

3) Training Material for Upazila Disaster Risk Reduction (DRR) Action Plan Formulation Training

**Training Material
for
Upazila Disaster Risk Reduction (DRR)
Action Plan Formulation Training**

June 2025

**The Project for Capacity Enhancement on Formulation and
Implementation of Local Disaster Risk Reduction Plan (LDRRP)**

Timetable of UzDRRAP Formulation Training

Standard UzDRRAP formulation training can be a 2 days training.

Day 1	1. Purpose of Training and Supporting System
	2. Outline of Upazila Disaster Risk Reduction Action Plan
	3. Description of the Plan
	1) General Information
	2) Hazard Characteristics
	3) Disaster Risk
Day 2	4) Disaster Risk Reduction Target
	5) Action Plan for DRR Measures
	6) Monitoring and Updating
	Planning and Implementation Workflow
	Scheduling for Planning Activity

1

Timetable of UzDRRAP Formulation Training

Day 1		
Time	Contents	Note
09:30-09:45	Introduction of Participants (Icebreaking)	
09:45-10:15 (30min)	1. Purpose of the UzDRRAP Training and Supporting System 2. Outline of Upazila Disaster Risk Reduction Action Plan	7 slides 17 slides
10:15-10:45 (30min)	3. Description of the plan 1) General Information *Covering "Chapter1 ~ Chapter2" of the UzDRRAP	18 slides
10:45-11:00	Break	
11:00-12:30 (90min)	2) Hazard Characters *Covering "Chapter3 until 3.3 Hazard map and disaster-prone area by each hazard" of the UzDRRAP and the "Hazard and Risk Analysis Guidelines"	13 slides + 10?
12:30-13:00 (30min)	3) Disaster Risk *Covering "Chapter3, 3.4 Disaster Risks" of the UzDRRAP	12 slides
13:00-14:00	Lunch and Prayer Break	
14:00-15:30 (90min)	Mapping Exercise 1: Identify the high-risk areas in your upazila	Workshop Style
15:30-16:00	Review of Day 1	

2

Timetable of UzDRRAP Formulation Training

Day 2		
Time	Contents	Note
09:30-10:00 (30min)	4) Disaster Risk Reduction Target *Covering "Chapter 4" of the UzDRRAP	10 slides
10:00-11:30 (90min)	Mapping Exercise 2: Discussion on Disaster Risk Reduction Targets	Workshop Style
11:30-11:45	Break	
11:45-12:15 (30min)	5) Action Plan for DRR Measures 6) Monitoring and Updating of the Plan *Covering "Chapter5" of the UzDRRAP	11 slides
12:15-13:15 (60min)	Documentation Exercise: Action Plans for DRR Targets	Workshop Style
13:15-14:15	Lunch and Prayer Break	
14:15-15:15 (60min)	4. Planning and Implementation Workflow *Covering Part 3 and 4 of the Training Material	40 slides
15:15-15:45 (30min)	5. Scheduling for Planning Activity	Workshop Style
15:45-16:00	Review of the Training	

3

Introduction

Purpose of the Introduction:
Explain the purpose of this training material and to provide information on the support system for UzDRRAP formulation

Training Curriculum

The outline of the UzDRRAP formulation training are summarized bellow.

Purpose

- To understand the purpose and benefit of the UzDRRAP
- To understand the concept and description of the UzDRRAP
- To understand the planning process of the UzDRRAP formulation
- To be familiar with the activities for UzDRRAP formulation (e.g. Discussion to be facilitated, Methodology of workshop using maps or Forms and templated to be used)
- To formulate a draft schedule of UzDRRAP formulation activity

Duration

- 3 days

Participants

- UNO, PIO, UzDMC members who intends to make the UzDRRAP

Proposed Lecturer

- DDM Officers in the central level and selected DRRO, PIO who participated the trial ToT in the central level

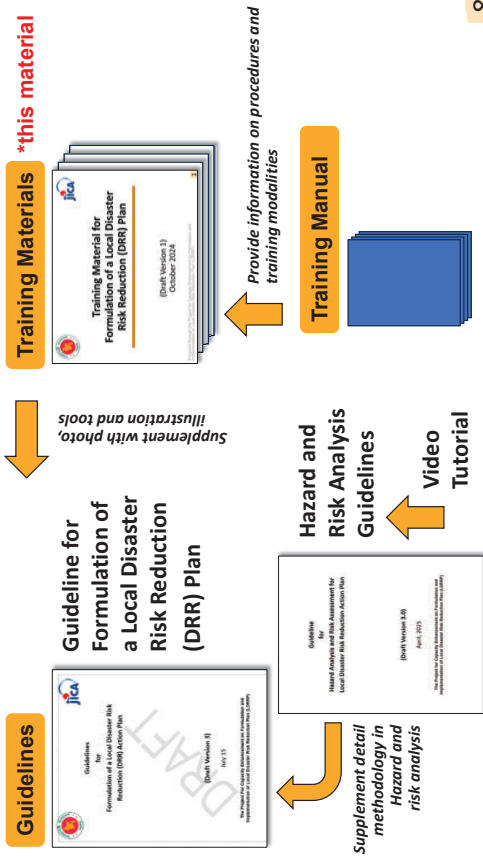
Timetable of UzDRRAP Formulation Training

UzDRRAP formulation training could be a 2 days training program.

Day 1	1. Purpose of Training and Supporting System
	2. Outline of Upazila Disaster Risk Reduction Action Plan
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	Planning and Implementation Workflow
	Scheduling for Planning Activity

Supports for LDRRAP Formulation

“Guidelines”, “Training Material (*this material)” and “Training Manual” can be used to facilitate the formulation of the LDRRAP



Guideline for Formulation of Local DRR Plan

The guideline will be the main guidance material to support the formulation of local DRR plan

Proposed Scenario of Use

- To understand the concepts, standards and methods for creating UzDRRAPs.
- Concepts, rules/standards, methods (includes technical methodologies) in creating UzDRRAPs are main features.

Main Target

- Central and local level DDM staff and local DMC



9

Hazard and Risk Analysis Guidelines

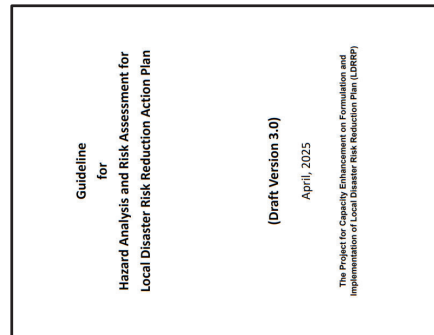
This guideline will supplement the guideline by providing details on the hazard and risk analysis.

Proposed Scenario of Use

- To understand the concepts and methodology of the simplified hazard and risk analysis which is utilized in the LDRRAP
- To understand the data available on hazard and risk analysis and how to access to does data.

Main Target

- Central and local level DDM staff and local DMC



10

Training Material and Training Manual

This guideline will supplement the guideline by providing details on the hazard and risk analysis. *This Material

Proposed Scenario of Use

- Training material to be used in trainings by DDM to explain procedures and methods to formulate UzDRRAPs from trainer to UzDMCs and DDMCs.
- Training materials will include photos, illustrations and planning tools to make it easy for DMC members to start formulating plans.
- Manual to show procedures and training methods for DDM to use in trainings. Includes proposal sample intended to be used when requesting budget for training.

Main Target

- Trainer – DDM central level staff
- Trainee – DDM local level staff, local consultants, UzDMC, DDMC, Central and local level DDM staff and local DMC



11

Part-1

Concept and Contents of UzDRRAP

Purpose of this Chapter:

Understand the legal background and the importance of the UzDRRAP (Upazila Disaster Risk Reduction Action Plan)



Prepared through the Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan (LDRRP)

12

Disaster Management Policy

The legal foundation of disaster management in Bangladesh is based on the Disaster Management Act 2012, Standing Orders on Disaster (SOD) 2019 and National Plan for Disaster Management (NPDM).

- The primary and principal legal document in disaster management in Bangladesh is the **Disaster Management Act 2012** which delineates the roles, responsibilities of Ministry of Disaster Management and Relief (MoDMR) and its affiliated department agency.
- **Standing Orders on disasters (SOD)** and **National Plan for Disaster Management (NPDM)** are the central laws and action plans that guide policies and activities under disaster management.
- In the **SOD 2019** it is recommended to prepare **Risk Reduction Action Plan (RRAP)** and the **Contingency Plan** by local Disaster Management Committees (DMCs).

13

Disaster Management Policy

The formulation of the UzDRRAP and the implementation of the countermeasures against disasters are in line with government strategies, policies, and plans of the country, as listed below.

Bangladesh Delta Plan 2100:

Importance of strengthening the disaster risk management and combating the effects of climate change.

8th Five Year Plan (July 2020–June 2025) :

Emphasizes appropriate policy and institutional capacity building to address their concerns on climate-resilient development and disaster management at all levels of the government, especially at the local government level where most of the programmes are to be implemented.

The National Plan for Disaster Management (NPDM 2021-2025):

Focuses on "Making disaster risk reduction a development practice to achieve resilient public investment and the SDGs" and "Building capacity and leadership to implement NPDM 2021-2025 at the national and local level".

National Sustainable Development Strategy (2010-2021):

NSDS identifies disaster risk reduction and climate change as one of the three cross-cutting areas that are critical to achieve sustainability in Bangladesh.

Emphasizes the need to scale up investments in disaster risk reduction so that a suitable environment for the economic and social development of the country can be created in the face of climate change.

