	90.04	Dhubri, India	5	4	5	8
1934	8.15	26.47	85.92	Bihar, India-Nepal				
1938	7.2	23.05	94.75	Mawlaik, Myanmar	-	5	-	5
1943	7.28	26	93	Assam, India				
1950	8.6	28.79	95.62	Assam, Himalaya	7	3	7	8
1954	7.02	25.86	94	Maniour, India	5	4	6	6
1957	6.96	24.4	93.8	Myanmar				
1988*	7.1	25.13	95.15	Myanmar				
1991	7.2	23.55	95.96	Myanmar				
2003	6.9	19.92	95.67	Myanmar				

*: 1988 with depth 90km



Ms: Surface Magnitude, MMI: Modified Mercalli (Seismic) Intensity

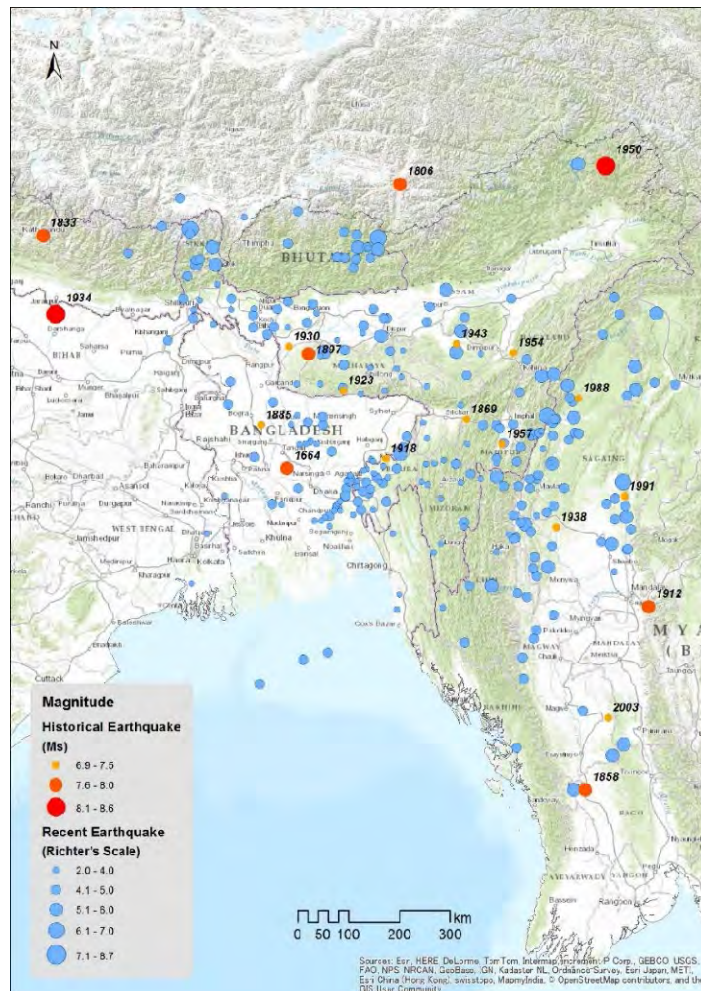
(Source: CDMP, 2009)

8) Distribution of Earthquakes recently occurred in and around Bangladesh

Bangladesh Meteorological Department (BMD) started seismic observation using new digital network seismometers after 2007. It has four observation sites, Dhaka, Sylhet, Chittagong and Rangpur. Figure 2.1.20 is the distribution of newly recorded epicenters in black line circle. In the map, epicenters of historical earthquake listed in Table 3.7 also presented in colored circles.

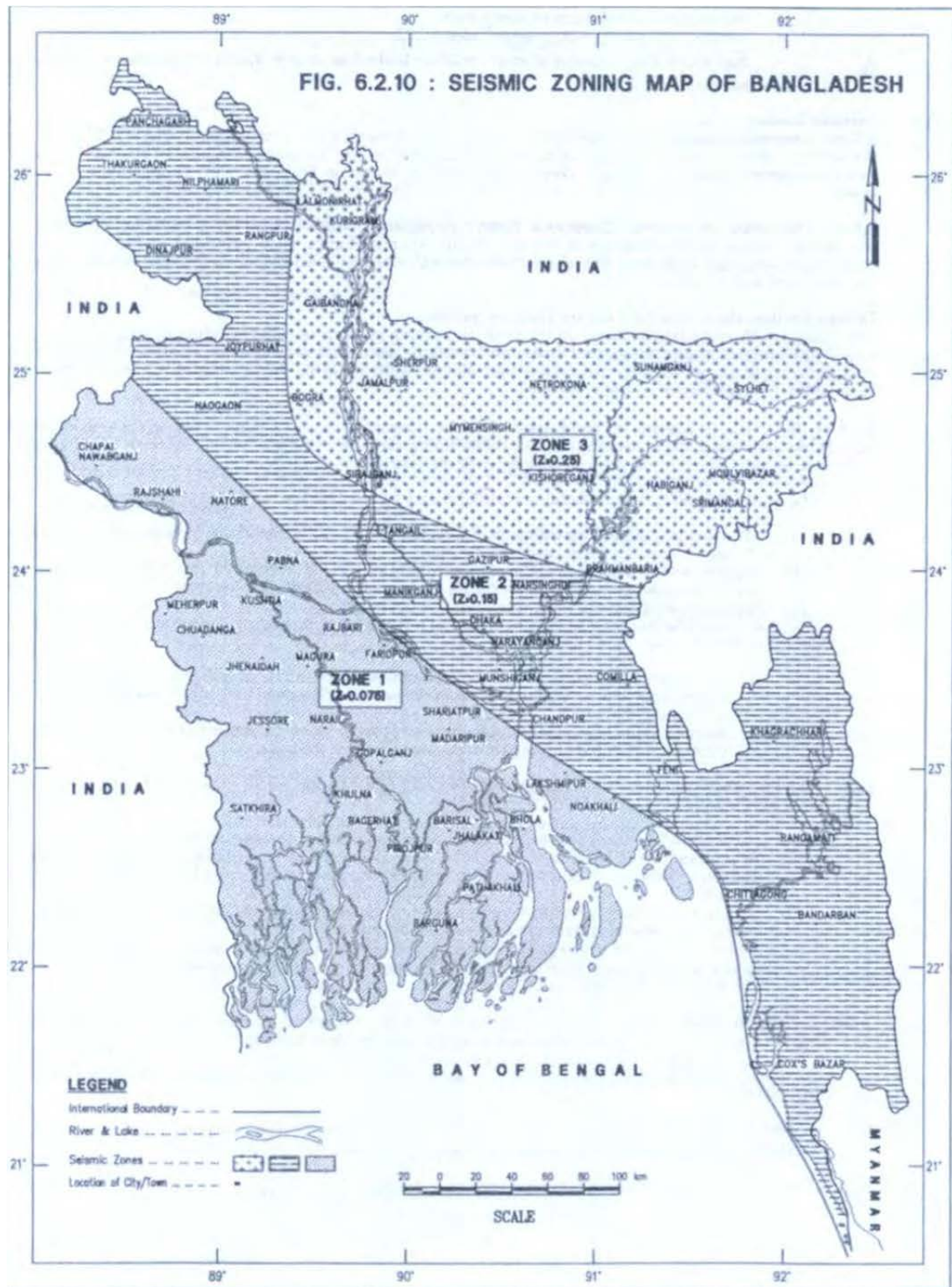
On 12 June 1897, Bangladesh experienced severe earthquake of magnitude 8 class named Great Assam Earthquake, which caused much masonry building damage and a couple of people were killed. After then some damaging earthquakes have happened in and around Bangladesh but small amount of damage rather than the Assam Earthquake. And recently the recurrence of large past earthquakes has been discussed frequently.

Figure 2.1.21 shows seismic zones in Bangladesh. From this map, it is confirmed that Dhaka is in the Zone II, in which basic seismic coefficient is assumed as 0.15G. In general this kind of seismic zoning map is created from the following analysis; 1) collected data of historical earthquakes, 2) estimation of magnitude and epicenter of each historical earthquake, 3) calculation of peak ground acceleration (PGA) empirically, and then 4) by superimposing of the all outputs to calculate statistical PGA for a couple of return periods. The seismic zones in BNBC 1993 were prepared for a return period of 200 years. However, in the new BNBC it will be clearly written the values for each zone are based on the 2500 years expected values, and when using for design purpose, it is better to use 2/3 of the zone values which may represent 500 year expected value.



Ms: Surface wave magnitude (Source Data from BMD and CDMP, 2009)

Figure 2.1.20 Distribution of Epicenter of Earthquakes occurred recently and Historical Catalogue



(Source: Bangladesh National Building Code, 1993)

Figure 2.1.21 Seismic Zones in Bangladesh

2.1.4 Natural Hazard Risk Assessment in Dhaka

a) Seismic Ground Motion, Liquefaction and Earthquake induced Landslide

As a result of CDMP (Comprehensive Disaster Management Programme, 2009), seismic hazard maps were prepared for 3 cities, Dhaka, Chittagong and Sylhet. Table 2.1.15 and Figure 2.1.22 show the 5 Scenario Earthquakes of CDMP (2009). Their Peak Ground Acceleration Maps for Dhaka City are shown in Figure 2.1.23. The severest case is Madhupur Fault (M=7.5 and 30km north of Dhaka) earthquake

which will cause 200-500gals peak ground acceleration (MMI VIII) within Dhaka City. It will be more than the BNBC requirement.

Together with acceleration, frequency or period of seismic motion is an important factor which is decided by earthquake characteristics such as magnitude and distance and ground conditions. As for ground dominant period, it depends on depth of soil layer boundary such as engineering bed layer, and average velocity above the boundary. Figure 2.1.24 shows the engineering geology maps of average shear wave velocity within a depth of 30m, and Holocene soil thickness. Usually a slower velocity and thicker soil shows longer periods of ground motion. Based on the above estimated seismic ground motion, the susceptibility of liquefaction and slope angles regarding to landslide susceptibility are shown in Figure 2.1.25.

In Dhaka susceptibility of liquefaction will be high in low land areas, and less susceptibility of slope failure. Predominant period of surface ground, an important factor of ground motion, isn't mentioned in CDMP study. Kamal et al. (2004) conducted microtremor measurement in Dhaka. In his paper, three characteristic zones were summarized by geomorphic units; 1) shows predominant period of around 1.0 sec in most of Pleistocene terrace, natural levee or shallow alluvial valley, 2) shows predominant period of around 1.8 sec in some erosional Pleistocene terrace, sloping terrace edge or inundated abundant channel, and 3) shows two peaks of period at around 1.6 sec and 0.6 sec in deep marshy land or deep alluvial valley.

According to the real examples, dominant periods caused by earthquakes were different due to the sites, magnitudes and epicentral distances and source mechanisms. For instance the Nepal earthquake dated on 25th April, 2015, higher buildings and lower land shaking much by the longer periods of 1.5 to 2 seconds, caused by more than 700km away and large magnitude of 7.9, though lower buildings such as 2,3 storeyed were shaken less. On the contrary smaller magnitudes and shorter distance earthquakes the ground vibrated with periods of 0.2-0.5 seconds and shaking much for lower buildings in the central area of Dhaka.

Table 2.1.15 Scenario Earthquakes for Bangladesh (CDMP, 2009)

Fault	Mw	Depth to top of fault (km)	Dip (degree)	Down-dip rupture width (km)	Fault Type
Madhupur Fault (MF)	7.5	10	45	42	Reverse
Dauki Fault (DF)	8.0	3	60	43	Reverse
Plate Boundary Fault -1 (PBF-1)	8.5	3	20/30	337	Reverse
Plate Boundary Fault -2 (PBF-2)	8.0	3	20	137	Reverse
Plate Boundary Fault -3 (PBF-3)	8.3	3	20/30	337	Reverse

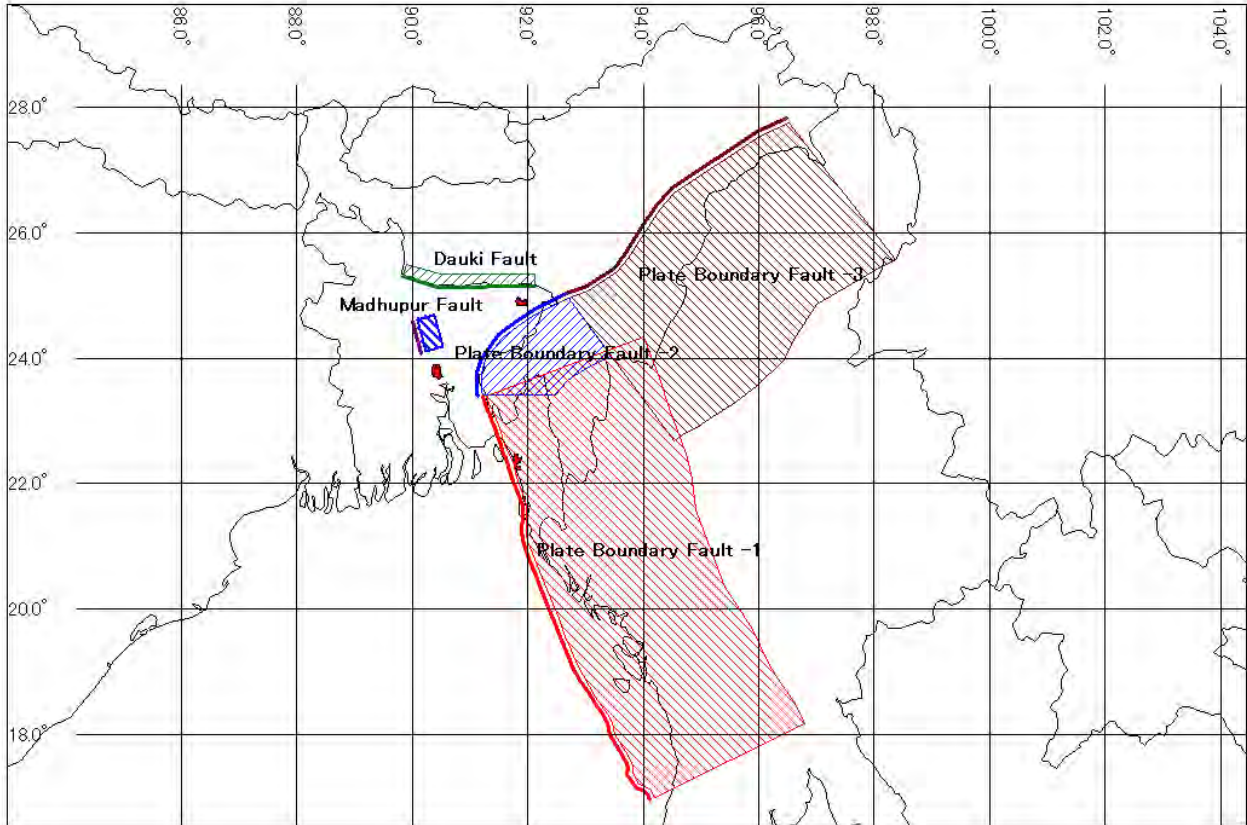


Figure 2.1.22 Scenario Earthquakes for Bangladesh (CDMP, 2009)

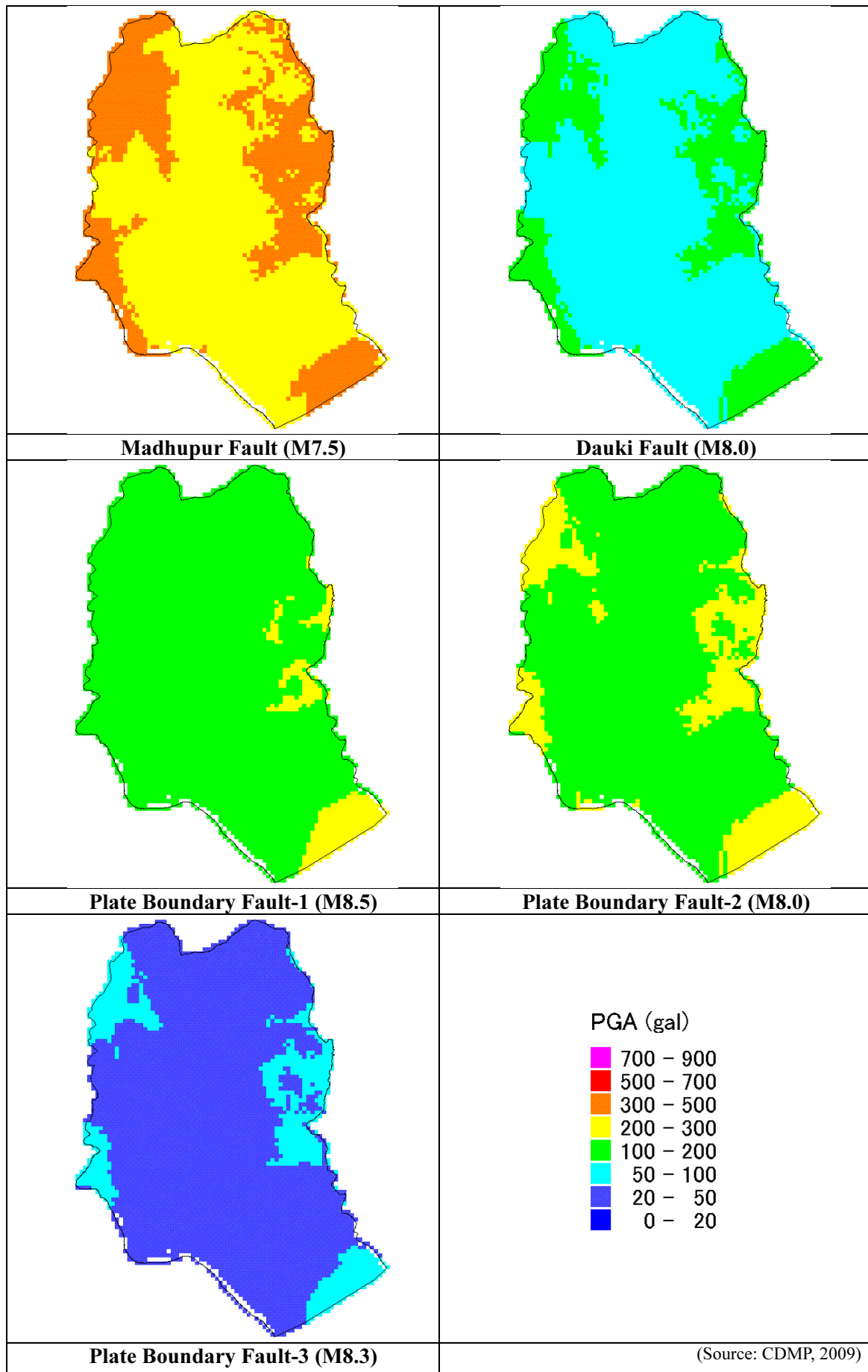
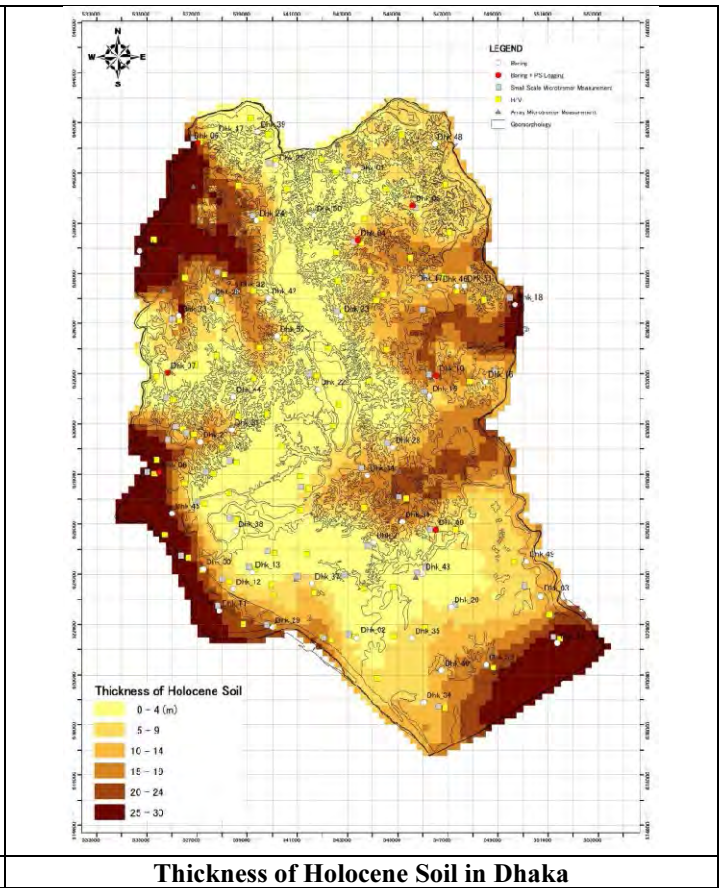
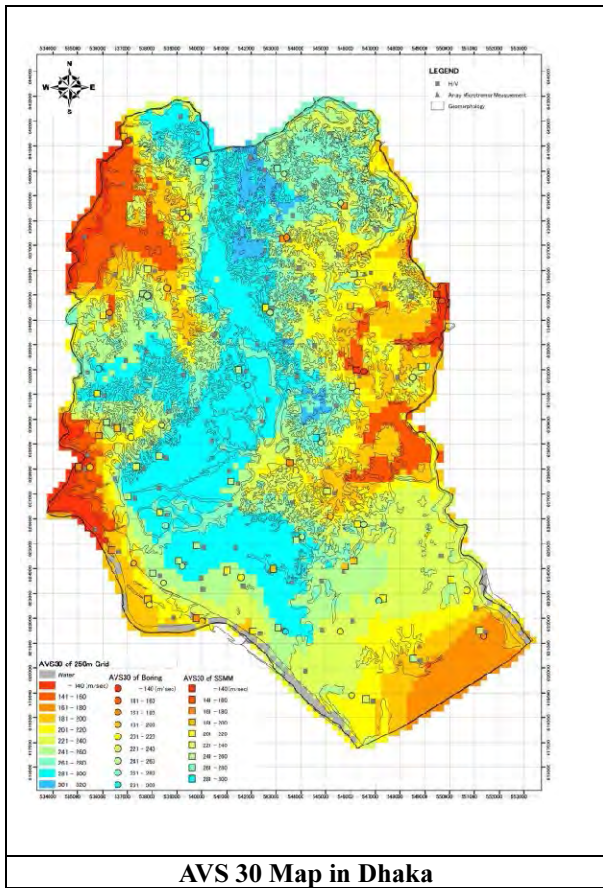
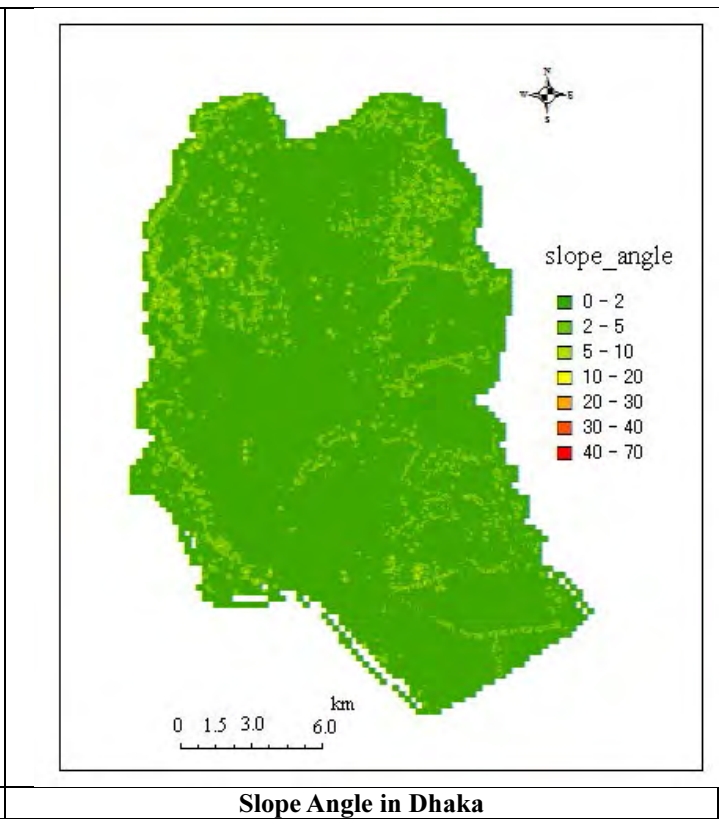
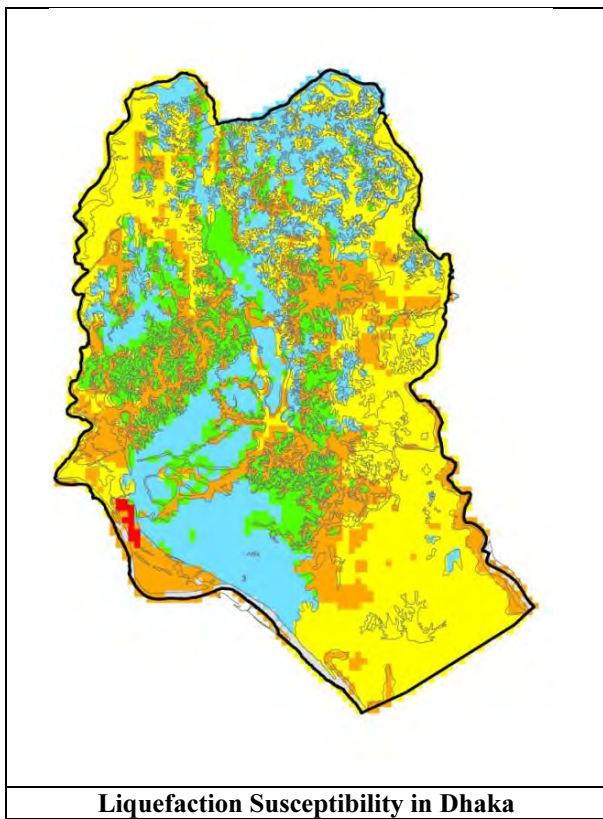


Figure 2.1.23 Peak Ground Acceleration based on scenario earthquakes in Dhaka



(Source: CDMP, 2009)

Figure 2.1.24 Engineering geology Maps in Dhaka



(Source: CDMP, 2009)

Figure 2.1.25 Liquefaction Susceptibility and Slope Angle in Dhaka

b) Earthquake Damage Risk Assessment

1) CDMP

CDMP (2009) also estimated damages to buildings, facilities, lifelines and casualties in three cities due to scenario earthquakes. The methodology is mainly based on HAZUS (Hazard Assessment for U.S.) from FEMA (Federal Emergency Management Agency of U.S). The procedure of risk assessment is as follows; 1) collecting building and lifeline inventory, 2) preparation of seismic hazard data including ground motion, liquefaction and landslide, and then 3) applying fragility function to assess the risks.

Table 2.1.16 (a) to (e) show the result of damage estimations in Dhaka City; (a) buildings per structure types, (b) buildings per uses, (c) facilities, (d) lifelines, (e) number of killed caused by the Case 1 Earthquake, which is Madhupur Fault earthquake. The results were summarized only in tables, not presented in maps. The Case 1 estimated, by which about 49 percent of buildings, 158,635 would be damaged more than Moderate level, and among them 22% of 72,316 buildings will be collapsed. Many and various facilities lifelines will be damaged and 88,503 people will be killed if the earthquake occurs at 2 a.m. case.

Table 2.1.16 Examples of Damage Estimation by CDMP (2009)

(a) Buildings per Structure Type (Case 1: Madhupur Fault, M7.5)

Dhaka : Case 1										
	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Steel	8	0.01	14	0.03	125	0.24	324	0.98	948	1.31
Concrete	101,832	81.51	17,066	39.47	15,152	28.50	12,866	38.81	38,648	53.44
Masonry	6,353	5.09	10,784	24.94	26,558	49.95	17,328	52.26	21,611	29.89
Thin Shed and Bamboo	16,745	13.40	15368	35.55	11,331	21.31	2,635	7.95	11,108	15.36
Total	124,939		43,232		53,166		33,153		72,316	

(Source: CDMP, 2009)

(b) Buildings per Use Type (Case 1: Madhupur Fault, M7.5)

Dhaka : Case 1										
	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	261	0.21	291	0.67	485	0.91	264	0.80	343	0.47
Commercial	8,199	6.56	5,232	12.10	11,973	22.52	8,841	26.67	12,500	17.29
Education	476	0.38	343	0.79	844	1.59	629	1.90	870	1.20
Government	122	0.10	100	0.23	269	0.51	202	0.61	230	0.32
Industrial	1,245	1.00	748	1.73	1,538	2.89	1,137	3.43	1,708	2.36
Non-SFD Residential	112,110	89.73	35,473	82.05	36,242	68.17	20,891	63.01	54,644	75.56
Religion	407	0.33	307	0.71	567	1.07	372	1.12	526	0.73
Single Family Dwelling(SFD) Residential	2,118	1.70	739	1.71	1,248	2.35	817	2.46	1,495	2.07
Total	124,939		43,232		53,166		33,153		72,316	

(Source: CDMP, 2009)

(c) Major Facilities (Case 1: Madhupur Fault, M7.5)

Dhaka : Case 1				
Classification	Total	Facilities		
		At Least Moderate Damage >50%	Complete Damage >50%	With Functionality >50% on day 1
Hospitals	600	241	10	224
Schools	2,737	1,173	90	895
EOCs	18	8	2	7
Police Stations	62	30	0	15
Fire Stations	10	4	0	3

(Source: CDMP, 2009)

(d) Lifelines (Case 1: Madhupur Fault, M7.5)

System	Component	Scenario 1				
		Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality >50%	
					After Day 1	After Day 7
Highway	Roads	21,979	0	0	21,979	21,979
	Bridges	10	5	0	4	9
Railway	Tracks	217	0	0	217	217
	Facilities	19	0	0	19	19
Bus	Facilities	25	0	0	25	25
Ferry	Facilities	8	0	0	8	8

(Source: CDMP, 2009)

(e) Number of Killed (Case 1: Madhupur Fault, M7.5)

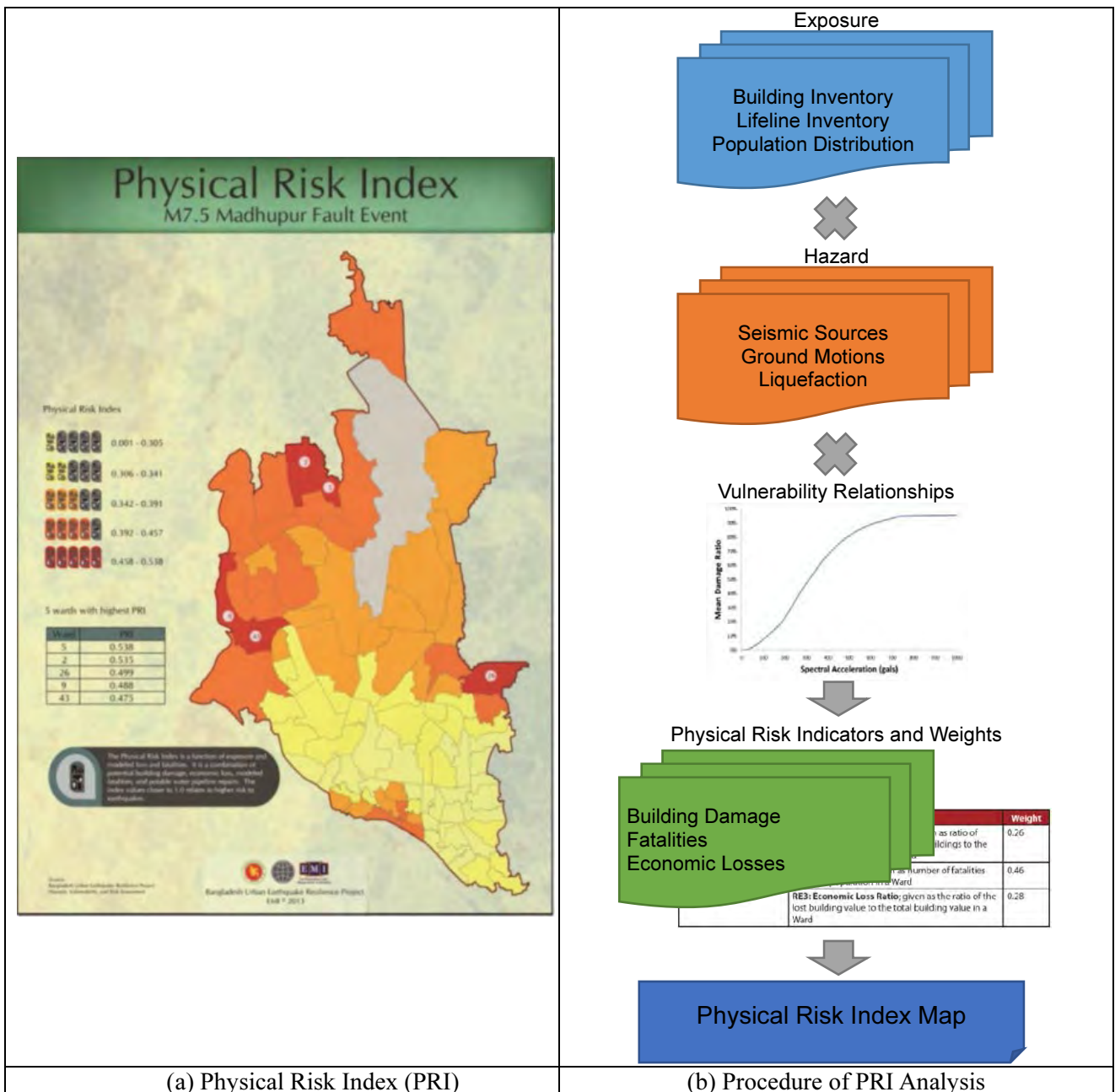
Dhaka : Case 1					
		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	964	182	53	390
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	117	21	6	70
	Industrial	391	72	22	191
	Other-Residential	119,889	20,975	5,182	87,617
	Single Family	454	84	25	234
	Total	121,815	21,355	5,287	88,503
2 PM	Commercial	69,278	13,525	3,863	27,422
	Commuting	0	0	0	0
	Educational	18,185	3,659	1,020	6,120
	Hotels	23	4	1	13
	Industrial	2,918	554	166	1,390
	Other-Residential	40,473	8,132	1,983	26,273
	Single Family	153	32	9	70
	Total	131,029	25,905	7,043	61,288

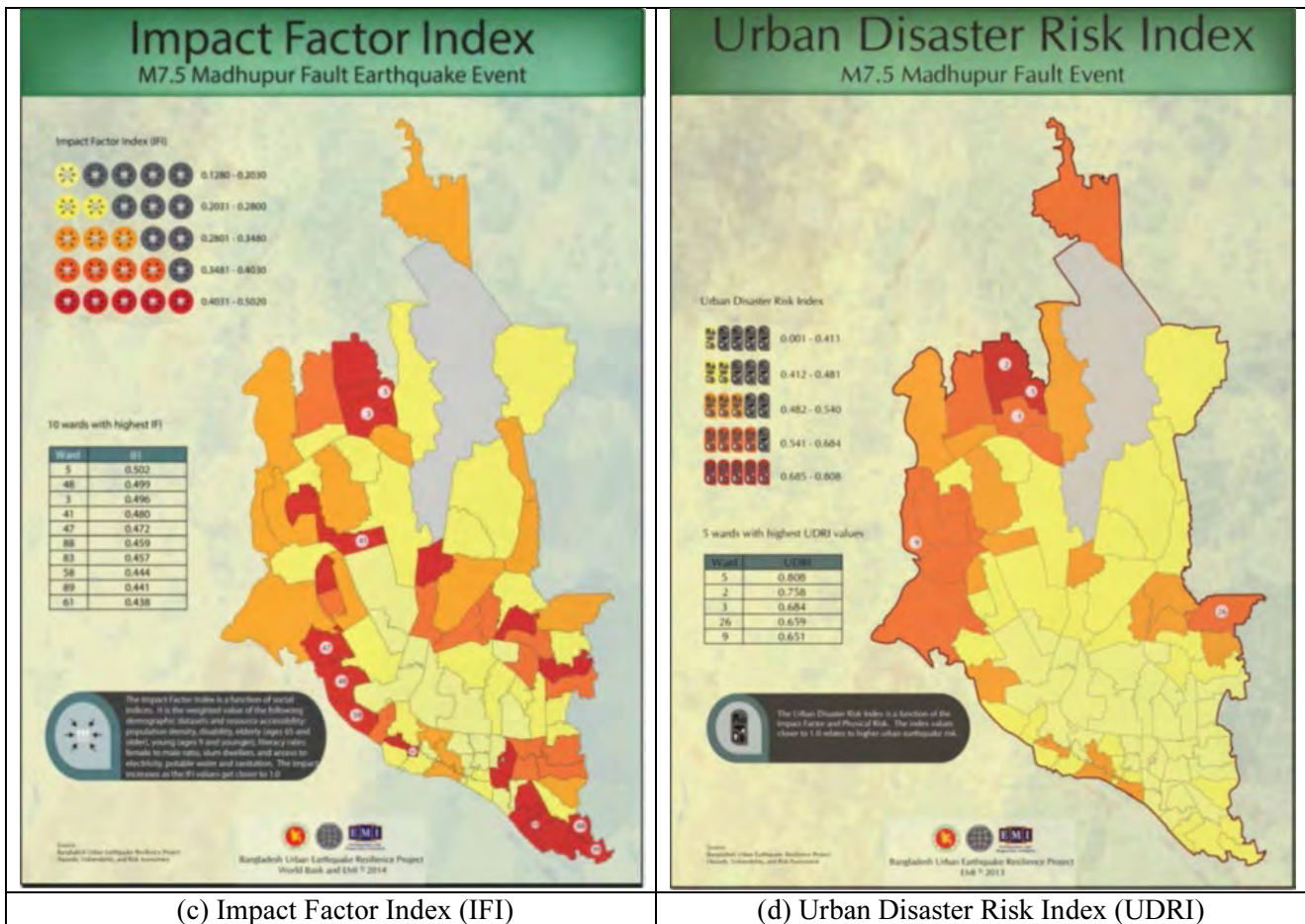
(Source: CDMP, 2009)

2) HVRA

Based on CDMP outputs, World Bank and EMI conducted an assessment named HVRA (Earthquake Hazard, Vulnerabilities and Risk Assessment) as an achievement of Bangladesh Urban Earthquake Resilience Project. In the project, Seismic hazard and vulnerability were assessed using the ward wise results of CDMP, adding social and economic information. The results were shown in Figure 2.1.26 using the following three indices, Physical Risk Index (PRI), Impact Factor Index (IFI) and Urban Disaster Risk Index (UDRI). UDRI is obtained by multiplying the PRI by IFI, according to the following formula: $UDRI = PRI (1+IFI)$.

As an example of procedure to evaluating these indices, the procedure of PRI is summarized in (b) of Figure 2.1.26. In short, three indicators; Building Damage Ratio, Fatalities and Economic Losses are calculated and weighted sum of these indicators is obtained to derive the Physical Risk Index score in each ward.





Physical Risk Index (PRI): Building Damage (weight=0.26), Fatalities (0.46) and Economic Losses (0.28) are considered with their weights.

● **Impact Factor Index (IFI):** Population Density (weight=0.23), Children (0.13), Elderly (0.08), Disabled (0.26), Illiterate (0.03), Gender (0.04), Dilapidated Housing (0.16), and Lack of Access to services (0.23) are considered as social vulnerability with their weights. Moreover, Hospital (0.56), School (0.28) and Police (0.16) are considered as coping capacities.

● **Urban Disaster Risk Index (UDRI):** $PRI * (1 + IFI)$

Figure 2.1.26 Example of Output Mapping of HVRA in Dhaka (Source: WB and EMI, 2014)

c) Flood Hazard Assessment

Some flood hazard maps in country scale could be found. But no flood hazard assessment maps in Dhaka city scale were found. Meanwhile, it is confirmed that Detailed Area Plan (DAP, a land use plan map) for Dhaka Metropolitan area prepared by RAJUK includes hazardous area of flood. It is an achievement of FAP. As an example, Figure 2.1.27 presents Flood Flow Zone, Water Retention Area and Waterbody on a satellite base map.

RAJUK informed that this flood hazardous map can be used for checking construction sites in the due diligence* by banks. After this check on the map, Department of Environment (DoE) would approve the survey result as a procedure of the Environment Impact Assessment (EIA).

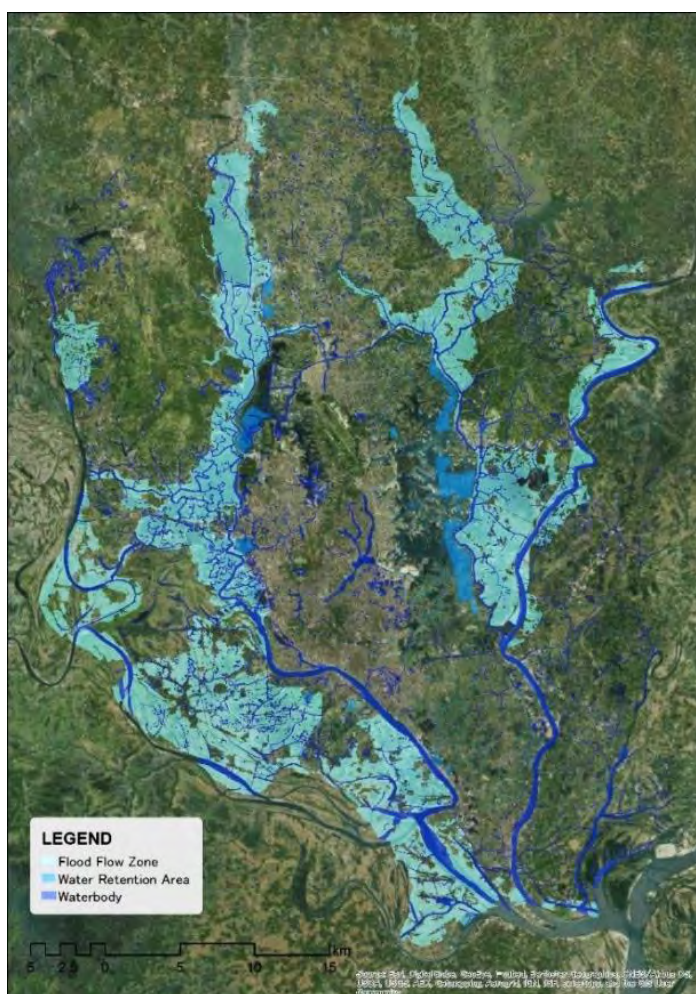


Figure 2.1.27 Flood Flow Zone, Water Retention Area and Waterbody in the Detailed Area Plan (DAP) prepared by RAJUK (2010)

* Bangladesh Bank issues Environmental Risk Management Guidelines for Banks and Financial Institutions in Bangladesh, which describes a General Environmental Due-Diligence Checklist. This checklist is to be used for all proposals for financing being considered by the Banks. Especially, Land location and Climate change in the list include natural hazards, such as location on the river bank vulnerable to floods, or climate condition on cyclones, storm surges, floods and droughts.

- **Land location:** Is the land location / site free from vulnerability from an environmental perspective? Vulnerability can arise due to the issues such as the location being on the river bank (floods) and on national parks / forests?
- **Climate change:** Is the proposal for financing protected against climate change related impacts such as cyclones, storm surges, floods and droughts if relevant?

d) Flood Risk Simulation

Institute of Water Modelling (IWM) is an institute conducting flood simulation in Bangladesh. Though the output for Dhaka area was not open to the public, some reports are available in CORFU (FP7 Collaborative research on flood resilience in urban areas).

As one example of flood simulation in central Dhaka, Figure 2.1.28 presents a flood hazard map with the following condition; return period: 100 years, eastern side flood event, duration of heavy rainfalls: six hours (JICA study 1987). From this map, south of Gulshan and east of Tejgaon may be inundated over three meters depth along the river, and Motijheel downtown is estimated more or less 1.8 meters inundation. Meanwhile, most of the central area of Dhaka is estimated less than 0.3 meters inundation. This kind of detailed flood risk is never imagined from RAJUK's Detailed Area Plan. From this recent simulation study, it is revealed that there exists a little bit flood inundation risk in some areas of the central Dhaka.

On the other hand, even IWM never estimate the break of western embankment of central Dhaka because the event is estimated in the return period of over 100 years. From hearing survey to BWDB, it is found that height of embankment around Mirpur observation site is about 9 meters from mean sea level. The difference between the level of embankment and the past recorded highest level is only about 0.6 meters. (See Table 2.1.13) It must be necessary to conduct another flood simulation in such case that the western embankment could be broken.

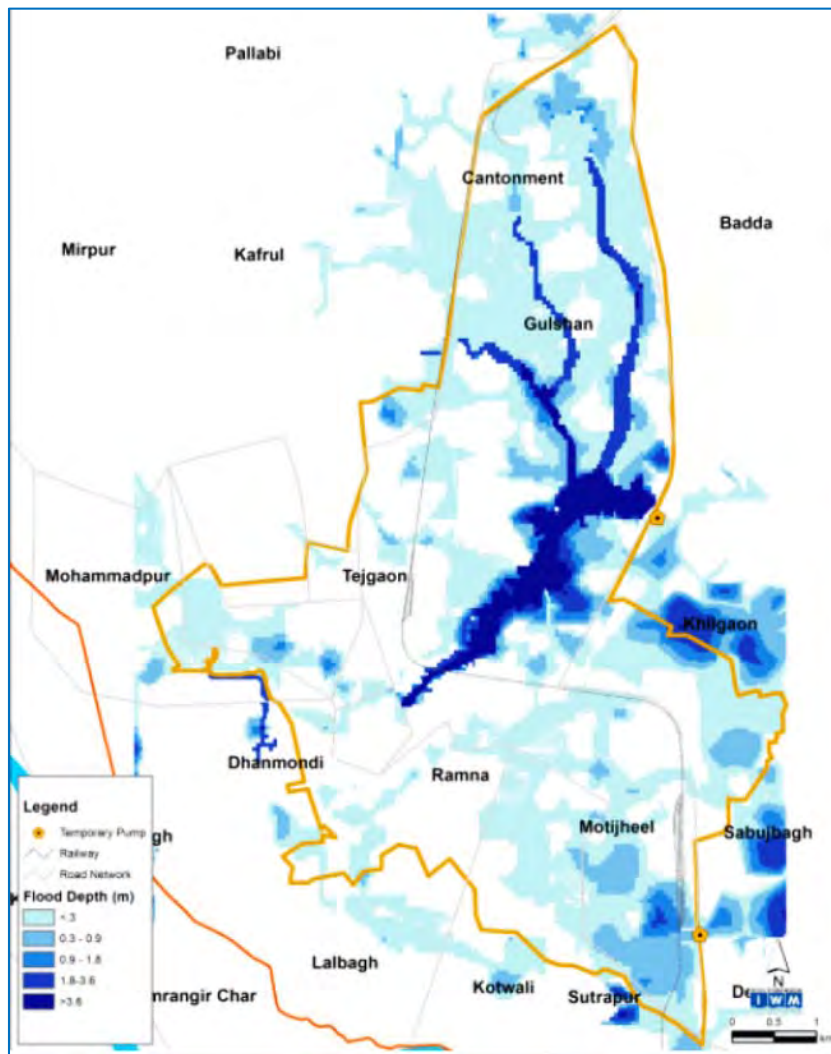


Figure 2.1.28 Flood simulation in Dhaka by IWM (Return period: 100 years)
(Source: CORFU Project Report Contract no. 244047, 2014)

2.2 Socio-economic Conditions

2.2.1 The Survey area

The Survey Area in this survey consists of Dhaka District, Gazipur District and Narayanganj District. They are the parts of Dhaka division, which has 17 districts. The socio-economic conditions of each district are described below.

a) Dhaka District

Dhaka, the capital of Bangladesh, has a fairly long history. It grew as an urban center in the Sultanate period and rose into prominence in the Mughal period when it enjoyed the position of a provincial capital.

Dhaka District (Dhaka Zilla) has an area of 1497.17sqkm, located in between 23°53' and 24°06' north latitudes and in between 90°01' and 90°37' east longitudes. It is bounded by Gazipur and Tangail districts on the north, Munshiganj district on the south, Narayanganj district on the east, Manikganj and Rajbari districts on the west¹.

Population: The total population of Dhaka District is 12,043,977 (Male- 6,555,792 and Female- 5,488,185), sex ratio 119:100, population density 8,229/sqkm and annual growth rate is 3.48%².

Literacy: The Literacy Rate of Dhaka District is 54.20% (Male- 57.00% and Female- 51.30%), School attendance rate is 50.70% for 5 to 24 years age group. There are 17 public and private universities, 4 government medical colleges, 11 private medical colleges³.

Administration: Dhaka District, the site of capital city was formerly a sub-division of Dhaka District. Dhaka District was established in 1772. Dhaka municipality was established in 1864 and it was turned into a Town Committee in 1960. The Town Committee was abolished in 1972 and it was upgraded into a Municipal Corporation in 1983. Dhaka Town was turned into a City Corporation in 1990⁴. On 29 November 2011, Dhaka City Corporation has been divided into two administrative parts, namely, (1) Dhaka City Corporation-North and (2) Dhaka City Corporation-South, for ensuring better civic facilities⁵. Dhaka City Corporations (both north and south) and areas under fourteen metropolitan thanas (part or full), Keraniganj thana and Savar thana (part) and Municipal area (part) are under the 1,528sqkm (590sq. mile) jurisdiction area of RAJUK (Rajdhani Unnayan Kartripakkha), the capital development authority of Bangladesh⁶.

Manufacturing Industries: Once Muslin of Dhaka was world famous. Currently, the major manufacturing industries of Dhaka district are ceramic, beverage, press and publication, garments, foot ware, jute mills, textile mills, biscuit and bread factory, pharmaceutical, cosmetic, soap factory, ball-pen industry, polythene industry etc.

Main Exports: Ready-made garments, rice, mustard seed, vegetables, peanut, banana, coconut, jackfruit, medicine, cosmetics, electronics, electrical goods etc.

Economic Situation: Dhaka is the commercial heart of Bangladesh with a large middle class population, increasing the market for modern consumer and luxury goods. Many skilled workers are employed in the businesses and industries located in the Dhaka metropolitan area. The city has historically attracted a large number of migrant workers. Hawkers, peddlers, small shops, rickshaws transport,

¹ http://www.banglapedia.org/HT/D_0182.htm

² Population and Housing Census 2011, BBS

³ Population and Housing Census 2011, BBS

⁴ http://www.banglapedia.org/HT/D_0182.htm

⁵ Available at <http://web.archive.org/web/20111130233931/http://www.bdnews24.com/details.php?id=212488&cid=3>, accessed on 30 October, 2014

⁶ http://www.rajukdhaka.gov.bd/rajuk/page/web/about/rajuk_jurisdiction.jsp

roadside vendors and stalls employ a large segment of the population. According to City Mayors Statistics⁷, Dhaka's GDP registered at \$52 billion in 2005 with an annual growth rate of 6.1%. Its estimated GDP in the year 2020 is \$126 billion. The annual per capita income of Dhaka is estimated at \$550, although a large segment of the population lives below the poverty line, with many surviving on less than \$3 a day.⁸

b) Gazipur District

Gazipur District is located at just north of capital city of Dhaka. The previous name of the region is "Joydebpur". Once, the region was under the deep jungle of Vowal Pargana (Sub-Division). Gazipur District is one of the ancient and historical regions with hundreds years old tradition.

Gazipur District (Dhaka division) has an area 1741.53sqkm, located in between 23°53' and 24°21' north latitudes and in between 90°09' and 92°39' east longitudes. It is bounded by Mymensingh and Kishoreganj districts on the north. Narayanganj and Narsingdi Districts on the south, Narsingdi District on the east, Dhaka and Tangail Districts on the west⁹.

Population: The total population of Gazipur district is 3,403,912 (Male- 1,775,310 and Female- 1,628,602), population density 1,884/sqkm and annual growth rate is 5.21%¹⁰.

Literacy: Literacy rate of Gazipur District is 62.60% (Male- 66.00% and Female- 58.90%), School attendance rate is 42.50% for 5 to 24 years age group. There are 42 colleges (including 04 Govt colleges), 308 Secondary School (Including 05 Govt Secondary Schools), 742 Primary School including (542 Govt), 176 Madrasha, 2 Medical colleges, 15 Vocational Institute and 06 universities in Gazipur¹¹.

Administration: Gazipur District was previously a sub-division of Dhaka District. It was upgraded to a district in 1984 under Dhaka Division. There is a city corporation, 4 Municipalities, 5 Upazilla, 44 Unions, 762 Mauzas and 1,114 Villages¹². The Gazipur Thana (part) and Municipal area (part), Tongi Thana and Municipal area are under the jurisdiction of RAJUK¹³.

Manufacturing Industries: Main manufacturing industries in Gazipur district are garment industry, aluminum factory, textile mill, pharmaceutical industry, cosmetics industry, machine tools factory, diesel plant, security printing press, ordnance factory, ceramics factory, packaging industry, rick field etc.

Main Exports: Vegetables, fruits, medicine, cosmetics, cigarettes, aluminum products, readymade garments, mosquito coil, beverage (soft drinks) etc. are main exports items of this district.

Economic Situation: Agrarian economy prevails almost in all the corners of the district. Out of total 538,597 holdings, about 42.74% holdings are performing agricultural activities which produce varieties of crops, namely, local and HYV¹⁴ paddy, jute, pulses, vegetables, oilseeds and other minor crops. Non-farm economic activities have also a substantial share in revenue earnings and livelihood of rural people of the district. It is reported that in all the economic sectors about 62.21% of all the establishments are located in urban areas and 37.79% of the total is located in rural areas¹⁵.

c) Narayanganj District

⁷ <http://www.citymayors.com/statistics/richest-cities-2005.html>

⁸ Buerk, Roland (2004-11-02). "Shoppers flock to Dhaka mega-mall" (PHP). BBC News. Retrieved 2006-10-02

⁹ http://www.banglapedia.org/HT/G_0075.htm

¹⁰ Population and Housing Census 2011, BBS

¹¹ District Statistics 2011, BBS

¹² District Statistics 2011, BBS

¹³ http://www.rajukdhaka.gov.bd/rajuk/page/web/about/rajuk_jurisdiction.jsp

¹⁴ HYV: High-yielding varieties

¹⁵ District Statistics 2011, BBS

Narayanganj, the oldest and most prominent river port of Bangladesh, grew into a place of trade and commerce and therefore, became known as a ganj¹⁶. Legend goes that one Bicon Lal Pandey (also known as Benur Thakur or Lakshmi Narayan Thakur), a Hindu religious leader, acquired this region from the east India company in 1766. He declared the markets located on the bank of the river shitalakshya as endowed property by a will to meet the expenses of the worship of God Narayan and consequently, the place got the name Narayanganj.

Narayanganj district is bounded by Gazipur and Narsingdi districts on the north, Brahmanbaria and Comilla districts on the east, Munshiganj district on the south, and Dhaka district on the west. The total area of the district is 759.57sqkm., of which 48.56sqkm. is riverine and 0.60sqkm. is under forest. The district lies between 23°33' and 23°57' north latitude and between 90°26' and 90°45' east longitude¹⁷.

Population: The population of Narayanganj 2,948,217, (Male- 1,521,438 and Female- 1,426,779); annual growth rate 3.05%; and population density 4,308/sqkm¹⁸.

Literacy: Literacy rate of Narayanganj district is 57.10%, (Male- 59.50% and Female- 54.60%). School Attendance rate is 44.60% for 5 to 24 years age group¹⁹. There are 20 colleges (including 04 Govt colleges), 10 Higher secondary schools, 126 high schools (including 2 Govt. Schools), 13 junior high school, 1,425 primary school including (425 Govt), 54 Madrasha., 1 Marine Institute and 4 vocational institute (including Govt- 2) in in Narayanganj²⁰.

Administration: Narayanganj, a former sub-divisional town of Dhaka district was upgraded to a district in February 1984 and recently promoted as a city corporation²¹. It has 5 municipalities, 5 Upazilla, 41 Unions, 619 Mauzas, and 1,204 villages outside of City Corporation. Narayanganj Thana including municipal area, Siddhirganj Thana, Bandar Thana including Kadam Rasul municipal area, Sonargaon Thana (Part), Fatullah Thana and Araihasar Thana (Part) are part of RAJUK jurisdiction area²².

Manufacturing Industries: The district is pioneer in merchandising yarn and dying items. It is also a center of business and industry, especially the jute trade and processing plants, and the textile sector of the country. It is nicknamed the Dundee of Bangladesh due to the presence of lots of jute mills. Dundee was the first industrialized Jute polis in the world. Cottage industry like weaving is abounds in this district. International trading, import and export business, shipyard brickfield, etc. create employment opportunities to the people which facilitate additional income to the household population. Small and medium industries of cotton are increasing day by day which fills the employment aids of peoples.

Economic Situation: As mentioned above, the district is a pioneer in merchandising and manufacturing of jute, yarn and dying items. The rural economy of Narayanganj is agricultural. Varieties of fishes are caught from rivers, channels, creeks and from paddy fields during rainy season. The major income generating activities of the people in this district is business and working in the mill and factories.

2.2.2 Country Overview, Macro-economy and Industry

a) Country Overview

Situated in the deltas of large rivers in South Asia, Bangladesh is a young democratic country with diverse growth pains. It hosts a rapidly growing population of 156.6 million (2013; IMF estimate) within an area of 147,570sqkm. The country has attractive population demography with nearly two thirds of its total population under the age of 34. 90 percent of the population is Muslim, 9% Hindu. The country is

¹⁶ The term "Ganj" refers to large market place which was established centering river port.

¹⁷ http://www.banglapedia.org/HT/N_0062.htm

¹⁸ Population and Housing Census 2011, BBS

¹⁹ Population and Housing Census 2011, BBS

²⁰ <http://www.narayanganj.gov.bd/node/300945>

²¹ Population and Housing Census 2011, BBS

²² http://www.rajukdhaka.gov.bd/rajuk/page/web/about/rajuk_jurisdiction.jsp

also known as one of the most densely populated countries in the world. The geographical location results in frequent natural disaster such as floods, monsoons, cyclones and droughts.

b) Macro-Economic Situation

Bangladesh has experienced rapid economic growth over the last decade but it remains one of the Least Developed Countries (LDCs)²³ with 31.5% of the total population living below the poverty line, and is the 8th most populous country in the world. Income per capita increased from US\$ 110 in 1974 to approximately US\$ 780 in 2012. The Bangladesh economy expanded by 6.3% in 2012 and has been growing at an average annual rate of 5.6% between 1994 and 2013 despite many obstacles including political instability, widely spread corruption, weak infrastructure, slow implementation of economic reforms, and insufficient power supplies. There have been considerable improvements in various human development indicators including higher life expectancy, child survival and girls' education.

According to the latest EIU Country Report for outlook during 2014 – 2018, real GDP is expected to expand by 5.8% in FY 2014/15 (July/June), up from an estimated 5.6% in 2013/14. Growth will accelerate slightly in 2015/16 and 2017/18, to an annual average of 6.3%. Inflationary pressures will remain high in 2014. Consumer prices are expected to rise by an average of 7.3% this year, down from 7.5% in 2013. Inflation is expected to moderate over 2015/18, with price increases average 6.7% a year. The current account surplus will decline in 2014, to the equivalent of 2.1% of GDP, from an estimated 2.4% in 2013, and is expected to post smaller surpluses in 2015 – 18, averaging the equivalent of 1% of GDP.

Forecast during 2013 to 2018 is summarized below.

Table 2.2.1 Economic Forecast Summary (% unless otherwise indicated)

Item	Year	2013 ^a	2014 ^b	2015 ^b	2016 ^b	2017 ^b	2018 ^b
Real GDP growth ^c		5.9 ^d	5.6 ^d	5.8	6.1	6.5	6.4
Industrial production growth		11.6	8.0	7.5	8.5	9.0	9.2
Unemployment rate (av.)		5.0 ^d	5.0	4.9	4.9	4.8	4.8
Consumer price inflation (av.)		7.5	7.4	7.2	6.9	6.6	6.0
Government balance (% of GDP) ^c		- 5.0	- 5.2 ^d	- 5.3	- 5.3	- 5.4	- 5.1
Exports of goods fob (US\$ bn.)		27.1 ^d	29.3	32.0	35.0	38.8	43.1
Imports of goods fob (US\$ bn.)		32.8 ^d	35.1	37.7	41.7	46.7	52.4
Current-account balance (US\$ bn.)		3.2 ^d	3.2	3.3	2.6	1.5	0.1
Current-account balance (% of GDP)		2.4 ^d	2.1	1.9	1.3	0.7	0.0
External debt (end-period; US\$ bn.)		26.5 ^d	27.2	27.7	27.9	27.6	27.2
Exchange rate BDT:US\$ (av.)		78.10	77.71	78.13	79.65	82.46	84.74
Exchange rate BDT:¥100 (av.)		80.03	76.15	76.36	78.09	81.64	84.74

a: Actual, b: EIU forecast c: Fiscal years (ending June 30th) d: EIU estimate

Source: EIU Country Report (Bangladesh) Generated on July 24, 2014

Economic growth is accompanied by structural changes in the economy with the decrease in relative share of agriculture from approximately 32% in 1981 to 19% in 2010 and increase in the relative share of industry from 19% in 1981 to 29% in 2010. The labour force participation rate has increased from 51.2 percent in 1990-1991 to 59.3 percent in 2010, led by women's growing participation in the labour market, which reached 36 per cent in 2010 as compared to 14 per cent in 1990-1991 and 23.9 per cent in 1999-2000. As a result, the incidence of poverty, although still prevalent, has declined from more than 80 per cent in 1973-74 to 31.5 per cent in 2010. In the economy's external sector, the composition of the

²³ The countries approved by the United Nations General Assembly as especially delaying in development, based on the criteria that the United Nations Development Planning Committee (CDP) has certified, and after the deliberations of the United Nations Development Economic and Social Council. According to the criteria on 2012, GNI (2008-2010 average) per capita is 992 US dollars or less. In Asia they are 9 countries including Bangladesh.

export basket has improved with the decline of primary products such as natural fibers and agriculture and the increase of modern manufacturing including of apparel, shoes, furniture, pharmaceuticals and ship building. This shift has been accompanied by rising remittances.²⁴ For prospect of the latest macroeconomic situation for the period of 2nd half of 2014 and 2015, refer to Box in the next page.

Box: Prospect of Bangladesh Macroeconomic Situation for the period of 2nd Half of 2014 and 2015

The Bangladesh Development Update October 2014 of World Bank notes on the current macroeconomic situation and provides the prospect up to FY 2015. Here are the summaries of the key aspects.

Overall macroeconomic stability maintained though inflation is still high. Inflation increased to 7.4% in FY14 from 6.8% in FY13, driven by food price increases. This was due in part to the supply disruptions caused by political unrest in 2013. Stable international oil prices and exchange rate as well as prudent monetary management reduced non-food inflation to 5.5% in FY14 from 9.2% in FY13. Despite a lower trade deficit, the current account surplus narrowed in FY14 because of a decline in remittances and an increase in services account deficit. The surplus in balance of payment increased from US\$5.1 billion in FY13 to US\$5.5 billion, creating an excess supply of foreign exchange. Bangladesh Bank (BB)'s interventions in the foreign exchange market limited nominal appreciation of taka. The real exchange rate appreciated by 8.5% in FY14 relative to FY13 due to small (2.7%) nominal appreciation and higher domestic inflation relative to international inflation. Foreign reserve increased to US\$21.6 billion in June 2014.

Monetary management was challenged by fast reserve accumulation. BB managed to keep reserve and broad money growth within target by stepping up sterilization operations. BB's net domestic assets and reserve money targets were met. Private sector credit growth remained subdued at 12.3%. BB increased Cash reserve ratio (CRR) from 6% to 6.5% in June 2014.

Financial sector is not out of the woods yet. Credit and risk management status is unsatisfactory in banking sector. Asset quality in the state-owned commercial banks (SCB) deteriorated in FY14 due to political unrest, poor lending decisions and change in loan classification standards. BB has started implementing the new provisions related to lending and bank's exposure to stock markets. This should prevent excessive risk taking by the banks.

Fiscal policy is affected by revenue collection and development budget implementation shortfalls. The overall fiscal deficit in FY14 was a modest 3.1% of GDP. Public debt as a share of GDP is declining. However, there is little improvement in the quality of the Annual Development Plan (ADP) expenditures. Yet, the size of ADP in FY15 is envisaged to increase by 34% relative to the FY14 revised ADP.

Overall pace of structural reforms is slow, but there has been significant progress in the garments industry towards improving working conditions for factory workers, amendments to the labour and the Export Processing Zone (EPZ) laws, government's capacity in assessing factory safety and agreement on common standards to assess structural building safety. Speedier progress is needed in the implementation of the new VAT law, liberalization of exchange regulations, infrastructure management, and financial supervision.

Growth and inflation outlook is favorable for 2015. Political stability since January, increase in remittance inflows, expected recovery in exports following a weak start, and a buoyant consumption demand than last year, bode well for growth in FY15, which is projected at 6.2%. Macroeconomic stability, improved governance in banking system, market development for long term financing, trade liberalization, and stronger attention to efficient implementation of infrastructure investments remain key factors in this process. Underlying inflationary pressures are expected to maintain a downward trend on continued policy restraint. Achieving this will depend on international price trends, domestic supply conditions and macroeconomic policies.

What needs to be done in the near term to sustain growth?

Stronger attention is needed to complete the transition in garments including implementing wage increases and the new labour legislations, recruiting more factory inspectors and completing building inspections followed by remediation measures such as relocation of closed garments factories. Priority should be on completing the ongoing road development projects, i.e. Dhaka-Chittagong and Dhaka-Mymensingh highway; Double Tracking of Dhaka-Chittagong Railway; the Padma Bridge; Dhaka metro rail; and the two Bibiyana gas field based power plants. Immediate action should be taken to enact the Public Private Partnership (PPP) law, and awarding contracts for building Special Economic Zones (SEZs).

c) Industrial Policy and Private Sector Development in Bangladesh

²⁴ Quoted from ILO Report.

Efforts towards industrialization in Bangladesh were made under changing economic and political circumstances. Since independence in 1971, seven industrial policies were formulated up-to 2005 for the industrial development of the country. These policies had different impacts on industrial progress. The most visible policy switch occurred with the transition from state-owned and controlled enterprise economy to a liberal market economy with the private sector as the main engine of growth. And the private sector has been playing a commendable role although there is scope for further stimulating the sector through policy supports, strategic interventions and creating required supportive infrastructure.

Contribution of industrial sector to GDP has been increasing in a consistent way over the past decades. In order to accelerate the pace of industrialization in the country, the government has announced the **‘National Industrial Policy (NIP) 2010’**, the latest industrial policy. The important and underlying objectives of the policy include generation of productive employment, mainstreaming women in the industrialization process and poverty alleviation. The NIP 2010 set the vision to achieve a dominant industrial sector where manufacturing is expected to account for at least 30% of the GDP and 20% employment of the workforce in the country by 2021²⁵. This is supposed to be realized through a vibrant and dynamic private sector with the public sector playing a complimentary role. Accordingly, the government also enacted Bangladesh Economic Zones Act 2010 to facilitate establishment of Economic Zones (EZs) in different parts of the country for increasing employment and income. Also, the Public Private Partnership (PPP) model for infrastructure development has been an added feature of the policy to motivate private sector growth in creating related industrial infrastructure including EZs. The NIP also enunciates the different incentive schemes for investors including foreign direct investment (FDI) and export orientation. Special attention is given to the development of cottage, small and medium industries in decentralized employment, women entrepreneurship development and poverty alleviation. The industry sector is expected to be labour and environment friendly with social compliance, health, safety and other standards required by the WTO.

Moreover, both NIP 2005 and 2010 have also identified several types of industries to boost up the economy and these are called “Thrust Sectors”. There are 34 different types of industries and are based on the potentials within the country. The government is committed to provide supports to these thrust sector industries. Among them there are some sectors named as ‘Booster Sectors’ that include agro-based and agro-processing, light engineering, footwear and leather, plastics, electrical and electronics, etc. Salient features of the NIP 2010 of Bangladesh are: a) Reclassification of Industry and Redefinition of Industry Size, b) Thrust Sector Industries, c) Regulated Industries, d) Policy Contradictions about Private and Public Sector Involvement, e) Public Private Partnership (PPP), and f) Investment Incentives.

Besides the NIP 2010, the government also introduced other relevant and supportive policies for industrial development, trade and investment promotion in Bangladesh. These include ‘Export and Import Policy’, ‘SME Policy and Strategy’, ‘Investment Promotion Policy’, Bangladesh Export Processing Zones Act, Bangladesh Economic Zones Act, Competition Policy, etc. These policies aimed at supporting the industrial development, trade and investment promotion in the country for rapid industrialization for creation of jobs and poverty alleviation. Under the SME Policy and Strategy, the government identified SME Booster sectors and six industrial sectors have been identified with high growth potential targeting the local and export markets. Besides EPZs, the government is also dedicated to develop Economic Zones to attract FDI for rapid industrialization and a list of incentive schemes is included under the investment policy for local and foreign investors. Institutions like SME Foundation, Bangladesh Economic Zone Authority (BEZA), PPP office etc. are established to create an enabling business environment and

²⁵ Vision 2021

investment climate. In this regard, the government avails required technical assistance support from different bilateral and multilateral development partners.

d) Definition of SME

Current definition of small and medium scale enterprises, SME, is provided in National Industrial Policy 2010.

1) Small Industry

In terms of manufacturing sector, Small Industry is one which has a total fixed asset ranges from BDT 5.0 million to BDT 100 million excluding the price of land and factory building or there are 25-99 workers working in that industry.

In case of service industry, Small Industry is one which has total fixed asset ranges from BDT 500,000 to BDT 10 million excluding the price of land and factory building or there are 10-25 workers working in that industry.

Any business activity under certain criteria or standards may be defined as small industry but it may apparently be included as a medium industry under a separate criteria or standard, in such situation, the said activity shall be regarded as activity under the medium industry.

2) Medium Industry

In terms of manufacturing sector, medium Industry is one which has a total fixed asset more than BDT 100 million but limited to BDT 300 million excluding the price of land and factory building, or there are 100-250 workers working in that industry.

In case of service industry, medium Industry is one which has total fixed asset ranges from more than BDT 10 million to BDT 150 million excluding the price of land and factory building or there are 50-100 workers are working in that industry.

Any business activity under certain criteria or standards may be defined as medium industry but it may apparently be included as a large industry under separate criteria or standard, in such situation, the said activity shall be regarded as activity under the large industry.

3) Large Industry

In terms of manufacturing sector, large Industry is one which has a total fixed asset more than BDT 300 million excluding the price of land and factory building, or there are more than 250 workers working in that industry.

In case of service industry, large Industry is one which has total fixed asset ranges from more than BDT 150 million excluding the price of land and factory building or there are more 100 workers are working in that industry.

Table 2.2.2 Classification of Businesses by the Size**Small Industries:**

Manufacturing		Services	
Total fixed assets excluding land and building	Employees	Total fixed assets excluding land and building	Employees
BDT 50 mil. to 100 mil.	25 - 99	BDT 500,000 to 10 mil.	10 - 25

Medium Industries:

Manufacturing		Services	
Total fixed assets excluding land and building	Employees	Total fixed assets excluding land and building	Employees
More than BDT 100 mil. to 300 mil.	100 - 250	More than BDT 10 mil. to 150 mil.	50 - 100

Large Industries:

Manufacturing		Services	
Total fixed assets excluding land and building	Employees	Total fixed assets excluding land and building	Employees
More than BDT 300 mil.	More than 250	More than BDT 150 mil.	More than 100

Source: National Industrial Policy 2010

2.2.3 Financial Sector and Financial Markets in Bangladesh

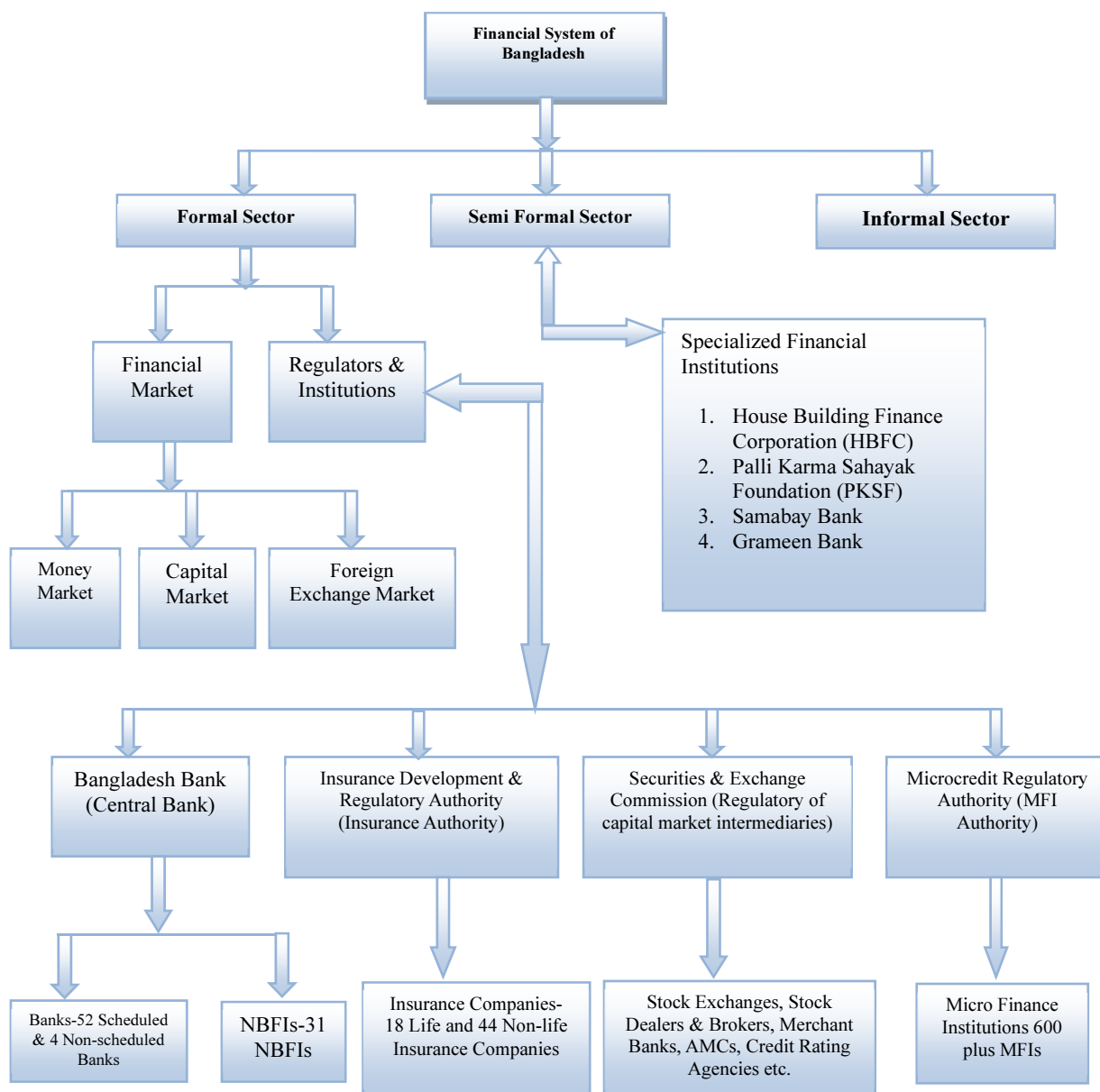
This section is basically sourced from Chapter 3 of Study on Private Sector Development and Investment Promotion in Bangladesh through Infrastructure and Industrial Financing.

Just after the independence in 1971, socialism became the national policy with nationalized banks and insurance companies and pegged exchange rate system. It was in 1991, as per the amendments prescribed under Financial Sector Reform Programme (FRSP), when Bangladesh financial system was actually transformed and days of controlled interest rates, credit quota and pegged exchange rate system were over. Regime of market-based financial system was on.

Bangladesh financial system currently consists of scheduled and non-scheduled banks, non-bank finance institutions, microfinance institutions, insurance companies, co-operative banks, credit rating companies, merchant banks, brokerage houses and stock exchanges. The financial system includes 4 state-owned commercial banks (SCBs), 4 government-owned specialized development banks (SDBs), 56 private commercial banks (PCBs) including 9 foreign commercial banks (FCBs), 4 Non-scheduled banks and 31 non-bank financial institutions (NBFIs).

The financial system also embraces Investment Corporation of Bangladesh (ICB), House Building Finance Corporation (HBFC), 2 stock exchanges, 62 insurance companies, 599 registered micro-credit organizations, 54 merchant banks (investment banks), 387 depository participants (stock dealers, brokers, etc.), 8 credit rating companies, and 119 registered co-operative banks²⁶. The overall financial system of Bangladesh can be presented in the following diagram in brief:

²⁶ Financial Stability Report 2012



Source: Study on Private Sector Development and Investment Promotion in Bangladesh Through Infrastructure and Industrial Financing: Chapter 3

Figure 2.2.1 Bangladesh Financial System

a) Banking System in Bangladesh

Banks, Non-bank Financial Institutions (NBFI), mutual funds, microfinance institutions are the major participants in Bangladesh financial system. Over the years the extent financial inclusion has certainly enhanced and banks have played the major role in this advancement (under all sorts of inclusion benchmarks)²⁷. During the last decade, asset size, deposit portfolio volume of banking sector increased in multiples. It is the privatized commercial banks which exerted this breakthrough. The following table underlines this development.

²⁷ MoF, 2009.

Table 2.2.3 Aggregate Balance Sheet of Banking Sector

Particulars	Amount in Billion BDT				Change (%)	
	2009	2010	2011	2012	2010 to 11	2011 to 12
Property & Assets:						
Cash in Hand (including FC)	52		59.7	81.1	14.8%	35.8%
Balance with BB & SB (including FC)	300.6		399.5	450.8	32.9%	12.8%
Balance with other Banks & FIs	146.6		155.9	244.7	6.3%	57.0%
Money at Call & Short Notice	43.9		128.1	66.8	191.8%	-47.8%
Investments;						
Government	490.8		662.1	972.2	34.9%	46.8%
Others	98.5		131.3	141.3	33.3%	7.6%
Total	589.3		793.4	1113.4	34.6%	40.3%
Loans and Advances;						
Loans, CC, OD etc.	2361.6	2973.4	3525	4098.4	18.6%	16.3%
Bills purchased & Disc.	131.6	225.3	267.5	288.2	18.7%	7.7%
Total	2493.2	3198.6	3792.5	4386.7	18.6%	15.7%
Fixed Assets	61.3	101.7	143.7	162.1	41.3%	12.8%
Other Assets	316.2	421.1	401	488.1	-4.8%	21.7%
Non-banking Assets	1.1	1.1	1.2	36.9	9.1%	2978.9%
Total Assets	3932.2	4855	5875	7030.7	21.0%	19.7%
Liabilities:						
Borrowings from other banks/FIs	122	159.8	226.3	316.0	41.6%	39.6%
Deposits & Other Accounts:						
Current Deposit	544.3	712.7	992.9	989.6	39.3%	-0.3%
Bills Payable	48.7	59.8	65.3	76.0	9.2%	16.3%
Savings Deposit	731.7	852.4	933.7	972.6	9.5%	4.2%
Fixed/Term Deposit	1805.9	2156.7	2583.2	2985.6	19.8%	15.6%
Other Deposits				474.4		
Total	3130.6	3781.6	4575.1	5498.2	21.0%	20.2%
Other Liabilities	406.9	494.8	546.4	640.6	10.4%	17.2%
Total Liabilities	3659.5	4436.2	5347.8	6454.7	20.5%	20.7%
Capital/Shareholder's Equity	272.7	418.7	527.1	575.9	25.9%	9.3%
Total Liabilities & Shareholder's Equity	3932.2	4855	5874.9	7030.7	21.0%	19.7%
Off-balance Sheet Items	911.6	1985.8	1814.6	1871.25	-8.6%	3.1%

Source: Financial Stability Report (2011) Bangladesh Bank

Besides financial inclusion, the banking sector in Bangladesh also earned remarkable success over the decade and table below shows aggregate income statement of banking sector in Bangladesh:

Table 2.2.4 Aggregate Income Statement of Banking Sector

Particulars (Year)	Amount in Billion BDT				Change (%)	
	2009	2010	2011	2012	2010 to 2011	2011 to 2012
Interest Income	271.2	321.7	442.8	572.1	37.6	29.2
Less: Interest Expense	186.8	200.2	297.5	418.3	48.6	40.6
Net Interest Income	84.4	121.5	145.3	153.8	19.6	5.9
Non-Interest/Investment Income	118.4	164.8	168.5	186.4	2.2	10.6
Total Income	202.9	286.4	313.8	340.2	9.6	8.4
Operating Expenses	86.6	115.5	127.0	142.9	10.0	12.6
Profit before Provision	116.2	170.9	186.8	197.3	9.3	5.6
Total Provision	26.1	35.6	44.7	86.4	25.6	93.4
Profit before Taxes	90.1	135.3	142.1	110.8	5.0	(22.0)
Provision for Taxation	35.9	52	66.9	66.2	28.7	(1.1)
Profit after Taxation/Net Profit	54.1	83.3	75.2	44.66	(9.7)	(40.6)

Source: Financial Stability Report (2011) Bangladesh Bank, Dhaka.

Bangladesh financial system comprises three layers: regulatory authorities, public finance and private finance, as shown in Figure 2.2.1 above. Bangladesh Bank as the central bank and the Ministry of Finance as the key regulatory authority decide overall framework and issue directives, which governs the operation of commercial banks and the overall financial performance in Bangladesh. Government financial institutions are owned and controlled by the government. As regards to private finance, the financial institutions so far developed are in the category of commercial banks owned by Bangladeshi nationals, some life and non-life insurance companies, leasing companies and foreign commercial banks owned by foreigners.

Available statistics suggest that up-to March 2013 the number of scheduled banks in the country was 50 and the number of non-banking financial institutions (NBFI) was 31. The number of bank branches was 8,375 and the number of branches of NBFIs including their head office was only 170. There were 4 scheduled commercial banks and 4 specialized financial institutions under government ownership. Out of the private commercial banks, 33 were under private sector and 9 were under foreign ownership.

It is observed that the amount of default loans in the banking sector almost doubled in 2012 mainly due to scams, loan stuck in some sectors and the new loan classification rules. The amount stood at 10.03 percent of the banks' outstanding loans to reach BDT 427,260 million on December 31, 2013 according to the Bangladesh Bank statistics. In 2012, default loans in state banks rose by BDT 123,440 million, while the amount increased by BDT 58,330 million in private banks, by BDT 2,190 million in foreign banks and by BDT 16,850 million in specialized banks. According to Bangladesh Bank data the overall defaulted loans increased to BDT 567,201 million as on September 30, 2013 from BDT 427,255 million as on December 31, 2012. In November 2013 Bangladesh Bank appointed an observer to BASIC Bank, a state owned specialized bank for industrial finance, after it failed to fulfill major conditions put by the central bank to improve its financial health.