14

Global Agenda

Major disaster in the world have notice us the importance to wisely deal with repeating disaster and its history have given us wisdom to **proactively act against the disaster**

2004 Sumatra Earthquake and Indian Ocean Tsunami

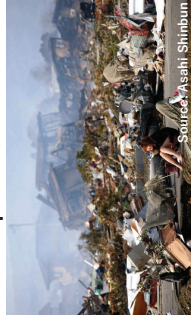


January 7 2005



Source: BBC

2011 East Japan Great Earthquake and Tsunami



Source: Asahi Shinbun



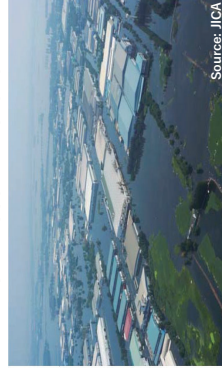
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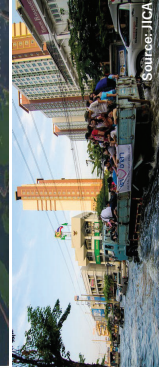
Global Agenda

Major disaster in the world have notice us the importance to wisely deal with repeating disaster and its history have given us wisdom to **proactively act against the disaster**

2011 Flood in Thailand

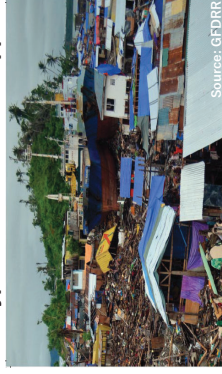


Source: JICA



Source: JICA

2013 Typhoon Yolanda In Philippines



Source: GFDRR



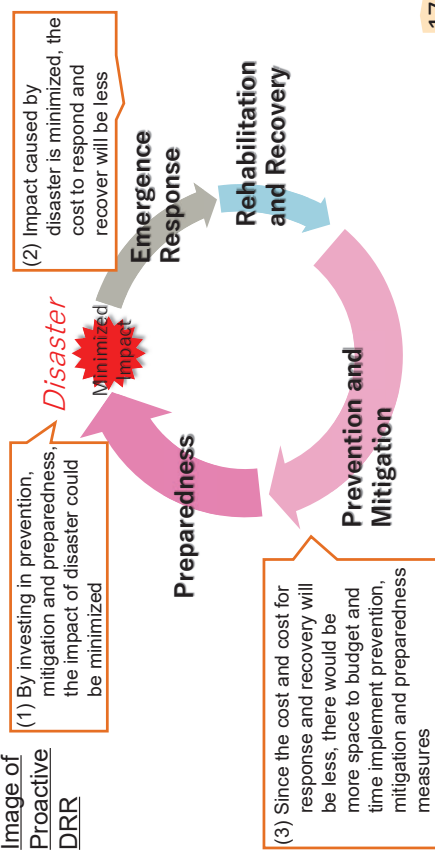
Source: GFDRR

16

Importance of Disaster Risk Reduction

If more investment could be done in the Prevention, Mitigation and Preparedness stage the overall cost for DRR and the damage and loss caused by disaster can be minimized.

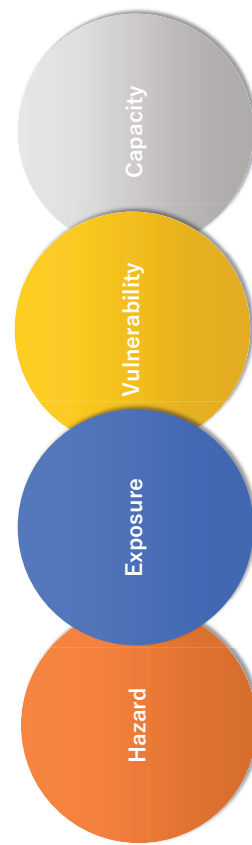
Image of
Proactive
DRR



Elements of Disaster Risk

It is important to understand the four elements of “Disaster Risk” to understand and consider how to reduce the risk and the consequent damage or loss caused by disaster.

Four Elements of Disaster Risk



Global Agenda

The Global Agenda for disasters have been proceeding by reflecting the latest knowledge and prioritize in each period of the time.

Yokohama Strategy and Plan of Action for a Safer World 1994

Guidelines for Natural Disaster Prevention, Preparedness and Mitigation

*It was a guideline provided in the mid-term review of the international decades for Natural Disaster Reduction

Hyogo Framework for Action 2005 – 2015

Building the Resilience of Nations and Communities to Disaster

Sendai Framework for Disaster Risk Reduction 2015-2030

Seven clear targets and four priorities for action to prevent new and reduce existing disaster risks

Global Agenda

Initial efforts to be done under the national and local government level is to formulate a strategy on what kind of DRR investment are necessary to reduce the disaster risk.

Global target E

Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020

E-1 : Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.

E-2 :Percentage of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies.

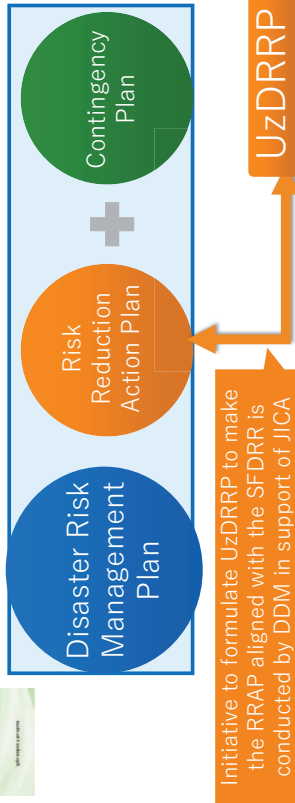
Legal Background of UzDRRAP

DDM is taking leadership in the formulation of UzDRRAP which act as a master plan to emphasize the disaster risk reduction and propose the necessary actions, corresponding to the RRAP.



"APPENDIX 10 Upazila Disaster Risk Management Plan –Issues to Consider"

Each Upazila will prepare an Upazila Disaster Risk Management Plan (UzDMP) in the light of the duties and functions described in the SOD. The UzDMP plan will be prepared based on the plans of the Unions under the Upazila. The plan will include: 1) Risk Reduction Action Plan; and 2) Contingency Plan.



21

Legal Background of UzDRRAP

UzDRRAP plays an advisory role to each implementing agency. However, based on the uniqueness that the plan is not the plan of the implementation agency itself but developed by the UzDMC, the objective of the UzDRRAP could be described as below.

The UzDRRAP is a document that organizes and express the Upazila administration's policy on disaster risk reduction based on objective hazard information and the sector plans of each Line Ministries

23

Legal Background of UzDRRAP

The RRAP shall include structural and non-structural measures based on disaster risk. Implementation of the action plan, shall be pressured including preparation of Development Project Proposals (DPPs) and Annual Development Programmes (ADPs).

"APPENDIX 10 Upazila Disaster Risk Management Plan –Issues to Consider"

1. Risk Reduction Action Plan (RRAP)

- 1.1 Undertake a comparative analysis of the different types of hazards and vulnerabilities within the Upazila;
- 1.2 Prioritize physical and non-physical risk reduction activities based on the risks of the respective Upazila;
- 1.3 The Risk Reduction Action Plan will contain a list of specific and measurable risk reduction activities in a tabular format along with a roadmap (i.e. who, when, where, resource requirements, etc.) for implementation;
- 1.4 In the implementation of the Action Plan, consider the resources and planning by the government departments, NGOs, community-based organizations (CBOs) and the private sector;
- 1.5 Take necessary steps for capacity building and preparedness measures through government agencies, NGOs, CBOs and the private sector;
- 1.6 Consider gender sensitivity, disability inclusion and environmental considerations for both physical and non-physical risk reduction activities.

22

Concept of UzDRRAP

Bellow is the standard table of contents of the UzDRRAP

Chapter 1 Introduction (Objectives, Rationale, Methodology)

Chapter 2: General Information of the Target Area

Chapter 3: Hazard Characteristics and Disaster Risk

(Historical Disaster Records, Hazard Maps, Risk Assessment Result)

Chapter 4: Disaster Risk Reduction Targets

(Priority risks to be addressed, DRR Targets)

Chapter 5: Action Plan of DRR Measures

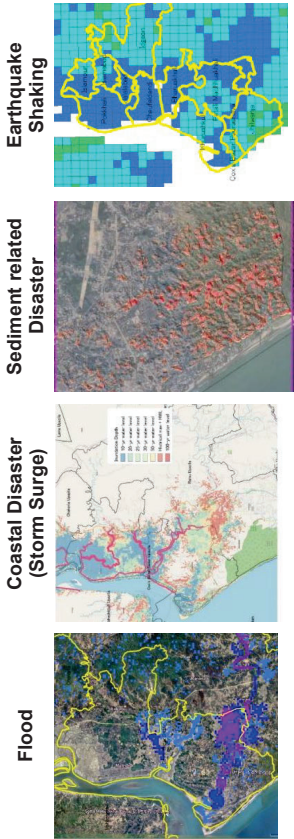
- **Current Condition of Structural and Non-Structural Measures**
- **Action Plans for DRR Target**
- **Monitoring and Updating of the Plan**

24

Concept of UzDRRAP

Feature1: Scientific Analysis for Local Hazards

The hazard maps are developed by technical analysis, which processes differ from the Community Risk Assessment (CRA) under the Comprehensive Disaster Management Programme (CDMP), using disaster records, Digital Elevation Model (DEM), and current hazard maps. The developed hazard maps represent the vulnerable areas of the Upazila and help promote to objectively understand the hazard potential.



25

Concept of UzDRRAP

Feature 3: Involvement of Project Implementing Agencies

The Upazila Sub-Committee (UzSC), which is composed of the Upazila chairman, UNO, PIO, engineers from LGED, BWDB, and DPHE in the Upazila, Upazila officials, Union Parishad chairman, is established to identify disaster risks and consider priorities of countermeasures against the disasters at the Upazila level. Since the committee at the Upazila level does not have the authority to determine the countermeasures listed in the plan to be implemented, the members from the line ministries at the central level are involved in the planning processes to promote the schemes/projects listed in the UzDRRP and secure budgets.

Image of Meetings and Workshops where project implementing agencies attended



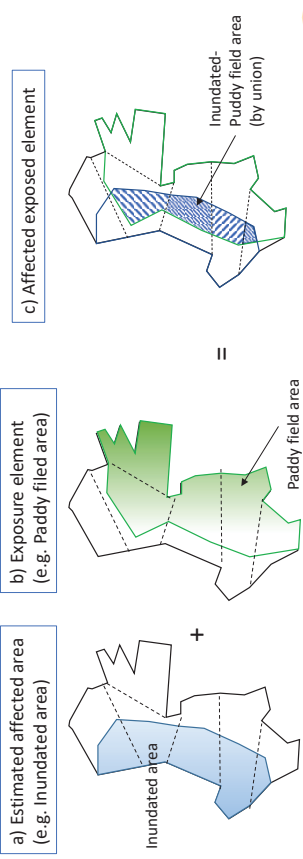
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Concept of UzDRRAP

Feature 2: Setting DRR Targets based on Risk Quantification

Risks in Upazila area are quantified based on risk quantification using the hazard maps and various factors such as natural conditions and socio-economic factors and visualized to share with relevant agencies. A DRR target is set based on the result of identifying which areas are mostly affected by hazards, by these risk quantifications.

Image of Risk Quantification



26

Benefit of UzDRRAP

By formulating the UzDRRAP, there are several benefits, not only for the local authority and the community members but also for DDM and central government institutions.

I. Promote cost-efficient disaster management

- Investment to the disaster prevention, such as installing permanent dikes against flood instead of putting sand-bags temporarily on the riverside, it will reduce the cost of disaster response and recovery, so that DDM and DMC are able to transfer their limited resources to much more vulnerable area.
- Eventually, more lives would be saved.
- Therefore, investment to DRR will help those who are committed to DM activity as well.

28

Benefit of UzDRRAP

By formulating the UzDRRAP, there are several benefits, not only for the local authority and the community members but also for DDM and central government institutions.

II. More available information on Hazard and vulnerability

- Sharing information about disaster risk and vulnerability in local area, it will encourage the other sector's participation, and involvement of line ministries and line departments which are related to DRR issues. In addition to utilizing existing guidelines such as the CRA, more scientific approaches can be applied when the LDDRP project could collaborate with line ministries like LGED or DWDB. For example, in case of planning in Sunamganj, 2023, flood analysis method by BWDB has been applied in the UzDRRAP.
- Using same information, same hazard maps, also helps stakeholders to encourage a common understanding among those line departments and ministries.
- Information on local risk and vulnerability will also help the people in other sectors who have not been familiar with and accustomed to making projects in consideration of DRR. Those stakeholders become able to refer those risk information. For them, the DRR document can provide good reasoning of how the DRR project is important and can give some good explanation to them. Or it could provide accurate explanation on their DPP that avoid certain disaster risk there.

Benefit of UzDRRAP

By formulating the UzDRRAP, there are several benefits, not only for the local authority and the community members but also for DDM and central government institutions.

III. Appealing to international society on DRR progress in Bangladesh

- Compiling the DRR plans by DDM shall help MoDMR and Planning Commission to monitor the progress of DRR at national government level.
- The disclosure of the progress of DRR as a monitoring of administrative execution of the GoB would lead Line ministries and international donors to get much more attentions to DRR related developments. Once the information on DRR related projects that the GoB have addressed through ADPs are openly share to the public, the information on UzDRRAPs enables them to obtain necessary information for future project design that they require before start seeking possibility to make DRR projects. The information of what they need is the ones, such as which projects have already done, how much the progress has been made in terms of DRR, and which areas remain to be developed as an area more vulnerable to natural disaster for the next challenges. Such information is always required for decision making. In this regard, UzDRRAP is expected to function as a master plan in general term.

Part-2
Description of the
Plan Contents

Purpose of this Chapter:

To introduce description of the plan in detail to provide clear understanding on what the UzDRRAP shall include.

Example Table of Contents of UzDRRAP

An example of table of contents of the UzDRRAP is as bellow.
In this chapter the description of the plan will be explained

Chapter-1. Introduction

- 1.1 Purpose and aim of the Plan
- 1.2 Rationale for the formulation of the Plan
- 1.3 Relevance to other Upazila plans
- 1.4 Features of the Plan
- 1.5 Methodology for the development of the Plan

Chapter-2. Geographic, Socio-economic, and Meteorological Conditions

- 2.1 Location and Geographic Conditions
- 2.2 Socio-economic Conditions
- 2.3 Meteorological Conditions

Example Table of Contents of UzDRRAP

An example of table of contents of the UzDRRAP is as below.
In this chapter the description of the plan will be explained

Chapter-3. Hazards Characteristics and Disaster Risk

- 3.1 Disaster Record of the Upazila
- 3.2 Target Hazards of this Plan
- 3.3 Hazard map and Disaster-prone Areas by each Hazard
- 3.4 Disaster Risks

Chapter-4. Disaster Risk Reduction Target

- 4.1 Disaster Risk Reduction Target

Chapter-5. Action Plan of DRR Measures

- 5.1 Current Condition of Structural and Non-structural Measures
- 5.2 Action Plans for DRR Target
- 5.3 Monitoring and Updating of the Plan

Chapter 1: Introduction

Chapter 1 of the UzDRRAP describes the objectives of the planning.
It shall include a summary description of the information provided in Chapters 1 and 2 of the Guideline for LDRRAP

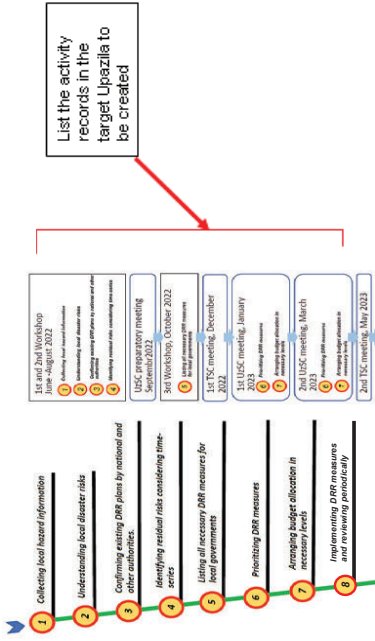
The sections of Chapter 1

- 1.1 Purpose and aim of the Plan
- 1.2 Rationale for the Formulation of the Plan
- 1.3 Legal Position of the Plan
- 1.4 Features of the Plan
- 1.5 Methodology for the development of the Plan
 - 1.5.1 Institutional Arrangement
 - 1.5.2 Planning Process

Chapter 1: Introduction

The planning process in Chapters 1-5 of the UzDRRAP includes a parallel record of actual workshops held right next to the general 8-step flow diagram for DRR planning.

Examples of UzDRRAP descriptions (Cox's Bazar, 2023)



Chapter 2: General Information of the Target Area

Chapter 2 of the UzDRRAP describes the geographic, socioeconomic, and meteorological conditions of the target area, respectively. These are the information that could cause the occurrence of a disaster or the spread of damage.

The sections of Chapter 2

- 2.1 Location and Geographic Conditions
 - 2.1.1 Location of Upazila
 - 2.1.2 Topography of the Upazila
 - 2.1.3 River system of the Upazila
- 2.2 Socio-economic Conditions
 - 2.2.1 Demography
 - 2.2.2 Economy and industry
 - 2.2.3 Urbanization
- 2.3 Meteorological Conditions

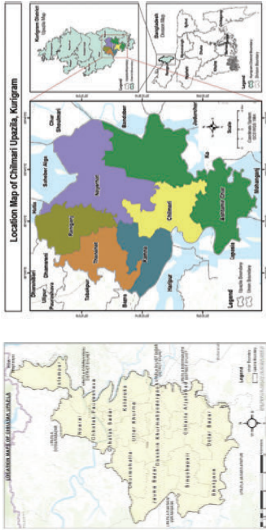
Chapter 2: General Information of the Target Area

2.1.1 Location of Upazila

Geographical conditions of the Upazila shall be documented and the location and boundaries shall be visualized on the map.

Items to be included:

- Administrative Boundary of the District, Upazila and Unions
- Location of Upazila in the District
- Names of the surrounding Upazilas
- Names of the Unions in the district
- Distance from major cities
- Area of the Upazila (km²)



Point: Recognize the Geographical condition as a pre-condition of planning

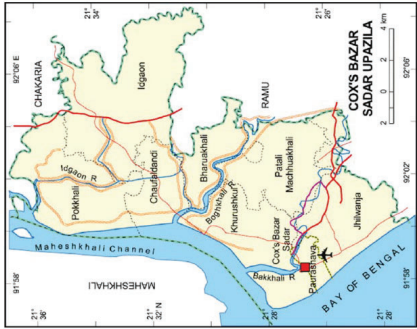
Chapter 2: General Information of the Target Area

2.1.2 Existing Infrastructure Map

Location of major infrastructure shall be collected and visualized on the map and description of major infrastructure shall be documented.

Items to be included:

- City Area (Paurashava etc.)
- Major Roads
- Major Infrastructure (bridge, ports etc.)
- Major Facility (hospital, schools, administrative building, factory etc.)



Point: Understand the location, distribution and function of the basic infrastructure in the Upazila

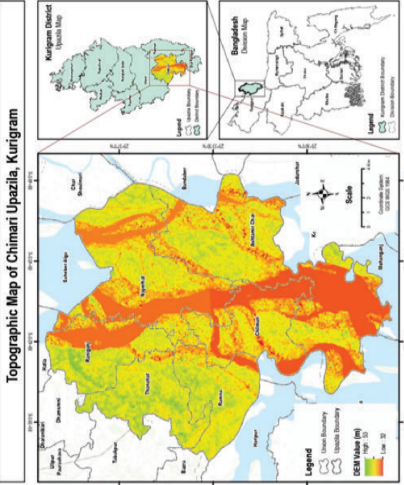
Chapter 2: General Information of the Target Area

2.1.3 Topography of the Upazila

The topography shall be visualized on the map and the character of the landscape of the upazila shall be documented

Items to be included:

- Elevation
- Rivers
- Location Hoar area, Low-land area, Hill area, Coastal area etc.