In Bangladesh, Offshore Banking²⁸ Unit mainly deals with non-residents Bangladeshi citizens, maintaining exclusively foreign currency transactions, can borrow and lend in foreign currency with any

²⁸ Offshore banking refers to the banking system which is set up in specially demarcated zones which are separate from the domestic banking system and which raised funds for its operation from offshore or non-resident sources for investment in domestic and or third country projects. It also refers to the banking operations that cover only non-residents and do not mix with the domestic banking. An off shore banking centre is a place where deliberate attempt is made to attract international banking by offering many concessions in the form of taxes and levies being imposed at lower rates or not being charged. A more important relaxation for the offshore banks is the exemption from restrictions on operations. Offshore banking in these

other local and global Banks, being treated its operation as a country within a country, commissioned by a separate Banking License from Bangladesh Bank and free from minimum reserve requirement. Bangladeshi citizen and on contrary dealing with the non-residents 100% foreign-owned and joint-venture investment enterprises inside the export processing zones which does not fall under the set regulations of Bangladesh Bank and other regulators. It is completely a separate function and distinct identity, where its customers can enjoy unique package of tax benefit and the operations which are free from local regulations to compete with domestic banks including local branches of foreign banks

Offshore banks in Bangladesh operate with a lower cost base and can provide higher interest rates than the rate in the home country due to lower overheads and a lack of government intervention. Advocates of offshore banking often characterize government regulation as a form of tax on domestic banks, reducing interest rates on deposits. In Bangladesh, there is a ten-year period of tax holiday for companies based in Export Processing Zones (EPZs) companies. Offshore banks are free to accept deposits or to borrow, from persons/institutions not residents in the Bangladesh including Bangladesh nationals working abroad. Offshore banks are also free to accept deposits from, or to borrow from, Type - A (wholly foreign-owned) units in the EPZs in Bangladesh. However, such banks are not to accept deposits from persons/institutions residents in Bangladesh including Type - B (joint venture) and Type C (100% locally-owned company) units in the EPZs in Bangladesh.

b) Regulatory Framework of the Financial Markets in Bangladesh

The size and number of companies and corporations in Bangladesh are relatively small. There are about 45,000 private limited companies and 256 public limited companies listed in the Dhaka Stock Exchange (DSE) and the Chittagong Stock Exchange (CSE). The corporate sector is a mixture of local-private, foreign-multinational and state owned companies. Among the local companies very few have any international operation. Unlike in other countries, the number of state-owned companies in Bangladesh is relatively large. In most of these companies the condition of management practices, internal control and corporate governance is very poor. There is no effective structure of internal audit review and report on internal control and other operations. Moreover, in companies where there is some kind of internal audit unit, the auditors are not independent, financial reporting is faulty, there is no audit committee and there is no audit charter for internal audit.

Currently, the Companies Act of 1994 is the law that governs the incorporated domestic corporations and institutions. The other significant laws which have important role in governing the corporate sectors are: Securities and Exchange Ordinance 1969, Bangladesh Bank Order 1972, Bank Companies Act 1991, Financial Institutions Act 1993, Securities and Exchange Commission Act 1993 and the Bankruptcy Act, 1997.

Generally, Bangladesh Bank (BB) declares the monetary policy on a regular basis in order to stabilize the monetary management issues and to support the financial markets and capital markets. In order to cushion the impact of recent domestic disruptions on businesses, the BB has taken a number of important policy steps as mentioned below:

- Broadening the scope of the Export Development Fund
- Reducing the borrowing costs
- Instructing banks to offer loan rescheduling facilities to genuine borrowers facing cash flow difficulties

centers can carry on their activities of deposit taking and lending from / to international enterprises or investors without conflict with the domestic fiscal and monetary policy.

c) Government Institutions in the Financial Sector

1) Ministry of Finance, Government of Bangladesh

The Ministry of Finance (MOF) is the focal point of the financial sector of the government. MOF comprises of four divisions namely i) Bank and Financial Institutions Division (BFID), ii) Finance Division (FD), iii) Economic Relations Division (ERD), and iv) Internal Resources Division (IRD). BFID deals with the law and policy issues related to the Banks, Non-Bank Financial Institutions, Capital Market, Insurance sector and Microcredit sector. BFID coordinates the activities for formulating policies on capital adequacy as well as review of related policies and programs. However, monitoring the utilization of foreign loans and other types of assistance channeled to different agencies like Bangladesh Bank, Bangladesh Securities and Exchange Commission (BSEC), Palli Karma-Sahayak Foundation (PKSF), Social Development Foundation (SDF), Bangladesh Municipal Development Foundation (BMDF) and Bangladesh NGO Foundation etc. are also important activities of BFID.

The Division also performs co-ordination activities with different regulatory bodies like Bangladesh Bank, Bangladesh Securities and Exchange Commission (BSEC), Insurance Development and Regulatory Authority (IDRA), Microcredit Regulatory Authority (MRA), Bangladesh Institute of Capital Market (BICM) and Bangladesh Insurance Academy (BIA), etc.

ERD mobilizes external resources for socio-economic development of the country. ERD leads as the focal point of the Government for interfacing with the development partners as well as for co-ordination of all external assistance inflows into the country. It assesses the needs of external assistance, devises strategy for negotiations and mobilizing foreign assistance, formalizes and enables aid mobilization through signing of loans and grants agreements, determines and executes external economic policy.

2) Bangladesh Bank (BB)

Bangladesh Bank has been working as the central bank since the country's independence. Its prime jobs include issuing of currency, maintaining foreign exchange reserve and providing transaction facilities of all public monetary matters. BB is also responsible for planning the government's monetary policy and implementing it thereby. BB has a governing body consisting of nine members with the Governor as its chief. Apart from the head office in Dhaka, it has nine more branches, of which two in Dhaka and one each in Chittagong, Rajshahi, Khulna, Bogra, Sylhet, Rangpur and Barisal. BB has a functioning Credit Information Bureau (CIB) that is involved in disclosing credit history of account holders seeking a loan for BDT 50,000 and above.

3) Scheduled Commercial Banks (SCBs)

There are 56 scheduled commercial banks in Bangladesh, having a total of 8,422 branches in 2012, out of which 3,600 were in the rural areas and 4,827 in the urban areas. These scheduled commercial banks are categorized into three groups: nationalized commercial banks (NCBs) owned by the Government, private commercial banks (PCBs) and foreign commercial banks (FCBs). The NCBs have wide network of branches throughout the country compared to the other two groups. In the past, one of the NCBs named Sonali Bank used to serve as '**clearing house**' in places where there was no branch of Bangladesh Bank.

4) Specialized Banks (SBs) for Industrial and Other Sectors

There are a few specialized banks for financing different sectors including industrial sector namely Bangladesh Development Bank Limited (BDBL), Bangladesh Krishi Bank, Rajshahi Krishi Unnayan Bank (RAKUB), BASIC Bank Limited and Bangladesh Samabaya Bank Limited (BSBL). BDBL was established upon merger of two financial institutions named Bangladesh Shilpa Bank (BSB) and Bangladesh Shilpa Rin Sangstha (BSRS). Both BSB and BSRS were the most prominent ones having long

history of financing industries in Bangladesh. Due to cumulative financial loss, weak lending performance and recovery and operational inefficiency, the government abolished these two FIs and established BDBL as a fresh financial institution.

5) Non-Banking Financial Institutions: DFIs and Leasing Companies

At present, there are 31 Non-Banking Financial Institutions (NBFIs) operating in Bangladesh under the license from Bangladesh Bank. These financial institutions are playing a vital role in short and long term financing for trade and commerce, industry, agriculture and housing sectors. As NBFIs, there are 20 leasing companies and the rest are specialized financing institutions for industrial development. Under Companies Act, 1994, the government established two NBFIs specialized for infrastructure financing: Infrastructure Development Co., Ltd. (IDCOL) and Bangladesh Infrastructure Finance Fund Ltd. (BIFFL). Some of these prominent NBFIs are IDCOL, BIFFL, IPDC, SABINCO, IDLC, ULC, Delta BRAC Housing, National Housing Ltd, etc. Except IDCOL and BIFFL, they are mainly involved in industrial and housing finance.

6) Islamic Banking

Islami Bank Bangladesh Limited (IBBL) is the first bank that introduced commercial banking based on Islamic Shariah with foreign shareholding in Bangladesh in 1983. Since then Islamic banking has been growing progressively together with the conventional banks. Currently, there are seven banks operating as full-fledged Islamic Banks with 750 branches. Apart from these, there are nine conventional banks offering Islamic banking services through setting up of 20 Islamic banking branches and 8 more conventional banks are doing so with 30 Islamic banking windows. Islamic banks are now focusing on a wider horizon, encompassing not only the conventional Shariah products but also they are involved in SME and microfinance and financing in the Agriculture sector. Islamic banks have been operating as Shariah banks for the last three decades alongside with the traditional banks.

7) Investment Corporation of Bangladesh (ICB)

The Investment Corporation of Bangladesh was established in 1976 with the objective of encouraging and broadening the base of industrial investment. ICB underwrites issues of securities, provides substantial bridge financing programmers', and maintains investment accounts, floats and manages closed-end & open-end mutual funds & closed-end unit funds to ensure supply of securities as well as generate demand for securities. ICB also operates in the DSE and CSE as dealers. ICB has so far floated eight closed-end mutual funds. ICB mutual funds have become very popular with the investors due to payment of attractive dividends regularly.

8) Bangladesh Securities and Exchange Commission (SEC)

Bangladesh Securities and Exchange Commission (BSEC) was established on 8th June, 1993 under the Securities and Exchange Commission Act, 1993. The Chairman and Members of the Commission are appointed by the government and have overall responsibility to administer securities legislation. The Commission is a statutory body and attached to the Ministry of Finance. There are two stock exchanges: Dhaka Stock Exchange (DSE) and Chittagong Stock Exchange (CSE).

9) Cooperative Banks

In Bangladesh 119 cooperative banks are operating, of which 64 are central cooperative banks, 48 are land mortgage and the rest seven are other cooperative banks. The maximum share of total assets, 90%, is controlled by central cooperatives. Similarly, the maximum share deposits (85%) and advances (90%) are handled by the same central cooperatives.

Apart from the above banks and FIs under the Ministry of Finance, there are supportive operational units mandated to support promotion of industrial and infrastructure investment in the country functioning directly under the Prime Minister’s Office (PMO) and these are namely, Board of Investment (BOI), Bangladesh Export Processing Zones Authority (BEPZA), Bangladesh Economic Zones Authority (BEZA), Public-Private Partnership Office and the Private Export Processing Zones Cell.

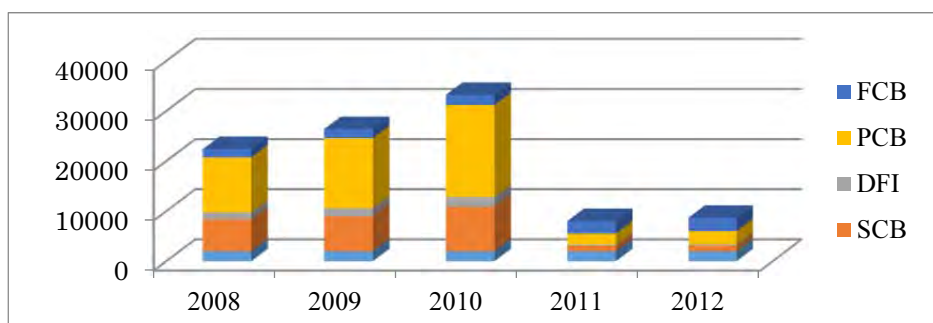
d) Performance in Financial Sector

1) Performance of Banks and Financial Institutions

Performance of banks and FIs can be measured in terms of volume of loans and advances, deposits and branch network. The share of loans and advances was the largest among asset items, but recently, it has declined by 2.2% in calendar year (CY)²⁹ 2012 while the share of investment in government and other securities was increased by 2.3% due to high government borrowing from the banking sector.

The share of banks' assets with BB was decreased by 0.4% and with other banks and FIs increased by 0.9%. Banks' money at call has decreased by 1.2% at end-December 2012 compared with end-December 2011 due to the increase in availability of liquid funds of banks. Higher availability of funds also brought down the cash-to-deposit ratio (CDR) of many banks below 90 percent in CY 2012. Classified loans of the banking sector did actually rise to 10% from 6.2%, an increase of 3.8% at end-December 2012 due to reasons including strict provisioning regulations of BB. Classified loans of state-owned commercial banks to total classified loans in the sector increased by 9.9%. In monetary terms, classified loans of state owned commercial banks have increased by BDT 123.4 billion in CY12 from that of CY11. Figure below shows the trend of loans and advances.

Figure 2.2.2 indicates that overall volume of loans and advances drastically fell due to the stringent policy and conservative attitude of the banks and FIs after the scam in the banking sector. The bankers became very much hesitant to extend loans and also adopted stringent policy as recommended by the central bank and the respective Board of Directors. This has resulted in drastic decline of loans and advances by the banks.



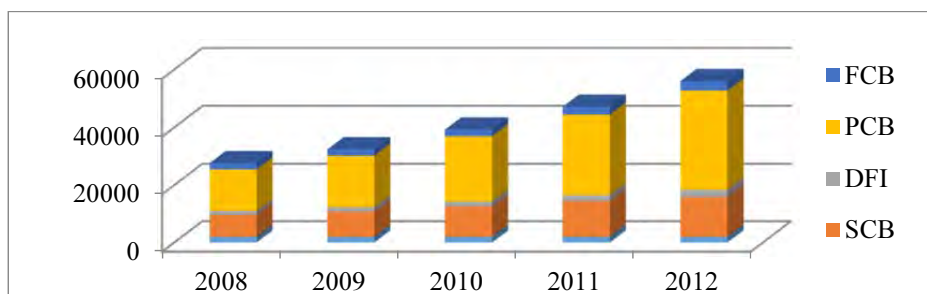
Source: *Financial Stability Report Bangladesh Bank, Dhaka*³⁰

Figure 2.2.2 Loan Value of Banks and FIs in million BDT (2008-2012)

Deposits are the largest source of external funds in the banking sector. The share of total deposits was 84% of the total liabilities as at end-December 2012. Total banking sector deposits were composed of 88.2% urban and 11.8% rural deposits in CY12. The share of term deposits was 54.3% of total deposits, whereas the share of savings deposits, current deposits, and other deposits were 17.7%, 18% and 8.6% respectively of total deposits at end-December 2012. The deposit structure shows a greater reliance on

²⁹ CY: Calendar Year. i.e. January- December. FY means fiscal year i.e. July 2103 to June 2014.
 In Bangladesh, reporting is made in dual consideration, like for annual budgeting and tax payments, the government follows fiscal year. Banks are following calendar year for their accounting.
³⁰ FCB: Foreign Commercial Banks, PCB: Private Commercial Banks, DFI: Development Financial Institutions, SCB: Specialized Commercial Banks

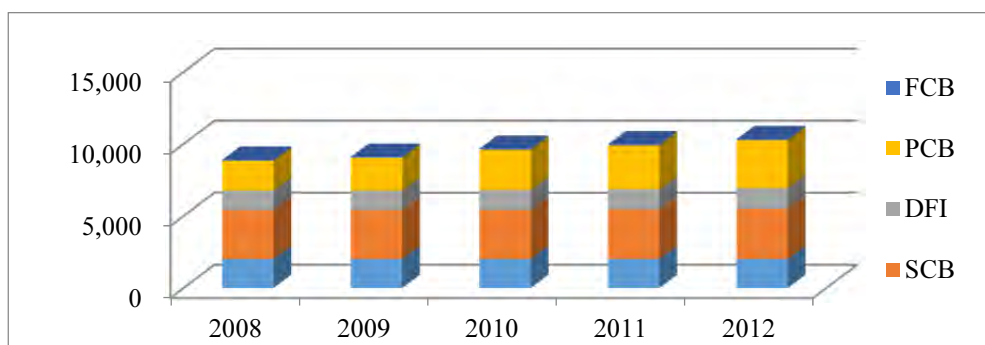
term deposits, regarded as more stable, which contributes to financial stability. The share of top 5 banks and top 10 banks within total deposits are 34.6% and 49.1% respectively at end-December 2012. Among the top 10 banks, 3 are state-owned commercial banks, 5 are domestic private commercial banks, 1 is a specialized development bank and 1 is a foreign commercial bank. And among the top 5 banks, 3 are state-owned commercial banks and rest 2 domestic private commercial banks. Figure below shows that the deposit of banks and FIs during period from 2008 to 2012 has grown steadily where major contribution was made by the private commercial banks due to their aggressive drive by bank executives.



Source: BB Annual Reports 2013

Figure 2.2.3 Deposit of Banks and FIs in Million (2008-2012)

To comply with the central bank's on-going financial inclusion³¹ programs, opening of new branches has been enhanced with an aim to help strengthen branch network and expansion of branches. This has brought in unbanked people into the banking systems. Thus, it indicates a better financial inclusion during the last five years. Figure below shows the growth in branch network although not at a high percentage.



Source: BB Annual Report 2013

Figure 2.2.4 Number of Branches of Banks and FIs during 2008 -2012

2) Performance of Commercial Banks

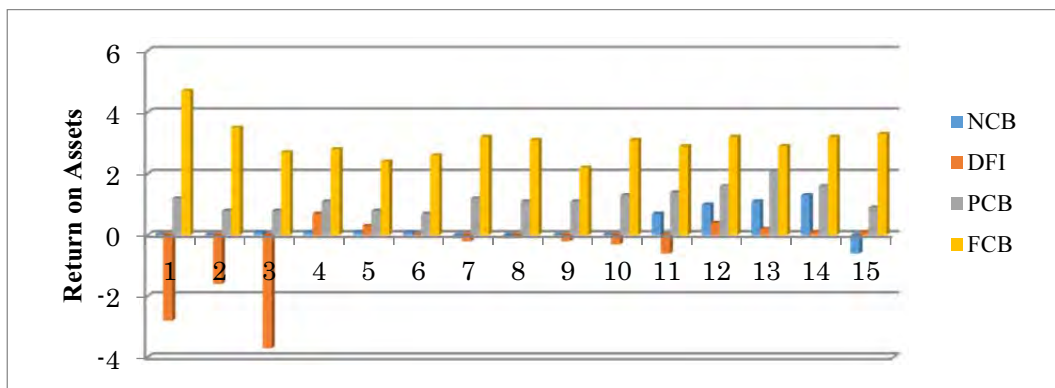
During the last one and half decade, private commercial banks, leasing companies and other NBFIs achieved steady growth in Bangladesh despite global financial crisis, although the scenario is just opposite for state-owned commercial banks. This has been possible due to several reasons like operational efficiency, credit disbursements without external influence, skilled manpower and increased application of ICT tools in all activities, earning increased level of confidence on depositors, etc. The four state-owned commercial banks (SCB) of Bangladesh which are termed as an integral part of Bangladesh banking sector underwent major reforms in 2007. The existing financial health of these banks is very volatile due to inefficient resource allocation through disbursement of credit, imprudent risk analysis, poor supervisory and management quality, and weak governance. More recently, a series of loan scams and increased rate of loan default have further worsened the financial conditions of SCBs. To analyze and measure the

³¹ The Governor of BB introduced for the first time "10-Taka Bank Account for Farmers," on February 4, 2010. Also, the Governor made provision of finance for marginal people under different programs (landless farmers). Upon taking this initiative, farmers and marginal people are brought under banking system. This is called financial inclusion.

performance of the commercial banks, following key issues (profitability, operational efficiency, capital adequacy, etc.) have been taken into consideration and explained as below:

a. Return on Asset (ROA)

Any type of business should earn adequate profit by utilizing its scarce resources. Performance of nationalized commercial banks has not been satisfactory as the ROA (Return on Assets) have always been less than 2% and it was a volatile number all across the time. The performance of DFI (development finance institutions) has been even worse during the last 14 years of time horizon. Even though the local private commercial banks (PCBs) have been earning positive profit figures all across the time this performance looks unconvincing on a relative scale. During the time period, it is the FCBs (foreign commercial banks) whose performance was more stable and satisfactory on a reasonable ground.

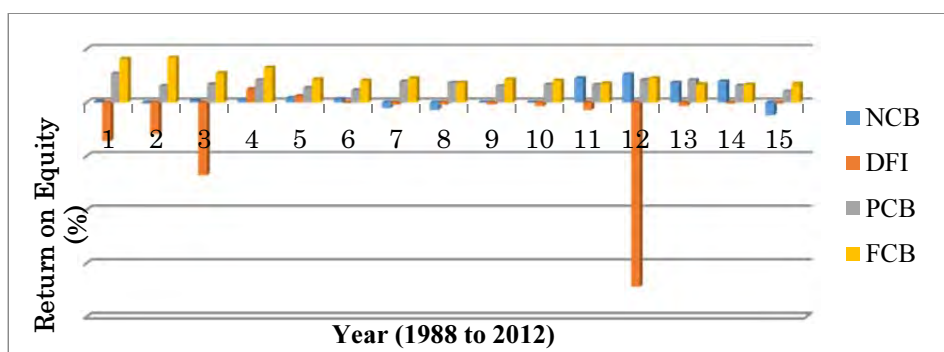


Source: Return on Assets, Statistics of the Banking Sector (1998-2012)

Figure 2.2.5 ROA of Banking Sector

b. Return on Equity (ROE)

Performance of nationalized commercial banks have not been satisfactory as the ROE (return on assets) was a volatile number all across the time. The performance of DFI (development finance institutions) has been even worse during the fourteen years of time horizon; never ever the equity holders get their desired level of compensation. During the time period, it is the PCBs (private commercial banks) and FCBs (foreign commercial banks) whose performance was more stable and satisfactory on an absolute and relative basis.



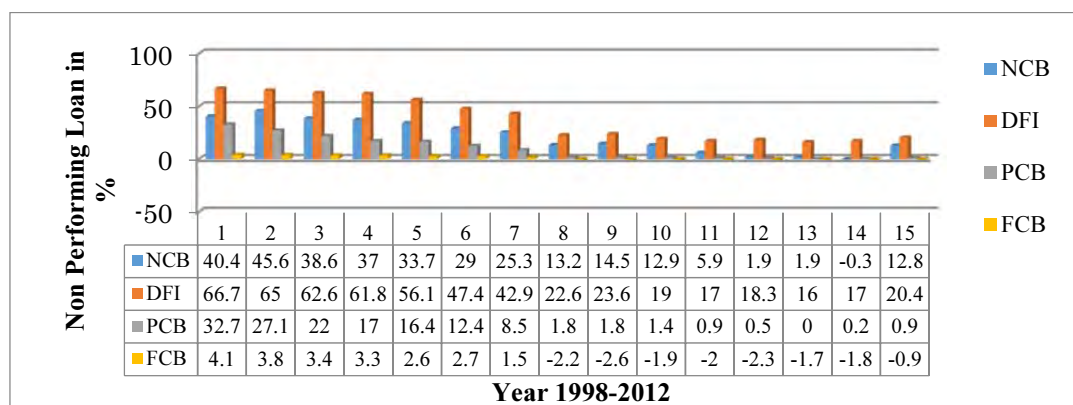
Source: ROE statistics of the banking sector (1998-2012), Bangladesh Bank

Figure 2.2.6 ROE of Banking Sector

Recently, Sonali Bank and Janata Bank incurred losses of BDT 12.8 billion and BDT 5.4 billion respectively in 2012, but Agrani Bank and Rupali Bank reported profits of BDT 6.8 billion and BDT 1.3 billion respectively in the same year. Scrutiny from a central bank inspection team of the balance sheets of Agrani bank revealed massive accounting fraud where the bank showed inflated profits despite incurring net loss of BDT 11.85 billion by not abiding by the provisioning guidelines set by BB and the profit was calculated without keeping required provisioning against its classified loans and investments.

c. Non-Performing Loans (NPL)

One of the biggest yardsticks of bank's efficiency as well as healthy management is the NPL percentage. It has been evident from Figure 2.2.7 mentioned below that the NPL scenario of both the NCBs and the DFIs are at a staggering stage since majority of the time they had a NPL statistics over 10%. During the last few years the situation has improved a little bit. On the other hand, the PCBs and the FCBs have been successful in reducing the adverse selection and moral hazards issue.



Source: Non Performing Loans Statistics of the Banking Sector (1998-2012), Bangladesh Bank

Figure 2.2.7 NPL of Banking Sectors

However, recently, these banks have failed to ensure quality of portfolio while disbursed their loans and advances and the ratio of NPLs to total loans is 63% which is very alarming. Although central bank cushioned to maintain a ratio of NPL to the total portfolio at 10% maximum, these banks failed to achieve this target thus indicates very unsatisfactory loan performance. On the contrary, the private commercial banks are maintaining a NPL to total loan ratio of 3.8% only operating in the same market. This necessitates huge reforms and advisory services in the operational activities of these banks supported by strong political will of the government and without ensuring prudential banking practices, these banks may not be able to continue smooth operation in the future and thus may fall far behind the private commercial banks where cost of fund is very high for the industrial entrepreneurs.

d. Loan Recovery

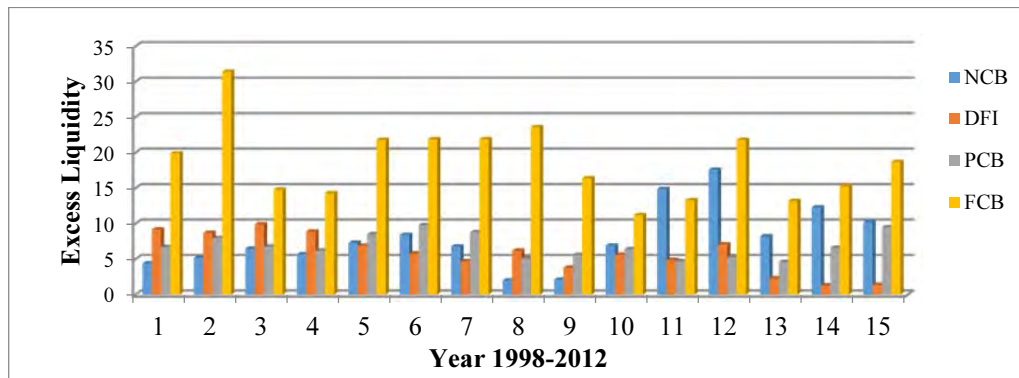
It can be concluded here that all the SCBs are in deep financial crisis and if this crisis prolongs further, this would have very impact on the banking sector. Immediate measures that can be helpful to overcome this crisis may include privatization of these SCBs, enforce politically unbiased management of SCBs and Autonomy of BB.

Currently, local banks face different kinds of risks during the operations and these can be classified in different ways. A) Operational risk which is resulting from inadequate or failed internal processes, people and system, or from external events. B) Strategic risk arises from potential adverse effect of high-level business decisions or the ineffective implementation of those decisions and from how well management identifies and addresses external factors that affect the strategic direction of the business. C) Compliance risk is also another factor incurred due to inadequate monitoring and other reasons. However, these can be addressed by proper understanding of legal/regulatory issues, rigorous compliance monitoring, thorough documentation, and supervisory reviews and sound anti-money laundering (AML) program. Also, financial reporting risk arises from non-compliance with the accounting policies or reporting requirements of regulators, tax authorities and MIS (management information system).

e. Excess Liquidity

The table below reveals that across the years it has been the DFIs who had been the most resilient financial intermediaries to use its loanable funds. The FCBs were the most unwilling to provide credits to the economically lagging sector – a phenomenon which forced them to carry big deposit burden. It was

also revealed from the table that during the last three years there had been excess liquidity getting accumulated.



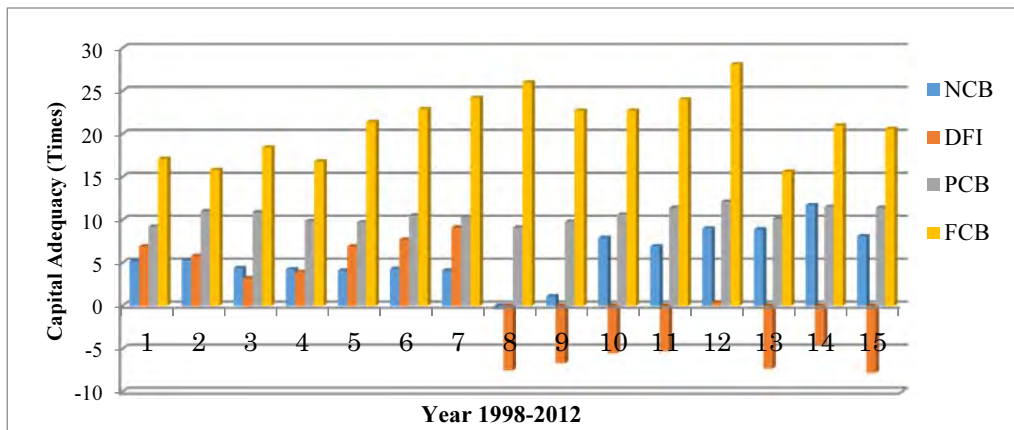
Source: Excess liquidity statistics of the banking sector (1998-2012), BB

Figure 2.2.8 Excess Liquidity

The demand for bank’s credit was extraordinarily low during the last couple of years. Political transition had disastrous impact over the economy and both the demand for working finance and long-term finance was on a lower note.

f. Capital Adequacy

This is a trade-off between opportunity cost and safety. Higher the portion of owner’s equity in the balance sheet, lower is the possibility of bank getting defaulted; on the contrary higher the portion of owner’s equity in the balance sheet, higher is the opportunity cost (IMF Survey, 2005). It is evident from the table below that the capital adequacy position of NCBs and the PCBs are perfect as only the adequate extent of capital is available for these banks. The DFIs are running backed by governmental support as the equity is negative for the last eight years. Finally, FCBs are having huge opportunity cost since they have certainly failed to better capitalize their funds and generated excessive reserves. As a whole the owner’s equity level is increasing in the banking sector because of the regulatory changes during the last few years.



Source: Capital Adequacy Statistics of the Banking Sector (1998-2012), BB

Figure 2.2.9 Capital Adequacy

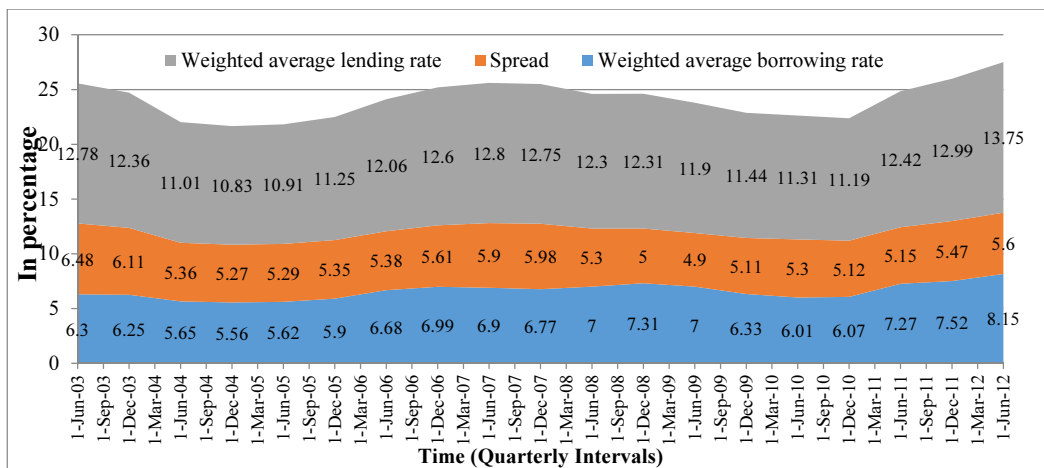
According to central bank’s rules, a banking company is required to maintain Capital Adequacy Ratio of 10%, which means that 10% of Risk Weighted Assets (RWA) must be kept as minimum capital. However, none of the SCBs were maintaining the required standard as of June 30, 2013.

Under these circumstances, these banks are vulnerable to risks associated with economic and financial shocks. As such, the International Monetary Fund (IMF) imposed a condition on the government to recapitalize the banks to help them meet the deficits by the end of FY2013 and the government allocated

around BDT 41 billion during FY2013 budget to help recapitalize all the SCBs, however, these measures may not be adequate to solve the financial crisis of SCBs.

g. Spread of Banks

It refers to the difference between the lending rate and the borrowing rate on a weighted average basis. The brown-colored band in Figure 2.2.10 below shows the spread enjoyed by banks, which represent gross margin from loan operation. In comparison to the developed economies, the spread of Bangladesh banks is obviously higher. But, it is not the operating efficiency, rather the deficiency of the quality financier which has created this irrational spread.

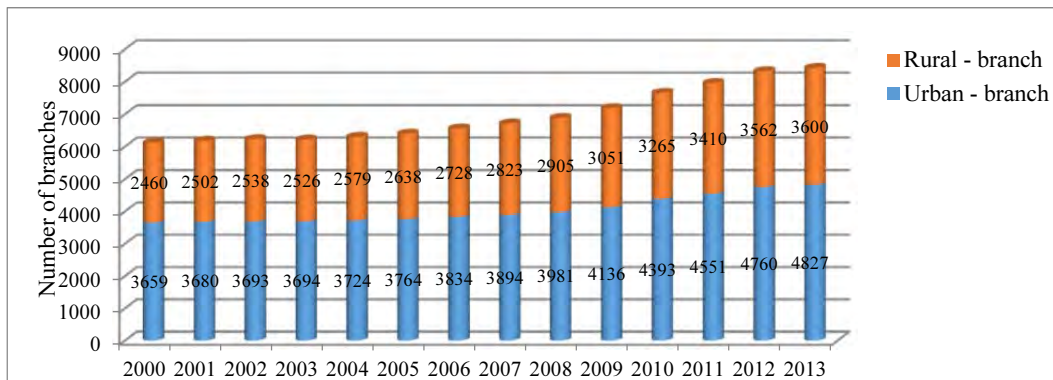


Source: Spread Statistics of the Banking Sector (2003-2012), BB

Figure 2.2.10 Spread of Banks

h. Financial Inclusion

Courtesy to the central bank’s initiatives, a wide stream of the population living in the rural areas has been enjoying the banking facilities (European Commission, 2008). It has been evident from the figure below that shows branch network in the urban and rural area.



Source: Financial Inclusion Statistics of the Banking Sector (2003-2012), BB

Figure 2.2.11 Branch Network in Urban and Rural Area

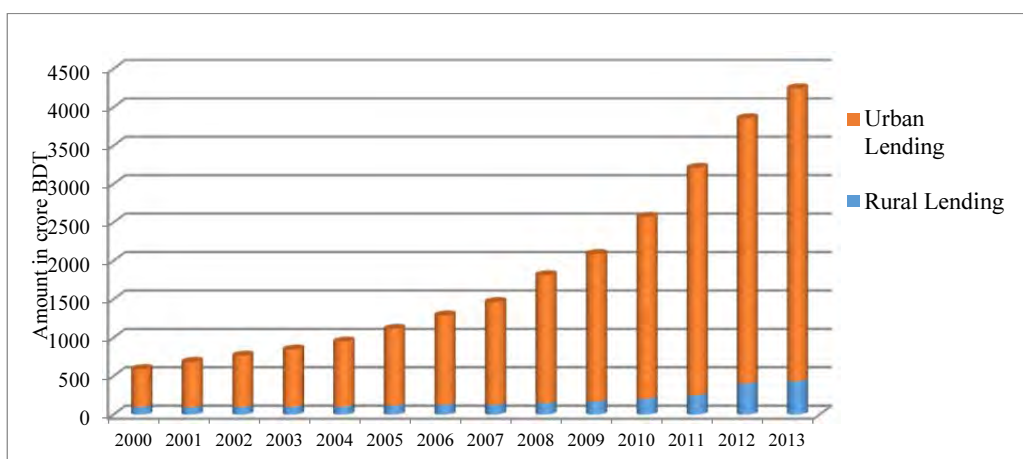
Since special attention for this Study has been put on urban areas, the number of bank branches located in urban areas of Dhaka and Chittagong has been drawn from the data above to develop Table 2.2.5 below showing distribution of bank branches in urban areas of Dhaka Division and Chittagong Division. Take, for instance, the figure of year 2013 of Table 2.2.5, Dhaka takes 19.13% and Chittagong takes 9.35%, totaling 28.48%. So, it can be said that 28.48% out of total bank branches nationwide are located in urban areas of Dhaka Division and Chittagong Division.

Table 2.2.5 Distribution of Bank Branches in Urban Areas of Dhaka and Chittagong
(unit: % of nationwide)

Division/ Year	1990	1995	2000	2005	2010	2013
Dhaka	14.04	14.04	17.01	18.29	19.06	19.13
Chittagong	8.93	8.93	8.42	8.67	9.23	9.35
Total of Dhaka + Chittagong	22.97	22.97	25.43	26.96	28.29	28.48

Source: Statistics Department, Bangladesh Bank

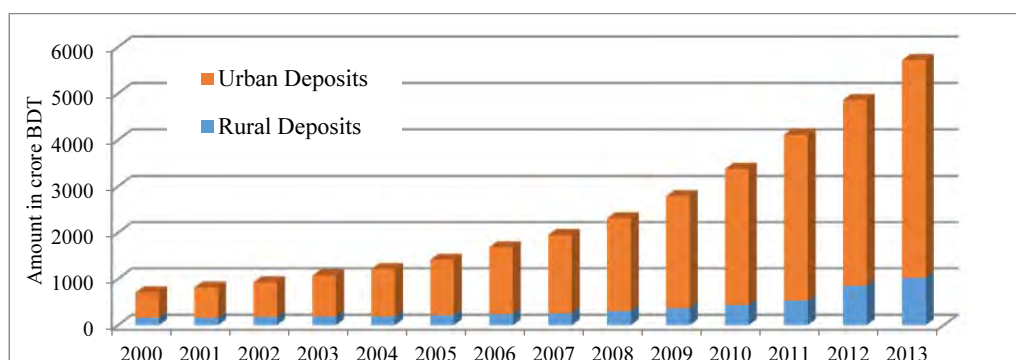
Although the number of bank branches in the rural areas is quite significant compared to the urban areas, the lending activities in terms of volume of credits is insignificant. This indicates that business and commercial activities in the rural areas is very insignificant. In Bangladesh, business enterprises and industries are mainly established in cities and its surrounding locations. In order to improve rural economy, the number of business enterprises has to be increased where banks can offer its financial services (European Commission, 2008).



Source: Financial Inclusion Statistics of the Banking Sector (2003-2012), BB

Figure 2.2.12 Share of Urban and Rural Lending

Also, deposit volume and rural lending volume have outclassed the urban deposit volume and urban lending volume by strong margins as can be seen in the figure below:



Source: Financial Inclusion Statistics of the Banking Sector (2003-2012), BB

Figure 2.2.13 Share of Urban and Rural Deposits

Based on the indicators applied in this section and some additional information such as basic information and management policies, overall financial performances of the 40 potential PFIs, 22 banks

and 18 NBFIs, selected by the Survey Team have been reviewed and summarized in Tables 2.2.7 and 2.2.8.

3) Performance of Housing Finance in Bangladesh

The only state-owned housing finance company was established by the government named Bangladesh Housing Building Finance Corporation (BHBFC). Apart from BHBFC, four state owned commercial banks also disbursed housing finance, but not a large extent. In early nineties, the second housing finance company named Delta BRAC Housing Finance Company Limited came into operation as a non-banking finance institution-in collaboration with NGO and an insurance company and other institutions. Thereafter, Industrial Promotion of Development Company of Bangladesh Ltd. (IPDC) promoted another housing finance company called National Housing Finance Company Limited. To address the housing needs of grass root people and lower income groups, the central bank also initiated housing scheme time to time.

Grameen Bank also launched its housing finance scheme to ensure shelters for landless and grass root people in the rural Bangladesh. Table below furnishes data on the outstanding of housing loans by different specialized financial institutions, public and private commercial banks, NBFIs and micro credit institutions.

Table 2.2.6 Outstanding Housing Loans (Billion BDT)

Year	Specialized Housing Finance Companies			Banks			MFI	Total
	HBFC	DBHF	NHFC	SCBs	Other Banks	Other FIs	Grameen Bank	
FY04	28.90	3.40	1.30	23.60	22.9	1.00	1.3	82.40
FY05	27.80	4.40	1.80	24.10	26.2	1.60	0.9	86.80
FY06	26.80	5.50	1.90	25.70	32.9	2.90	0.4	96.10
FY07	25.20	7.10	1.90	28.60	57.5	4.10	0.2	124.60
FY08	24.40	9.50	1.90	33.60	67.6	5.50	0.2	142.70
FY09	25.00	13.20	2.00	36.80	86.9	7.00	0.2	171.10
FY10	25.60	17.70	2.20	48.10	114.5	11.10	0.2	219.40
FY11	25.30	20.70	2.50	52.70	167.6	11.30	0.1	280.20
FY12	26.00	23.10	2.40	63.40	223.4	13.80	0.1	352.20
FY13	28.20	24.40	2.80	73.10	275.9	16.70	0.04	421.14

Source: BB Annual Reports 2013

Table 2.2.7 Summary of Operational and Financial Indicators of Different Banks and NBFIs - Banks (No.1 to No.22)

Serial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Banks/NBFIs																						
	Bank Asia Ltd	Eastern Bank Ltd.	IFIC Bank Ltd.	Jamuna Bank Ltd.	Mercantile Bank Ltd.	Mutual Trust Bank Ltd.	One Bank Ltd.	Premier Bank Ltd.	The city bank Ltd.	The Trust Bank Ltd.	AB Bank Ltd.	BRAC Bank Ltd.	Commercial Bank of Ceylon PLC.	Dhaka Bank Ltd.	Dutch Bangla Bank Ltd.	Habib Bank Ltd.	National Bank Ltd.	NCC Bank Ltd.	Prime Bank Ltd.	Southeast Bank Ltd.	Standard Bank Ltd.	BDBL Bank Limited
Banks & NBFIs																						
Indicator																						
Financial Year (Jan/Dec)	2012	2013	2012	2012	2012	2012	2012	2012	2012	2012	2012	2012	2013	2012	2012	2013	2013	2012	2012	2013	2012	2013
a. Basic Information																						
Year of Establishment	1999	1992	1976	2001	1999	1999	1999	1999	1983	1999	1982	1999	2004	1995	1996	N/A	1983	1985	1995	1995	1999	2009
Authorized Capital (Amount in BDT million)	15,000	20,000	20,000	10,000	8,000	10,000	10,000	6,000	10,000	10,000	6,000	12,000	N/A	10,000	4,000	N/A	17,500	10,000	25,000	10,000	15,000	10,000
Paid-up Capital (Amount in BDT million)	6,305	6,112	3,460	4,488	6,110	2,543	4,145	4,658	6,319	3,459	4,423	3,855	N/A	5,414	2,000	N/A	14,196	6,951	9,358	8,732	4,870	4,000
Shareholders Equity in 2013 (Amount in BDT million)	14,617	18,559	9,098	8,881	12,574	5,449	8,394	7,986	18,525	6,866	16,940	11,587	N/A	11,887	12,642	4,165	23,929	13,261	23,030	21,929	9,289	16,470
Gov't Share (%) (Year)	-	-	32.75%	-	-	-	-	-	-	-	0.57%	-	N/A	-	-	N/A	-	-	-	-	2.65%	100%
Public Share (%) (Year)	22%	57%	37%	31%	53%	30%	50%	41%	59%	19%	30%	46%	N/A	38%	13%	N/A	53%	60%	35%	40%	44%	-
Number of Branch in Dhaka	43	36	54	47	37	37	26	27	51	42	36	31	10	29	77	7	88	41	58	53	30	13
Number of Branch outside of Dhaka	36	35	54	44	49	57	38	52	39	41	53	55	8	42	60	2	87	101	62	50	47	15
Number of Off-shore Branches	1	2	1	1	2	1	2	1	-	1	1	1	2	1	2	-	1	2	3	1	2	N/A
Number of ATM Branches	90 (2014)	175	49	80	115	150	38	N/A	163	129 (2013)	222	319	19	40	2,424 (2014)	7	10	50	134	45	29	N/A
Manpower (Number of officers)	1,267	-	-	-	-	-	-	1,208	-	1,207	-	-	-	-	-	N/A	-	-	-	-	-	-
Total Manpower	1,485	1,498	2,422	2,006	1,981	1,316	1,608	1,259	2,765	1,299	2,179	7,400	211	1,655	5,268	196	3,919	1,811	2,544	2,111	1,270	826
CAMELS Rating	B-Class	C-Class	B-Class	B-Class	B-Class	C-Class	C-Class	B-Class	C-Class	C-Class	B-Class	C-Class	A-Class	A-Class	B-Class	C-Class	B-Class	B-Class	A-Class	B-Class	A-Class	C-Class
Capital Adequacy Ratio (CAR)	11.28% (2014)	12.01%	10.18%	12.21%	10.83%	10.70%	10.46%	11.04%	11.70%	13.86%	11.4% (2011)	11.44%	16.93%	11%	12%	0.87%	12.29% (2010)	11.47%	12.64%	10.90%	11.28%	24.78%
b. Financial Services																						
Project Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Syndicated Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Working Capital Loans → What is this?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Housing loans	Y	N	Y	N	N	N	Y	N	Y	Y	N	Y	-	N	N	N	Y	Y	Y	Y	Y	Y
Loans for RMG sector	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	-	Y	Y	Y	Y	Y	N	Y	Y	N
Interest Rates subject to loan type (%)	Term Loan: 14.00% Working Capital Loan: 14.00%	Term Loan: 15% Working Capital Loan: 14.50-15.50%	Term Loan: 14.00-15.50% Working Capital Loan: 14.00-15.50%	Term Loan: 15.00% Working Capital Loan: 15.00%	Term Loan: 15.00% Working Capital Loan: 14.50%-15.50%	Term Loan: 15.50-16.50% Working Capital Loan: 14-15%	Term Loan: 13.50-14.00% Working Capital Loan: 13.50%	Term Loan: 13% Working Capital Loan: 16-18%	Term Loan: 16-18% Working Capital Loan: 14.5%	Term Loan: 11.50% Working Capital Loan: 11.5%	Term Loan: 12.50-15.50% Working Capital Loan: 12.50-15.50%	Term Loan: 14.0% Working Capital Loan: 14%	Term Loan: 14.0% Working Capital Loan: 14%	Term Loan: 13.50-16.50% Working Capital Loan: 12.50-15.50%	Term Loan: 15.50% Working Capital Loan: 15.50%	Term Loan: 15.5% Working Capital Loan: 15.5%	Term Loan: 13% Working Capital Loan: 16.5%	Term Loan: 14-15% Working Capital Loan: 15%	Term Loan: 13.50-16.50% Working Capital Loan: 12.50-15.50%	Term Loan: 13.50-16.50% Working Capital Loan: 12.50-15.50%	Term Loan: 15.50% Working Capital Loan: 15.50%	Term Loan: 15-16% Working Capital Loan: 15-16%
c. Operational Performance																						
Return on average assets (ROA) (%)	0.70%	1.68%	0.38%	1.01%	1.02%	0.39%	1.39%	0.74%	0.60%	0.21%	0.88%	0.35%	4.99%	0.59%	1.70%	N/A	N/A	1.14%	1.23%	1.64%	1.57%	2.18%
Return on average equity (ROE) (%)	7.11%	14.40%	5.76%	13.20%	13.42%	6.80%	14.21%	8.44%	4.30%	3.02%	6.13%	5.47%	18.40%	7.24%	23.40%	N/A	2.36 (2008) 6.726	11.81%	13.53%	16.20%	17.65%	6.19%
Profit before provision & tax (Amount in BDT million)	2,723	4,839	1,390	3,207	3,350	818	2,125	823	1,763	693	3,496	1,988	1,371	1,440	4,817	136	6,726	2,742	5,515	6,700	2,998	2,255
Profit after tax (Amount in BDT million)	908	2,535	388	2,080	1,381	328	1,055	603	763	183	1,461	540	833	701	2,314	71	3,856	1,308	2,700	3,379	1,331	1,020
Non-performing loans (NPL) in 2013 (Amount in BDT million)	5,879	3,697	3,168	5,133	4,680	2,155	3,740	3,021	3,645	2,470	4,720	7,601	N/A	4,137	4,175	572	4,898	4,862	7,815	5,350	2,599	5,202
NPLs to total loans & advances (%) in 2013	5.61%	3.59%	3.77%	7.59%	4.77%	3.62%	4.89%	5.73%	8.10%	3.12%	3.37%	7.40%	3.98%	4.15%	3.90%	15.55%	3.24%	5.56%	5.09%	3.94%	3.50%	40%
NPLs to Shareholders' Equity (%) in 2013	40.22%	19.92%	34.82%	57.80%	37.22%	39.55%	44.56%	37.83%	19.68%	35.97%	27.86%	65.60%	N/A	34.80%	33.02%	13.73%	20.47%	36.66%	33.93%	24.40%	27.98%	31.58%
Earning Per Share (EPS) (%)	1.35	4.2	1.12	2.32	2.26	1.29	2.55	1.3	1.21	0.55	3.25	1.32	N/A	1.69	11.6	N/A	2.72	2.06	2.88	3.87	2.73	25.5
Productivity (Operating Income/ No. of Employee)	3.98	6.40	2.62	2.63	1.69	2.66	2.87	8.50	2.29	2.31	3.87	0.86	26.87	3.83	2.14	1.70	2.03	3.41	5.30	3.17	3.54	3.96
d. Practicing policies																						
CSR Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Green Banking Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
e. Disbursement in JICA TSL FSPDSME (Yes/No)																						
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No

Source: Banks and NBFIs Annual Report, websites and Google Search

Table 2.2.8 Summary of Operational and Financial Indicators of Different Banks and NBFIs - NBF1 (No.23 to No.40)

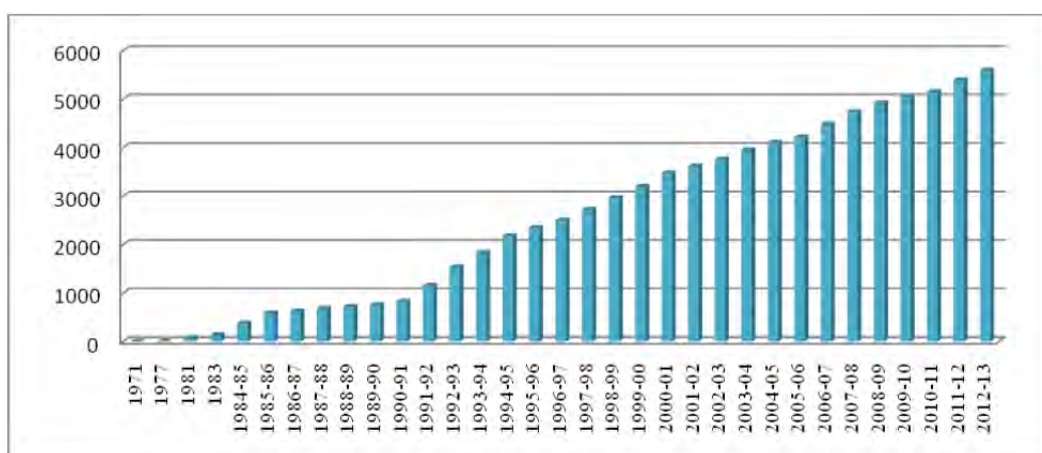
Serial	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Banks/NBFIs	Non-Bank Financial Institution (NBFIs)																	
Indicator	Bay Leasing & Investment	Fareast Finance & Investment Ltd	Bangladesh (BD) Finance & Investment Company Ltd	IDLC Finance Limited	Industrial & Infra. Dev. Finance Co. Ltd (IIDFC)	Prime Finance & Investment Ltd.	Union Capital Ltd	United Leasing Company Ltd	FAS Finance & Investment Ltd.	First Lease Finance & Investment Ltd.	International Leasing & Financial Services Ltd.	Lanka Bangla Finance Ltd.	MIDAS Financing Ltd.	National Housing Finance & Investment Ltd.	Phoenix Finance & Investment Ltd.	Premier Leasing & Finance Ltd.	Uttara Finance & Investment Ltd.	Bangladesh Industrial Finance Co. Ltd.
Financial Year (Jan/Dec)	2013	2013	2013	2013	2012	2013	2013	2012	2013	2013	2013	2013	2012	2013	2013	2012	2013	2013
a. Basic Information																		
Year of Establishment	1996	2002	1999	1985	2001	1996		1989	2001	1993	1996	1996	2000	1998	1995	2001	1995	1995
Authorized Capital (Amount in BDT million)	3,000	2,000	2,000	4,000	1,000	3,000	2,000	3,000	2,100	5,000	2,000	3,000	2,000	2,000	3,000	3,000	5,000	4,000
Paid-up Capital (Amount in BDT million)	1,138	1,600	1,144	1,608	1,000	2,729	1,099	1,402	1,118	1,006	1,711	2,188	601	1,064	1,215	1,094	1,138	671
Shareholders Equity in 2013 (Amount in BDT million)	2,897	1,772	1,547	5,363	1,421	5,249	2,011	2,165	1,577	1,436	2,116	4,625	613	1,426	2,546	1,234	5,581	1,233
Gov't Share (%) (Year)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Public Share (%) (Year)	41%	25%	40%	22%	22%	23%	25%	53%	38%	35%	42%	61%	31%	13%	29%	54%	21%	27%
Number of Branch in Dhaka	1	1	3	11	1	1	3	4	1	4	1	5	5	3	4	1	3	3
Number of Branch outside of Dhaka	-	-	2	9	1	2	2	12	1	2	1	10	11	3	6	3	2	1
Number of Off-shore Branches	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Number of ATM Branches	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manpower (Number of officers)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93	-
Total Manpower	31	33	74	113	94	84	89	209	56	84	59	261	60	89	116	62	156	-
CAMELS Rating	BBB1	A-	A-	AAA	N/A	AA	AA	N/A	BBB2	A-	A-	A2	N/A	A2	A+	C-Class	A+	A-
Capital Adequacy Ratio (CAR)	27.04%	N/A	N/A	15.43%	11.26%	N/A	15.67%	10.50%	N/A	N/A	N/A	10.50%	N/A	N/A	15.24%	N/A	10.54%	N/A
b. Financial Services																		
Project Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Syndicated Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Working Capital Loans → What is this?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Housing loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Loans for RMG sector	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Interest Rates subject to loan type (%)	Industrial Loan: 16-18.75% Trade & Commerce Loan: 16-18.5%	Industrial Loan: 18-24% Trade & Commerce Loan: 17.5-20%	Industrial Loan: 18.5-21% Trade & Commerce Loan: 18.5-21.5%	Industrial Loan: 17.83-19.13% Trade & Commerce Loan: 17.25-19.38%	Industrial Loan: 18-21% Trade & Commerce Loan: 18-21%	Industrial Loan: 17.5-20% Trade & Commerce Loan: 17-20%	Industrial Loan: 17-20% Trade & Commerce Loan: 17-20.0%	Industrial Loan: 14.75-17.5% Trade & Commerce Loan: 17-19.50%	Industrial Loan: 19-21% Trade & Commerce Loan: 19-21%	Industrial Loan: 20-22% Trade & Commerce Loan: 20-22%	Industrial Loan: 17-20%	Industrial Loan: 18-20% Trade & Commerce Loan: 18-20%	Industrial Loan: 18.50-18.75% Trade & Commerce Loan: 18.50-18.75%	Industrial Loan: 19-20% Trade & Commerce Loan: 18-20%	Industrial Loan: 16-19% Trade & Commerce Loan: 16-19%	Industrial Loan: 20-21% Trade & Commerce Loan: 19%	Industrial Loan: 19% Trade & Commerce Loan: 19%	Industrial Loan: 19-21% Trade & Commerce Loan: 17-21%
c. Operational Performance																		
Return on average assets (ROA) (%)	2.27%	-0.83%	0.94%	1.90%	0.17%	-	1.01%	1.93%	0.49%	1.84%	1.51%	6.36%	-1.62%	2.85%	2.07%	3.8%	3.65%	N/A
Return on average equity (ROE) (%)	4.75%	-4.31%	6.84%	19.24%	1.24%	-	7.01%	10.18%	1.52%	2.65%	5.52%	10.48%	-17.98%	14.30%	12.33%	28%	16.22%	N/A
Profit before provision & tax (Amount in BDT million)	189	N/A	229	1,551	77	568	208	349	46	252	257	624	(91)	233	434	40	1,404	N/A
Profit after tax (Amount in BDT million)	137	(68)	85	811	22	370	141	229	19	133	116	484	(119)	167	313	11	852	N/A
Non-performing loans (NPL) in 2013 (Amount in BDT million)	82	944	439	2,812	511	822	936	174	343	752	1,199	931	921	240	560	1,071	838	774
NPLs to total loans & advances (%) in 2013	5.10%	11.09%	5.28%	1.63%	5.49%	7.63%	8.85%	3.53%	9.88%	12.62%	7.74%	4.84%	16.59%	5.19%	4.64%	18.92%	4.64%	10.25%
NPLs to Shareholders' Equity (%) in 2013	2.83%	53.26%	28.38%	52.43%	35.96%	15.66%	46.55%	8.04%	21.75%	52.37%	56.66%	20.13%	150.24%	16.83%	21.99%	86.79%	15.02%	62.77%
Earning Per Share (EPS) (%)	1.21	5.14	1.23	4.16	2.22	1.1	1.29	2.07	0.24	1.32	0.68	2.52	-1.99	1.57	2.58	0.1	2.21	N/A
Productivity (Operating Income/ No. of Employee)	26.48	37.12	16.23	24.45	16.89	9.31	18.69	3.09	3.50	11.40	8.32	18.96	17.05	10.02	6.41	2.81	21.51	N/A
d. Practicing policies																		
CSR Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Green Banking Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
e. Disbursement in JICA TSL FSPDSME (Yes/No)																		
	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No

Source: Banks and NBFIs Annual Report, websites and Google S

2.2.4 Overview of Bangladesh Garment Sector

a) History of Bangladesh Ready-made Garment Sector

In 1976 onward some local entrepreneurs came forward to set-up 100% export oriented garment industry and the first consignment of garment was exported from Bangladesh in 1977 by Reaz and Jewel Garment. Till the end of 1982, there were only 47 garment manufacturing units, however, the breakthrough occurred in 1984-85, when the number of garment factories increased to 587. The number of RMG factories shot up to around 2,900 in 1999. The industry has grown during the 1990s roughly at the rate of 22%. In the past, until 1980, jute and jute goods topped the list of merchandises exported from Bangladesh and contributed more than 50% of the total export earnings. By late 1980s, RMG exports replaced jute and jute goods and became the number one in terms of exports. According to an estimate by 2013 the number of garment factory in Bangladesh reached 5,600³² and currently, the number has reduced at 5,150 due to non-compliance and recent incidences of Tasrin Garment and Rana Plaza. Figure 2.2.14 below depicts the trend of growth and development of garment industry in Bangladesh.



Source: BGMEA data

Figure 2.2.14 Growth of Garment Factories in Bangladesh

b) Contribution of Garment Sector in the Economy

1) Export Performance of Garment Sector

With the passage of time from agrarian to manufacturing transformation Bangladesh developed significantly in areas of poverty alleviation, employment, women empowerment, industrial growth and economic diversification - thanks solely to labour intensive RMG sector. Since the beginning of RMG export from Bangladesh in 1985-86 the share of RMG in total export has been increasing continuously as evident from Figure 2.2.15. The amount of RMG export in 1985-86 was only \$116.2 million. The growth of RMG export reached to a highest rate in FY 2010-11 as shown in Figure 2.2.16. The RMG sector has always achieved a growth rate in between 10-15% in most years. In FY 2012-13, RMG export from Bangladesh reached its maximum value of 21.52 billion with highest amount of garment products.

³² http://www.bgmea.com.bd/chart_test/factory_growth_in_bangladesh

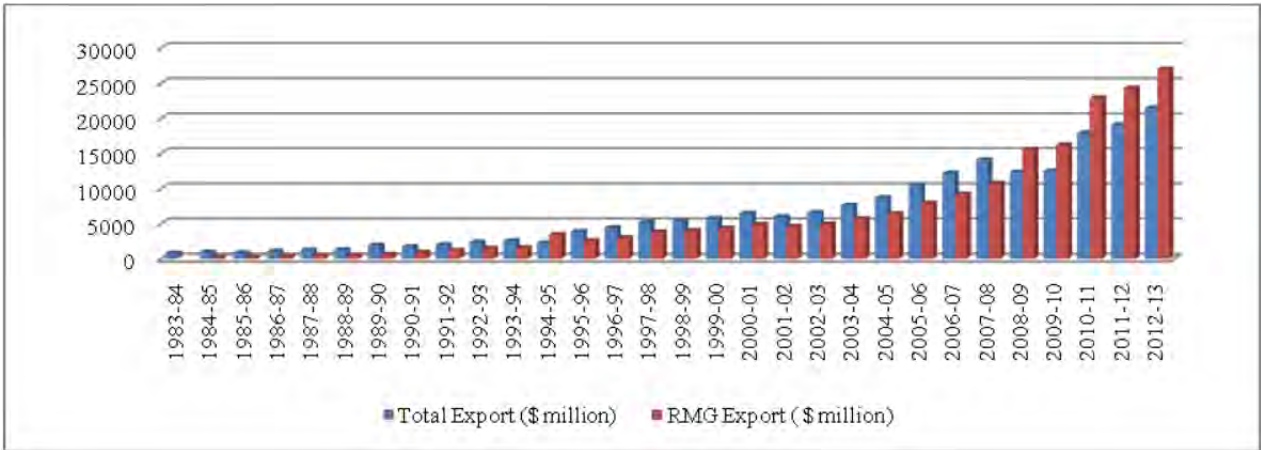
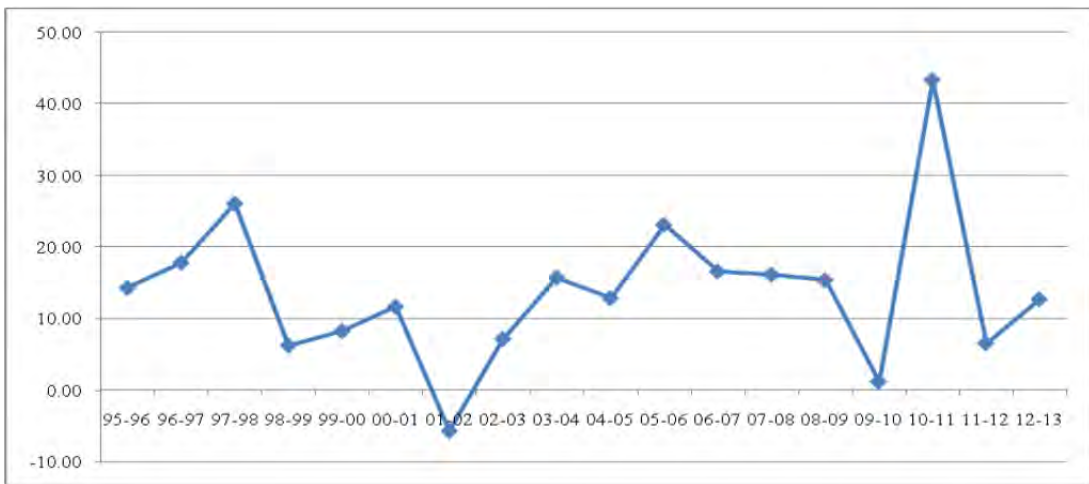


Figure 2.2.15 RMG Export in Comparison to Total Export from Bangladesh



Source: BGMEA data

Figure 2.2.16 Growth of RMG Export from Bangladesh

Bangladesh RMG sector mainly comprises knit and woven garment, competing vigorously to surpass each other for taking up the leadership commands within the economy. But, before 2004 major garment export from Bangladesh has solely been woven wear as at the beginning knitwear experienced somewhat cluttered and shoddy start attributable to the absence of rudimentary plans and evolutionary industrial mechanism. Since Multi Fiber Agreement (MFA), signed in 1974, phase out in 2004 the growth of Bangladesh knitwear has escalated rapidly. In fact, from fiscal year 2007-08 knitwear continues to capture lion’s share in national exports (38.77% in FY 2012-13) what was slightly 7.64% in the two decades back. Table 2.2.9 below shows the growth of knitwear and woven wear as the major export product of Bangladesh.

Table 2.2.9 Comparative Statistics of Bangladesh Apparel Export Value

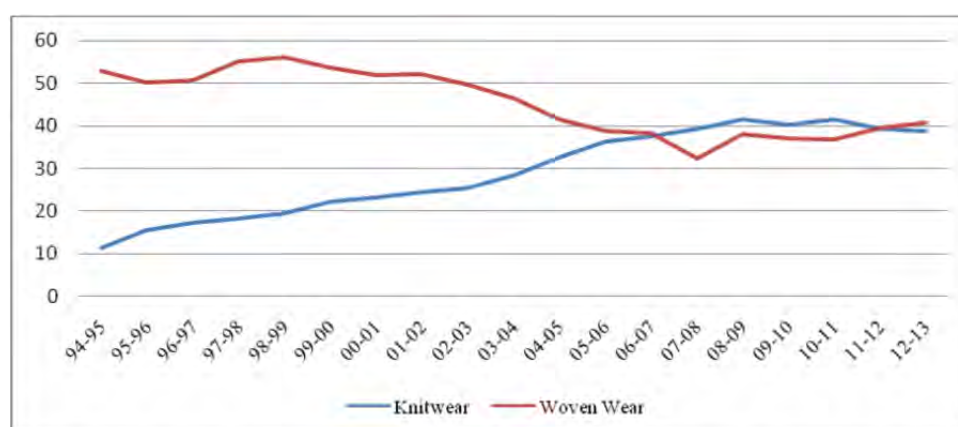
(unit: US\$ million; Quantity in million dozen)

Fiscal Year	Knitwear			Woven Wear			Total Export	
	Value	Quantity	Share of value in Export (%)	Value	Quantity	Share of value in Export (%)	Value	Quantity
94-95	393.26	15.3	11.32	1,835.09	47.21	52.85	2,228.35	62.51
95-96	598.32	23.18	15.41	1,948.81	48.82	50.2	2,547.13	72
96-97	763.3	27.54	17.28	2,237.95	53.45	50.65	3,001.25	80.99
97-98	940.31	32.6	18.22	2,843.33	65.59	55.09	3,783.64	101.45
98-99	1,035.36	36.66	19.49	2,984.81	64.79	56.18	4,020.17	111.9
99-00	1,269.83	45.27	22.08	3,082.56	66.63	53.59	4,352.39	124.02
00-01	1,496.23	52.54	23.14	3,364.2	71.48	52.02	4,860.43	140.44
01-02	1,459.24	63.39	24.38	3,124.56	77.05	52.2	4,583.8	152.01
02-03	1,653.83	69.18	25.26	3,258.27	82.83	49.76	4,912.1	182.08
03-04	2,148.02	91.6	28.25	3,538.07	90.48	46.54	5,686.09	212.39
04-05	2,819.47	120.13	32.58	3,598.2	92.26	41.58	6,417.67	273.84
05-06	3,816.98	165.02	36.26	4,083.82	108.82	38.78	7,900.8	332.62
06-07	4,553.6	199.54	37.39	4,657.63	133.08	38.25	9,211.23	389.03
07-08	5,532.52	241.6	39.21	5,167.28	147.43	32.3	10,699.8	389.03
08-09	6,429.0	290.92	41.3	5,918.51	169.59	38.02	12,347.51	460.51
09-10	6,483.29	292.7	40.01	6,013.43	172.8	37.11	12,496.72	465.5
10-11	9,482.06	441.03	41.36	8,432.4	247.28	36.78	17,914.46	688.31
11-12	9,486.39	441.23	39.06	9,603.34	281.62	39.54	19,089.73	722.85
12-13	10,475.88	490.57	38.77	11,039.85	323.75	40.86	21,515.73	814.71

Source: Export Promotion Bureau

Over the decades the growth of knitwear sector has been incessantly rising over 20% at CAGR³³ base and continuously grabbing more portions in the export pie of Bangladesh. This recent robust growth is partly achieved owing to preferential support from the European Commission’s GSP and Relaxation of Rules of Origin (ROO) and the Duty Free Quota Free (DFQF) access granted by Canada, Australia, Japan and the members of European Free Trade Agreement (EFTA). Along this growth momentum, favorable policies from the government of Bangladesh in the form of export subsidies i.e. cash incentives also contributed greatly for making it the most attractive sourcing hub.

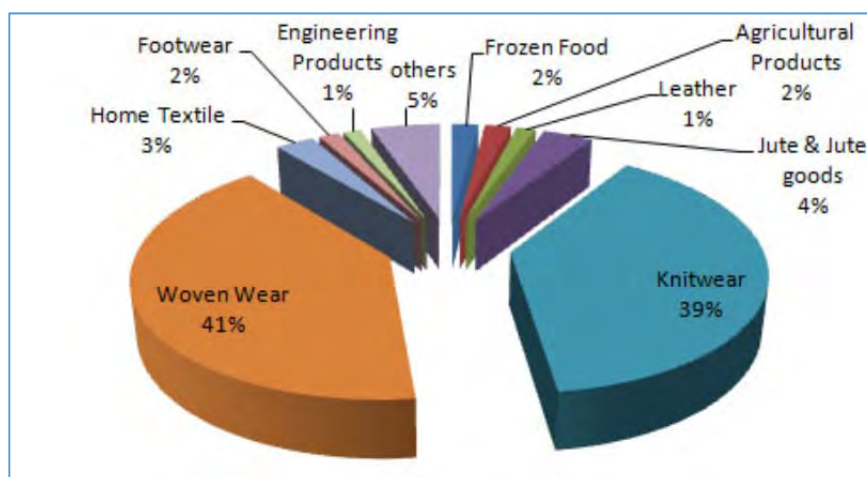
Figures 2.2.17, 2.2.18 below depict the development of the gap between woven and knitwear in the percentage share of value in Bangladesh export:



Source: Calculated from export promotion bureau data

Figure 2.2.17 Percentage Share of Value in BD Export

³³ CAGR: Compound Annual Growth Rate

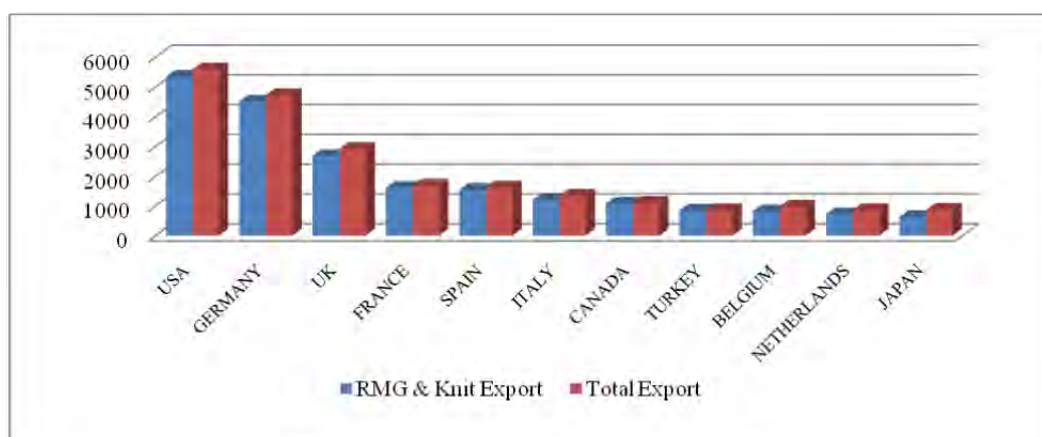


Source: Export Promotion Bureau, Bangladesh

Figure 2.2.18 Bangladesh Export by Major Products in FY 2012-13

2) Major Export Destination of Bangladesh Garment Products

According to the data of Export Promotion Bureau of Bangladesh, major export destinations for Bangladeshi garment products are generally USA and EU countries as shown in Figure 2.3.19 below. In fiscal year 2013-14, Bangladesh exported US\$ 21.52 billion of garment products and major importing countries of Bangladesh garment products were USA, Canada, Japan, Turkey and some EU countries, namely United Kingdom, Germany, France, Spain, Italy, Netherlands and Belgium.



Source: Compiled by JICA Survey Team from Export Promotion Bureau data

Figure 2.2.19 Export Destination of Bangladesh Garment Products

3) Foreign Direct Investment in Garment Sector

Garment sector of Bangladesh has been a prominent destination for FDI inflow in Bangladesh since the emergence of this sector as a promising foreign currency earning sector. The inflow of FDI in the garment sector has been steady overtime and growing at an increasing rate also. In FY-09, the share of garment sector in total FDI inflow was about 14%, which increased to about 24% of total FDI inflow in FY-13 as evidenced from the Bangladesh Bank data shown in Table 2.2.10.

Table 2.2.10 Bangladesh Garment Sector in Attracting FDI

(unit: US\$ million)

Fiscal Year	Total FDI Inflow In Bangladesh	FDI Attracted by the Garment Sector
FY-09	960.59	130.34
FY-10	913.02	157.95
FY-11	779.04	225.17
FY-12	1,194.88	241.39
FY-13	1,730.63	412.43

Source: Bangladesh Bank

Growing export performance of garment sector not only attracted increasing FDI in this sector but also it contributed greatly in the increasing foreign exchange reserves in Bangladesh Bank as the sector earns increasing amount of foreign currency each year. Therefore, as the export of garment products expands, the foreign exchange reserves of the country is expected to increase further.

Table 2.2.11 Growing Foreign Exchange Reserve in BB

(in million US \$)

Fiscal Year	Reserves
2014-2015	21,383.50
2013-2014	21,558.00
2012-2013	15,315.20
2011-2012	10,364.40
2010-2011	10,911.60
2009-2010	10,749.70
2008-2009	7,470.90
2007-2008	6,148.80
2006-2007	5,077.20
2005-2006	3,483.80
*data up to month of August of Financial Year 2014-2015.	

Source: Accounts & Budgeting Department, Bangladesh Bank

4) Comparison between RMG Export Growth, GDP Growth and Reduced Poverty

The RMG sector with its diversified and multiplier effects contributes greatly in the economic development of Bangladesh through providing the poor and underprivileged populace of the country with an opportunity of regular earning and ensuring increasing domestic production. With the outstanding performance from RGM sector in the domestic and international market, the overall size of the economy of Bangladesh is also increasing in terms of Gross Domestic Product (GDP) and Gross National Product (GNP). The following table gives a comparative understanding on the relationship between RMG export growth and GDP growth.

Table 2.2.12 GDP Growth and Export Growth of Bangladesh (%)

Year	GDP Growth	RMG Sector Export Growth
2001	5.27	n.a.
2002	4.42	-6.03
2003	5.26	6.68
2004	6.27	13.61
2005	5.96	11.40
2006	6.63	18.77
2007	6.43	14.23
2008	6.19	13.91
2009	5.74	13.34
2010	6.07	1.19
2011	6.71	30.24
2012	6.32	6.16
2013	6.01	11.28

Source: data.worldbank.org

During that last decade, the people of Bangladesh also experienced a continuous and upward increase in their Per Capital Gross National Income as apparent from following graph. According to World Bank, during the first decade of 21 century per capital GNI rose from \$380 in 2001 to \$690 in 2010 and reached a maximum value of \$900 in 2013.



Source: Worldbank.org/GNI Per Capital, Atlas Method

Figure 2.2.20 Per Capital Gross National Income of Bangladesh in US\$

This increases in GDP and per capital GNI consequently resulted in lower poverty and increasing life standard for the people of Bangladesh.

c) Competitors of Bangladesh in Global RMG Export Market

International market for garment products can be categorized in two broad categories, namely, Textile Market and Clothing Market. In the international textile market major textile importing countries are USA, EU countries, China, Japan and Turkey. On the other hand, in the clothing market the major importing countries are Canada, United States, European Union countries and Japan. Bangladesh is not still very competitive in the world market in terms of exporting textiles in comparison to cloths. The world RMG market is \$40 billion market dominated by China. Along with China many other countries like India, EU countries, Mexico, Pakistan, Turkey, Korea Republic, China Taipei, Vietnam and Japan etc. are strong competition for Bangladesh in the world market.

Bangladesh garment sector has weathered the international competition and in fact received a glut of knitwear and sweater orders, which it finds difficult to deal with. Many of the problems such as delays caused by lead-time delays, late deliveries of imported raw materials, licensing or production, electricity outage, port obstruction, etc. are caused by government inefficiency and poor planning.

d) Employer’s Associations in Bangladesh

Garment sector of Bangladesh is being monitored and guided by two prominent trade associations, namely, Bangladesh Garment Manufacturers and Exporters Associations (BGMEA) and Bangladesh Knitwear Manufacturers & Exporters Association (BKMEA). These two trade associations are employers’ associations aiming to look after the rights and protect the interests of the entrepreneurs and develop RMG industry of Bangladesh. Presently, BGMEA and BKMEA have a total of more than 7,050 member factories as summarized below:

Table 2.2.13 Member of BGMEA and BKMEA

Name of Association	Number of Member Factory	Total	Percentage (%)
BGMEA	5,150	More than 7,050	73
BKMEA	More than 1,900		27

Source: JICA Survey Team

Obligations and membership of each association are comparatively summarized in Table 2.2.14 below.

Table 2.2.14 Obligations for BKMEA and BGMEA Members

BGMEA	BKMEA
<ul style="list-style-type: none"> • BGMEA is one of the largest trade associations in the country representing the ready-made garment industry, particularly the woven garments, knitwear and sweater sub-sectors with equal importance. Presently, BGMEA has around 5,150 member factories. Around 40% of BGMEA member factories are knitwear and sweater manufacturers, and the rest 60% are woven garment manufactures. • There are some obligations for all of upcoming and existing members of BGMEA. The members of BKMEA are obligated to maintain various compulsions including administrative and financial. 	<ul style="list-style-type: none"> • BKMEA has long been in effort to expand new markets for RMG exporters of Bangladesh. Today it is an association of about 1,700 knitwear manufacturers and exporters that represent the largest export earning sector of the country. • There are some obligations for all of upcoming and existing members of BKMEA. The members of BKMEA are obligated to maintain various compulsions including administrative and financial.
<ul style="list-style-type: none"> • Annual Fee: Each member of BGMEA has to pay annual fee for renewable membership. The range of the annual fee is from 7,500 to 25,000 BDT. 	<ul style="list-style-type: none"> • Annual Fee: Each member of BKMEA has to pay 10,000 BDT per annum for renewal of membership.
<ul style="list-style-type: none"> • Group Insurance: Group Insurance is mandatory by all members. However, it depends on the number of workers. The number of workers higher, the number of payable amount higher. Each member company must ensure to insurance coverage for their employees. For 500 workers the insurance charge is 25,000 BDT per annum. If the number of increases the insurance charge will also increase. 	<ul style="list-style-type: none"> • Group Insurance: Group Insurance is mandatory by all members. However, it depends on the number of workers. The number of workers higher, the number of payable amount higher. Each member company must ensure to insurance coverage for their employees. For 500 workers the insurance charge is 25,000 BDT per annum. If the number of increases the insurance charge will also increase.
<ul style="list-style-type: none"> • Employee List: The member of all BKMEA must provide their employee list with number. 	<ul style="list-style-type: none"> • Employee List: All members of BKMEA shall provide their list of employees and workers.
<ul style="list-style-type: none"> • Training: The member company shall organize training for awareness development and BKMEA will offer such training its owned training institute. An amount of 10,000 BDT shall be paid for receiving training. 	<ul style="list-style-type: none"> • Training: The member company shall organize training for awareness development and BKMEA will offer such training its owned training institute.
<ul style="list-style-type: none"> • Maintaining UDUP Process: All of the members have to maintain UD (utilization declaration) & UP (utilization permission) process. 	<ul style="list-style-type: none"> • Maintaining UDUP: All of the members have to maintain UD (utilization declaration) and UP (utilization permission) process.
<ul style="list-style-type: none"> • Rules & Regulation: All member companies of BGMEA must follow its rules & regulations, such as ensure minimum wage, fire service & civil defense law, child labour free company, building safety, environment safety etc. 	<ul style="list-style-type: none"> • Rules & Regulations: All member companies of BKMEA must follow its rules & regulation, such as ensure minimum wage, fire service & civil defense law, child labour free Company, building safety, environment safety etc.
<ul style="list-style-type: none"> • Meeting: As a member company, the entrepreneur shall attend some meetings with the officials of BGMEA. 	<ul style="list-style-type: none"> • Meeting: As a member company, the entrepreneur shall attend some meetings with the officials of BKMEA.
<ul style="list-style-type: none"> • Audit: All member companies must face regular audit from BGMEA. 	<ul style="list-style-type: none"> • Audit: All member companies face regular audit from BKMEA.
<ul style="list-style-type: none"> • Trade Fair: The member company can join national & international trade fairs 	<ul style="list-style-type: none"> • Trade Fair: The member company can join national & international trade fairs.
<ul style="list-style-type: none"> • Custom Obligation: For duty free export, i.e., Back to Back LC, the Member Company shall obtain license from “Custom Bond Commission”. In this case, an amount of 10,000 BDT will be paid including 15% VAT. 	

Source: BGMEA and BKMEA

1) Bangladesh Garment Manufacturers and Exporters Association (BGMEA)

BGMEA is a pioneering and one of the largest trade associations in the country representing ready-made garment industry, particularly woven garment, knitwear and sweater sub-sectors with equal importance. It has brought garment manufacturers and exporters on a common platform with an aim to ensure a congenial business climate for sustainable growth in the apparel industry. Since its inception in

1983, BGMEA has been working relentlessly to promote and protect the interests of the apparel industry through policy advocacy to the government, services to members, ensuring workers' rights and social compliance at factories that has brought about revolutionary socio-economic changes in Bangladesh by generating employment, empowering women and alleviating poverty.

a. BGMEA Mission and Vision

BGMEA works with the vision to develop RMG industry of Bangladesh and the economy of the country. Having such vision BGMEA chalked out the following missions: Firstly, to protect and promote the interests of the industry; thus ensuring a sustained growth in the foreign exchange earnings of the country. Secondly, BGMEA is committed to ensure all legitimate rights and privileges of the garment workers. The association also strives toward the betterment of the society and environment.

b. Members

BGMEA started with only 12 members in 1978 and presently has around 5,150 member factories. Around 40% of BGMEA member factories are knitwear and sweater manufactures, and the rest 60% are woven garment manufactures. BGMEA member factories account for 100% woven garment exports of the country and more than 95% of sweater exports, while around half of the light knitwear exports are made by them.

c. How BGMEA Runs

BGMEA is being run by a 27-member elected Board of Directors. Members of the Board are elected for a two-year term. Four Vice Presidents having important portfolios, along with a secretariat of experienced officials, assists the President in formulating and executing vital policies and programs of the organization. The President is the highest executive authority of the association. The Board of Directors takes assistance from different Standing Committees headed by a Chairman and composed of members having vast experience in the related fields.

2) Bangladesh Knitwear Manufacturers & Exporters Association (BKMEA)

Presently, Bangladesh is the 3rd largest knitwear exporter in the world just after China and Turkey. To lead Bangladesh in the world apparel market, Bangladesh Knitwear Manufacturers & Exporters Association (BKMEA) was established in 1996 by the all-out efforts of a few knitwear manufacturers to look after the interest of the knitwear sector of the country.

Now, BKMEA is a worldwide organization entrusted with the custodianship of the most promising knitwear sector of Bangladesh. This nascent organization following its inception back in 1996 with only 200 members has grown not only vertically but also horizontally. Now it embodies more than 1,900 members who are employing more than one million workforce mostly women.

BKMEA is putting diligent efforts to diversify export market, and ensure better market access of the country's knitwear products to EU, USA, China, South Africa, Japan and other countries. It is also working closely for some specific and potential destinations like Brazil, Argentina, South Africa, South Korea, Russia, Saudi Arabia, Mexico, and Malaysia. To promote the sector, BKMEA is implementing development projects with German Technical Cooperation (GTZ) and other international organizations in this regard. The association has signed MOU with GTZ on March 16, 2005 and Metro Group, Germany on 26 April, 2010. BKMEA Institute of Apparel Research and Technology has been equipped to discharge its role in the dissemination of modern technology and management practices. The development works include: enhance productivity and improve social compliance status of its member factories, promote workers welfare through centralized day-care center and health care center, prepare sector related research and publication, organize trade promotion missions and fairs in home and abroad. BKMEA has strong

relationship with the government to formulate strategies and national policies on sector related and other socio-economic important issues.

e) Recent Labour Issues and Accidents in Bangladesh Garment Industry

Bangladesh garment sector has been subject to violent labour unrests from docile, expendable labour force taking place in relatively well run “model factories”, where workers have been fairly well paid. The prime reasons for such agitation are increasing disparities between management and labour and increasing awareness of inequalities. For several years workers have repeated vital demands pertaining to their terms of work and their conditions of work.

According to a report by ILO, garment workers of Bangladesh earn some of the lowest wages in the region. The monthly minimum wage for entry-level workers in the sector was \$39 per month before the hike of minimum worker salary by 77 percent to BDT 5,300 implemented from December 1, 2013—about half of the lowest rate in other major garment-exporting countries, such as Cambodia (\$80), India (\$71), Pakistan (\$79), Sri Lanka (\$73) and Vietnam (\$78).

Workers of the garment sector have been the victims of radical accidents in regular intervals since 1990s. Following data on deaths in fire accidents in garment factories can give a hint about the disastrous conditions:

Table 2.2.15 Accidents in Bangladesh Garment Sector

Year	No of deaths	Factory
1990	32	Saraka Garment, Dhaka
1997	24	Shanghai Apparels, Dhaka
1996	22	Lushakh Garment, Dhaka
1997	20	Jahanara Fashion, Narayanganj
2000	12	Globe knitting, Dhaka
2000	23	Macro Sweater, Dhaka
2004	23	Choudhury Knitwear Narsingdi
2005	23	Shan Knitting, Narayanganj
2006	62	KTS Garment, Chittagong
2010	29	Ha-Meem groupsports wear factory, Chittagong
24 Nov. 2012	13	Tazreen Fashions, Asulia, Dhaka
26 Jan. 2013	8	Smart Export Garment, Dhaka
24 Apr. 2013	1,127	Rana Plaza, Savar, Dhaka

Source: Compiled by JICA Survey Team from various News Papers

In addition to these, political crises and tensions have always been hurdles in the way rapid industrialization in Bangladesh. Recent political crisis and tension at the first half of 2013 also contributed to the economic growth of Bangladesh and expansion of the garment sector in a similar unfavorable mode through frustrating the prospective investors and making them feel insecure when buyers of RMG were inclining towards Bangladesh, reacting to high cost in China, Cambodia and neighboring countries. The tension had risen to such extent that buyers were forced to cancel their plans to purchase from Bangladesh as they generally were not interested to come here amidst such chaos. China, Cambodia and Vietnam turned out to be better alternatives.

f) Recent Fire and Building Collapse Incidents in Bangladesh

Fire is one of the most common disasters in Bangladesh, especially in the urban areas. There were a total number of 6,051 fire incidents in 2001 in Bangladesh which reached 17,912 in 2013. The present increasing rate is quite alarming. It possesses high vulnerability of fire hazards. Fire in Shopping malls,

Apparels, Garments, Industries, Slums, Markets, High-rise Buildings and Residential buildings are extremely difficult to extinguish when it's devastating blaze and smoke turns into gruesome and perilous situation.

Big fire incidents in high-rise buildings, slums, chemical industries, markets are increasing alarmingly in the country, out of which the mentionable incidences are: KTS Textiles Mill Building Fire (February, 2006), BSEC building fire, Chittagong, (February 2007), Bashundhara City Shopping Mall Fire, Dhaka (March, 2009), Japan Garden City Apartment Building Fire, Dhaka (February, 2010) and Nimtoli Chemical Fire, Dhaka (June, 2011) etc.

Besides fire incidents, major disasters associated with building collapse are increasing very alarmingly in Bangladesh. There were several building collapses in the last few years such as: Shakhribazar Residential Building Collapse (2004), Spectrum Garments Building Collapse (2004), Phoenix Building Collapse (2006), Begunbari Building Collapse (2011) etc., and the very recent fatal building collapse, namely "Rana Plaza" Building Collapse (2013) at Savar was the greatest man-made havoc. It caused death of 1,127 lives and injury of 2,458 people. It took 27 days to finish the whole search and rescue operation utilizing total strength of FSCD with the support of all responding organizations. Moreover, the country has been experiencing natural & man-made hazards like: cyclone, flood, fire, landslides and other hazardous incidents very frequently.

g) Recent Initiatives Adopted by GoB and Stakeholders

The collapse of Rana Plaza in Savar, the worst workplace disaster in textile history, on April 24, 2013, came as a shock to the entire nation. The following analysis explains the initiatives undertaken by the GoB and other stakeholders for the well-being of the Bangladeshi garment workers in a nutshell.

(Legal and Institutional System)

- The government amended the Labour Act of 2006³⁴ in July 2013³⁵ to allow formation of trade unions by workers in the factories, a key indicator of workers' rights.
- Following the Rana Plaza Incident, RMG workers became agitated leading to the subsequent increase of tension and unrest in the garment sector of the country. This led to the government's decision to increase the legal minimum wage which had not been adjusted since 2010, despite strong increases of basic living costs and high inflation rates. The government issued the "Gazette on Minimum Wages 2013" on December 5, 2013, effective legally on January 1, 2014, which defines a new wage structure for full-time workers of the RMG industry only. (The new salary structure is not for part-time workers and not applied to other industries and sectors.) This government intervention increased the gross monthly minimum wage to be paid to the benefitted workers from BDT 3,000 to BDT 5,300, increased by 77%.
- Other important steps taken to ensure workplace safety include:
 - the establishment of a task force on building and fire safety of the Cabinet Committee for the RMG sector;
 - upgrade of the Department of Inspection for Factories and Establishments (DIFE) to a directorate;
 - the development and introduction of unified fire safety checklist to be used by all relevant government agencies;
 - establishment of a workers' safety hotline through the Fire Service and Civil Defence (FSCD), and lastly, the adoption of a National Occupational Safety and Health Policy.³⁶

³⁴ Officially, Bangladesh Labour Act No. 42 of 2006

³⁵ Officially, Bangladesh Labour Act No. 30 of 2013. For original manuscript, refer to: http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_229274.pdf

(Initiatives for Safety of Workplace)

- The administration has allowed three agencies – two international and a national – to inspect factories for ensuring workplace safety. The agencies are: the Accord on Fire and Building Safety in Bangladesh, Alliance for Bangladesh Worker Safety and Bangladesh University of Engineering and Technology (BUET).

The Accord, a platform of 150 retailers and brands mainly from Europe, has so far carried out inspections of 80 factories of 1626. The Alliance, a platform of 27 US-based apparel retailers and brands, inspected 247 out of 626 factories. Meanwhile, BUET has completed inspection at 247 factories out of around 2,000 factories, according to the TIB study.

- The National Tripartite Plan of Action on Fire, Electrical Safety and Physical Integrity in the RMG Sector of Bangladesh (NAP) is the key initiative under which the government authorities and supporting organizations committed to various activities in response to the Rana Plaza incident.

The NAP is one of the notable initiatives undertaken by local and international stakeholders, part of which seeks to ensure long-term enforcement of a globally acceptable fire, electrical and structural safety standard across the garment industry that is harmonized with the standards of the foreign buyers/retailers. International Labour Organization (ILO) has taken upon advisory and coordinator roles to support the timely implementation of the prescribed activities and minimize duplication of efforts.

- According to the BGMEA, about 146 trade unions got registration in 2013 against only 38 in the previous eight years. Therefore, this tragedy and challenge which originated from the Rana Plaza accident could be translated into a major opportunity for the country.

h) Negative Externality Effects of Safety Initiatives

Different safety initiatives adopted by the GoB and other stakeholders, although aimed to ensure garment workers welfare and safety in their workplace, such initiatives have caused some negative externality effects also. One of the major effects is the shutting down of many garment factories. According to different factory owners, foreign buyers are pushing the owners very hardly for improving their work environment after Rana Plaza incident.

In order to monitor the working environment of garment factories the Alliance and the Accord started inspecting different garment factories at the beginning of 2014. Such inspections incurred increased production costs of factories by 10 to 12%. According to BGMEA, 218 BGMEA member factories shut down their production due to such effects during one and half years. This number is 192 in case BKMEA member factories. Moreover, Accord and Alliance stopped another 21 factories through inspection. This shutting down of large number of factories is increasing the number of sick factories in the economy. On the other hand, some disputes between garment owners and garment workers safety regarding re-inspection of garment factories are becoming apparent in recent times as there are no clarifications on a number of matters including,

- How will the inspection and re-inspection activities follow?
- How will the unions work in harmony?
- Whether national or international rules will be followed during the inspection and re-inspection?
- Who will inspect the factories?
- From where will the required funds come for reformations?
- During the reformation what will be salary pattern of the workers?

³⁶ <http://www.thedailystar.net/Rana-plaza/>

2.3 Legal Aspects for Buildings in Bangladesh

2.3.1 Relevant Regulations

a) Building Construction Act, Rules and Codes

Following Table 2.3.1 lists the summary of the major regulations related to building construction in Bangladesh. Dhaka Metropolitan Building Construction Rules (Dhaka BCR: GAZETTE) was formulated particularly for Dhaka National Capital and Metropolitan Area to regulate its urban development based on Building Construction Rules (BCR).

Table 2.3.1 Building Construction Acts, Rules and Codes

Year of enacting	Most Recent renewal	Name (Act, Code, Rule)	Remarks	Lang uage
1952	2006	Building Construction Act (BCA)	<p>It is the first act related to building construction formulated in the East Pakistan area. In the preamble of BCA, it is described as “an Act to provide for the prevention of haphazard construction of buildings and excavation of tanks which are likely to interfere with the planning of certain areas in Bangladesh.”</p> <p>Definition as well as authority of “Authorized Officer (AO)” who has full responsibilities to building permit is stipulated in Section 2 of BCA.</p> <p>(Contents)</p> <ol style="list-style-type: none"> 1. Short title, extent and commencement 2. Definitions 3. Restriction on construction of building and excavation of tank <ol style="list-style-type: none"> 3A. Restriction on improper use of lands and buildings 3B. Direction for removal of construction, etc. 3C. Restriction on cutting etc., of hills 3D. Direction for stopping cutting or razing of hill 4. Power of removal of temporary building 5. Power of removal of building under construction 6. Eviction of occupier 7. Removal of building, etc. 8. Application for sanction 9. Cancellation of sanction on breach of terms and conditions thereof 10. Entry into premises 10A. Power of seizure and arrest without warrant 12. Penalty 13. Cognizance of offence 14 Bar to jurisdiction of Civil Court 15. Appeal 16. Public servant 17. Indemnity 18. Power to make rules 18A. Power to make Bangladesh National Building Code 19. Compensation when not payable 11. [Omitted.], 12A. [Omitted.], 20. [Repealed] 	Bengali

1993	2006	Bangladesh National Building Code (BNBC)	<p>With a view to bringing in control and ensuring a uniform standard of building construction practice in the country, BNBC was prepared in 1993 by House and Building Research Institution (HBRI) and Bangladesh Standards and Testing Institution (BSTI). It is formulated fully based on UBC91 (Uniform Building Code, 1991), except for stipulations on earthquake zone.</p> <p>The latest edition is BNBC 2006, although it is the same as BNBC 1993. The purpose of issue of BNBC 2006 was to publish it in A4-size and disseminate to architects and structural engineers who work for private design office. BNBC is composed of following 10 parts.</p> <p>Part 1 : Scope and Definitions Part 2 : Administration and Enforcement Part 3 : General Building Requirements, Control and Regulation Part 4 : Fire Protection Part 5 : Building Materials Part 6 : Structural Design Part 7 : Construction Practices and Safety Part 8 : Building Services Part 9 : Alteration, Addition to and Change of Use of Existing Buildings Part 10 : Signs and Outdoor Display</p> <p>BNBC 2006 is currently being revised. If revised, number of earthquake zones shall be increased three to four. Moreover, if BNBC 2006 is revised, it should stipulate the establishment of Building Regulatory Authority (BRA). If such an authority is established, then a system of examining buildings properly by external examiner, similar to the system in place in Japan, should also be introduced.</p>	Bengali English
1953	2006	Building Construction Rules (BCR)	<p>The rules in BCR seek to control development plot-by-plot and case-by-case. It controls development by imposing conditions on setbacks, site coverage, construction of garages, access to plot, provision of lift, land use of that particular plot and height of building.</p> <p>The contents are said to be similar to the following Dhaka BCR: GAZETTE, by DOA representatives, because the documents is not available.</p>	Bengali
1996	2008	Dhaka Metropolitan Building Construction Rules (Dhaka BCR: GAZETTE)	<p>This superseded the earlier set of BCR issued in 1996 for the Dhaka National Capital and Metropolitan Area and provided more authority to RAJUK (Capital Development Authority of the Government of Bangladesh) in the following way;</p> <ol style="list-style-type: none"> 1. Clear-cut responsibility to monitor the development of the city, 2. Spread out the responsibilities to various actors, 3. Spelled out responsibilities of building designers, structural engineers, site supervisors and their penalties etc. <p>One of the most significant points is introduction of floor area ratio (FAR). To manage the growth of the city it provides rules of building coverage area, allowable floor space and relation among building height - road width and plot size.</p>	Bengali

Since BCA describes the rules for conduction the BCA, such as BNBC, then BNBC and the rules are under BCA. The contents of the rules are similar to BNBC and more practical. Thus, BCA is the law with punishment, and BNBC is regulation (code) without punishment and the rules are practical enforcement issues with punishment. The Dhaka BCR (GAZETTE) has some collective provisions such as floor-area

ratio, building coverage rate, building height etc. Therefore these Bangladesh building construction relating regulations are totally similar to Japanese system of the combination among “The Building Standard Law, the Building Standards Law Enforcement Order, and the Building Standards Law Enforcement Regulations.

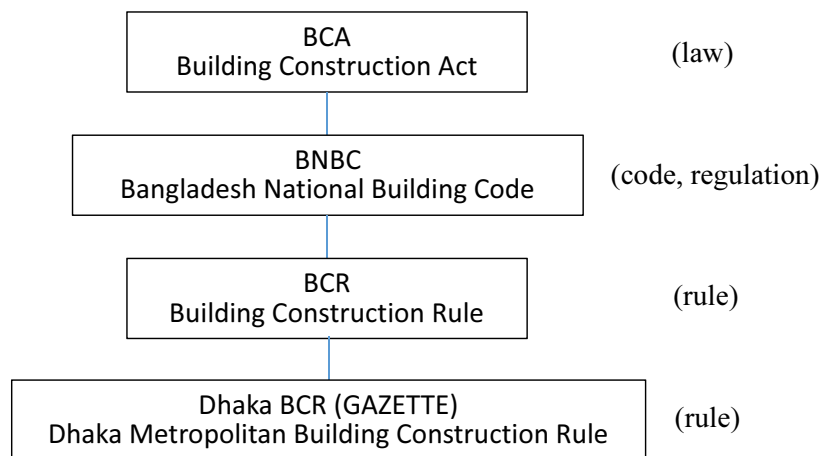


Figure 2.3.1 Scheme of Major Building Construction Regulations in Bangladesh

b) Associated Acts Related to Building Construction

In addition to above regulations, following regulations are related to building construction. The architects in DOA need to design considering compliance to the following regulations according to use and scale of building to be planned. The original editions of them are written only in Bengali. Since the contents are not available, only name list is presenting.

Table 2.3.2 Associated acts related to Building Construction

Associated acts related to Building Construction
Public Park Act
Cantonment Act
Town Improvement Act
Antiquity act
Municipal Ordinance
Bangladesh Environment Conservation Act
Open Space and Wetland Preservation Act
Fire Control and Protection Act
Private Housing (Land) development ordinance
City Cooperation Act

c) The New BNBC

1) Trends

According to the HBRI editing and publishing authority of the new BNBC, it was expected to be approved by the Ministry of Housing and Public Works in December 2014. However, in November 2014, the Steering Committee composed of representatives from related organizations, was reviewing the draft.

The new BNBC could not be confirmed so far, the experimentally print-out version was confirmed in HBRI. It is the proposal version in late September 2014. It was consisted of 3 parts in A4 size (Volume 1: Part 1-5, Volume 2: Part 6, Volume 3: Part 7-10). Simply compared to 1993/2006 editions, it becomes three times volume.

2) Key Points of Revision

The following table shows the key points to be revised in the new BNBC. The shaded portions indicate that either portions added in the new BNBC, or portions added particularly notable provision in the chapter although almost the same configuration as the old version BNBC. It is confirmed that totally 27 chapters (shown in Table 2.3.3) are added or added notable provisions thorough Part 1 to Part 10.

Table 2.3.3 Differences in Descriptions of BNBC between New (as of September 2014) and Old (1993/2006) versions

Part/ Chapter	Descriptions		Remarks
	New Version (as of September 2014)	Old Version (1993/2006)	
Part-01 Scope and Definition			
Chapter -01	Title, Scope and General	Almost or all the same as on the left	
Chapter -02	Definitions	Almost or all the same as on the left	Establishment of Bangladesh Regulatory Authority (BRA) is described in Section 2.1.1. (*1)
Chapter -03	Abbreviations	Almost or all the same as on the left	
Part-02 Planning, Environment, Administration and Legislation			
Chapter -01	Purpose and Applicability	Described as “Purpose and Scope”	Renamed
Chapter -02	Organization and Enforcement	Almost or all the same as on the left	
Chapter -03	Permit and Inspection	Almost or all the same as on the left	
Appendix A	Land Use/ Development Building Permit	Described as “First Application to Develop, Erect, Demolish or to Make Alternation in any Part of the Building”	Renamed
Appendix B	Certificate of Supervision	Almost or all the same as on the left	
Appendix C	Sanction or Refusal of Land Use/ Development Building Permit	Almost or all the same as on the left	
Appendix D	Appeal against Refusal of any Permit	-	Newly added in New ver.
Appendix E	Completion Certificate	Described in Appendix D	App.D of old ver. is converted to App.E of New ver.
Appendix F	Occupancy Certificate	-	Newly added in New ver.
Part-03 General Building Requirements, Control and Regulation			
Chapter -01	General Building Requirements	Almost or all the same as on the left	
Chapter -02	Classification of Buildings based on Occupancy	Almost or all the same as on the left	
Chapter -03	Classification of Building Construction Types Based on Fire resistance	Almost or all the same as on the left	
Chapter -04	Energy Efficiency and Sustainability	-	Newly added in New ver.
Part-04 Fire Protection			
Chapter -01	General Provisions	Almost or all the same as on the left	
Chapter -02	Precautionary Requirements	Almost or all the same as on the left	
Chapter -03	Means of Egress	Described as “Means of Escape”	Renamed
Chapter -04	Equipment and In-built Facilities Standards	Almost or all the same as on the left	
Chapter -05	Specific Requirements for Fire detection and Extinguishing System	Described as “Specific Requirements for Various Occupancies”	Renamed

Appendix -A	Fire Drill and Evacuation Procedure for High-rise Buildings: Guidelines	Almost or all the same as on the left	
Appendix- B	Venting for Fire Protection in Industrial and Storage Buildings	Almost or all the same as on the left	
Appendix -C	Selection and Siting of Fire Detection System: Guidelines	Almost or all the same as on the left	
Appendix -D	-	Special Requirements of Buildings more than 20m high	Deleted
Part-05 Building Materials			
Chapter -01	Scope and Definitions	Almost or all the same as on the left	
Chapter -02	Building Materials	Almost or all the same as on the left	
Part-06 Structural Design			
Chapter -01	Definitions and general requirements	Described as “General design requirements”	Renamed
Chapter -02	Loads on buildings and structures	Described as “Loads”	Renamed Number of earthquake zones is increased from three to four in New version.
Chapter -03	Soils and foundations	Described as “Foundation”	Renamed
Appendix -A3	Methods of soil exploration , sampling and groundwater measurements	Described as “Appendix B Methods of Soil Exploration and Sampling Appendix B”	Renamed
Appendix -B3	Recommended criteria for identification and classification of expansive soil	-	Newly added in New ver.
Appendix -C3	Other methods of estimating ultimate axial load capacity of piles and drilled shafts	-	Newly added in New ver.
Chapter -04	Bamboo	-	Newly added in New ver.
Chapter -05	Concrete Material	Almost or all the same as on the left	
Chapter -06	Strength Design of Reinforced Concrete Structures	-	Newly added in New ver.
Chapter -07	Masonry Structures	Described in Chapter 4	
Chapter -08	Detailing of Reinforced Concrete Structures	Almost or all the same as on the left	
Chapter -09	Pre-stressed Concrete Structure	Almost or all the same as on the left	
Chapter -10	Steel Structure	Almost or all the same as on the left	
Appendix -10.A	Prequalification of beam-column and link-to-column connections	-	Newly added in New ver.
Appendix -10.B	Quality assurance plan	-	Newly added in New ver.
Appendix -10.C	Seismic design coefficients and Approximate period parameters	-	Newly added in New ver.
Appendix -10.D	Qualifying cyclic tests of beam-to-column and link-to-column connections	-	Newly added in New ver.
Appendix -10.E	Qualifying cyclic tests Of buckling-restrained braces	-	Newly added in New ver.
Appendix -10.F	Welding provisions	-	Newly added in New ver.
Appendix -10.G	Weld metal/welding procedure specification notch toughness verification test	-	Newly added in New ver.
Chapter -11	Timber	Almost or all the same as on the left	
Chapter -12	Ferrocement Structures	Almost or all the same as on the left	
Appendix -A	Strut-and-tie models	-	Newly added in New ver.
Appendix- B	Alternative design method for reinforced concrete structures: working stress design	-	Newly added in New ver.

Appendix -C	Seismo-tectonics and earthquake occurrence in and around Bangladesh	-	Newly added in New ver.
Appendix -D	Anchoring to concrete	-	Newly added in New ver.
Appendix -E	Information on steel reinforcement	-	Newly added in New ver.
Appendix -F	Equivalence of non-homogenous equations in the code In SI-metric, MKS-metric, and U.S. Customary units	-	Newly added in New ver.
Chapter -13	Steel-Concrete Composite Structural Members	-	Newly added in New ver.
Part-07 Construction Practices and Safety			
Chapter -1	Constructional Responsibilities and Practices	Almost or all the same as on the left	
Chapter -2	Storage, Stacking and Handling Practices	Almost or all the same as on the left	
Chapter -3	Safety during Construction	Almost or all the same as on the left	
Chapter -4	Demolition Work	Almost or all the same as on the left	
Chapter -5	Maintenance Management, Repairs, Retrofitting and Strengthening of Buildings	-	Newly added in New ver.
Part-08 Building Services			
Chapter -1	Electrical and Electronic Engineering Services for Buildings	Chapter 1 Lighting Chapter 2 Electrical Installation	Chap 1 & 2 of Old ver. are converted to Chapter 1 in New ver.
Chapter -2	Air-conditioning, Heating and Ventilation	Described in Chapter 3	Converted to Chapter 2 in New ver.
Chapter -3	Acoustics and Noise Control	Described in Chapter 4	Converted to Chapter 3 in New ver.
Chapter -4	Lifts, Escalators and Moving Walks	Described in Chapter 5	Converted to Chapter 4 in New ver.
Chapter -5	Water Supply	Described in Chapter 6	Converted to Chapter 5 in New ver.
Appendix -(6.N-6Q)	Appendices of Water Supply	Almost or all the same as on the left	
Chapter -6	Sanitary Drainage	Described in Chapter 7	Converted to Chapter 6 in New ver.
Chapter -7	Rainwater Management	-	Newly added in New ver.
Appendix -(R,S,T,U,V)	Appendices of Rainwater Management	-	Newly added in New ver.
Chapter -8	Fuel Gas Supply	Almost or all the same as on the left	
Part-09 Alteration, Addition to and Change of use of Existing Building			
Chapter -1	Applicability and Implementation	Almost or all the same as on the left	
Chapter -2	Evaluation and Compliance	Almost or all the same as on the left	
Chapter -3	Conservation and rehabilitation of historical and cultural heritage	-	Newly added in New ver.
Part-10 Signs and Outdoor Display			
Chapter- 1	Scope and General	Almost or all the same as on the left	
Chapter-2	General Requirements	Almost or all the same as on the left	
Chapter -3	Specific Requirements for Various Types of Sign	Almost or all the same as on the left	
Appendix-A	Application for Permit to Erect or Alter Outdoor Signs	Almost or all the same as on the left	

Source: HBRI

*Note1 in Chapter 2 of Part 1: BRA shall be established by the Government. It is a new authority responsible for enforcement of BNBC throughout Bangladesh. It is specified as apex body to implement the provisions of BNBC and will be administered under the Ministry of Housing and Public Works.

Most of the old chapters are modified or further information included as technology, product standard and procedure are changed.

The major changed portions from above table are described as below

(1) Setting Bangladesh Regulatory Authority (BRA)

BRA is a special committee, which is and Public Works involving BNBC and the related national level policy formulation. BRA is composed of the engineers with more than 30 years' experience, architects, lawyers, social workers, and urban planning experts.

So far Authorized Officer (AO), who is the chief executive involved in the building permit, had been the same for private buildings. However, by the new BNBC introduction, BRA will be installed as the top institution of AO. The system that BRA will monitor AO will be in place. This has been seeking a stricter building permit system. In addition, AO has the responsibility for the examination of the legal adequacy of architectural drawings, and BRA is not involved in directly drawing review.

The provisions is also included that BRA has the right to advice for measures of penalties to designers and contractors, if it has been confirmed that the design and construction of the building has not been compliance to Building Construction Act (BCA) and BNBC. On the contrary, the penalties for designers of illegal buildings are not defined in BNBC. The penalties are specified in Article 12 of the Building Construction Act (BCA).

(2) Increase of Number of Seismic Zone

In the new BNBC, the number of seismic zone is increased to four from three in Part 6-Chapter 2 "Loads on buildings and structures". The current BNBC has defined three seismic zones in 1993, when seismic coefficients were not studied on the basis of sufficient data. The new BNBC defines 4 seismic zones and seismic coefficients based on well study.

(3) Addition of Provision on "Maintenance Management, Repairs, Retrofitting and Strengthening of Buildings"

The new BNBC will add the chapter regarding to "Maintenance Management, Repairs, Retrofitting and Strengthening of Buildings" in Part 7. However, even the chapter is added, the provision remains to promote designers such as Architect and Engineer to conduct repair and retrofitting keeping costs rather than new construction in some situations. Provisions do not define the technical approach for repair and retrofitting methods.

(4) Addition of Provision of "Retrofitting: Evaluation of Strength of Existing Structures"

Though current BNBC has no word of "Retrofitting", the new BNBC adds a section of "Evaluation of strength of existing structures" in its Part 6, Chapter 6, Sec.6.11. It is coming from Chapter 20 of ACI 318, which showed evaluation of existing building strength by load testing, including evaluation methods for existing concrete and iron bars. Besides, the Part 7, Chapter 5, Sec.5.10.2 " Structural Repairs ", as well as Sec.5.10.3 "Seismic Strengthening", and Sec.5.10.4 "Seismic Retrofitting" show the basic regulation on retrofitting construction works. Although some methods are introduced, their strength evaluation indices are missing. The extent of strength increase of each retrofitting method is tremendously important.

3) Comparison with Japanese Regulation

Table 2.3.4 and Table 2.3.5 are the chapter lists of Japanese Building Standard law and the Building Standard Laws Enforcement Order. It can be seen, of course the order and focus are different, the BNBC is somewhat a combination of Japanese standard law and its enforcement order.

Table 2.3.4 Chapter list of the Japanese Building Standard Law

THE BUILDING STANDARD LAW (Law No. 201, May. 24, 1950)	
(Latest Amendment and Enforcement day: Law No. 40, 2008 / Nov. 4, 2008)	
Table of Contents	
Chapter	
I	General Provisions
II	Site, Structure and Equipment of Building
III	Site, Structure and Equipment of Building within Urban Planning Area
	Section 1 General Provisions
	Section 2 Relations between Buildings or their Sites and Roads or Wall Alignments
	Section 3 Use of Buildings
	Section 4 Site and Structure of Building
	Section 4-2 Special Districts for Urban Renaissance
	Section 5 Fire Protection Zones
	Section 5-2 Special Disaster Prevention Block Maintenance District
	Section 6 Landscape Preservation istricts
	Section 7 Areas of District Developing Plan, etc.
	Section 8 Site and Structure of Buildings in Areas Other than Urban and Quasi-urban Planning Area
III-2	Conformity Certification for Types and Models
IV	Building Agreement
IV-2	Designated Qualifying Examination Institutions and Others
	Section 1 Designated Qualifying Examination Institution
	Section 2 Designated Confirmation and Inspection Institutions
	Section 3 Designated structural calculation compatibility judgment institution
	Section 4 Designated certification agencies
	Section 5 Designated performance evaluation institutions
IV-3	Registration of Qualified Building Regulation Conformity Inspectors
V	Building Review Council
VI	Miscellaneous Provisions
VII	Penal Provisions
	Annexed Tables
	Annexed Table 1
	Annexed Table 2
	Annexed Table 3
	Annexed Table 4

Table 2.3.5 Chapter list of the Japanese Building Standard Laws Enforcement Order

Building Standards Law Enforcement Order (Law No. 338, November. 16, 1950)	
Table of contents	
Chapter 1	General Provisions
Chapter 2	General Structures
Chapter 3	Structural Strength
Chapter 4	Fireproof Structure, Semi-Fireproof Structure, Fire Protection Structure, Fire Compartment, etc.
Chapter 5	Evacuation Facilities, etc.
Chapter 5-2	Interior of Special Buildings etc.
Chapter 5-2-2	Verification of Safety during Evacuation
Chapter 5-3	Large Scale Building, Main Part of Which can be Wooden
Chapter 5-4	Construction Equipment, etc.
Chapter 6	Usage of Building
Chapter 7	Height etc. of Each Part of Building
Chapter 7-2	Buildings in Fire Protection Region or Quasi-Fire Protection Region
Chapter 7-2-2	Buildings in Maintenance Region for Specific Disaster Protection Blocks
Chapter 7-3	Area for Block Planning etc.
Chapter 7-4	Site and Structure of Buildings in Other Areas of Urban Planning Area and Quasi-Urban Planning Area
Chapter 7-5	Model Suitability Certification etc.
Chapter 7-6	Designated Confirmatory Testing Institutions etc.
Chapter 7-7	Registration Fee of Building Standards Conformity Judgment Qualified Personnel
Chapter 7-8	Prevention of Harm at Construction Site
Chapter 7-9	Relaxation of Restrictions on Simple Structured Building
Chapter 7-10	Relaxation of Restriction on Regarding Ground as One etc.
Chapter 8	Relaxation of Restrictions on Existing Buildings etc.
Chapter 9	Workpiece
Chapter 10	Miscellaneous Provisions
	Supplementary Provisions

2.3.2 Process for Construction of the Public Buildings

a) Design works

Most of all ministries' public buildings in Bangladesh are basically designed by DOA and PWD. DOA has consultations with clients or ministries on their requirements and prepares architectural design documents. After they have been prepared, PWD prepares structural and building services design documents. In Rules of Business, which is regulated by Cabinet it is stipulated that DOA and PWD do design works for buildings of most ministries.

The exceptions of public buildings for above are the school buildings to be designed by MOE and the hospital buildings that have less than 100 beds to be designed by MOH. Further, the local governments' buildings are often outsourced to private design offices by LGED. Local governments do design works for their buildings by themselves. Even if they have in-house architects and engineers, they often contract out design works to private design offices. These buildings' constructions need getting approval from Authorized Officer (AO) unlike the case of the public buildings designed by DOA and PWD. Necessary process of application by building owners to approval of AO is described in the next section of 2.3.3.

b) Design Works by DOA and System of Approval of Architectural Design Documents

The DOA architects have consultations with clients (ministries) to confirm their requirements and then prepare architectural design documents in compliance with BNBC, BCR and other associated regulations. After the architectural design documents have been prepared by the DOA architects, whether they are prepared according to BNBC, BCR, and other associated regulations is examined by DOA's Chief Architect (CA). If CA approves them, they are regarded as authorized documents.

CA is regarded as "Authorized Officer (AO)", definition and responsibilities of that are stipulated in Building Construction Act (BCA). BCA (Chapter 2 (a)) stipulates that any design documents are authorized if AO approves them. There is not a legal system in which external organization examines the DOA's design documents unlike in the case of Japan.

The DOA architects prepare only architectural design documents. Structural design documents are prepared by the PWD engineers. Although the DOA's architects complete university studies in architecture, they do not complete structural engineering unlike in the case of programs of the architectural course of university in Japan. Therefore, generally, the Bangladesh architects do not have knowledge of structural engineering.

c) Role of DOA

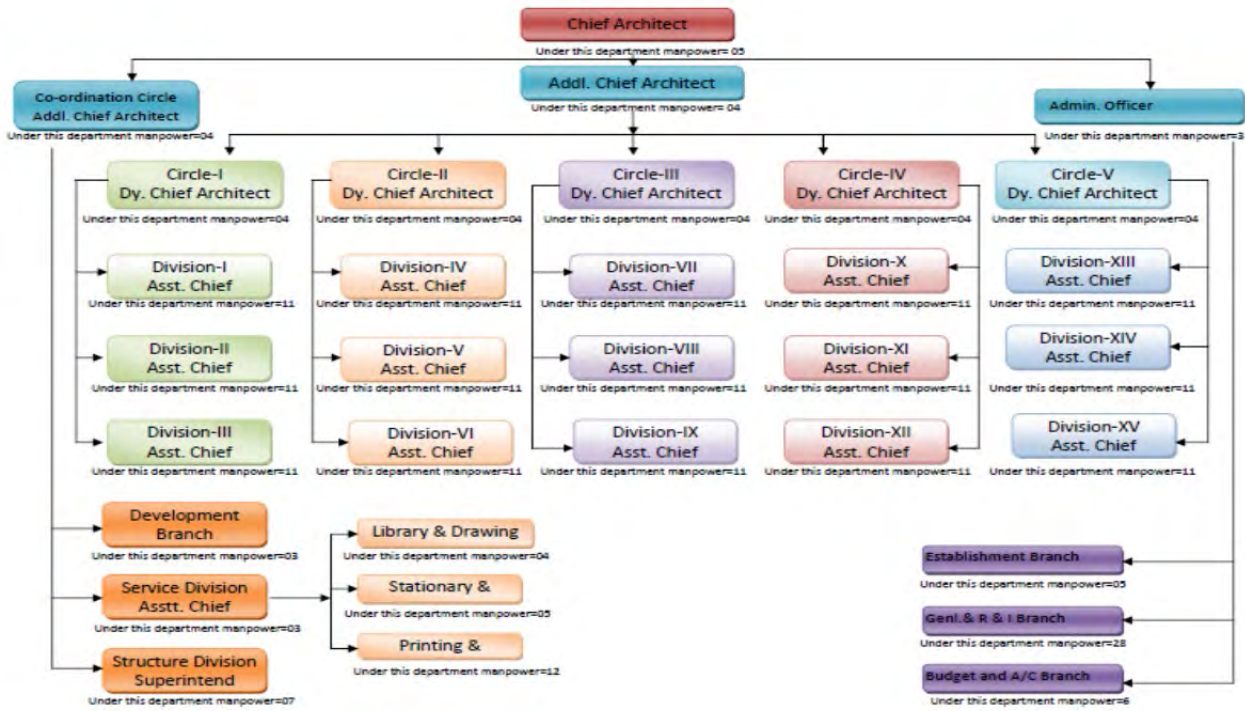
(1) Number of Work Force of DOA

There are 5 circles (divisions) in DOA (Figure 2.3.2). All 20 or more clients (ministries) are categorized into five groups. It is defined which circle does design works for which group. Deputy Chief Architects, Assistant Chief Architects and Assistant Architects in Class 1³⁷ are involved in directly or indirectly preparing design documents. As of August 2014, the number of those architects is 70. As the number of new design projects of last year (July 2013 to June 2014) was 169, 2.4 projects per person are assigned.

As of August 2014, total number of the DOA staff from Class 1 to Class 4 was 277 (Class 2 staff was not assigned in DOA: see Table 2.3.6). As seen in the Table 2.3.6, there are two engineers (one Executive Engineer and one Assistant Engineer) in Class 1. However, these engineers do not always examine the

³⁷ The staff who has university degree is given Class 1. There are four classes, and Class 1 is the highest.

structural drawings. DOA has a plan to increase number of engineers to 109 and to complete all kinds of building design works including structural and building services design works within DOA.



Source: DOA

Figure 2.3.2 Organogram of DOA

Table 2.3.6 DOA Staff

Name of Post	Active Post Number (Current)	Newly Created Post Number (Planned additional number)	Total
Class-I			
Chief Architect	1	-	1
Additional Chief Architect	1	1	2
Deputy Chief Architect	6	2	8
Superintend Engineer	-	1	1
Assistant Chief Architect	16	8	24
Executive Engineer	1	1	2
Senior Assistant Architect	-	8	8
Sub-Divisional Engineer	-	2	2
Assistant Architect	48	-	48
Assistant Engineer	1	1	2
Class-II			
-	0	0	0
Class-III			
Sub -Assistant Architect	-	11	11
Sub -Assistant Engineer	-	2	2
Administrative Officer	1	-	1
Librarian	1	-	1
Draftsman (Designer) Grade-I	16	4	20
3D Animator	-	3	3
Draftsman (Designer) Grade-II	16	4	20
Draftsman (Designer) Grade-III	24	8	32
Draftsman (Designer) Grade-IV	24	8	32
Model Maker	2	1	3
Assistant Model Maker	-	3	3
Print-man/Printer	3	-	3

Assistant Print-man/Printer	6	1	7
Superintend	4	1	5
Stenographer-cum-computer operator	8	-	8
Steno typist-cum-computer operator	17	-	17
Upper Division Assistant(UDA)	11	-	11
Office Assistant(LDA)	6	-	6
Office Assistant with computer operator	3	12	15
Computer typist	1	-	1
Caretaker	-	1	1
Telephone operator	1	-	1
Assistant Telephone operator	1	-	1
Driver	20	-	20
Electrician	-	2	2
Liftman	-	2	2
Plumber	-	1	1
Carpenter	-	1	1
Messenger	-	2	2
Book binder	-	1	1
Class-IV			
M.L.S.S	36	8	44
Security guard	-	3	3
Par ash	-	3	3
Gardener	-	1	1
Sweeper	2	2	4
Total	277	109	386

Source: DOA

(2) Issues in the DOA's Design Works

The DOA's architects progress design works within legal constraints (setback, floor area ratio (FAR), building coverage are, etc.) stipulated in BCR (Dhaka BCR 2008 is applied, if the building site is in Dhaka National and Metropolitan Area).

In Japan, "Building Officials (BO)" whose responsibilities are similar to those of "Authorized Officer (AO)" that is stipulated in BCA in Bangladesh prepare the standard checklists on which the points of the Building Standard Law of Japan, which is comparable to BNBC in Bangladesh, are listed in order to prevent mistakes in examining design documents as much as possible. Then, BO often request building owners or architects to fill in the checklists and submit to BO. In Bangladesh, however, examination using such checklists is not introduced. Regarding the situations in Bangladesh, some DOA architects considered it necessary to introduce such checklists as seen in Japan and to establish the rules for the DOA architects to prepare design documents using the standard checklists.

(3) Inspection during the Construction Period

The DOA architects are not directly involved in construction management. Field Engineers (FE) in PWD does construction management, although the DOA architects sometimes visit construction site for inspection upon request from FE. The timings of visit for the DOA architects are when FE found it unclear on the architectural design documents and when FE needed to ask advice on materials to be used in finish work. They do not have a legal obligation to do inspection during the construction period.

d) Design Works by PWD and System of Approval of Design Documents

The PWD engineers prepare design documents of structural and building services drawings after the architectural drawings for them are approved by the DOA's CA. Sub-divisional Engineers (SDE) or Assistant Engineers (AE)³⁸ are directly involved in preparing design documents. Structural engineers

³⁸ AE is a title for PWD staff who has earned bachelor's degree in civil engineering. And, SDE is a title for PWD staff with four years of experience as AE.

design buildings according to BNBC in order to ensure structural safety for external force such as earthquake, wind, etc. And, the building services engineers design according to Fire Control and Protection Act for building users to be able to evacuate safely when in fire.

The PWD engineers had not been engaged in design works for retrofitting until CNCRP was implemented in 2011. It was through the pilot project by PWD under CNCRP that they experienced retrofit design and retrofitting work for the first time. It is the first attempt of retrofitting for public buildings in Bangladesh.

After SDEs or AEs have prepared design documents, they are examined whether they are designed within legal constraints by the PWD's Executive Engineers (EE) and Superintendent Engineers (SE). First, they are examined by EE, second examined by SE. If SE approves, the design documents are regarded as authorized documents. They are regarded as the same as "Authorized Officer (AO)" that is stipulated in BCA authorized.

The time required for examination by EE and SE ranges a few days to a few weeks. It depends on scale of buildings in floor area.

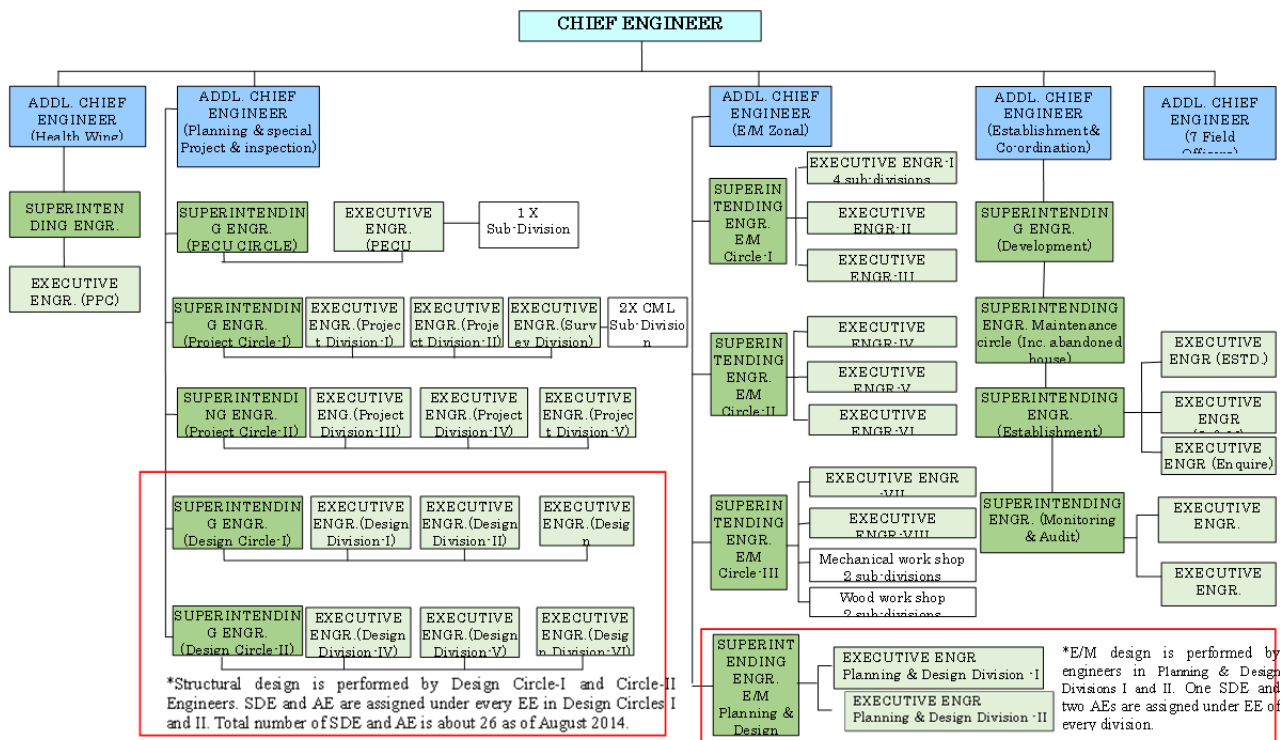
e) Role of PWD

(1) Number of Work Force of PWD

The structural design documents are prepared by the Class 1 engineers who belong to Design Circles I and II under Department of Planning and Special Project & Inspection. The building services design documents are prepared by the Class 1 engineers who belong to Planning and Design Divisions I and II under Department of E/M. The SDEs or AEs in the circles or divisions do practical design works. Then, the EEs examine the design documents prepared by SDE or AE. After EEs have examined, furthermore, SEs examine. The design and examination works are completed within a division or design circle (Figure 2.3.3).

As of August 2014, the number of SDEs and AEs who directly do structural design works in Department of Planning and Special Project & Inspection of Circle I and Circle II was about 26. And the number of SDEs and AEs who do directly building services design works was about 6. About 32 engineers in total were assigned as designers in PWD. As total number of SDE and AE engineers in PWD is 602 (259+343), 5 percent of the PWD engineers are directly involved in design works (Table 2.3.7).

According to Department of Establishment & Coordination in PWD, the number of new design projects of last year (July 2013 to June 2014) was 169. Only 26 structural engineers and 6 building services engineers were assigned for doing design works for 169 projects. But, in fact, some engineers in the PWD's field offices often assist in design works of SDEs and AEs in the PWD headquarters.



Source: PWD

Figure 2.3.3 Organogram of PWD

Table 2.3.7 PWD's Workforce

Name of Post	No. of sanctioned post		Total
	Regular	Reserve	
Class-1			
Chief Engineer	1	-	1
Additional Chief Engineer	11	1	12
Superintending Engineer (SE)	33	4	37
Executive Engineer (EE)	130	11	141
Sub-Divisional Engineer (SDE)*	259	25	284
Assistant Engineer (AE)*	343	17	360
Chief Arbor culturist	1	-	1
Sub-Divisional Officer (SDO, Arbor)	6	-	6
Legal Advisor	1	-	1
Legal Officer	1	-	1
Chief Account Officer	1	-	1
Account Officer	1	-	1
Total Class-1	788	58	846
Class-2			
Administrative Officer	5	-	5
Welfare Officer	1	-	1
Sub-Divisional Engineer	1,183	-	1,183
Divisional Accountant	103	-	103
Imam	1	-	1
Arbor culturist	1	-	1
Total Class-2	1,294	-	1,294
Class-3			
Total Class-3	3,352	-	3,352
Class-4			
Total Class-4	2,004	-	2,004
Grand Total	7,438	58	7,496

*Total number of SDE and AE is 602. 26 of them do structural design. 6 of them do E/M design.

Source: PWD

(2) Issues in the PWD Design Works

In PWD, the SDEs or the AEs do design works, and then the EEs and the SEs examine the design documents prepared by SDE or AEs. As well as in the case of DOA, there are not the standard checklists that are used among ADEs, AEs, EEs and SEs on which the points of relevant regulations are listed. Every engineer does design works or examinations on their own ways.

When a JICA Technical Cooperation Project: “Project for Capacity Development on Natural Disaster-resistant Techniques of Construction and Retrofitting for Public Buildings (CNCRP)” was initiated in 2011, it was discussed preparation of the standard checklists to be shared among the PWD engineers who are involved in designing and examination as a method of ensuring quality of design documents. It was also discussed establishment of rules of doing design works and examining using the standard checklists. They are currently being developed in CNCRP.

(3) Inspection during the Construction Period

After examination by the PWD’s SE, design documents are handed to Field Engineers (FE). Then, the construction works are initiated and managed by FEs (refer to quality management system for construction works by the PWD FEs in the below Box. The PWD FE is stationed at the construction site as site manager. The designers: i.e.: SDEs or AEs and their superior: EEs visit the construction site for inspection as necessary.

At the time of completion of construction works, if the PWD SE approves completion, the building is handed over to building owner. As the SE is regarded as Authorized Officer (AO) that is stipulated in BCA, if the SE approves, the building is regarded as being officially completed.

BOX: Construction Management by the PWD Field Engineers (FEs)

The PWD FEs have to manage the contractors’ works including concrete, structural, finishing, plumbing works, etc. so that they can be appropriately progressed. However, the system for FEs to manage the works is considered as imperfect. Although the situations are being improved through CNCRP, their quality management system for construction is not perfect. For example, the method for inspecting the works performed by contractors as well as the method for judging appropriately the result of material quality tests was not standardized and the records of approval of building materials are not kept (verbal confirmation). As of August 2014, the situations are being improved through CNCRP, but they are not adequately improved.

CNCRP is preparing some standardized checklists for the FEs as a tool to inspect to what extent the works performed by contractors have been done in accordance with the building drawings as well as a tool to appropriately see the result of the material tests in order to ensure quality of building in the construction works.

As of August 2014, CNCRP was doing the retrofitting works for a fire station building with a floor area of about 700sqm as a pilot project. And, records of inspection and some checklists for quality management were kept in the site office by site manager who is a PWD FE. Compared to the situations at the beginning of CNCRP, the situations had been remarkably improved.

2.3.3 Process of Construction of Private Buildings

Speaking as a rule for private building, if constructing a building in Bangladesh, it is necessary to issue a construction application, etc. to the authority. However, they vary by region. For Dhaka city it is RAJUK (Rajdhani Unnayan Kartipakha, Capital Development Authority of Bangladesh under MoHPW), and for Chittagong, Khulna, Rajshahi, Cox Bazar, Development Authority of each City Corporation will manage.

In addition, when local governments are concerned LGED will be, and others are District Office of PWD or City Corporation such as Sylhet will manage. It seems to be unknown portions that in some cases it is subdivided by the height and usage of building. Furthermore in practice, there are often cases that the owner can choose authority from possible ones.

In Bangladesh, the parent law relating to the construction of the building is BCA, the Building Construction Act, 1952 (East Bengal Act No. II of 1953). In addition, based on BCA, each authority manages using local BCR (Building Construction Rule, among stakeholders called Bangladesh GAZETTE) as its practical rule. Therefore, the content of them are almost the same as the GAZETTE of RAJUK. In addition, GAZETTEs are in accordance with BNBC as previously described.

GAZETTE is the rule for the owners of buildings and the building contractors, because it is the rules for building construction including private buildings. GAZETTE shows the necessary documents and materials including drawings for the application of construction, and necessary report for the completion of construction.

Management authorities including RAJUK should be the Authorities regulated in GAZETTE. In other words, for all over the country, the almost common rules are distributed, and submission destination authorities for construction application will be the jurisdiction authority. In Dhaka the Authority is RAJUK, for Chittagong CDA (Chittagong Development Authority of Chittagong City Corporation) will be the authority.

Regulations surrounding the building construction works will be primarily BCA and GAZETTE. Though the rules and agencies are defined, many people suggested that the rules prescribed in GAZETTE are not effective actually. In other words, they are not mostly complied. The reason is that the consistency in the rules and customs of the country has problems, in practice, such as it is possible to apply for either even City Corporation even RAJUK, in Dhaka. Also, that the penalties regulations have not been effective has a possibility to inhibit the operation. On the other hand, as described later, both the digitization the procedure of application and the commencement of effective use and enhancement of the human resources have begun. Disaster management can proceed just after tragic disaster is common all over the world is happy but sad.

Moreover, as mentioned later, BCC (Building Construction Committee) will review the inspection by RAJUK, designated in GAZETTE. And BRA (Bangladesh Building Regulatory Authority) exist as management institutions above RAJUK. Their functions are defined in BNBC, but they have not yet worked at all in practice. In order to achieve the safe buildings in Bangladesh, the owners or the related organizations of the buildings should follow the rules. Therefore, the efforts from both directions of below and above, on improvement of management systems, capacity building of related organizations, and requires mandatory rules compliance.

In the following, because rules are almost the same, taking the Dhaka City as an example, the reality of construction and application around RAJUK will be described.

a. RAJUK (Capital Development Authority of the Government of Bangladesh)

RAJUK has responsibility for issuing building permits for private buildings etc. It is a Bangladesh public agency responsible for coordinating urban development. It is composed of various public officials, city planners, urban administrators, engineers and architects. It is the National Authoritative Board on building planning, estates and resources, plot allotment and construction approvals from both public and private entities (see organogram of Figure 2.3.4).

b. The Buildings Needing Approval of RAJUK before Construction

All private buildings as well as the public buildings that are not designed by DOA and PWD need approval of RAJUK before construction. The owners of these buildings, regardless of scale and use of building, need to get approval from Authorized Officer (AO) in RAJUK that is stipulated in BCA.

c. Building Permit System of RAJUK

(1) Authorized Officer (AO)

The responsible department for building permit in RAJUK is Department of Development Control (DC). Total number of staff is 1,980 (August 2014) and 1,064 of them belong to DC.

There are eight regional offices under DC. As of August 2014, 1,014 personnel were assigned in the eight regional offices (125 personnel and some accounts in a regional office were assigned). Most personnel in DC belong to regional offices. The practical works are mainly by regional offices.

One Authorized Officer (AO) is assigned in every regional office. AO has full responsibilities of building permit. The building owners in the RAJUK jurisdiction area need to submit application to AO.

Only one AO is currently assigned in a regional office. Total number of AOs in all regional offices is only 8. The average number of building applications in the RAJUK jurisdiction area in a year is 7,500. Therefore, lack of AOs has been a problem. But, RAJUK has currently a plan to increase the number of AOs in a regional office to 3 (24 in all regional offices).

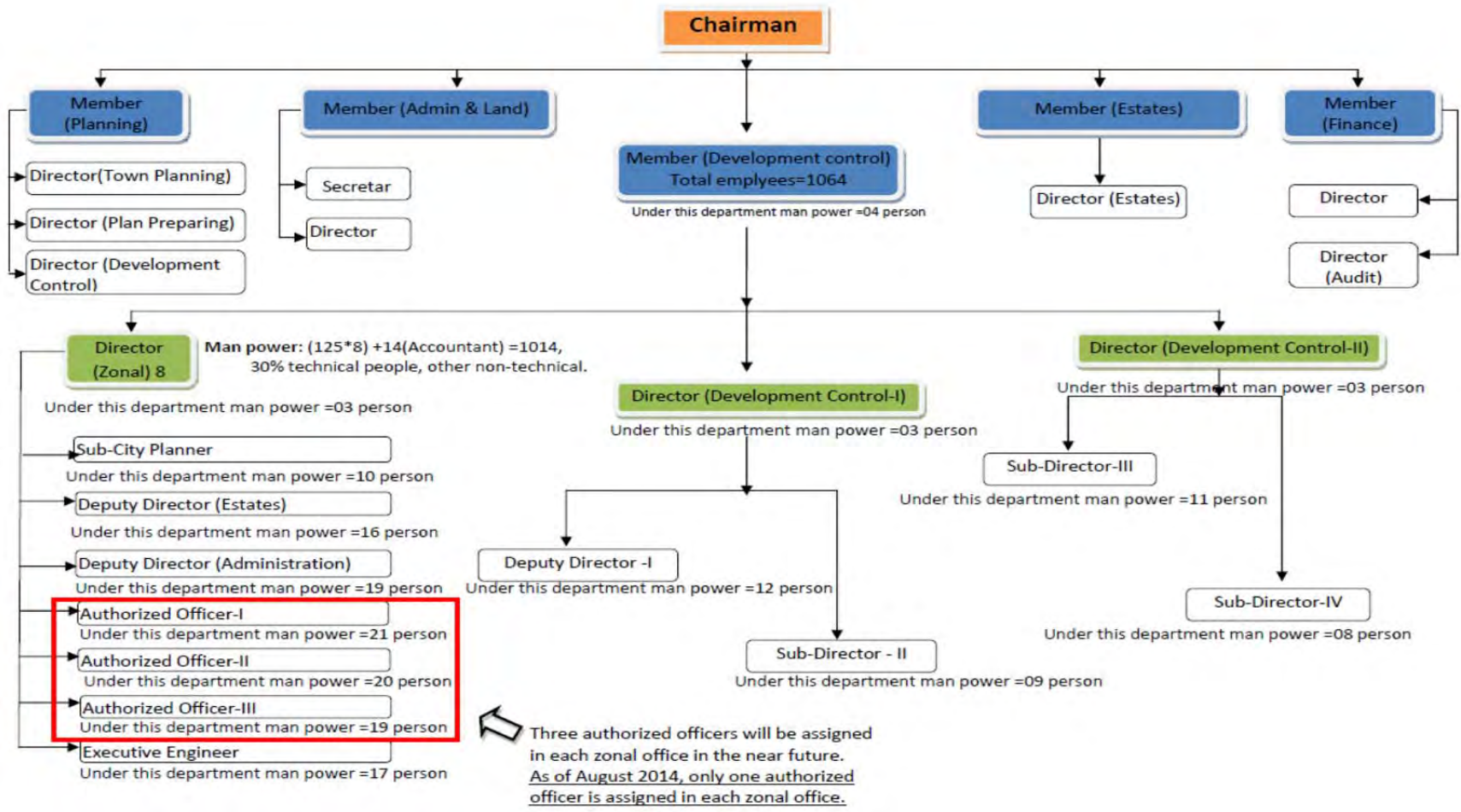


Figure 2.3.4 Organogram of RAJUK

Source: RAJUK

(2) Process of Building Permit

The process of building permit from application by building owner to approval by RAJUK is shown in Figure 2.3.5. And, more detailed process is shown in Figure 2.3.6 to Figure 2.3.8. These processes are stipulated in Chapter 2 of the GAZETTE (Dhaka BCR). Also, after approval of permit application, GAZETTE defines the task of RAJUK for inspection during construction works, as well as the review after the completion of construction. Further, GAZETTE defined the necessary documents and drawings during the process such as the application, and completion as below.

As mentioned below, around 5,000 to 7,500 applications in a year for RAJUK, that maybe some part (supposed 1/2 to 1/4?) of all the building construction in the designated area of RAJUK. And most of them not always follow strictly the GAZETTE. Especially, for inspection during construction works and following review at the completion, it is said only 5% or less of the application.

Building owners submit necessary documents for application to one of the RAJUK regional office. The necessary documents include application form, soil survey report, building design documents, etc. In addition, they need to pay application fee. The minimum fee is BDT15,000. It depends on floor area of the building applied.

In some cases, building owners need to apply to CAAB (Civil Aviation Authority of Bangladesh), DESA/DESCO (Dhaka Electric Supply Authority / Dhaka Electric Supply Company Ltd.), TITAS (TITAS Gas Transmission and Distribution Company Ltd.), FSCD (Fire Service and Civil Defence Department), WASA (Dhaka Water and Sewage Authority), DOE (Department of Environment), DCC (Dhaka City Corporation), DTCB (Dhaka Transport Coordination Board) and DMP (Dhaka Metropolitan Police) before they apply to RAJUK. It is called “9 types of clearance”, as there are 9 organizations. But, it is on very rare occasion to get approvals from all 9 organizations. Although there is often an occasion to get approval from FSCD, it is on very rare occasion to get approvals from other eight organizations unless the building applied are special in terms of building use and location of construction site. It is not until they get obtained approvals from those organizations that they can apply to RAJUK.

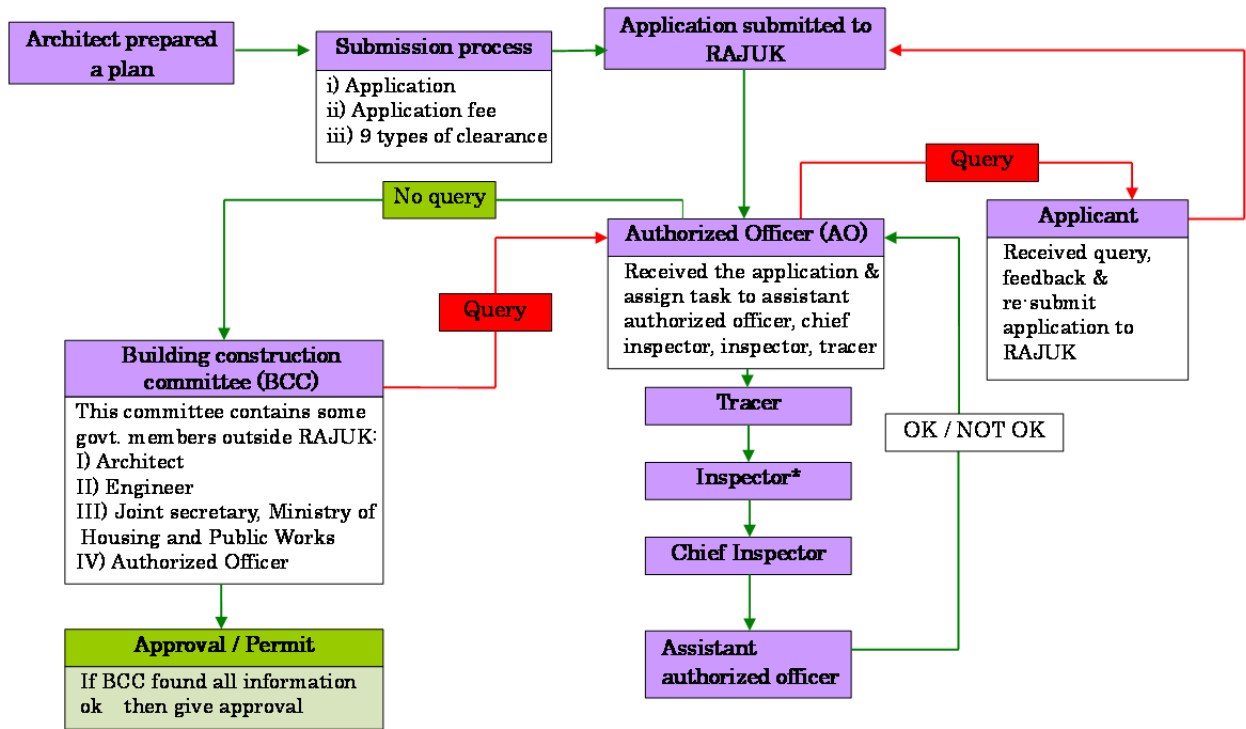
Once building owners submit the necessary documents to one of regional office of RAJUK, they are sent to AO in a regional office. Then, AO gives instruction to tracer to confirm whether the building applied can be constructed in the site applied according to the GAZETTE. Afterward, inspectors visit the site for inspection of the surroundings. Lack of inspectors has also been a problem, as only 5 inspectors in every regional office (40 inspectors in all regional offices) are stationed and have to do inspections of about 940 buildings in average in a year. Totally, about 5,000 to 7,500 buildings in all regional offices are applied to be inspected.

After the results of survey by inspectors are verified by chief inspector, they are sent to Assistant Authorized Officer (AAO). If they are approved by AAO, following by AO, the works of building permit by RAJUK end. The academic background of AO is architecture or civil engineering. But, in fact, AO cannot adequately examine the design documents applied by building owners, because the number of application is too large.

Finally, the documents applied by building owners are scrutinized by Building Construction Committee (BCC). BCC is a special committee and composed of five members: an external architect, two external engineers and a RAJUK AO. BCC was established in 1999 in order to strengthen the system of examination by RAJUK, when urbanization of the Dhaka area rapidly progressed in 1998 and it had to be necessary to strengthen the system for examining safety of building structure properly.

The term of process from building application to approval has to be no less than 45 days in accordance

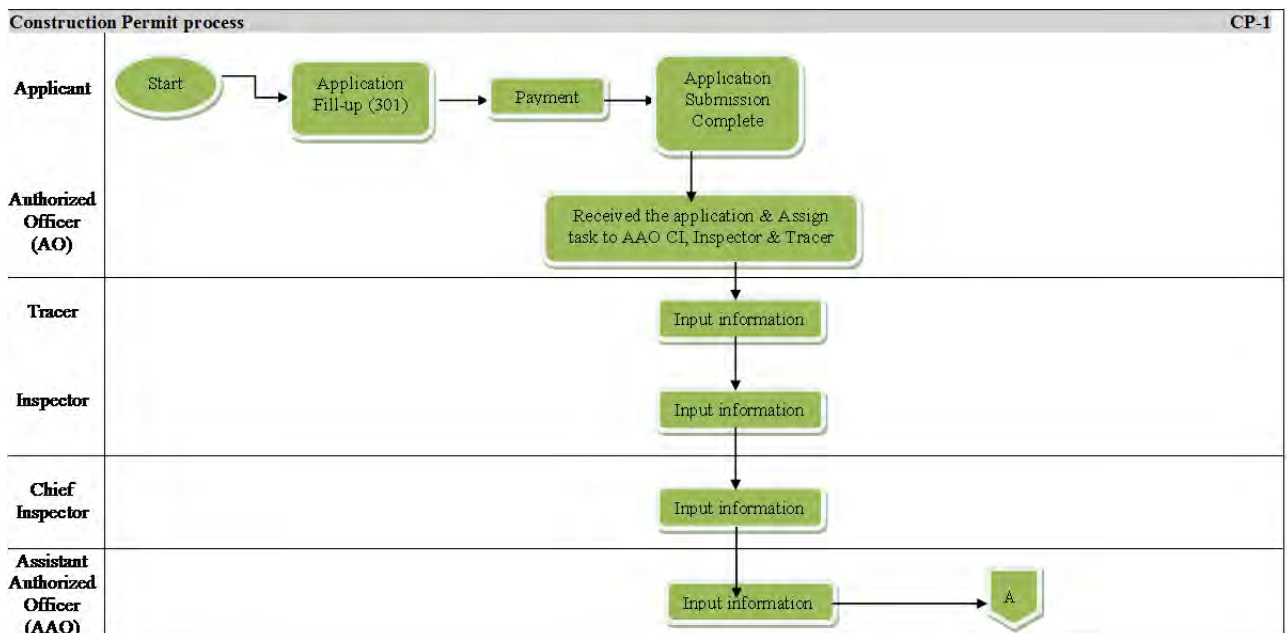
with BCR. However, in fact, actual term is more than 45 days. In some cases it take more than 6 months



*Inspector investigate 3 time in a construction site i) After submit the plan, ii) During start the construction & iii) After completion the project.

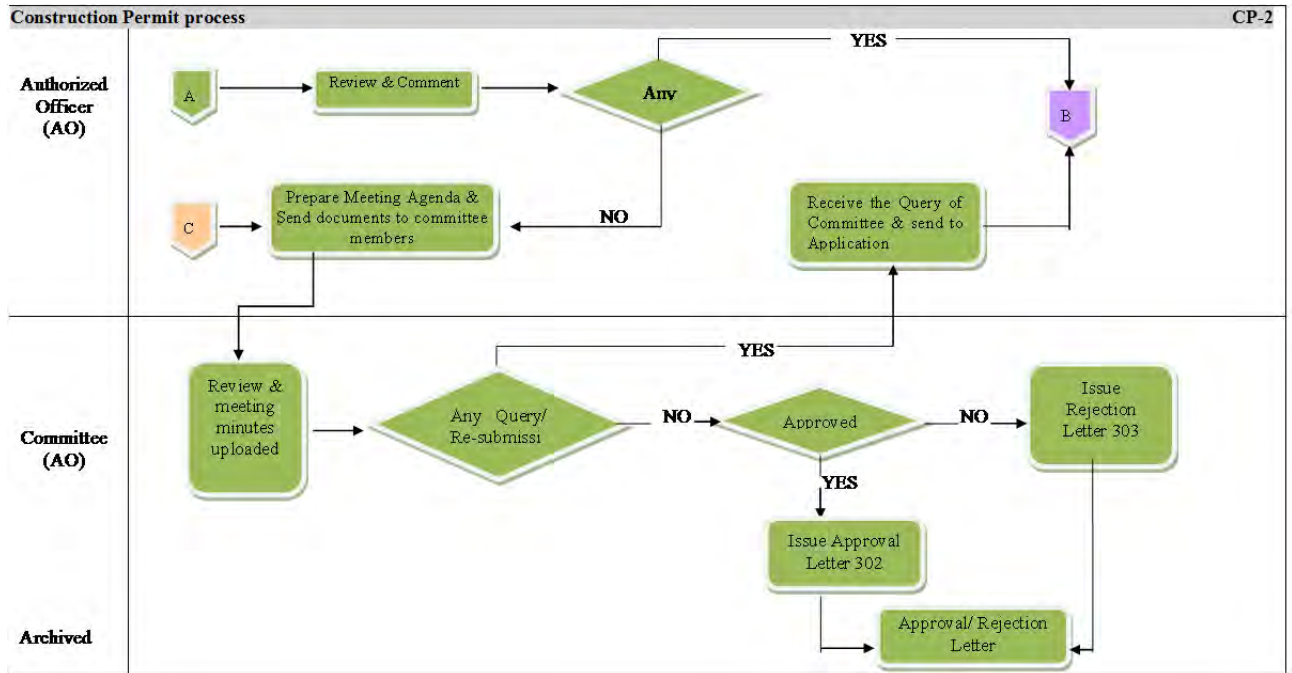
Source: RAJUK

Figure 2.3.5 Process of Building Permit



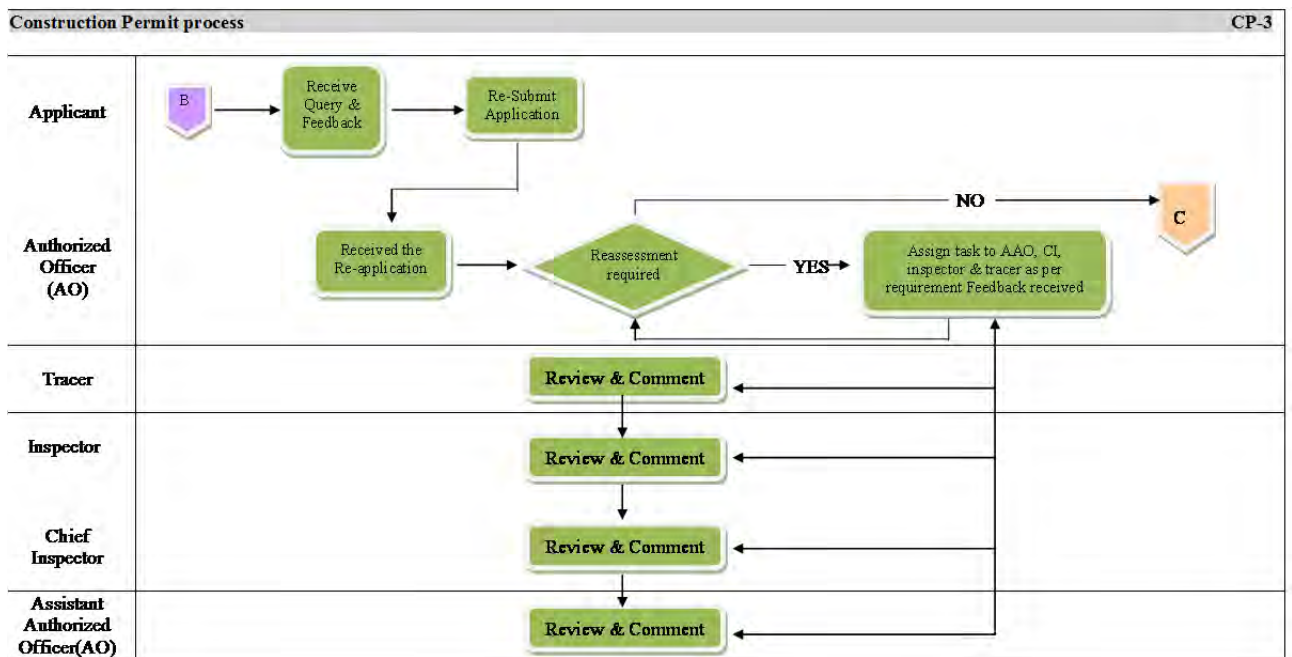
Source: RAJUK

Figure 2.3.6 Detailed Process of Building Permit (1)



Source: RAJUK

Figure 2.3.7 Detailed Process of Building Permit (2)



Source: RAJUK

Figure 2.3.8 Detailed Process of Building Permit (3)

(3) Inspection Items and Tools

RAJUK examines whether the site and floor plans of the buildings applied are in compliance with GAZETTE (Dhaka BCR). The RAJUK AO has the standard checklist on which the points of GAZETTE (Dhaka BCR) are listed as a tool for checking design documents effectively (below table). The inspection items are listed to confirm the conditions of setbacks, floor area ratio (FAR), site coverage, etc. that are stipulated in GAZETTE (Dhaka BCR).

Table 2.3.8 Checklist for RAJUK Authorized Officer (AO)

NO	Important information	Attach	Remarks
01	Complete & Signed application & Bank receipt		
02	Royalty document of Proposed land		
a)	Land document (Attested copy)		
b)	D.C.R (Attested copy)		
c)	Mutation copy, Settlement record (Attested copy)		
d)	Mutation & proposed land divided copy (Attested copy)		
e)	Power of attorney certified copy		
f)	Up-to-date revenue/treasure receipt		
03	Clearance of land use or no objection later of govt. agency		
04	Approval for Special project clearance (If applicable)		
05	clearance from KPIDC (If applicable)		
06	Necessary clearance from different govt. authority for high rise building (environment, Fire, WASA, Electricity, City corporation, TITAS, DC Traffic, Dhaka Vehicle Co-ordination Board, Bangladesh Civil Aviation Authority etc.)		
07	Clearance from national housing Authority (If applicable)		
08	Approval letter from ministry of housing & PWD (If applicable)		
09	Divided/United design with approval latter from PWD & housing or RAJUK (If applicable)		
10	Specified Bank receipt fee for drawing approval		
11	Floor Area Ratio (FAR)		
12	Applicant must attach 301 signed compensation for Constriction of deep foundation, piling, basement or under ground floor		
13	Soil test report (If applicable)		
14	According to Law-13 landowner name , signature & Technical(Designers/Architect) persons Name, signature, Address, Cell No/Telephone NO , membership & registration no from Professional institute.		
15	According to Law-13 (7,8) Site plan, lay out plan		
16	According to Law-13 (9,10,11,12)		
a)	Floor plan		
b)	Parking plan		
c)	Vertical & horizontal section		
d)	Elevation		
17	If applicable, according to law-43 designers/architects experience Certificates from Professional institute.		
18	Non-judicial agreement (BDT150) if remove old construction /demolish work needed (If applicable).		

Source: RAJUK

*Original document is written in Bengal, and translated into English by JICA Expert Team.

As seen in the above checklist, there are not any items to confirm structural safety on the building applied. Because GAZETTE (Dhaka BCR) does not stipulate any guidelines for ensuring structural safety of the buildings applied.

BCC, member of which include two engineers is expected to appropriately verify whether structural design of the building is appropriately planned. However, in fact, they cannot adequately verify it. There

are so many applications that they cannot adequately verify it. Therefore, the buildings are often constructed using the almost-unchecked design documents that are prepared by design office. If the designers of the design office do not prepare design documents in compliance with BNBC, the building would be built without ensuring structural safety. Although there are punitive clauses: e.g. minimum BDT5,000 or 7-year sentence to the designers who have prepared design documents illegally, they are not applied unless the building does collapse and it is verified as illegally-designed building. They are not prepared for the purpose of preventing building collapse beforehand.

(4) Inspection during the Construction Period

Once the application documents are approved by RAJUK, the building owners can start construction.

In the construction term, the RAJUK side does inspection at the beginning and at the completion of construction. It sometimes does inspection at the middle of construction, if necessary. The items of those inspections are related to the conditions of setbacks, site area, etc. (Figure 2.3.9).

In addition to those inspections, the inspectors visit the construction sites periodically to see progress of construction. As they are neither architects nor engineers, they do not do inspection from the technical points. They inspect whether or not the number of floors is increased, distance of setback is appropriately kept, etc. that are often seen in Bangladesh. But, as the number of inspectors assigned to every RAJUK regional office is only 5 and there are so many buildings to be inspected, in fact they cannot appropriately inspect all buildings.

At the time of completion of the building construction, BCC gets involved in approval of completion. However, BCC members do not always visit the site before judging approval.

Table 2.3.9 Checklist for RAJUK Inspector

<ol style="list-style-type: none"> 1. Applicant Name (According to submitted document) & Address): 2. Name & Signature found similar in application & design: 3. Residence description of Proposed land / plot: <ol style="list-style-type: none"> a) C S / R S Dag No: e) Plot No: b) Place(Mouja) Name: f) Block No: c) Road name / No: g) Sector No: d) Sit No: h) Ward No: 4. Documents: <ol style="list-style-type: none"> a) Lands document: e) Revenue receipt: b) D C R : f) Clearance of land use: c) Mutation & proposal of land dividetion: g) City mapping/ survey: d) Mutation settlement record ,R S: h) Design/Plan: <p>Remarks: Above mention documents & plan/Design are checked: If not correct then described.....</p> <ol style="list-style-type: none"> 5. Measurement description of land / plot: <ol style="list-style-type: none"> a) Area of land according to document or allotted paper (sqm): b) Land area according to confines of occupation/possession (sqm): c) Differentiated land of area (sqm): d) According to proposed lay out design total land occupation area (sqm) which is% of total land. e) Measurement of land. North.....m, South.....m, East.....m, West.....m. 6. Description of road: <ol style="list-style-type: none"> a) Front road & connect road name adjacent the site: b) Width of front road(With footpath/without): If road is closed then width:m Length:m c) Width of back road(If applicable): d) Width of right side road(If applicable): e) Surface of front road: Bituminous / Concrete / H B B / Unmetalled or lacking road

Source: RAJUK

*Original document is written in Bengal. The above was translated into English by the JICA Expert Team.

(5) Support by Other Donor Agency

International Finance Corporation (IFC) of World Bank Group is planning a project "Regulatory Modernization for Digital Bangladesh (# 584327)" targeting RAJUK. In the project, by automating the procedure by IT introduction, the activities will be implemented to improve the efficiency of operations for reception of building applications from the owners. If proceeding as planned and is due to be introduced in February 2015. The automation system introduced by the project, building applicant is possible to transmit electronic data applying documents from the PC screen. Since it becomes rather than traditional paper-based application, the applicant owners are not necessary to visit RAJUK to bring application documents. Moreover, this system enables to save time for the staff concerned in building permit in RAJUK to scrutinize the application documents to a large extent.

In addition, since the information management becomes easy introducing electronic application process, operational efficiency can be realized even for RAJUK staff. In other words, time to re-input process from the description of the paper-based documents submitted by applicants to another document so far will be skipped. Therefore, if it will be carried out as scheduled, not only applicants but also RAJUK staff can reduce the work load, the process can be performed more quickly and accurately, and shortening time involved in licensing will be achieved.

It should be noted, the technical inspection of the confirmation request documents does not done automatically through the introduction of this system. As for the technical inspection, AO, Tracer and Inspector inspect reviewing the application drawings as usual. Even when drawings are electronic, inspection is not automatically carried out by the machine.

Table 2.3.10 Outline of Regulatory Modernization for Digital Bangladesh by IFC

Item	Outline
Project Title	Regulatory Modernization for Digital Bangladesh (#584327)
Project Components	a) Process Streamlining & Automation b) Regulatory Modernization c) Institutional Capacity Building * Automation of construction confirmation by RAJUK is included in the component of a).
Budget for operating all components	6.2million million dollars
Expected Time of the Project Initiation	February 2015
Beneficiary Group	RAJUK staff concerned in the building permit
Effect	-To streamline building permit system -To shorten term of building permit

(after Web page of WB)

2.3.4 Inspection by Fire Service & Civil Defense (FSCD)

a) The Buildings to be inspected by FSCD

If the buildings exceed 20m in height and they are school, public hall, office, factory, hazardous buildings exceeding 500sqm, they need to be inspected on ensuring fire safety by FSCD under Section 3.2.3.6 in Part 2 and Part 3 of BNBC. However, if they are designed by DOA and PWD, they are not needed to be inspected. As the PWD's SEs who are an authorizer of building services design documents are regarded as Authorized Officer (AO), all building services design documents approved by the PWD's SEs are regarded as authorized documents.

The inspectors examine the design documents using this checklist. The time required for inspection ranges from 2 weeks to 3 months. The minimum fee of application is BDT1,500. It depends on floor area of the building applied.

Table 2.3.11 Checklist for FSCD Inspectors

Item No.	Item		
1	General Information:		
	A)	Name of Inspected Factory, Types of Factory, Registration No:	
	B)	Factory Address:	
	C)	Name of Managing Director / Chairman:	
	D)	Phone/Fax No:	
	E)	Number of Story:	
	F)	In which floor factory is situated:	
	G)	Total number of floor in this factory:	
	H)	Area of factory:	
	I)	Total Number of employees: Male Female	
	J)	Time schedule of the factory: Starting/closing times:	
	K)	If Shifting duty then	
		1	Starting time of 1 st shift : Closing time: Employees I) Male: 2) Female:
		2	Starting time of 2 nd shift : Closing time: Employees I) Male: 2) Female:
3		Starting time of 3 rd shift : Closing time: Employees I) Male: 2) Female:	
2	Is there updated/up-to-date fire license available?		
3	High rise building clearance certificate from Fire Service & Civil Defense (If applicable):		
4	Is approved drawing available from appropriate Authority?		
5	Necessary number of serviceable fire extinguisher present at factory building & It must be written at register book:		
6	a)	"No smoke" sign must visible inside the factory building in Necessary position:	
	b)	Nearest fire service station phone number must be written in visible place at every floor of factory building in block latter:	
7	a)	Every floor of the building within 1000sqft must have two auto stop nozzle & wet riser with 100ft long composite type hose reel:	
	b)	Must have a extra pump house with one main fire pump, one standby diesel pump & one jockey pump, pressure of hose reel must be 2.5 bar:	
8	On roof top of the factory building must have an extra water tank with capacity to preserve 25.000 gal for the purpose of fire protection (With connection of active water line):		
9	The factory building must have a underground water tank with a capacity of minimum ±50.000 gal (With connection of main fire pump):		
10	Must have active smoke, heat detector & auto fire alarm with control panel:		
11	Must have torch light, lock cutter & necessary equipment for fire fighter use:		

12	a)	In emergency time for exit facility must have a stair with 1.5 m width:
	b)	Number of stair in factory building
	I	If employee number 500, then 2 stairs.
	II	If employee number 1000, then 3 stairs.
	III	If employee more than 1000, then 4 stairs.
	IV	If each floor area more than 500sqm, then must have 2 stairs (without smoke) which directly exit in outside the factory building in open area.
13		Must have emergency exit bulb (with all emergency exit instruction/ sign) in every exit path & stair:
14		Is there entry & exit door open during duty time?
15		Is there all stair & walk way/ path free from obstacle?
16		Is there any alternative stair? If any, what is the width?
17		Is there any electrical connection in godown:
18		Is there sufficient facilities of necessary amount of IPS/ battery guided charger?
19		Is electrical line/connection counsel with appropriate/perfect/proper wire?
29		Is there main electrical switch place outside factory building?
21		Is there any obstacle in roof top, when rescue led by fire fighter in emergency time?
22		Is there any obstacle in stair & walk way?
23		Is there enough space to easily enter fire vehicle from main gate/entry?
24		Every team member should be trained by fire service & civil defense about fire extinguishing, investigation and fast aid & have proper fire dress:
25		Is there every rehearsal description written in register book?

b) Inspection System during the Construction Period

About 300 applications in average all over the country in a year are submitted to FSCD. And, the locations of about 200 buildings of them are in Dhaka National Capital and Metropolitan Area.

The FSCD inspectors periodically visit construction sites as the RAJUK inspectors do. The inspection items include whether fire sensor, water tank, fire pump, generator, fire escape stairs, lifts, etc. are equipped according to design documents. FSCD has a rule on frequency to visit construction sites. They visit every month, every quarter, every six months or every year. It depends on importance of the buildings to be inspected. However, in fact, the FSCD inspectors cannot visit the site adequately.