Point: Understand the natural condition and underlying condition to cause natural disaster

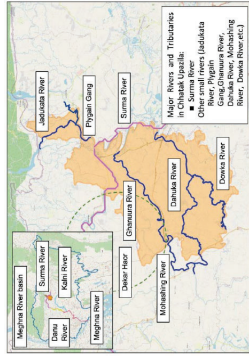
Chapter 2: General Information of the Target Area

2.1.4 River system of the Upazila

In frequently flooded areas, a schematic map shall be formulated to visualize the river system effecting the area and understand its risk

Items to be included:

- Location of the major rivers and tributaries which flow through the Upazila from the upstream
- Catchment area of the major rivers
- Information of the rainfall and discharge situation and seasonal changes of the river
- Information on any measures for flood management



Point: Flooding may be caused by the water upstream of the river, to understand its impact correctly, it is important to understand the situation of rivers flowing through the Upazila

Chapter 2: General Information of the Target Area

2.2.1 Demography

Population related data shall be collected from union and make a summary, and the character of the demography shall be documented

Items to be included:

- Number of Population
- Number of households
- Number of houses
- Type of houses
- Number of people by occupation (e.g. fishermen, farmers)
- * Ideal to collect the above information in ward level.

Table 2-1. Demography of the Upazila

Union Name*	Total Area (km²)	Total Population	Number of Households
Bharuakhali	13.67	26,662	6,160
Chaulfaldandi	14.71	33,506	7,615
Cox's Bazar Paurashava	6.85	196,378	44,631
Ilgson	24.00	42,351	9,673
Isamabad	16.80	33,608	7,638
Isampur	14.70	26,762	6,082
Jalalabad	11.20	22,330	5,075
Jhikwajia	14.70	59,380	13,541
Khurachul	23.67	54,558	12,400
Kutubdia	14.70	26,762	6,082
Pakhal	24.00	24,104	5,524
Total	201.55	546,905	128,842

Source: Population & Housing Census 2022 and interview with Unions.

Point:

Understand where the population is distributed and recognize the impact of hazard. Disaggregated data will provide added data on what type of population/households will suffer damage

Chapter 2: General Information of the Target Area

2.2.2 Economy and Industry

Major economic and industrial activity in the Upazila to be collected and summarize to table, make documentation and visualized on map.

Items to be included:

- List of the important key industries of the region (minimum sufficient)
- Major development project in the region
- Location of the facility and assets of the major industry
- Development plans supported by international donors

Table 2-2. The number of industries

Sl. no.	Name of industry	No. of industry	Sl. no.	Name of industry	No. of industry
1	Rice mill	19	6	Bamboo & cane industry	205
2	Poultry	02	7	Wooden furniture	15
3	Processing Crab/mill	20	8	Sawmill	24
4	Dry fish processing	20	09	Gallery	11
5	Cottage industry	50	10	Flouring shop	117
Total of industries establishment *					597

(Source: District statistics - 2011)

Point:

Understand the main industry in the upazila and consider the impact the industry may suffer due to disaster. Recognize areas where the important assets are located to consider how to protect the assets from natural hazards.

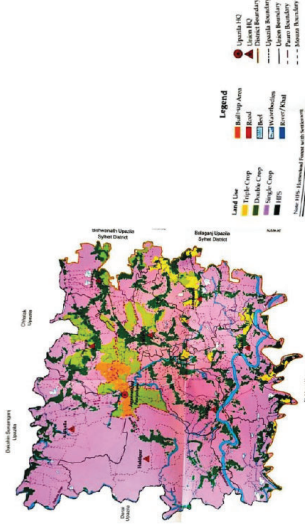
Chapter 2: General Information of the Target Area

It is advisable to obtain a land use zoning map from the Ministry of Land when available.

Land Use Zoning Map

In Bangladesh, the Ministry of Land has been conducting land use zoning projects to ensure the planned and proper use of land. Under the Coastal Land Zoning project, digital land zoning maps have been prepared for 152 upazilas of 21 districts, covering the coastal areas of Bangladesh.

Under the National Land Zoning (2nd Phase) project, digital land zoning maps have been prepared for 274 upazilas of 40 districts, covering the rest of the country.



(Source: National Land Zoning Project, Ministry of Land)

Figure 3-4. Land Use Zoning Map

Chapter 2: General Information of the Target Area

2.2.3 Urbanization

Identify the urbanization situation from related documents and summarize to table, make documentation and visualized on map.

Items to be included:

- Population change in union level
- Expansion zone of industrial, commercial or residential area which may impact the hazard situation
- Major development programs which may impact the hazard situation

Table 2-3. Population growth rate of the Upazila

Upazila / Union Name	Population 2011	Population 2022	Annual Population Growth Rate (2011 - 2022)
Jagannathpur Paurashava	40,699	40,499	-0.05%
Asharandi	27,740	37,005	3.34%
Chakura Haldipur	26,057	29,093	1.48%
Sakura	21,854	23,153	0.61%
Mirzapur	21,364	23,119	0.82%
Poigon	30,117	32,525	0.93%
Firli	21,383	22,885	0.70%
Rangpur	36,295	38,114	0.50%
Syedpur Shaharpara	23,882	24,589	0.29%

Source: Population & Housing Census 2011, Community Report: Sunamganj RBG (Data for 2011), interview to unions (data for 2022)

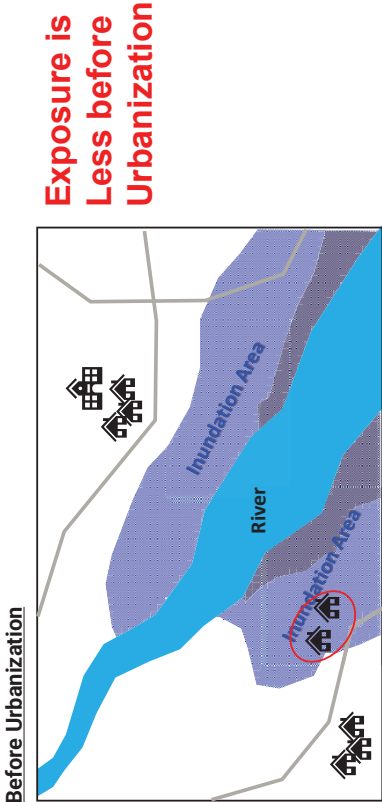
NOTE: In Upazila, where the population is heavily concentrated in rural areas, "2.2.3 Urbanization" may be omitted in some cases.

Point:

Understand the issue caused by urbanization such as, Urbanization in hazard area will increase the exposure to hazard Urbanization may impact natural mechanism to reduce hazard.

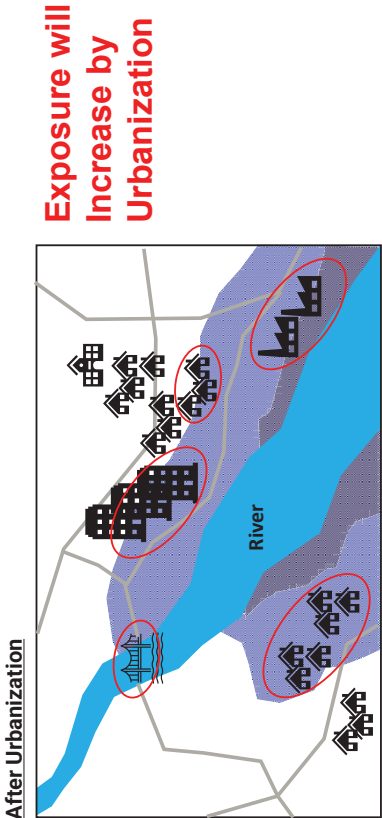
Chapter 2: General Information of the Target Area

In case of flood before urbanization along the river, even the flooding happens there will be no impact. However, if the urbanization happens and assets accumulate along the river it will cause damage.



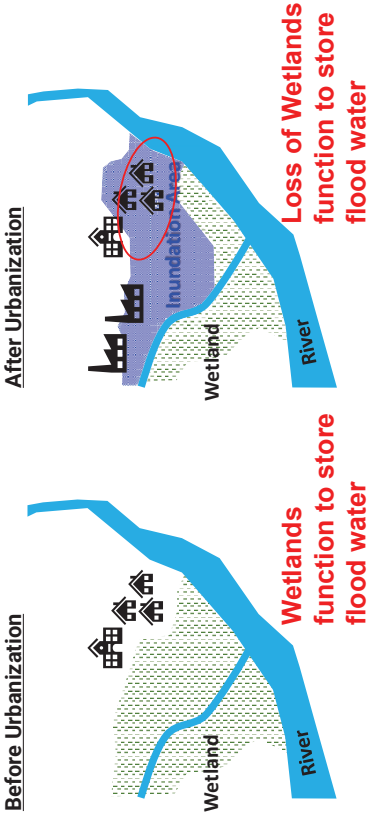
Chapter 2: General Information of the Target Area

In case of flood before urbanization along the river, even the flooding happens there will be no impact. However, if the urbanization happens and assets accumulate along the river it will cause damage.



Chapter 2: General Information of the Target Area

In case of reclamation of wetlands due to economic development causes the land to lose its function of storing and flowing water, increasing the flow into rivers and increasing the impact of flooding.



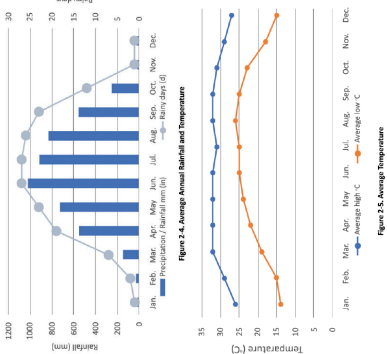
Chapter 2: General Information of the Target Area

2.3 Meteorological Condition

Collect information on weather condition and formulate graphs

- Items to be included:
- Annual rainfall and temperature pattern in the district level
 - Information of the seasonal change and character of the weather in the Upazila
 - Comparison with national average and surrounding districts

Point:
Understand the observed amount of rainfall in its amount which may trigger flooding or landslide and its comparative severity between the national average or among surrounding districts.