2.3.5 Inspection by DIFE (Department of Inspection for Factories and Establishments)

DIFE is a department under the Ministry of Labour and Employment. It has a headquarters in Dhaka and 23 district offices with a staff of 993 (2014) (see Appendix 2 for organograms of the Department and its Dhaka Division Office). It is responsible for ensuring welfare, safety and health of valuable human resources working in various sectors contributing national development. In the website of DIFE, its vision, missions and activities are described in the following table.

Table 2.3.12 Outline of DIFE

Items	Contents
<u>Vision</u>	To create a better working environment for the workers
<u>Missions</u>	<ul style="list-style-type: none"> To implement labour laws and regulations To eliminate child labour To enhance productivity of Factories by creating a better working environment To ensure workplace safety including fire safety and welfare of workers To implement minimum wages declared in different sectors
<u>Activities</u>	<ul style="list-style-type: none"> • To inspect factories, shops, industries and commercial establishments, tea garden, railway, internal water transport and road transport for establishing the terms of employment, safety, health issues, labour welfare, payment of wages, ascertaining working hours, leave etc. under the Bangladesh Labour Law, 2006 along with the other existing regulations • To Investigate and response to every complaint received • To give explanations on labour law and rules related issues • To eliminate child labour • To monitor factories of high hazardous risks • To share knowledge and experiences with workers , employers and concerned organizations • To lodge cases in the labour court against the law violating employer or authority • To approve the construction, modification and expansion plan of a factory • To issue registration for factory and also to renew the licence • To correspond with various government organizations, employers association and trade union for the proper implementation of labour laws • To give exemption to a management from certain labour rules for the sake of special public interest considering special cases/conditions • To co-operate the government for the amendment together with materialization, formulation of labour laws and regulations • To collaborate closely with ILO on ILO Conventions and recommendations. • To give assistance to international organizations in making survey report on labour inspection, wage administration, condition of work, occupational health and safety • To attend as a government representative in international and national seminars, meetings and forums on labour inspection and productivity • Control and ensure legal compliance by the employers and employees on labour laws • Determine measures and procedures on inspection • Jointly carry out assigned works with other concerned agencies • Promoting occupational safety and Health (OSH) system in the workplaces • Promoting prevention and monitoring systems on accidents at work and surveillance on occupational diseases • Minimize the problems pertaining occupational injuries or diseases caused by working conditions • To carry out promotional and publicity programs to employers, workers and the general public to foster and increase the awareness of occupational safety and health

DIFE collaborates with various government and private organizations, agencies along with international organizations, especially ILO to facilitate policy, planning, measures and directions adopted to enhance occupational safety and health for all workers by appropriate working conditions and environment.

a) Relevant Legislations

1) Labour Laws

DIFE exercises legal rights and discharges its responsibilities to ensure safe and hygienic work place for labours. Bangladesh Labour laws 2013 specify provisions for ensuring that labours can work in a safe and hygienic place. Following table shows the points of provisions. If a factory owner does not comply with the provisions, it is forced to close up operation under Articles 60 and 61 of Labour.

Table 2.3.13 Points of Provisions of Labour Laws 2013

Laws	Points of provisions
Labour Laws 2013	<ul style="list-style-type: none">• One day weekly holiday in factories and one and half a day weekly holiday in shops and commercial establishments shall be ensured.• The minimum wages declared by the Government for the workers in different sectors shall be followed.• The wage of every worker shall be paid before the expiry of the seventh day of the wage period in respect of which the wages are payable.• Approval of plan of a new factory construction or expansion and the modification of factory building shall be taken from DIFE.• Factory registration and license shall be taken from DIFE.• Every factory shall be provided with at least one emergency alternative connection stairway with each floor to avoid various accidents specially fire related accidents in factories.• Fire-fighting equipment shall be kept in every room.• At the time of working, all the gates along with the exit shall be kept open.• All the stairways and passages shall be clear of all obstructions.• At least one fire drill shall be arranged in every six months in the factory.• Hygienic environment shall be ensured at the work place.• Personal protective equipment (PPE), in due cases, must be used.• Workers working with risky chemicals shall be undergone regular medical check-up.• Workers shall be given their due casual, sick, annual and festival leave.• Women workers, in due cases, shall be given maternity leave and benefit.• No child under fourteen (14) shall be employed or allowed to work.• Workers shall be engaged in work for two more hours (overtime) than the prescribed hours in any day and the workers will get overtime at the rate of twice of his average basic wage.• Violating labour laws is legally a punishable offence.

2) Associated Acts

In addition to Labour laws, following acts, regulations and rules stipulate provisions on occupational health, hygiene of workers, occupational diseases, industrial accidents, protection of women and young persons in dangerous occupations, and also cover conditions of work, working hours, welfare facilities, holidays, leave, etc.

(1) The Factories Act, 1965 and the Factories Rules, 1979

Following table shows the points of provisions of the Factories Act, 1965 and the Factories Rules 1979. It is enforced by DIFE.

Table 2.3.14 Points of Provision of the Factory Act 1965 and the Factories Rules 1979

Act	Points of provisions
The Factories Act, 1965 and the Factories Rules 1979	<p>This act prescribes the requirements of safety and health to be maintained, and covers:</p> <ul style="list-style-type: none"> • Maintenance of standards of cleanliness. • Adequate lighting, ventilation & temperature. • Control of elements hazardous to health like dusts, gases, fumes, etc. associated with particular operations. • Requirement of certificate of fitness for young persons from certifying surgeons. • Requirement of periodical medical examination for persons engaged in hazardous operations. • Requirement for making available adequate first-aid facilities. • Requirement of a dispensary manned by a medical practitioner for units employing 500 or more workers. • Length of working hours & night work for young persons and women, and prohibition of employment for operating dangerous machines • Prohibition of employment of women and children near cotton openers • Requirement of precaution against fire and explosions. • Requirement of fencing and guarding of machinery, casing of new machinery • Requirement for work on or near machinery in motion, striking gear and devices for cutting off power, self-acting machine • Requirement for cranes and other lifting machinery, hoist and lift, revolving machinery, pressure plant • Requirement of safety measures for buildings • Requirement of precautions against dangerous fumes • Maximum weight to be lifted carried or moved by adult men, women and young persons. • Requirement for floors, stairs and means of access; pits, sumps, opening in floors, etc. • Requirement for protection of eyes • Requirement for explosive or inflammable dust, gas, etc. • Reporting of accidents and occupational diseases. • Sanitary conveniences- requirement of latrine, urinals, spittoons, drinking water • Requirement of canteen, eating place, washing facilities, rest room, child room • Requirement for appointment of welfare officer for units employing 500 or more workers.

(2) Other associated Acts

Other associated acts are as shown below. These are related to securement of safety of workers.

Table 2.3.15 Other Associated Acts

Act	Enforcing Agency
Dock Labourers Act 1934	DIFE
Dock Labourers Regulations 1948	DIFE
Tea Plantation Labourers Ordinance 1962 and the rules thereunder	DIFE
The Workmen's Compensation Act 1923 as amended in 1980 and 1983	DIFE
The Shops and Establishments Act 1965	DIFE
Employment of Children Act 1938	DIFE
The Maternity Benefit Tea Estates Act 1950	DIFE
The Maternity Benefit Act 1939	DIFE
The Maternity Benefit Rules 1953	DIFE
The Boilers Act 1923	Chief Inspector of Boilers under Ministry of Industry
Nuclear Safety and Radiation control Act 1993	Atomic Energy Commission Bangladesh

b) National Tripartite Action Plan for Building and Fire Safety

In the wake of the fire of 24 November 2012 at Tazreen Fashions Limited, NTC (National Tripartite Committee: consisted of Ministry of Labour, BGMEA, BKMEA, ACCORD, ALLIANCE, BUET, Labour organizations) formulated “National Tripartite Action Plan for Building and Fire Safety (NTAP)” for the purpose of promoting fire safety and structural integrity in Bangladesh, in particular in the ready-made garment (RMG) sector. NTAP was endorsed by the Ministry of Labour and Employment on 24 March 2013.

1) Activities of Bangladesh Side for RMG Factory Inspection

During the days, April 2013, the Rana Plaza incident happened. Then, the Government of Bangladesh has started the comprehensive responses including the promotion of the revision of BNBC (MoHPW), the improvement of working environment (Ministry of Labour and Employment and ILO), the strengthening of local disaster prevention system (Ministry of Home Affairs, FSCD), and the strengthening of building construction system taking into consideration of earthquake disaster (PWD, JICA), and so on. Especially based on NTAP, in order to standardize building assessment, the Tripartite Agreement (Common Standard for Assessment of fire, electrical and building safety of the factories) was established among DIFE, ACCORD, ALLIANCE and BUET on November 2013. Based on the Tripartite Agreement, DIFE established Review Panel together with NTC members, and ILO cooperates. The Review Committee has evaluated the RMG factory buildings as the followings.

BOX: TOR of the Review Panel (DIFE)

- (1) During their Inspection if BUET, ACCORD or ALLIANCE teams find any immediate risks and imminent danger with reference to structural integrity of any particular factory building, the inspection team of BUET or ACCORD or ALLIANCE will recommend in writing appropriate measures including temporary suspension of operation to the Inspector General of Department of Inspection for factories and Establishment (IG-FE) along with a copy to the concerned factory management.
- (2) Upon receipt of such report from any of the three Initiatives the IG-FE will take a decision within 48 hours or as early as possible regarding temporary suspension of factory operations invoking relevant provisions of BLA-2006. (BLA: Bangladesh Labour Act)
- (3) Within next 5 days or as early as possible from the date of the temporary suspension order of the factory operations issued by IG-FE, the Review panel will convene meeting/visit the concerned factory and the four engineers of the Review Panel through a unanimous decision may recommend for continued closure/alternative remediation measures and resume full or partial factory operations and the IG-FE will consider the recommendation of the Review Panel and take appropriate action as deemed necessary.
- (4) In case of closure of any factory by the recommendation of the review Panel, the factory may be re-opened only after due remediation is completed and the Review Panel has given its unanimous recommendation in the regard.
- (5) If there is no consensus in the Review Panel, the final recommendation should be based on results of the load test of the concerned factory building by the Review Panel. Necessary parameters for the load test shall be agreed by the three Initiatives.

Two stages of assessment are adopted, where assessment is Inspection in Review Panel. The first stage is referred to as Preliminary Assessment which is visual inspections. Its assessment results evaluate the problem for fire safety and structural safety and labour environment based on the search for fire protection facilities, columns, beams, and the wall and slab surface are searched visually. The evaluation results are

expressed as Green (safety), Yellow (with some problems), and Amber (detail assessment is required). On actual basis, Green is 20%, Yellow is 50%, and Amber is 30%. In Preliminary Assessment, the criteria of the structural issue is adopted below about half level of BNBC, because of the purpose of screening to search plants better to be stopped right away.

When a factory is judged as “Amber”, it proceeds to the Detailed Engineering Assessment (DEA) as the second stage. In DEA, with respect to the structure, preparation of as-built drawing, strength tests for concrete and rebar in the field, check placement of rebar. Then, the factory building will be numerically modelled from the results, and a structural calculation will be performed. Their results will point out the shortage portions against BNBC. In other words, an engineering structural strength will be confirmed.

However, the above evaluations are essentially the determination of whether at risk. And it is not mentioned how to measure and remediate the buildings for satisfying BNBC. In addition, since the funds for the remediation have not been ready sufficiently, the requests of measures and budget are coming from the factory side one after another.

For Preliminary Assessment that has been done so far, ACCORD/ALLIANCE planned to assess the approximately 2000 plants of all members by their own. At the time of October 2014, 1681 factories were assessed already. On the other hand, the factories, which are not the ACCORD/ALLIANCE members, BUET planned about 1,500 plants, gained budget support from ILO. By October 2014, BUET has completed assessment of 380 cases.

The process of implementation of the above assessment and activities by DIFE is described below.

First, BUET/ACCORD/ALLIANCE performs a Preliminary Assessment. They will report the results to DIFE. DIFE will inform the building owner the results of the Preliminary Assessment. For Green and Yellow, the factory can continue operation. However, for the case of Amber, DIFE will order the owner to conduct the Detailed Engineering Assessment. In addition, DIFE will decide within 48 hours to interrupt the operation temporarily, and DIFE will hold the Review Panel within 5 days. The Review Panel will visit the concerned factory and the four engineers of them (why and who are unknown) through a unanimous decision may recommended for continued closure or closure/alternative remediation measures, and resume full or partial factory operations. DIFE will determine the action on this basis.

Factory that was made stop the operation is, can re-open the operation only after approval by the Review Panel on the completion report of the necessary remediation.

If there is no consensus in the conclusions unanimously in Review Panel, the Load Test was performed on site, it is to obtain the final conclusion that the result to the original. The contents of the Load Test shall be agreed by BUET/ACCORD/ALLIABNCE.

In addition, DEA, different from the load test, will be carried out by building owners with their expenses to have the cooperation of private engineering company. If the owners do not implement DEA, DIFE continues to stop operation. It can be noted that, at the factory side, the friction with regarding to the shortage of working opportunities and salary of the employees during operation suspension has become a problem.

2) Preliminary Assessment Results by NTAP

Under NTAP, BUET has been engaged in conducting building assessment (structural integrity, fire and electrical safety) with a target of covering 1,500 factories using the assessment checklist shown in Appendix 3. Besides BUET, “Accord on Fire and Building Safety” (ACCORD) and “Alliance for

Bangladesh Workers Safety” (ALLIANCE) - two unions of international buyers have also undertaken preliminary assessment (structural integrity, fire and electrical safety). The following table shows targets and completions by organization as of September 2014.

Table 2.3.16 Status of Factory Preliminary Assessment

Assessment Organization	Total no. of Factory	Assessment Completed	Assessment Due
BUET	1,500	380	1,120
ACCORD	1,400	1,094	300
ALLIANCE	587	587	0

as of 15 September 2014 (Source: DIFE)

3) Factories/ Buildings Referred to Review Panel

A total of 70 factories have been referred to the Review Panel of DIFE. Out of 70 factories 29 factories located in 12 buildings were closed, 17 factories located in 10 buildings were partially closed and 19 factories located in 12 buildings were allowed to operate.

Table 2.3.17 Status of Factories/Buildings referred by the Review Panel

	No. of factories inspected				No. of buildings inspected				No. of workers affected
	BUET	Accord	Alliance	Total	BUET	Accord	Alliance	Total	
Visited	2	38	30	70	2	18	16	38	20,724
Closed	1	24	4	29	1	9	2	12	15,093
Partially Closed	1	8	8	17	1	5	4	10	1,530
Allowed Operation	0	6	13	19	0	4	8	12	4,101

as of 15 September 2014 (Source: DIFE)

4) Comparison with the RMG Sector Safe Working Environment Program

After the Rana Plaza incident, the five organizations of JICA, BB (Bangladesh Bank), BGMEA (Bangladesh Garment Manufacturing and Export Dealers Association), BGMEA (Bangladesh Knitwear Manufacturing and Export Dealers Association), and PWD signed a MOU to initiate the "RMG Sector Safe Working Environment Program" in October 2013. The program, provided about one hundred crore BDT from the yen loan program of "SME Promotion Financial Sector Business" as a special frame, has decided to make the earthquake resilience funding for private garment factories using the two-step loan scheme. It should be noted that, regarding to this program, the technical cooperation project between JICA and PWD, namely "Project for Capacity Development on Natural Disaster-Resistant Techniques of Construction and Retrofitting for Public Buildings in the People's Republic of Bangladesh (CNCRP)" (2011-2015) is basically supporting technically.

By April 2015, one factory has started the seismic retrofitting works, and other five factories are planned to carry out the seismic retrofitting works after seismic retrofitting design have finished, utilizing the funds. This is the remarkable difference between Bangladesh side activities and this program. Bangladesh side has conducted numerous Preliminary Assessments without design. Even DEA has been done, but only 40-50 cases so far. As far as they can be seen from DIFE homepage, and good jobs but unfortunately no remediation works by its fund.

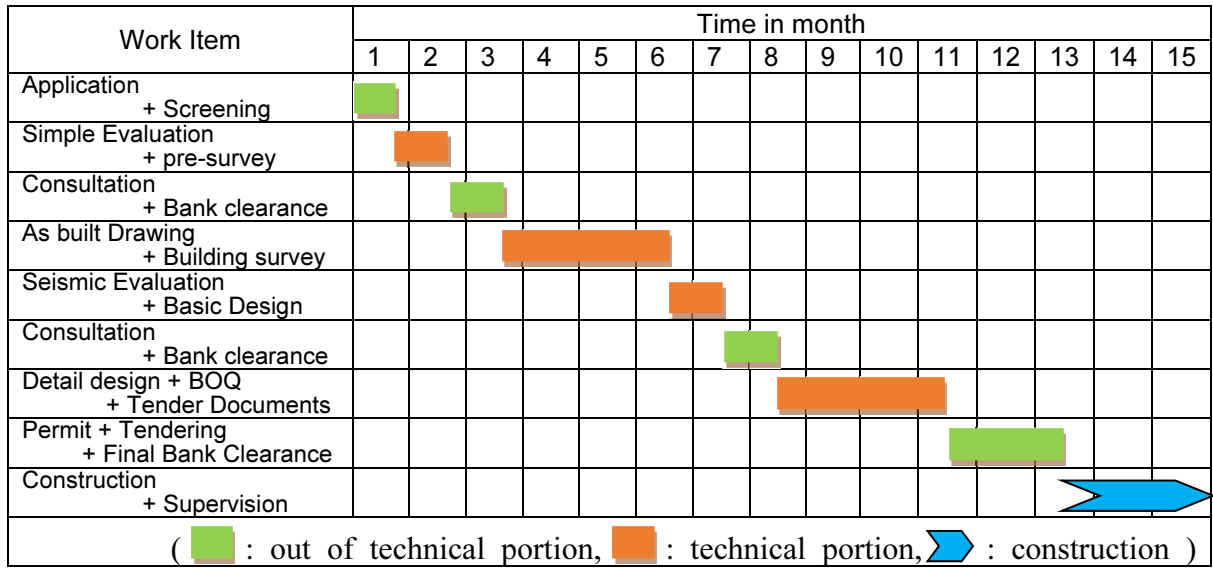


Figure 2.3.9 A Standard Schedule for Retrofitting (single factory case) for the RMG Sector Safe Working Environment Program

2.3.6 Issues Relating to Safer Buildings

In order to consider the realization and continuity of safer buildings in Bangladesh, not only implement building permit system for owners, contractors and by relevant officers, but also supportive issues such as resources management for the system and process, and raising awareness etc. are necessary. For this context, two issues are discussed below, namely, education and qualification. These are sometimes incentives for the process development and continuity.

a) Educational Activities for Government Officer of Building Sector, Building Architect, Contractor and Building Owner

The fire incident of Tazreen Fashions Limited in November 2012, Rana Plaza collapse accident occurred in April 2013 have occurred and they provided extensive damage. However, using these incidents as trigger, educational activities for raising disaster management awareness against building collapse has not been performed towards government officer involving building sector, building architect, contractor, and building owner, activities by the agency of Bangladesh as well as by international organizations. When considering the possibility of future support and cooperation of Japan, it may be valuable to propose on implementation of education and dissemination activities. Followings are related description.

1) Government Officer of Building Sector

Through this study, it was confirmed that the ultimate challenge from the government sides in construction confirmation of RAJUK is the lack of appropriate human resources. In other words, Authorized Officer (AO) level of human resources is insufficient that meets the requirements who can review the legal adequacy of construction drawings, such as Full-Architect or Full-Engineer, either credential construction of university or civil engineering department graduation plus office experience 8 years. In addition, even if inviting the corresponding human resources from outside private sectors, there are insufficient human resources with aptitude throughout the country.

Although the suitable personnel corresponding to AO future is expected to increase, it is not rapidly increases in a short period of time. One possibility to increase the personnel in a short period of time, it is considered to increase the personnel by reducing the high level qualifications required for current AO level. However, it leads to lowering the quality of the inspection if lowering the eligibility requirements. In order to prevent deterioration of quality, it may be considered to be effective to suppress a decrease in the quality of the examination complementing knowledge by performing a special guidance for inspection capacity building,

It may be considered possible to cultivate a certain level of inspectors as below. When the qualifications required for AO, for example, down to about architecture or civil engineering department graduation plus office experience three years of college. And a guidelines manual of effective inspection implementation for these human resources will be prepared. Using them, training, guidance for practical operation will be conducted with final examination. After then, a certain duration of practical experiences will be implemented.

Japanese architecture director corresponding to AO, it is required to pass the examination of predetermined test. However, it is possible to take the building secretary examination, if there is a practical experience for two years after getting primary architect qualification.

2) Building Architect and Contractor

In the dissemination activities for capacity building of the architectural and structural design engineer or contractor, registered ones of IAB (Institute of Architects Bangladesh) or IEB (Institute of Engineers Bangladesh) will be given opportunities of participation to technology seminars sponsored by IAB or IEB. For example, if the associated laws and regulations have been amended, sometimes regarding seminar will be held for dissemination purposes. However, legal obligation of participation is not imposed.

In Japan, structure drawing and document disguised incident is discovered in 2005. After 2010 in response to this, under the Licensed Architect Law, architect belonging to the architectural firm must participate architect regular training courses by the accreditation body is mandatory in every three years.

However, there is no movement to construct equivalent system in Bangladesh. It should be valuable for Bangladesh to establish equivalent system or institution of training, as well as to introduce a system for mandatory to attend by IAB and IBE registrant.

3) Building Owner

Within RAJUK jurisdiction area in Dhaka, number of private buildings such as apartment houses and commercial facilities is assumed to be around 300,000, except the factory. At the time of large-scale earthquake, many buildings are estimated to collapse, and the city will have possibilities of suffering enormous disaster. Therefore, vulnerable buildings are in the situation to be promoted reconstruction or retrofitting. For this reason, there should be significance to implement a dissemination seminar to promote the rebuilding or retrofitting of buildings to their owners. However, such seminars may not be always highly-effective. Majority of building owners are in the situation where it is not possible easily to bear the cost by their own.

In Japan, there is a system of local government to subsidies to the building owner who wishes to seismic diagnosis and renovation design and renovation. In Bangladesh, the rebuilding or retrofitting must be promoted to general building owners providing some incentives such as using subsidies system.

b) Qualification System

As described above, the building owners of private buildings and public buildings that are not designed by DOA and PWD have to apply building permit to RAJUK and get approval for construction from the RAJUK's AO. However, as far as the examination system of RAJUK is looked at, in fact, the building design documents are not well examined, although a system in which BCC, a special committee including members of external architects and engineers examine the design documents was established. Therefore, the buildings are often constructed using the almost-unchecked design documents that are prepared by design office. If the designers have a lack of capacity or if they do not have high moral standards, the building designed by such designers would be collapsed some day in the future. So, heavy responsibilities are placed on building designers in an earthquake country such as Bangladesh. With the above-mentioned background, it was considered that system of qualification for architects in Bangladesh need to be grasped.

1) Relevant Legal System

The architects in Bangladesh are entitled to design the buildings by becoming a member of Institute of Architects Bangladesh (IAB) or Institute of Diploma Engineers Bangladesh (IDEB). IAB or IDEB is an official accreditation organization. They were established under the Societies Registration Act.

2) Process to become a Registered Architect

In Bangladesh someone who would like to become an architect needs to graduate from architectural course of certified university and to become a member of IAB after graduation of university (IAB-architect). Or, he or she needs to graduate from high school and to become a member of IDEB after graduation of high school (IDEB-architect).

In order to become an IAB-architect, first it needs to obtain a bachelor degree. Then, the candidate is entitled to become an associate IAB-registered Member (Architect) without taking examination. After further 6-year experience the candidate is entitled to design all buildings.

IDEB membership (IDEB-architect) is given to high-school graduate. The extent to which the IDEB-architects can design buildings is limited compared to the case of the IAB-membership holders (IAB-architects). The IDEB-architects are not entitled to design the building exceeding 1,000 sqm in floor area and 5 in number of floors.

This section mentions the necessary process to become the IAB-registered architects (memberships) who are entitled to design all buildings depending on years of experience in more detail.

Moreover, the IAB-registered architects are not entitled to prepare structural design documents unlike the case in Japan. In Bangladesh the structural design documents are prepared by the IEB-registered engineers. IEB is an official accreditation organization for university graduate engineers. This section also mentions IEB-registered engineers briefly.

(1) Process to become an “Associate IAB-Registered Member (architect)”

The candidates of associate IAB-registered architects are the holders of bachelor-degree in architecture at the certified universities in Bangladesh. They are entitled to become an associate IAB-registered architects by becoming associate members of IAB, only if they obtain the bachelor degree in architecture. They are sometimes called “associate architects”. They are entitled to prepare architectural design documents for the buildings not exceeding 5,000sqm in floor area under the IAB rules. As of August 2014, the number of associate architects is 1,400.

The membership fee for IAB-associate member is Tk.1,600. Afterward, they need to continue to pay Tk. 1,600 as renewal fee every year.

(2) Process to become an “IAB-Registered Member (architect)”

After two years’ work experience as associate members (architects), they are entitled to become the IAB-registered members (architects). However, they need to take and pass the IAB-membership examination. The opportunity for examination is given every month. The fee for examination Tk 2,800. The contents of examination include 30 minutes-oral test and 30 minutes-paper test. The examination is held at the IAB headquarters in Dhaka. In the paper test, questions on relevant regulations such as BNBC, BCA2008, Fire Safety Laws, Ethics Laws, Universal Accessibility Laws, etc. are asked. Unlike the case in Japan, there are no questions about building planning, structure and site management. If they pass the examination, they are called “IAB-Architect”. The pass rate is about 60 percent. If the candidates fail in the examination, they are given opportunity to again and again take the examination until they pass, regardless of age. The opportunity of examination is given every month, and the candidates do not have to pay for re-examination. Therefore, it is easier for them to take re-examination compared to the case in Japan where the opportunity of examination is given only once a year. As of August 2014, the number of the IAB-registered members (architects) is 1,355.

Moreover, after six years' work experience as IAB-registered members (architects), they are entitled to become "full architect" who can design all buildings in Bangladesh. It is comparable to first-class registered architect in Japan. The number of full architects is estimated about 1,000.

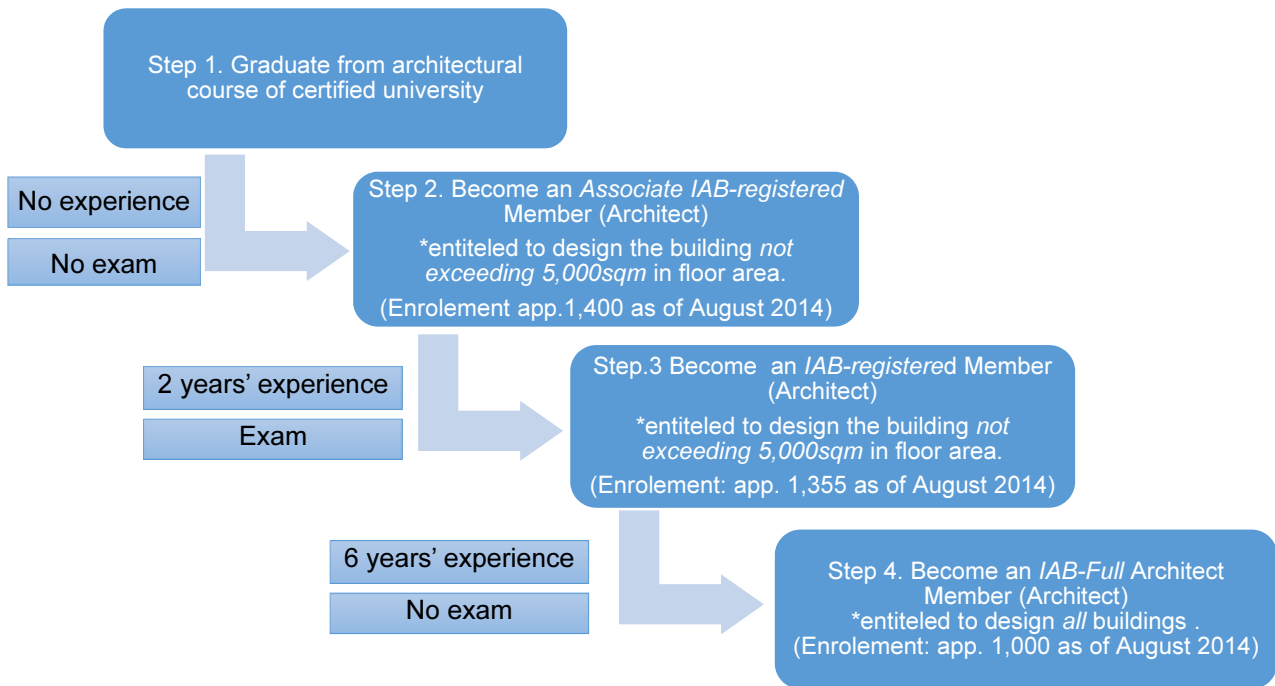


Figure 2.3.10 Process to become an "IAB-Full Architect"

(3) The IEB-Registered Engineers

As the IAB-architects are not entitled to prepare structural design documents, the IEB-registered engineers prepare those documents. IEB is an official accreditation organization for university graduate engineers. As of August 2014, total number of the IEB-registered engineers was estimated 21,533. And, 8,377 of them were estimated to be civil engineers who can prepare structural design documents. Furthermore, several thousands of them are estimated to be "full-engineers" who can prepare the structural design documents for all buildings.

3) Awareness Building Activities for Architects/Building Engineers to be Able to comply with the Relevant Regulations

In Bangladesh, when relevant regulations are revised, IAB-registered architects are demanded to participate in some special seminar for sharing information on revision, that are held by IAB. But, the participation is not mandatory.

In Japan, all registered architects who belong to design offices are demanded to participate in the seminar by the Japan Architectural Education and Information Center that are held every three years under the Licensed Architects/ Building Engineers' Law since 2010. It is mandatory for them.

4) Special Measures for the Architects/Building Engineers who Acquired Relevant License in a Foreign Country

The Bangladesh architects who have obtained relevant license in a foreign country are entitled to become an IAB-registered architect. However, non-Bangladesh citizen who has not graduated from any university in Bangladesh is not entitled to become an IAB-architect in principle.

Table 2.3.18 Summary of Qualification System

Item	Bangladesh		Japan	
Name of certification examination	Membership Examination		Examination for the Licensed Architects/ Building Engineers	
Relevant law	The Societies Registration Act		The Licensed Architects/ Building Engineers' Law	
Titles for Licenced Person	Title	Extent of the buildings to be designed	Title	Extent of the buildings to be designed
	1) IAB-Full Architect	All buildings, however not entitled to prepare structural design documents for <u>all</u> buildings	1) First-class architect/ building engineer	All buildings, however not entitled to prepare structural documents for <u>some</u> buildings.
	2) IAB-Architect	Buildings not exceeding 5,000sqm in floor area. Not entitled to prepare structural design documents for all buildings	2) Second-class architect/ building engineer	Wooden and RC buildings not exceeding 300sqm in a floor area. Entitled to prepare architectural and structural drawings for these types of buildings.
	3) IAB-Associate Architect	Same as the above. It is a title for the architect with a bachelor degree whose year of experience is less than two years.	3) Licenced wooden buildings architect/ building engineer	Wooden building not exceeding 300sqm in a floor area. Entitled to prepare architectural and structural drawings for this type of building.
	4) IDEB-Diploma Architect	Buildings not exceeding 1,000sqm in floor area and 5 in the number of floors. Not entitled to prepare structural design documents for all buildings.	-	-
Qualifications for exam (academic background, practical experience) to become " <u>Full Architect</u> " (Bangladesh) or " <u>First-class Registered Architect/Building Engineer</u> (Japan)	University (five-year architectural course (associate architect) + two years' work experience +further six years work experience after having been qualified as IAB-registered architect)		1) University (four-year architectural or civil engineering course+ two years' work experience) 2) Three-year college (three-year architectural or civil engineering course+ three years' work experience) 3) Two-year college (two-year architectural or civil engineering course+ four years' work experience) 4) Technical college (four-year architectural or civil engineering course+ four years' work experience) 5) Four years' experience as second-class architect/ building engineer	
No. of examination takers (" <u>Associate Architect</u> " (Bangladesh) or " <u>First-class Registered Architect/Building Engineer</u> (Japan))	200 to 300 (no. of undergraduate students who studied architecture (2013))		26,801 (no. of takers of exam for first-class registered architect/ building engineer (2013))	
No. of successful candidates (" <u>Associate Architect</u> " (Bangladesh) or " <u>First-class Registered Architect/Building Engineer</u> (Japan))	120 to 180 (no. of undergraduate students who studied architecture (2013))		4,014 (no. of successful candidates for first-class registered architect/ building engineer (2013))	
Pass rate for examination (" <u>Associate Architect</u> " (Bangladesh) or " <u>First-class Registered Architect/Building Engineer</u> (Japan))	About 60 percent (2013)		12.7 percent (first-class architect/ building engineer, 2013)	
Examination fee (" <u>Associate Architect</u> " (Bangladesh) or	Tk. 2,800 (fee for IAB- associate architect to take exam to become an IAB-architect)		19,700 yen (first-class architect/ building engineer, 2014)	

<u>"First-class Registered Architect/Building Engineer (Japan)"</u>		
No. of examination a year	12 times (every month)	Once
Examination operator	Institutes of Architects Bangladesh (IAB)	Minister of Land, Infrastructure and Transportation *The examination is managed by the Japan Architectural Education and Information Center.
Method and subjects of examination of <u>IAB-Architect" (Bangladesh) or "First-class Registered Architect/Building Engineer (Japan)"</u>	1) First test: paper test on relevant regulations (30 minutes) 2) Second test: oral test (30 minutes)	1) First test: paper test on building planning, relevant regulations, structural engineering and construction management (6 hours) 2) Second test (practical test): drafting and design (5.5 hours)
Enrolment	1) Full Architect: about 1,000 (=1,000 of 1,355 of the below 2)) (2014) (comparable to first-class registered architect/ building engineer in Japan) 2) Architect: about 1,355 (2014) 3) Associate Architect: about 1,400 (2014) 4) Diploma Architect	1) First-class architect/ building engineer: 352,453 (2013) 2) Second-class architect/ building engineer: 742,122 (2013) 3) Licenced wooden buildings architect/ building engineer: 17,203 (2013)
Renewing system	Payment of renewal fee is required every year.	Nil
Awareness building activities for architects/building engineers to be able to comply with the relevant regulations	When relevant regulations are revised, the IAB-registered architects are demanded to participate in a special seminar on revision of the regulations, but their participation is not mandatory.	All registered architects who belong to design office have to take a mandatory seminar that is held every three years under the Licensed Architects/ Building Engineers' Law.
Special measures for the architects/building engineers who acquired relevant license in a foreign country	The Bangladesh architects who have obtained relevant license in a foreign country are entitled to become an IAB-registered architect. However, non-Bangladesh citizen who has not graduated from any university in Bangladesh is not entitled to become an IAB-architect in principle.	Foreign national architects are able to become the registered architects in Japan without taking exam under the Licensed Architects/ Building Engineers' Law.

2.3.7 Summary of Legal Environment for Building Permit System

a) Enforcement system as defined in BNBC

Regarding to the laws and regulations related to building construction, BCA should be the primary, and under BCA, BNBC as a code, BCR as a rule including local BCRs in region level, so-called “GAZETTE” are locating. The enforcement structure has been shown in the provisions of BNBC and others above.

In BNBC, the enforcement structure of BNBC is defined in Part 2, Chapter 2 "Organization and Enforcement". It is demanded that MoHPW, the main executor of BNBC, shall set up the Building Regulatory Authority (BRA). BRA is consisted of less than five members of professional engineers, etc. BRA is the executive agency of the national level. And for the local government level, the Building Construction Committee (BCC) is responsible for the actual building review function. 75% of BCC members are architect, civil engineer, town planner etc. As for the coordination between BCC and the building owners, the Office of the Building Official (OBA) is responsible. OBA is assumed as district or city government, specifically is RAJUK, CDA for Chittagong, RDA for Rajshahi, KDA for Khulna, City Corporation, Development Authority, PWD division office, etc. (BNBC, Part 2, Chapter 2). Unfortunately, the detail relation and operation among BRA, BCC, OBA and Building Officers have not been described in BNBC.

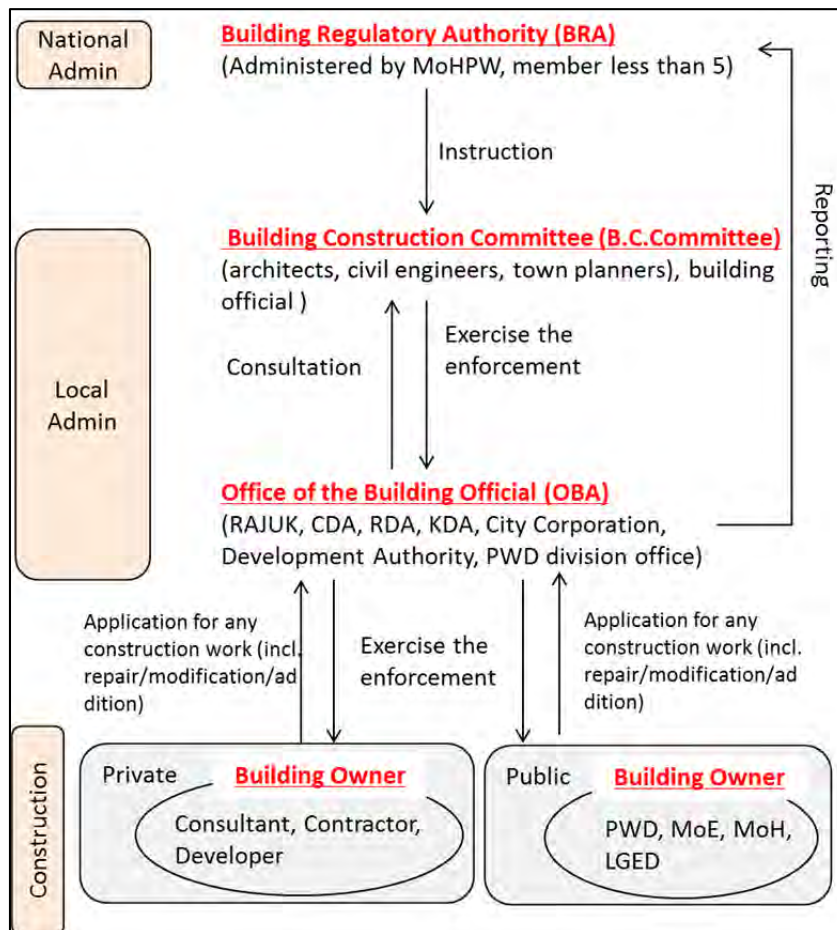


Figure 2.3.11 Enforcement system as defined in BNBC

b) Current situation of Building permit process in Bangladesh

The building construction permit system of Bangladesh is summarized below and the Japanese case is shown a side in Table 2.3.19.

1) Permit system by DOA and PWD

- The building permit system for public buildings designed by DOA and PWD is more simplified than the system for other buildings like private buildings.
- Whether or not the public buildings designed by DOA and PWD are designed according to the relevant regulations including BNBC are examined internally. However, they are not examined using standard tools for examination such as the standard checklist for examining design drawings.
- In Japan, similar to Bangladesh, the submission of the construction plan for a public building is simpler than the process for other buildings. However, the design document is examined by an external and registered organization, using the standard checklists.

2) Permit system by RAJUK

- All over the country, city corporations, development authorities, and PWD division offices etc. are managing building permit in each area using GAZETTE similar to Dhaka BSR following BNBC. As for the Dhaka National Capital and Metropolitan Area are examined by RAJUK.
- In Japan almost all private buildings are examined by an external designated organization whether structural design meets the Japanese building regulations.
- Further, there are insufficient number of Authorized Officers (AO) and inspectors, who have full responsibility for issuing building permits in RAJUK. AO and inspectors cannot adequately examine the design documents applied by building owners, because there are too many applications in Dhaka.
- RAJUK inspects the conditions of setbacks, floor area ratio (FAR), site coverage, etc. which are stipulated in GAZETTE (Dhaka BCR), but does not examine architectural, structural and building service drawings. They are supposed to be examined by Building Construction Committee (BCC). However, BCC also cannot adequately verify these items, because there are too many applications.
- In Japan, usually contractor supervised construction with checklists of quality control and construction management. In some cases, authorized organizations check construction works.

c) Summary of Current Situation

Current situation regarding to the laws and regulations on building construction, BCA (law), BNBC (standard), BCR (rule) and regional level BCR (so called GAZATTE) are aligned. These seem to correspond in total to those of the rules of the Japanese Building Standards Law, its order and rules. In addition, as a system to execute, RAJUK, city corporation, development authority, and PWD divisions are assigned. And, BCC (Building Construction Committee) is that performing a virtual examination, running a task to protect the criteria according to BCR. There is BRA as a management mechanism to enforce BNBC, but not yet established.

On the other hand, the execution level is not sufficiently performed the contents listed in the rules. The applications are not all buildings, and usage and set-back are checked, but not structural check. Further, inspections of the construction stage are rare which is said to be about five percent of the applications. In addition, it is the reality that the drawings at the time of completion are also little left. It is also difficult to perform strict inspection by administrative officers even in Japan where those detail inspections are outsourced.

The cause of not able to inspect numerous applications is said to be a lack of personnel. In other words, it is the lack of human resources with expertise or an absolute shortage of the officers. In this context, IFC under WB is supporting RAJUK for the automation of application. While it increases easiness of

application side, it is worth the effort to reduce the load of the inspection side. In addition, after Rana Plaza incident, the development and enhancement of human resources have been performed in RAJUK.

Based on such realities of enforcement system, building application and construction inspection, the activities that may correspond to realize the implementation of enhancement for safety of buildings can currently be considered as follows.

1) Enforcement of BNBC

It is the first priority to establish the system for the application at the new construction, as well as the performance of the proper inspection. It is also conceivable to change the level of the inspection according to the importance of the buildings. At the same time, other activities that assist to apply easily by giving incentives to both the applicants and the inspectors.

2) Raising awareness on disaster management

In government, the development of the master plan is desired. Building owners are to have safety awareness, constructors and designers are to have a consciousness of quality and safety as a common sense. For citizens, they should know the disasters, and it is considerable to develop the activities recognizing the importance of disaster management.

3) Technical dissemination on planning, design, construction and human resource development

It is necessary to disseminate the technology and to increase the number of engineers on construction planning, design, construction, and construction supervision considering the safety concept. Also it is necessary to implement education and trainings, including at schools and vocational. The mechanism considering for both private and public, and takes into account the technology level is to be established.

Table 2.3.19 Summary of Building Permit Systems with Japanese case

Item	Bangladesh			Japan	
	Building Permit System for <u>Public Building</u>		Building Permit System for <u>Private Building</u>	Building Permit System for <u>Public Building</u>	Building Permit System for <u>Private Building</u>
	If designed by DOA and PWD	If NOT designed by DOA and PWD			
Name for Building Permit System	Nil	Building Plan Application		<i>Submission of the plan</i> (same process as <i>Submission of the Plan</i> in the right-hand side)	<i>Application for confirmation</i>
Relevant law	Building Construction Act (BCA) (Bangladesh)			The Building Standard Law (Japan)	
Responsible Organization for Building Permit	1) Architectural drawings are designed and examined/ approved by DOA 2) Structural and building services drawings designed and examined/ approved by PWD	RAJUK		Special administrative agency (building officials) or government-designated inspection agency	
Fee for building application	Nil	Minimum BDT15,000 (RAJUK jurisdiction area)		5,600 yen to 1,064,000 yen (in case of Tokyo Metropolis)	
Tool for examination	Nil	Development control Division Construction approval Application Check List Part-1(Attach with Form-301)		Standard checklist for design documents. *There is a variety of styles of checklists. Special administrative agencies (building officials) or government-designated inspection agencies have their own styles of checklists.	
Qualification for examiner/ inspector	1) Architectural drawings are examined/ approved by the DOA's Chief Architect (CA) 2) Structural and building services drawings are examined/ approved by the PWD's Superintending Engineer (SE)	RAJUK Authorized Officer		1) If examiners/inspectors are government employees, they have to be first-class registered architects/building engineers with two years practical experience 2) If they are not government employees, they have to be government-designated personnel who have passed official qualification examination.	
Permit process until construction of the applied building is completed	Approval of architectural drawings by the DOA's CA→ Approval of structural and building services drawings by the PWD's SE→ Supervision of construction site by the PWD's FE→ Approval by the PWD's SE→ Completion of construction	Site survey by building owner (Surveys on land use, soil, etc.)→ Building Plan Application to FSCD→ Building Plan Application to RAJUK→ Examination by RAJUK→ Approval by BCC→ Initiation of construction → Inspection at the start of construction by RAJUK→ Inspection at the completion of construction by BCC→ Completion of construction		Site survey by building owner (Surveys on land use, soil, etc.)→ <i>Submission of the plan or Application for confirmation</i> → Examination by building officials or government-designated inspection agency → Permission from fire inspector or notification to fire inspector → Issue of certificate of approval → Implementation of construction → Mid-term inspection (in case of some buildings) → Inspection at the end of construction by Special administrative agency (building officials) or government-designated inspection agency → Completion of construction	
Period of examination	No special rules on term of examination	Need to be examined in 45 days		Need to be examined in 35 days for large-scale buildings in floor area or in 7 days for other buildings	
Review of the system for building permit, if any	Nil	In the wake of Rana Plaza building collapse in April 2013, the number of the FSCD inspectors is remarkably increased.		In the wake of the case that a first-class registered architects/building engineer fabricated structural calculation sheets was exposed in November 2005, relevant regulations were revised. Since 20 June 2007, building calculation for some buildings had to be examined by designated agency and site inspection for some buildings by special administrative agency (building officials) or government-designated inspection agency became mandatory.	

2.3.8 Outline of Environmental and Social considerations Law in Bangladesh

a) Environment Conservation Rules, 1995 and 1997

In 1995, the government drew up the National Environmental Management Action Plan (NEMAP) with the cooperation of the United Nations Environment Programme. Its stated purposes included increasing awareness of serious environmental problems in Bangladesh, reducing environmental deterioration as much as possible, improving the environment and conserving biodiversity, and deciding on the actions needed to facilitate sustainable development and to improve the qualitative indicators for human livelihoods (MoEF, 1995). NEMAP covers four categories: institutional issues, sectoral issues, location-specific issues and long-term issues, and it was developed while holding citizen-participation workshops attended not only by administrative authorities but also by NGOs and involved citizens. It manages matters such as the understanding of environmental problems in each region and measures to contend with them (Miyake 2009).

Also in 1995, the Bangladesh Environment Conservation Act (ECA) was passed to repeal the 1989 Bangladesh Environment Prevention Ordinance. Its 21 articles comprehensively covered the basic sectors of environmental conservation. The law was partially amended in 2000 and again in 2002.

The main objectives of ECA are as follows:

- Conservation and improvement of the environment
- Control and mitigation of pollution of environment
- Declaration of ecologically critical areas
- Restriction on the operation and process that can or cannot be carried out in ecologically critical areas
- Environmental clearance
- Regulation of the industries and discharge permit for other development activities
- Promulgation of standards for the quality of air, water, noise and soil for different areas and for different purposes
- Promulgation of standard limits for the discharge and emission of waste
- Formulation and declaration of environmental guidelines

This Act is implemented by the Department of Environment (DoE), which is a department of the Ministry of Environment and Forest and is headed by a Director General (DG), who has complete control over the DoE. The power of the DG, as given in the Act, may be outlined as follows:

- The DG has the power to close down activities considered harmful to human life or to the environment. The operator of the DoE has the right to appeal the decision of the DG, and there are procedures in place for this. However, if the incident is considered an emergency, there is no opportunity for appeal.
- The DG has the power to declare an area affected by pollution as an ecologically critical area. The type of work or process that can take place in such an area is governed by the DoE.

In 1997, the government enacted the Bangladesh Environment Conservation Rules (ECR) to supplement the ECA. The rules specify environmental standards for, among others, air and water quality and noise and foul odors. These were partially amended in 2002 and again in 2003. The Act stipulates the Environmental Impact Assessment (EIA) process within the framework of Environment Clearance Certificate (ECC). In 2000, the Environmental Court Act was enacted especially for court cases involving pollution. Environmental courts were established at six sites throughout the country and granted rights such as the right

to enter premises and conduct investigations. Although environmental laws have gradually been enacted they are still insufficient in terms of applying precise regulatory power and assuring the implementation of policy measures for solving environmental problems. Deficiencies include missing items, no methodology specified for the enactment of regulation, articles that allow expanded interpretations and items that leave no room for administrative guidance (Miyake 2009).

b) Environmental Assessment

1) Legal Framework for Environmental Assessment

The legislative bases for environmental assessment in Bangladesh are the 1995 Environment Conservation Act (ECA) and the 1997 Environment Conservation Rules (ECR). The Department of Environment (DoE), under the Ministry of Environment and Forest, is the regulatory body responsible for enforcing the act and the rules. The ECA was amended in 2010; however, the English version has not been prepared.

2) Environmental Assessment and Environmental Clearance Certificate (classification)

In Bangladesh, environmental assessment is conducted as part of the process of issuing Environmental Clearance Certificates (ECCs). Industrial projects are divided into four categories, namely, Green, Orange-A, Orange-B and Red, according to their environmental significance and the location of the proposed development.

Category Green projects require neither initial environmental examination (IEE) nor EIA. Red Category projects, by contrast, require both IEE and EIA. This normative screening process enables the DoE and the proposers to determine which steps to follow in acquiring ECCs. Special emphasis is placed on site selection for industries with a significant potential for environmental impacts. Thus, the proposers are required to consider alternative sites, keeping in mind the criteria put forward by the DoE (Momtaz, 2002). The tables below set out the classification of industries and projects for each category.

Table 2.3.20 Green Category

No.	Sector
1	Assembly and manufacturing of TV and radio
2	Assembly and manufacturing of clocks and watches
3	Assembly of telephones
4	Assembly and manufacturing of toys (excluding plastic items)
5	Bookbinding
6	Rope and mat (made of cotton, jute and artificial fibre)
7	Photography (excluding film and X-ray)
8	Manufacturing of artificial leather goods
9	Assembly of motorcycles, bicycles and toy cycles
10	Assembly of scientific and mathematical instruments (no manufacturing)
11	Musical instruments
12	Sports goods (excluding plastic ones)
13	Tea packing (no processing)
14	Re-packing of powdered milk (no production)
15	Bamboo and cane goods
16	Artificial flowers (excluding plastic ones)
17	Fountain pens and ball pens
18	Jewelry shops (without manufacturing)
19	Candles
20	Medical and surgical appliances (without manufacturing)
21	Factories manufacturing cork items (excluding metallic ones)
22	Laundry (without washing)

Table 2.3.21 Orange-A Category

No.	Sector
1	Dairy farm (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas)
2	Poultry (maximum of 250 in urban areas and 1,000 in rural areas)
3	Grinding/husking of wheat, rice, turmeric, pepper and pulses (up to 20 hp)
4	Weaving and handloom
5	Production of shoes and leather goods (capital up to 500,000 taka)
6	Sawmill/wood sawing
7	Furniture of wood, iron, aluminum, etc. (capital up to 500,000 taka)
8	Printing press
9	Plastic and rubber goods (excluding PVC)
10	Restaurants
11	Carton/box manufacturing/printing packaging
12	Cinema hall
13	Dry-cleaning
14	Manufacturing of artificial leather goods (capital up to 500,000 taka)
15	Sports equipment and appliances
16	Salt production (capital up to 500,000 taka)
17	Agricultural machinery and equipment
18	Industrial machinery, tools and equipment
19	Production of gold ornaments
20	Pin and U-pin
21	Frames of spectacles
22	Combs
23	Production of brass and bronze utensils
24	Biscuit and bread factories (capital up to 500,000 taka)
25	Chocolate and lozenge factories (capital up to 500,000 taka)
26	Wooden water vessel manufacturing

Table 2.3.22 Orange-B Category

No.	Sector
1	PVC items
2	Artificial fiber (raw material)
3	Glass factories
4	Life-saving drugs (formulation only)
5	Edible oil
6	Coal tar
7	Jute mill
8	Hotels, multi-story commercial and apartment buildings
9	Casting and molding
10	Aluminum goods
11	Glue (excluding animal glue)
12	Bricks/tiles
13	Lime
14	Plastic goods
15	Processing and bottling of drinking water and carbonated drinks
16	Galvanizing
17	Perfume and cosmetics
18	Flour (large)
19	Carbon rod
20	Stone grinding, cutting and polishing
21	Fish, meat and food processing
22	Printing and writing ink
23	Animal feed

24	Ice cream
25	Clinics and pathological laboratories
26	Utensils made of clay and china clay/sanitary ware (ceramics)
27	Processing of prawn/shrimp
28	Water treatment/purification plants
29	Metal utensils
30	Sodium silicate
31	Matches
32	Starch and glucose
33	Feeds for domestic animals
34	Automatic rice mill
35	Assembly of motor vehicles
36	Wooden water vessel manufacturing
37	Photography (activities related to production of films for movies and X-ray)
38	Tea processing
39	Powdered milk manufacturing/condensed milk/dairy
40	Re-rolling
41	Wood processing
42	Soap
43	Repairing of refrigerators
44	Repairing of metallic water vessels
45	Engineering works (capital up to 10 hundred thousand taka)
46	Yarn manufacturing (spinning mills)
47	Electric cables
48	Cold storage
49	Tire re-treading
50	Repair works of motor vehicles (capital up to 10 hundred thousand taka)
51	Cattle farm (more than 10 in urban areas and 25 in rural areas)
52	Poultry (more than 250 birds in urban areas and 1,000 birds in rural areas)
53	Grinding/husking of wheat, rice, turmeric, chillies and pulses – machine more than 20 hp
54	Shoe and leather goods manufacturing (capital up to 10 hundred thousand taka)
55	Wood, iron and aluminum furniture (capital up to 10 hundred thousand taka)
56	Artificial leather goods manufacturing (capital up to 10 hundred thousand taka)
57	Salt production (capital up to 10 hundred thousand taka)
58	Biscuit and bread factories (capital up to 10 hundred thousand taka)
59	Chocolate and lozenge factory (capital up to 10 hundred thousand taka)
60	Garments and sweater manufacturing
61	Garments/fabric washing
62	Power looms
63	Road construction/reconstruction/extension (feeder road and local road)
64	Bridge construction/reconstruction/extension (length less than 100 m)
65	Public toilets
66	Ship breaking
67	G1 wires
68	Assembly of batteries
69	Dairy and food

Table 2.3.23 Red Category

No.	Sector
1	Leather processing (tannery)
2	Formaldehyde
3	Urea fertilizer
4	T.S.P. fertilizer
5	Chemical dyes, polishes, varnishes and enamels
6	Power plants
7	All mining projects (coal, limestone, hard rock, natural gas, mineral oil, etc.)
8	Cement

9	Fuels (oil refineries)
10	Artificial rubber
11	Paper and pulp
12	Sugar
13	Distillery
14	Fabric dyeing and chemical processing
15	Caustic soda, potash
16	Other alkalis
17	Iron and steel manufacturing
18	Raw materials for medicine and basic drugs
19	Electroplating
20	Photo films, photo paper and photo chemicals
21	Chemicals derived from petroleum or coal
22	Explosives
23	Acids and their salts (organic and inorganic)
24	Nitrogen compounds (cyanide, cyanamide, etc.)
25	Production of plastic raw materials (PVC, PP/iron, polystyrene, etc.)
26	Asbestos
27	Fiberglass
28	Pesticides, fungicides and herbicides
29	Phosphorus and its compounds/derivatives
30	Chlorine, fluorine, bromine, iodine and their compounds/derivatives
31	Industrial gases (excluding nitrogen, oxygen and carbon dioxide)
32	Waste incinerators
33	Other chemicals
34	Ordinance factory
35	Nuclear power
36	Alcoholic beverages
37	Non-metallic chemicals not listed elsewhere
38	Non-metals not listed elsewhere
39	Industrial estate
40	Basic industrial chemicals
41	Non-iron basic metals
42	Detergent
43	Landfilling by household/industrial/commercial waste
44	Sewage treatment plants
45	Lifesaving drugs
46	Animal glue
47	Rodenticide
48	Refractories
49	Industrial gas (nitrogen, oxygen, carbon dioxide)
50	Batteries
51	Hospitals
52	Ship manufacturing
53	Tobacco (processing/cigarette/bin-making)
54	Metallic boat manufacturing
55	Wooden boat manufacturing
56	Refrigerator, air conditioner/air cooler manufacturing
57	Tires and tubes
58	Board mills
59	Carpets
60	Engineering works (capital above 10 hundred thousand taka)
61	Repairing of motor vehicles (capital above 10 hundred thousand taka)
62	Water treatment plants
63	Laying down/replacement/expansion of sewerage pipelines
64	Laying down/replacement/expansion of water, power and gas distribution lines
65	Exploration/extraction/distribution of mineral resources

66	Construction/reconstruction/expansion of flood control embankment, polder, dike, etc.
67	Construction/reconstruction/expansion of roads (regional, national and international)
68	Construction/reconstruction/expansion of bridge (length 200 m or more)
69	Muriate of potash (manufacturing)

According to the category into which the assessed project falls, site selection is limited by the Environment Conservation Rules as follows.

Table 2.3.24 Limitations on Site Selection

Category	Sector
Green	(a) Units of all kinds of cottage industries other than those listed in this schedule shall remain outside the purview of the ECC (the units of cottage industries indicate all industrial units producing goods or services in which full-time or part-time family members are engaged and the capital investment of which does not exceed 500,000 taka).
	(b) No industrial unit listed in this schedule shall be located in any residential area.
	(c) Industrial units shall preferably be located in areas declared as industrial zones, in areas where there is a concentration of industries, or in vacant areas.
	(d) Industrial units likely to produce sound, smoke or odor beyond permissible limits shall not be acceptable in commercial areas.
Orange-A and Orange-B	(a) No industrial unit included in this list shall be located in any residential area.
	(b) Industrial units shall preferably be located in areas declared as industrial zones, in areas where there is a concentration of industries, or in vacant areas.
	(c) Industrial units likely to produce sound, smoke and odor beyond permissible limits shall not be accepted in commercial areas.
Red	(a) No industrial unit included in this list shall be located in any residential area.
	(b) Industrial units shall preferably be located in areas declared as industrial zones, in areas where there is a concentration of industries, or in vacant areas.
	(c) Industrial units likely to produce sound, smoke and odor beyond permissible limits shall not be accepted in commercial areas.
	(d) After obtaining the location clearance based on the IEE report, the EIA report in accordance with the approved terms of reference, along with the effluent treatment plant (ETP) design and its time schedule, shall be submitted within the approved time limit.

c) Procedures and Relevant Organizations

As stated above, environmental assessment is conducted within the procedure of issuing an Environmental Clearance Certificate (ECC) in Bangladesh. The Department of Environment (DoE) is in charge of all these processes. The ECC application process varies according to the category into which the proposed project falls.

For Green Category projects, the following documents must be submitted:

- General information pertaining to the industry or project
- Description of raw materials and finished products
- Process flow diagram
- No-objection certificate from the local authority

For Orange-A and Orange-B Category projects, the following documents must be submitted:

- General information pertaining to the industry or project
- Description of the product along with that of the raw materials
- Process flow diagram
- Layout plan (indicating the site for effluent treatment plant)
- Waste disposal system

- Outlines of relocation, and rehabilitation plan (where applicable)
- Other relevant information (where applicable)
- Feasibility study report of the industry or project (applicable only for proposed industries or projects)
- Initial Environmental Examination (IEE) report, with the process flow diagram, layout plan (Indicating the site for effluent treatment plant) and design of the effluent treatment plan (ETP; applicable only for proposed industries or projects)
- Environment management plan (EMP) with process flow diagram, layout plan (Indicating the site for ETP), design and efficiency of the ETP (applicable only for existing industries or projects)
- No-objection certificate (NOC) from the local authority
- Contingency plan in respect of adverse environmental impacts together with plan to reduce pollution load
- Outlines of relocation, rehabilitation plan (where applicable)
- Other relevant information.

For Red Category projects, the following documents must be submitted:

- Feasibility study report of the industry or project (applicable only for proposed industries or projects)
- Initial Environmental Examination (IEE) report, together with the terms of reference of Environmental Impact Assessment (EIA) and the process flow diagram of the industry or project, or the Environmental Impact Assessment (EIA) report prepared on the basis of terms of reference approved earlier by the Department of Environment, layout plan (indicating the site for effluent treatment plant), design and time schedule to construct the ETP, process flow diagram (applicable only for proposed industries or projects)
- Environment management plan (EMP), together with process flow diagram, layout plan (indicating location of ETP), design and efficiency of the effluent treatment plant (applicable only for existing industries or projects)
- No-objection certificate (NOC) from the local authority
- Contingency plan in respect of adverse environmental impacts, together with the plan to reduce pollution load
- Outlines of relocation and rehabilitation plan (where applicable)
- Other relevant information

The ECC should be issued to all industries and projects when they fall into the categories that require the EIA process to be conducted during screening. The Green Category requires ECC only; there is no need to conduct EIA. Orange-A, Orange-B and Red Categories must, in general, acquire a site clearance certificate before the ECC can be issued, unless the Director General of DoE specifies otherwise. The site clearance certificate is awarded if the Director General of DoE considers issuing such a certificate appropriate.

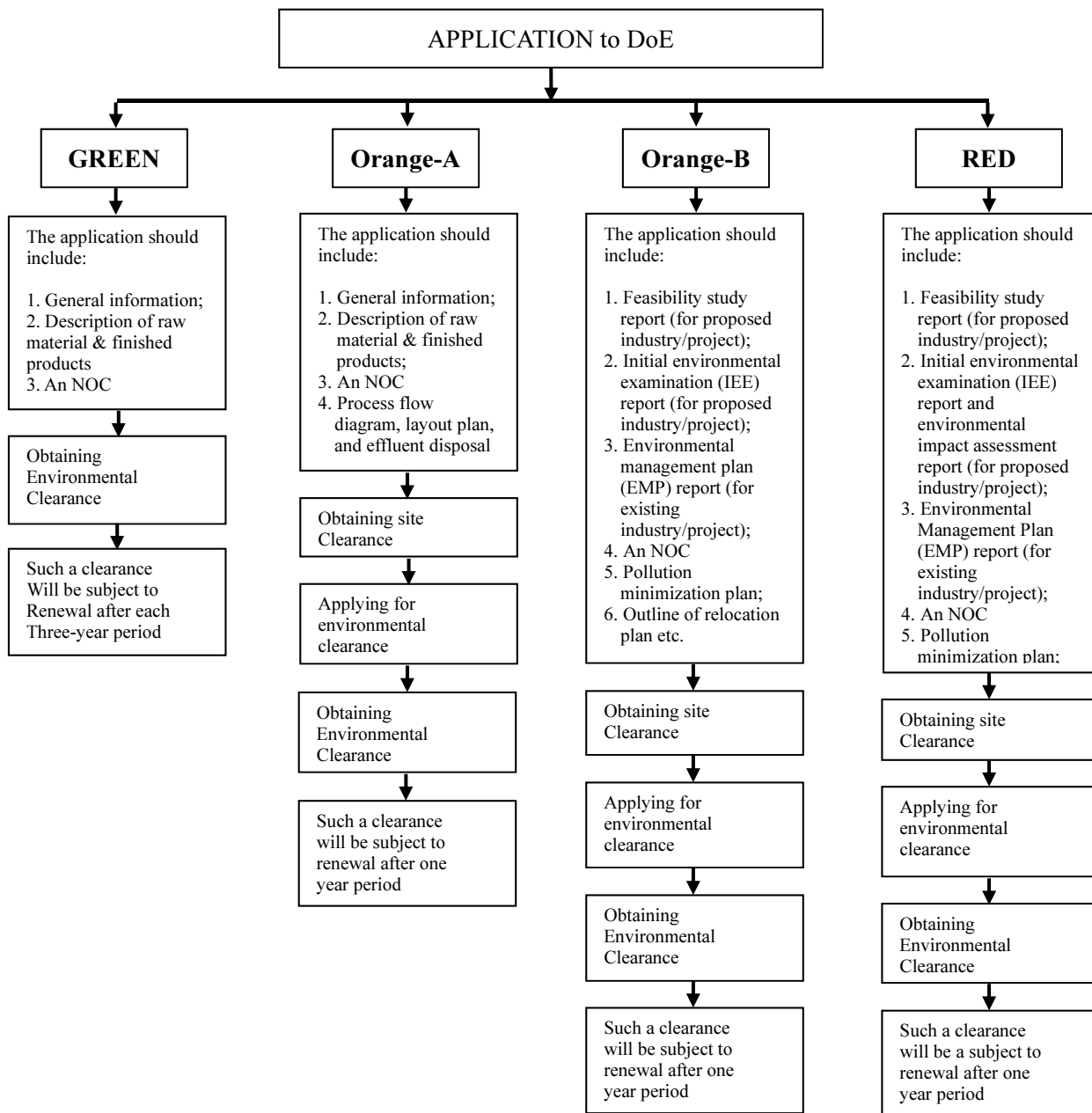


Figure 2.3.12 Steps Involved in Obtaining the Environmental Clearance Certificate

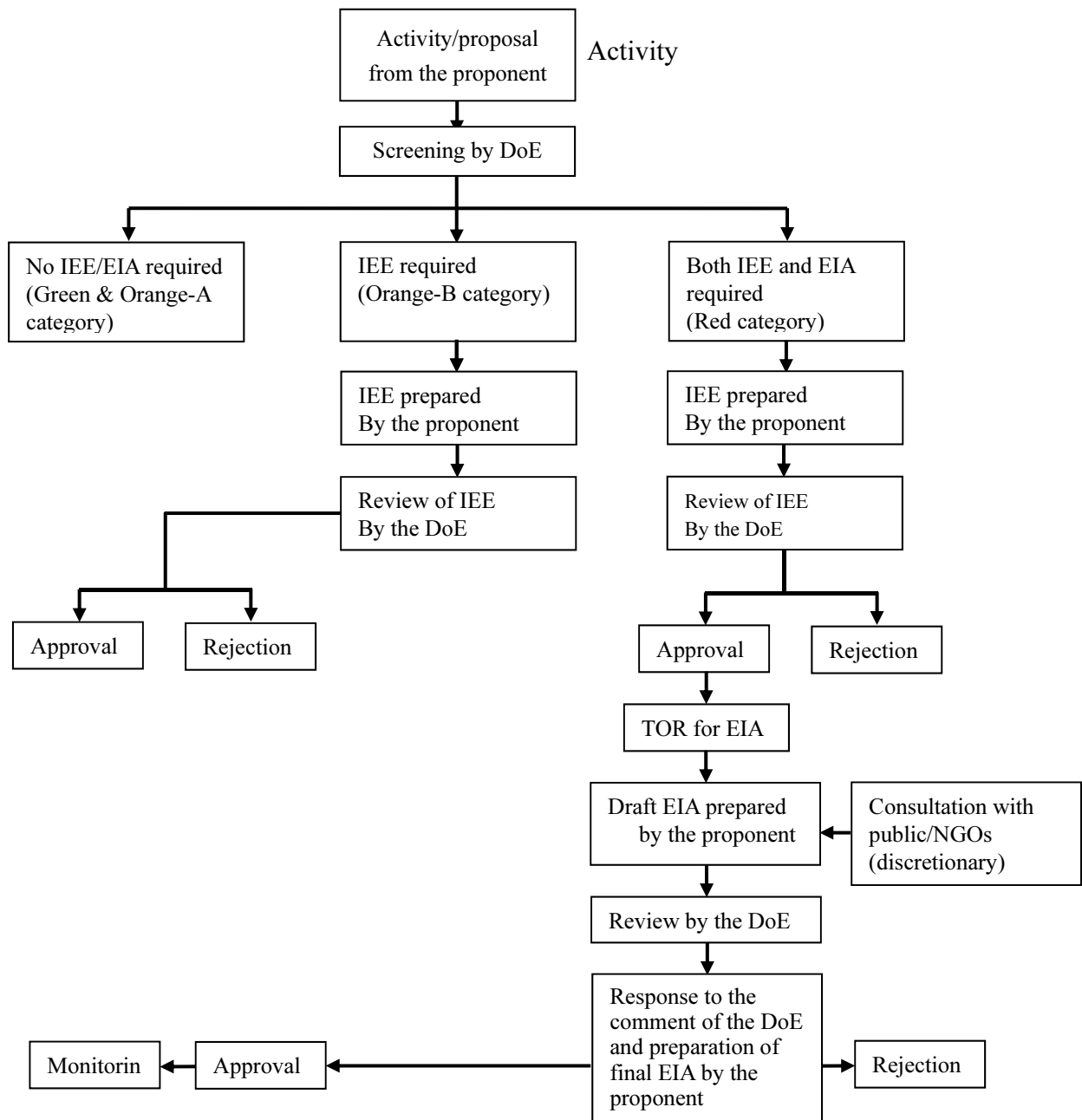


Figure 2.3.13 Flowchart of the EIA Process in Bangladesh

Upon receiving the site clearance certificate (required for all categories except the Green Category), the entrepreneur may:

- Undertake activities related to land development and infrastructure development
- Install machinery and equipment, including the ETP of the unit or project (applicable to Orange-A and Orange-B Category industrial units or projects only)
- Apply for the ECC upon completion of the activities specified previously. However, without the ECC, the entrepreneur shall not have a gas line connection, start trial production in the industrial unit or operate the project (applicable to Orange-A and Orange-B Category industrial units or projects only)
- Submit for approval of the Department the EIA report prepared based on the programme outlined in the IEE report, along with the schedule of timings and the ETP design (applicable to Red Category industrial units or projects)

Scoping is not mandatory under domestic law and is not an identified milestone in the environmental clearance process. EIA guidelines consider IEE as the milestone where scoping is to be carried out. The impacts assessed in the Government of Bangladesh's EIA system include components such as air, noise, land, water, biological and socio-economic aspects.

2.4 Conditions of Buildings in Bangladesh

2.4.1 General conditions

The data used for the estimation of damage in CDMP (Comprehensive Disaster Management Program), which was implemented by MoFDM (Ministry of Food and Disaster Management) and reported in 2009. It is informative as a material for grasping the building conditions in Bangladesh. The CDMP report analyzed the scale of damage anticipated to be caused by earthquakes which likely hit the three major cities of Bangladesh, viz. Dhaka, Chittagong, and Sylhet³⁹. The building data used in the report can be used to grasp the building composition in the respective cities. The building conditions summarized in the report are shown below. The building data show the conditions as of 2008, and the number of buildings must have increased by the subsequent development activities of Bangladesh. However, the data are considered still usable to grasp the tendency of the building situation roughly.

a) Application Purposes of Buildings

Table 2.4.1 shows the data classified by the major use of buildings as well as the facilities for disaster response. This table indicates that residential buildings represent more than 80% of all the buildings in each city.

Table 2.4.1 Number of Grouped Occupancy Classes (as of 2008)

City	Residential	Commercial	Industrial	Essential Facilities			Other	Total
				Medical Care	Emergency Response	School		
Dhaka	265,777 81.32%	46,769 14.31%	6,379 1.95%	663 0.20%	245 0.07%	2,154 0.66%	4,838 1.48%	326,825 100.00%
Chittagong	149,061 81.78%	28,462 15.61%	2,080 1.14%	119 0.07%	52 0.03%	1,221 0.67%	1,282 0.70%	182,277 100.00%
Sylhet	44,443 85.18%	6,085 11.66%	449 0.86%	120 0.23%	22 0.04%	414 0.79%	644 1.23%	52,176 100.00%

(CDMP, 2009)

The details of the disaster corresponding facilities are shown in Table 2.4.2, and the damage estimation results for the worst-case scenario of each city are shown in Table 2.4.3. In Dhaka and Sylhet, more than half of schools and hospitals, which are to be facilities for evacuation and rescue during disasters, is estimated to be a partially destroyed or collapsed. In Dhaka, the operation of the emergency facilities is also estimated as low as about 20% immediately after the worst case disaster. Chittagong is even worse situation is assumed. For about 80% of the emergency facility is partially destroyed or collapsed, immediately after the disaster, it is an emergency facility is not expected to be almost running.

³⁹ In CDMP (2009), regarding the estimation of seismic ground motion, first the scenario earthquakes are set by the analyses on both historical earthquake and active fault information. And, ground condition is modeled based on the ground survey and analysis. Then, peak ground motion during the scenario earthquakes is estimated. On the other hand, as for the risk assessment, at first the current information such as buildings and lifeline facilities, population is collected and arranged. Then, HAZUS (Hazard Assessment for US) technique by FEMA (Federal Emergency Management Authority) is used for estimation of damage or risk. This method was said to be revised approaching to meet the Bangladesh.

Table 2.4.2 Number of Essential Facilities (as of 2008)

Essential Facility	Dhaka	Chittagong	Sylhet
<i>Medical Care</i>			
Large Hospital	75	45	7
Medium Hospital	59	15	6
Small Hospital	98	36	7
Medical Clinic	368	66	67
Total	600	162	87
<i>Emergency Response</i>			
Police Station	62	11	6
Fire Station	10	12	2
Emergency Operation Center	18	11	9
Total	90	34	17
<i>Schools</i>			
Grade School	2,026	906	162
College/University	711	127	49
Total	2,737	1,033	211

(CDMP, 2009)

Note: Although *Table-1* and *Table-2* are different in number of buildings, the figures in the report are shown as they are in the tables because the details are unknown.

Table 2.4.3 Expected Damage to Essential Facilities (as of 2008)

Area	Essential Facility	Total	At Least Moderate Damage>50%		Complete Damage>50%		With Functionality >50%on day1	
Dhaka (Scenario case 3)	Hospitals	600	364	60.7%	23	3.8%	128	21.3%
	Schools	2,737	1,567	57.3%	165	6.0%	495	18.1%
	EOCs	18	9	50.0%	0	0.0%	4	22.2%
	Police Staitions	62	39	62.9%	0	0.0%	2	3.2%
	Fire Staions	10	6	60.0%	0	0.0%	0	0.0%
Chittagong (Scenario case 4)	Hospitals	162	132	81.5%	125	77.2%	0	0.0%
	Schools	1,033	816	79.0%	734	71.1%	0	0.0%
	EOCs	11	1	9.1%	1	9.1%	0	0.0%
	Police Staitions	11	10	90.9%	10	90.9%	0	0.0%
	Fire Staions	12	12	100.0%	8	66.7%	0	0.0%
Shyhet (Scenario Case 4)	Hospitals	87	47	54.0%	42	48.3%	40	46.0%
	Schools	211	111	52.6%	105	49.8%	100	47.4%
	EOCs	9	0	0.0%	0	0.0%	0	0.0%
	Police Staitions	6	4	66.7%	4	66.7%	2	33.3%
	Fire Staions	2	0	0.0%	0	0.0%	2	100.0%

(CDMP, 2009)

Note: Although *Table-1* and *Table-3* are different in the number of buildings, the figures in the report are shown as they are in the tables because the details are unknown.

b) Major structures

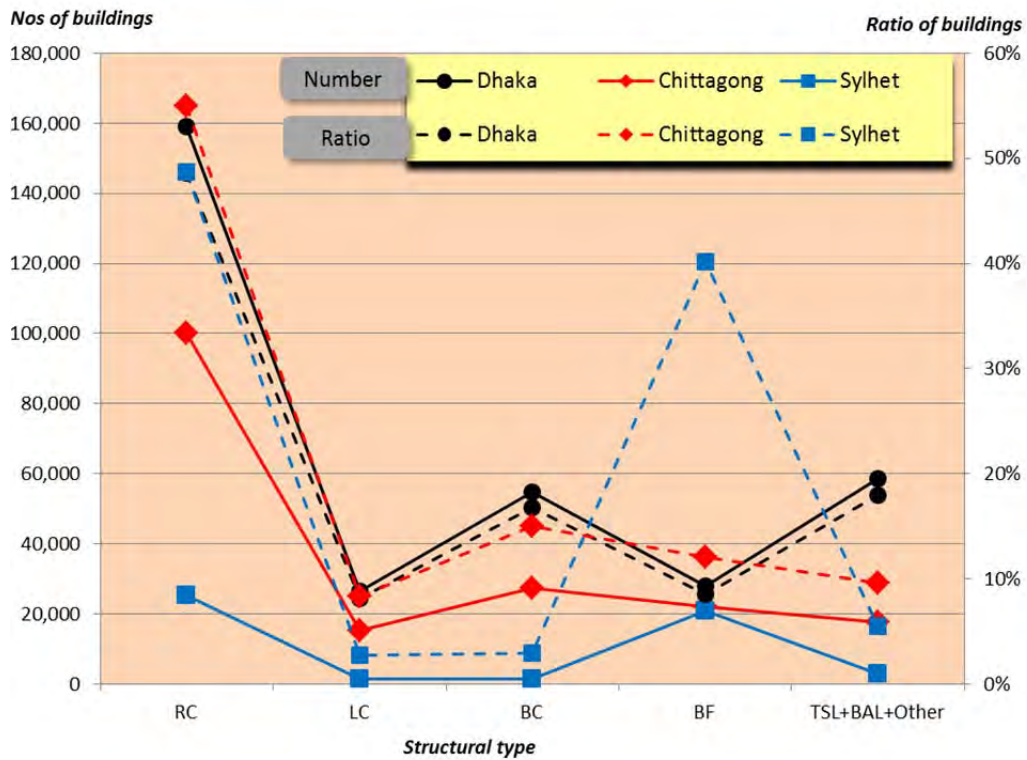
Table 2.4.4 and Figure 2.4.1 show the numbers of buildings in three cities by major structural types. RC buildings represent approximately 50% in all the cities. Each city has its own characteristics to a certain degree. While the ratios of structural types are similar in Dhaka and Sylhet, the ratios of TSL+BAL+Other buildings in Dhaka are remarkable at approximately 18% compared with the other cities. This characteristic likely shows that the city is intensely inhabited by low income earners. In Sylhet, RC buildings and BF buildings represent approximately more than 90%. BF buildings are constructed with bricks but have low seismic capacity compared with other types of masonry, and are probably mainly used for residences.

Table 2.4.4 Number of Main Structural types (as of 2008)

City	Structure(No. of buildings)					Total
	Concrete		Masonry		TSL+BAL+Other	
	RC	LC	BC	BF		
Dhaka	158,924 48.63%	26,602 8.14%	54,804 16.77%	27,825 8.51%	58,670 17.95%	326,825 100.00%
Chittagong	100,188 54.96%	15,241 8.36%	27,401 15.03%	21,927 12.03%	17,520 9.61%	182,277 100.00%
Sylhet	25,409 48.70%	1,405 2.69%	1,535 2.94%	20,974 40.20%	2,853 5.47%	52,176 100.00%

(CDMP, 2009)

RC: Reinforced concrete buildings, LC: Lightly reinforced concrete buildings. BC: Brick in cement mortal with concrete floor, BF: Brick in cement mortal with flexible roof, TSL: Thin shed, BAL: Bamboo



(CDMP, 2009)

Figure 2.4.1 Number of Main Structural Types (as of 2008)

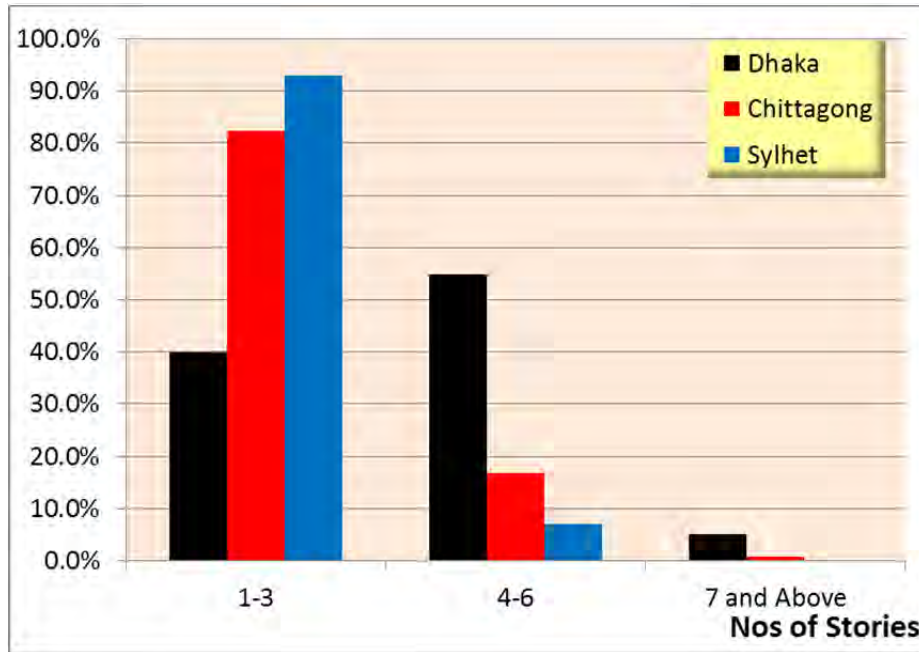
c) Number of building stories

Table 2.4.5 and Figure 2.4.2 show the numbers of buildings in three cities by the number of stories. This data (8,741 buildings in Dhaka, 6,175 buildings in Chittagong, 3,536 buildings in Sylhet) is a result based on the primary level survey (Level-1) on fragility evaluation implemented as an important factor for the damage estimation. And they may slightly different from the actual situation of the numbers of stories, though showing a tendency. This data supports the fact that urbanization has progressed in Dhaka with the low- to medium-rise 4-storied to 6-storied buildings represent the largest number and the medium- to high-rise buildings of 7 or more stories tend to represent a larger number than the other cities. In the other cities, low-story buildings represent the majority at 80% to 90%.

Table 2.4.5 Number of stories (as of 2008)

City	The number of stories			Total
	1-3	4-6	7 and Above	
Dhaka	3,494 40.0%	4,804 55.0%	443 5.1%	8,741 100.0%
Chittagong	5,090 82.43%	1,042 16.87%	43 0.70%	6,175 100.0%
Sylhet	3,285 92.90%	246 6.96%	5 0.14%	3,536 100.0%

(CDMP, 2009)



(CDMP, 2009)

Figure 2.4.2 Number of stories (as of 2008)

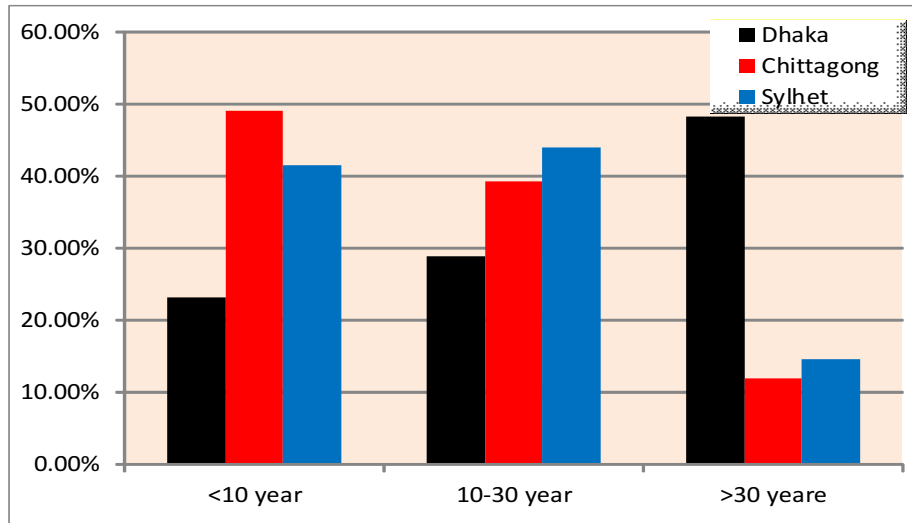
d) Building age

Table 2.4.6 and Figure 2.4.3 show the numbers of buildings in three cities by age. In Dhaka, buildings that have been constructed for more than 30 years represent 50%. The buildings of more than 30 years of age are constituted of buildings constructed without seismic structural design and with empirically-obtained knowledge (Non-Engineered buildings) that likely have extremely low seismic capacity. In Chittagong and Sylhet, buildings of less than 30 years of age represent approximately 90%.

Table 2.4.6 Building's age (as of 2008)

City	<10 year	10-30 year	>30 year	Total
Dhaka	75,192 23.01%	93,923 28.74%	157,710 48.26%	326,825 100.00%
Chittagong	89,212 48.94%	71,285 39.11%	21,780 11.95%	182,277 100.00%
Sylhet	21,635 41.47%	22,945 43.98%	7,596 14.56%	52,176 100.00%

(CDMP, 2009)

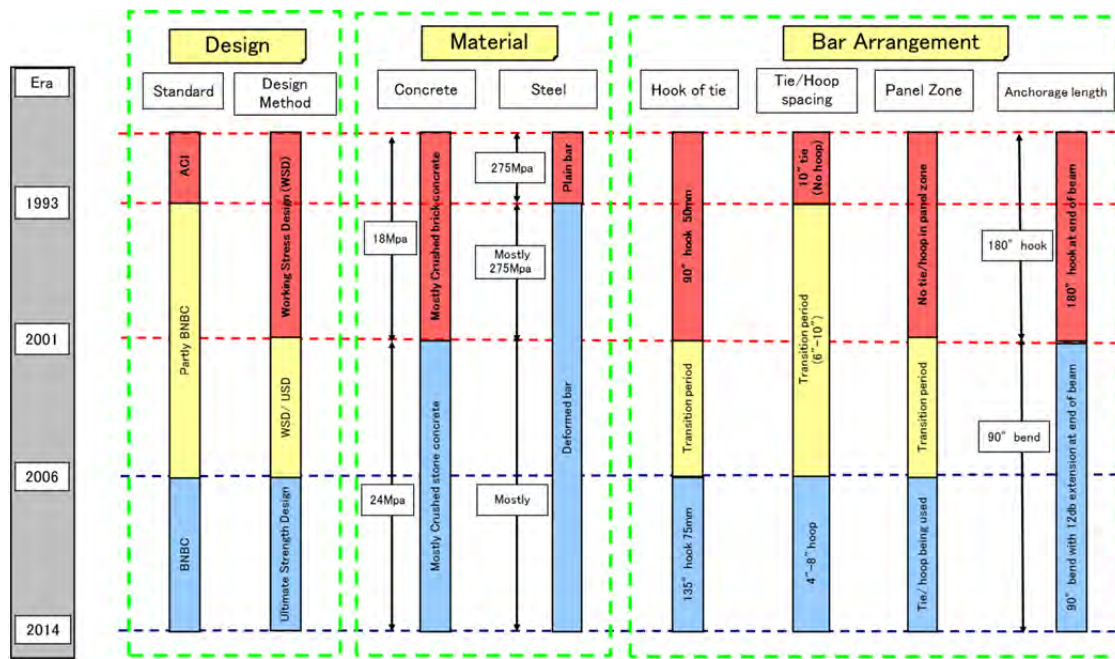


(CDMP, 2009)

Figure 2.4.3 Building's Age (as of 2008)

e) Changes in structural standards and building structure situation

Figure 2.4.4 shows the data on the changes in structural design standards, used materials, and arrangement of bars in Bangladesh with an influence on the seismic capacity obtained in the activities of the ongoing CNCRP (2011-2015).



(CNCRP, 2015)

Figure 2.4.4 Changes in Structural Design and Used Materials in Bangladesh

For the structural design, the BNBC was initially enacted in 1993 as BNBC93. Before the BNBC93, structural design had been performed only for the vertical load (gravity load) without consideration of the seismic load. The seismic load was taken into consideration since BNBC93. However, unlike the situation in Japan, the designing remained lacking compliance to the BNBC93 after its enactment, and the revised BNBC was enforced in 2006 as BNBC06 (the 2008 Gazette is the enforcement practically) with the objective of encouraging the compliance to the standard. Later, buildings have been designed in conformity to the standard to a certain extent. However, as the case of the Rana Plaza, which collapsed in April 2013, there still exist numerous illegally constructed structures.

It was revealed in the seismic capacity survey of existing private Ready-Made Garment factories around Dhaka performed in CNCRP (ongoing from 2013) that most buildings have not structural calculation sheets, which prove the conformity of the building design to the BNBC06. And there are few documents that prove the conformity of the building construction to drawing and specification. Worse still, the field survey results show the existence of buildings that were not constructed in compliance with the design drawing.

Therefore, there exist no means of judging whether the existing buildings are conformable to BNBC. Accordingly, in-depth structural survey and detailed structural study are required to judge whether the buildings have any structural problems or not.

f) Structural problems

Figure 2.4.5 shows the issues of buildings in Bangladesh for structure and construction that were known from the activities of CNCRP.

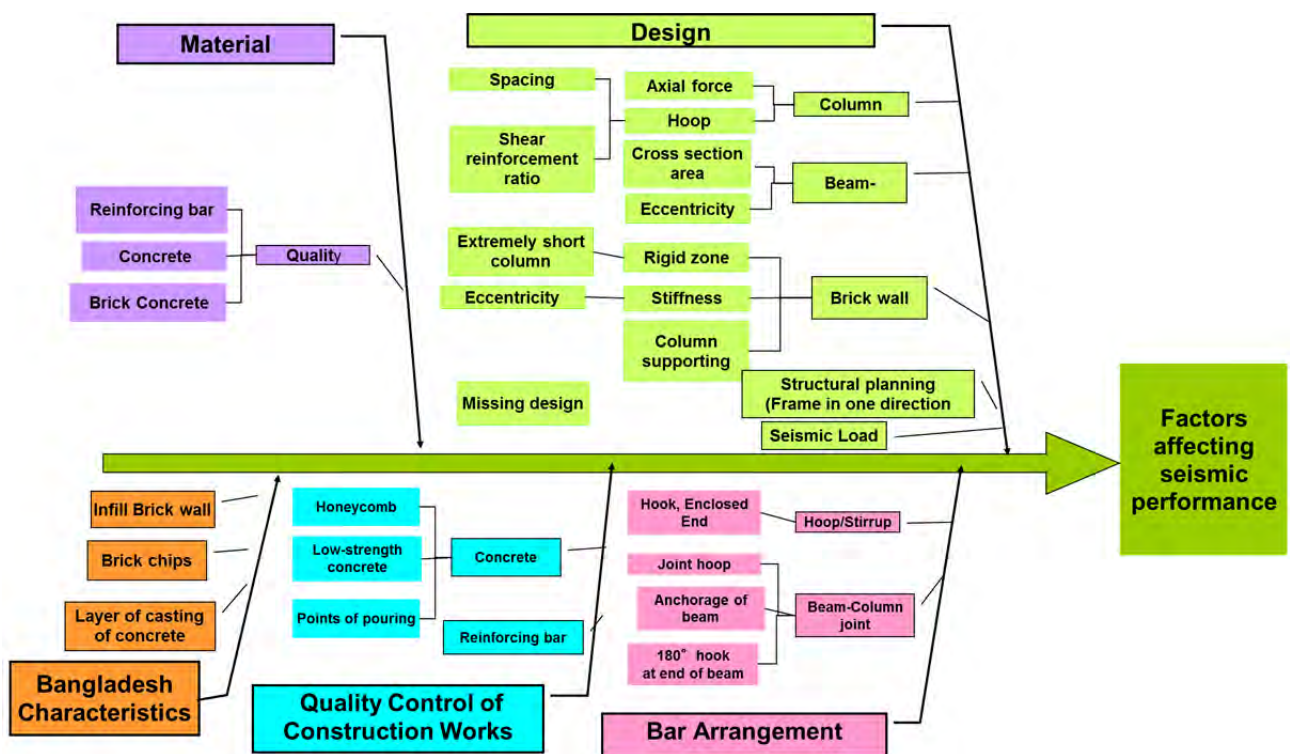


Figure 2.4.5 Issues of Buildings in Terms of Structure and Construction

Of the above issues, one of the most structurally important points is the low-strength concrete caused by the low-grade quality of construction. Figure 2.4.6 shows the result of concrete strength tests that were performed using the design strength using the concrete cores sampled from actual buildings. Most buildings show lower strength than the design one. In addition, most of the concrete has low-strength concrete of approximately 10N/mm² (MPa) or lower. Under such construction condition, buildings will become structurally problematic even if the structural design is proper. As a matter of fact, a building, which underwent a seismic capacity evaluation, tends to be short of the surplus strength to resist the horizontal force (seismic force) by the increased axial force applied to the first floor column as a result of the influence of this low-strength concrete.

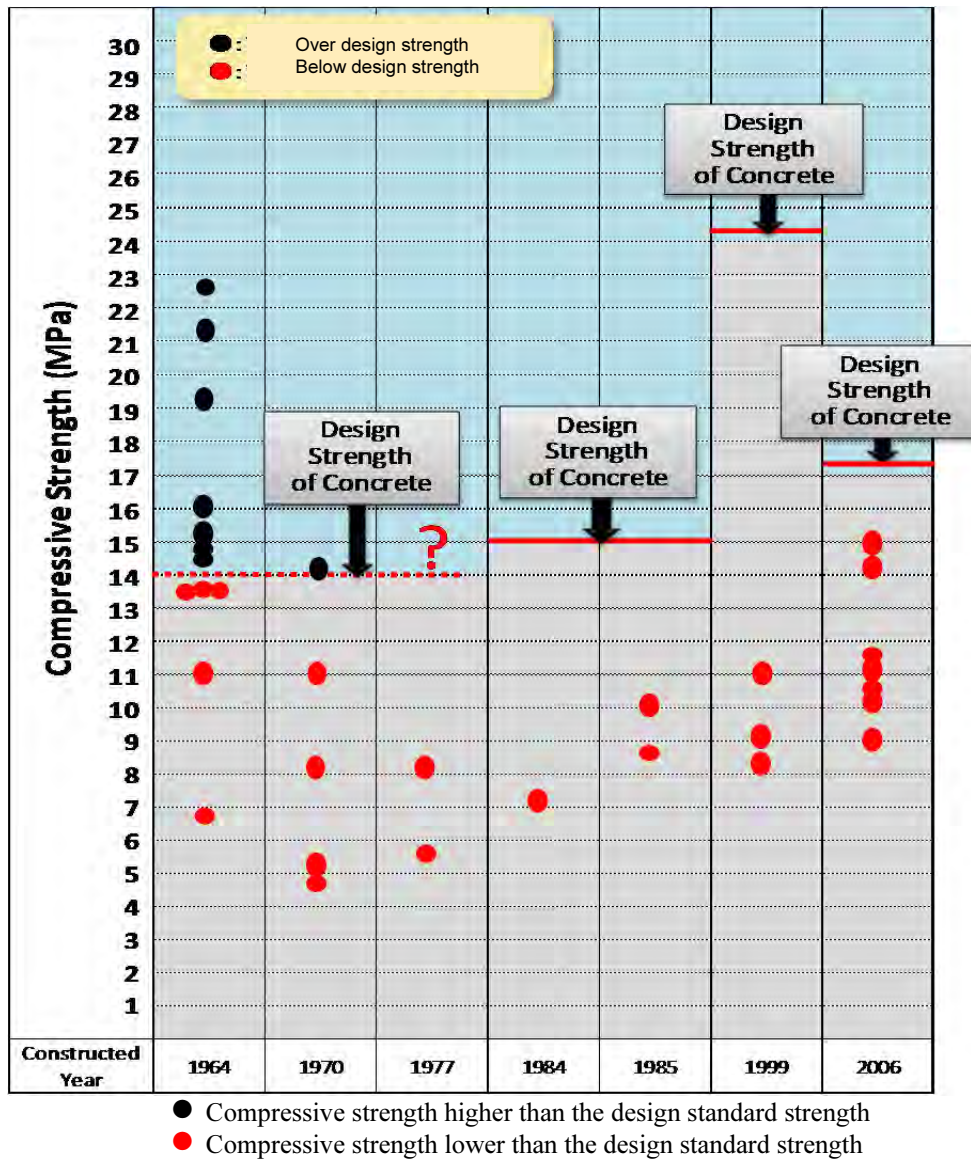


Figure 2.4.6 Design Strength and Actual Strength of Concrete (after (CNCRP))

Another important issue is that most existing buildings have lost their structural drawings. Figure 2.4.7 shows data on drawings of public buildings in Dhaka. This graph shows data on inventory prepared in CNCRP.

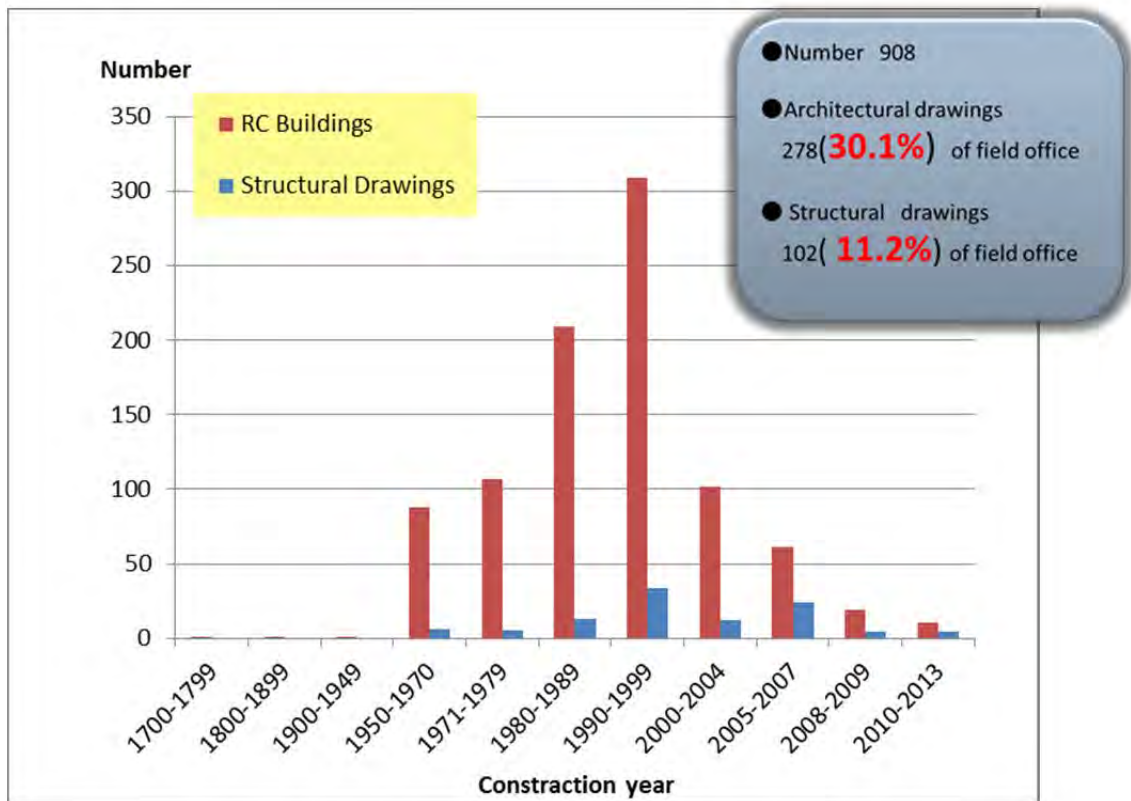


Figure 2.4.7 Number of Existing Reinforced Concrete Structures and Number of Buildings Maintaining Structural Drawings (after CNCRP)

The number of buildings with the preservation of structural drawings confirmed is very small, only 102 (11%) against the total number of buildings of 908. This situation will cause impediments to the dissemination of seismic capacity evaluation in Bangladesh such as inevitable time-consuming and costly investigation and calculation in evaluating the structural safety of existing buildings.

Lastly, the characteristics of structural issues of current buildings in Bangladesh are summarized as below Table 2.4.7 (1) to (3).

Table 2.4.7 (1) Characteristics of structural problems of current Bangladesh (1)



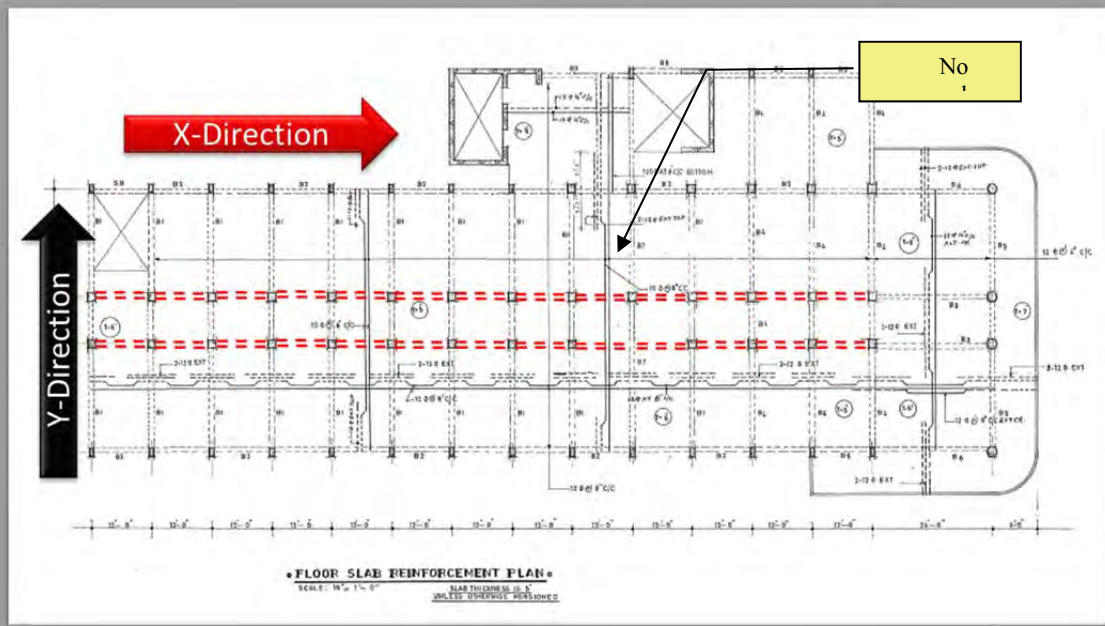
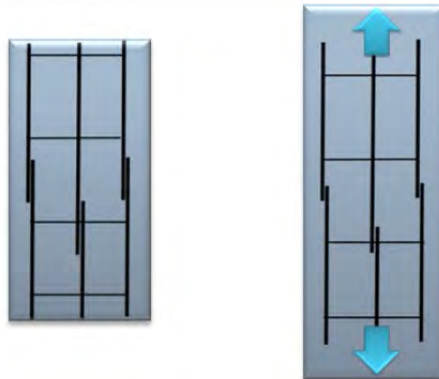
(1) Low-strength concrete See Figure 2.4.6
(2) Loss of existing structural drawing See Figure 2.4.7
(3) Maintenance and repair

(4) Ill-built concrete construction joint


Table 2.4.7 (2) Characteristics of structural problems of current Bangladesh (2)

(5) Single-direction underground beams and beams (seismic capacity is low in the direction without beams)



(6) Shortage of the lap joint length of round steels



(7) Sub reinforcement and stirrup hooked by 90 degrees

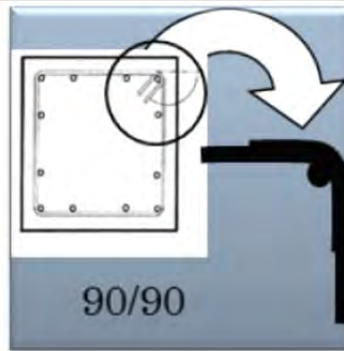
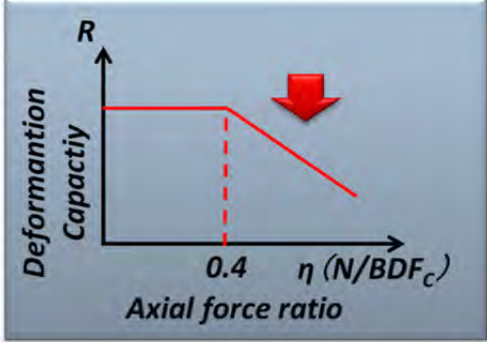
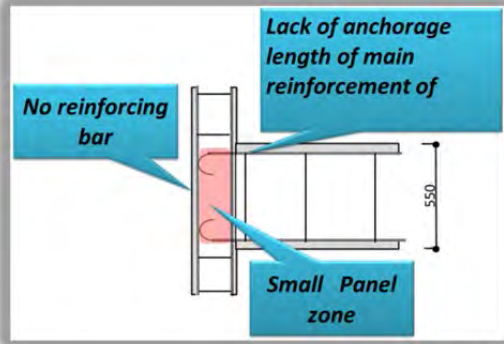
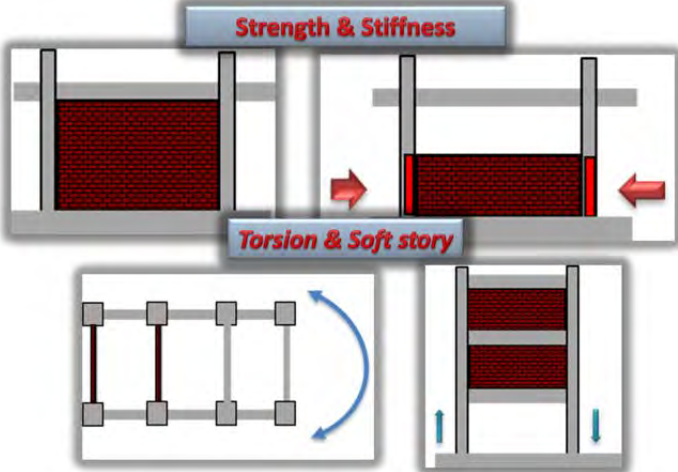



Table 2.4.7 (3) Characteristics of structural problems of current Bangladesh (3)

<p>(8) Deformation performance degradation from higher axial force of column</p>	<p>(9) Ill-built and non-reinforced beam-to-column joint</p>
 <p>The graph plots Deformation Capacity (R) on the y-axis against Axial force ratio (η (N/BDF_c)) on the x-axis. A horizontal line represents constant capacity up to an axial force ratio of 0.4. Beyond this point, the capacity decreases linearly. A red arrow points to this downward-sloping region.</p>	 <p>The diagram shows a cross-section of a beam-to-column joint. Labels indicate 'No reinforcing bar' in the joint region, 'Lack of anchorage length of main reinforcement of Small Panel zone', and a 'Small Panel zone' with a height of 550 units.</p>
<p>(10) Ill handling of the brick wall in the structural frame (eccentricity and adverse effect on the entire building including pilotis and columns)</p>	
 <p>The diagrams illustrate the effects of brick walls. The top part, labeled 'Strength & Stiffness', shows a frame with a brick wall on one side, and a comparison with a frame where the wall is removed, showing reduced strength and stiffness. The bottom part, labeled 'Torsion & Soft story', shows a frame with a brick wall on one side, and a comparison with a frame where the wall is removed, showing increased torsion and a soft story effect.</p>	
<p>(11) Narrow intervals of expansion joints</p>	
 <p>The photograph shows an exterior view of a building with a narrow interval between expansion joints, labeled 'Expansion Joint' and 'Exterior'. The diagram shows an interior view of the same interval, labeled 'Expansion Joint' and 'Interior'.</p>	

2.4.2 Present State and Trend of Seismic Retrofitting in Bangladesh

a) Present state and trend of seismic retrofitting in Bangladesh

Bangladesh has very less experience of seismic retrofitting for public buildings. Therefore, an activity to transfer the Japanese seismic retrofitting technology is under way as a part of the ongoing CNCRP (2011-2015). In association with the activity, seismic retrofitting works of a fire station in Tejgaon is under way as a pilot project by PWD. This is the first public building that undergoes seismic retrofitting works in Bangladesh. Basic information of the seismic retrofitting works is presented in the table below.

Table 2.4.8 Basic Information by PWD

Name	Tejgaon Fire station
Usage	Fire station
Occupancy type	IV by New BNBC
Year of construction	1963
Stories	2
Building area	259m ² per floor
Structure type	Mixed type with brick masonry at both side and RC frame at middle part

Calculation sheets of seismic evaluation and retrofitting design showed the fact that they were performed based on the seismic evaluation standard of Japan with the strength and ductility of existing brick walls taken into consideration. Since the failure point of building was thought as the failure point of shear failure of brick-walls, the seismic evaluation is $F=0.8$ (story deformation angle=1/500). As a result, Seismic Index of Structure is calculated as $I_s=0.23$ (longitudinal direction), $I_s=0.21$ (transverse direction), which was below Seismic Demand Index of Structure $I_{S0}=0.45$ (I_{S0} was proposed in CNCRP). Then, it was determined that the seismic retrofitting was required for the building. The principle of retrofitting design is decided using the strength improvement type as Figure 2.4.8.

According to the seismic retrofitting design, the Seismic Index of Structure I_s is provided as 0.54 (longitudinal direction) and 0.62 (transverse direction) respectively and they satisfied $I_{S0} < I_s$.

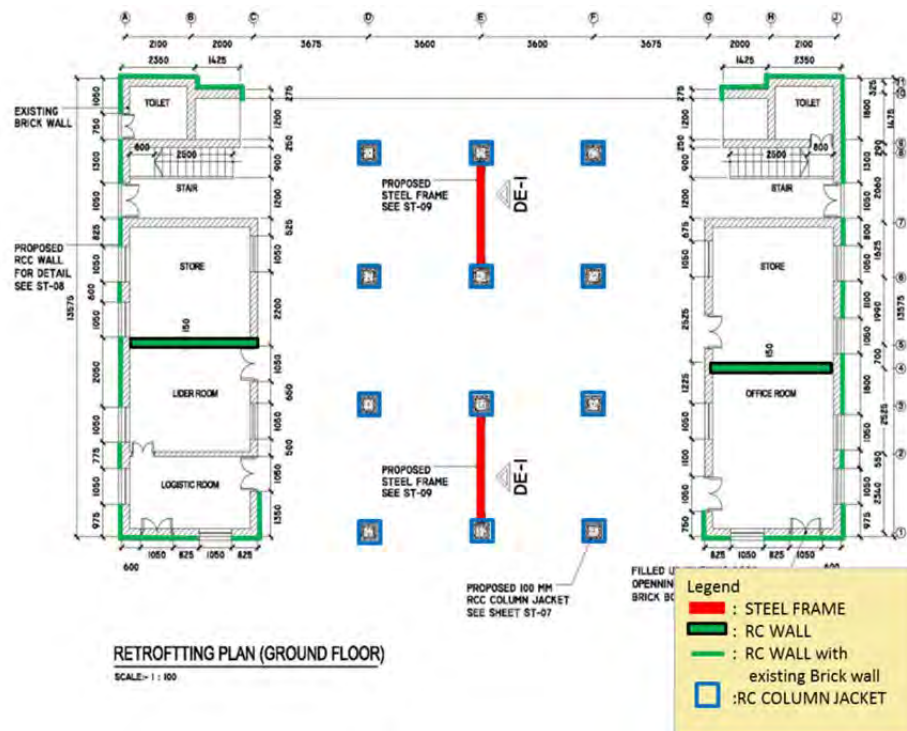


Figure 2.4.8 First Floor Plan View for Seismic Retrofitting (CNCRP)

After seismic retrofitting design, construction plan was established and around 6 months schedule were estimated as shown in Figure 2.4.9. And various scenes for before, during and after construction are shown in Figure 2.4.10.

Work Schedule of Retrofitting work of Fire Service & Civil Defense Station at Taigaon work CNCRP.

Sl.	Item Description	Days																	
		14-Jun			14-Jul			14-Aug			14-Sep			14-Oct			14-Nov		
		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1	Mobilization of Materials & prepare of site office	█																	
2	Column retrofitting work (ground & 1st floor)																		
3	Shear wall & Installation of steel members																		
4	RCC Partition wall at ground floor																		
5	RCC Lamination work of ground & 1st floor																		
6	Brick wall & plaster work at 1st floor																		
7	RCC Partition wall at 1st floor																		
8	Outer side drainage work																		
9	Lime terracing work at slab																		
10	Electric work																		
11	Sanitary & water supply work																		
12	Tiles work at 1st floor																		
13	S.S railing work at 1st floor & stair																		
14	Painting work																		

Figure 2.4.9 Work Schedule of Retrofitting Work (PWD)



Before retrofit



Before retrofit



Recent construction site



Recent construction site



Steel frame



New RC wall



Existing brick wall



RC wall with existing brick wall



RC column jacket



RC column jacket

Figure 2.4.10 Seismic Retrofitting Scene (PWD)

b) Current condition of fire stations in Dhaka

A simple survey to grasp the structure condition such as visual screening survey and drawing survey was performed for the earthquake resistance of the buildings of fire stations in Dhaka. They are managed by the Department of Fire Service and Civil Defence (FSCD), which is expected as a base for emergency response during disasters as the organization leading disaster management.

1) Target buildings

This survey targeted 17 fire stations and relating training center buildings in Dhaka. The distribution of them is shown in Figure 2.4.11.

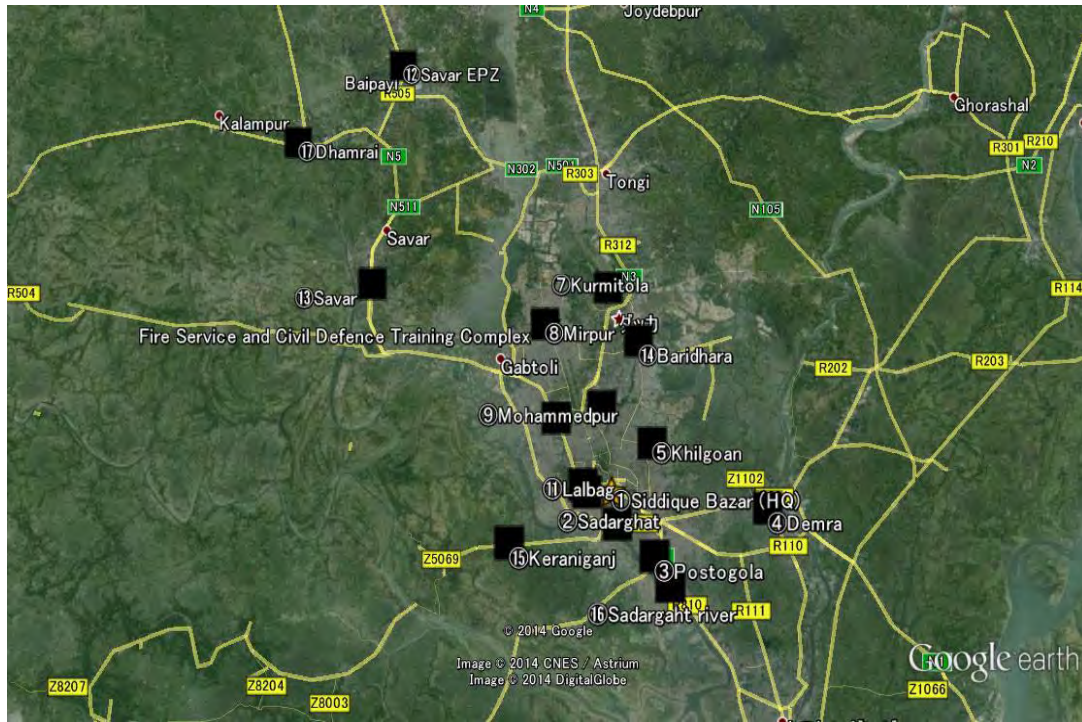


Figure 2.4.11 Locations of the Buildings Targeted for Survey

2) Simple Survey method

The simple survey methods and criteria used are as follows;

(Methods)

- (1) Collection of the drawings of the target buildings
- (2) Simple survey (visual screening survey) of the target buildings
- (3) Survey whether the buildings were designed in accordance with BNBC, based on the collected drawings

(Criteria)

- Constructed year (before or after 1993)
- Mixed structure of RC and brick wall (Mixed structure is not mentioned in BNBC)
- Column spacing is following BNBC_or not. (BNBC: Section 8.3.5.4 Transverse Reinforcement b) Transverse reinforcement shall not be spaced more than one-quarter of minimum member dimension nor 100mm)

3) Simple Survey results

The following Table 2.4.9 (1) and (2) summarized the simple survey results.

Table 2.4.9 (1) Summary of Simple Survey Result (1)


















No.	Building Nama	Constriction Year	Recent Pictures	Drawings	Ageing	Adaptaion of BNBC	Cheked Items			Investigation date	Note
							Construction year	Combination structre	Tie spacing		
1	Siddique Bazar (HQ)	1978		●	40	×	×	●	Not shown	14-Aug-14	
2	Sadarghat	1961		●	53	×	×	●	@8"	14-Aug-14	This location has a problem as a disaster prevention base.
3	Postogola	1963		●	50	×	×	×	@10"	14-Aug-14	
4	Demra	1983		●	31	×	×	×	@10"	17-Aug-14	
5	Khilgoan	2014		▲	0	×	●	●	@4-8"	17-Aug-14	
6	Teigoan	1965		●	49	×	×	×	@10"	-	Seismic retrofitting has been done on this building.
7	Kurmitola	1980		●	34	×	×	×	@10"	18-Aug-14	
8	Mirpur	1967		●	49	×	×	×	@9"	13-Aug-14	
9	Mohammedpur	1963		●	51	×	×	×	@8"	16-Aug-14	

Table 2.4.9 (2) Summary of Simple Survey Result (2)

No.	Building Nama	Construction Year	Recent Pictures	Drawings	Ageing	Adaptation of BNBC	Checked Items			Investigation date	Note
							Construction year	Combination structure	Tie spacing		
10	Polasshi Barak	1947		×	67	×	×	×	-	16-Aug-14	The severe deterioration situation
11	Lalbag	2001		●	13	×	●	×	@10"	16-Aug-14	This location has a problem as a disaster prevention base.
12	Savar EPZ	1997		●	17	×	●	●	@8"	13-Aug-14	
13	Savar	2004		×	10	▲	●	▲	-	13-Aug-14	Lack of seismic capacity
14	Baridhara	2004		▲	10	×	●	×	@10"	17-Aug-14	Lack of seismic capacity
15	Keraniganj	2004		▲	10	×	●	●	@10"	14-Aug-14	
16	Sadargaht river	-		-	-	-	-	-	-	14-Aug-14	In the earthquake disaster, the use of the waterway by ship as a transportation vehicle is
17	Dhamrai	2010		▲	4	×	●	●	@4-8"	16-Aug-14	
-	Training Complex Mirupur	1980		×	34	×	×	●	-	13-Aug-14	
-	Barack Building	1983 (2008)		×	31	×	×	●	-	13-Aug-14	

Investigation results showed that most of all these buildings have not complied with the BNBC standards. The details of above preliminary field survey sheets for fire station buildings are shown in the Appendix 4.

2.4.3 State of Seismic Capacity Evaluation and Seismic Retrofitting in Dhaka

a) Seismic capacity evaluation state in Dhaka

During CNCRP (2011-2015) including RMG (Ready-Made Garment) Sector Safe Working Environment Program (ongoing from 2013), a seismic capacity evaluation of private RMG factories in and around areas of Dhaka was conducted.

This section discusses the seismic capacity of the private RMG Sector factory buildings in and around Dhaka with the seismic capacity evaluation results shown below.

1) Target buildings for Evaluation

The earthquake resistance was inspected for 48 buildings in total of the existing RMG factories in and around Dhaka by a seismic capacity evaluation.

2) Seismic capacity evaluation method

(1) The required earthquake resistance was determined in the following two procedures.

i) Seismic capacity: Compare the seismic capacity of the buildings with the seismic capacity required by the Bangladesh National Building Code (BNBC, 2006).

ii) Gravity (vertical) direction performance: Investigate the stress level of the vertical structural member (column) to the vertical dead load.

(2) The “Simplified Evaluation” method was developed for the evaluation of seismic resistance. The Japanese earthquake resistance evaluation technique was applied to the BNBC that conforms to the U.S. and Western seismic design code.

(3) The earthquake resistance was evaluated based on the structural drawings without performing a field survey for materials and so on.

3) Seismic capacity evaluation results

The results of the seismic capacity evaluation are shown in Figures 2.4.12 to 2.4.19. The terms used in the figures are as described below.

IBS: An earthquake resistance index obtained from the result of the seismic capacity evaluation

IBSO: The earthquake resistance index required by BNBC (the target earthquake resistance index of the buildings around Dhaka is around 0.4).

IBD: The axial stress ratio (compression stress of column and concrete strength under dead load)

IBD1: 0.4 (axial stress ratio: TLV-1) (TLV: Threshold Limit Value)

IBD2: 0.7 (axial stress ratio: TLV-2)

(1) IBS-IBSO Relations (Figure 2.4.12) and IBS/IBSO-Number of Building Relations (Figure 2.4.13)

Two dashed lines, $IBS=IBSO$ and $IBS=0.5*IBSO$, are shown in Figure 2.4.12. The figure shows that the IBS (Evaluated Seismic Capacity) relative to the target earthquake resistance of the buildings around Dhaka scatters in the range from 0.1 to 0.9. The buildings with IBSs above the ISBO, which satisfy the target earthquake resistance, represent approximately 25% of all the buildings. Approximately 75% of the buildings do not satisfy the target earthquake resistance with approximately 10% of them having IBSs lower than the half of the ISBO.

(2) IBS/IBSO-Approved Year Relations (Figure 2.4.14)

The construction year of the buildings ranges from 1989 to 2013. The BNBC was firstly enacted in 1993 and revised in 2006. This figure shows that approximately 25% of the buildings satisfies the earthquake resistance IBSO required by the BNBC standard. The buildings not satisfying the required earthquake resistance are observed over the years targeted for the survey regardless of the approved year, and the buildings do not satisfy it even in recent years when the standard was enforced.

(3) IBD/IBD1-Number of Building Relations (Figure 2.4.15)

This figure evaluates the ratio of buildings with constant weight load applied to the column. The target value 0.4 is obtained by dividing the axial stress of the column by the concrete strength. This target value was set at 0.4 in conformity to the Japanese seismic design and seismic capacity evaluation that set 0.4 as a boundary value to be dangerous. The figure shows that the ratio of IBDs to the IBD1 ranges from 0.2 to 2.0 with approximately 38% above 0.4.

(4) IBD/IBD1-Story Relations (Figure 2.4.16)

The number of stories of the surveyed buildings ranges from two to 13 and the largest number of the buildings are five-storied and six-storied. In terms of the relationship between IBD/IBD1 and the number of building stories, as the number of stories increases, the ratio of the degree of the column stress risk under the constant load increases. The figure also shows that approximately 40% of the buildings exceed the boundary value to the danger 0.4.

(5) IBD/IBD2-Number of Building Relations (Figure 2.4.17)

This figure shows the stress level of the column under the constant load similarly as Figure 2.4.15 but is different in that 0.7 is adopted as the TLV (IBD2) to danger. This value 0.7 shows that the compression stress of the column has reached 70% of F_c (concrete strength) and was defined as an extremely critical stress state of concrete near collapsing. The figure shows that only two buildings exceed TLV 0.7.

(6) BD/IBD2-Story Relations (Figure 2.4.18)

While six-storied to 13-storied buildings are under high axial stress in average, only one six-storied building and one 13-storied building exceed TLV 0.7.

(7) IBS/IBSO-IBD/IBD1 Relations (Figure 2.4.19)

This figure shows the earthquake resistance index and the constant load index. There is a correlation between the two indices and the higher the earthquake resistance, the higher the safety against the constant load, and the lower the earthquake resistance, the lower the safety against the gravity load. While approximately 25% of the buildings are high both in the earthquake resistance and the safety against the constant load, approximately 38% of the buildings are low in both indices.

4) Summary

The evaluation results of the targeted 48 Ready-Made Garment factories are summarized as below.

(1) The buildings satisfying the earthquake resistance conformable to the BNBC standard represent approximately 25% of all the buildings. The buildings not satisfying the required earthquake resistance represent approximately 75%, with approximately 10% of them having an earthquake resistance below the half of the ISBO.

(2) Buildings with a low safety against the gravity load corresponding to the dangerous axial force ratio of 0.4 conformable to the quake-resistance standard of Japan represent approximately 38%. On the other hand, only two buildings have a low safety against the gravity load corresponding to the threshold axial force ratio of 0.7.

(3) The buildings, which are high both in the high earthquake resistance and the safety against the gravity load (dangerous axial force ratio of 0.4), represent approximately 25% of all the buildings, whereas the buildings, which are low in both criteria, represent approximately 38%.

(4) However, this earthquake resistance evaluation result is based on only structural drawings. In order to obtain more detailed result, a field survey needs to be performed for materials such as structural members and concrete strength to reflect the survey results in the evaluations.

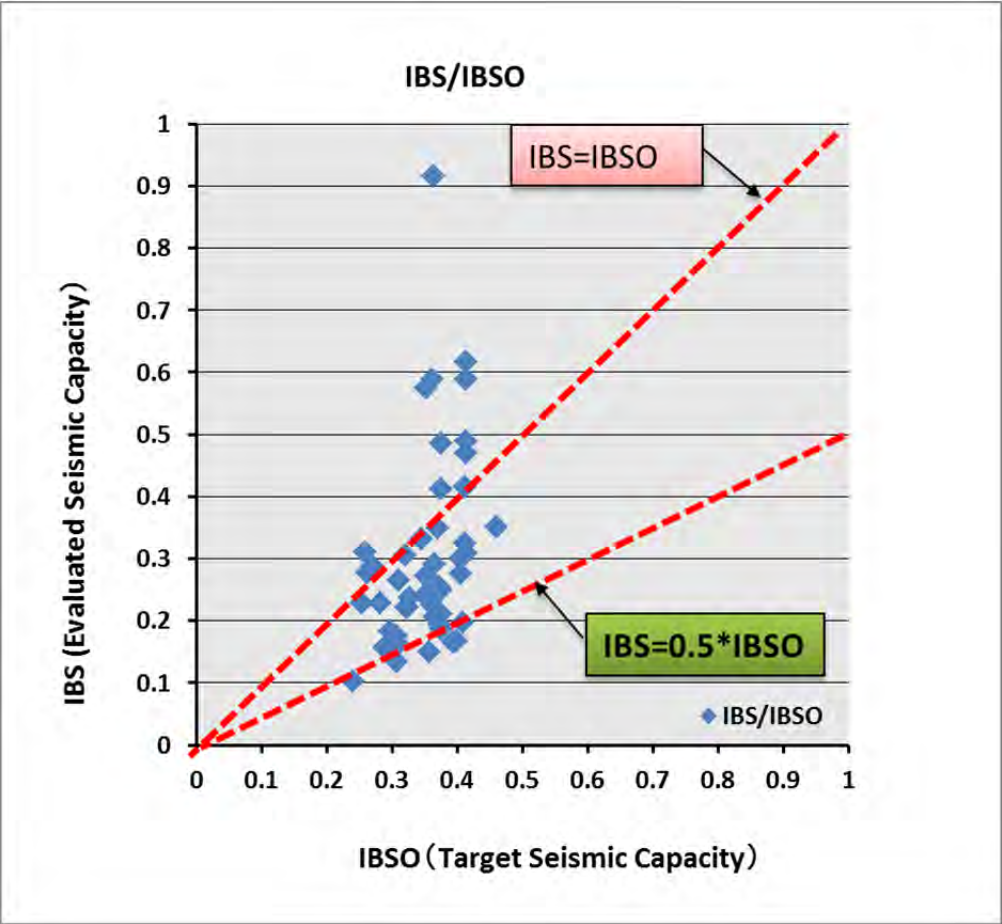


Figure 2.4.12 IBS – IBSO Relations (CNCRP)

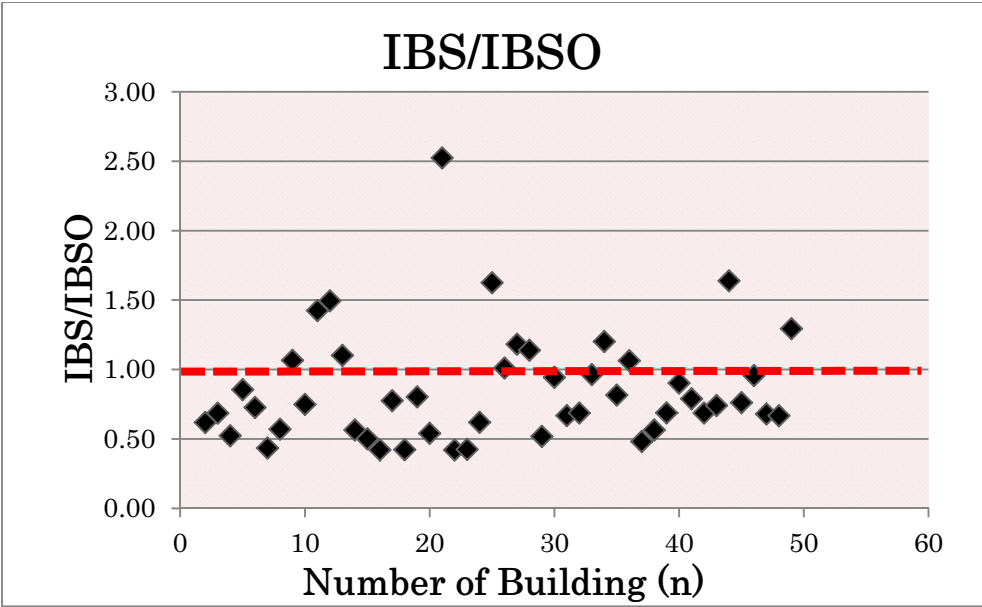


Figure 2.4.13 IBS/IBSO – Number of Building Relations (CNCRP)

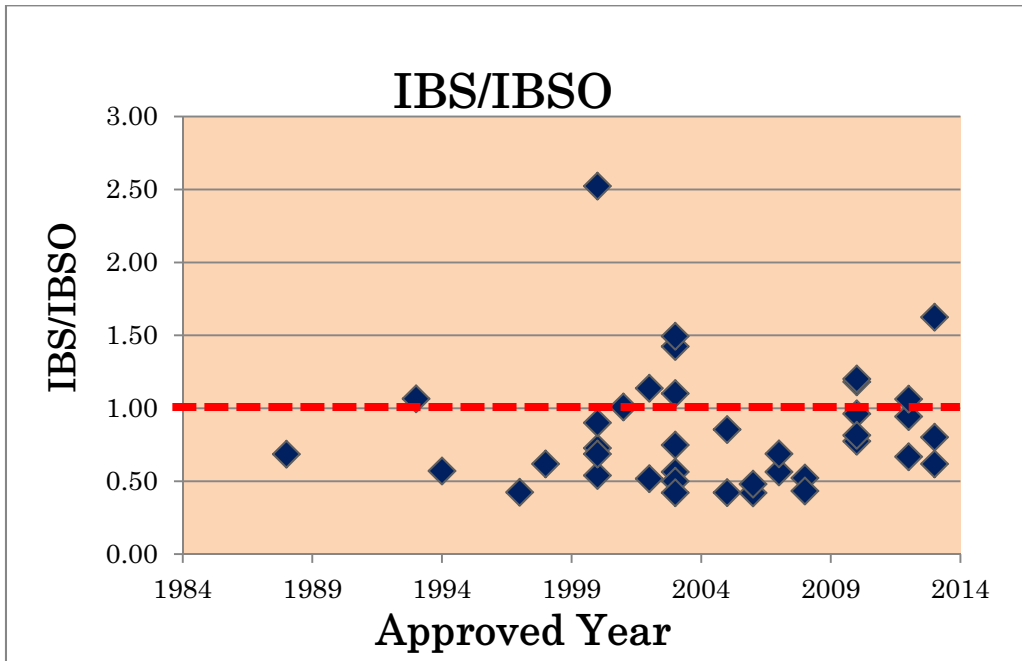


Figure 2.4.14 IBS/IBSO – Approved Year Relations (CNCRP)

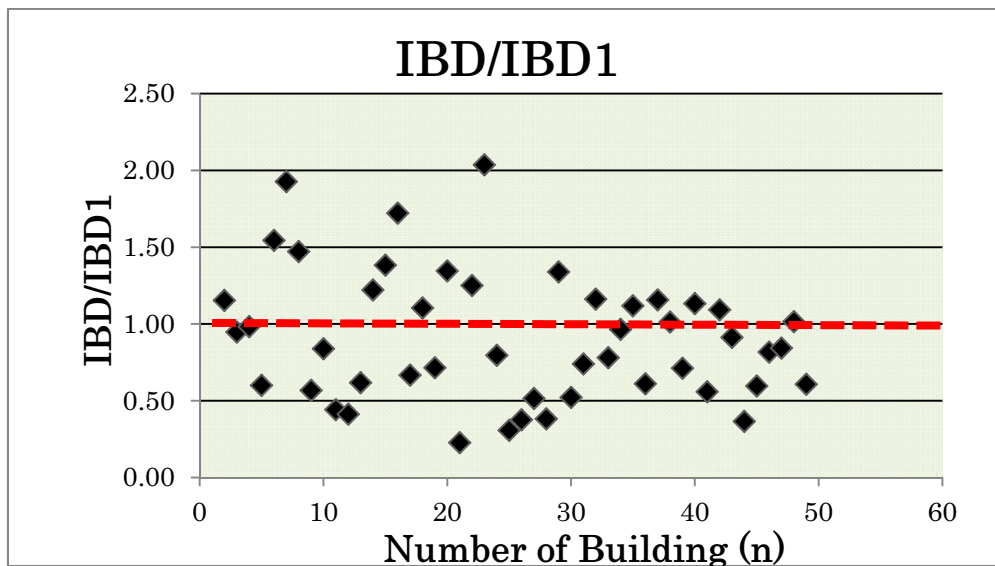


Figure 2.4.15 IBD/IBD1 – Number of Building Relations (CNCRP)

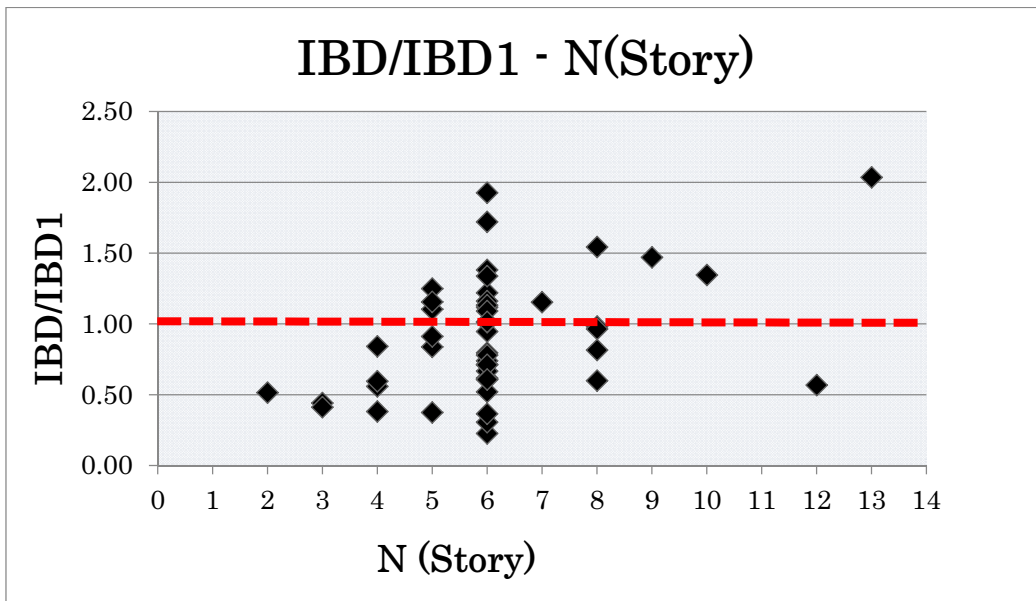


Figure 2.4.16 IBD/IBD1 – Story Relations (CNCRP)

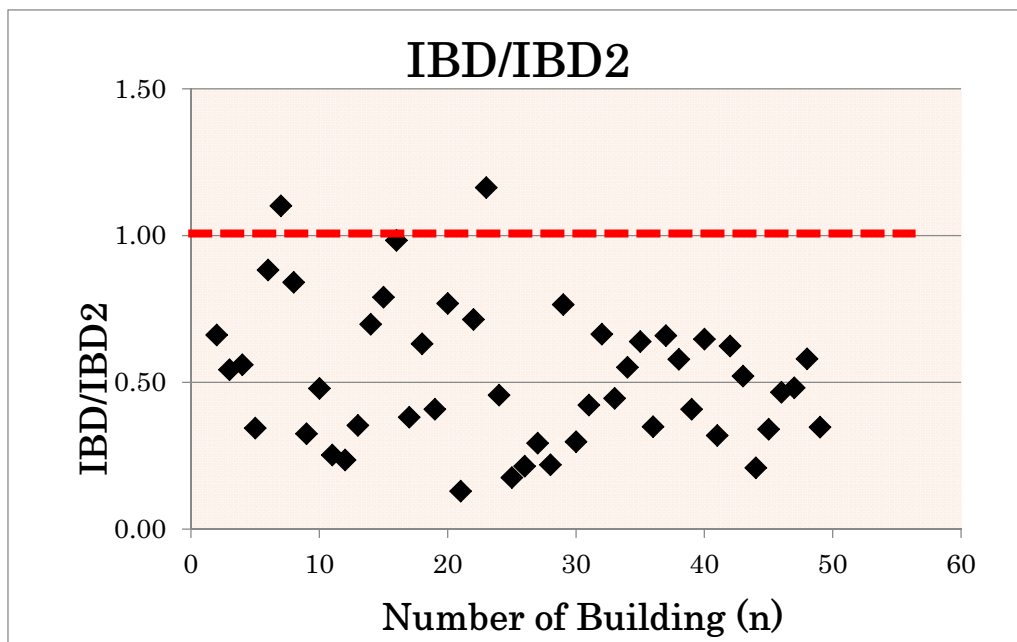


Figure 2.4.17 IBD /IBD2 – Number of Building Relations (CNCRP)

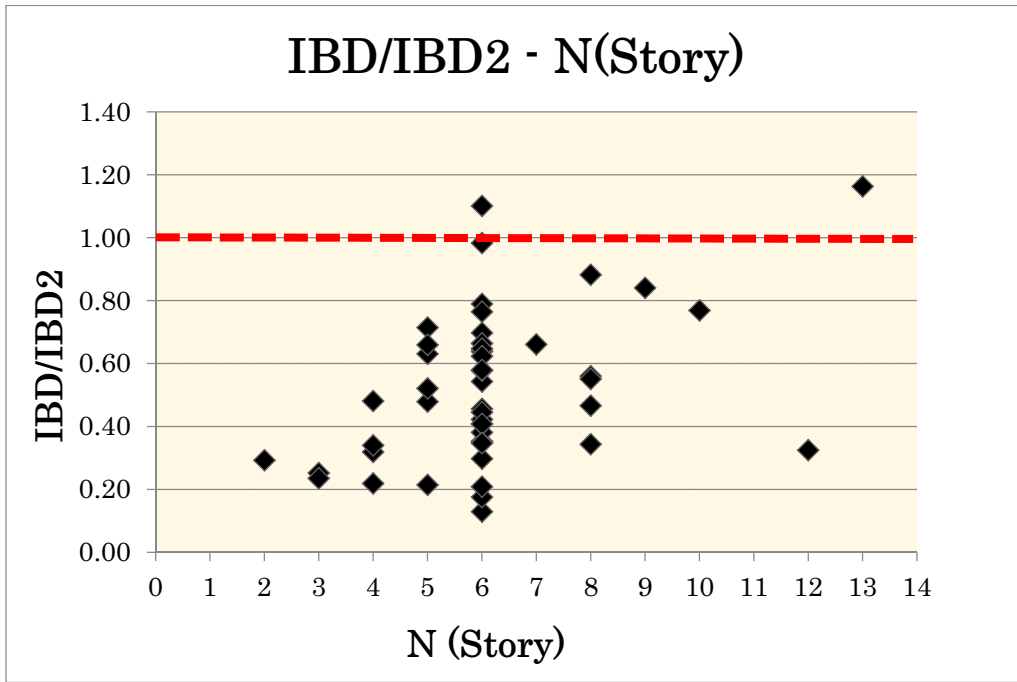


Figure 2.4.18 IBD/IBD2 – Story Relations (CNCRP)

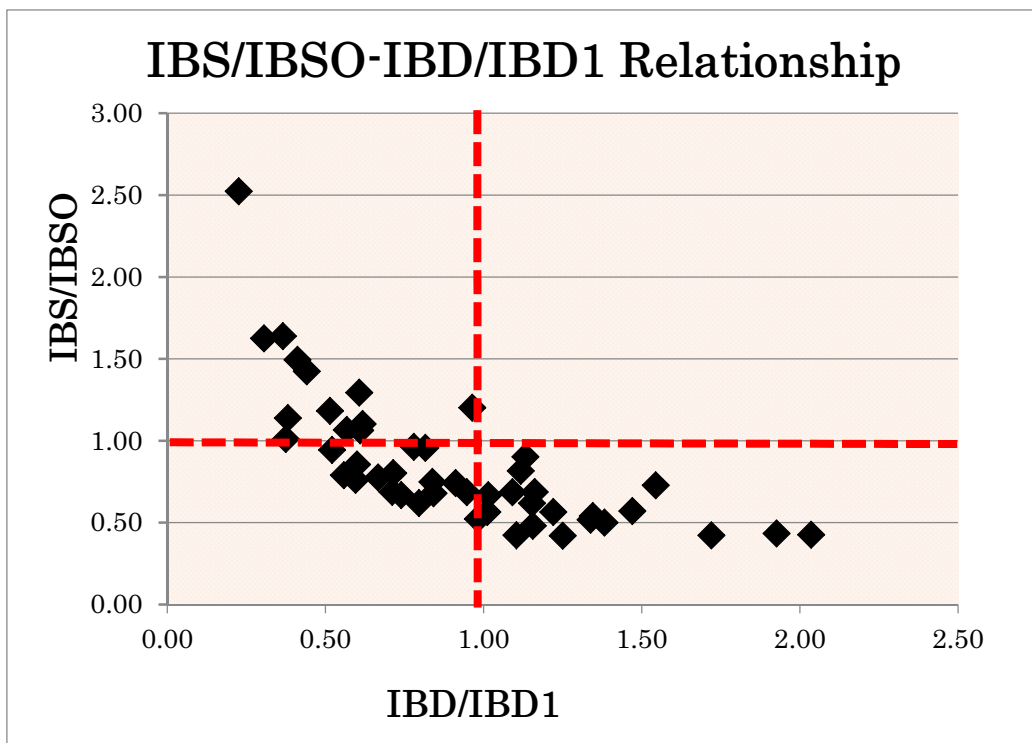


Figure 2.4.19 IBS/IBSO – IBD/IBD1 Relations (CNCRP)

b) Seismic retrofitting status in Dhaka

The project team of on-going RMG program in CNCRP has recruited contractors, who showed interests about the seismic retrofitting and fire safety works. Out of the twenty-two applicants, seven companies were above the standard criteria, and only one company had some experiences of seismic retrofitting. CNCRP interviewed three of those companies for the purpose of understanding the status of retrofitting works in Dhaka. Information received using questions and answers are shown below.

Table 2.4.10 Questions and Answers of Retrofitting Works

Company	A	B	C
How long have you been involved in retrofit works? When was the first construction for you?	1 year 2014	1 year 2014	13 years 2002 till now
What was the purpose of the retrofit work?	Vertical Load	Vertical Load	Vertical Load Seismic Load Vertical extension.
Which was the building standard used for the retrofit work?	Unknown	BNBC	BNBC ACI
What kind of construction methods did you use?	Steel beam support	Column jacketing	Steel frame Column jacketing
Which is any other construction methods that you know?	No	No	Yes
Are there any demands for retrofit works at present?	Yes	No	Yes
Are you aware of the estimated number of on-going retrofit works in Dhaka?	1	Unknown	1
Do you think that buildings in Dhaka need to be retrofit?	Yes	Yes	Yes
Do you think that the number of retrofit work in Dhaka will increase in the future?	Yes	Yes	Yes

The findings from the interview are also noted below.

- Most cases of retrofitting works are reinforcement works against the vertical load that are done based on BNBC, and not the reinforcement against the seismic load.
- Only one of those three companies had performed the seismic retrofit in 2004.
- It was done at the request of a foreign company.
- Reinforcement with steels and jacketing of columns using concrete were performed (see the figures and photos below) .
- It is easy to guess from the picture the insufficient quality management of the construction.
For examples;

- 1) Inappropriate shear reinforcement spacing of overlapping joints of the main reinforcement
- 2) non-uniformity in hook shape and extra length of shear reinforcement of each column
- 3) Inappropriate reinforcement of additional portion of column
- 4) Inadequate spacing of anchor for main reinforcement
- 5) Unfixed shear reinforcement
- 6) Barefoot and no helmet from safety management point of view

From the interview of the construction companies, it is clear that the seismic retrofitting has not yet been performed so far. The development of the country in the future will attract the foreign companies, which will lead the demand growth of seismic retrofitting. Therefore, to improve the seismic retrofit technique and construction management are essential for Bangladesh.

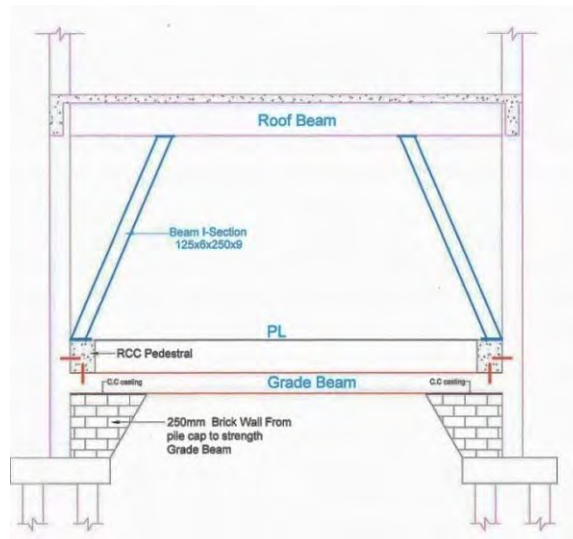
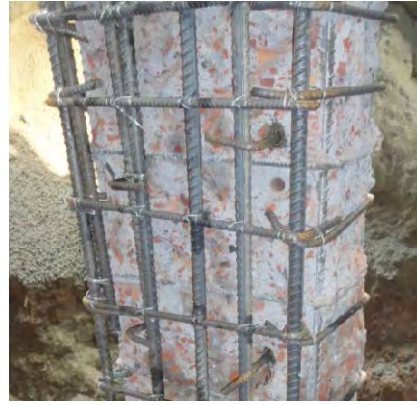


Figure 2.4.20 Retrofit for beam with steel support (Reference)

SL	Existing column	After chipping
C-1	<p>Existing column C1 Existing column size-12x25"</p>	<p>Chipping column C1 Chipping column size-9x22"</p> <ul style="list-style-type: none"> 20-25mm existing main bar Additional steel in 12mm dia @ 419/34" c/c Apply bonding agent with ribbed EP

SL	Column jacketing	Section
C-1	<p>Column-Section a-a Proposed column size-15x25"</p> <ul style="list-style-type: none"> Remove the steel reinforcement with 15" offset Remove the main bar Epoxy coating for bonding After chipping concrete size 9"x22" New concrete with non-shrink micro concrete 	<p>Section x1-x1</p> <ul style="list-style-type: none"> 1" dia core for pouring micro concrete Anchoring with Loke-B (25mm hole) 8-20mm dia main bar Epoxy coating for bonding New concrete with non-shrink micro concrete

Figure 2.4.21 RC Column Jacketing (Reference)



RC column jacketing (Reference)



RC column jacketing (Reference)



Casting concrete for RC column jacketing (Reference)

Figure 2.4.22 Retrofitting Scene (Reference)

2.5 Fire Safety in Bangladesh

2.5.1 Fire safety related institutions

a) Background and Introduction

FSCD is a service oriented organization under the Ministry of Home Affairs. It was created in 1982, putting three departments together, namely Fire Service, Civil Defence and Rescue. FSCD is one of the main first responder organizations in Bangladesh. It is sole responsibility of FSCD to better prepare for any kind of disaster in the country.

At present FSCD has a total 273 Fire Stations all over the country and if present development activities go well, by 2016 the total number of stations would be 589. In terms of manpower, FSCD has a total manpower of about 7,800. Of which, the number of warehouse inspectors are 265, PEER graduates are 145, Medical first responder inspector are 74, Collapsed structure search and rescue inspector are 73, rest are different categories including fire fighters. The number of total workforce of FSCD will be increased to about 16,000 by the end of 2016. The existing organogram of FSCD is presented below

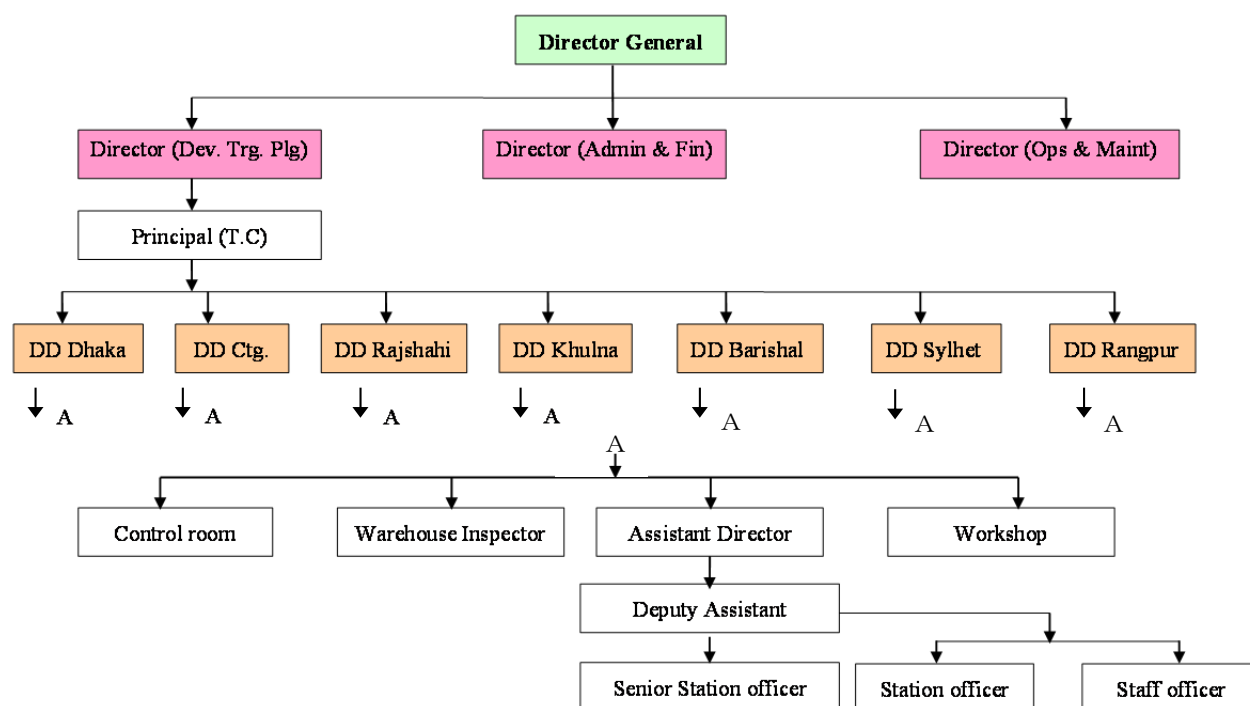


Figure 2.5.1 FSCD's Existing Organogram

b) Core Responsibilities of FSCD

The core responsibilities of FSCD are, as the first responder during disasters, not only firefighting, rescue, first aid but also training. Its breakdown is shown as the followings;

Table 2.5.1 Core responsibilities of FSCD

1	To control all types of fires at 24/7 days
2	To carry out rescue from compartment fire and collapsed structures
3	To provide transportation for casualties and sick persons to the hospitals
4	To provide advice on fire prevention and fire protection measures for buildings, industrial and commercial installations

5	To issue/renew fire license for any industry/warehouse/factory
6	To issue clearance certificate on fire safety measures of high rise buildings
7	To provide training to volunteers, factory workers/employees/schools/colony residents/media/government/NGOs/urban volunteers/slum/garments and so on
8	To maintain liaison with the International Fire Fighting and Civil Defence Organizations and to represent Bangladesh in International conferences/seminars in the field of firefighting and civil defence.

c) Strength of FSCD

The strength of FSCD is as the followings;

Table 2.5.2 Strength of FSCD

1	- Committed and dedicated personnel
2	- Updated rules and regulations
3	- Highest acceptance by the by people
4	- Professional training complex

d) Weaknesses of FSCD

The weaknesses of FSCD are as the followings;

Table 2.5.3 Weakness of FSCD

1	- Limited capacity for managing large scale and severe disaster
2	- Shortage of modern equipment
3	- Absence of well-equipped rescue unit
4	- Inadequate access to modern technology
5	- Inadequate civil defence measures
6	- Inadequate training in dealing with chemical fire
7	- Absence of a well-equipped rescue unit (collapsed buildings/water incidents)
8	- Delay in implementation of development projects

e) Annual budget of FSCD

Every year FSCD prepares a budget and submits it to the ministry, after an evaluation the money is allocated for that fiscal year. Budget for the 2013 - 14 fiscal year is 1,572,071,000 BDT.

f) Status and division wise distribution of Fire Stations

FSCD has classification criteria for the stations. There are three (3) classes of stations, namely Class “A”, Class “B and Class “C”. They are classified on the basis of manpower and equipment available at the station:

Class “A”: Five vehicle and 35 manpower, Class “B”: Three vehicle and 27 manpower, Class “C”: Two vehicle and 17 manpower. There are 9 stations located on floating pontoons and are not classified. Division wise total number of stations is tabulated below. As of 2013, there are 52 class A, 144 Class B and 68 Class C and 9 river stations in BD.

Table 2.5.4 Class of Fire Stations

<u>Division</u>	<u>Class A</u>	<u>Class B</u>	<u>Class C</u>	<u>River</u>	<u>Total</u>
Dhaka	19	33	22	5	79
Chittagong	18	23	15	2	58
Rajshahi	3	22	7	-	32
Khulna	5	24	5	1	35
Barisal	2	16	6	1	25
Sylhet	1	11	3	-	15
Rangpur	4	15	10	-	29
Total	52	144	68	9	273

g) Summary of Fire Statistics**1) Number of incidents**

The yearly statistics show that numbers of fire incidents all over the country are in increasing trend. Statistics of fires in country and sector wise financial damages of recent years along with fire incidents in Dhaka are presented below.

Table 2.5.5 Fire incidents types

<u>Year</u>	<u>Incidents (Total)</u>	<u>(Industrial)</u>		<u>(Residential)</u>		<u>(RMG factories)</u>	
		<u>Fire</u>	<u>Loss (BDT)</u>	<u>Fire</u>	<u>Loss (BDT)</u>	<u>Fire</u>	<u>Loss (BDT)</u>
2010	15,815	1,583	738,721,620	8,501	1,074,154,102	220	745,389,418
2011	17,504	2148	119,887,090	8,158	857,867,302	234	166,985,732
2012	17,912	990	1,560,224,525	8,317	596,645,882	257	980,038,670

Table 2.5.6 Breakdown of loss due to fire

No.	Year	Number of fire incidents		Loss of buildings		Loss of Human lives		Amount of Loss (in Lakh BDT)	
		Dhaka area	whole Bangladesh	Dhaka area	whole Bangladesh	Dhaka area	whole Bangladesh	Dhaka area	whole Bangladesh
0	2013-2014 (up to 26.9.2014)	1,826	6,318	1,708	6,182	34	60	82.91	187.81
1	2012-2013	5,286	17,912	1,802	8,629	41	162	453.87	779.72
2	2011-2012	4,981	17,504	1,845	8,317	133	210	280.25	482.4
3	2010-2011	3,998	15,815	1,804	8,158	79	365	117.72	293.49
4	2009-2010	4,333	14,682	2,203	8,501	126	182	170.07	325.66
5	2008-2009	3,577	12,182	1,870	8,730	45	120	195.15	305.9
6	2007-2008	2,912	9,310	2,801	5,465	135	233	128.42	230.94
7	2006-2007	2,867	9,196	1,444	6,914	21	160	207.16	309.24
8	2005-2006	2,853	9,542	2,222	7,069	25	92	145.21	238.76
9	2004-2005	2,279	5,475	1,602	5,679	-	49	104.91	272.97

Source: FSCD

2) Main causes of fire

There are various reasons that cause fires. However, main causes of fires are electrical-short-circuit, kitchen and cigarette. Statistics show that 55% shares by electrical short-circuits, 15% by kitchen fire and 8% fires originated from Cigarettes.

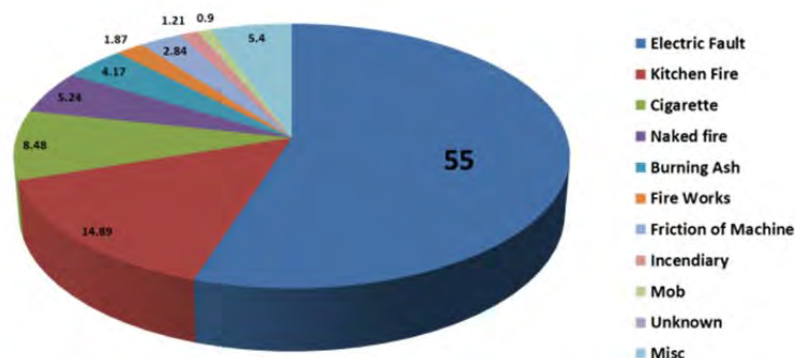


Figure 2.5.2 Main causes of fire

h) Recent mention worthy fire and incidents of building collapse;

Table 2.5.7 Recent remarkable fires in Bangladesh

SI #	Year	Factory/building	Death	Reason	Loss (MBDT)
1	11/04/2005	Spectrum Building Collapse	46		NA
2	13/03/2009	Basundhara City Fire	7	Electrical	516
2	25/02/2010	Garib and Garib Co.	21		NA
3	14/12/2010	Hamim Group Fire	26		NA
4	24/11/2012	Tazreen Fashion Fire	111	Arson	635
5	26/01/2013	Smart Exports Garments Fire	7		NA
6	24/04/2013	Rana Plaza Collapse	1,130	Fault construction, Over loading	Over 1,000

i) Rana Plaza building collapse effects

Physical damage due to Rana Plaza incident is shown below. There were 5 garments factories in the Rana Plaza building. During the rescue operation, in some cases, it was found that some victims took shelter under the hard table of sewing machine of garments factories and were able to survive by preventing the direct impact of falling loads. Some other victims also have survived by staying in the void place under the collapsed building.

The figure below shows changes in the number of people rescued from the collapsed Rana Plaza building and the number of bodies retrieved over time. The 72 hours (3 days) after the disaster is called the “golden 72 hours”, and more than 2,400 people were rescued in this most important time zone. During the subsequent 3 days, more than 1,100 bodies were recovered. The fire department made such a big contribution to rescuing people.

Table 2.5.8 Physical damage of Rana Plaza incident

	Physical Damage
(i)	8 storied high rise building
(ii)	Machineries, raw goods, finished goods, Furniture and Accessories of 5 Garments Factories
(iii)	157 shops with goods
(iv)	One commercial bank
(v)	Cars in basements
(vi)	Adjacent one 3 storied building
(vii)	1130 death and 2500 injuries

Table 2.5.9 Rescue operation of Rana Plaza building Collapse

Date	Live rescued	Dead body	Remarks
24.04.2013	1276	0	Rescued within 24 hours
25.04.2013	1018	25	Rescued within 48 hours
26.04.2013	144	51	Rescued within 72 hours
27.04.2013	16	210	
28.04.2013	2	514	
29.04.2013	1	327	
10.5.2013	0	1	
Total	2458	1127	

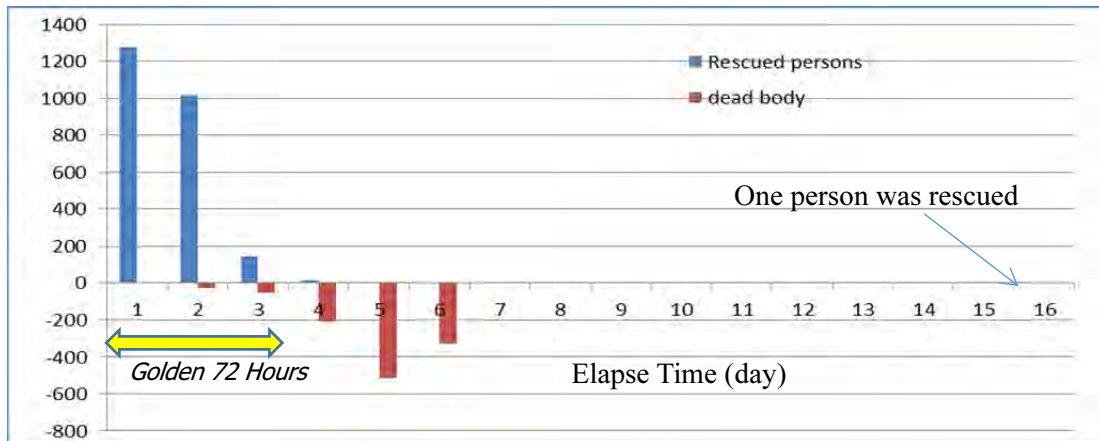


Figure 2.5.3 Days after Rana Plaza accident (number of people rescued (blue) and recovered dead (red))

j) Fire stations in Dhaka

Description of Fire Stations in Dhaka is shown below. To classify the fire stations in terms of their strength it is very difficult without performing any tests and very careful site visit. However just for a preliminary idea an attempt is made to classify them on the basis of construction year, picture and information provided by FSCD. It should be noted that there are 8 more stations under construction as part of a continuous national project and 9 planned stations in and around garment factory concentrated area such as Gazipur and Ashulia.

- 1) In principle, the stations which were built in 1960s have been classified as REBUILDING category. The reason is the reinforced bars are significantly rusted and lost the strength. It assumed that the strength of concrete is also deteriorated
- 2) The rest has been put into RETROFITTING category.
- 3) In any case, final decision should be made on the basis of further site visits, test of concrete strength, checking of as-built-drawings (if drawings are not available - they should be prepared first), conditions of rebar etc.

Table 2.5.10 17 Fire Stations in Dhaka

	Recent pictures	Name	ESTD	Class	L. area	W Force	Equipment	Remarks
1		Siddique Bazar (HQ)	1978	A	(n acre) 2.3	217	94	Retrofitting
2		Sadarghat	1961	A	1.27	33(35)	6	Rebuilding
3		Postogola	1963	A	1.67	31(35)	9	Rebuilding
4		Demra	1983	B	1.11	33(35)	6	Retrofitting
5		Khilgoan	2014		1.72	35(35)	2	Retrofitting
6		Tejgaon	1965	A	1.0	35(35)	9	Rebuilding
7		Kurmitola	1980	A	0.6	35(35)	7	Retrofitting
8		Mirpur	1967	A	6.8	35(35)	12	Rebuilding
9		Mohammedpur	1963	A	0.5	34(35)	9	Rebuilding
10		Polasshi Barak	1947	A	0.66	35(35)	6	Rebuilding

11		Lalbag	2001	A	0.5	32(35)	9	Retrofitting
12		Savar EPZ	2004	A		35(35)	11	Retrofitting
13		Savar	2004	B	0.66	25(27)	6	Retrofitting
14		Baridhara	2004	B	0.33	24(27)	8	Retrofitting
15		Keraniganj	2004	B	1.0	23(27)	6	Retrofitting
16		Sadarghat river		B	--	14(14)	4	--
17		Dhamrai	2010	C	0.33	16(16)		Retrofitting

Table 2.5.11 Building features for fire station classes

Sl.	Class	Type of Building	Foundation	Ground floor	First floor	Second floor
01.	A	RCC	Three Storied Building with 4 Storied Foundation	3947 sft. Height- 18ft.	3947 sft. Height- 12ft.	2800 sft. Height- 10ft.
02.	B	RCC	Three Storied Building with 3 Storied Foundation	1875 sft. Height- 16ft.	1965 sft. Height- 10ft.	952 sft. Height- 10ft.
03	C	RCC		1,345sft	1,445sft	952sft

- Notes: 1) Siddique Bazar F S(#19) is attached to the HQ, within the HQ. It is 3 storied
2) Mirpur Fire Station (#8) has 3 buildings, fire station itself is one storied,
3) Sadarghat river fire station (#16) is not a building, it is on a pontoon (boat)
4) Dhamrai Fire station (#17) is a C class fire station not B as written in the table.
5) The classification started from 1998, Class A—can accommodate 5 vehicles and can lodge 35 staff, Class B- can accommodate 3 vehicle and can lodge 27 staff, Class C- can accommodate 2 vehicles and can lodge 17 staff.

k) Fire engines in Dhaka

There are 139 fire engines in 17 Dhaka fire stations. Out of them, more than 30 years older ones are 25, shown as below. Maintenance cost is also shown.