Chapter 3: Hazard Characteristics and Disaster Risk

Chapter 3 of the UzDRRAP describes the types and characteristics of hazards in the target area and disaster risk.

The sections of Chapter 3 are as follows.

- 3.1 Disaster Record of the Upazila
- 3.2 Target Hazards of this Plan
- 3.3 Hazard map and Disaster-prone Areas by each Hazard
 - 3.3.1 Flood
 - 3.3.2 Storm surge
 - 3.3.3 Sediment Disaster
 - 3.3.4 Earthquake Shaking
- 3.4 Disaster Risks
 - 3.4.1 Flood
 - 3.4.2 Storm surge
 - 3.4.3 Sediment Disaster
 - 3.4.4 Earthquake Shaking
 - 3.4.5 High Risk Unions

Chapter 3: Hazard Characteristics and Disaster Risk

3.1 Disaster Record of the Upazila

Past disaster history shall be collected through questionnaires to Union Parishads, BWDB, LGED, and DPHE and disaster database.

Items to be included:

- Most destructive hazard in the Upazila
- Total damage situation in the Upazila
- Each disaster event record shall include, date, cause, affected population, casualty, damaged data (houses, infrastructure etc.)
- All type of hazards shall be included

3.1 Disaster Record of the Upazila

Jagannathpur Upazila has experienced several disasters affecting the lives and livelihoods of the local communities, due to its topography and meteorology. The table below shows the disaster records in this Upazila. One of the most historic and destructive disasters was the 2022 flood which severely affected the Upazila with over 6,000 damaged houses and 50,000 affected people.

Table 3.1. Recent Disaster Record in Jagannathpur Upazila	
No.	Year
1.	Flood
(1)	May, 2024
Cause: Flash flood by heavy rain, heavy rain, high tide, and strong wind. Casualty: 00 dead people	
Damaged houses: 200	
Other Damage: 20 km stretch of river embankment, school, tube well, and pond	
(2)	May, 2024
Cause: Flash flood, strong wind, and heavy rain. Casualty: 01 dead people	
Damaged houses: 50,000 people	
Other Damage: 5.00 km stretch of river embankment, school, tube well, and pond	

Point:

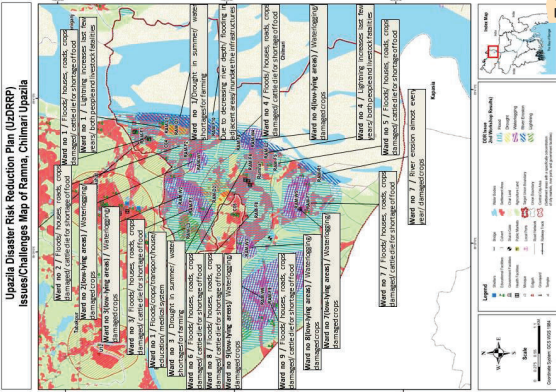
Objective is to identify trends in disasters, the disaster history should not be limited to records in Upazila, but should broadly describe at the District or Region level, including the Upazila

Chapter 3: Hazard Characteristics and Disaster Risk

3.1 Disaster Record of the Upazila Issues/challenges in each Union shall be summarized on the map

- Items to be included:
- Issues and challenges collected from the Union level to be pointed out on the map
 - Area with DRR issues to be plotted on the map
 - Description of the disaster situation in each Union to be documented

Point: The Issues and Challenges Identified here will be the Basis of DRR Measure Consideration



Chapter 3: Hazard Characteristics and Disaster Risk

3.2 Target Hazard of this Plan

Considering the hazard dominant in the Upazila, the target hazard to focus on the plan shall be clarified.

Decision Criteria to included:

- With major impact and damage and happen frequently
- Potential Damage can be analyzed scientifically and the high can be described on the map

3.2 Target Hazards of this Plan

Apart from the above, there are several types of other disasters that can also cause damage to this Upazila. This plan targets all the possible hazards in the Upazila including lightning and drought, whereas it was decided that the following hazards were objectively and scientifically analyzed and shown by maps to identify the spatial distribution of hazard potentials in the Upazila in terms of relatively frequency and potential for occurrence.

- Flood
- Storm surge
- Sediment disaster
- Earthquake shaking

Point:

Objective is to clarify the hazard with major impact and decide the hazard to consider in detail. Collective decision shall be made based on the discussion with unions and other stakeholders through workshops.

Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard

The description for the situation of target hazard shall be documented and hazard map for target hazard shall be described on the map.

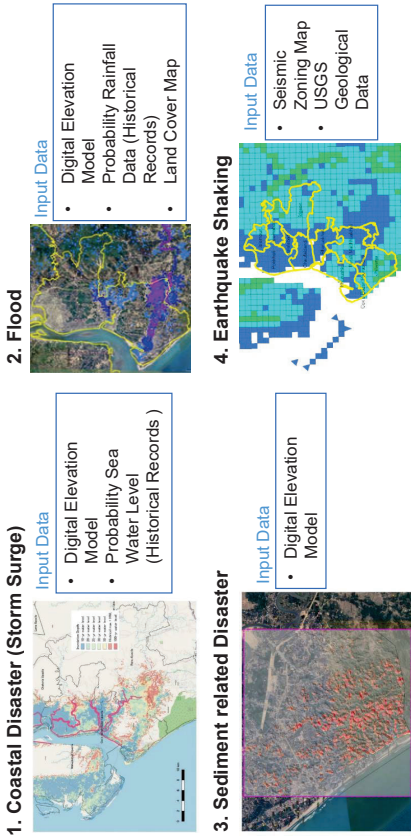
- Items to be included in the description:
- Condition of the hazard analysis used to formulate hazard map (e.g. return period of hazard considered in the analysis, methodology of the analysis)
 - Outline of the hazard
 - Description on the area where most effected by the hazard
 - Information of the hazard (e.g. inundation depth, inundation area)
 - Information on data used in the analysis

Point:
The description should be concise, with at most one or two paragraphs of general description per disaster type.

Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard

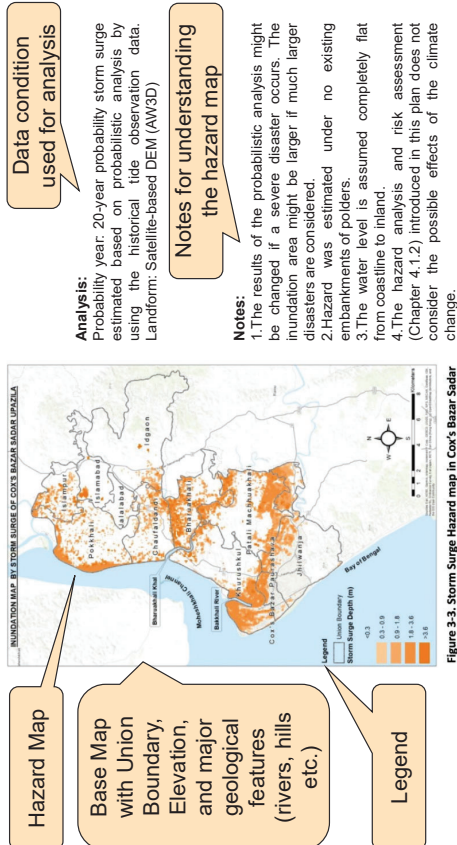
Hazard map was formulated by a simplified technical analysis. Refer to the “Hazard and Risk Analysis Guidelines” for details



Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard

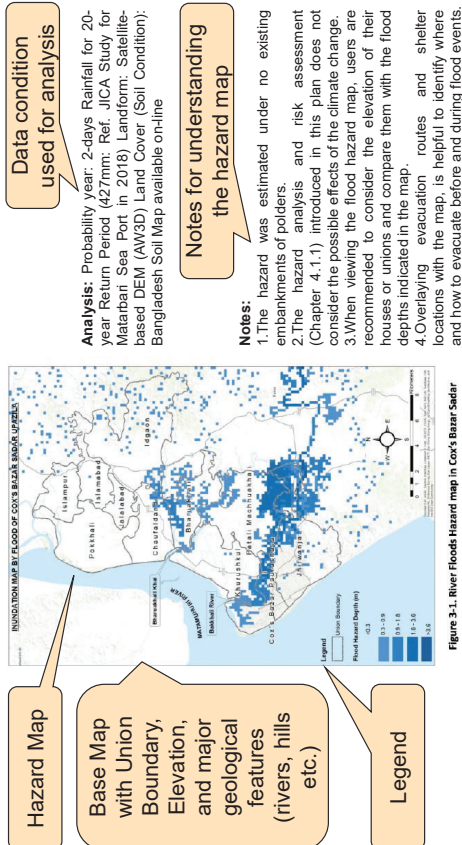
Example of the “Coastal Disaster (Storm Surge)” hazard map



Chapter 3: Hazard Characteristics and Disaster Risk

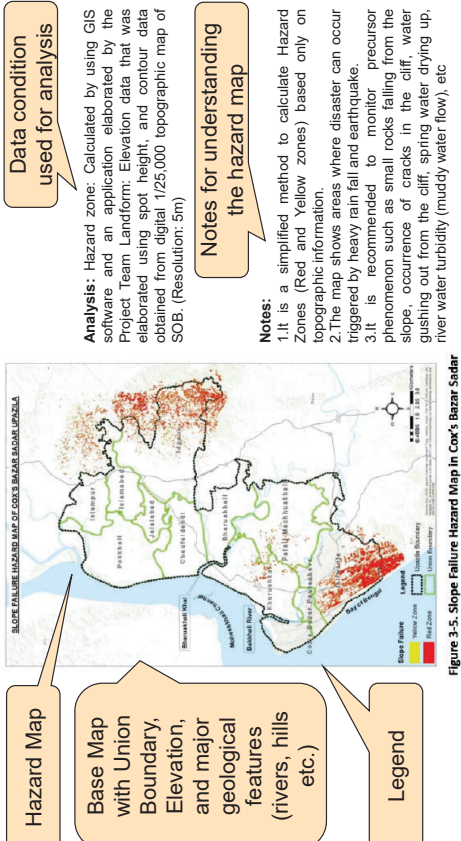
3.3 Hazard map and disaster-prone areas by each hazard