Table 2.5.12 Year after constructed of fire stations

Years	Quantity
Less than 10 years	22
10-19 years	70
20-29 years	22
30-39 years	19
40-48 years	6
Total	139

Table 2.5.13 Fire engines at fire stations

SL No	Name of Station	Class	Name of Equipment	Type	Reg. No.	Brand	Model	Fuel	#	Received Year
01.	Sadarghat	1 st	Water Tender	6500 Ltrs	Dhaka-matro-sha-14-0211	Issuzu	FTR-33H	Diesel	1	2003
			Water Tender	4300 Ltrs	Dhaka-Ta-436	Bedford	J-6	Diesel	1	1966
			Towing Vehicle	-	Dhaka-Tha-14-0986	Mitsubishi	L-200	Diesel	1	1998
			Ambulance	-	Dhaka-Ka-71-0112	Mitsubishi	L-200	Diesel	1	1998
			Towing Vehicle	-	Dhaka-Matro-14-0078	Mitsubishi	L-200	Diesel	1	2004
			Fire Fighting Pump	-	-	Angus	LW-2300	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	LW2300MK11	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	-	Octane	1	1982
			Fire Fighting Pump	-	-	Godiva	2274	Petrol	1	2002
Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2003			
02.	Postogola	1 st	Water Tender	4300 Ltrs	Dhaka-Sha-14-0366		FM617H	Diesel	1	1986
			Water Tender	6500 Ltrs	Dhaka-Da-2632	Issuzu	DA640	Diesel	1	1779
			Towing Vehicle	-	Dhaka-Tha-14-0984	Mitsubishi	L-200	Diesel	1	1998
			Towing Vehicle	-	Dhaka-Na-2803	Nissan	SD-33	Diesel	1	1983
			Ambulance	-	Dhaka-Matro-Cha-02-3633	Toyota	2 LT	Diesel	1	1995
			Fire Fighting Pump	-	-	Angus	LW2300MK11	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	LW-2300	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	LW-2300	Octane	1	2003
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2002
03.	Tejgaong	1 st	Fire Fighting Pump	-	-	Wadia		Petrol	1	1990
			Fire Fighting Pump	-	-	Tohatsu		Petrol	1	1985
			Water Tender	4300 Ltrs	Dhaka-Matro-Na-5160	Mitsubishi	FK-415H	Diesel	1	1984
			Water Tender	6300 Ltrs	Bakar-Ta-277	Bedford	J-6	Diesel	1	1966
			Towing Vehicle	-	-	Nissan	G.60.H	Petrol	1	1983
			Towing Vehicle	-	Dhaka-Matro-Tha-14-1107	Issuzu	NHR 55E	Diesel	1	2004
			Ambulance	-	Dhaka-Matro-Cha-02-3358	Toyota	2 LT	Diesel	1	1995
			Fire Fighting Pump	-	-	Angus	LW-2300MK11	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	LW-1300	Octane	1	1990
04.	Tejgaong		Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2004
			Fire Fighting Pump	-	-	Tohatsu	V-75	Petrol	1	1985
			Water Tender	6000 Ltrs	Dhaka-matro-sha-14-0212	Issuzu	FTR-33H	Diesel	1	2006
			Towing Vehicle	-	Dhaka-matro-Na-7241	Mitsubishi	L-300	Diesel	1	1984
			Towing Vehicle	-	Dhaka-matro-sha-14-0113	Issuzu	NHR 55E	Diesel	1	2004
05.	Mohammadpur	1 st	Fire Fighting Pump	-	-	Godiva	GP- 2300	Octane	1	2004
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2002
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2002
			Fire Fighting Pump	-	-	Angus	LW-1200	Octane	1	1990
			Water Tender	4300 Ltrs	Dhaka-Matro-Na-7273	Mitsubishi	FK-415H	Diesel	1	1984
			Water Tender	4800 Ltrs	Dhaka-matro-sha-14-0051	Issuzu	FTR-33H	Diesel	1	1977
			Towing Vehicle	-	-	Issuzu	NHR 55E	Diesel	1	2004
			Ambulance	-	Dhaka-Matro-Cha-74-0005	Toyota	2 LT	Diesel	1	1995
			Fire Fighting Pump	-	-	Angus	LW-2300MK11	Octane	1	2004
06.	Mirpur	1 st	Fire Fighting Pump	-	-	Angus	LW-1300	Octane	1	1992
			Fire Fighting Pump	-	-	Angus	LW-2300MK11	Octane	1	2004
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2004
			Water Tender	6500 Ltrs	-	Issuzu	FTR-33H	Diesel	1	1977
			Water Tender	9000 Ltrs	Dhaka-Ta-2086	Bedford	J-6	Diesel	1	1966
			Towing Vehicle	-	Dhaka-Matro-Tha-14-1105	Issuzu	-	Diesel	1	2004
			Towing Vehicle	-	-	Issuzu	NHR-55E	Diesel	1	2004
			Ambulance	-	Dhaka-Matro-Cha-02-3356	Toyota	2 LT	Diesel	1	1995
			Emergency Tender	-	Dhaka-Matro-Na-9910	Morita	FK415H	Diesel	1	1984
Fire Fighting Pump	-	-	Angus	LW-2300MK11	Octane	1	2002			

			Fire Fighting Pump	-	-	Angus	2275	Octane	1	1982
			Fire Fighting Pump	-	-	Godiva	2274	Petrol	1	1980
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Petrol	1	2004
07.	Kurmitola	1 st	Water Tender	6500 Ltrs	Dhaka-Matro-Da-11-0073	Issuzu	FTR-33H	Diesel	1	1998
			Towing Vehicle	-	Dhaka-Tha-11-7295	Mitsubishi	L-200	Diesel	1	2004
			Foam Tender	4400 Ltrs	Dhaka-Matro-Sha-14-0170	Issuzu	FTR-33H	Diesel	1	2004
			Towing Vehicle	-	-	Issuzu	TFS54	Diesel	1	2004
			Fire Fighting Pump	-	-	Godiva	Gp-2300	Octane	1	2004
			Fire Fighting Pump	-	-	Godiva	2274	Octane	1	1986
08.	Palashi	1 st	Water Tender	4800 Ltrs	Dhaka-matro-Dha-14-2709	Bedford	J-6	Diesel	1	1966
			Water Tender	4200 Ltrs	Dhaka-Matro-Da-11-1550	Issuzu	DA-640	Diesel	1	1984
			Towing Vehicle	-	Dhaka-Matro-sha-14-0054	Mitsubishi	L-200	Diesel	1	2002
			Fire Fighting Pump	-	-	Godiva	Gp-2300	Octane	1	2004
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Octane	1	2002
			Fire Fighting Pump	-	-	Angus	LW-1300	Octane	1	1990
09.	Lalbag	1 st	Water Tender	1800 Ltrs	Dhaka-Matro-sha-14-0130	Issuzu	NPR-66G	Diesel	1	2004
			Towing Vehicle	-	Dhaka-Matro-sha-14-0044	Mitsubishi	L-200	Diesel	1	2004
			Fire Fighting Pump	-	-	Angus	LW-2300	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	LW-1300	Octane	1	2002
			Fire Fighting Pump	-	-	Angus	LW-1300	Octane	1	1990
			Fire Fighting Pump	-	-	Godiva	Gp-2300	Octane	1	2004
10.	DEPZ	1 st	Water Tender	4800 Ltrs	Cumilla-Da-11-0001	Issuzu	FTR-33H	Diesel	1	1984
			Water Tender	4800 Ltrs	Dhaka-matro-Ta-2085	Bedford	J-6	Diesel	1	1966
			Light Unit	-	-	Mitsubisi	L-300	Diesel	1	1984
			Towing Vehicle	-	Dhaka-Matro-Tha-11-0436	Mitsubishi	L-200	Diesel	1	2002
			Towing Vehicle	-	Dhaka-Matro-Tha-11-9441	Mitsubishi	L-200	Diesel	1	2002
			Chemical Tender	-	-	Issuzu	FTR-33H	Diesel	1	2006
			Vima	-	-	Volva	FM400	Diesel	1	2008
			Fire Fighting Pump	-	-	Angus	LW2300MK11	Octane	1	2004
			Fire Fighting Pump	-	-	Angus	LW2300	Octane	1	2002
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1990
11.	Karanigonj	1 st	Water Tender	1800 Ltrs	Dhaka-Matro-sha-14-0075	Issuzu	NPR-66G	Diesel	1	2004
			Towing Vehicle	-	Dhaka-Matro-sha-14-1103	Mitsubishi	-	Diesel	1	2002
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1992
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Octane	1	2004
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Octane	1	2004
12.	Savar	1 st	Water Tender	6500 Ltrs	Dhaka-Matro-Da-11-0061	Issuzu	FTR-33H	Diesel	1	2004
			Water Tender	4800 Ltrs	Chattagram-Ta-6149	Bedford	J-6	Diesel	1	1966
			Towing Vehicle	-	Dhaka-Matro-sha-14-0045	Mitsubishi	-	Diesel	1	2002
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1990
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1990
			Fire Fighting Pump	-	-	Angus	LW2300	Octane	1	1992
13.	Baridhara	1 st	Water Tender	6500 Ltrs	Dhaka-Matro-Sha-14-0050	Issuzu	FTR-33H	Diesel	1	2004
			Towing Vehicle	-	Dhaka-Matro-Tha-14-1104	Mitsubishi	-	Diesel	1	2002
			Snorkel	-	Dhaka-Matro-4700	Morita	-	Diesel	1	1984
			Towing Vehicle	-	Dhaka-Matro-Sha-14-0271	Mitsubishi	-	Diesel	1	2000
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1990
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1990
			Fire Fighting Pump	-	-	Angus	LW2300	Octane	1	2002
14.	Siddik Bazar	1 st	Water Tender	11000 Ltrs	Dhaka-Matro-Na-4703	Mitsubishi	FU-313	Diesel	1	2004
			Water Tender	11000 Ltrs	Dhaka-Matro-Da-14-0112	Issuzu	CXZ-800	Diesel	1	2002
			Water Tender	4300 Ltrs	Dhaka-Matro-Mo-07-0265	Mitsubishi	FK-415H	Diesel	1	1986
			Water Tender	11000 Ltrs	On test	Mitsubishi	FV515P	Diesel	1	1987
			Water Tender	4800 Ltrs	Chadpur-Dha-11-0002	-	-	Diesel	1	2004
			Water Tender	1800 Ltrs	Dhaka-Matro-sha-14-0164	Issuzu	NPR-66G	Diesel	1	1985
			Water Tender	6500 Ltrs	Dhaka-Matro-Sha-14-0046	Issuzu	FTR-33H	Diesel	1	2004
			Water Tender	6500 Ltrs	-	Issuzu	FTR-33H	Diesel	1	2004
			Fire & Rescue Tender	4000+ 400 Ltrs	-	Issuzu	FVR23H	Diesel	1	2009
			Foam Tender	4000+ 400 Ltrs	Dhaka-Matro-Eu-14-0016	Mitsubishi	FK-617H	Diesel	1	1990
			Foam Tender	4000+ 400 Ltrs	-	Mitsubishi	FK-617H	Diesel	1	2000
			Light Unit	-	-	Mitsubishi	FU-434	Diesel	1	1983
			Arial Platform Leader	-	-	Volvo	FM400	Diesel	1	2006
	Siddik Bazar		Arial Platform Leader	-	-	Volvo	FM400	Diesel	1	2009
			Arial Platform Leader	-	-	Bronto	FM400	Diesel	1	2009
			Lifting Crane	-	-	XCMG-QY-12	Xcmggy 12	Diesel	1	2010
			Chemical Tender	-	-	Issuzu	FTR-33H	Diesel	1	2008
			Snorkel	-	Dhaka-Matro-Chha-14-0002	Mitsu Bishu	FU-313	Diesel	1	1997
			Tern Table Leader	-	Dhaka-Matro-Na-4702	Mitsu Bishu	FU-313	Diesel	1	1983
			Wrecker Van	-	-	Issuzu	FTH33F	Diesel	1	2008
			Light Unit	-	Dhaka-Matro-Na-4701	Mitsu Bishu	FU-434	Diesel	1	2007

			Emergency Tender			Mitsu Bishu	FM617H	Diesel	1	2008
			Towing Vehicle		Dhaka-Matro-Tha-14-1106	Issuzu	NHR-55E	Diesel	1	2008
			Towing Vehicle		-	Issuzu	TF554	Diesel	1	2009
			Towing Vehicle		Dhaka-Matro-Sha-14-0053	Issuzu	NHR-55E	Diesel	1	2008
			Towing Vehicle							
			Towing Vehicle		Dhaka-Matro-Na-7275	Mitsu Bishu	L-300	Diesel	1	1990
15	Demra	1 st	Water Tender	4300 Ltrs	Dhaka-Matro-Da-4870	Mitsubishi	FK-415H	Diesel	1	1996
			Towing Vehicle		Dhaka-Matro-Sha-14-0056	Mitsu Bishu	-	Diesel	1	2009
			Towing Vehicle		Dhaka-Da-3759	Nisan	SD-33	Diesel	1	1983
			Fire Fighting Pump	-	-	Angus	LW1300	Octane	1	1998
			Fire Fighting Pump	-	-	Angus	LW2300	Octane	1	2003
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Octane	1	2007
			Fire Fighting Pump	-	-	Angus	2275	Octane	1	2008
			Towing Vehicle		Dhaka-Matro-Sha-14-1379	Mitsu Bishu	-	Diesel	1	2003
16.	Dhamri	2 nd	Water Tender	6500 Ltrs	-	Issuzu	FTR-33H	Diesel	1	2005
			Towing Vehicle		Dhaka-Matro-Sha-14-0077	Mitsubishi	-	Diesel	1	2005
			Fire Fighting Pump	-	-	Angus	LW2300	Octane	1	2005
			Fire Fighting Pump	-	-	Godiva	GP- 10/10	Octane	1	2005

Table 2.5.14 Fiscal year wise budgetary allocation under Repairing & Maintenance head of the FSCD
Unit BDT (in Lakh)

Sl.	Financial Year	Number of Vehicles	Allocation	Expenditure
1.	2009-2010	570	170.00	170.00
2.	2010-2011	615	170.00	170.00
3.	2011-2012	650	250.00	250.00
4.	2012-2013	720	250.00	250.00
5.	2013-2014	819	500.00	500.00
Grand Total			1340.00	1340.00

D) Volunteers

Urban Volunteers for disaster management was started in Bangladesh by CDMP in 2009, under the Ministry of Disaster Management. In fact it has been funded by CDMP, though it is scheduled to end within 2015. Under the fund, FSCD is implementing the start-up and management of the volunteers. Urban volunteers are registered at fire stations under the registration system. Target disaster are various such as fire, earthquake, flood etc. The volunteers are listed in the <http://www.urbanvolunteer-fscd.gov.bd/index.php>.

The number of Urban Volunteers was targeted of 62,000 people for national wide, and so far FSCD instructed currently 26,425 people that have registered in Dhaka, Chittagong and Sylhet. The resent volunteers are divided into 660 organizations, 40 people each. Roles of a volunteer team are “Search” 12 people, “Rescue” 24 people, and “Relief” 6 people. Urban volunteer was initially assuming the earthquake, Dhaka, Sylhet, Chittagong are the main area and is targeting basically urban safety. One example, that Savar area was outside the target initially, recently it is considered as an urban district, and was included.

Activities implemented at normal times are the following;

- 1) evacuation training
- 2) training (refresh study)
- 3) educational activities for local residents
- 4) fellowships inside the team

Activities of a normal fire are as follows;

- 1) Blockage around fire site to preventing people from entering into the site.
- 2) Traffic control around the fire site
- 3) Confirmation of the position of water for firefighting (river, pond, fire water supply) and ensure (negotiation people for using the firefighting water from surrounding buildings)

4) Transportation of hoses, and auxiliary work of installation, etc.

5) Protection of firefighters (to protect from excited local residents, and to make concentrated for the firefighting)

In order to train the volunteers, typically, a 15 items for 3 days training is executed with the training kit which is provided from the committee of CDMP.

FSCD is training FSCD officers to grow instructors for urban volunteers. In these 5 years activities, 121 volunteers have become instructors. In recent years, the urban volunteers are educated to be instructors, and 25 people have been grown to date.

To inform the Urban Volunteers at an event of a fire implement, there are 2 types of way. They are automatically gathering to fire stations, and the other is that FSCD asks the registered contacts. Usually latter one is ordinary. After the volunteer receives a call from FSCD, he or she start mobilizing within 30 seconds, though the other issue is not determined more. Actually according to the local problems of traffic condition, jam and distance, they cannot reach within a short period of time in many cases. It took an hour or two usually. The volunteers, though acting with firefighters, do not carried out active firefighting. However, even if the appropriate equipment and training are available that can make the volunteers to perform the initial firefighting activities.

As a fire brigade will use currently, the hydrants are installed in the area of the plant ordinary. Normally, the brigades get the firefighting water from rivers, ponds, or the building nearby. In Old Dhaka, for less rivers and ponds, also less buildings that stored the firefighting water, it is a big challenge.

In a normal fire, one car pump, one Water Tender engage the firefighting. In the case of the factory fire, 2 pumps and 2 Water Tender units will be provided to firefighting.

m) Ongoing and Future Plans of FSCD

The role and responsibilities of FSCD is increasing day by day. FSCD needs more fire stations, new technologies, workforce, training etc. In order to fulfill the gaps, FSCD has taken many development activities own their own and also with the help of development partners. Below some of the development plans are described.

For the construction of new FS all over country, FSCD has undertaken four on-going projects, started in 1998. There are termed as project 76, project 78, project 25 and project 256. Apart from these four, another project consisting of 9 new FS are also in the pipe line. This has been initiated considering the importance of RMG sector. Out 9 FS, 7 are located in Dhaka district where the concentration of RMG factories is very high, two are for Chittagong. All these projects are funded by GoB funds.

In the recent years, quite a few foreign development partners have shown interests in the development of FSCD in terms of capacity building and equipment/facilities.

n) Mention-worthy Initiatives

- 1) Relocation of existing HQ at the exiting Training Centre (TC) at Mirpur #10: A data/information collection survey is on-going. This project will be implemented by the Japanese Yen loan. This package may also include construction of a regional HQ (at the existing HQ in Siddique bazar) and some new equipment.
- 2) Relocation of existing Training Centre (TC): The existing TC will be relocated at Purbachal new town by the GoB fund. Three pieces of required land have been allocated already but actual work yet to be started.

- 3) Disaster Management Centre (DMC): A comprehensive DMC is a long time demand of FSCD. WB has shown interest to establish for FSCD. Starting date of the project is yet to be determined.
- 4) Communication System (CS): A modern communication system is very important for disaster management. And FSCD has been pushing for it in different forums. KOIKA of Korea came forward to establish a modern communication system for FSCD.
- 5) Equipment from USAID: USAID will provide some equipment to FSCD (its in the process now)
- 6) Construction of a hospital which will deal with burnt people (the construction is in progress)

o) Achievements

- 1) Trained almost 25,000 (out of planned 32,600) Urban community volunteers in 3 big cities namely Dhaka, Chittagong and Sylhet. Also started to train volunteers in all district headquarters as a part of total 62,000 volunteers all over the country as planned by CDMP
- 2) Trained many factory workers/employees, government employees and advised many factories in relation to fire safety
- 3) Trained many school students within Dhaka city and government colony residents
- 4) Many FSCD personnel received foreign training
- 5) Established community awareness development program through local FS
- 6) Handled very efficiently big fire incidents and building collapses (Spectrum, Tazreen, Rana Plaza etc.)

p) Issues to be addressed

- 1) Inadequate operational equipment
- 2) Inadequate manpower
- 3) Inadequate advance training
- 4) Absence of a modern database
- 5) Inadequate number of FS in RMG factory areas
- 6) Lack of a database on RMG factories
- 7) Lack of modern communication facilities
- 8) Lack of modern fire investigation facilities
- 9) Lack of water sources
- 10) Un-planned urbanization
- 11) Narrow roads and traffic jam
- 12) Inadequate awareness among the people
- 13) Crowd control
- 14) Lack of compliance of fire safety measures
- 15) Recruitment and training of more urban volunteers and effective measures to sustain them
- 16) How to strengthen and expand community awareness development program

2.5.2 Legal Aspects for Fire Prevention and Fire Fighting in BD

a) Laws, Ordinance, Acts etc.

In order to discuss this issue we have to go back to the period of East Pakistan (before 1971). The only document related to fire and other means of protecting/helping civilians was “Civil Defence Act of 1952”. In fact it is an Act for ensure defence against any form of hostile attack by a foreign power. However, in one Article of this Act, the Civil Defence Authority is given power to make rules to take (i) measures for preventing and dealing with the outbreak of fire.

Later in 1959, another Act was enacted in the name of “Fire Service Ordinance—1959” and later in 1961, another regulation “East Pakistan Fire Service Regulation” was formulated-and up-until 17th of Sept 2014, FSCD was regulated and follow the rules and regulations of this Regulation.

However, as time passed, many issues showed up and Bangladesh had to pass their Laws and Acts to run fire related organization, to broaden the jurisdiction of activities and also for fire prevention and

firefighting. Among them, a government Gazette for inclusion of RMG factories, shipbuilding and warehouses was published in 1999 is mentioned worthy.

In 2003, another Act titled “Fire Prevention and Extinguishing Act—2003” was enacted as a major step forward in dealing with Fire related matters. This Act is very comprehensive and updated.

Using the power of 2003 Act, comprehensive rules were drafted and sent to the ministry for approval in 2011. These rules titled “Fire Prevention and Extinguishing Rules, 2014” have been passed by the Ministry of Law on **Sept 18, 2014**. A government gazette has been published. And the FSCD is running by these rules.

b) Fire Safety issues in BNBC

Shortage of manpower and equipment, and absence of strict implementation of laws, the number of fire incidents have not been decreased. Everyday many houses/buildings are built without caring the fire related laws and building codes.

In order to build quality buildings (stronger buildings) Bangladesh National Building Codes (BNBC) have been drafted in 1993, after many revisions, it was approved by the government in 2006. It was learnt that new topics namely retrofitting design, issue of climate changes etc. are still in the process of incorporation in the new BNBC. It is hoped that very soon final version of BNBC will be published.

Regarding Fire issue, BNBC has explained very elaborately. Out 10 Parts, Part 4 with five Chapters and three (3) Appendices are completely written on Fire issues. The issues addressed in the BNBC are:

Table 2.5.15 Fire issues in BNBC

Chapter	Title
Chapter 1:	General Provisions
Chapter 2:	Pre-cautionary requirements
Chapter 3:	Means of Egress
Chapter 4:	Equipment and in-built facilities standard
Chapter 5:	Requirement of Fire detector and extinguishing systems
Appendix A:	Fire drill and evacuation procedure
Appendix B:	Fire protection considerations and venting in industrial and storage buildings
Appendix C:	Selection and setting of fire detection systems

c) Main Objectives of These Rules

These rules are drafted aiming at the functions of FSCD, procedures of getting a fire safety license: it is a must if someone wants to construct a factory/warehouse/building etc. how to get the license renewed, costs of license, if an application for license is rejected—what a owner should do, formalities in case an address change etc. Also in case of factory, instructions for fire drills, proper establishment of fire exit doors, size and number of doors, water tanks, signs showing to way out, emergency bell, fire extinguishers, smoke detectors and other fire safety facilities are written in these rules (in other words, all about general methods of fire extinguishing), FSCD inspects factories/private/government buildings time to time using checklists to confirm whether they are in good condition or not.

2.5.3 Preliminary Plan for Strengthening

a) Background:

Bangladesh is located on the plate boundary region among Eurasia, India and Bhutan plate which is one of the most seismic zones in the world. Seven large earthquakes happened over the last 150 years. Among others Dhaka Metropolitan and Chittagong city, where political, Economic & cultural functions of the

nation concentrated, are the areas with higher buildings in a dense city. However, most of the buildings have not complied with Bangladesh National Building code resulting in little resilience in earthquake. According to the projection, it is estimated that if earth quake with magnitude 6 in the Richter scale would happen near from Dhaka, 56% buildings will be beyond economic repair, and citizens of Dhaka will be killed more than 150,000 and 5% GDP will be lost. Also, it is underlined that 05 large scale collapses without tremors happened in 10 years, due to the illegal expansion of the building, inadequate design quality and so forth.

b) Current Situation

Fire is one of the most common disasters in Bangladesh especially in the urban areas. There were a total number of 6,051 fire incidents in 2001 in Bangladesh which reached 17,912 in 2013. The present increasing rate is quite alarming. It possesses high vulnerability of fire hazards. Fire in Shopping malls, Apparels, Garments, Industries, Slums, Markets, High-rise Buildings and Residential buildings are extremely difficult to extinguish when it's devastating blaze and smoke turns into gruesome and perilous situation.

Big fire incidents in High-rise buildings, slums, chemical industries, markets are increasing alarmingly in the country out of which the mentionable incidence are: KTS Textiles mill building fire (February, 2006), BSEC building fire, Chittagong, Bangladesh (February 2007), Bashundhara City Shopping Mall Fire, Dhaka, Bangladesh (March, 2009), Japan Garden City Apartment Building Fire, Dhaka, Bangladesh (February, 2010) and Nimtoli Chemical Fire, Dhaka, Bangladesh (June, 2011) etc.

Besides fire incidents, the major disaster associated with building collapses are increasing very alarmingly in Bangladesh. There were several building collapses in Bangladesh in last few years such as: Shakhribazar Residential Building Collapse (2004), Spectrum Garments Building Collapse (2004), Phoenix Building Collapse (2006), Begunbari Building Collapse (2011) etc. the very recent fatal building collapse namely "Rana Plaza" Building Collapse (2013) at Savar was the greatest man-made havoc. It caused death of 1,127 lives and injury of 2458 people. It took 27 days to finish the whole search and rescue operation utilizing total strength of FSCD with the support of all responding organizations. Moreover, the country has been experiencing natural & man-made hazards like: cyclone, flood, fire, landslides and other hazardous incidents Very frequently.

c) Government's Plans and Priorities:

Fire Service and Civil Defence (FSCD) is the first responding organization of the nation for managing any types of disaster. FSCD fights fire and responses disaster through its existing 273 Fire Service and Civil Defence Stations (September, 2014) located throughout the country. The whole country is yet to under coverage of the fire service stations. On the other hand, most of the fire stations located in the urban areas including the HQs at Dhaka were constructed long ago and also not earth quake resilience. Therefore, It is planned to increase the number of stations from existing 273 to 549 and the manpower strength from existing 7,570 (September, 2014) to ±14,500 by in December/2016. Secondly, As the HQ building of FSCD was built long ago, it is assumed that, the HQs building will be first one to be collapsed with all sophisticated equipment and logistics which are being kept in its premises. As major sophisticated search & rescue equipment are being kept with HQs. So it is utmost important to construct a new HQs building resilience to earthquake and also we are badly in need of retrofitting/ rebuilt of existing old fire stations in the Dhaka city. It is expected that the completion of the proposed work will be able to safe all the sophisticated equipment and retrofitted / rebuild fire stations will be operation during and after earth quake. The other Strategies to reduce disaster and loss of lives and properties includes: (1) Modernization of Fire Service & Civil Defence through procuring modern firefighting equipment. (2) Upgrade Fire Service & Civil Defence Training Complex into full-fledged Fire Service & Civil Defence Training Academy along

with modern research facility (3) Expansion of Ambulance Service of Fire Service & Civil Defence Directorate (4) establishment of **Emergency Operations Center** for early warning and quick response.

Table 2.5.16 Priorities by FSCD side

Items	Priority 1	Priority 2	Priority 3	Priority 4	Note	
New national HQ (Mirpur)	O	-	-	O	Need to demolish Current T/C	Base Isolation
New Training Academy (Purbhachal)	-	O	-	-		
Rebuilt Regional HQ	-	-	O	-		
Old FS (14)	O	O	O	O	with meeting room for 15 sites	
New FS (7)	-	-	O	O		

d) Impact

Under the new initiative 14 old stations of Greater Dhaka will be retrofitted / rebuilt and a earthquake resilience New HQ will be constructed. As all the sophisticated equipment are being kept in HQs, so on completion of the construction of HQ quarters, it is planned that the equipment will be saved and will be operational during disaster.

Fire and other disaster not only affects the life and property of human being but also it possess great adverse effect on all aspects such as: economical, social, socio-economical and cultural as well. By acquiring advance training and establishment of new HQs with the provisions of emergency operation center, the operational capability of Fire Service & Civil Defence, Bangladesh will be further strengthened and thus will be able to provide better services. As a result there will have a great impact on public safety, society, economy and also in environment. It will also have a valuable impact on the reduction of carbon dioxide emissions not only in Bangladesh but also in the world.

2.5.4 Field Investigations on Past Fire Incidents

a) Garment factory in Mirpur

At night, when there were no employees in the factory, the owner was having a party with friends on the 8 floor of the factory building, when the fire broke out, he could not notice the fire at right time. He died with the effect of smoke in the stairs.

The cause of the fire was electrical short circuit in the second floor. Since the clothes were kept on the second floor, fire spread quickly. There were no fire doors to the stairs but only shutters which helped to escalate and spread the fire via stairs to other floors.

b) Shopping center

The fire broke out from a restaurant. Due to holiday there were no customers at the time of fire. Fire spread through the pipes of the toilet that connect the upper and lower stories. Stairs had been fire proofed, but nearby pipes have not been the same. Insufficient longitudinal holes in the compartments are suspected to be main cause of spread of fire.

c) Nimtoli chemical warehouse

Fire was ignited in the stock area of chemicals. More than 77 people were killed and 100 injured by this fire. The area is densely populated, the fire did not spread covering a wide area, but it had an impact of smoke on the surrounding areas. With that said there was a person who fell down on the street, which thought to be the huge effect of toxic gas generated due to fire. To deal with chemicals that are explosive and toxic gas, proper management and strict fire prevention facilities are necessary. Construction of a factory that requires large amount of storage and handling area, should be far away from the residential areas.



Figure 2.5.4 Observation results of the past fire events

2.5.5 Survey on Candidate Garment Factories

a) Purple Apparel

The biggest problem is this factory is that there is only one staircase. Moreover, the stairs do not have fire proof partition. If there is no partition in the staircase, it is impossible to prevent the propagation path of the smoke. Again, when escape route and smoke path become together resulting in cut-off the escape route and the safety is impaired.

b) DK Knitwear

The rooms of this factory are in good conditions, things are not kept on the evacuation path and have good displays to follow the evacuation routes, but the stairs do not have the fire proof compartments, therefore the problems remain.

2.5.6 Checklist for Fire Prevention

A simple fire prevention checklist is prepared and presented below. The detailed checklist must be prepared incorporating BNBC's guidelines, but this can be used as a first step. Since this checklist is prepared targeting the RMG factories, for the building of other applications, it is necessary to change some items of the checklist.

As a procedure, No.1 to 6 will be used on drawings, and after confirmation, the rest will be checked in the site.

As a case study, an explanation session with PWD engineers using this Checklist was organized, but it was felt that the engineers have insufficient knowledge of fire incidents, and they need to learn the technology related to fire continuously.

Table 2.5.17 Fire Prevention Checklist (RMG factory): Preliminary Proposal

No.	Items	Explanation
1	Stairs · EV · ESC · Shaft with longitudinal holes and fire proof partition	This will prevent to spread and prevent the smoke to move to upper stairs
2	Two stair cases for two way evacuation	In case, one stair case become un-useable in that case in order to make best use of other staircase, placement of stair cases should be symmetrical. In case floor area does not exceed 200sqm, one stair case is enough. It is desirable that staircases should not be more than 45m apart
3	Compartments of staircases are exclusively for staircases, do not put flammable materials there.	If staircases are used as warehouse, the fire will spread very quickly
4	From staircase, use hall room for evacuation to outside	If you are in stair case and a fire breaks out, evacuate to outside without passing the fire room.
5	Stock Yard part	Take measures for prevention of fire and its spreading
6	In house power generation room	Take measures for prevention of fire and its spreading
7	Compartment of electrical wiring	To prevent fire from electrical wiring and to stop the spreading of fire
8	Establishment of early detector and emergency bell	To help to find out the fire point quickly
9	Installation of automatic fire alarm	To identify the point of fire and to let all people in the building about the fire
10	Establishment of communication facilities for contacting fire service	To contact fire service department quickly
11	Establishment of fire extinguisher	For initial fire extinguishing
12	Fixing of signs indicating emergency exits	To show the way for evacuation
13	Installation of sprinklers or indoor fire hydrants	For initial fire extinguishing

2.6 CBDM Questionnaire Survey

2.6.1 Executive Summary

In order to know the existing knowledge of urban community people about disasters in particular earthquake and Fire, and their necessity, a questionnaire (shown in the Appendix 5) survey in and around five (5) selected fire stations in Dhaka city was conducted during the months of August and September, 2014.

The survey results show that all respondents are aware about the Bangladesh's proneness to earthquakes and many of them (18%) believe that if a big earthquake hits Bangladesh within 1-2 years they will not surprise.

Very percentage of respondents is familiar with the importance of preparedness (15%) and very few of them have experience of taking part in evacuation drill (8%).

Majority of the respondents do not know about a place where they can take shelter in case it is necessary (26%) however, most of them (74%) feel that shelters should be established near their community. Supply of food and medicine should get the priority during their stay in the shelters followed by security and toilet facilities.

The term BNBC is not an unfamiliar term among the respondents (75%) and most of them (97%) want strict implementation of BNBC.

Regarding government awareness development program, most of them (90%) believe that existing program is not sufficient.

In an answer to a question related to what they need to be taken care of first after an earthquake, most of the respondents (84%) think that reconstruction of houses should be the first followed by food, medicine and hygiene.

The survey revealed that people want more use of mass media (TV, newspaper), workshops, seminar to develop awareness among the general people.

2.6.2 Introduction

a) Background

This report is prepared in connection with CBDM (Community Based Disaster Management) Questionnaire Survey carried out for a project titled "Data Collection on Urban Building Safety Project in People's Republic of Bangladesh". In compliance with the project outline, a plan to know the existing knowledge of the community people about disasters, in particular, about earthquake disaster and fire was formulated. The plan contained a questionnaire survey to be carried out in and around five (5) selected fire stations covering different areas of metropolitan Dhaka city with variety of community people and their housings. On the basis of the outcome of the survey it is believed that a comprehensive CBDM plan can be formulated centering each fire station so that community people are well prepared for disasters and damages are minimized.

b) Objectives of the Study

The main objectives of this study are as follows-

- 1) To acquire baseline information about disaster related knowledge/preparedness of Urban residents
- 2) To know about existing conditions and community's necessity

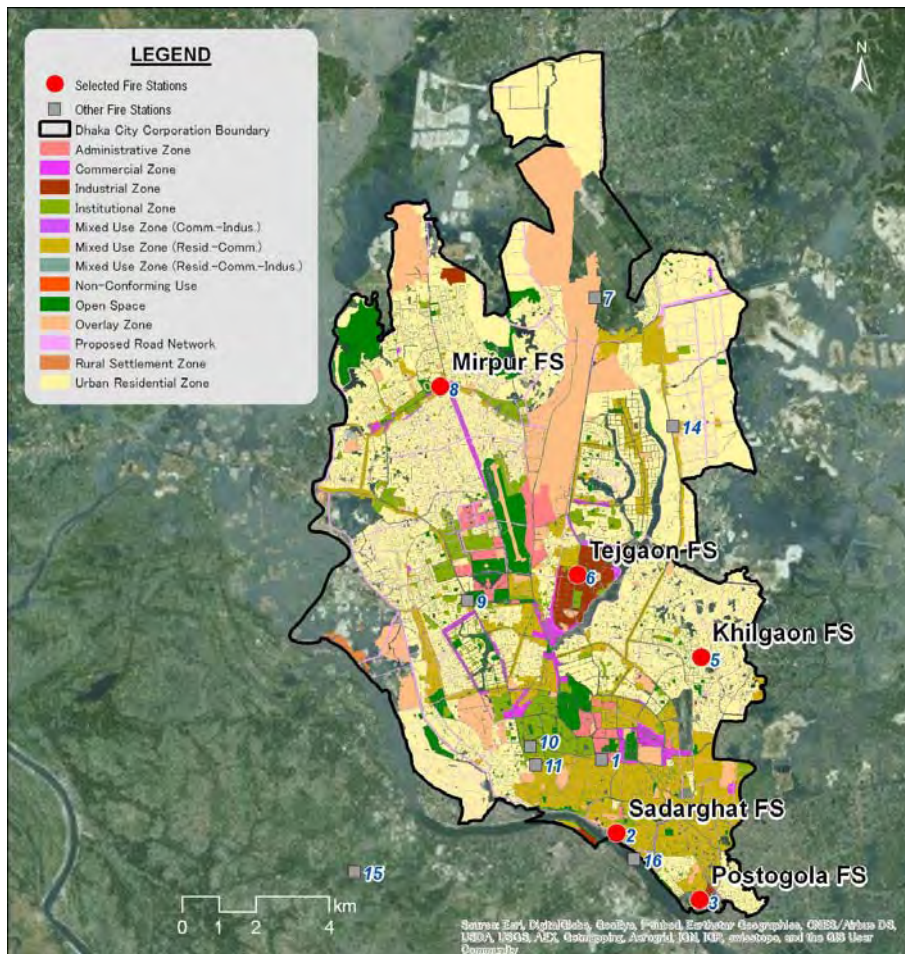
c) Study Area

The study area includes five (5) Fire Service stations of Dhaka city corporation. The names of the stations are as follows:

- i. Sadarghat (representative of old Dhaka),
- ii. Postogola (representative of old Dhaka),
- iii. Mirpur (representative of new Dhaka, where there are garment factories and some slums),
- iv. Tejgaon (representative of industrial area),
- v. Khilgaon (representative of new and old Dhaka also covering slum area)

Followings were the considering factors to select the above mentioned five FS out of 17 FS in Dhaka City area.

- Old Dhaka city area with more density of population, congested community, presence of heritage buildings and limited access for entering FSCD’s rescue vehicles in case of any fire incident
- New Dhaka city area, where settlements are comparatively new and diversified, residential system is comparatively better
- Industrial areas as the working place of city dwellers, production center, high requirement of fire & earthquake safety measures
- Another area which is in-between old and new settlements, where many slums have been developed and fire is a common incident in these areas



Background Landuse map was prepared by RAJUK (2010). Some legends were arranged.

Figure 2.6.1 Locations of Selected 5 Fire Stations

2.6.3 Methodology

a) General

A semi-structured questionnaire (emphasizing Earthquake and Fire) incorporating individuals' and members of community organizations' information such as kind of houses they live in, knowledge about disasters, aspirations and some technical aspects of earthquakes was used in this study. Transect walks, rapport building, key informants interview (KII), Focus group discussion (FGD), validation of data were also parts of the survey.

b) Category of respondents

In the survey, three broad categories of respondents were considered.

- 1) General community members
- 2) Representatives of various organizations active in the community
- 3) Some community members (randomly selected) for informal interview

General Community Members: In this category, the respondents belong to various professions as mentioned below:

- Rickshaw pullers
- Housewives
- Daily labours
- Businessmen (petty business- tea shop owners, grocery owners etc.)
- Professionals like Tailor master, electricians, mechanics etc.)
- Professionals (Police, community based health workers, teachers, lawyers, drivers, salesmen, security guards etc.)
- Students

Members from various organizations: In this category, Community Based Organizations such as Market associations, House owners' associations, Clubs, NGOs, Cooperative societies, Educational institutions, Religious institutions, Community based volunteers' associations have been covered.

Community members for informal interview: To understand over all community perspective regarding earthquake and fire risks, 25 randomly selected individuals from five fire stations were selected. The respondents belonged to Tea-shop owners, Petty business men, Rickshaw pullers and Daily labours and so on.

A summary of the Fire Station-wise respondents and categories are presented below.

Table 2.6.1 Summary of the Fire Station-wise respondents

Name of Fire Station	Number of Respondents			Total
	Individuals	Community Organizations	For Informal interview	
Sadarghat	18	18	5	41
Postogola	18	18	5	41
Mirpur	18	18	5	41
Tejgaon	18	18	5	41
Khilgoan	18	18	5	41
Total	90	90	25	205

c) Survey team

A three member team was formed for conducting the survey. The list of team members are:

- Mohammed Ah san Ullah -- CBDRM Specialist (Team leader)

- Ms. Noorun Nahar Setu ---- Member (Interviewer/Data collector)
- Mr. Towkir Islam ----- Member(Interviewer/Data collector)

The main tasks that carried out by the team were;

- To conduct interviews in the five selected fire stations
- Compilation of survey questionnaire/forms after completion of interviews.
- Carry out validation/checking of data and performance of analysis

d) Pre-test of the questionnaire

Pre-testing of the questionnaire on seven (7) individuals, three (3) members from organization category and one (1) focal person of Tejgaon Fire Station was carried out. On the basis of the outcome of the pre-testing, minor changes were made in the questionnaire and finalized.

e) Schedule for field work and data collection

In order to carry out the survey smoothly the following schedule was prepared and followed.

Table 2.6.2 Contents of activities

Sl No.	Activity	Location	Date
1	Questionnaire Pre-Testing (with 10 respondents)	Tejgaon Fire Station Area	24 th August 2014
2	Discussion on the Pre-testing results and corrections of questionnaire as required	ADPC office/ OYO office	25 th August 2014
3	Interview (20 respondents)	Tejgaon Fire Station Area	26 th August 2014
	Interview (21 respondents)	Tejgaon Fire Station Area	27 th August 2014
4	Discussion and feedback on the survey	ADPC office	28 th August 2014
5	Reporting		30 th August 2014
	Next Days Preparation		31 st August 2014
	Interview (20 respondents)	Khilgaon Fire Station Area	1 st September 2014
	Interview (21 respondents)	Khilgaon Fire Station Area	2 nd September 2014
	Interview (20 respondents)	Postogola Fire Station Area	3 rd September 2014
	Interview (21 respondents)	Postogola Fire Station Area	4 th September 2014
	Interview (21 respondents)	Sadarghat Fire Station Area	6 th September 2014
	Interview (20 respondents)	Sadarghat Fire Station Area	7 th September 2014
	Interview (21 respondents)	Mirpur Fire Station Area	8 th September 2014
Interview (21 respondents)	Mirpur Fire Station Area	9 th September 2014	

In total 90 general community members, 90 members from various active community organizations and 25 randomly selected community members were interviewed,

f) Data compilation and analysis

After the completion of the interview survey validation of data were performed. Some results of the analyzed data were grouped according to the topics and some were presented as answers to the questions directly (who answered what basis). It should be mentioned that in compilation of data, answers of 180 respondents (90 individuals and 90 from organizations) were only considered. Answers of twenty five (25) randomly selected individuals were not tabulated. However, their views were noted separately in paragraph “D”.

In principle, topics were grouped into three:

- 1) Answers related to general questions
- 2) Answers related to knowledge about earthquake
- 3) Experience of earthquake, Activities, Necessities and Thoughts of respondents

1) Answers related to general questions

For a better understanding, the data under each group were tabulated in the form of sub-titles, such as types of building, age group of respondents, information about housing etc. Analyzed data are presented in three (3) tables as follows.

Table 2.6.3 Types of Building

Types of Building	No of Respondents		
	Organization category	Individual category	Total
RC	18	14	32 (17%)
Brick Masonry	8	2	10 (6%)
Tin shed	9	3	12 (7%)
Others (Semi Paka, Kacha)	55	71	126 (70%)
Total	90	90	180

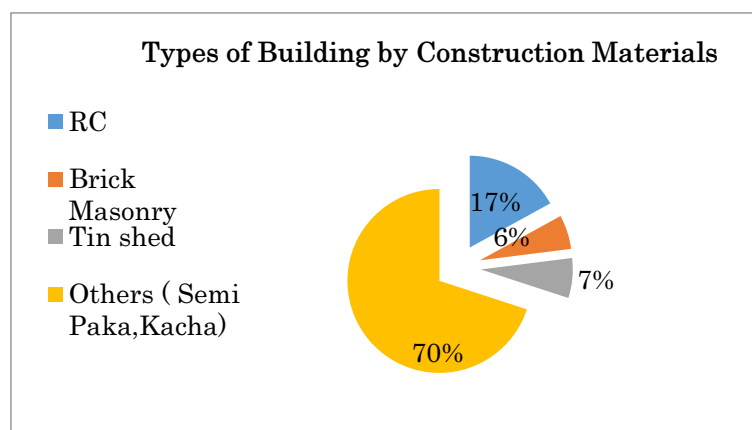


Figure 2.6.2 Types of Building by Construction Materials

Table 2.6.4 Age Groups of Respondents

Age Groups (Years)	No of Respondents		
	Organization category	Individual category	Total
<20	0	1	1
21-30	2	10	12
31-40	4	12	16
41-50	10	14	24
51-60	3	5	8
61&>	0	0	0
Total	19	42	61

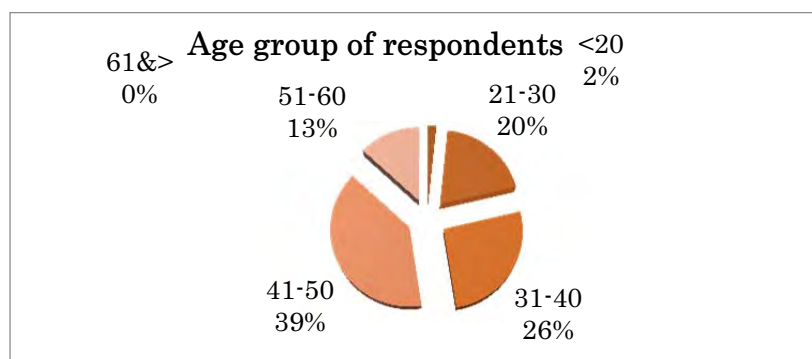


Figure 2.6.3 Age group of respondents

Table 2.6.5 Information About Housing

Building Information	Particulars of response	No of Respondents
Year of living	<1 Year	5
	1-5 Years	32
	6-10 years	14
	11-15 years	8
	16-20 years	2
	21 &>	8
Which floor	Ground Floor	31
	1 st -2 nd Floor	7
	3 rd - 4 th Floor	22
	5 th -6 th Floor	6
	7 th &>	6
Height of Building	Not Building	12
	Up to 2 nd storey	23
	Up to 4 th storey	19
	Up-to 6 th Storey	6
	7 th &>	1

2) Answers related to knowledge about EQ

The data under earthquake related knowledge were analyzed and tabulated in two tables in the form of;

- General knowledge about earthquake
- Reasons why many people are killed by the earthquakes

Table 2.6.6 General Knowledge About Earthquake

Description	Yes	No
Is BD an earthquake Prone Country?	180	0
Have you ever heard about Bengal, Assam Earthquake?	45	135
Do you know the reasons of earthquake occurrence?	72	108

Regarding the technical questions above, all respondents believe that Bangladesh is an earthquake prone country. On the other hand knowledge about historical earthquake is not so high (25%). Forty percent respondents know reasons of earthquakes.

Table 2.6.7 Reasons Why Many People are Killed by the earthquakes

Reasons	No of Respondents				Total
	Organization category		Individual category		
	Male	Female	Male	Female	
Building Collapse	71	4	63	17	155
Fire	0	0	2	0	2
Starvation	1	0	0	0	1
Others (Afraid of)	12	2	6	1	15

The reasons why so many people die during an earthquake is also a difficult question, surprisingly most of the respondents (90%) correctly answered that is “cause of maximum casualty is building collapse”.

3) Experience of earthquake, Activities, Necessity and Thoughts of respondents

The term preparedness for an earthquake is not familiar to the respondents. Only 15% answered that they are prepared. Regarding an evacuation drill, only 8% answered that they have experience in taking part in an evacuation drill.

The result of the survey revealed that 75% of the respondents know the term BNBC and 97% want strict implementation of BNBC.

Regarding a shelter near their houses, only 26% know where to take shelter in case it is necessary, however 74% respondents want to have shelters in their community.

Table 2.6.8 Question C1, C4, C6, C7, C8, C10, C12, C13, C14, C16 of the Questionnaire

Preparedness issues	Yes			No		
	Organization	Individual	Total	Organization	Individual	Total
C 1 Having experiences of any earthquake in recent years	38	33	71	52	57	109
C 4 Having any preparation for earthquake	24	3	27	65	86	151
C 6 Ever attended any meeting organized by FSCD for awareness development	25	5	30	65	84	149
C 7 Participated in any Evacuation Drill	11	3	14	79	85	164
C 8 Have Found the participated drill is very helpful	12	5	17	0	2	2
C 10 Known the year of construction of living building	79	67	146	10	22	32
C 12 Ever heard of BNBC	64	71	135	25	19	44
C 13 Want full implementation of BNBC	87	88	175	1	2	3
C 14 Known any place that can be used as shelter in cases it is needed	40	6	46	79	48	127
C 16 Feel that there should be a designated shelter close the living place	52	81	133	4	5	9

Table 2.6.9 Believe in the Possibility of an Earthquake Soon (Question C2 of Questionnaire)

Years	Respondents					
	Organization			Individual		
< 1 years	Male	Female	Total	Male	Female	Total
Within 1-2 years	3	1	4	1	3	4
Within 3-4 years	20	1	21	8	3	11
Within 5-6 years	5	0	5	16	2	18
Within 7-8 years	1	0	1	0	0	0
Within 9-10 years	0	0	0	0	0	0
11 years & >	0	0	0	0	0	0

While all of the respondents believe that Bangladesh is an earthquake prone country, analysis reveals that 18% of them believe that a big earthquake may happen in 1-2 years, and 13% believe that it may happen within 3-4 years time.

Table 2.6.10 Detail of Preparedness (Question C5 of Questionnaire)

Types of Preparation	Respondents					
	Organization			Individual		
	Male	Female	Total	Male	Female	Total
Dry Food	0	0	0	0	0	0
Torch	0	0	0	0	1	1
First Aid	5	1	6	1	1	2
Water	2	0	2	0	0	0

The response to this question was very few. This is may be due to the poor knowledge about past earthquakes and lack of preparedness activities and teaching of importance of preparedness. Among the respondents first aid got the highest importance for preparedness.

Table 2.6.11 Opinion on Existing Earthquake Awareness Development (Question C9 of Questionnaire)

Nature of Preparation	Respondents		Total
	Organization	Individual	
Enough	9	9	18
Not Enough	81	81	162
Total	90	90	180

90% respondents believe that the existing awareness development program of the government is not enough and needs to be expanded and strengthened. In both categories, respondents believe that condition of their houses is good or ordinary and followed by bad.

Table 2.6.12 Opinion About the Strength of the Building that They Live (Question C11 of Questionnaire)

Opinion of Respondents	Respondents	
	Organization	Individual
Good	51	38
Ordinary	26	33
Bad	12	18
Very Bad	1	1
Total	90	90

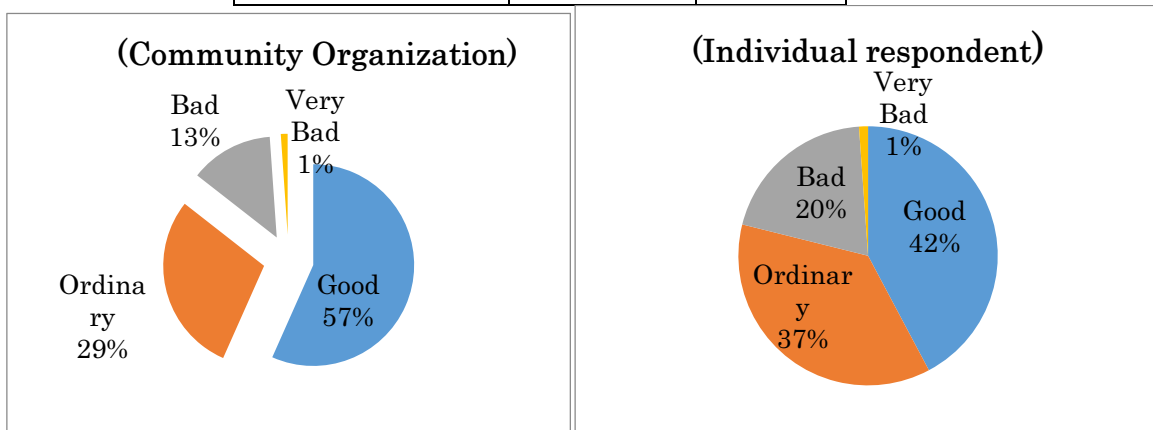


Figure 2.6.4 Opinion About the Strength of the Building that They Live

Table 2.6.13 Services That Want to Have While They Live in Shelters (Question C17 of Questionnaire)

Opinion of Respondents	# of Respondents	
	Organization	Individual
Food	30	34
Medicine	23	28
Toilets	17	15
Security	20	13

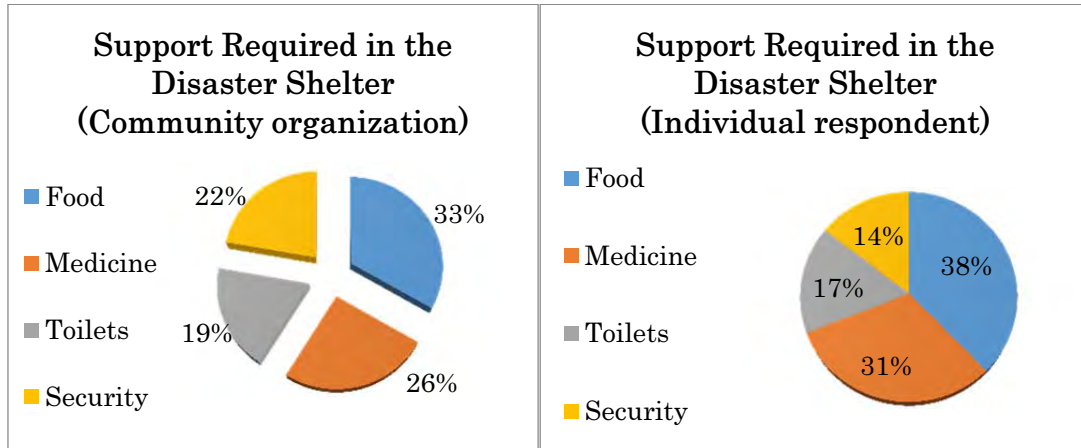


Figure 2.6.5 Support required in the disaster shelter

Table 2.6.14 Opinion on the Most Essential Things They Need After an earthquake (Question C18 of Questionnaire)

Opinion of Respondents	Respondents	
	Organization	Individual
Reconstruction of Houses	39	51
Life Line/Utilities	8	1
Temporary Shelters	10	4
Food ,Medicine, Hygiene	33	33

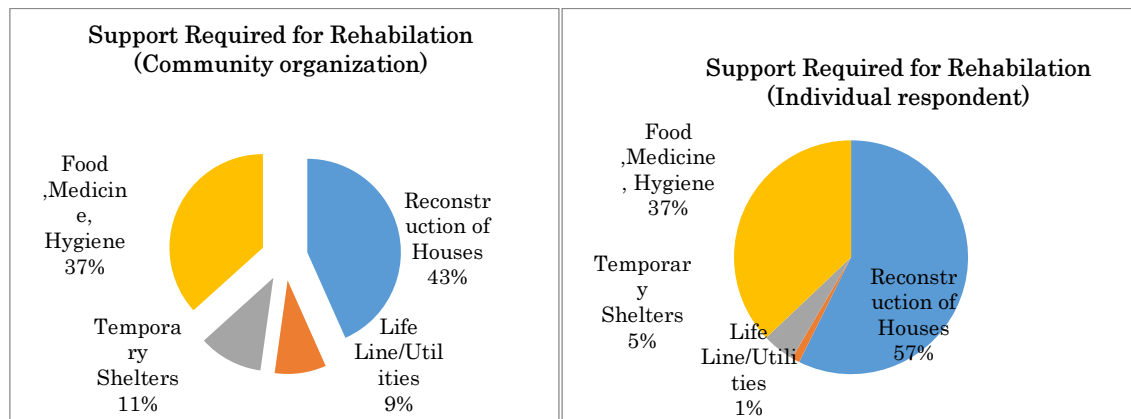


Figure 2.6.6 Support required rehabilitation

4) Opinions of Randomly Selected Individuals

Although it was thought that only five randomly selected individuals from each fire station will be interviewed in an informal manner in the field many people showed interest to take part in the informal discussion. The participants were from various backgrounds (student, market association, and imam of

mosque, school teacher, shop owner and so on). As mentioned the reason above, the summarized opinions are of more than 25 individual respondents. The opinions are presented below.

(1) Opinions on awareness development program

- The government should take more initiatives for awareness development program
- Promotion of earthquake related news is necessary. More publicity is necessary to attract more community members in the activity. TV, newspaper and or other mass media should be used.
- More volunteers should be trained along with effective activities such as campaign and seminars/workshops.

(2) Opinions of building safety

- Demolish very old buildings and build new ones. Regular check-up of building's conditions should be carried out.
- Strict maintenance of building code is very important
- Earthquake resistant building should be built. Construction of building should not be allowed in all places

(3) Opinions on Training/Shelters etc.

- Fire drill should be open for everybody
- Every locality should have shelters
- More emergency equipment should be provided to FSCD

2.6.4 Major findings and Recommendations

a) General

Through this interview survey few things have become very clear. Among others, the community where the survey was carried out is aware about the vulnerability of Bangladesh to earthquakes. They also feel that any time, within 1-4 years, a big earthquake may hit Bangladesh. The existing awareness development program of the government is not enough. They also think that there should be shelters in each community.

b) Major Findings

- Almost all respondents believe that Bangladesh is an earthquake prone country
- Many of them(75%)do not have enough knowledge about the historical earthquakes
- They have fear that in about 1-4 years time, a major earthquake may hit Bangladesh
- The community knows (90%)that the main cause of casualty due to an earthquake is building collapse
- Community is not well aware about term preparedness for an earthquake
- Most of the community members think that the existing awareness building program by the government is not enough
- Majority respondents believe that there houses are in good condition
- Majority do not have any experience in participating in an evacuation drill
- Respondents feel that there should be shelters in and around their community with enough food, medicine, toilets and security but do not know where a shelter should be
- People are well aware of BNBC and think that it should be strictly implemented
- The most essential things that the community want the government should do first (after an EQ) is reconstruction of the destroyed houses, second is food, medicine and hygiene, followed by temporary shelters and lifelines

c) Recommendations

- 1) Since people are aware about the vulnerability of Bangladesh to earthquakes, preparedness should get the first priority
- 2) In the module of preparedness development, periodical evacuation drill by FSCD personnel and Urban Volunteers, activities for a better understanding of preparedness by the community (before, during and after the earthquake) should be under taken. Use of mass media could be a very useful tool to teach community very effectively
- 3) All these activities can be undertaken by each Fire Station in the city with the help of Urban Volunteers and expand horizontally step by step so that all areas under each fire station's jurisdiction are covered
- 4) Implementation of BNBC should be undertaken without any further delay
- 5) Necessary logistics for each fire station should be provided

Chapter 3 JICA's Assistance Policy for Urban Building Resilience

In order to achieve the objectives, a survey team consisting of various disciplines was dispatched to Bangladesh for collecting data / information in the areas of government policy, socio-economic / natural conditions, conditions of the existing buildings, construction methods and its issues, prevailing financial systems, latest support trends of other donors, on-going projects and so on. The team spent about 4 months in Dhaka city and carried out extensive survey to grasp the existing conditions of the above mentioned fields and met and discussed with many government policy makers of different ministries. On the basis of those efforts, the team made an assessment of the necessity of the Bangladesh government in the area of building safety. In this chapter, summarized findings of the survey team, further analyses of the issues / problems and proposals to address those problems by Japanese assistance in the future are presented.

3.1 Background and Status Quo

a) Urban Agglomeration

Bangladesh has 160 million populations and urban agglomeration is progressing, resulting in high urban agglomeration ratio of 32% in the largest city (World Development Report of World Bank, 2013), which is the 6th highest ranking in the world largest cities (UN, Department of Economic and Social Affairs, Population Division, 2014). Especially, 10% of national population is concentrating in Dhaka.

b) Law and Regulation Establishment

1) Disaster Related Law and Act

In the overarching legal structure on Disaster Risk Management (DRM), Bangladesh has National Plan for Disaster Management (NPDM, 2010), Disaster Management Act (DMA, 2012) and Standing Orders on Disaster (SOD, 2010). Those policy and legal structure stressed that Bangladesh is subject to the multi-types of disasters and the responsibility of each concerned ministry is clearly mentioned.

2) Building Related Law and Act

The superordinate legal deliverable in building administration is Building Construction Act (BCA) in 1953 and revised 2006. Under BCA, the technical regulation is given by Bangladesh National Building Code (BNBC, 1993 and 2006), while administrative control is governed by Building Construction Rules (BCR, 1996 and 2008). In the city level, Dhaka Metropolitan area specifies the Dhaka Metropolitan Building Construction Rules (Dhaka BCR, 2008).

c) Enforcement for Building Construction

In building permission, BCR (2008) and Dhaka BCR (2008) require confirmation on 1) application formats, 2) designs (no description on structure or architect, prepared by registered engineer), 3) land use certificate, 4) application fees, 5) land ownership document, 6) soil test result, 7) layout, 8) report of piling and 9) certificate of engineer. After the construction, BDR and Dhaka BCR require confirmation on 1) Completion Report, 2) As-built Architectural Drawing, 3) Structural Design including Seismic Design, and 4) Building Services.

d) Institutional Arrangement

1) Disaster Risk Management

At the national level, the Ministry of Disaster Management and Relief (MoDMR) is the coordinating national agency for disaster risk and emergency management at a policy level. At the highest level, the National Disaster Management Council (NDMC), headed by the Prime Minister, formulates and reviews disaster management policies. The Inter-Ministerial Disaster Management Coordination Committee

(IMDMCC), headed by the Minister of MoDMR, implements disaster management policies and decisions of the NDMC. At the city level, with regards to construction, RAJUK was established in 1987 under the Ministry of Housing and Public Works (MoHPW) to lead planning and development in Dhaka City and peripheral areas. The Local Government Act (2009) does not mention responsibility for enforcement of building codes, but assigns broad authority to local governments on health and safety matters. In practice, this creates ambiguity on responsibility for building safety. While the emergency response to disasters, Fire Services and Civil Defence (FSCD) under the Ministry of Home Affairs (MoHA) is officially assigned as the responsible organization.

2) Building Construction

At the national level, the Ministry of Housing and Public Works (MoHPW) is the coordinating national agency for policy issues on building planning and construction. At the administrative level, Department of Architecture (DOA) and Public Works Department (PWD) are the main organizations for building design and construction. DOA and PWD are mainly responsible for planning, design and construction of public building. For private buildings, RAJUK under MoHPW and/or the municipality authorities is the front organization for building permission. It is envisaged to organize inter-ministerial coordination committee, Bangladesh Building Regulatory Authority (BRA) at the national level and Building Construction Committee (BCC) at the city level, however those are yet to be officially established.

e) Human Resources Development

Continuous effort on human resources development (HRD) in building planning and construction was extended to PWD by CNCRP (JICA's Technical Cooperation Project), which has developed the capacity on building remediation to 20-30 staffs. These activities are focused to the training course will be continued at the PWD Training Academy. Urban Resilience Project by World Bank (WB) intends to build the capacity of RAJUK for Urban Resilience Unit (URU) as well as of FSCD for emergency response capacity.

3.2 Causes of the problems

The causes of above problems are summarized as limited enforcement, education, technical capacity and financing modality leads to the proliferation of fragile buildings.

a) Enforcement

In spite of the legal guidance and Standing Orders on Disaster (SOD), which describes the role and responsibility of relevant offices and required level of building construction is not met. This is due to the limited inter-ministerial coordination, insufficient procedural guidance in compliance with the legal framework, limited capacity of the concerned officials on building permission and construction.

1) At the national level

In order to boost the enforcement mechanism, the set-up of BRA and procedural guidance are significant to facilitate the inter-ministerial coordination.

2) At the sub national level

Technical manuals and capacity development to RAJUK and similar level organizations shall be addressed including enhancement of Building Construction Committee (BCC).

b) Education

Limited education to the technical people hinders the appropriate planning and implementation of the building construction.

1) For practitioners

Continuous technical trainings to government officials (PWD, DOA, RAJUK) and private engineers (consultant, contractors) are significant for quality and quantity expansion. To educate the practitioners, the multi-layered approach can be considered such as professional training to government officials and technical/practical training to construction companies.

2) For research

Internalization of applied overseas technology is critically significant such as retrofitting method or use of the local material for construction material.

3) For university

There is limited educational program in university especially in building remediation. The improvement or reformation of education program is necessary.

4) For primary and secondary education

It is fundamental to know what is disaster and importance of measure to be taken against disasters to protect life. This type of education should be the base for future development of urban resilience.

c) Technical Capacity

As the technical capacity to construct the technically appropriate buildings, it is significant to improve the method of construction supervision, method of seismic design, technical awareness to use structural materials and non-structural materials are pressing needs. not only trainings with dissemination materials such as manuals, but also raising awareness is essential.

d) Finance

In order to mainstream the building remediation by the private sector, stimulant to financing has to be prepared since the building remediation is not profitable business, thus sharing of certain risks between government and private sector is crucial through low interest loan, reinsurance and guarantee system.

3.3 Other development partner's plans

Several development partners of international organizations such as World Bank, UNDP and USAID etc. have been conducted activities on disaster management. Among them, World Bank is worthy to note as below.

World Bank

World Bank has recently initiated new project, named as "Urban Resilience Project" (173 million USD). This project covers following 5 (A to E) components.

1) Component A: Reinforcing the Country's Emergency Management Response Capacity –US\$110 million

- a) Renovate and outfit national-level Disaster Risk Management (DRM) facilities (Component A1)
- b) Build, renovate and outfit local-level City Corporation and Fire Service and Civil Defense (FSCD) DRM facilities in Dhaka and Sylhet (Component A2)
- c) Supply, install and integrate specialized Emergency Management and Communications Technology (ECT) equipment for DRM and emergency response within national-level and local-level agencies (Component A3)
- d) Supply specialized search and rescue equipment to local-level agencies involved in DRM (Component A4)

e) Provide Training, Exercises and Drills (TED) to national-level and local-level agencies involved in DRM (Component A5)

2) Component B: Vulnerability Assessment of Critical and Essential Facilities – US\$12 million

- a) Conduct a vulnerability assessment of critical and essential facilities and lifelines (Component B1)
- b) Support the development of a risk-sensitive land use planning practice in Dhaka (Component B2)

3) Component C: Improved Construction, Urban Planning and Development – US\$41 million

- a) Create and operationalize an Urban Resilience Unit (URU) in RAJUK (Component C1)
- b) Establish an electronic construction permitting system (Component C2, US\$ 8.7M)
- c) Set up a professional accreditation program for engineers, architects and planners (Component C3)
- d) Improve building code enforcement within RAJUK jurisdiction (Component C4)

4) Component D: Project Coordination, Monitoring and Evaluation – US\$10 million

- a) Overall support of the activities of the Project Steering Committee (PSC) and the Project Coordination and Monitoring Unit (PCMU)
- b) Support of activities related to overall progress, monitoring and evaluation, compliance with the Project’s safeguard and fiduciary requirements, and capacity development
- c) Support of communication and promotional activities reflecting project contributions and stakeholder expectations
- d) Procurement of vehicles, office furniture, and information technology equipment for the PCMU
- e) Operating costs of the PCMU
- f) Hiring of experts and specialists to reinforce the staffing and technically support the mission of the PCMU
- g) Strategic studies

5) Component E: Contingent Emergency Response – US\$ 0 million

a) Government may request the Bank to re-allocate project funds to this component (which presently carries a zero allocation) to support response and reconstruction. This component would allow the Government to request the Bank to reallocate project funds and designate them as Immediate Response Mechanism funds to be engaged to partially cover emergency response and recovery costs. This component could also be used.

Table 3.3.1 World Bank’s Urban Resilience Project

Project Components	Project Cost
1. Reinforcing the Country’s Emergency Management Response Capacity	110
2. Vulnerability Assessment of Critical and Essential Facilities	12
3. Improved Construction, Urban planning and Development	41
4. Project Implementation	10
5. Contingent Emergency Response Component	0
Total Financing Required	173

3.4 Issues related to Urban Building Resilience, measures to be taken and recommendations

As described above, strengthening of urban resilience is critical issue for Bangladesh. The identified issues, measures and recommendations are prescribed below.

Table 3.4.1 Identified issues on measures and recommendations

Issues	Measures to be taken	Description with Recommendations	Responsible GOB	Priority
1) <i>Enforcement</i>	Improve the building permission process	There are nine items required by BCA2008 for building permit. The process of permission is starting from owner of the building with their consultant, then the relevant document is delivered to Office of Building Officials (OBO) for permission. However OBO does not review the structural and architectural design. Therefore it is necessary to maintain the certain technical level supported by Building Construction Committee (B.C.Committee). Review and optimization of building permission process is required.	MoHPW RAJUK	High
	Improve the building construction process	There are 4 documents required for building construction process under the BCA2008. The construction process is started from the owner of the building along with construction company, though the construction company will never be to subject to inspection during construction. Such monitoring during construction shall be maintained by OBO and Building Construction Committee. After the construction, based on the report including as-built drawing, owner submits them to OBO. OBO is supposed to check the site and the report, but the actual site confirmation and necessary inspection are not applied by OBO. Review and optimization of building construction process is required.	MoHPW RAJUK	High
	Functionalization of BRA/B.C. Committee	To effectively enforce the legal framework, the set-up and operationalization of coordination body is critically important. So far there are no descriptions about the function of BRA and Building Construction Committee (B.C. Committee), thus it is significant to establish those entities through the overview of the building administration.	MoHPW	High
2) <i>Education</i>	<Practitioner>			
	Training on seismic design	Due to the limited number of the engineers who have expertise on seismic design, the quality of the building design is constrained. Not only the public sector but the private sector, the provision of technical trainings is significant.	PWD	High
	Proliferation of private sector engineers	The large portion of the buildings is owned by private sector. The role of the government is to provide the technical guidance and policy intension, while the technical capacity development services shall be provided from public to private. In this end, systemized increase of the private engineers is pressing issue.	MoHPW/PW D	High
	Appropriate engineer accreditation system	In the process of building permit, it is often the case that the accredited engineers are not exactly looking into the submitted document by the owner of the building. Without the recurrent review process of the accredited engineers, it is difficult to maintain the certain quality of the registered engineers.	Institute of Engineering?	Medium
	<Research>			
	Research on local building material	Since Bangladesh has limited construction material, she is forced to be constrained for ensuring appropriate level of construction. It is envisaged to form and operationalize the research institute on investigating local construction material and construction method.	MoHPW	Medium
	<University>			
	Education Program Reform on retrofitting	There is no systematic educational program for structural engineers and architects to acquire the fundamentals and advanced knowledge about structural integrity. The education program has to be provided in university, vocational training center and polytechnic college through the formulation of education program and exchange of the relevant professors.	MOE?	Medium
Creation of research circle	To continuously improve the technical standard and quality in building remediation, research group or research circle have to be established.	MOE?	Low	

3)	Technical Capacity	Seismic Design	In the process of reviewing the structural design of the buildings, due to the limited technical capacity of the government staffs, the technical review of the seismic design is not conducted. The continuous OJT type technical transfer is prerequisite.	PWD	High
		Improve the use of Non Structural Material	There are many buildings and structure which use the non-structural materials like bricks. The construction method of structural material and non-structural material are entirely different, requiring different type of technique and method.	HBRI?	Medium
		Construction Supervision	The practical skill for construction supervision is hindered by the technical capacity of the local government staffs, limited manuals/guidelines and uncertain procedural guidance.	PWD?	Medium
4)	Finance	Government-led loan	Since the building remediation is not profitable business, thus the government led loan is necessary. The loan should pay attention to the interest rate which is directly affect the overall amount of the lending/borrowing considering the financial situation of the banks and end-borrowers.	BFID/BB	High
		Reinsurance/Bank Guarantee	As stated above, the financing to retrofitting or rebuilding will not be accelerated unless certain guarantee for the banks is provided. In order to facilitate the private bank or non-bank, it is important to ease the terms and conditions for lending, thus the reinsurance scheme for private financing authority is crucial.	BFID/BB	High
		Improve Due Diligence	In the process of actual financing to borrower (owner of the building), sometimes the due diligence is the matter for financing. For both banks and borrowers side, it is necessary to improve the process on due diligence.	BFID/BB	Low
5)	Emergency Response	Equipment Improvement	Limited possession of equipment for emergency operation for FSCD hinders the lifesaving activities.	FSCD	Medium
		USAR Technical training	Urban Search and Rescue (USAR) technique is internationally evaluated by International Search and Rescue Advisory Group (INSARAG). FSCD of Bangladesh does not maintain or equip necessary technical capacity.	FSCD	Medium
		SOP improvement	FSCD has its own Standard Operating Procedures (SOP) which states the standardized emergency operation procedures. In order to improve the operation quality, SOPs needs to be improved.	FSCD	Medium
		Community DRM system	Not only for government system, but it is also important to strengthen the community DRM system which is currently implemented with the community volunteer registration system. For further expansion of the community volunteer system, the review and expansion are expected.	FSCD	Medium
6)	Awareness Raising	Community DRM hub	To raise the awareness of the DRM for public community, community facility to tell and disseminate the impact and experience of past disaster is essential.	MoDMR/FSCD	Medium
		Publicizing	Awareness raising materials such as TV, video, SNS, brochure, pamphlet are necessary to be prepared.	MoDMR	Medium
		Primary education	Awareness raising through the primary education in the community needs to be continuously implemented.	MoDMR	Medium
7)	Coordination	Operationalize BRA/B.C Committee	The central institution who manages and guides the regulation and technical standards are pivotal for the effective building administration. BRA and B.C. Committee are supposed to play such a role.	MoHPW	High
		Int'l organization coordination	After the Rana Plaza Incident, a number of international organization initiated their own actions subject to their own standard or situation. The harmonized actions are required among relevant partners, which is only made through the joint platform such as BRA/B.C. Committee.	MoHPW/MoDMR	High
		Exclusion of legal overlapping	There are number of legal or regulation document concerned with urban resilience which sometimes have overlapping and/or discrepancy among them. The legal rearrangement aligning the relevant law and regulations are necessary.	Various	Medium

3.5 Proposals for Japanese Assistance

As stated above, there are number of critical issues that GOB has to address in the area of enforcement, education, technical capacity, finance, emergency response, awareness raising and coordination to improve the urban building safety and urban resilience. However, the superordinate issues beyond them are 1) no clearer overall picture on urban resilience, 2) limited progress on building safety measures and 3) ambiguity

of roles and responsibilities of relevant government agencies. In order to address those overarching issues on urban resilience, it is recommended to implement the following projects.

Table 3.5.1 Recommending Projects of Japanese Assistance for Building Safety Enhancement in Bangladesh

No	1	2	3
Project name	Project for Urban Resilience Master Plan (URMP)	Urban Building Safety Project (UBSP)	Building Safety Promotion Project for Disaster Risk Reduction (BSPP)
Financial mode	Technical Cooperation	Japanese ODA Loan	Technical Cooperation
Main C/P	Ministry of Disaster Management and Relief	Ministry of Housing and Public Works Ministry of Finance	Ministry of Housing and Public Works
Rationale	To fine tune the coordinated arrangements	To mainstream DRM approach for public & private sectors	Boosting the engineers' capability, engineers resource development as well as institutional reform support
Main activities	a) Law & Regulation establishment Support b) Human resources development c) DM Info System	a) Construction of new FSCD HQ b) Retrofitting of existing FS in Dhaka c) Retrofitting of RMG factories by TSL	a) Development of engineers capacity of seismic retrofitting b) Development of training system for dissemination of seismic retrofitting c) Development of plan for building safety by MoHPW

The description of the respective projects is as follows.

a) Project 1 – Development Planning -

1) Project Name

Project for Urban Resilience Master Plan (URMP)

2) Rationale

There are multiple agencies who concerned with the building and emergency administration in the government, which is not harmoniously coordinated. Technical capacity for urban resilience is also hindering the appropriate planning and implementation process, however there is no scientific analysis on who has to possess which particular technical requirement. In overall, the lack of overall plan to identify the plan, actions, resources, resource allocation and technical requirement is the key area that the government has to address. Therefore integrated approach through the development of urban resilience master plan to fine tune the coordinated arrangements is necessary.

3) Project Objectives

To develop the optimum and harmonious urban resilience master plan

4) Project Scope/Outputs

(1) Following sub-system in urban resilience is reviewed.

- i) Law and Regulation Establishment
- ii) Enforcement
- iii) Human Resources Development
- iv) Disaster Management Information System
- v) Institutional

- vi) Arrangement
- vii) Disaster Response Capacity
- viii) Disaster Management Capacity
- ix) Finance
- x) Following sub-system in urban resilience is reviewed.

(2) Resources

The relevant resource in the government and private sector are identified and tasked in a coordinated manner.

(3) Urban Resilience Master Plan is developed with relevant counterparts.

5) Implementing Agency

Ministry of Disaster Management and Relief (MoDMR), MoHPW, DOA, PWD, RAJUK, MoHA, FSCD

6) Implementation Scheme

Technical Cooperation for Development Planning

7) Remark

Since WB is implementing Urban Resilience Project, the consultation process has to be required with WB for the proceedings of the MP formulation.

b) Project 2 - ODA Loan -

1) Project Name

Urban Building Safety Project (UBSP)

2) Rationale

Ensuring structural integrity is an essential issue for Bangladesh to keep its economic growth. However, there lacks the physical skill to build earthquake resistant buildings, financial facilitation measures to promote the retrofitting finance and ensured building construction system. Those are the immediate issues that GOB has to address to mainstream DRM approach for public and private sectors.

3) Project Objective

To ensure the building safety in urban areas in Bangladesh through providing the measures for building safety for public buildings and facilitating the financing modality for building remediation of private buildings.

4) Project Scope/Outputs

(1) Public Building

- i) New construction of earthquake resistant FSCD HQs
- ii) Retrofitting of existing fire stations in Dhaka

(2) Private Building

- i) Low interest Two Step Loan for building remediation

(3) Structural Integrity Ensuring system

- i) Establishment of Technical Review Panel

5) Implementing Agency

MoHPW, PWD and DOA, BFID and BB

6) Implementation Scheme

Japanese ODA Loan

Project 3 – Technical Cooperation Project -

1) Project Name

Building Safety Promotion Project for Disaster Risk Reduction (BSPP)

2) Rationale

To enhance safety for disaster of vulnerable building in Bangladesh is an urgent and essential task. In order to achieve this issue, it is the first measures to increase the number of building that comply BNBC and BCR. CNCRP has been aimed so far to improve the retrofitting technology by PWD engineers. However, it is insufficient still exact engineers in this field. Therefore, first, to realize safer buildings, it is necessary to consider a mechanism for complying BNBC by development of trainings and training system as well as the monitoring of construction process,.

3) Project Objective

To prepare the construction and retrofitting technology and its implementation system, and to develop the supporting procedure for their technical dissemination

4) Project Scope/Outputs

- (1) Development of implementation capacity of retrofitting design and construction works supervision
- (2) Development of capacity for maintenance and management of manuals and guidelines
- (3) Implementation of trial run to develop system and organizational unit in PWD (Public Works Department) for new and retrofitting building construction which are safe against natural disasters and durability losses
- (4) Development of training system for dissemination of retrofitting, re-strengthening and fire safety assessment technology.
- (5) Development of project planning capability for retrofitting, re-strengthening and fire safety assessment of public buildings
- (6) Formulation of implementation plan for building safety and dissemination plan for seismic resilient building technique by PWD and MoHPW (Ministry of Housing and Public Works).

5) Implementing Agency

MoHPW, PWD and DOA

6) Implementation Scheme

Technical Cooperation Project

Chapter 4 Selection of Private Buildings targeted for safety Enhancement

4.1 Background

In Bangladesh, buildings have been constructed with bricks for the ease of material procurement and the beauty of the buildings. The economic growth of Bangladesh has been also supported by brick buildings. On the other hand, as brick buildings are weak to the horizontal movement such as the seismic force, buildings tend to be constructed with an RC (reinforced concrete) frame buildings with horizontal deformability and resistance on a world-wide basis from the experience of earthquake damage resulting in collapse of buildings and this trend is also the case in Bangladesh.

According to the CDMP 2009, there are approximately 320 thousand buildings in Dhaka, of which brick buildings represent approximately 25% and RC buildings 60%.

Bangladesh is located at a position where the Indian, Australian, and Eurasian Plates are colliding and is one of nations with the highest earthquake potential in the world. This nation, however, has not been hit by a major destructive earthquake for the past 100 years. During this period, Bangladesh has boasted a high economic growth especially in recent years. As a result, buildings lack safety due to too much importance placed on cost efficiency such as those with less concrete strength due to little content of concrete.

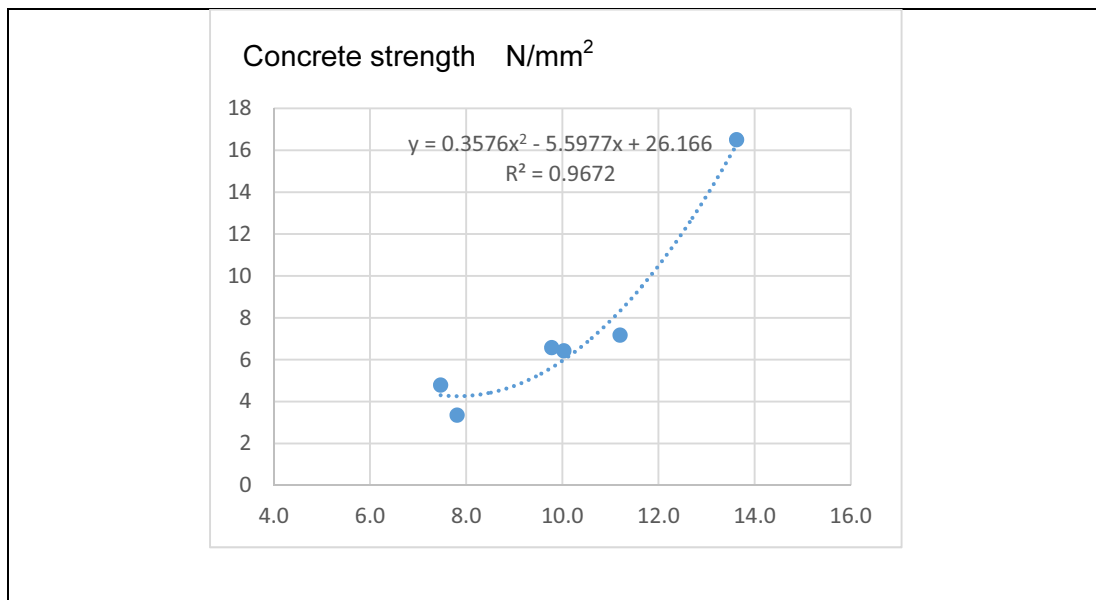


Figure 4.1.1 Correlation between Calcium Content and Concrete Strength

One of the characteristics of the buildings in Bangladesh is the low concrete strength. CNCRP attributes the low concrete strength to the less concrete content due to too much importance placed on cost efficiency as well as to the brick chips used for aggregate. While there is a high correlation between the calcium content and the concrete content, there is also a high correlation between the calcium content and the concrete strength as shown in above.

The CDMP (2009) predicts that if an earthquake of magnitude 6 occurs immediately below Dhaka City, approximately 56% of the total buildings will be significantly damaged with damage ratios of RC buildings at approximately 40% and of brick buildings at 80%.

Under the above-mentioned circumstances, the Rana Plaza Building, in which a garment factory was located as a tenant, collapsed in April 2013 that resulted in a tragedy of more than 1,000 deaths. The direct damage is as shown below.

* Deaths: 1,135; seriously and slightly injured: 1,800 persons

* Economic damage: Building damage of around 270 million BDT, damage compensation of around 85 million BDT, and loss of plant materials and so on

However, the most significant problem was the loss of trust of the global society in the garment industry for the poor working environment.

The garment industry is a key industry of Bangladesh with the export amount expected to increase at an annual ratio of 7% to 9% for ten years in future and estimated to amount to three times of the present level in 2020 according to McKinsey & Company announced in 2012 (Bangladesh All Party Parliamentary Group “After Rana Plaza” 2013). The garment industry placed in such a poor working environment is the most important industry that supports the economic growth of Bangladesh.

As a matter of fact, a garment industry buyers' union in the United States, ACCORD, and a garment industry buyers union in Europe, ALLIANCE, are calling out a boycott of goods from unsafe plants under their umbrella. ILO also evaluates the soundness and safety of garment factories from the aspect of the soundness and safety of working environment for applicant plants by committing the practice to the BUET.

JICA also has launched a loan project supported by the seismic retrofitting technology of the Earthquake Resistance Technology Project, namely CNCRP, under way for the PWD in response to the request from joint associations for the garment industry, BGMEA and BKMEA, to meet the demand of the society.

In Dhaka City, houses represent 80% of the buildings and commercial facilities approximately 15%. The ratios of industrial facilities and government buildings represent 1% to 2% respectively. It is important to promote the safety of houses and commercial facilities by rolling out a campaign of observing the building standards (BNBC) including newly constructed buildings and rebuilt buildings as an entire society rather than handling it by a single project in light of the tremendous numbers of those buildings. It is said that the above mentioned earthquake disasters can be mostly prevented by constructing buildings in conformity to the BNBC and human lives may be saved even if people may be injured to a certain extent.

On the other hand, given the present situation with too much importance placed on economic efficiency and the active activities for safety enhancement already started for industrial facilities (approximately 2%) among other private buildings, more light should be shed on garment factories.