Example of the “Flood” hazard map



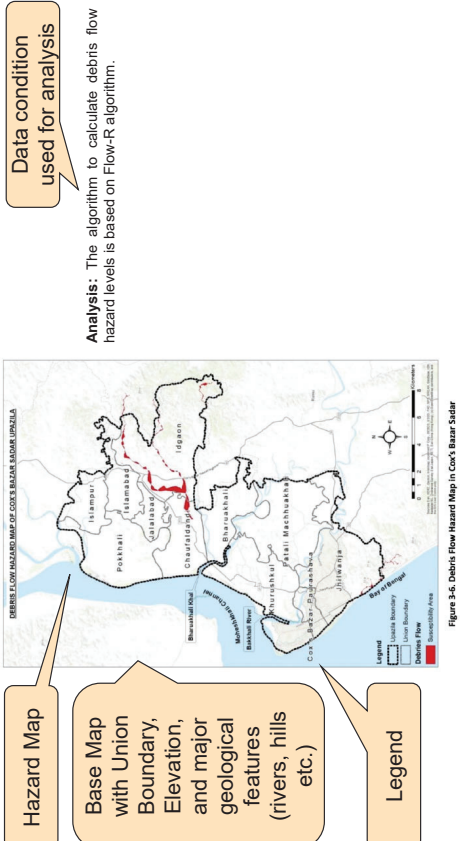
Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard
Example of the “sediment disaster (slope failure)” hazard map



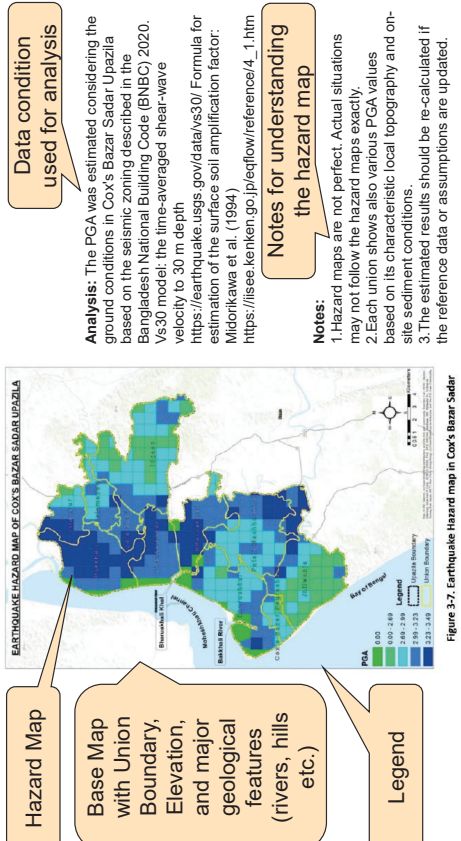
Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard
Example of the “sediment disaster (debris flow)” hazard map



Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard
Example of the “earthquake shaking” hazard map



Chapter 3: Hazard Characteristics and Disaster Risk

3.3 Hazard map and disaster-prone areas by each hazard
Verification of the hazard map shall be done through the discussion with local stakeholders such as Union parishads

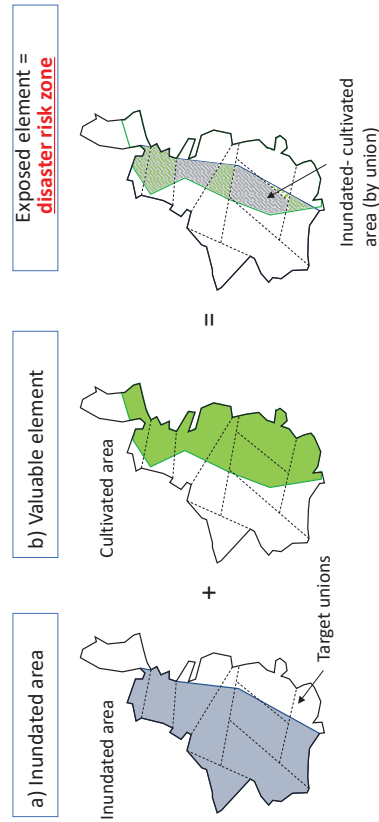


Based on the Hazard Map, discussion was held among upazila and union members (UZDMC) to identify local disaster risk. Through the workshop, comments were collected as shown in the right map.

Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

In the local DRR plan formulation guideline, the risk analysis is focused on “exposure” which is the most basic elements of risk.



= Chapter 3-2 of the GL

💡- Important Concepts

Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

Valuable elements to be assessed are shown below.

- Valuable element:
 - 1. Paddy fields
 - Disaster impact on Agricultural Industry
 - 2. Settlement area
 - Disaster impact on settlement/people
 - 3. DRR-related facilities *1
 - Disaster impact on DRR administrative Management and Operations
 - 4. Central city areas *2
 - Disaster impact on local economic zones

*1 Government offices, education facilities, medical facilities, shelters, roads, bridges (including culverts and sluice gates)

*2 Areas with a concentration of city markets, river ports, and government facilities in proximity to or within the settlement areas.

Chapter 3-2 of the GL

💡 Important Concepts

Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

In understanding risk the points mentioned can also be considered

Nature-based & Impact-based Prediction

DDM recommends to introduce the following analysis methods

- Estimation of inundation zones using vegetative and topographic changes (e.g., planting Hizal and Koros in haor areas)
- Impact-based forecasting that evaluates consequences on asset value and evacuation facility functionality

It is recommended to integrate scientific analysis with local knowledge to improve hazard and risk mapping if resources are sufficient and methods are developed enough.

Chapter 3-2 of the GL

💡 Important Concepts

Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

Example of risk assessment of “Storm Surge” hazard to evaluate the exposure to “Paddy Field”

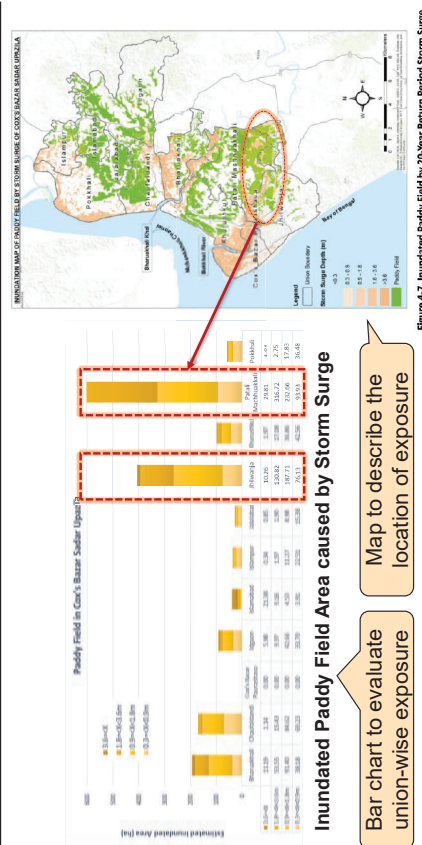


Figure 4-7. Inundated Paddy Field by 20-Year Return Period Storm Surge

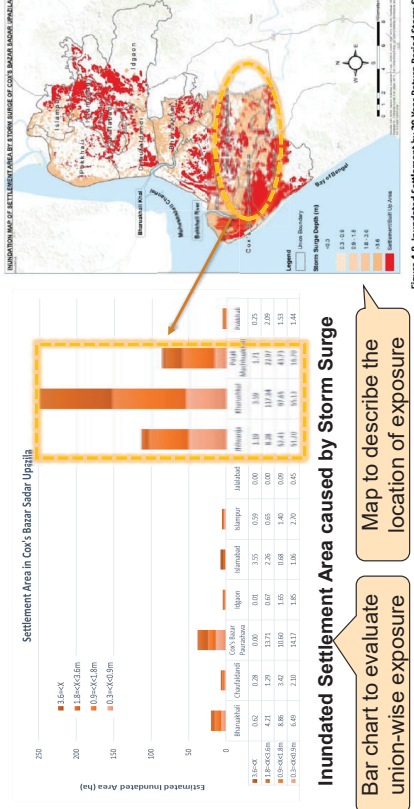
Chapter 3-2 of the GL

Expected Output

Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

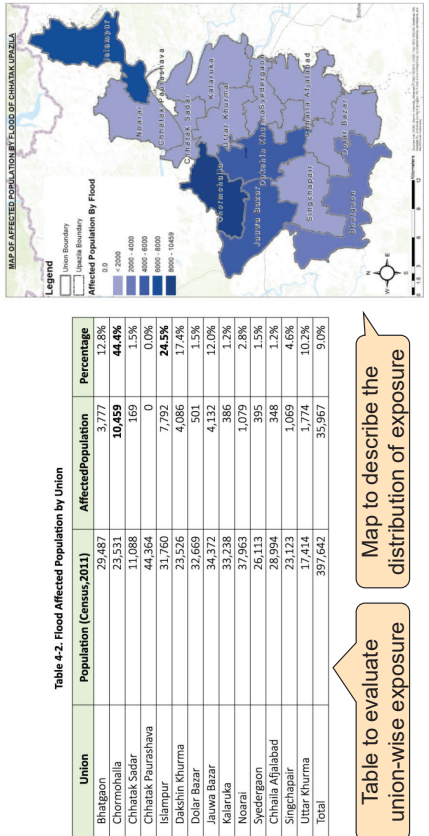
Example of risk assessment of “Storm Surge” hazard to evaluate the exposure to “Settlement Area”



Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

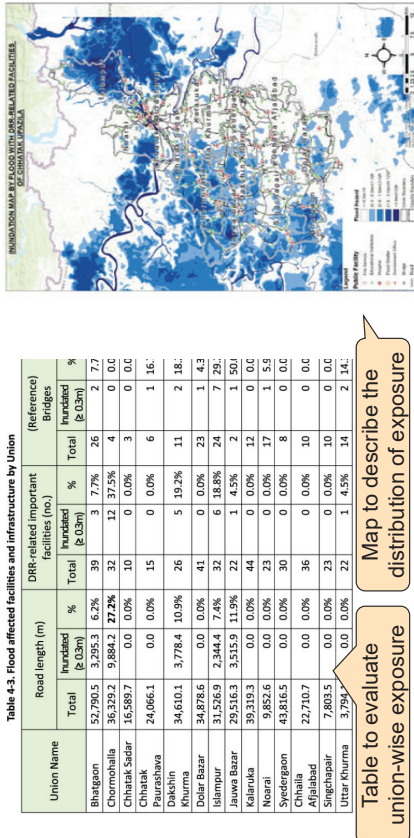
Example of risk assessment of “Flood” hazard to evaluate the exposure to “Population”



Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

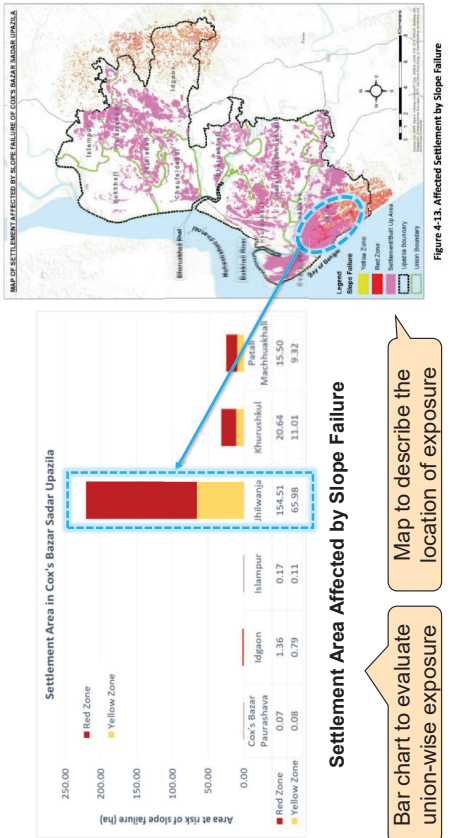
Example of risk assessment of “Flood” hazard to evaluate the exposure to “Infrastructure” and “DRR facilities”



Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

Example of risk assessment of “Sediment Disaster (slope failure)”



Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

Example of risk assessment of “Earthquake” hazard to evaluate the exposure to “Affected Households”

Table 4-5. Affected Household by Earthquake Shaking

Union	Households (Census 2011)	Affected Households	Percentage
Bhailgaon	4,619	3,352	72.6
Chormohalla	4,182	3,276	78.3
Chhatak Sadar	1,916	1,446	75.5
Chhatak Paurashava	7,701	4,541	59.0
Islampur	5,144	3,990	77.6
Dakshin Khurma	3,879	2,932	75.6
Dolar Bazar	5,288	3,595	68.0
Jauwa Bazar	5,447	4,016	73.7
Kalaruka	5,330	3,750	70.4
Noarai	6,550	5,080	77.6
Sydegaon	4,537	3,184	70.2
Chhaila Aljalabad	5,122	3,617	70.6
Singchapair	3,733	2,758	73.9
Uttar Khurma	2,915	2,205	75.7

Table to evaluate union-wise exposure

Map to describe the distribution of exposure

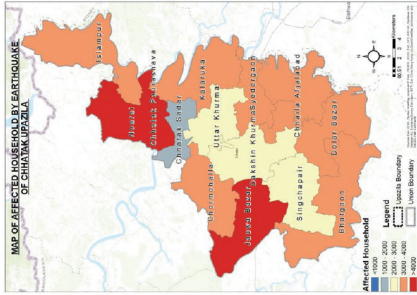


Figure 4-9 Number of Affected Households

Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

Impact caused by “Earthquake” depends on the structure of the building or infrastructure. It is important to understand the structure in each area and consider measures fit to the situation in each area

Type of Structure	Characteristics	Administrative Unit	Number of Households	Percentage of Type of Structure
Pucca	Permanent, durable dwelling built of materials such as brick, cement, iron, wood, board, or asbestos.	Residence Community	81523	11.8
Semi-pucca	Semi-permanent, durable houses built of a combination of pucca and kucha materials.	Cox's Bazar Sadar Upazila Total	30374	23.8
Kutcha	Temporary housing built with natural and inexpensive materials such as bamboo, thatch, mud, tree leaves, and mats, which are not very durable.	Cox's Bazar Paurashava	3939	6.9
Jhupri	Temporary and inexpensive dwellings built from recycled discarded materials such as cardboard, plastic, metal, and cloth.	Cox's Bazar Paurashava	5195	5.2
		Chauladand Union Total	5984	8.5
		Islampur Union Total	3926	5.3
		Jhalabhad Union Total	5275	5.8
		Jhalabhad Union Total	3048	11.4
		Jhilmara Union Total	7552	9.1
		Khurshid Union Total	6807	3.6
		Patali Mochhuakhat Union Total	6103	5.9
		Pokkhali Union Total	3920	7.6

Typical type of structure in Bangladesh is as shown here with different vulnerability

In the pilot activity in Cox's Bazar Sadar, a table of the number of households by building type for each union was organized based on information from the Bureau of Statistics

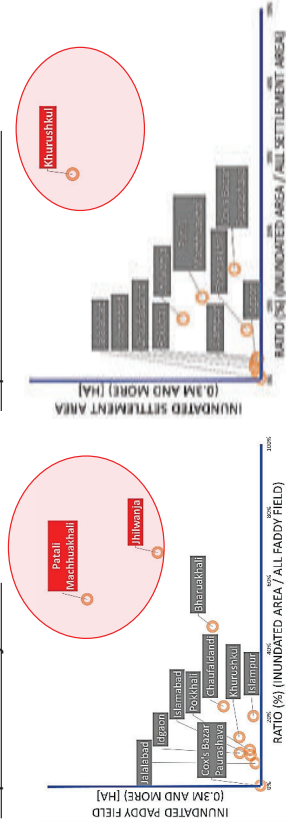
Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

The impact caused by inundation can be summarized by two axis by the inundated area by [ha] and its ratio of exposed area to understand the severity of the damage in each union and to identify the higher-risk unions

Impact to Paddy Field

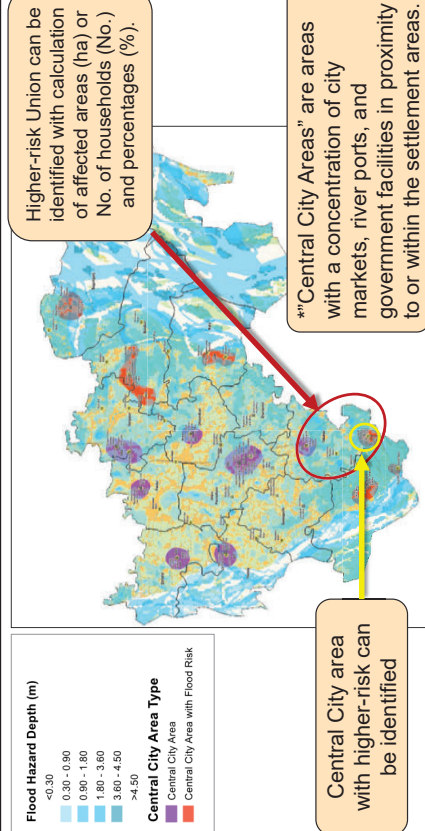
Impact to Settlement Area



Chapter 3: Hazard Characteristics and Disaster Risk

3.4 Disaster Risks

Among the higher-risk union, “Central City Areas*” with high risk can be identified as an important areas to consider DRR measures



Flood Hazard Depth (m)

Central City Area Type

Central City area with higher-risk can be identified

*“Central City Areas” are areas with a concentration of city markets, river ports, and government facilities in proximity to or within the settlement areas.

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 1: Identify the high-risk areas in you upazila



1. Prepare a base map (Prepare before the training)
2. Identify valuable element
3. Write out the hazard area
4. Identify the high-risk areas
5. Identify Challenges for each hazard on the map

Point:

The purpose of the exercise is to be familiarized with the activity and the way of thinking in the planning process. Therefore, data to be used (hazard area, land-use etc.) can be a rough information.