4.2 Characteristics of buildings in Bangladesh

The CNCRP (Earthquake Resistance Technology Pro) announces the following survey results as characteristics of the buildings in Bangladesh subject to seismic retrofitting.

- (1) Most buildings are medium-storied.
- (2) The buildings in Dhaka are mostly constituted of RC-frame structure (approximately 60%) and brick buildings (approximately 25%) and their ratios are 2:1. (CDMP 2009)
- (3) While the RC frame is highly deformable with thin columns, the walls are mostly made of bricks. Thus the existence of the rigid wall inside the highly deformable frame is apt to cause a problem resulting from the difference in deformability between the frame and the wall during an earthquake.
- (4) The construction technology is low, the quality of construction materials for buildings is low, and the concrete strength is low. Worse still, the construction quality is not uniform with the strength different for each column. Most buildings do not secure a uniform quality for reinforcing bars either.

- (5) Many buildings have been constructed by low construction methods such as flat slab that do not meet the requirements for seismic retrofitting.
- (6) Partly because builders are not familiar with seismic retrofitting, limited techniques are applicable in the nation.

The above characteristics make seismic retrofitting difficult. Due to the constraint in applying the Japanese techniques as they are, the seismic retrofitting method needs to be considered with the minimum requirement satisfied in consideration of the BNBC standard.

Here, the Bangladesh National Building Code (BNBC) should be described a little. The BNBC was established in 1993 but has no legal power. People seem to come to abide by the standard little by little since 2008. However, most buildings remain uncomformable to the BNBC. With a revised edition approved by the committee in 2014, the new BNBC is about to be improved as a law. Observation of the BNBC should be promoted at least for newly constructed, rebuilt, and extended buildings, and promotion of the activities by the committee will lead to the safety enhancement of buildings in Bangladesh.

4.3 RMG Sector Loan Project in Earthquake Resistance Technology Promotion

JICA also launched a loan project using the seismic retrofitting technology of the Earthquake Resistance Technology Pro (CNCRP) under way for the PWD in response to the request from joint associations for the garment industry, BGMEA and BKMEA. In October 3, 2013, JICA concluded a MOU for a RMG project among five parties including BB. In this RMG project, the process has been developed as guidelines. More specifically, the guidelines enable judging of the treatment of target buildings by an “Advanced Simplified Evaluation” consisting of screening of documents and a little field survey in the fair “selection of candidate buildings.” In addition, if the owner desires the progress of investigation, in-depth “building survey,” “seismic assessment,” “seismic retrofitting design,” and “retrofitting works” of buildings will be implemented in order. This process includes the obtaining of a loan from a bank and the application for the building permit of the construction plan to the authorities.

Thus JICA completely meets the demand from the society by not only rendering investigation but by implementing a consistent flow of detailed building survey, seismic assessment, seismic retrofitting design, and construction works. Seismic retrofitting is unfortunately a new technology in Bangladesh, and the shortage of engineers who can use the technology remains an issue. The CNCRP has nurtured approximately 20 engineers for the PWD for the past four years. However, given the number of brittle buildings of the garment factories, fostering of engineers is urgently needed and it is obvious that the need of seismic retrofitting cannot be met without promoting this activity.

4.4 Flow of RMG Sector Loan Project

This investigation targets garment factory registered to the BGMEA or the BKMEA that meet the following five conditions in consideration of smooth pursuit with less problems.

- (1) A plant located around Dhaka.
- (2) A building owned by the plant owner.
- (3) A plant with not more than 2,000 employees (because the loan targets small- to medium-sized enterprises).
- (4) RC structure building.
- (5) Existence of architectural drawing.

The investigations by the PWD were performed in the following sequence.

- (1) Screening of documents

Firstly, the application documents to JICA will be reviewed. Submission of construction permit drawings of the building is required to implement reinforcement works and submission of drawings is required to grasp the building condition. Applications without drawings are excluded from the candidates.

(2) Simplified Evaluation

A Advanced Simplified Evaluation (ASE) for building soundness enhancement will be performed based on the submitted drawings. In addition, because it is often the case that the drawings are different from the actual building (drawing layout, material strength, building to land ratio, etc.), building survey will be performed, if desired by the owner, to perform evaluation more appropriate for the site. At this point in time, the order of priority for seismic retrofitting works will be fixed and the rough approximate cost will be estimated to calculate the amount that the owner should borrow.

(3) Seismic assessment/Seismic retrofitting design

If the owner desires and has a prospect of obtaining a loan from a bank, seismic capacity evaluation and designing will be performed for the building. More specifically, drawings required for seismic assessment and designing will be prepared, materials tests for concrete strength and so on will be performed, the present state of the building will be investigated in details such as as-build drawings, and seismic design will be conducted based on those data.

(4) Seismic retrofitting works

After the seismic design completes, seismic retrofitting works will be performed using the loan obtained by the owner from the bank. Because a construction company may construct a building using concrete of low design strength due to their low engineering capabilities, construction work supervision/management is required. To that end, the PWD will supervise the construction works as the top supervisor in accordance with the MoU. Besides, from the perspective that construction works supervision and quality control will start with the selection of contractors, the contractor will be selected from the list of candidate companies narrowed down in advance.

On the other hand, if the owner considers rebuilding or relocation, the owner will hire a designer to implement new building design and construction. The PWD will take a role of the top supervisor in that case too.

4.5 Changes in the number of applicants

a) Screening of documents

Table 4.5.1 Results of Screening of Documents

Organization	Number of Applications ¹⁾	Building number that passed through the 1st judgement ²⁾	Building number through 2nd judgement ³⁾	Number of Simplified evaluation was done
BGMEA	134	61	39	39
BKMEA	80	23	16	16
Total	214	84	55	55

First of all, documents were screened. As a result, 55 buildings were raised as candidates for seismic retrofitting of 214 applicants in total. More than 150 buildings and owners did not submit the evidence for construction permit of their buildings that is a prerequisite for application. This seemed to be a major problem for the building construction in Bangladesh.

For the 55 buildings, for which documents including drawings were submitted, a simplified evaluation was performed using the drawings.

b) DK, PURPLE

A pilot seismic design for two factories of DK and PURPLE has been firstly started with an approval obtained from the BGMEA and the BKMEA. In this process, it is aimed to establish project implementation procedures and to improve problems.

As a matter of fact, problems in implementing the project such as the understanding of seismic retrofitting by related organizations, the establishment of procedures, and the fire safety designs were improved and thus the first seismic design sufficiently played its role as a pilot design.

c) Simplified evaluation of the site

Except for DK and PURPELE, 21 owners were interested in implementing the seismic design on loan. Of them, three owners changed their minds during the building survey, and an Advanced Simplified Evaluation including the site information for the remaining 18 owners were actually performed.

Table 4.5.2 Applicants for Simplified Site Evaluation

Organization	Number of applicants	Advanced simplified evaluation was performed	Comment
BGMEA	15	13	When we found the problems of applied drawing, we did not the evaluation
BKMEA	6	5	When we found the problems of applied drawing, we did not the evaluation. GLARE Fashions Ltd. has two buildings
Total	21	18	

As a result, 18 owners of 214 applicants were targeted for seismic retrofitting design. And later one owner resigned its application, then now totally 17.

d) Applicants for seismic design

Finally, 12 owners were targeted for seismic retrofitting design as shown in Table 4.2.3. Of 214 applicants, 12 owners, or 5% of owners of all the applicants, were interested in seismic retrofitting design to the end. And later one owner resigned its application, then now totally 17.

At the stage of the drawing investigation, approximately 30% of the buildings were determined as problematic in terms of the BNBC standard (strength as low as the Rana Plaza). Given this ratio of problematic buildings, the number of applicants we had is far from large.

Table 4.5.3 Targets for Reinforcement Design

Organization	Number of applicants	Candidates of retrofitting	Comment
BGMEA	13	8	Targets for reinforcement design and construction
		2	Targets for fire control design only without problems in the building structure
BKMEA	5	0	Targets for reinforcement design and construction
		2	Targets for fire control design only without problems in the building structure
Total	18	12	

e) Additional application

We invite the candidates, who were rejected in the initial application, to re-apply for the seismic design on condition that the owners re-obtain their building permits. There is a possibility that some owners re-apply for the project.

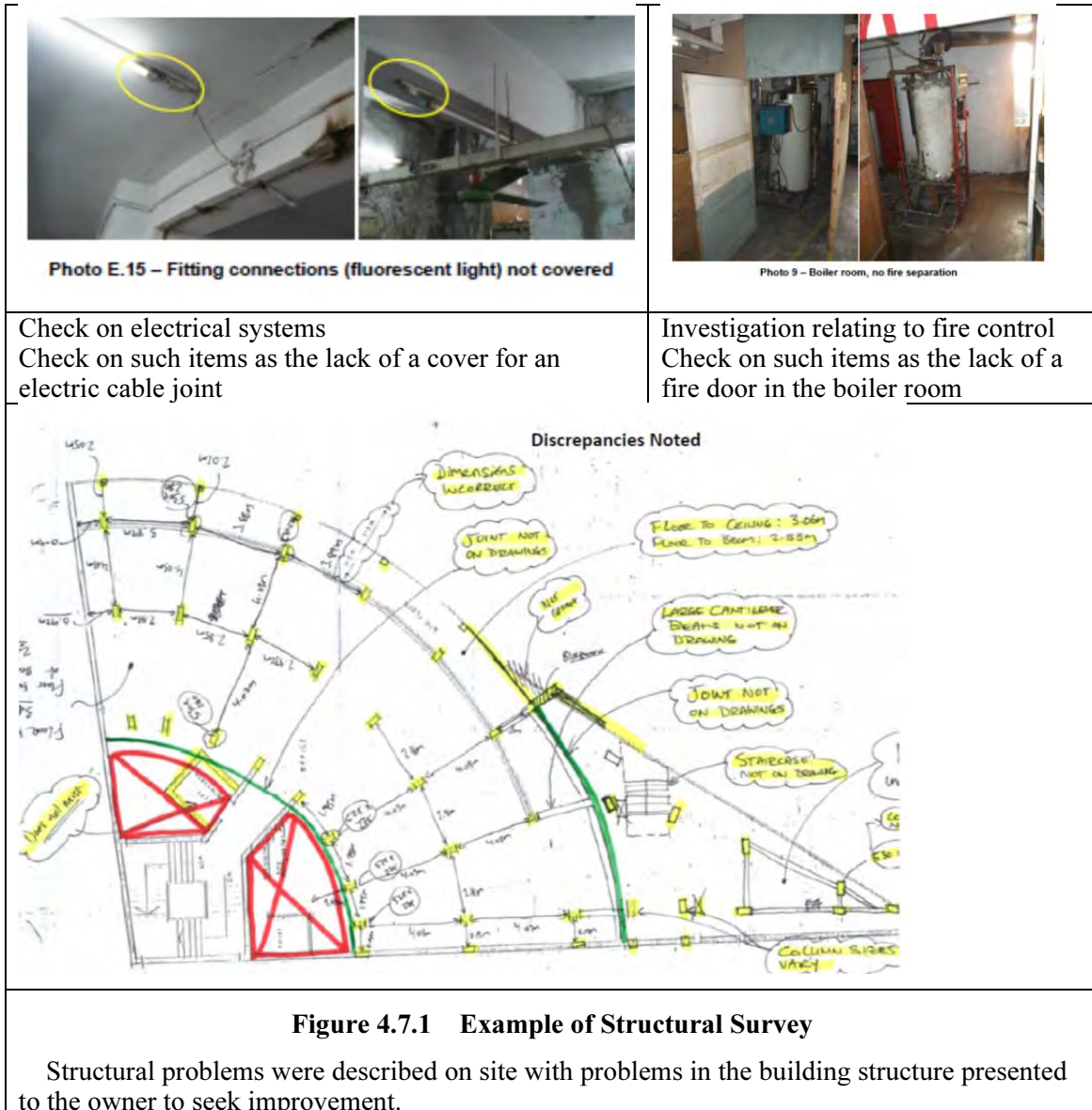
4.6 Environmental Social Considerations in Private Sector

There is a strong probability that the environmental social considerations in private sector is are categorized as 'FI (defined as Unspecified sub-projects, such as Two-Step Loans, Sector Loans etc.)' according to the JICA guideline for environmental and social considerations due to the utilization of the Two Step Loan to finance for the private sector. The loan customer has not yet been decided because of environmental review stage. Therefore, the ESMSs of Financial Intermediary/Executing Agency in Bangladesh including Bangladesh Bank were checked in this report. As shown in previously and the ESMSs of Financial Intermediary/Executing Agency in the Appendices 9 and 10 concrete items in the environmental review stage as showing below have been already established in Bangladesh. Accordingly, further measures for reinforcing and improving capacity are unnecessary.

- (1) The policy for environmental and social considerations
- (2) The procedures for screening, categorizing and review
- (3) The organization structure and personnel for environmental and social considerations
- (4) The procedures for monitoring and reporting
- (5) The experiences for environmental and social management

4.7 Evaluation technique of ILO

As previously mentioned, ILO, ACCORD, and ALLIANCE evaluate buildings similarly as the JICA RMG project. ALLIANCE publishes their results on the WEB.



What is common among ILO, ACCORD, and ALLIANCE is that they suggest structural and fire safety problems to the owner from the aspect of safety improvement to seek for improvement, based on their own inspection. In Bangladesh, with no private companies that render seismic retrofitting, it remains a problem that the owners have no specific means of improving the suggested problems.

ILO reportedly calculates the seismic strength at present by creating a building model based on the interview and building surveys for the DEA (Detail Engineering Assessment) that are implemented by local consultant instructed by BUET. Accordingly, the evaluation technique seems to have any problems except for the problem whether the model expresses the actual building, though it does not mean the deny of the evaluation itself. What remains a problem is, however, whether ILO has acquired the information about the construction works in addition to the evaluation-related information when seismic retrofitting design and construction works are performed for the buildings evaluated by ILO.

Some examples will be quoted as below.

(1) Application for building permit

While application for construction permit is required for reinforcement construction in Bangladesh, there is a problem that some owners cannot submit the drawings for building permit for their existing buildings due to negligent application and maintenance. As a matter of fact, it takes time for re-application without such information in implementing reinforcement construction, and thus we do not accept applications of owners who do not possess documents for building permit.

(2) Investigation results (evaluation) by BUET

The results of evaluation, concrete investigation, and AS-BUILD DRAWING investigation performed by BUET can be used for the current project. Those data can dispense with a part of the work and is useful for efficient review.

However, the As-BUILD DRAWINGS, for example, need to be prepared for all the floors for seismic design. The possibility of efficiency improvement depends on how many required basic investigation results have been prepared including concrete test result.

In the meantime, the evaluation performed by the CNCRP (Bangladesh Technology Pro Team) at present intends to convey the present state of the building to the owner as a grade point (such as below the BNBC standard) and to estimate the approximate cost based on the grade point. Accordingly, this evaluation is indispensable but not time-consuming.

(3) Future approach to the buildings evaluated by the ILO

To include the buildings evaluated by the ILO in the project target is considered as a necessary item to contribute to the disaster mitigation in Bangladesh and to the protection of economic infrastructures.

There are two approaches to enable this item. One is to include the buildings evaluated by the ILO in the RMG project presently implemented by the Technology Pro. In that case, owners will apply to the JICA via the BGMEA or the KMEA with the BUET's investigation result attached in addition to the documents required for the present RMG project (such as the application form to the JICA and the evidence of building permit). In this case, the CNCRP will screen and evaluate the documents for seismic design and construction.

This approach is considered to be feasible under the current MoU scheme; however, the ILO's target plants include those not under the umbrella of the BBGMEA or the BKMEA. Accordingly, in order to include plants not belonging to the BGMEA and the BKMEA in the project target, MoU needs to be concluded with the relevant organizations.

4.8 Impediments

While this project has made progress to a certain degree, it is actually implemented in face of some impediments to the progress.

(1) Driving force

This project started in response to the request from the BGMEA and the BKMEA with the collapse of the Rana Plaza as the direct trigger. However, the clients of the project, namely the BGMEA, the BKMEA, and owners, are driven by the sense of crisis over the boycott of goods by other buyers under unsafe working environment rather than the sense of crisis over their building strength, and are consequently not interested in buildings that have been already regarded as acceptable in the investigation by other buyers.

It is considered to be very problematic that the government sets forth no initiative in implementing the future building safety enhancement plan in light of the recent plant destruction accident. For example, a safety enhancement plan once proposed to MoHPW by CNCRP as shown in Appendix 6, which was

proposed during CNCRP on September 2014, will have a possibility the PWD to be involved in the work in a leadership position. It is just an idea.

(2) Interest charge

The high interest on borrowing from banks is pointed out. This high interest is caused by an interest charge of 5% imposed on the money supply to commercial banks (4% by the government and 1% by the Bangladesh Central Bank). This fact also shows that the Bangladeshi seismic retrofitting plan depends on others.

(3) Motivation

Owners apply for the project only when the building reinforcement works are worth paying under the pressure from buyers and in their business models. If the reinforcement works are not to be driven by the government but to be encouraged to owners, the owners need to be motivated. Possible motivations include the following;

- Request the government to grant a special low interest rate for a period of at least 10 years.
- Consider providing the design service free of charge of the construction fees (usability of JICA's tool).
- Attach a large safety mark to the completed building for advertisement to the public.
- The government, the Ministry of Labour, and the PWD will publicly recognize the companies that implemented seismic retrofitting for their improvement of working environment.
- Request the government to subsidize 20% to 30% of the construction cost given the role of the seismic retrofitted buildings as an evacuation shelter.

(4) Reconstruction, relocation

When taking rebuilding and relocation into consideration, the total construction cost may exceed the present upper limit of BDT 100 million per building. Given rebuilding and relocation, the upper limit should be judged by banks instead the present upper limit of BDT 100 million removed.

4.9 Future prospects

Gradually but steadily, the JICA's seismic retrofitting promotion project for RMG factories is likely getting known by owners and related stakeholders in Bangladesh and internationally. Some owners, who had not been interested in applying for the project after undergoing seismic assessment at the additional application, showed intent to apply for seismic retrofitting at the next opportunity. In addition, owners of buildings, which were evaluated by the RMG buyers such as ALLIANCE, ACCORD or the international organization of ILO or the governmental organization DIFE of the Ministry of Labour, will come to the JICA project, because such organizations have conducted inspection but not remediation. Under such circumstances, there are tremendous huge needs of the present JICA's RMG project only which can form assessment, design and remediation like retrofitting, rebuilding and relocation.

However, because it is owners who decide to actually borrow the capital of approximately BDT 100 million, a means of facilitating the loan of such a large amount needs to be considered. Therefore if considering the new project for RMG factory remediation, the condition for the loan and other process should be reconsidered for more appropriate and smooth implementation.

Chapter 5 Study of Possible Scheme by JICA Finance for Building Safety in Bangladesh

5.1 Study on JICA assistance for building safety

5.1.1 Building safety and financial system

It is not easy to conduct construction works necessary for building safety (seismic retrofitting) by funds borrowed from a financing institution in Bangladesh. Seismic retrofitting of buildings including houses is possible in a quake-ridden country like Japan where local governments have established a system for grants to promote retrofitting works in response to the strong needs for seismic retrofitting. As a matter of fact, however, seismic retrofitting has not progressed as much as expected even in Japan.

In the case that the need of national earthquake resistance improvement is emphasized as in Japan, a structure to promote and encourage earthquake resistance improvement have been established in various fields including the development of legal systems for disaster prevention, the revision of the building code based on the respect for human life, improvement of earthquake-proof/aseismic base isolation technologies, the strengthening of disaster prevention-related services by administrative bodies, and the development of preferential financial products for promotion of earthquake resistance improvement. In other words, in order to implement earthquake resistance improvement through the financial system, interference only on the financial aspect is insufficient and the development on the administrative aspect surrounding the finance needs to be facilitated. Accordingly, it is too early for Bangladesh, where the responsible national administration system to protect the life of citizens has not been sufficiently established, to promote earthquake resistance improvement of buildings through the financial system.

5.1.2 Safety strengthening of buildings with high urgency

As mentioned above, it is difficult for Bangladesh, where the institutional structure has not been sufficiently established, to implement the safety strengthening of buildings. In addition, the people of Bangladesh with less frequency of earthquake occurrence have a sense of values for the need of earthquake resistance significantly different from that of the Japanese and it is not likely highly urgent for them to implement earthquake resistance works on loans in the stringent economic circumstances. On the other hand, however, it is also true that safety and earthquake resistance improvement of buildings are urgently needed without waiting for the establishment of the administration system with many buildings constructed in defiance of the building code⁴⁰ existing not only in the metropolitan Dhaka area but all over Bangladesh.

In light of the above situation, JICA conducted this survey with a view to implement safety of private buildings in Bangladesh (metropolitan Dhaka area and Chittagong city) considering a possibility of using the yen-loan-financed scheme.

Given that a two-step loan (TSL) is considered to be appropriate as a method to provide funds required for safety buildings through private financing institutions to the private sector including the owners of ready-made-garment (RMG) factories, this survey studied a highly feasible scheme by making a hearing survey to local relevant organizations such as various financing institutions including the Bangladesh Central Bank.

⁴⁰ The Bangladesh National Building Code (BNBC), which corresponds to the Building Standard Law of Japan, has been established.

5.2 Present status of the RMG sector in an urgent need of building safety strengthening

5.2.1 Changes in the state since the Rana Plaza destruction accident

The destruction accident of the Rana Plaza Building, which occurred in April 2013, was the worst building disaster in the history that resulted in more than 1,100 deaths and missings. Five RMG factories dealing with famous apparel corporations including Walmart and Benetton tenanted in the eight-storied building. The collapse of this building was reportedly caused by load and vibration of garment manufacturing machines including many sewing machines that reduced the life of the building that did not meet the building code. Many of the victims were female workers who worked for the five ready made garment factories.

5.2.2 Actual condition of the closure measures and responses of RMG factory owners

The textile/garment industry is an extremely important leading industry for Bangladesh representing 70% of its export. In other words, this fact means that many apparel corporations in all over the world including the United States and Europe depend on the transaction with the textile/garment industry in Bangladesh and it is easily understood that it is so important for the apparel corporations in the world to secure stable business partners that they need to avoid the recurrence of the accident like the collapse of the Rana Plaza.

In light of this situation, the apparel industry in Europe organized the ACCORD⁴¹ and the apparel industry in the United States the ALLIANCE⁴². Those organizations aim to secure Bangladesh as a stable supplier by including the development of the environment, where workers of textile/RMG factories can work safely, in their terms and conditions.

The above-mentioned ACCORD and ALLIANCE, together with the ILO and the Bangladesh University of Engineering and Technology (BUET), established a mechanism for assessing the working environment and usage status (electric facilities, fire safety facilities, building strength) of RMG factories in Bangladesh and reporting the assessment results to the Review Panel run by the Department of Inspection for Factories and Establishment (DIFE) with the authority of closing private factories. The Review Panel discusses the remedial measures for the working environment of the assessed factories and issues orders to close of factories recognized to be under a high degree of risk to ensure prevention of accidents. If the remedial measures described in the order were taken by the factory owner, the reopening of operation is expected to be permitted after site inspection by the DIFE.

The above measures where factories, which have not developed a safe working environment, will not be recognized as a business partner and will be closed under the frameworks of the ACCORD and the ALLIANCE are agreeable from the perspective of the respect for human life. However, while the benefit and need of the measures are recognized, it is a major problem that no consideration after closure is given to the factory owners who are ordered to close their factories. Factory owners, who are ordered to make improvements, and factory owners, who are ordered to close their factories due to high degree of risk, as a result of the assessment by the ACCORD and the ALLIANCE, usually need funds to implement works for improvement and reform. However, no access to preferential finance is taken into consideration at present. It is a serious problem.

⁴¹ The Accord is a legally binding agreement. It has been signed by over 190 apparel corporations from 20 countries in Europe, North America, Asia and Australia; two global trade unions, IndustriALL and UNI; and numerous Bangladeshi unions. Clean Clothes Campaign, Worker Rights Consortium, International Labour Rights Forum and Maquila Solidarity Network are non-governmental organizations witnesses to the Accord. The International Labour Organization (ILO) acts as the independent chair.

⁴² The Alliance for Bangladesh Worker Safety is a group of 26 major global retailers formed to develop and launch the Bangladesh Worker Safety Initiative, a binding, five-year undertaking with the intent of improving safety in Bangladeshi ready-made garment (RMG) factories. Collectively, Alliance members represent the majority of North American imports of ready-made garments from Bangladesh, produced in more than 700 factories.

JICA plans to consider a measure that enables factory owners, who are ordered to take measures by the above DIFE, to use a new TSL on the assumption that they need a financial support.

5.3 Consideration of a financial support scheme (TSL) by JICA

5.3.1 Target end user and end user selection procedure

a) Target end user

JICA determined financing RMG factories in need of building safety through the existing TSL, which aims to promote small and medium-sized corporations, to protect the RMG sector from destruction accidents immediately after the destruction accident of the RANA Plaza.

This survey was conducted with the objective of forming a TSL scheme targeting more RMG factories in need of strengthening their building safety because the number of RMG factories that can be supported by the above existing TSL is limited.

While the new TSL basically targets the RMG sector for support, if a commercial building under a high degree of risk that urgently needs safety strengthening is found, JICA will also consider it as a target for support.

b) End user selection procedure

Detailed selection procedures for end-users are shown in Attachment-1.

Owners of RMG factories to be included in end users are largely divided into two categories. One is factory owners with the safety strengthening of their buildings recognized as necessary as a result of the technology assessment under JICA's technical cooperation and the other is factory owners ordered to close as a result of the above-mentioned technology assessment by the ACCORD, the ALLIANCE, and BUET.

The regular membership of the BGMEA or the BKMEA⁴³ (both organizations will be described later) will be made mandatory because the membership enables confirmation of the legitimacy of the business right for both of the above end user categories in the RMG sector.

While the central bank is an implementation body on the financial aspect under JICA's new TSL, the Public Works department (PWD) is an implementation body on the technical aspect for the total integrated procedure from the technical assessment of the building safety to designing for safety strengthening, support for bidding of related works, construction management, and confirmation of completion. Accordingly, it is important to have end users understand the details of the JICA/TSL scheme including the characteristics of the scheme.

Owners of RMG factories, who wish to borrow the JICA/TSL loan, will firstly visit the association they belong to, BGMEA or BKMEA, and receive outline explanation about the procedure of the JICA loan. If they agree with the procedure, then they will submit an application to receive technology assessment. The subsequent procedures are the same shown in Attachment-1.

c) Points to note in end user selection procedure

1) Setting of standard required period for expedition of detail design and estimation of construction cost

The determination of the construction cost required for borrowing a bank loan is important for factory owners, who determined the strengthening of factory safety by borrowing a bank loan, and all the more for factory owners, who were ordered to close, and thus preparation of a detail design should not take a long period as a matter of course. A detail design for construction is prepared by the PWD, but a standard required period should be set in advance in accordance with the construction details to expedite the loan procedure for factory owners and financing institutions.

⁴³ BGMEA: Bangladesh Garment Manufacturers & Exporters Association.
BKMEA: Bangladesh Knitwear Manufacturers & Exporters Association

For commercial buildings, the project implementation unit of the Bangladesh Bank (BB-PIU) will function as the window to receive an application first and the procedures similar to the above are likely taken after undergoing the technical assessment for the need of safety strengthening of the building. However, on the utilization of TSL loan for private buildings, partly because of the possible restriction of the loan amount, further detailed consideration will be made by BB and JICA.

The Survey made series of interview with RMG factory owners for the purpose of formulating the most appropriate scheme of the TSL for building safety. The interview is summarized as per Attachment-2. And interview records with each factory owner are also attached to Appendix 7

2) Importance of the role played by the PIU

A characteristic of the new JICA/TSL is that it is not a usual TSL, which provides funds to end users, but is an unprecedented scheme for JICA who aims at proper implementation of safety strengthening of the end users' buildings. Accordingly, it is extremely important for the BB in charge of financing and the PWD in charge of technical matters to establish close cooperation through their PIUs to establish a structure that enables the persons in charge of coordination of the both units to follow up the procedure and to properly respond to the end user.

In the case of establishing each PIU for BB and PWD under the new JICA/TSL, sufficient personnel should be assigned to both PIUs with due consideration given to this point.

5.3.2 Participating financing institutions (PFIs) and selection criteria

a) Investigation of candidate PFIs

1) Participation of public financing institutions

The new JICA/TSL aims to enable factory owners with factories assessed as under a high degree of risk and in an urgent need of safety strengthening to strengthen the building safety through financing from financing institutions. However, given that building safety itself does not generate profit, it is obviously difficult for factory owners to implement building safety under the usual conditionality. Accordingly, it is necessary to devise a measure enabling financing with conditionality as preferential as possible.

This survey examined the participation of public financing institutions in consideration of this point given that public financing institutions may possibly set a more concessional conditionality than private financing institutions where no institutional finance for building safety exists in Bangladesh. In the interview implemented during this survey, a strong will of participation was expressed from public financing institutions and the Ministry of Finance also expressed affirmative views on the participation.

However, the investigation of the fiscal health, financing fields, and so on of the public financing institutions revealed that they do not meet the selection criteria of the BB and that the local roles of the public financing institutions need to be changed for the participation, and the survey team determined it difficult for them to participate in the upcoming JICA/TSL.

In the case of implementing building safety through the financial system in future, the national government may need to establish a political support system and to consider establishing institutional finance that can set a concessional conditionality. All banks including a public financing institution summarized with their financial status and related information necessary for the upcoming JICA/TSL is shown in Attachment-3.

2) Private financing institutions

This survey investigated the organization, business lines, financing fields, conditionality, bad-loan ratio, capital adequacy ratio, and so on for the private financing institutions (banks and nonbanks) selected for JICA's existing TSL, FSPDSME.

The BB intends to solicit all financing institutions for participation in the new JICA/TSL after setting selection criteria anew and to select participating financing institutions from those which wish to participate.

b) Investigation of intents of private financing institutions keen on participation

1) Interest Rate

What is the most important for factory owners wishing to strengthen building safety on loans from financing institutions is the interest.

This survey investigated the interest rates applied in the existing TSL for small and medium-sized enterprises (FSPDSME), in which more concessional interests are likely applied than general loans. As a result, it was revealed that the interest ranges from 10% to 22%.

Accordingly, when considering the preferential interest rate for building safety, it is likely possible to target 10% that is the lowest interest rate for financing small and medium-sized enterprises. Beyond that, because the new TSL aims at building safety that is directly involved with the human life and that relates to the growth of the RMG sector that is important for the Bangladeshi economy, it is likely needless to consider an interest higher than 10%⁴⁴.

As a result of interviewing 10 banks in excellent performance and operational conditions (See Attachment-4), who likely apply a low interest, in this survey, several banks assured that they can offer an interest rate within 5% as PFIs if they can procure money from the government with an interest rate within 5%, and that they would reduce the interest if the government reduces the interest rate of the money lending to them. (See Attachment-5, And Interview records with each PFI are also attached to Appendix 8)

If the Bangladeshi government places priority on the strengthening of the factory safety in the RMG sector, it can be expected that the Ministry of Finance and the Bangladesh Bank will reduce the interest rate of the money lending to PFIs from the present 5%⁴⁵, and, if this is realized, the loan rate to end users will lower for that, one-digit interest rate will be realized in Bangladesh, and the financing record for the strengthening of building safety is expected to increase.

2) Loan period

The building (factory) safety strengthening works are classified into three types depending on the present status of the building: retrofitting, re-building, and new construction on another land possessed by the factory owner. Even retrofitting with a relatively short construction period needs approximately one year because periods for designing, bidding, and construction are required. Given that two years are likely needed for new construction, it will be appropriate to leave the determination of the loan period to the examination by the financing institution depending on the construction amount and details with 15 years as the upper limit.

It may be appropriate to set the grace period to the construction period.

3) Collateral

⁴⁴ The survey Team asked financing institutions about the cost and the profit as a percentage of the interest in the interview with them, and most of them answered 2% and 3% respectively.

⁴⁵ The breakdown of 5% is 4% from the Ministry of Finance and 1% from the central bank.

Security will be set by the financing institution depending on the value of the property targeted for financing, but land, a building, or a third-party's guaranty is usually adopted.

5.3.3 Establishment of implementation system of Bangladesh Bank (BB) relating to TSL for building safety

a) Functions and roles of BB-PIU

Given that the new JICA/TSL aims to enable the strengthening of building safety, it is required of the BB-PIU not only to supervise finance but also to play the role of a coordinator between the PWD-PIU and the factory owner, who will borrow a loan, through such activities as performing the specified monitoring by keeping close cooperation with the PWD-PIU, who is in charge of the total integrated procedures until the completion of construction including the advanced evaluation assessment (ASE), bidding, contracting, implementation of construction, and construction management.

The BB-PIU needs to pay attention to the point that assignment of the above personnel in charge of coordination is the key to the JICA/TSL Project.

b) Implementation/operation method (establishment of Operating Guidelines)

In order to efficiently operate and implement the JICA/TSL for building safety, the Operating Guidelines has been drafted by the Survey Team and attached hereto as Appendix-9.

While the operating guidelines for the development of small and medium-sized enterprises have been established, given that the new JICA/TSL aims to enable building safety as described above, functional guidelines need to be prepared with due consideration given to the responsibilities and roles of the BB and the PWD so that they can be used not only by BB but also by PWD effectively.

c) Roles and personnel of the consultant

The consultant to be hired by the BB will assume the management of the special account to be opened when the TSL will be implemented and promotion and monitoring of financing as its principal roles in a usual TSL case.

In the new JICA/TSL, however, it should be considered to have the consultant to assume the role of liaison and coordination with the BB-PIU, the PWD-PIU, and the consultant to be hired by the PWD.

For reference sake, the BB expressed a view that they are not much satisfied with the performance of local consultants from their past experience and that they wish to hire a foreign consultant even if the unit price gets higher and the number of personnel is reduced.

5.3.4 Establishment of implementation system relating to TSL for building safety in the Public Works Department (PWD)

a) Technology assessment procedure and establishment of assessment scheme

The technology assessment for building safety of private factories needs to be implemented efficiently in a short period of time with the assessment procedure clarified. After the Japanese consultant engaged in the JICA's technical cooperation at present and the consultant to be hired for the new JICA/TSL complete their duties, the PWD staff needs to perform the same type and same level of duties on their own. Accordingly, it is important to incorporate the task in the TOR when the above consultants implement their duties to ensure proper technology transfer to the PWD. In this regard, JICA needs to guide the PWD so that necessary personnel should be assigned.

In addition, given that the technology assessment results are extremely important also for the loan procedure, it is necessary to manage the progress by setting a standard work period so that the period

required for technology assessment may be known to factory owners and financing institutions in disclosing the assessment procedure. For reference, a table showing standard work period required for each work is made as per Attachment-6.

b) Functions and roles of the PWD-PIU

The new JICA aid for building safety consists of two components: the component for private buildings safety through the TSL scheme and the public component for buildings safety related to the Fire Defense Headquarters and fire stations.

What needs a special attention in this JICA assistance is that the PWD, who is usually not involved in private buildings, will also assume the assessment and designing of private buildings undergoing safety works under the TSL scheme. Accordingly, given that the efficient implementation of this project depends on the implementation capability of the PWD, who will take charge of the building safety not only of private buildings but also public buildings, the securing of sufficient personnel for the PWD is indispensable. Special consideration is required on this point for the Bangladeshi government and relevant regulatory authorities.

c) Roles of the consultants to be hired by BB and PWD

The consultant to be hired by the PWD in the building safety project will perform appropriate duties both for the public sector and the private sector similarly as the above-mentioned PWD-PIU. Given the existence of a consultant to be hired by the BB to assume the finance-related duties associated with the TSL in the private sector, the consultant to be hired by the PWD is expected to perform such duties as the assessment of private buildings, support for D/D, support for bidding, and construction monitoring.

Accordingly, the consultant to be hired by the PWD will assume a special TOR of being involved in the JICA/TSL scheme with the objective of the safety of private buildings, in which a consultant employed by PWD does not usually need to be involved. Thus, for the purpose of realizing smooth and effective implementation of assessment, designing, and inspection of many private factories, it is strongly recommended for both constraints to be hired by BB and PWD to build up functions for coordination between technical procedures and financial procedures in their TORs.

d) Support for factories ordered to close by the DIFE

As already mentioned, the ACCORD, the ALLIANCE, and the BUET assess the safety of RMG factories and those diagnosed as having a high degree of risk are ordered to close by the Review Panel run by the DIFE, and so far, 30 factories have been closed. (See the table below)

Table 5.3.1 Status on factories instructed by Review Panel

(as of mid-October, 2014)

Status on Factories Instructed by Review Panel					
Inspector	Instruction to close	Operation after completion of works instructed by Review Panel	Partially operation under construction	Detailed Engineering Assessment ordered	Closed
ACCORD	14	3	3	2	6
ALLIANCE	16	4	2	9	1
Total	30	7	5	11	7

* Total number of employees at inspected factory = 17,945 (Dhaka: 12,900, Chittagong: 4,985)

As already described, the end users of the JICA/TSL will be selected by the procedure as shown in Attachment-1. If a factory owner ordered to close by the DIFE wishes to use the JICA loan, he will firstly apply for the ASE at the BGMEA or the BKMEA, receive confirmation of the details of the technology assessment performed by the ACCORD or the ALLIANCE in advance, and then receive advice on the subsequent procedures.

Accordingly, close cooperation among BGMEA and BKMEA, who will serve as an application window, the BB-PIU, who will manage the JICA/TSL, and the PWD-PIU, who will take charge of the assessment and safety works of buildings, is essential when the factories ordered to close by the DIFE are eligible for the JICA loan. Thus, the procedures have been clarified in the Operating Guidelines attached hereto as Appendix-9.

5.3.5 Organizations and roles of BGMEA/BKMEA

a) Organizations and roles

The two organizations are summarized in the following table. Both organizations are highly important in the RMG sector and can be expected as a window for the JICA/TSL.

Table 5.3.2 Summary of BGMEA and BKMEA

	BGMEA	BKMEA
No. of Member	5150 (out of which 40% Knitwear)	1700
Annual Fee	7,500~25,000BDT	10,000BDT
Rules & Regulation	Ensure minimum wage, fire service & civil defense law, child labor free Company, building safety, environment safety etc.	ditto
Group Insurance	Group Insurance is mandatory to all members. However, it depends on the number of workers. The number of workers higher, the number of payable amount higher. Each member company must ensure to insurance coverage for their employees. For 500 workers the insurance charge is 25,000 BDT per annum. If the number of increases the insurance charge will also increase.	ditto
Registration	List of all employees must be submitted.	ditto
Training	Member company shall organize training for awareness development and BKMEA will offer such training its owned training institute.	ditto
Obligation	Member entrepreneur shall attend some meetings with the officials of BKMEA	ditto
Audit	Audited by BGMEA regularly	Audited by BKMEA regularly
		(Source:Study Team)

b) Strengthening of the window functions of the BGMEA and the BKMEA - establishment of the JICA Project Office -

Membership of the BGMEA or the BKMEA is made mandatory for corporations in the RMG sector, who wish to apply for the use of the JICA/TSL, partly to enhance the factors of credit protection in consideration of the public character of the JICA loan.

It is because that the BGMEA and the BKMEA need to function as a window for the JICA/TSL.

Accordingly, it is essential to assign staff proficient in the procedure of the JICA/TSL to the both organizations and it may be effective to form the JICA Project Office (provisional name) to clarify the application window to users.

In addition, it is indispensable to provide education programs to the above office for mastery of the procedure for the JICA loan at an early stage before the JICA/TSL is implemented.

c) Procedure for supports ordered to close by the DIFE

As already described, the JICA/TSL plans to accept factory owners, who were ordered to close by the DIFE in the name of the fast track, as its end users.

The first-track end users have been already received the technology assessment by the ACCORD, the ALLIANCE, or the BUET, but if they use the JICA/TSL, the consistency with the technology assessment by the JICA/TSL needs to be confirmed. To that end, it should be known to the BGMEA and the BKMEA that they should serve as an application window of the JICA/TSL also for fast-track end users similarly as usual end users.

5.3.6 Considerations in implementing JICA aid associated with building safety

In addition to the points as previously mentioned, some cautions should be given to the following points in general in implementing the TSL for building safety in future.

a) Publicizing the JICA/TSL - make the loan for building safety widely known –

1) Publicizing by the BGMEA and the BKMEA

Introduction to all member corporations and organizing explanatory meetings

2) Publicizing to PFIs

Implement seminars to obtain understanding about the loan procedure for building safety and about the activities involved by the technical side including the PWD (technology assessment, bidding, construction contracts, etc.)

3) Publicizing to government agencies

It is important to establish an organizational support system by making the widest possible notification not only to the departments in charge of the TSL but widely inside the organizations of the PWD, who will implement the safety of buildings from the technical side, and the Ministry of Housing and Public Works (MOHPW), who is a relevant government agency, as well as the Ministry of Finance and the Bangladesh Bank who are implementation bodies of the JICA/TSL.

b) Simplification of the JICA loan procedure and setting of standard required period on procedure

This survey involved visits to many financing institutions. While the information obtained in the interview was already described, many views were obtained from them on their requests for JICA's new loan for building safety that the procedure takes too much time and that the procedure is too complicated and simplification is necessary. JICA needs to address those problems. Simple and prompt procedures are required all the more for the nature of the finance for building safety that is concerned with the human life.

In order to realize this, the survey team considers it appropriate to set a standard required period for a series of procedures from the application for the loan to the approval of the loan after the technology assessment and to have the relevant parties to manage the time. A provisionally set standard timeline is already attached (See Attachment-6).

c) Establishment and strengthening of the cooperative system among PIUs and consultants employed by BB and PWD

1) Sufficient budgetary measures

The new JICA/TSL involves the consultants hired by the BB and the PWD respectively, in addition to the BB-PIU and the PWD-PIU. Given that the PWD-PIU and the PWD's consultant will play a role of strengthening the safety of the fire station buildings as well as the safety of private factories, sufficient

budgetary measures are required to enable prompt response with due caution given to the personnel assignment.

2) Holding of periodical meeting

Given that the implementation body of the JICA/TSL is the BB, a liaison council run by the BB-PIU will be held periodically and on ad hoc base.

Permanent members will be the persons in charge of the TSL from the PWD-PIU and the consultants hired by the BB and the PWD. The survey team also proposes that JICA participate in the periodical meeting as an observer.

d) Management of the Revolving Fund

As already described, the loan period assumed for end users in this TSL for building safety is 15 years in maximum. Because a sub-loan with the loan period set at 15 years will not be repaid until 15 years pass, the revolving fund cannot be managed in a period of approximately 3 to 5 years as implemented in the usual type of TSL.

Thus, as the revolving fund cannot be managed in this regard, it is considered that JICA should determine not to manage it within the disbursement period of the relevant Loan Agreement. While the TSL provides a loan period of 15 years in maximum, it entails revolving as a matter of course and hence a revolving fund needs to be established for repayment to JICA.

e) Disclosure of the estimated price of construction works of private factories

As already described, the detail design of private factories and the estimation of construction cost will be performed by the PWD. The PWD will estimate the construction cost and submit it to the factory owner who is required to submit it to the PFI for the loan examination.

One problem for the PWD is that the submission of the estimation to the factory owner may fall under prior disclosure of the estimated price resulting in interference with fair bidding.

As for this issue, however, it is proposed that the disclosure of the estimated price should be interpreted as no problem in consideration of the following points.

- (1) The disclosure of the price is interpreted as no problem because the target is a private building.
- (2) The disclosure of the estimated price is interpreted as necessary to implement the construction as designed.
- (3) The construction of the factory is not technically sophisticated.
- (4) A price significantly lower than the estimated price should not be allowed from the perspective of safety.
- (5) Importance placed on the service aspect such as the construction period and maintenance rather than the amount.
- (6) From the above considerations, the cost estimation (estimated price) by the PWD is extremely important for quality control.

f) Change of terms of the existing TSL Loan for Development of Small and Medium-sized Enterprises (FSPDSME)

The end users to be admitted in the existing TSL loan are limited to the factory owners who own the buildings in the RMG sector. In other words, it has been made a rule that a factory owner with a rented building cannot borrow the JICA loan. Given that the new JICA/TSL includes factory owners with rented buildings in its finance target, therefore, it is desired to change the target of the existing TSL immediately.

g) Proposed scheme for TSL of Building Safety

Proposed TSL project scheme is shown in the following Figure 3.3.1 describing financial part and relevant technical bodies concerned.

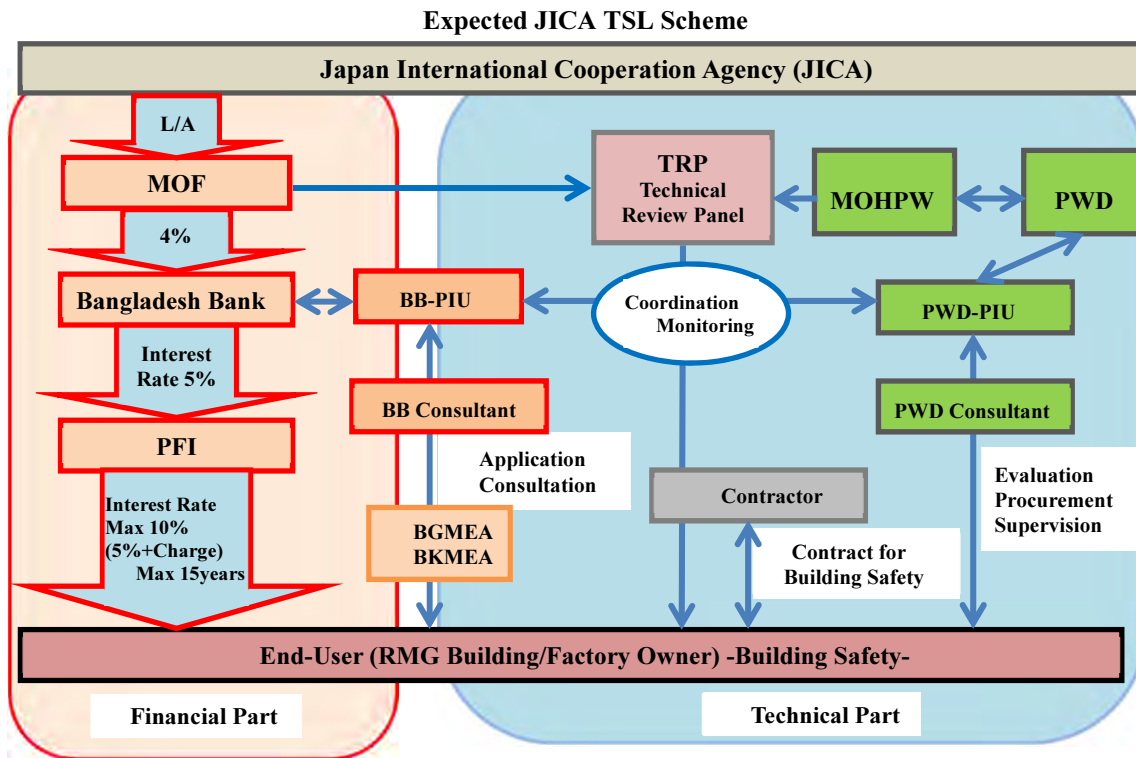


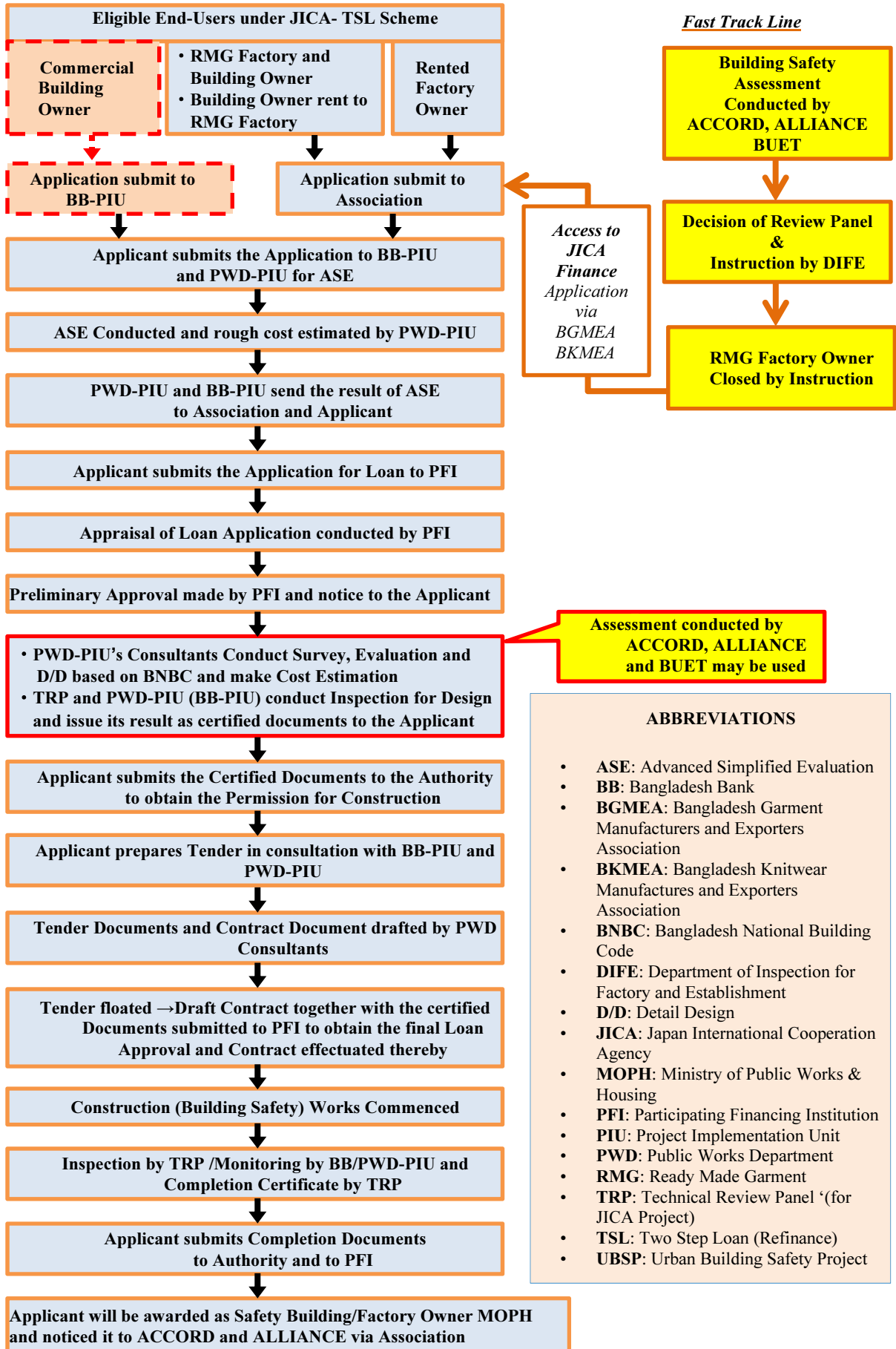
Figure 5.3.1 Expected JICA TSL Scheme

Among technical bodies shown in the above figure, Technical Review Panel (TRP) will be organized to take responsibilities for monitoring and evaluating the status of building from the view point of compliance to BNBC since such organization is indispensable to strengthening the building safety.

As stated in 2.3.3 The New BNBC of Chapter 2.3 Legal Aspects for Buildings in Bangladesh, Bangladesh Building Regulatory Authority (BRA) responsible for enforcement of BNBC is scheduled to be formally established under the new revision of BNBC. This TRP will be playing the same role of BRA in place for TSL Project until BRA is officially established.

Attachment-1: JICA TSL Financing Procedure

Refinance Procedures of JICA Urban Building Safety Project (TSL Scheme)



Attachement-2: Summary of Meetings with RMG Factory Owners

Attachment-2: SUMMARY OF INFORMATION COLLECTED FROM RMG FACTORY OWNERS

No.	Name of Factory	Date	(1)	(2)	(3)	(4)
			Present Status	Relation with PFI	Concern about JICA-Building Safety Program	Request for JICA-Building Safety Program
1	Purple Apparels Ltd.	19-Aug; 19-Oct	6 story factory has been closed since January 2014 based on ASE. The factory is candidate end-user under JICA finance. 300 workers have already been recruited to other factories. D/D is being done by PWD which will be finalized at the beginning of November. Export: \$0.3 -0.35 mil./M (Exported to USA, EU, Korea Japan) The owner requested strongly to finalize D/D soon and start retrofitting soon, since 8 months have already been passed.	Experienced to borrow 20 mil. BDT from Sonali Bank with 12% interest rate. For JICA finance, owner's bank is Uttara Finance and Investment.	JICA-ASE resulted 65 mil. BDT estimated for retrofitting. Uttara Finance and Investment Ltd. has been waiting for necessary documents including final estimated cost from the owner. D/D has been processed by PWD.	The owner requested strongly JICA to simplify the procedures for loan and minimizing the time to commencement of retrofitting works. <u>Less than 8% of interest rate was desired.</u>
2	DK. Knitwear Ltd.	28-Aug	The factory is 4 story building owned by the factory owner located in owner's land. June to July in 2013, the owner applied for JICA-ASE via BKMEA. As a result of ASE, 60 mil. BDT estimated for retrofitting and fire safety equipment.	Owner's bank is City bank. City bank showed a positive stance to prepare for appraisal of DK Knitware since the factory is good customer to the bank.	PFI is waiting for financial documents including the result of D/D necessary for appraisal.	DANIDA provides financial assistance with 7.0~7.5% in terms of dollar or Euro. / Same level of interest rate (<u>7~7.5%</u>) was expected by the owner to JICA finance.
3	Florence Fashion Ltd.	21-Oct	Florence is one of 17 closed factories inspected by ACCORD. The owner paid compensation of 27.5mil.BDT to about 800 workers which is equivalent to 4 months value of salary. The owner continues business in sub-contracting with other factories to survive. The owner is also planning to build his own factory in his own land. This time, the owner was introduced by ACCORD to meet JICA survey team.	Owner's bank is Southeast Bank, Gulshan branch office. The owner received sanction of 68.5mil. BDT out of the total amount of 110 mil. BDT from the bank in October 2014. The interest rate is 15.5% with 6 years repayment including 1.5 years grace.	The owner desired to get supports from JICA to change his loan to JICA finance. The present condition given by the bank is very severe.	The owner desired to change his present loan to JICA loan. The owner had a meeting with JICA officers upon the introduction of the survey team.

No.	Name of Factory	Date	(1)	(2)	(3)	(4)
			Present Status	Relation with PFI	Concern about JICA-Building Safety Program	Request for JICA-Building Safety Program
4	Four Wings Ltd.	27-Oct	Rented factory. When inspection was conducted by ACCORD in April 2014, the owner decided to close factory immediately. The owner of the building has agreed to retrofitting for whole building. DEA was made with cost of 365,000USD) The building owner is considering the method by either retrofitting or re-building.	Owner's bank is IFIC.	The survey team introduced JICA RMG Sector Safe Environment Program The owner had a meeting with JICA officers and received detailed information about JICA scheme.	Based on the meeting, JICA office is considering the possibility of finance, since rented owner of factory is not eligible user under the present RMG loan.
5	Fame Knitwears Ltd.	27-Oct	Rented factory. In the beginning of 2014, the factory was inspected by ACCORD. Soon after the inspection, the owner decided to close the factory. The owner of the building has not decided the method of construction by either retrofitting or relocation.	The owner's bank is Dutch-Bangla Bank and IFIC Bank. Interest rate is 4 – 15% for term loan. Borrowing from HSBC in Dollar base, its interest rate is 5%.	The owner did not show interest in JICA finance though the survey team introduced. Because 10% is still very high for the owner.	As amount of loan for building safety is normally very large, <u>10% is still high.</u> But the owner admitted and mentioned that JICA loan shall be expanded to a large extent.
6	Crystal Apparels Ltd.	2-Nov	Rented factory. The factory owner used 3 stories out of 8 story building. In accordance with the inspection done by ACCORD, its 8th floor was closed and adjusted lord moving heavy items to ground floor. By this treatment, factory is now under operation permitted by DIFE. Having more than 500 workers and owner has other factory in different building in different place. Seles: \$ 3.5mil. /year. (Exporting to USA and EU)	Sole bank is Social Investment Bank (SIB) having 22 years relation. The owner received sanction with the amount of \$ 2mil.from the bank for relocation. Interest rate is 11%. Interest rate of 6% has been offered by Standard Chartered Bank. The owner experienced to use ADB loan for production equipment with 8% in 1992.	The owner complained about BGMEA because he applied JICA loan to BGMEA in April 2014, but no response has been made till now. As the owner has a plan to build his own factory in his own land, the survey team recommended the owner to utilize JICA loan.	The owner complained BGMEA which has not provided a proper guidance on JICA loan scheme. The procedure of JICA loan shall also be simplified more and time required shall be minimized too.
7	Jeans Care Ltd.	2-Nov; 4-Nov	Rented factory. The building is 28 years old. Inspection was conducted by ACCORD in February 2014. Consulting services done by ARUP. Closure was instructed by ACCORD, but operation was permitted after	The owner's bank is Mercantile Bank.	The owner has submitted the application to BGMEA with 20mil. BDT necessary for	The owner desired to use JICA loan. BGMEA is strongly requested to give a proper guidance on JICA loan procedure to the factory owner

No.	Name of Factory	Date	(1)	(2)	(3)	(4)
			Present Status	Relation with PFI	Concern about JICA-Building Safety Program	Request for JICA-Building Safety Program
			inspection again made by DIFE with condition. The owner received DEA for structure with 16mil BDT, safety equipment with 4mil. BDT. Electrical defects were already improved with 2mil. BDT. DEA is conducted by Scientific Safety Solutions. The factory owner has also his own land. The owner is planning to build his own factory.		retrofitting. However, no response has been made by BGMEA.	and shall be functioned well in coordination with BB/PWD-PIU.
8	Softex Cotton	2-Nov	Rented factory. In early 2014, the factory was closed by the inspection of ACCORD. Due to the closure, present operation capacity has been decreased to 50% . No plan for retrofitting and relocation was shown by the owner.	Not disclosed.	No definitive plan	No interest in borrowings was shown.

Attachement-3: Status of Candidates PFI

Attachement-3 Summary of Operational and Financial Indicators of Different Banks and NBFIs																						
Serial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Banks	Bank Asia Ltd	Eastern Bank Ltd.	IFIC Bank Ltd.	Jamuna Bank Ltd.	Mercantile Bank Ltd.	Mutual Trust Bank Ltd.	One Bank Ltd.	Premier Bank Ltd.	The city bank Ltd.	The Trust Bank Ltd.	AB Bank Ltd.	BRAC Bank Ltd.	Commercial Bank of Ceylon PLC.	Dhaka Bank Ltd.	Dutch Bangla Bank Ltd.	Habib Bank Ltd.	National Bank Ltd.	NCC Bank Ltd.	Prime Bank Ltd.	Southeast Bank Ltd.	Standard Bank Ltd.	BDBL Bank Limited
Financial Year (Jan/Dec)	2012	2013	2012	2012	2012	2012	2012	2012	2012	2012	2012	2012	2013	2012	2012	2013	2013	2012	2012	2013	2012	2013
a. Basic Information																						
Year of Establishment	1999	1992	1976	2001	1999	1999	1999	1999	1983	1999	1982	1999	2004	1995	1996	N/A	1983	1985	1995	1995	1999	2009
Aurhorized Capital (Amount in BDT million)	15,000	20,000	20,000	10,000	8,000	10,000	10,000	6,000	10,000	10,000	6,000	12,000	N/A	10,000	4,000	N/A	17,500	10,000	25,000	10,000	15,000	10,000
Paid-up Capital (Amount in BDT million)	6,305	6,112	3,460	4,488	6,110	2,543	4,145	4,658	6,319	3,459	4,423	3,855	N/A	5,414	2,000	N/A	14,196	6,951	9,358	8,732	4,870	4,000
Shareholders Equity in 2013 (Amount in BDT million)	14,617	18,559	9,098	8,881	12,574	5,449	8,394	7,986	18,525	6,866	16,940	11,587	N/A	11,887	12,642	4,165	23,929	13,261	23,030	21,929	9,289	16,470
Gov't Share (%) (Year)	-	-	32.75%	-	-	-	-	-	-	-	0.57%	-	N/A	-	-	N/A	-	-	-	2.65%	-	100%
Public Share (%) (Year)	22%	57%	37%	31%	53%	30%	50%	41%	59%	19%	30%	46%	N/A	38%	13%	N/A	53%	60%	35%	40%	44%	-
Number of Branch in Dhaka	43	36	54	47	37	37	26	27	51	42	36	31	10	29	77	7	88	41	58	53	30	13
Number of Branch outside of Dhaka	36	35	54	44	49	57	38	52	39	41	53	55	8	42	60	2	87	101	62	50	47	15
Number of Off-shore Branches	1	2	1	1	2	1	2	1	-	1	1	1	2	1	2	-	1	2	3	1	2	N/A
Number of ATM Branches	90	175	49	80	115	150	38	N/A	163	29 (2013)	222	319	19	40	2,424	7	10	50	134	45	29	N/A
Manpower (Number of officers)	1,267	-	-	-	-	-	-	1,208	-	1,207	-	-	-	-	-	N/A	-	-	-	-	-	-
Total Manpower	1,485	1,498	2,422	2,006	1,981	1,316	1,608	1,259	2,765	1,299	2,179	7,400	211	1,655	5,268	196	3,919	1,811	2,544	2,111	1,270	826
CAMELS Rating	B-Class	C-Class	B-Class	B-Class	B-Class	C-Class	C-Class	B-Class	C-Class	C-Class	B-Class	C-Class	A-Class	A-Class	B-Class	C-Class	B-Class	B-Class	A-Class	B-Class	A-Class	C-Class
Capital Adequacy Ratio (CAR)	11.28 % (2014)	12.01%	10.18%	12.21%	10.83%	10.70%	10.46%	11.04%	11.70%	13.86%	11.4%	11.44%	16.93%	11%	12%	0.87%	12.29%	11.47%	12.64%	10.90%	11.28%	24.78%
b. Financial Services																						
Project Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Syndicated Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Working Capital Loans → What is this?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Housing loans	Y	N	Y	N	N	N	Y	N	Y	Y	N	Y	-	N	N	N	Y	Y	Y	Y	Y	Y
Loans for RMG sector	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	-	Y	Y	Y	Y	Y	N	Y	Y	N
Interest Rates subject to loan type (%)	Term Loan: 14.00% Working Capital Loan: 14.00%	Term Loan: 15% Working Capital Loan: 14.50-15.50%	Term Loan: 14.00-15.50% Working Capital Loan: 14.00-15.50%	Term Loan: 15.00% Working Capital Loan: 15.00%	Term Loan: 15.00% Working Capital Loan: 14.50%-15.50%	Term Loan: 15.50-16.50% Working Capital Loan: 14-15%	Term Loan: 13.50-14.00% Working Capital Loan: 13.50%	Term Loan: 13% Working Capital Loan: 16-18%	Term Loan: 16-18% Working Capital Loan: 14.5%	Term Loan: 11.50% Working Capital Loan: 11.5%	Term Loan: 12.50-15.50% Working Capital Loan: 12.50-15.50%	Term Loan: 14.0% Working Capital Loan: 14%	Term Loan: 14.0% Working Capital Loan: 14%	Term Loan: 13.50-16.50% Working Capital Loan: 12.50-15.50%	Term Loan: 15.50% Working Capital Loan: 15.50%	Term Loan: 15.5% Working Capital Loan: 15.5%	Term Loan: 13% Working Capital Loan: 16.5%	Term Loan: 14-15% Working Capital Loan: 15%	Term Loan: 13.50-16.50% Working Capital Loan: 12.50-15.50%	Term Loan: 13.50-16.50% Working Capital Loan: 12.50-15.50%	Term Loan: 15-15.50% Working Capital Loan: 15.50%	Term Loan: 16.0% Working Capital Loan: 15-16%
T/L Loan: Term Loan, W/C Loan: Working Capital Loan																						
c. Operational Performance																						
Return on average assets (ROA) (%)	0.70%	1.68%	0.38%	1.01%	1.02%	0.39%	1.39%	0.74%	0.60%	0.21%	0.88%	0.35%	4.99%	0.59%	1.70%	N/A	N/A	1.14%	1.23%	1.64%	1.57%	2.18%
Return on average equity (ROE) (%)	7.11%	14.40%	5.76%	13.20%	13.42%	6.80%	14.21%	8.44%	4.30%	3.02%	6.13%	5.47%	18.40%	7.24%	23.40%	N/A	2.36	11.81%	13.53%	16.20%	17.65%	6.19%
Profit before provision & tax (Amount in BDT million)	2,723	4,839	1,390	3,207	3,350	818	2,125	823	1,763	693	3,496	1,988	1,371	1,440	4,817	136	6,726	2,742	5,515	6,700	2,998	2,255
Profit after tax (Amount in BDT million)	908	2,535	388	2,080	1,381	328	1,055	603	763	183	1,461	540	833	701	2,314	71	3,856	1,308	2,700	3,379	1,331	1,020
Non-performing loans (NPL) in 2013 (Amount in BDT million)	5,879	3,697	3,168	5,133	4,680	2,155	3,740	3,021	3,645	2,470	4,720	7,601	N/A	4,137	4,175	572	4,898	4,862	7,815	5,350	2,599	5,202
NPLs to total loans & advances (%) in 2013	5.61%	3.59%	3.77%	7.59%	4.77%	3.62%	4.89%	5.73%	8.10%	3.12%	3.37%	7.40%	3.98%	4.15%	3.90%	15.55%	3.24%	5.56%	5.09%	3.94%	3.50%	40%
NPLs to Shareholders' Equity (%) in 2013	40.22%	19.92%	34.82%	57.80%	37.22%	39.55%	44.56%	37.83%	19.68%	35.97%	27.86%	65.60%	N/A	34.80%	33.02%	13.73%	20.47%	36.66%	33.93%	24.40%	27.98%	31.58%
Earning Per Share (EPS) (%)	1.35	4.2	1.12	2.32	2.26	1.29	2.55	1.3	1.21	0.55	3.25	1.32	N/A	1.69	11.6	N/A	2.72	2.06	2.88	3.87	2.73	25.5
Productivity (Operating Income/ No. of Employee)	3.98	6.40	2.62	2.63	1.69	2.66	2.87	8.50	2.29	2.31	3.87	0.86	26.87	3.83	2.14	1.70	2.03	3.41	5.30	3.17	3.54	3.96
d. Practicing policies																						
CSR Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Green Banking Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
e. Disbursement in JICA TSL FSPDSME (Yes/No)																						
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No

Source: Banks and NBFIs Annual Report, websites and Google Search

Attachment-3 Summary of Operational and Financial Indicators of Different Banks and NBFIs

Serial	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
Indicator	NBFIs	Bay Leasing & Investment Ltd	Fareast Finance & Investment Ltd	Bangladesh (BD) Finance & Investment Company Ltd	IDLC Finance Limited	Industrial & Infra. Dev. Finance Co. Ltd (IIDFC)	Prime Finance & Investment Ltd.	Union Capital Ltd	United Leasing Company Ltd	FAS Finance & Investment Ltd.	First Lease Finance & Investment Ltd.	International Leasing & Financial Services Ltd.	Lanka Bangla Finance Ltd.	MIDAS Financing Ltd.	National Housing Finance & Investment Ltd.	Phoenix Finance & Investment Ltd.	Premier Leasing & Finance Ltd.	Uttara Finance & Investment Ltd.	Bangladesh Industrial Finance Co. Ltd.
Financial Year (Jan/Dec)	2013	2013	2013	2013	2012	2013	2013	2012	2013	2013	2013	2013	2012	2013	2013	2012	2013	2013	
a. Basic Information																			
Year of Establishment	1996	2002	1999	1985	2001	1996		1989	2001	1993	1996	1996	2000	1998	1995	2001	1995	1995	
Aurhorized Capital (Amount in BDT million)	3,000	2,000	2,000	4,000	1,000	3,000	2,000	3,000	2,100	5,000	2,000	3,000	2,000	2,000	3,000	3,000	5,000	4,000	
Paid-up Capital (Amount in BDT million)	1,138	1,600	1,144	1,608	1,000	2,729	1,099	1,402	1,118	1,006	1,711	2,188	601	1,064	1,215	1,094	1,138	671	
Shareholders Equity in 2013 (Amount in BDT million)	2,897	1,772	1,547	5,363	1,421	5,249	2,011	2,165	1,577	1,436	2,116	4,625	613	1,426	2,546	1,234	5,581	1,233	
Gov't Share (%) (Year)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Public Share (%) (Year)	41%	25%	40%	22%	22%	23%	25%	53%	38%	35%	42%	61%	31%	13%	29%	54%	21%	27%	
Number of Branch in Dhaka	1	1	3	11	1	1	3	4	1	4	1	5	5	3	4	1	3	3	
Number of Branch outside of Dhaka	-	-	2	9	1	2	2	12	1	2	1	10	11	3	6	3	2	1	
Number of Off-shore Branches	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Number of ATM Branches	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Manpower (Number of officers)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93	-	
Total Manpower	31	33	74	113	94	84	89	209	56	84	59	261	60	89	116	62	156		
CAMELS Rating	BBB1	A-	A-	AAA	N/A	AA	AA	N/A	BBB2	A-	A-	A2	N/A	A2	A+	C-Class	A+	A-	
Capital Adequacy Ratio (CAR)	27.04%	N/A	N/A	15.43%	11.26%	N/A	15.67%	10.50%	N/A	N/A	N/A	10.50%	N/A	N/A	15.24%	N/A	10.54%	N/A	
b. Financial Services																			
Project Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Syndicated Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Working Capital Loans → What is this?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Housing loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Loans for RMG sector	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Interest Rates subject to loan type (%)	Industrial Loan: 16-18.75%	Industrial Loan: 18-24%	Industrial Loan: 18.5-21%	Industrial Loan: 17.83-19.13%	Industrial Loan: 18-21%	Industrial Loan: 17.5-20%	Industrial Loan: 17-20%	Industrial Loan: 14.75-17.5%	Industrial Loan: 19-21%	Industrial Loan: 20-22%	Industrial Loan: 17-20%	Industrial Loan: 18-20%	Industrial Loan: 18.5-18.75%	Industrial Loan: 19-20%	Industrial Loan: 16-19%	Industrial Loan: 20-21%	Industrial Loan: 19% Trade & Commerce	Industrial Loan: 19-21% Trade & Commerce	
T/L Loan: Term Loan, W/C Loan: Working Capital Loan	Trade & Commerce Loan: 16-18.5%	Trade & Commerce Loan: 17.5-20%	Trade & Commerce Loan: 18.5-21.5%	Trade & Commerce Loan: 17.25-19.38%	Trade & Commerce Loan: 18-21%	Trade & Commerce Loan: 17-20%	Trade & Commerce Loan: 17-20.0%	Trade & Commerce Loan: 17-19.50%	Trade & Commerce Loan: 19-21%	Trade & Commerce Loan: 20-22%	Trade & Commerce Loan: 20-22%	Trade & Commerce Loan: 18-20%	Trade & Commerce Loan: 18.5-18.75%	Trade & Commerce Loan: 18-20%	Trade & Commerce Loan: 16-19%	Trade & Commerce Loan:	Trade & Commerce Loan: 19%	Trade & Commerce Loan: 17-21%	
c. Operational Performance																			
Return on average assets (ROA) (%)	2.27%	-0.83%	0.94%	1.90%	0.17%	-	1.01%	1.93%	0.49%	1.84%	1.51%	6.36%	-1.62%	2.85%	2.07%	3.8%	3.65%	N/A	
Return on average equity (ROE) (%)	4.75%	-4.31%	6.84%	19.24%	1.24%	-	7.01%	10.18%	1.52%	2.65%	5.52%	10.48%	-17.98%	14.30%	12.33%	28%	16.22%	N/A	
Profit before provision & tax (Amount in BDT million)	189	N/A	229	1,551	77	568	208	349	46	252	257	624	(91)	233	434	40	1,404	N/A	
Profit after tax (Amount in BDT million)	137	(68)	85	811	22	370	141	229	19	133	116	484	(119)	167	313	11	852	N/A	
Non-performing loans (NPL) in 2013 (Amount in BDT)	82	944	439	2,812	511	822	936	174	343	752	1,199	931	921	240	560	1,071	838	774	
NPLs to total loans & advances (%) in 2013	5.10%	11.09%	5.28%	1.63%	5.49%	7.63%	8.85%	3.53%	9.88%	12.62%	7.74%	4.84%	16.59%	5.19%	4.64%	18.92%	4.64%	10.25%	
NPLs to Shareholders' Equity (%) in 2013	2.83%	53.26%	28.38%	52.43%	35.96%	15.66%	46.55%	8.04%	21.75%	52.37%	56.66%	20.13%	150.24%	16.83%	21.99%	86.79%	15.02%	62.77%	
Earning Per Share (EPS) (%)	1.21	5.14	1.23	4.16	2.22	1.1	1.29	2.07	0.24	1.32	0.68	2.52	-1.99	1.57	2.58	0.1	2.21	N/A	
Productivity (Operating Income/ No. of Employee)	26.48	37.12	16.23	24.45	16.89	9.31	18.69	3.09	3.50	11.40	8.32	18.96	17.05	10.02	6.41	2.81	21.51	N/A	
d. Practicing policies																			
CSR Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Green Banking Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
e. Disbursement in JICA TSL FSPDSME (Yes/No)																			
	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No

Source: Banks and NBFIs Annual Report, websites and Google Search

Attachemnt-4: Selected 10 Banks

Attachment-4 Selected Banks with Good Performance										
Indicator	1	2	3	4	5	6	7	8	9	10
	Eastern Bank Ltd.	Jamuna Bank Ltd.	Mercantile Bank Ltd.	One Bank Ltd.	Commercial Bank of Ceylon PLC.	Dutch Bangla Bank Ltd.	NCC Bank Ltd.	Prime Bank Ltd.	Southeast Bank Ltd.	Standard Bank Ltd.
Financial Year (Jan/Dec)	2013	2012	2012	2012	2013	2012	2012	2012	2013	2012
a. Basic Information										
Year of Establishment	1992	2001	1999	1999	2004	1996	1985	1995	1995	1999
Aurhorized Capital (Amount in BDT million)	20,000	10,000	8,000	10,000	N/A	4,000	10,000	25,000	10,000	15,000
Paid-up Capital (Amount in BDT million)	6,112	4,488	6,110	4,145	N/A	2,000	6,951	9,358	8,732	4,870
Shareholders Equity (Amount in BDT millio)	18,559	8,324	10,924	7,312	N/A	10,855	12,136	20,787	21,929	8,218
Public Share (%) (Year)	57%	31%	53%	50%	N/A	13%	60%	35%	40%	44%
Number of Branch in Dhaka	36	47	37	26	10	77	41	58	53	30
Number of Branch outside of Dhaka	35	44	49	38	8	60	101	62	50	47
Number of Off-shore Branches	2	1	2	2	2	2	2	3	1	2
Number of ATM Branches	175	80	115	38	19	2,424	50	134	45	29
Total Manpower	1,498	2,006	1,981	1,608	211	5,268	1,811	2,544	2,111	1,270
CAMELS Rating	C-Class	B-Class	B-Class	C-Class	A-Class	B-Class	B-Class	A-Class	B-Class	A-Class
Capital Adequacy Ratio (CAR)	12.01%	12.21%	10.83%	10.46%	16.93%	12%	11.47%	12.64%	10.90%	11.28%
b. Financial Services										
Project Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Syndicated Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Working Capital Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Housing loans	N	N	N	Y	-	N	Y	Y	Y	Y
Loans for RMG sector	Y	Y	Y	Y	-	Y	Y	N	Y	Y
Avarage Interest Rate	15.00%	15.00%	15.00%	13.67%	14.00%	15.50%	14.67%	14.50%	14.50%	15.50%
c. Operational Performance										
Return on average assets (ROA) (%)	1.68%	1.01%	1.02%	1.39%	4.99%	1.70%	1.14%	1.23%	1.64%	1.57%
Return on average equity (ROE) (more than 10%)	14.40%	13.20%	13.42%	14.21%	18.40%	23.40%	11.81%	13.53%	16.20%	17.65%
Profit before provision & tax (Amount in BDT million)	4,839	3,207	3,350	2,125	1,371	4,817	2,742	5,515	6,700	2,998
Profit after tax (Amount in BDT million)	2,535	2,080	1381	1,055	833	2,314	1,308	2,700	3,379	1,331
Non-performing loans (NPL)(Amount in BDT million)	3,697	5,337	4,090	3,322	N/A	4,175	4,862	3,021	5,350	1,538
Non-performing loans (NPL) in 2013 (Amount in BDT	3,697	5,133	4,680	3,740	N/A	4,175	5.56%	5.73%	5,350	2,599
NPLs to total loans & advances (%) in 2013	3.59%	7.59%	4.77%	4.89%	3.98%	3.90%	48.62%	12.08%	3.94%	3.50%
NPLs to Shareholders' Equity (%) in 2013	60.49%	114.37%	76.60%	90.23%	N/A	208.75%	36.00%	29.67%	61.27%	53.37%
Earning Per Share (EPS) (%)	4.2	2.32	2.26	2.55	N/A	11.6	2.06	2.88	3.87	2.73
Productivity (Operating Income/ No. of Employee)	6.40	2.63	1.69	2.87	26.87	2.14	3.41	5.30	3.17	3.54
d. Practicing policies										
CSR Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Green Banking Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
e. Participation in JICA TSL FSPDSME										
Yes or No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No
f. Acceptable Interest Rate on Sub-loan under RMG Bldg. Safety Program										
Willingness to accept 5% as PFI margin	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Annual reports of banks and web-site

Attachement-5: Summary of Meetings with Financial Institutions

Attachment-5: SUMMARY OF INFORMATION OBTAINED REGARDING JICA-BUILDING SAFETY PROGRAM (Banks & Non-Bank Financial Institutions: NBFIs)

No	Financial Institutions	Date	(1)	(2)	(3)	(4)
			Willingness to participate in JICA Building Safety Project as PFI	Interest Rate and Maturity in Operation	Margin (Service Charge) -without Wholesale Rate	Comment or request for JICA Loan and its Procedures if any
1	Bangladesh House Building Finance Corporation (BHBFC)	18-Aug	BHBFC has no financing record for retrofitting and rebuilding. However if the Government allows, BHBFC would like to take part in the JICA scheme. Present level of NPL shows 6.5% which is lowest among public financial institutions.	Under daily operation, interest rate is set at 12% for Dhaka and Chittagong cities. For other cities, 10% is applied. Maturity is between 15 - 20years.	Not disclosed.	Not mentioned.
2	Eastern Bank Ltd.	19-Aug	Financing to SME sector has recorded 25% out of total outstanding .EBL has 8 projects financed under JICA-FSPDSME. As for ongoing JICA-RMG-TSL, there would be little appeal since the ceiling amount has been set. However, EBL showed a strong intention to take part in new JICA building safety project.	Not disclosed.	Not disclosed.	Working capital shall be admitted in JICA TSL loan since its demand is so high. Furthermore, sectors other than RMG sector shall be considered as financing targets. Refinancing in Dollar term with LIBOR + 1% was also requested to consider under JICA scheme.
3	IDLC Finance Ltd. (IDLC)	20-Aug	IDLC has recorded strong supports to RMG sector and also positive participation to JICA-FSPDSME. For financing to SME, IDLC has been placed after BRAC Bank and Eastern Bank. IDLC expressed strong willingness to participate in JICA new loan.	Maturity for retrofitting may be 4-5 years however it depends on the status of cash flow.	Minimum 5%.	Retrofitting or rebuilding may be recommended to finance as packaged with working capital and production equipment or guarantee program in order to increase financial value both for PFIs and end-users.
4	Bangladesh Development Bank (BDBL)	21-Aug	BDBL is one of the two specialized banks in Bangladesh. Industrial finance is main operation. BDBL has 30% of exposure to RMG and textile industries. BDBL showed strong willingness to participate in new JICA scheme. BDBL is equipped with engineering unit in the bank which functions to cost estimation.	Ordinary interest rate is 12% with tenure of 1-4 years.	Not disclosed.	BDBL suggested that textile industry shall be included in new JICA scheme.

No	Financial Institutions	Date	(1)	(2)	(3)	(4)
			Willingness to participate in JICA Building Safety Project as PFI	Interest Rate and Maturity in Operation	Margin (Service Charge) -without Wholesale Rate	Comment or request for JICA Loan and its Procedures if any
5	National Housing Finance & Investment Ltd.	24- Aug 23-Oct	NHFI is registered PFI under JICA-FSPDSME. However, NHFI has no record though around 10 projects were considered. As NHFI has provided loan to rehabilitation and reform of commercial buildings, NHFI expressed positively to take part in new JICA building safety project.	Not disclosed	Not disclosed.	For JICA FSPDSME, about 10 projects were candidates for appraisal, however appraisal was not realized due to Environmental Clearance Certificate required by BB. This kind of certificate is not required by ADB and World Bank.
6	Uttra Finance & Investment Ltd.	24- Aug 21-Oct	UFIL has prepared for the appraisal for Purple factory and waiting for documents necessary for appraisal to be submitted by the owner. UFIL has been waiting for Detailed Technical Assessment Report made by CNCRP-PWD. UFIL is in a position to finalize appraisal work within 10 days after the submission of documents. UFIL complained about the slow response of owner.	8% of interest rate expected by the owner of Purple has never been determined which has not yet been disclosed by UFIL side. It should be set after examination. Ordinary tenure is 7 years, but 15 years is possible under JICA scheme.	Not disclosed.	Nothing in particular.
7	The City Bank Ltd.	24-Aug	The City participated in Investment and Promotion Facility with IFC, Dutch Development Bank, IDB, World Bank . The City has a lot of exposure to commercial buildings and RMG sector establishing a firm appraisal system. The City made technical evaluation independently utilizing their own engineering unit. The City is one of PFIs under JICA FSPDSME and has records. The City showed intention clearly to participate in the new JICA scheme.	Tenure is normally determined by cash flow, which is around 8 years, interest rate is 13% - 14.5%. Financing ratio is up to 70%. At present, the City has started appraisal for DK Knitwear under JICA RMG-TSL. Estimated amount 60mil. BDT, interest rate 10% and tenure 10 years are now considered.	Generally 3 - 4 %. Is considered as margin.	The City will not accept finance for retrofitting of micro sized rented RMG factories in accordance with the financial criteria of the bank. The City will consider the financing for retrofitting packaging with working capital and production equipment

No	Financial Institutions	Date	(1)	(2)	(3)	(4)
			Willingness to participate in JICA Building Safety Project as PFI	Interest Rate and Maturity in Operation	Margin (Service Charge) -without Wholesale Rate	Comment or request for JICA Loan and its Procedures if any
8	IFIC Bank	27-Aug	<p>IFIC has provided loan of BDT 178 million to fire safety facilities of RMG factories after fire incident of Tasreen Fashion building in 2013. Its interest rate is 6%. IFIC has a positive policy to RMG sector.</p> <p>IFIC clearly expressed to participate in new JICA TSL. However IFIC will utilize its own engineering unit for technical assessment.</p>	<p>The condition of new JICA scheme must be attractive to RMG owners.</p> <p>If 5 % is set at BB, 9% of interest rate can be possible. Maturity would be 5 years and 1.5 - 2 years grace.</p>	4%.of interest rate would be possible under JICA scheme.	IFIC expected pre-financing method due to long term loan. IFIC estimated that building owner cum factory owner may be only 7-8% of all RMG factory owners.
9	Mercantile Bank Ltd. (MBL)	21-Oct	<p>MBL has very large exposure to RMG sector with 25% worth out of total loan portfolio to 160-170 factories. However MBL has no financial record on retrofitting.</p> <p>MBL is one of PFIs under JICA FSPDSME and has utilized it.</p> <p>MBL showed interests in new JICA-TSL not for retrofitting but for relocation/rebuilding.</p>	<p>Ordinary loan term is 7 years including 1-2 years grace.</p> <p>Interest rate was not mentioned.</p>	Not disclosed.	<p>MBL requested that refinance procedure of JICA TSL must be simplified.</p> <p>MBL will consider some package of their own finance with JICA-TSL.</p> <p>MBL requested that PFI must be carefully selected and decreased in number.</p>
10	Southeast Bank Ltd.	21-Oct	<p>RMG sector is very important sector for SBL sharing with 1/3 of the total loan portfolio. SBL has about 300 customers mainly in Dhaka and Chittagong. Tough SBL is one of PFIs under JICA-SME and RMG-TSL, no performance has been recorded. SBL did not show positive interest in Retrofitting.</p> <p>SBL has provided BDT 500mili. loan for fire safety with 13- 14% of interest rate and maturity of 3-5 years including 6-10 months of grace period.</p>	<p>Present interest rate is 13 to 14%.</p> <p>SBL has expressed to provide more concessional rate with longer term for JICA building safety loan.</p>	Not disclosed.	<p>SBL requested JICA to simplify the application form and procedure for loan</p> <p>SBL expressed the necessity of credit guaranty scheme.</p>

No	Financial Institutions	Date	(1)	(2)	(3)	(4)
			Willingness to participate in JICA Building Safety Project as PFI	Interest Rate and Maturity in Operation	Margin (Service Charge) -without Wholesale Rate	Comment or request for JICA Loan and its Procedures if any
11	United Leasing Company Ltd.	23-Oct	For RNG sector, cumulative financing amount is BDT484mili.to 174 customers. ULC expressed a strong wish to participate in new JICA-TSL scheme.	Ordinary terms and condition; Interest rate is 12%, Maturity is 15years including 6months grace.	Not disclosed.	ULC expressed negatively that requirement of JICA for environment clearance certificate under FSPDSME-RMG -JICA TSL is very severe. ULC requested JICA to simplify the application form and procedure for loan.
12	NCC Bank Ltd.	23-Oct	NCC Bank has extended low rate of interest rate mainly for working capital. Exposure to RMG sector of NCC shows around 8-10%. NCC is one of PFIs under JICA-FSPDSME, however, no utilization has been recorded. NCC expressed strong intention to participate in new JICA scheme, however, UCC showed more interest in relocation or rebuilding rather than retrofitting.	There is a huge liquidity in financing institutions in Bangladesh. Due to this, competition has become harder among banks and interest rate has been in down trend.	Less than 5% would be possible.	NCC criticized the Environmental clearance certificate to be issued by the Department of Environment required under FSPDSME. NCC requested that PWD must conduct accurate cot estimation and the capacity of PWD must be improved. In addition, NCC added that "ONE-STOP Services" equipped with technical and financial capacity must be established for smooth implementation.
13	Standard Bank Ltd.	29-Oct	SBL is one PFIs under JICA-FSPDSME but has no record in utilization. For new JICA scheme, SBL showed a strong intention to take part in JICA building safety loan. SBL has extended finance to RMG sector by 20% out of total portfolio.	Ordinary interest rate to SME is 16- 17%. 16% is majority. If 5% is given by BB, 10% is possible rate.	5% of interest rate could be possible (Profit=3%, Cost =2%)	End-users who are registered by BGMEA or BKMEA are eligible borrowers to SBL.

No	Financial Institutions	Date	(1)	(2)	(3)	(4)
			Willingness to participate in JICA Building Safety Project as PFI	Interest Rate and Maturity in Operation	Margin (Service Charge) -without Wholesale Rate	Comment or request for JICA Loan and its Procedures if any
14	Commercial Bank of Ceylon PLC (CBC)	3-Nov	CBC expected the future development of RMG sector since CBC has established a good deal of business. CBC expressed its wish to take part in the new JICA-TSL. CBC mentioned that net profit normally generated in RMG factory is rather low around 3-5%.	At present, CBC has extended loan of \$500,000 to RMG sector. Interest rate is around 13% with 5 years maturity. CBC suggested that dollar loan shall be introduced for keeping interest rate low around 4.5-5%. For dollar loan, maturity of loan can be 10 years with 3 years grace.	Not disclosed.	CBC suggested that financing priority should be given to factory owners closed by the assessment conducted by ACCORD/Alliance. CBC also suggested that repayment in dollar shall be adopted under the new JICA scheme.
15	Prime Bank (PBL)	3-Nov	PBL has a great deal of business relations with garment and textile industries. PBL expects further development of RMG sector. PBL showed interests in the refinance scheme of BB.	PBL is positively utilizing Export Development Fund (EDF) of BB. Interest rate of EDF is LIBOR +2-3% and tenure is 5-10years in average.	Margin of 3.5% would be possible under JICA scheme.	Nothing in particular.
16	Dutch-Bangla Bank	3-Nov	DBBL has established good relations with RMG and textile industries and has a positive stance to get involved in RMG sector. DBBL showed interests in the refinance scheme of BB.	DBBL mentioned if BB's interest rate is set at 5%, DBBL can afford to set 9% to end-users. 15 years of maturity is also acceptable to DBBL.	4% of interest rate would be possible under JICA loan.	DBBL has made financial appraisal placing its high priority on the performance and quality of management and sustainability of the borrowing companies.
17	ONE Bank	5-Nov	OBL has a big deal of exposure to RMG and textile industries and continue to expand its finance to the relevant sectors.	OBL mentioned if the whole sale interest rate is set at 5%, the interest rate of PFI shall be 8%-10%. And 15 years maturity is also reasonable.	Interest rate of 3-5% would be appropriate under JICA scheme.	Nothing in particular.

Attachement-6: Manual for end-user revised Dec. 26,2014

Step	What to do by End-User	with/to/by	What to do by whom described in the left line	Time Required	Remarks
1	Decision for Building Safety				Factory owners of the first track are eligible.
2	Consultation on loan	Association	Guidance on JICA Procedures	1 day	Guidance includes the confirmation of eligibility of applicants and explanation of loan procedures.
3	Submit Application for ASE	Association	Acceptance for ASE Send it to BB-PIU	1 day	Application form for ASE shall be handed over to the Applicant at the Association.
4	Understanding of the procedures of ASE in detail	BB-PIU	Explanation of ASE and JICA Loan Procedures. Application sent to PWD-PIU	1 day	End-user will receive the detailed explanation of ASE procedures from BB-PIU/BB-Consultants.
5	Agreement on conduct of ASE	PWD-PIU	Detailed Explanation of ASE and Conducting ASE	1 month	End-user will receive the detailed explanation of ASE from the point of technical aspect by PWD-PIU/PWD-Consultants.
6	Receive Result of ASE	PWD-PIU	The Result of ASE and Cost Estimate noticed to End-User and BB-PIU	1 day	Cost estimation shall be necessary for loan request to PFI.
7	Loan negotiation for Building Safety with PFI	PFI	Explanation of Loan Procedure and confirmation of loan conditions	1 day	End-user must confirm necessary documents for loan application and loan conditions.
8	Receive Preliminary Approval of Loan	PFI	Preliminary appraisal	2 weeks	Preliminary appraisal will be conducted based on documents required by PFI.
9	Consultation on loan based on the preliminary approval of PFI	BB-PIU	Explanation on steps to be taken	2 days	End-user must understand future steps to be taken.
10	Submit Preliminary Approval for conducting D/D and other relevant works.	PWD-PIU	Conducting Survey, Evaluation, D/D and Estimated Cost	6 Month	Time required for ASE will be dependent on the condition of the building.
11	Receive the Result of D/D	PWD-PIU BB-PIU	Explanation of the Result of D/D	1 week	End-user will be explained the result of D/D together with Cost Estimation.
12	Submit the Result of D/D	PFI	Discuss and agree to go forward	1 day	End-user must confirm the loan amount.
13	Consultation for Tender	BB-PIU PWD-PIU	Confirmation of Tender Process and Contracting	1 week	End-user must understand relevant procedures.
14	Tender / Contract	PWD-PIU	Supporting to select contractor	2 months	Competitive tendering is no always required. Private tender is allowed.
15	Negotiation of Contract	Contractor	Supported by PWD-PIU and JICA Consultant	1 week	JICA consultant means the consultant employed by PWD.
16	Signing of Contract	Contractor	For obtaining final approval of PFI	2 days	The contract is conditioned which is effectuated by final loan

Step	What to do by End-User	with/to/by	What to do by whom described in the left line	Time Required	Remarks
					approval given by PFI.
17	Submit Signed-Contract	PFI	For obtaining final approval of PFI	1 day	There may be additional documents required by PFI.
18	Receive the Final Approval of Loan	PFI	For Effectuation of Contract	2 weeks	Time required for approval cannot be fixed.
19	Commencement	Contractor	Construction works	6 months - 1 year	Length of construction depends on the method of construction. In case of the construction of new building, it may take around 2 years.
20	Receive Monitoring	TRP/PWD-PIU/ BB-PIU	Periodically conducted	3 times	Monitoring shall be conducted at necessary timing.
21	Receive Completion Certificate	TRP	After final Inspection conducted, certificate issued	3 days	End-user must receive the completion certificate of the construction.
22	Submission of Certificate	Association	Association shall notice it to ACCORD/ALLIANCE in writing.	2 days	Completion of building safety shall be immediately noticed to ACCORD and ALLIANCE for normalization of factory operation.
23	Awarded as Safety Building/Factory Owner	MOHPW	For Reviving/Expanding of Exporting Market		Building safety can be expanded by Safety Building Owner Award.

5.3.7 Current Analysis of Environmental and Social Consideration in Financial Sector

Financial and economic development in Bangladesh has close association with the vulnerability for environmental issues which have been deteriorating annually. In recent years, the world has taken interest in guidelines including Environmental Risk Management (ERM) and Credit Risk Management (CRM) regarding the increase of risk which Financial Institutions (FIs) and private companies undergo due to environmental degradation and a rise in public awareness for environmental issues. Banks and FIs can implement sustainable banking activities and protect the finance from environmental risk by making and complying with the ERM. In this chapter, collected information with regards to environmental social consideration guidelines and policies in the Bangladeshi finance sector is showing below.

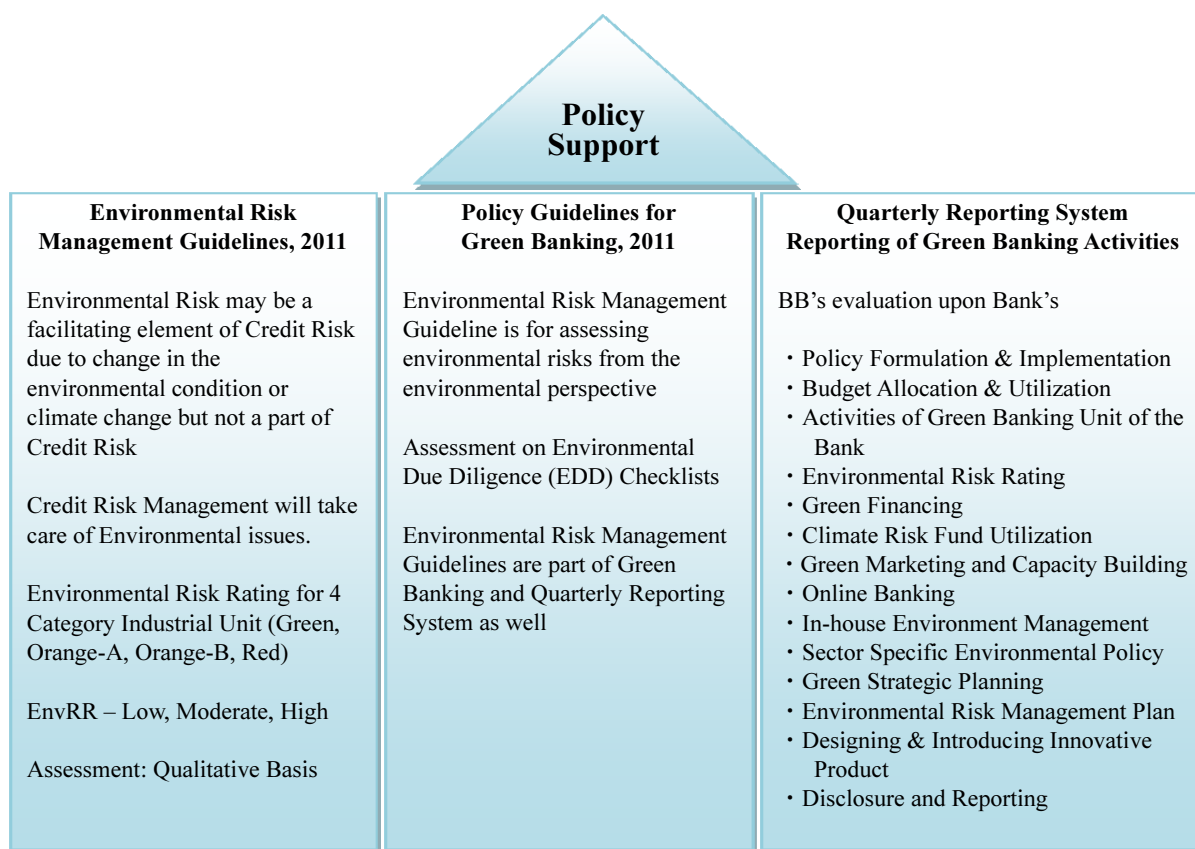
Appendices 9 and 10 are attached as the detailed information collected during the interviews or meetings with the stakeholders.

a) Bangladesh Bank

The Bangladesh Bank (BB), as the central bank in Bangladesh, has the guidelines and policies with regards to environmental social consideration as seen below. The BB has already had the Policy Support which is constructed by a quarterly report system of Green Banking Activities, Green Banking Policy in Bangladesh Fostering Environmentally Sustainable Inclusive Growth Process and Environmental Risk Management Guideline (ERMG) for Banks and FIs in Bangladesh. The BB also promotes Participant Agreement (PA) to scheduled banks and FIs which are interested in the Policy Support. The BB has already contracted the PA with 36 Scheduled Banks and 11 FIs by the end of August, 2014. They can apply for the funding to the BB to finance for any Identified Green Product. The BB also shares the collected information for all of scheduled Banks and PFs and offers consulting services for them, such as any claim management after finance and how to acquire the Environmental Clearance Certificate (ECC) issued by the Department of Environment (DoE), etc. However, the BB doesn't have the responsibility of finance which they executed. Although the BB has the policy of contracting PA with the all of the Banks and PIs in Bangladesh, the BB still have not contracted PA with 48 banks.

Table 5.3.3 Environmental Social consideration Guidelines and Policies in Financial Sector of Bangladesh

No.	Report Name	Date of issue	Supervisor
1	Green Banking Policy in Bangladesh Fostering Environmentally Sustainable Inclusive Growth Process	August,2013	Neo STAR Innovation
2	Environmental Risk Management Guideline (ERMG) for Banks and Financial Institution in Bangladesh	January, 2011	International Finance Corporation
3	Operating Guidelines for Financial Sector Project for the Development of Small and Medium-Sized Enterprises in Bangladesh	October, 2013	JICA



Reference: Annual Report on Green Banking, 2012 (Bangladesh Bank)

Figure 5.3.2 Policy Support by the BB

1) Green Banking in Bangladesh Fostering Environmentally Sustainable Inclusive Growth Process

Green banking thus involves a two pronged approach. Firstly, green banking focuses on the green transformation of internal operations of all banks. It means all the banks should adopt appropriate ways of utilizing renewable energy, automation and other measures to minimize carbon footprint from banking activities. Secondly, all banks should adopt environmentally responsible financing; weighing up environmental risks of projects before making financing decisions; and in particular supporting and fostering growth of upcoming 'green' initiatives and projects.

i) Green activity in-house

- Reduce dependency on grid power by shifting to use of solar
- Power and other renewable energy sources to the maximum feasible extent.
- Follow green architecture while constructing bank offices. Use energy saving technologies such as LED, CFL etc.
- Use energy efficient digital devices.
- Reduce use of paper by adoption of online automated work practices.
- Conduct energy audit regularly to monitor carbon footprint

ii) Green activities in financing

- Carry out environmental risk assessment of projects, financing only those that meet environmental safeguards/sustainability guidelines.

- Provide green loan to promote solar energy, biogas plants, effluent treatment plants and other energy saving output practices like Hybrid Hoffman Kilns in brick fields.
- Develop green banking products for clients.
- Promote growth of mobile banking and online banking.
- Include environmental sustainability support initiatives in corporate social responsibility (CSR) programs, inter alia including financial support to climate risk fund.

2) Environmental Risk Management Guideline for Banks and Financial Institution in Bangladesh

The main objectives of this guideline are as below;

- To implement appropriate evaluation with regarding to Environmental Social consideration on the occasion of financing
- To mitigate the financial risk as an uncollectible loan due to environmental and economic deterioration

This guideline was formulated based on Environmental Conservation Act, 1997 and is spread by the BB with cooperation of International Financial Corporation (IFC) which is a group of World Bank. Therefore, Certification of ECC issued by DoE is positioned as a priority item in General Environmental Due-Diligence Checklist (GEDDC) (Table 2.7.2 and 2.7.3) of this guideline. That is to say, financial project without ECC is evaluated as “High Risk” regardless of the evaluation of the other items. But the Scheduled banks and PIs can set appropriate items depending on the project case, because only minimum items are established in GEDCC to evaluate environmental risk.

Table 5.3.4 General Environmental Due-Diligence Checklist

Particulars	Yes/No/NA
Possible sources of environmental risk	
1. Environmental clearances: <i>* In the proposal for financing, have all the applicable compliances to environmental laws, i.e. site clearance certificate and environmental clearance certificate, been obtained from the Department of Environment (DOE)?</i>	
<i>* Have these clearances been obtained after submitting the appropriate documents for the different pollution category of industries (Green, Orange-A, Orange-B and Red)?</i>	
2. Land location / site: <i>Is the land location / site free from vulnerability from an environmental perspective? Vulnerability can arise due to the issues such as the location being on the river bank (floods) and on national parks /forests (non-compliance)?</i>	
3. Climate change: <i>Is the proposal for financing protected against climate change related impacts such as cyclones, storm surges, floods and droughts if relevant?</i>	
Borrower’s Environmental Management Systems	
4. Commitment: Is the potential borrower’s top management committed to environmental management?	
5. Manpower: Has the potential borrower planned for manpower resources to address environmental issues?	
6. Skills: If so, is the manpower skilled to address environmental issues?	
7. Labour / social issues: <i>Does the management adopt good practices vis-à-vis occupational health & safety and associated issues such as child labour, forced labour, wage compensation, discrimination and working hours?</i>	

Note1: During determining overall Environmental Risk Rating, the italicized questions are

the more important / critical ones.

Note 2: The Environmental Risk Rating is determined as follows:

Criteria	Environmental Risk Rating
If answers to any one of the italicized questions is “No”	“High”
If answers to all italicized questions is “yes” but 50% or more of the non-italicized questions is “No”	“High”
If answers to all italicized questions is “yes” and if answers to more than 25% and less than 50% of the remaining questions is “No”	“Moderate”
If answers to all italicized questions is “yes” and if answers to less than 25% of the remaining questions is “No”	“Low”

Reference: Environmental Risk Management Guideline for Banks and Financial Institution in Bangladesh

Table 5.3.5 Sector Environmental Due-Diligence Checklist: Textile and Apparels

Particulars	Yes/No/NA
1. Hazardous Chemicals: <i>Does the business activity include appropriate hazardous chemicals management methods in pretreatment, dyeing and other processes?</i>	
2. Wastewater / ETP: <i>* Does the proposed business activity have an ETP?</i>	
<i>* If business activity uses specific dyes (e.g. chrome dyes, sulphur dyes or phenolic compounds) in dyeing process, is there a method to check the limits of particular compounds in the effluent discharged?</i>	
<i>* Has the ETP design ensured that there is no bypass arrangement?</i>	
3. Solid Wastes: Is the management of solid wastes properly planned and methods of disposal identified? The wastes include trials, trimmings, cuttings of fabrics, spent dyes, pigments, and printing pastes; and ETP sludge containing mainly fibres and grease.	
4. Air emissions: Are air pollution control devices planned in the finishing processes such as coating and dyeing to manage air emissions that may contain toxic compounds?	
5. Fire and explosions: <i>Have proper design provisions been made to prevent fire and explosion hazards that may arise from operations?</i>	
6. Monitoring: Is environmental monitoring, particularly effluent characteristics, proposed on a periodic basis?	
7. Export requirements: If it is an export-oriented business or part of the supply chain, have all the buyer environmental requirements been met?	

Note1: During determining overall Environmental Risk Rating, the italicized questions are the more important / critical ones.

Note 2: The Environmental Risk Rating is determined as follows:

Criteria	Environmental Risk Rating
If answers to any one of the italicized questions is “No”	“High”
If answers to all italicized questions is “yes” but 50% or more of the non-italicized questions is “No”	“High”
If answers to all italicized questions is “yes” and if answers to more than 25% and less than 50% of the remaining questions is “No”	“Moderate”
If answers to all italicized questions is “yes” and if answers to less than 25% of the remaining questions is “No”	“Low”

Reference: Environmental Risk Management Guideline for Banks and Financial Institution in Bangladesh (Bangladesh Bank)

3) Operating Guidelines for Financial Sector Project for the Development of Small and Medium-Sized Enterprises in Bangladesh

The Operating Guideline focuses on Two Step Loan (TSL) project for Small and Medium-Sized

Enterprises (SME) and has the objectives as below.

- i) Provision of market-based medium- and long-term finance to SMEs in all sectors with certain exceptions
- ii) Provision of technical assistance to banks and financial institutions, thereby contributing to sound growth of the industry and economy in Bangladesh as well as the employment generation and poverty reduction on a sustainable basis, and the development of long-term finance market for SMEs. Given the strategic importance of the industry sector, financial assistance to SMEs in the manufacturing sector is highly expected.

The amount of the Loan is JPY 5,000,000,000 (BDT 4,500,000,000 equivalent) in total, of which JPY 4,787,500,000 (BDT 4,310,000,000 equivalent) is earmarked for TSL to SMEs.

b) The other Banks, the PFIs and the association

The survey team implemented the hearing survey for 8 Financial Institutes as below.

The Banks are selected based on the following standard: to have loan performance in Housing and using an existing TSL by JICA. Otherwise, Public Financial Institutes (PFIs) are selected with being expected to provide the favorable loan which the Banks cannot supply due to the loan for building safety which would not yield any immediate profit.

Table 5.3.6 The Organizations Selected for Hearing Survey

No.	Name
Banks	
1	Bangladesh Development Bank Ltd (BDBL)
2	The City Bank Limited (CBL)
3	Eastern Bank Limited (EBL)
Non-Banks Financing Institution	
4	Bangladesh House Building Finance Corporation (BHBFC)
5	Investment Corporation of Bangladesh (ICB)
6	IDLC Finance Limited (IDLC)
7	National Housing Finance and Investment Limited (NHFIL)
Association	
8	Bangladesh Garment Manufacturers & Exporters Association (BGMEA)

As a result of collecting information from their website and interviews, it was found that the banks and FIs which contracted the PA with BB had published the green banking policy on their website or printed documents. Specifically, they have set the phased target completion date for each item for the ESC so that their finance, organization system and working environment are improved regarding the ESC. And some of them have also evaluated the ERM items by industry accordance with the ERMG of BB. On the other hand, BGMEA requires their member firms of installing the effluent treatment plants, waste water and groundwater management system and EMS to follow the international standards in the textile industry as a background of being demanded the ESC due to the intensification of the international competition (refer to Appendix 10 and 11 for details).

Chapter 6 Overview of Basic Design Planning for Buildings

6.1 Basic Planning for Public Buildings

6.1.1 Background and Circumstances of Selecting Fire Stations

Bangladesh is located on the boundary region of three tectonic plates, i.e. Eurasia, India and Burma Plates, and is one of the most earthquake disaster prone countries. As earthquakes have been infrequent these years after the last earthquake, which occurred about 100 years ago, the risk of an earthquake is gradually increasing in Bangladesh.

Political, economic and cultural functions are concentrated in the Dhaka metropolitan area, where urbanization is notably advancing as symbolized by increasing tall buildings. However, only few of the buildings meet the Bangladesh National Building Code (BNBC), and most buildings are feared to be incapable of resisting earthquake and collapse, increasing the damage of the earthquake.

According to the Comprehensive Disaster Management Programme (CDMP, 2009) by the government of Bangladesh, an earthquake of Magnitude 6 on the Richter scale directly under Dhaka would, according to estimates, severely damage 56% of buildings and crush at least 95 thousand people to death. At the same time, it would cause a huge economic loss of 5% of the GDP.

Accompanying economic growth, factories are increasingly built in urban districts of Dhaka. Fires and accidents at such factories are also serious problems. Not only the number of fires are increasing (250 a year), but the damage has increased, such as one that killed more than 100 people. Sudden collapse of buildings has also occurred. The large-scale collapse at Rana Plaza in 2013 killed more than 1,000 people. People are killed or injured every year by fire, sudden collapse or other building-related accidents.

In this disaster-prone environment of Bangladesh, from the perspective of disaster management, public facilities that must be improved most to ensure safety include government offices, police, hospitals, fire stations, and schools. Although each facility no doubt is important for disaster management, from the viewpoint of emergency response and effectiveness, hospital and fire stations are given higher priority.

Though the hospital has high necessity for emergency response, there are numbers of private and public hospitals, and they have complex management entity. Also the buildings of hospitals are complex structure as well as detail building information are not always available. On the other hand, since FSCD is appointed as the first responder during disasters in SOD (Standing Order of Disaster), fire stations should begin acting first and foremost at the time of disasters. The activity would prevent disaster expansion, and it becomes possible to limit the disaster to a minimum. In addition, FSCD, in view of the recent increase of fire events, prepares plans of strengthening in Dhaka area and the national level expansion of fire stations. Thus FSCD has high awareness of seismic resistance and safety enhancement. In addition, the management entity of the fire stations is clear, and building data of fire stations are archived in the PWD. Therefore, in terms of work feasibility, it is adequate to view fire stations as the primary candidate.

Actually, fire stations and the fire department not only perform disaster prevention education during normal times, but also play a central role in fire fighting and rescue during an emergency. They are highly expected by people to work adequately as they are defined as the “first responder” and the core of rescue operations during a disaster in the National Earthquake Contingency Plan of Bangladesh. Fire stations and the fire department must be stable to smoothly perform their duties of fire fighting and rescue activities in a disaster, and are strong target candidates for this ODA loan project

6.1.2 Enhancing the Safety of Existing Fire Station Buildings

During an actual disaster, the lapse of time from the occurrence of the disaster until the time point of rescue is a key factor in rescue activities by the fire station, which plays the central role in firefighting and rescue, as well as disaster prevention education during normal times.

The figure below shows changes in the number of people rescued from the collapsed Rana Plaza building and the number of bodies retrieved over time. The 72 hours (3 days) after the disaster is called the “golden 72 hours”, and more than 2,400 people were rescued in this most important time zone. During the subsequent 3 days, more than 1,100 bodies were recovered. The fire department made such a big contribution to rescuing people.

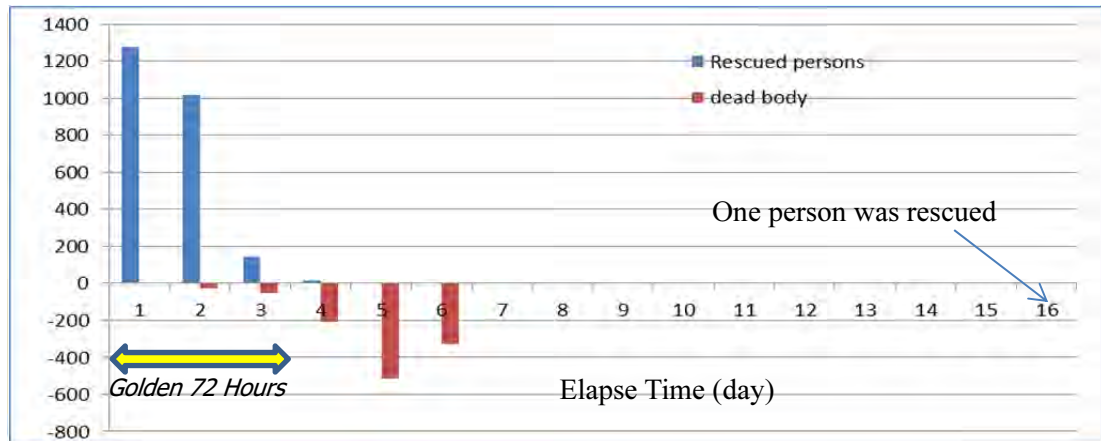


Figure 6.1.1 Days after Rana Plaza Accident, and the Number of People Rescued (blue) and Recovered dead (red)

For the fire department to rescue a number of citizens during an earthquake from collapsed houses, office buildings, factories, etc., the fire stations must not be damaged. Strengthening the buildings of fire stations against earthquakes and keeping them in sound condition are the most essential in disaster mitigation.

The population of Bangladesh is about 150 million, 1/10 of which is concentrated in Dhaka (accounting for about 1% of the national area). The number of fires has doubled in these 10 years, and reached approximately 15,000 a year. Of the fires, 1/3 have occurred in Dhaka. Therefore, it is likely effective to focus the project in the Dhaka area, where the central functions of the nation are concentrated.

At present, there are 17 fire stations in Dhaka, each supporting about a million people, as shown in Table 4.1.1 and Figure 4.1.2. Construction of new fire stations is waiting for the approval, but the funds are not sufficient. The fire stations are also training volunteers every weekend. To reduce disasters, it is practical and effective to train disaster volunteers and arouse the awareness of citizens as to disaster prevention. With such objectives, each fire station is encouraged to promote disaster prevention activities, such as constructing a meeting room, providing a space for practicing an emergency drill, and storing materials for such a drill (speaker, spade, sample of emergency food, fire extinguisher for drill, etc.), besides activities during an emergency.

It now takes about 1 hour for fire fighters to arrive at the site of a fire. They have set a goal of 30 minutes, but to achieve this goal, some kind of special measure is needed including the alleviation of traffic congestion and widening of narrow roads. The first actions to take are to construct a database and improve the fire communication system.

In the strengthening plan of FSCD on the 17 fire stations in Dhaka area, both the strengthening the 14

fire stations and the relocation of the headquarter building are the highest priority. As shown in the table below, among the 17 fire stations, the 7 older fire stations with more than 30-40years age are preferable to be rebuilding. One of them is the headquarters which is planned to be relocated. And with respect to the Tejgaon fire station, a seismic retrofitting works have been carried out under CNCRP. Therefore, the fire stations required rebuilding are five. In that regard, the other relatively newer fire stations are assumed to be desirable to have the seismic retrofitting. Note regarding to the Sadarghat River Fire Station, displayed on the lowermost, is temporal one on river, and no need of strengthening.

The building of the current headquarters of FSCD, more than 35 years have passed after the construction, is deteriorated. In addition, it is located in the old Dhaka, and the mobilization of fire vehicles has some obstacles. In the new expansion plan of fire stations, it becomes apparent that the current headquarters is not only narrow but also has interference with activities. Therefore, FSCD is planning to build the new headquarters at Mirpur site, after the training center moved, as more appropriate for headquarter. Mirpur site has wider area and easy access to wide road network. Already the concept of the new headquarters building including its scale and functions are organized. Therefore, it is conceivable to employ this relocation plan which is more realistic and reasonable.

Table 6.1.1 Fire Stations to be selected

No.	Name of Fire Station	Class of Fire Station	Construction Year	Type of Construction	Needs
1	Siddique Bazar Head Quarter	(Head Quarter)	1978	Relocation	Y
2	Sadarghat Fire Station	A class	1961	Rebuilding	Y
3	Pustagola Fire Station	A class	1963	Rebuilding	Y
4	Mirpur Fire Station	A class	1967	Rebuilding	Y
5	Mohammadpur Fire Station	A class	1963	Rebuilding	Y
6	Palashi Barak Fire Station	A class	1947	Rebuilding	Y
7	Demra Fire Station	A class	1983	Retrofitting	Y
8	Khilgaon Fire Station	A class	2014	Retrofitting	Y
9	Kurmitola Fire Station	A class	1980	Retrofitting	Y
10	Lalbag Fire Station	A class	2001	Retrofitting	Y
11	Saver EPZ Fire Station	A class	2004	Retrofitting	Y
12	Saver Fire Station	B class	2004	Retrofitting	Y
13	Baridhara Fire Station	B class	2004	Retrofitting	Y
14	Karanigonj Fire Station	B class	2004	Retrofitting	Y
15	Dhamrai Fire Station	C class	2010	Retrofitting	Y
16	Tejgaon Fire Station	A class	1965	Rebuilding (Retrofitted)	-
17	Sadarghat River Fire Station	(temporal)	-	-	-

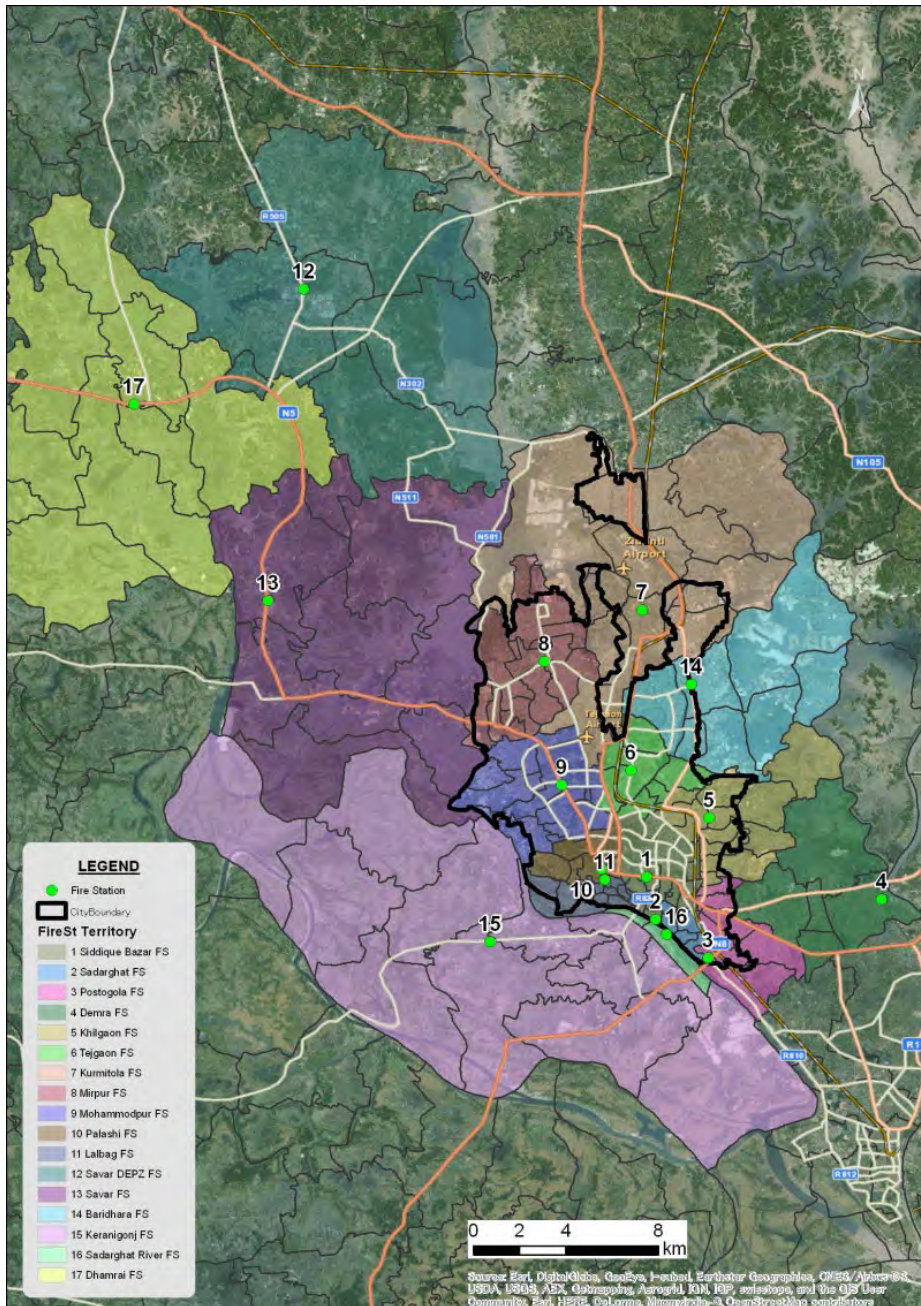


Figure 6.1.2 Location of Fire Stations

6.1.3 Investigation of the Construction Plan for the Fire Headquarters Building

The new headquarters building of FSCD, according to the future plan of aiming after 30 years, has been already formed the concept with the scale and the function. Its scale is large, it is new construction, and it will have the variety of functions. Since the position and the basic concept are already almost fixed, though simple, the outline of the structure can be examined as shown below using available basic information on ground condition and seismic coefficient and so on.

a) Seismic isolated structure

The strength and method of constructing a building are mainly determined by the seismic countermeasure(s) to implement. Because Dhaka will possibly be attacked by an earthquake stronger than the level prescribed by BNBC, a higher seismic strength is required for important buildings. In general, there are three structural types, namely seismic resistant, vibration control, and seismic isolation, for protecting the building from earthquake shaking and damage. Among them the most appropriate should be selected.

For the fire headquarters, it is desirable to implement seismic isolation from the viewpoint of ensuring the safety of the entire building, because the headquarters must be not only safe during an earthquake, but also able to maintain a system that can start firefighting and rescue activities immediately after the earthquake, and also because the building is to be relatively large, 10 stories, about 20 thousand m², and have an irregular shape.

This will be the first full-scale seismic isolated structure to be constructed in Bangladesh, and is an opportunity to implement the seismic isolation technology of Japan. In a seismic isolation structure, the seismic force can be absorbed by the isolating devices. Therefore, seismic force does not act on the superstructure, enabling the building with furniture to have a relatively free design. A building is being investigated that has a symbolic appearance and professes outstanding disaster resistance.

The following table is a comparison of seismic resistant, vibration control, and seismic isolated structures.

Table 6.1.2 Comparison of Seismic Resistant, Vibration Control, and Seismic Isolated Structures

	Seismic resistant	Vibration control	Seismic isolation
Method	The building is built with strong walls so that it does not collapse.	Dampers are installed to the framework (column, wall, etc.) to reduce vibration.	The building is detached from the ground to sharply reduce vibration.
Characteristics	<ul style="list-style-type: none"> ● Severe damage to structural members such as columns and beams ● People’s life is saved. ● Furniture inside the building falls and drops. Severe damage to non-structural members such as exterior walls and windows ● Requires a long time after the earthquake until function is restored ● Larger shakes at higher stories 	<ul style="list-style-type: none"> ● Damage to columns and beams, but slight compared to an earthquake resistant structure ● People’s life is saved. ● Furniture inside the building falls and drops. Slight damage to non-structural members such as exterior walls and windows ● Requires a certain period of time after the earthquake to restore function ● Requires dampers to be replaced after a large earthquake ● Generally effective for buildings taller than 10 stories 	<ul style="list-style-type: none"> ● Almost no damage to structural members such as columns and beams ● People’s life is saved. ● Almost no furniture inside the building falls or drops. Almost no damage to non-structural members such as exterior walls and windows ● Functions can be restored immediately after an earthquake, and services are not interrupted. ● Earthquake force does not act on the superstructure. Building can be designed freely, such as an irregular shape and light manner
Costs	<ul style="list-style-type: none"> ● Initial construction cost slightly lower than for vibration control or seismic isolation ● Requires large cycle cost (normal service life: 50 years) because the building needs to be repaired after every earthquake. 	<ul style="list-style-type: none"> ● Intermediate between earthquake-resistant and seismic isolated structures 	<ul style="list-style-type: none"> ● Initial cost slightly higher than for earthquake-resistant structure ● Life cycle cost is lower than for an earthquake-resistant structure because the building is not damaged by an earthquake, and thus does not need to be repaired.

<Concept of the planned building>

Construction drawings are currently in preparation. Perspective concept are shown below.



The dome and fan shape require a number of problems to be solved to ensure sufficient earthquake resistance. The seismic isolation system enables a building to be relatively freely designed.

b) Implementation of facilities for advanced urban disaster resilient system

As this headquarter building in future is focused to be an advanced disaster management one as a symbol, advanced technologies are required as its facilities. Assuming that the building is to serve as the

disaster management base during an earthquake, the building is to be disaster-resilient, and to be equipped with a solar power generation system and facilities for securing drinking water (by filtering rainwater), etc. It should also be constructed as an environmentally-friendly building such as a green building so as to serve as a model when buildings in Bangladesh are designed by considering the environment.

If an advanced and highly efficient environmental system is to be implemented, it is recommended to employ the Building Energy Management System (BEMS), which supports the operation of the environmental system. Implementation of the energy management system (EMS), which visualizes energy consumption, control devices for saving energy (reduction of CO2 emission), and control systems and batteries with renewable energy, such as solar power generation, is also being investigated as an effective idea from the viewpoint of protecting the environment. Implementation of such advanced and highly efficient environment systems is expected to produce synergistic effects. As an environment assessment method, the Comprehensive Assessment System for Built Environment Efficiency (CASBEE), which was developed in Japan, will be investigated as a candidate.

c) Use of international consultant

To build a symbolic “green” building, it is recommended to use an international consultant. In such a case, possibilities should be considered for Japanese consultants, contractors and facilities, which have advanced knowledge and skills, to participate. In the Shanta Tower Building, which is a goal of the Bangladesh Fire Service and Civil Defense (FSCD), the warning system of Nohmi Bosai is being installed, and other Japanese systems will also possibly be implemented.

6.1.4 Plan for improving the existing 14 fire station buildings

Besides the aforementioned Mirpur National Headquarters, which is to be newly constructed, reinforcement including seismic retrofitting and rebuilding needs to be planned for the 14 existing fire stations. Because a fire station building is not large and an earthquake-resistant structure is sufficient for ensuring the necessary strength, it is recommended to employ an earthquake-resistant structure rather than vibration control or seismic isolation, which is costly.

The fire station at Tejgaon, built in 1965, has already been seismic-retrofitted under CNCRP as a pilot case. The building had suffered more severe deterioration than expected. Photo 1 shows the states of Palashi Barak Fire Station built in 1947. Such old buildings are highly deteriorated, and need to be not retrofitted but rebuild. In this survey, all fire stations in Dhaka were observed. Visual observations showed that the five fire stations that were built before 1980 are better reconstructed, because the strength of the frames is remarkably low. For the remaining 9 stations, built in or after 1980, seismic retrofitting will be executed, when necessary by considering their service life of 50 years in general.



Photo: Actual states of Palashi Barak Fire Station
 (Built in 1947, the building has aged. The plaster has detached from the columns, and reinforcing bars are exposed and rusted. Concrete is brick chips. It is judged difficult to retrofit, and should rather be rebuilt.)

Table 6.1.3 Measures for the 14 Fire Stations

No.	Name of Fire Station	Class of Fire Station	Type of Construction	Construction Year
1	Mirpur New Headquarters	A class	New Construction	(newly)
2	Sadarghat Fire Station	A class	Rebuilding	1961
3	Pustagola Fire Station	A class	Rebuilding	1963
4	Mirpur Fire Station	A class	Rebuilding	1967
5	Mohammadpur Fire Station	A class	Rebuilding	1963
6	Palashi Barak Fire Station	A class	Rebuilding	1947
7	Demra Fire Station	A class	Retrofitting	1983
8	Khilgaon Fire Station	A class	Retrofitting	2014
9	Kurmitola Fire Station	A class	Retrofitting	1980
10	Lalbag Fire Station	A class	Retrofitting	2001
11	Saver EPZ Fire Station	A class	Retrofitting	2004
12	Saver Fire Station	B class	Retrofitting	2004
13	Baridhara Fire Station	B class	Retrofitting	2004
14	Karanigonj Fire Station	B class	Retrofitting	2004
15	Dhamrai Fire Station	C class	Retrofitting	2010

(The fire stations that were built in 2010 and 2014 may not be retrofitted if they have sufficient strength even under new BNBC)

6.1.5 Environmental Social Considerations in Public Sector

a) Outline of the Project in Dhaka city with regards to environmental social considerations

1) Components of the Project which have environmental impacts

The new building of FSCD National Headquarters at Mirpur is the first priority in FSCD's future plan, which examination of ESC (Environmental Social Consideration) is shown below. An environmental and social examination is a necessary step before the construction. The location and drawings of the project are outlined first. The building targeted of survey for environmental impact assessment has the central function.

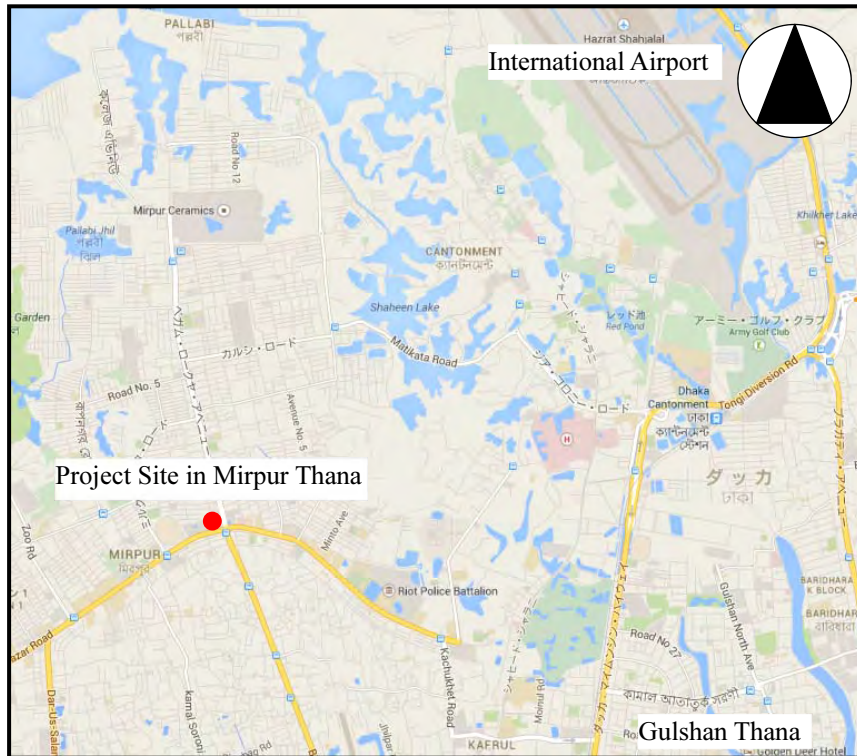


Figure 6.1.3 Project Site in Mirpur Thana

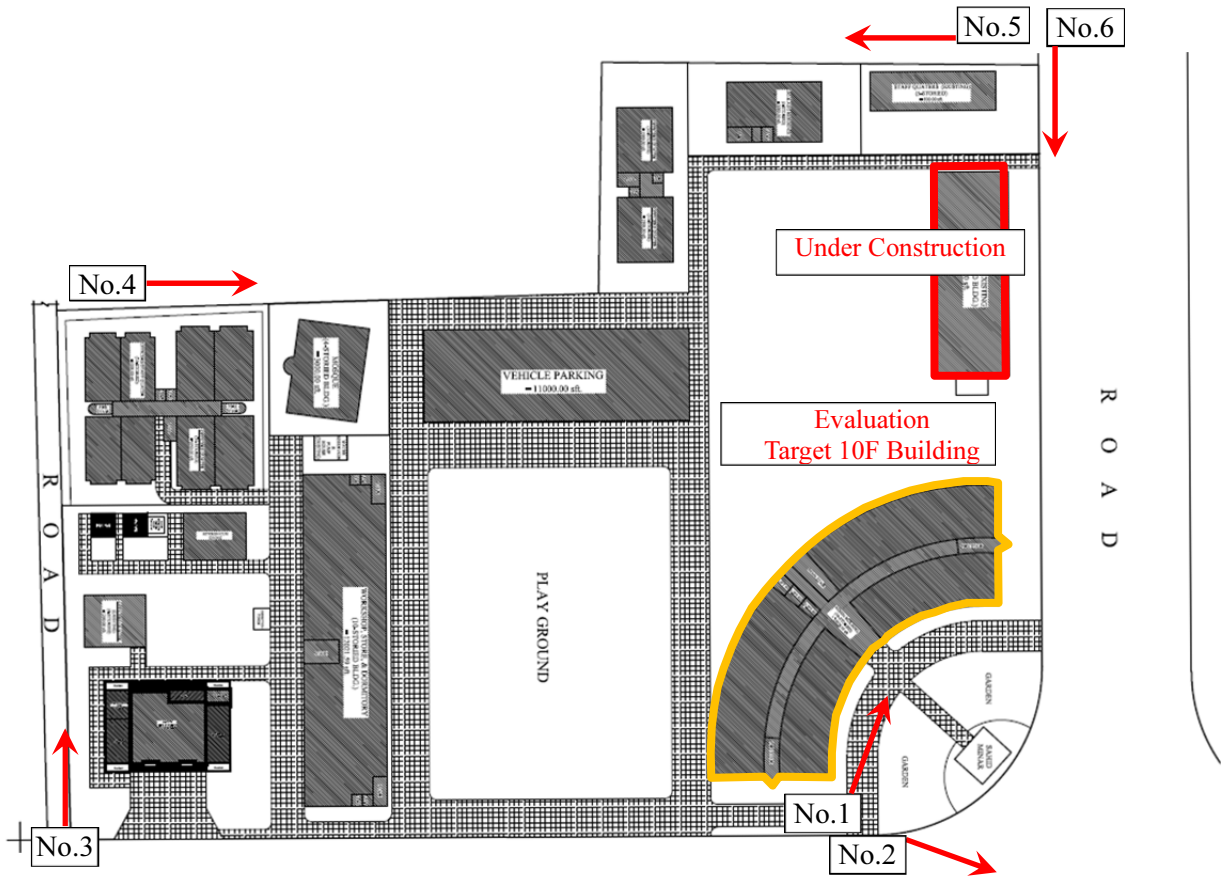


Figure 6.1.4 General Layout Plan of National Headquarter in Mirpur and the Photograph of its Surroundings

2) Environmental and social considerations category in Bangladesh and the JICA guideline

According to ECC (Environmental Clearance Certificate) issued by DoE, the construction building that is under 11 stories even with fire function don't need the ECC. New construction of the 10-stories building is planned. Therefore the ECC is unnecessary for this building. However, Initial Environmental Examination (IEE) may be implemented according to the JICA guidelines, because the construction is expected to have negative environmental and social impacts such as generated waste by demolishing the existing building. Accordingly, the preparation survey was carried out supposing that the construction will be classified as category "B" under the JICA guidelines.

b) The environmental and social conditions around the site

1) Land Use

The planning area has been already utilized as the Training Center by FSCD. Therefore, the issue of land acquisition and involuntary resettlement will not occur, because of the building reconstruction and the unchanging land use in the construction.

2) Natural Environment

There are many protected natural areas in Dhaka City according to the list. However the planning area has already been used by FSCD, and there is no impact for natural environment.



Figure 6.1.5 Protected Forest Areas in Bangladesh

Table 6.1.4 National Park, Wildlife Sanctuary and Game Reserve in Bangladesh

No.	Protected Areas	Forest types	Location	Area (ha)	Established (Extended)
National park (IUCN category V)					
1	Modhupur NP	Sal forest	Tangail	8,436	1962 (1982)
2	Bhawal NP	Sal forest	Gazipur	5,022	1974 (1982)
3	Himchari NP	Hill forest	Cox's Bazar	1,729	1980
4	Lawachara NP	Hill forest	Maulvibazar	1,250	1996
5	Kaptai NP	Hill forest	Rangamati	5,464	1999
6	Ramsagar NP	Sal forest	Dinajpur	27.75	2001
7	Nijhum Dweep NP	Coastal mangrove	Noakhali	16,352.23	2001
8	Medha Kachapia NP	Hill forest	Cox's Bazar	395.92	2004
9	Satchari NP	Hill forest	Habiganj	242.82	2005
10	Khadimnagar NP	Hill forest	Sylhet	679	2006
Wildlife sanctuary (IUCN category IV)					
1	Sundarban (East) WS	Natural mangrove	Bagerhat	31,226.94	1960 (1996)
2	Pablakhali WS	Hill forest	Rangamati	42,087	1962 (1983)
3	Char Kukri Mukri WS	Natural mangrove	Bhola	40	1981
4	Chunati WS	Hill forest	Chittagong	7,761	1986
5	Rema-Kalenga WS	Hill forest	Habiganj	1,975.54	1996
6	Sundarban (South) WS	Natural mangrove	Khulna	36,970.45	1996
7	Sundarban (West) WS	Natural mangrove	Satkhira	71,502.13	1996
Game reserve					
1	Teknaf GR	Hill forest	Cox's Bazar	11,615	1983

Source: Mukul et al. 2008. Protected Areas of Bangladesh: Current Status and Efficiency for Biodiversity Conservation. Proceedings of the Pakistan Academy of Sciences 45(2): 59–68.

c) Social economy

The planning site is located in relatively newly developed area and at the intersection of Mirpur Road with Begum Rokeya Avenue on which there is a great deal of vehicles and pedestrians. There are some houses and apartments at the northern area. Most of residents moved around the planning site from their hometown to make their living. According to the interview survey, they are working at garment factories as employees or supervisors. They make from 4,000BDT to 8,000BDT approximately as monthly salary.

d) Comparative examination of alternative plans for the construction in Mirpur

For the new construction of administration building, the existing building will be demolished and newly constructed with 10 stories. The possible alternative plans are as follows;

- Option 1: Increasing the height of the existing building from three stories to ten.
- Option 2: Utilization of the existing 3-story building and construction of 7-story building at another space
- Option 3: Demolishing the existing building and reconstruction 10-story building

Option 1: Increasing the height of the existing building from 3 stories to 10

Advantage: Existing building is not demolished, therefore no waste is generated. No need for additional area for constructing new building.

Disadvantage: Need to reinforce the existing building for withstanding the load of construction parts.

Since Mirpur is locating in flood-prone area with soft soil. Therefore, it is impossible to extend the existing building, because it needs not only the reinforcement but also pile driving under the existing building.

Option 2: Utilization of the existing 3-story building and construction of 7 stories building at another space

Advantage: Existing building is not demolished, therefore no waste is generated.

Disadvantage: Additional area is needed for the new 7 stories building.

The planning site will be small due to the construction of the new 7-story building and the administration building will require higher functionality as the National Headquarters. Accordingly, Further utilizing the existing building will prevent from developing the social service and social infrastructure as fire station.

Option 3: Demolishing the existing building and reconstruction 10 stories building

Advantage: No need for another building area.

Disadvantage: Need to dispose of the rubble generated by demolishing the existing building.

However the rubble will be generated by demolishing the existing building, the space for temporary storage yard can be reserved and the new construction and its operation will not be disturbed. The social infrastructure and social service will be improved by constructing 10 stories building as administration facility.

According to the survey and the evaluation of 3 alternative plans, Option 3 is recommended.

e) Scoping

The following Table 4.1.5 shows the checklist for scoping.

Table 6.1.5 Checklist for Scoping

No.	Impact item	Evaluation		Reasons
		During Construction	Operation	
Social environment				
1	Involuntary resettlement	D	D	There won't be any involuntary resettlement because the project includes only reconstruction of new administration building. Further land acquisition is unnecessary.
2	Local economy such as employment and livelihood, etc.	B+	D	It is possible that new jobs will be created with construction of new administration building.
3	Land use and utilization of local resources	D	D	The planning site has already been utilized as the training center by FSCD, therefore there is no further negative impact.
4	Social institutions such as social infrastructure and local decision-making institutions	D	D	There is no possibility of dividing local administrative organizations, local associations, assembly and local business by the project.
5	Existing social infrastructure and services	D	B+	The social infrastructure and social service will be improved by constructing new administration facility.
6	Poor classes	D	D	The project has no negative impact for poor classes because of reconstruction of the administration building.
7	The indigenous and ethnic people	D	D	There are not any indigenous and ethnic people around the project site and its surroundings.
8	Maldistribution of benefit and damage	D	D	There are not any Maldistribution of benefit and damage in surrounding areas because of reconstruction of the administration building.
9	Local conflict of interest	D	D	There are no local conflicts of interest in local area because of reconstruction of the administration building..
10	Water Usage	C-	D	If there are some wells for water drinking around the project site, the construction will have an impact by causing water turbidity.
11	Gender	D	D	There is no negative impact in the project in terms of gender.
12	Children's rights	D	D	There is no negative impact in the project in terms of children's rights.
13	Cultural heritage	D	D	There are no precious cultural heritage sites at the project site and its surroundings.

13	Infectious diseases such as HIV/AIDS	D	D	There is no negative impact in the project in terms of infectious diseases.
14	Labour environment	D	B+	Construction works which have negative impact to the labour are not scheduled in the construction and operation phases. In particular, in the operation phase, the labour environment will be improved because new facility will be installed in the new administration building.
Natural environment				
15	Topography and Geology	D	D	There will be no negative impacts because excavation and landfill works do not require flatland.
16	Bottom sediment	D	D	Construction works which have negative impact to bottom sediment are not scheduled in the project.
17	Biota and ecosystem	D	D	There is no negative impact in terms of biota and ecosystem because the project site is not assigned as a natural protection area.
18	Hydro-Geological Situation	D	D	There can be no negative impact on the hydro-geological situation because there are no rivers and lakes around the project site.
19	Landscape	D	B-	New building structure appears as the 10-story building.
20	Protection Area	D	D	The project site and its surrounding are not assigned as the national park and natural protection area.
21	Global warming	D	D	There are hardly any impacts in regards to global warming in the project.
Pollution Abatement				
22	Air pollution	C-	D	Under construction: Negative impact of air pollution is concerned with operating heavy machines and driving dump trucks. Especially, in terms of demolishing the existing building, fine particles by blocks will be generated.
23	Water pollution	C-	D	There is some possibility of water pollution by discharged waste water from the construction site, heavy machines and dump trucks.
24	Soil contamination	C-	D	Minor impact of soil contamination will be generated by oil leaks of heavy machines and dump trucks.
25	Waste	C-	D	There is a possibility that there will be waste construction materials and waste dumps.
26	Noise and vibration	C-	D	Under construction: Some negative impacts of noise and vibration are concerned with operating heavy machines and driving dump trucks.
27	Land subsidence	D	D	Construction works which have negative impact in terms of land subsidence are not scheduled in the project.
28	Offensive odor	D	D	Offensive odor from reconstructing building cannot be generated during the construction phase and the operation phase.
29	Accidents	B-	D	There is a possibility of some impacts by heavy machines and dump trucks.

Rating:

- A : Serious impact is expected.
B : Slight impact is expected.
C : Extent of impact is unknown (Examination is needed. Impacts may become clear as study progress.)
D : No impact is expected. IEE/EIA is not necessary.

f) TOR with regards to Environmental and Social Considerations

Table 2.7.19 illustrates the Terms of Reference (TOR) to environmental and social considerations.

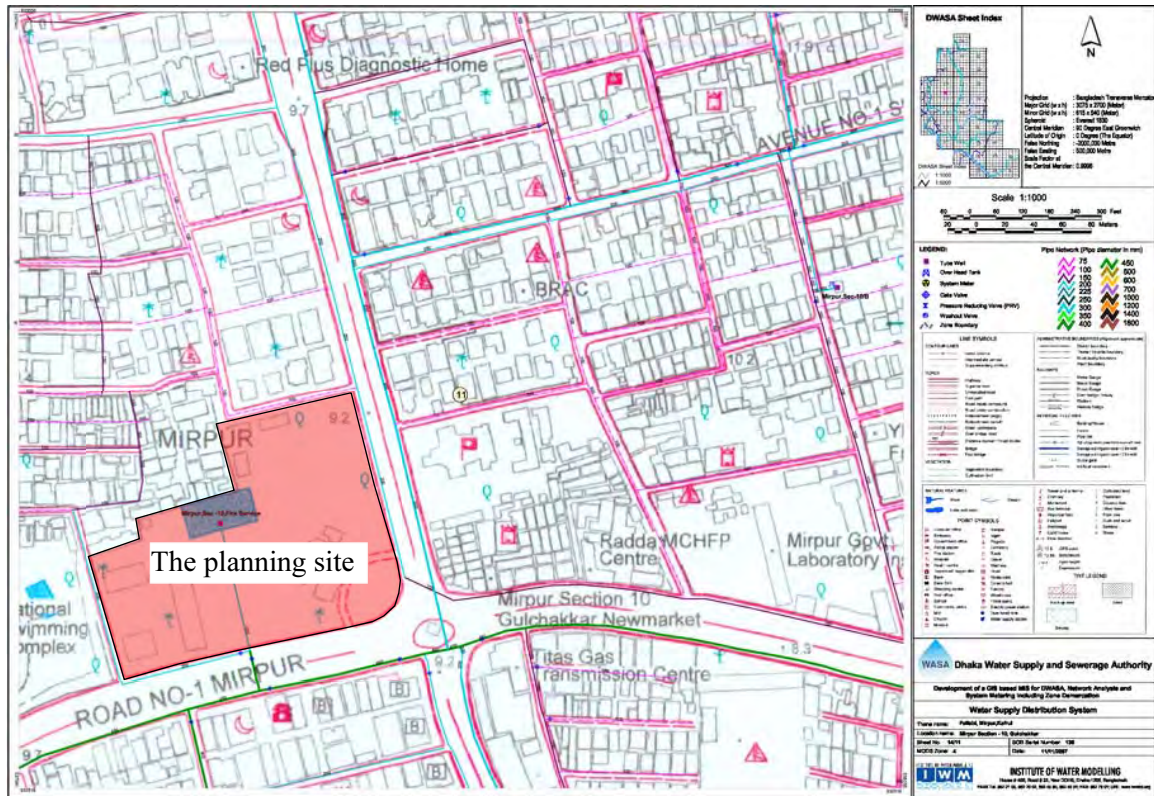
Table 6.1.6 TOR with regards to Environmental and Social Considerations

No.	Environmental Item	Survey Item	Survey method
Social Environment			
1	Water usage	Current condition of well usage around the project site	Interview to local people
Natural Environment			
2	Landscape	Current view from surrounding	Field survey
Pollution Abatement			
3	Air pollution	(1) The Environmental Standard in Bangladesh and in Japan (2) Distance from the project site to residences, schools, hospitals and so on. (3) Some impacts during the reconstruction	(1) Investigation of existing documents (2) Field survey and interview to local people (3) Confirmation of reconstruction type and period
4	Water pollution	(1) The Environmental Standard in Bangladesh and in Japan (2) Current condition of well usage around the project site (3) Some impacts during the reconstruction phase	(1) Investigation of existing documents (2) Field survey and interview to local people (3) Confirmation of reconstruction type and period.
5	Soil contamination	Oil leaks under construction.	Confirmation of reconstruction type, period and so on.
6	Waste	Construction waste materials	Confirmation of waste treatment method
7	Noise and vibration	(1) The Environmental Standard in Bangladesh and in Japan. (2) Distance from the project site to residences, schools, hospitals and so on. (3) Some impacts during the reconstruction phase.	(1) Investigation of existing documents (2) Field survey and interview to local people (3) Confirmation of reconstruction type and period
8	Accidents	Some impacts during the reconstruction phase.	Planning the prevention policy against accidents.

g) The results of environmental and social considerations examination

1) Water Usage

None of the residents around the planning site in Mirpur utilize well water for drinking according to the hearing survey. Accordingly, there will be no negative impact for inhabitants around the planning site. The Bangladeshi water supply authority has published the map of water supply distribution system as below.



http://info.dwasa.org.bd/gis_maps/Water/ws_block-14/wsp_1_14_11.pdf

Figure 6.1.6 The map of water supply distribution system landscape

2) Land scape

The shade of the administration building will be longer from the construction site to the north side due to the raise the building height, which has been changed from 10 meters to 30 meters. However, the hours of sunshine which reaches the residential area will not be changed during the daily active hours from 9:00 to 16:00 because the nearest neighborhood from the reconstruction building is situated 70meters away. Therefore, there is no negative impact regarding the Landscape sector.

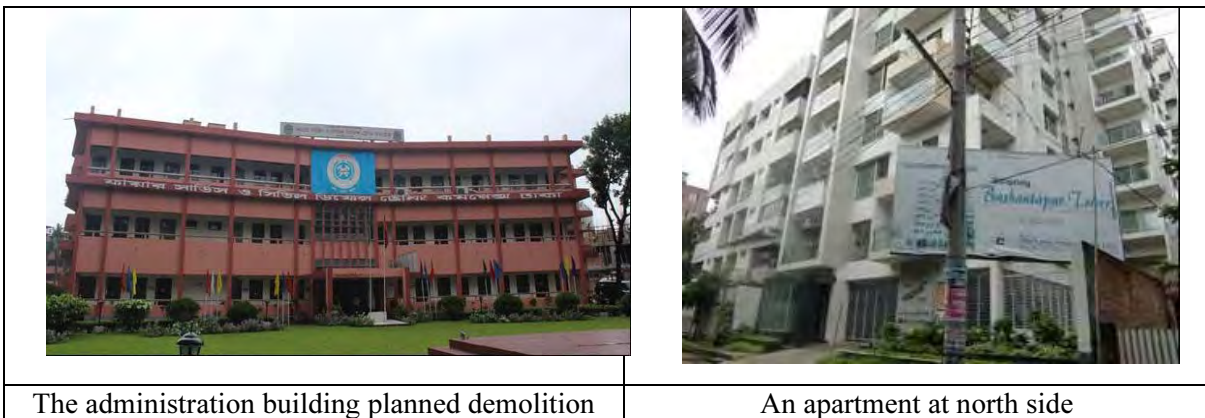


Figure 6.1.7 Landscape of Surrounding Area

3) Air pollution

i) The environmental standard in Bangladesh

The environmental standard in Bangladesh regarding air pollution is as follows.

Table 6.1.7 National Ambient Air Quality Standard in Bangladesh

Pollutant	Averaging Period	Standard
PM ₁₀ (µg/m ³)	1 year	50
	24 hours	150
PM _{2.5} (µg/m ³)	1 year	15
	24 ours	35

Bangladesh: 2005. Statutory Rules and Order No.220; Japan: Ministry of Environment

ii) Distance from the site to residences, schools, hospitals and so on

The distance to the nearest residence is roughly 70 meters from administration building. And there is no school and hospital in its surroundings.

iii) Some impacts during the reconstruction

There will be some negative impact as the dust during the destruction of the existing building and crushing the concrete blocks and bricks. Therefore, some measure should be implemented for scattering of dust.

4) Water pollution

i) The environmental standard in Bangladesh

Table 6.1.8 National Drinking-Water Standard of Main Items in Bangladesh

Parameters	Unit	Standard
Potential of Hydrogen	pH	6.5 - 8.5
Dissolved Oxygen	mg/l	6
Turbidity	JTU	10
Colour	Hazen	15
Odour	mg/l	Odourless
Chloride	mg/l	150 - 600
Nitrate	mg/l	10
Nitrite	mg/l	<1

Farooque, M. and S. R. Hasan. 2004. Laws Regulating Environment in Bangladesh, 2nd ed.

ii) Current condition of well usage around the site

There is no excavated well in its surroundings according to the site survey and the hearing survey.

iii) Some impacts during the construction phase

Although there is some possibility of water pollution around the planning site during the construction phase, there is no excavated well in its surroundings according to the site survey and the hearing survey. Therefore, there is no negative impact regarding the water pollution sector during the construction phase.

However, there is some possibility of water pollution by the discharged waste water from the kitchen, toilet and so on. Accordingly, prevention measures will be proposed.

5) Soil contamination

i) Oil leaks under construction

A large number of construction machines will be used during the construction phase. Accordingly, it is necessary to give care to trouble and maintenance of construction machines.

6) Waste

i) Construction waste materials

As rubble of dismantled building is generated, prevention measures will be proposed. It will be transported to final disposal site or be reused according to the construction plan.

7) Noise and vibration

i) The Environmental Standard in Bangladesh

Table 6.1.9 Bangladesh National Ambient Noise Quality Standards

Location	Standard dB (A)	
	Day (6 am to 9 pm)	Night (9 pm to 6 am)
Silent	50	40
Residential	55	45
Commercial	70	60
Industrial	75	70

GOB. 2006. Sound Pollution (Control) Rules

ii) Distance from the site to residences, schools, hospitals and so on

As a result of the interview survey in the surrounding area, there are no schools, hospitals and other facilities in which especially environmental consideration is needed. And the nearest neighborhood is situated 70 meters away from the construction building. Therefore, there is no negative impact regarding the noise and vibration.

iii) Some impacts during the reconstruction phase

The planning site also faces an intersection, so there are some adverse impacts, not the residential area but on the pedestrian's streets. Therefore, some measures should be implemented for noise and vibration.

8) Accidents

i) Planning the prevention policy against accidents

The intersection and street faced the planning site have so many pedestrians and large volume of traffic. Therefore, care should be taken when dump trucks entering and leaving from the planning site.

h) Impact Assessment and Mitigation Measures

Impact assessment and mitigation measures based on the results of the IEE (Initial Environmental Examination) are as shown below.

Table 6.1.10 Impact Assessment Based on Results of the IEE

No.	Affected item	Impact assessment at the scoping		Impact assessment based on results of the IEE		The reasons for change of evaluation
		Before and under construction	Operation phase	Before and under construction	Operation phase	
Social environment						
1	Water usage	C-	D	D	D	There is no negative impact regarding water usage because none of the residents around the planning site in Mirpur utilize well water for drinking according to hearing survey.
Natural environment						
2	Landscape	D	B-	D	D	As the results of the field survey, there is no negative impact visually because the hours of sunshine which reaches residential area will not be changed during general daytime to live that is from 9:00 to 16:00 and the nearest neighbourhood is situated 70 meters away from the reconstruction building.
Pollution abatement						
3	Air pollution	C-	D	B-	D	There will be some negative impact as the dust during the destruction of the existing building and crushing the concrete blocks and bricks. Therefore, some measure should be implemented for scattering of dust.
4	Water pollution	C-	D	B-	D	Although there is some possibility of water pollution around the planning site during the reconstruction phase, there is no excavated well in its surroundings according to the site survey and the hearing survey. Therefore, there is no negative impact regarding the water pollution sector.
5	Soil contamination	C-	D	B-	D	A large number of construction machines will be used during the reconstruction phase. It is necessary to give care to trouble and maintenance of construction machines.
6	Waste	C-	D	B-	D	As rubble of dismantled building is generated, prevention measures will be proposed. And it will be transported to the final disposal site or be reused according to the construction plan.
7	Noise and vibration	C-	D	B-	D	The planning site also faces an intersection, so there are some adverse impacts, not the residential area but on the pedestrian's streets. Therefore, some measures should be implemented for noise and vibration.
8	Accidents	B-	D	B-	D	The intersection and street faced the planning site have so many pedestrians and large volume of traffic. Therefore, care should be taken when dump trucks entering and leaving from the planning site.

Rating:

- A : Serious impact is expected.
- B : Some impact is expected.
- D : No impact is expected. IEE/EIA is not necessary.

Table 6.1.11 Mitigation Measures

No.	Affected item	Mitigation measures
Pollution abatement		
1	Air pollution	As it is possible that the dust will be emitted when the building is dismantled, sprinkle with water or scattering prevention seat covering the building is needed.
2	Water pollution	There is some possibility of water pollution by the discharged waste water from the kitchen, toilet and so on. Therefore, the septic tank is installed to treat waste water or the waste water is discharged into a sewage pipe directly.
3	Soil contamination	To perform inspection and maintenance for heavy machines and dump trucks periodically. In case of defects or troubles be found, they are to be fixed and necessary parts exchanged without delay.
4	Waste	The all rubble of dismantled building will be reused according to the construction plan.
5	Noise and vibration	Drivers of vehicles are to be educated and lectured on prohibition of unnecessary racing and needless idling. And noise and vibration level should be minimized by using low-level machines and keeping good maintenance.
6	Accidents	The workers during the construction and the operation phases will be educated and lectured on safe driving.

i) Monitoring Plan

The monitoring plan is as below based on the results of environmental impact assessment and mitigation measure.

Table 6.1.12 Monitoring Plan

Environmental item	Item	Frequency	Regulation standards	Monitoring point
Under construction				
Air pollution	Confirmation of implementing the prevention measure	During dismantling	—	Inside of the planning site
Waste	Confirmation of implementing the prevention measure	During dismantling	—	
Noise and vibration	Noise level	Quarterly	85-100dB*	Inside of the site
	Confirmation of the construction method with low noise type	Once per year	—	
Accidents	Accident records	Once per month	—	

*: 85dB: As measured at a distance of 7.5 meters from exhaust pipe, 100dB: As measured at a distance of 0.5 meters from exhaust pipe.

Notes: At the time of taking measurement, the motor vehicle shall not be in motion and its engine conditions shall be as follows:

(a) Diesel engine- maximum rotating speed.

(b) Gasoline engine -at two thirds of its maximum rotating speed and without any loud.

(c) Motorcycle- if maximum rotating speed is above 5000 rpm; two thirds of the speed and if maximum rotating speed is less than 5000 rpm, three fourth of the speed.

Source: Farooque, M. and S. R. Hasan. 2004. Laws Regulating Environment in Bangladesh, 2nd ed.

j) Consultant Meeting with Stakeholder

It was unnecessary to hold a stakeholder meeting in this project due to the following reasons.

- It doesn't generate the problem of involuntary resettlement and land acquisition due to the project which is situated in the owner's site.
- Regarding the procedure of EIA in Bangladesh, the ECC in the project is not required because of the construction of an under 10 stories building. Holding a stakeholder meeting also is not mandatory.

k) Land Acquisition and Involuntary Resettlement

These problems will not occur in this project as mentioned above.

l) Others

As mentioned above, the Environmental Certification by DoE in the project is not required.

6.2 A possible project to be conducted in near future

Finally, after the above investigation on the collected data and information, a possible project for safer private and public buildings is considered. For private buildings, retrofitting, rebuilding and relocation of vulnerable RMG factory buildings are preferable. As for public buildings, fire stations will be introduced. They will include a new headquarter building for FSCD, and retrofitting of the fire stations in Dhaka municipality, as shown in Appendix 12.

Chapter 7 Conclusion

Data and information regarding to natural and social situations were collected and arranged in the target area, including Dhaka. And the concept for support from Japan side was examined in order to study the issues and to solve them relating to the building.

7.1 Necessity of Future Support Projects

(1) Natural and social conditions

Bangladesh has the threat of flood, cyclone and earthquake. In particular, since earthquake would provide potential danger of a huge damage in collapse of buildings and human casualties, the area is in a high dangerous environment.

Dhaka metropolitan area is the political, economic, cultural center of Bangladesh. It shows rapid urbanization in recent years, with the constructions of high-rise buildings etc. Most of these buildings are not in compliance with the National Building Code (BNBC), also do not take into account threats to earthquakes and fire. Due to the trigger by Rana Plaza tragic disaster that occurred in 2013, both to enhance safety for disaster risk and to promote reduction of vulnerabilities in urban areas have become a pressing issue.

(2) Necessity of Measures to Buildings

Most of the buildings of Dhaka have been constructed before the building code was enforced. For this reason, the buildings are very vulnerable and do not have enough strength to withstand even a small earthquake. In addition, according to the CDMP (2009), when an earthquake of M7.5 occurred at Madhupur fault, out of the total 326,000 buildings, suffering buildings were estimated at 49 percent in Dhaka. When the earthquake occurs at 2 am, approximately 90,000 people were estimated to be killed. Under such circumstances, maintaining the enhancement of the safety and the quality of the construction quality of the buildings are absolutely necessary for Bangladesh.

According to the concrete strength test of the building by CNCRP, most of the building showed those below the design strength, and the half were only about half of design strength. Also even structural design is appropriate, if the construction is inadequate, the building becomes structurally inappropriate. Buildings that comply the criteria of BNBC is only about 25%.

During the years, Ministry of Housing and Public Works (MoHPW) is considering to build a disaster resilient city in order to support the rapidly growing economic in a stable manner. In this context, both the construction of earthquake-resistant buildings, and the construction of disaster management headquarters in order to maintain the function of government and public administration even just after the disaster are included

(3) Concept of Projects

In Bangladesh, the process for the construction of public buildings and private buildings are different. Public buildings are managed by Department of Architecture (DoA) and PWD under MoHPW. On the other hand, Private buildings are managed by various authorities such as the Dhaka Metropolitan Area Development Management Agency (RAJUK), City Corporations and Development Authorities, and other regional management institutions. Therefore, it was decided to examine separately the subject of public and private buildings.

1) Private Buildings

Taking into account the economic and the social impact, the factory buildings of the Ready-Made Garment (RMG) sector are considered as the candidate for this survey. Furthermore, the RMG project

which is implementing with the technical support by CNCRP, using the two-step loans (TSL) by JICA should be considered the continuity.

2) Public Buildings

Since there is no national master plan for the disaster management, it is difficult to identify the emergency public buildings to strengthen it. Therefore, the criteria in terms of availability, required cost and construction suitability were set for examination. As a result, the buildings of the Fire Service and Civil Defence (FSCD) have been selected as the candidate public buildings for conduction the support from the Japanese side.

7.2 Factors to be considered for project formation

The summary of factors considered for project formation is shown below.

(1) CNCRP activities

The CNCRP (2011~2015) activities includes preparation of building inventories, study on suitable seismic resistant methods, development of new construction and seismic retrofitting design manuals complying with BNBC, improvement of construction supervision and quality control, training of engineers in earthquake engineering fields. Since Bangladesh does not have enough data of concrete strength of existing buildings, laboratory tests (of core samples) were carried out. Various retrofitting methods were also tested in the field together with PWD engineers. Several types of structural tests were also carried out so that more data related to strength of the buildings can be generated. Finally a pilot project at Tejgaon fire station was implemented which provided a chance for the PWD engineers to implement their gained knowledge in the field.

(2) Process of Building Permit

In Bangladesh, the building permit is performed based on the main rules / regulations of the BCA (Building Act), BNBC and BCR (building codes, 2006). Public buildings are designed by DOA and PWD. Buildings that are not designed by DOA and PWD as well as whole private buildings are required the approval of the specific management authorities before the construction.

It is known that the inspections during construction stage are not performed properly for both private and public buildings. Therefore, even if the design is properly performed, that the quality of the monitoring and the materials of the construction works are insufficient, it is considered to be one of the major causes of poor quality of buildings.

It should be also mentioned that limited inter-ministerial coordination, insufficient guidance in compliance with the legal framework, limited capacity of the concerned officials on building permission and construction have also something to do with the building vulnerability. Limited education to the technical people also hinder the appropriate planning and implementation of building construction. The other identified causes for vulnerable buildings are lack of awareness, stimulant financial system for private sector and so on.

(3) How to address this issue

Information of CDMP report, results of CNCRP's structural tests, field investigations carried out suggest that buildings of Bangladesh are not strong enough against disasters such as earthquakes. This is the time to take measures to enhance the strength of buildings thus reducing the damages of properties and lives.

For existing buildings, assessment of design concrete strength is necessary, for which design drawings are needed. Unfortunately many buildings do not have those drawings and calculation sheets. As a first step, preparation of missing drawings and then calculation of design concrete strength should be performed and categorize buildings whether they have followed BNBC standard or not. As the second step, buildings should

be categorize into two categories. One which are beyond application of retrofitting should be demolished or relocated. Another category should be taken up for retrofitting with suitable methods.

In any case, new construction must be monitored so that they comply with the BNBC. It should be noted that BD does not have any experience in retrofitting of nay building, however, a pilot project under CNCRP has set an example of retrofitting in Bangladesh and about 30 PWD engineers are now familiar with the technology.

(4) Existing Relating Projects

1) RMG loan project

After the Rana plaza incident, JICA extended its help so that BD can start to enhance the safety of RMG factories and launched a loan project using the seismic retrofitting technology of the CNCRP in response to the request from joint associations of RMG sector i.e. BGMEA and BKMEA.

2) Activities of other development partners

In earthquake disaster management WB is another key development partner for Bangladesh. Recently WB has initiated a new project named as “Urban Resilience Project “with a budget of 173 million USD. The project has five main components with many sub-components. The main components are: i) Reinforcing the countries emergency management response capacity, ii) Vulnerability Assessment of critical and essential facilities, iii) Improved construction, urban planning and development, iv) Project implementation and v) Contingent emergency response component.

7.3 Proposal for the future project

Due to its geographic location, BD is one of the most EQ disaster prone countries. The risk of EQ is gradually increasing in the country. Therefore reconstruction of important and vulnerable buildings, and for enhancement of buildings safety retrofitting should be considered at an early date for both public and private sectors.

Taking into consideration the weakness in enforcement, education, technical capability, finance, emergency response, awareness raising and coordination issues, knowledge gained from the CNCRP and JICA’s Data Collection Survey on Urban Building Safety, and policy of Japanese government, it is recommended to implement the following projects.

Table 7.3.1 Recommending Projects of Japanese Assistance for Building Safety Enhancement in Bangladesh

No	1	2	3
Project name	Project for Urban Resilience Master Plan (URMP)	Urban Building Safety Project (UBSP)	Building Safety Promotion Project for Disaster Risk Reduction (BSPP)
Financial mode	Technical Cooperation	Japanese ODA Loan	Technical Cooperation
Main C/P	Ministry of Disaster Management and Relief	Ministry of Housing and Public Works Ministry of Finance	Ministry of Housing and Public Works
Rationale	To fine tune the coordinated arrangements	To mainstream DRM approach for public & private sectors	Boosting the engineers’ capability, engineers resource development as well as institutional reform support

Main activities	a) Law & Regulation establishment Support b) Human resources development c) DM Info System	a) Construction of new FSCD HQ b) Retrofitting of existing FS in Dhaka c) Retrofitting of RMG factories by TSL	a) Development of engineers capacity of seismic retrofitting b) Development of training system for dissemination of seismic retrofitting c) Development of plan for building safety by MoHPW
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Under Urban Building Safety Project, target buildings are of two categories and for both categories two financial arrangements are considered as described below.

(1) Private Buildings

Considering enormous economic and social impacts, RMG factories have been considered as candidates for Two-Step-Loan (TSL) in this survey. Several issues relating to TSL were examined such as the preferential interest rate with less than

10%, upper limit of the loan period of 15 years, setting the grace period for the construction period etc. Assets subject to financing will be land, buildings, and necessary materials. The extension of the ongoing RMG Project using TSL can be considered as the target.

(2) Public Buildings

From viewpoints of disaster prevention, urgency and effectiveness and feasibility, fire station buildings can be selected as a candidate. Along the planning of FSCD, the new construction of a new FSCD headquarters, retrofitting or rebuilding of the existing fire stations in Dhaka area can be proposed as activities. In addition, it can also include fire vehicles if necessary.

The new FSCD headquarter building should be not only safe for earthquakes, but also it can start quickly firefighting and rescue operations, and it is necessary to maintain the operating system. Thus, in view to secure the safety of the building and the maintenance of headquarter functions immediately just after the earthquake. Also taking into consideration of the complicated shape of the planned building, it is desirable to adopt the seismic base isolation system.