Exercise to Support GL

Practice Planning Activity

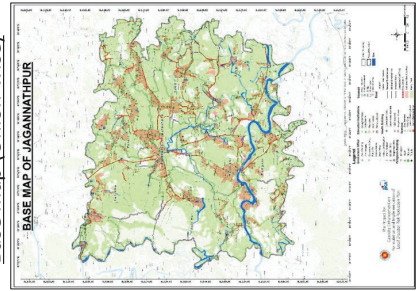
73

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 1: Identify the high-risk areas in you upazila

1. Prepare a base map (Prepare before the training)

Base map (Union-wise)



Items to be prepared

- Union-wise base map with information of major roads, settlement area and other major infrastructure in the target Upazila
- If available information of hazard and land-use in the target Upazila

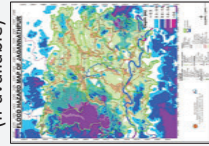
Worksheet



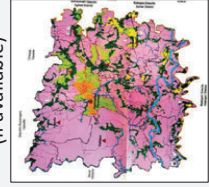
Marker
Pen
Sticker
Notes



Hazard map
(if available)



Land-use map
(if available)



Exercise to Support GL

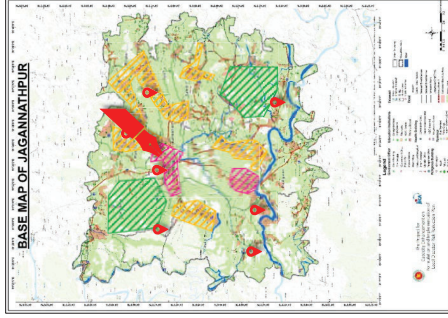
Practice Planning Activity

74

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 1: Identify the high-risk areas in your upazila

2. Identify valuable element



What to do

- Based on the knowledge in the target area draw the area of valuable elements
- Refer to land-use map if available

Valuable element:

1. Paddy fields
→ Disaster impact on *Agricultural Industry*
2. Settlement area
→ Disaster impact on *settlement/people*
3. DRR-related facilities *1
→ Disaster impact on *DRR administrative Management and Operations*
4. Central city areas *2
→ Disaster impact on *local economic zones*



Exercise to Support GL

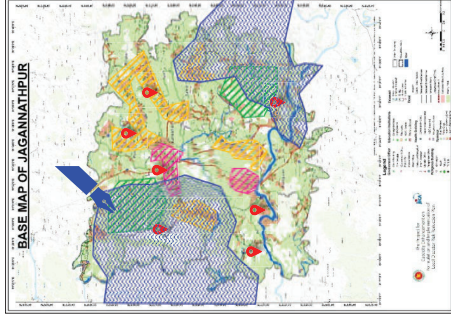
Practice Planning Activity

75

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 1: Identify the high-risk areas in your upazila

3. Write out the hazard area



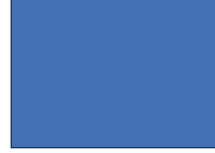
What to do

- Based on the knowledge (disaster record) in the target area draw the hazard area
- It is advised to focus on hazard type where the hazard area is clear (flood, storm surge) to understand the planning process
- Refer to hazard map if available

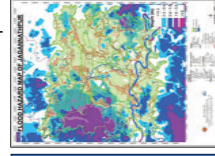


Reflect the location to the map

Disaster Record



Hazard map



Exercise to Support GL

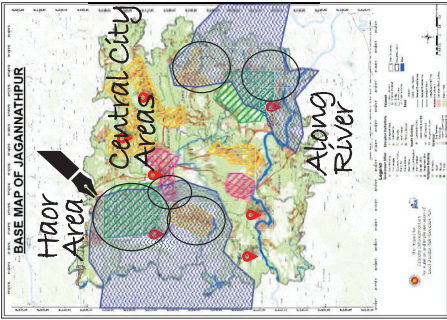
Practice Planning Activity

76

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 1: Identify the high-risk areas in your upazila

4. Identify the high-risk areas



What to do

- Circle the area where vulnerable elements and hazard area is overlapping, which means that the area identified is a high-risk area
- Set a target area where DRR measures are necessary and name it
- Challenges and necessary solution will be discussed in the "Mapping Exercise 2"

"In the actual planning activity scientific hazard map and detail land-use map will be used to conduct a qualitative analysis. However, in this training just to understand the process the work can be conducted in a rough information"

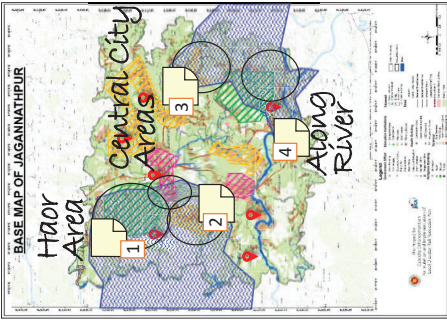
Exercise to Support GL

Practice Planning Activity

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

5. Identify Challenges for each hazard on the map



What to do

- Post challenges which the target area may face in the case disaster.

Example:

- Central city areas where many important building exists is inundated frequently
- Flood embankments is damaged and needs repair
- Crop land is frequently flooded
- Evacuation Route is inundated and difficult to evacuate

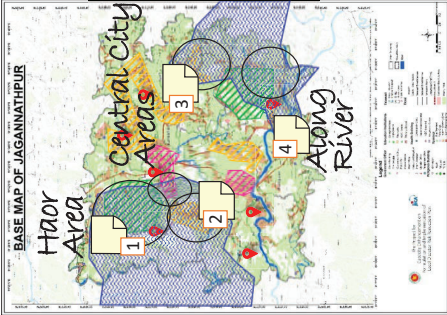
Exercise to Support GL

Practice Planning Activity

Chapter 3: Hazard Characteristics and Disaster Risk

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

5. Identify Challenges for each hazard on the map



What to do

- Describe the details on to the worksheet and put the same number on the map
- Write a detailed description related to the community, not individual matters

Session 3			
Issues/Challenges (Key questions: What happens during disasters in the community? What are issues/challenges to overcome?)		No. on the Map	
Issues/Challenges to overcome (See Hazard map & Disaster Record and consider in detail/specifically)	Types of Hazard (F- Flood/ E- Erosion/ D- Drought/- Lightning/ E- Earthquake/ O- Others)		
Ex) - Huge inundation in XX area every season. It's difficult to evacuate, Evacuation shelters in XX area are old, it seems not resistant to large earthquakes	Flood Earthquake	1 2	

Exercise to Support GL

Practice Planning Activity

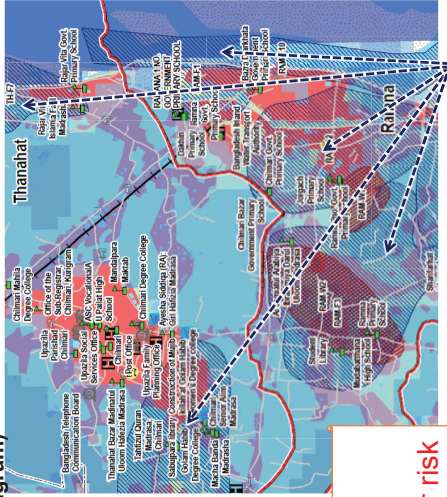
Chapter 3: Hazard Characteristics and Disaster Risk

5. Identify Challenges for each hazard on the map

Example of Mapping Result (Kurigram)

Hazard type	Challenges
Flood	• Damage to roads and houses and continued inundation • Damage to crops and fields and interruption of commercial activities • Damage to livestock due to infectious diseases and feed shortages caused by flooding • Disruption of the systems of education, transportation, and health • Disruption of transportation networks after flooding

Point:
Identify the issue and its location based on disaster risk assessment and consultation



Area where issues of "Flood" existing

Exercise to Support GL

Practice Planning Activity

Chapter 4: Disaster Risk Reduction Target

Chapter 4 of the UzDRRAP describes the DRR target which is identified based local challenges and disaster risk situation

The sections of Chapter 4 are as follows.

4.1 Disaster Risk Reduction Target

Chapter 4: Disaster Risk Reduction Target

4.1 Disaster Risk Reduction Target

Key points to follow in the “DRR Target” setting is as bellow

- Target setting will lay the foundation for reducing disaster risk and minimizing human suffering and property loss.
- The significance of the DRR Targets lies in the fact that they provide specific policies for disaster reduction measures for each risk (e.g. floods, landslides, riverbank erosion). Measures based on these policies are detailed in Chapter 5.
- DRR targets shall be set in three phases: short/medium-, and long-term, based on the disaster risk assessments described in Chapter 3. For each risk (e.g., flood, landslide, storm surge), the area, facilities, and population to be protected should be clearly identified, and realistic, phased measures should be proposed.
- This makes it possible to clarify realistic countermeasures that are tailored to the characteristics and conditions of the area, and to implement them in stages. This phased approach is important for increasing the effectiveness of disaster mitigation measures.

Chapter 4: Disaster Risk Reduction Target

4.1 Disaster Risk Reduction Target

Bellow are the sample of “DRR Target” setting

Target to be set for each hazard type

Hazard	Area	DRR Target (Short and mid) term)	DRR Target (Long term)
River Erosion	Along rivers	Urgently Control the progress of riverbank erosion by emergency measures at riverbanks and dredging in areas with recent significant erosion damage	Reduce the risk of riverbank erosion in the entire riverfront area through riverbank revetment and channel improvement, etc.
	Char area		Reduce the risk of riverbank erosion in administrative and commercial centers through emergency measures and dredging of revetments in some areas

Short-, medium- and long-term target to be set

Area to be mentioned in the DRR Target if available to specify

Point:

DRR target shall include **What to do** and **Means of the action**

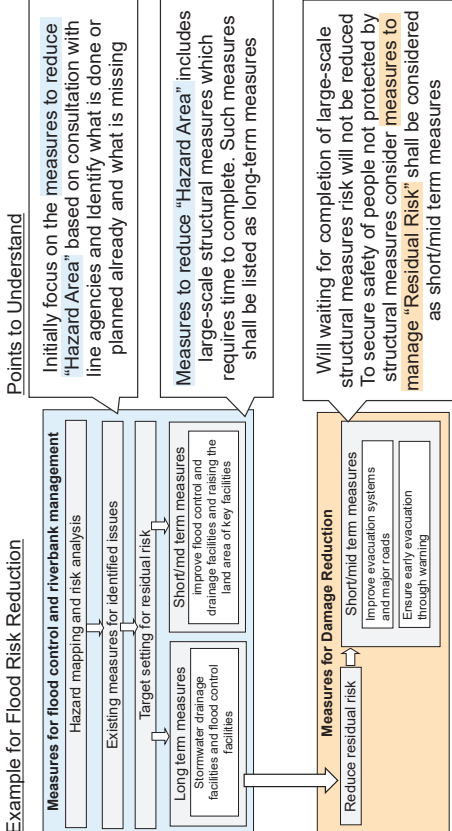
Chapter 4: Disaster Risk Reduction Target

Hazard	Area	DRR Target (Short and mid) term)	DRR Target (Long term)
Flood	Inland area	• Reduce at least the inundation risk of DRR-related facilities (e.g., government, medical care, education, and sanitation) and the central city areas* of the Upazila by improving flood control and drainage facilities and raising the land area of key facilities. • Reduce damage to at least people and assets (e.g., property, livestock) and maintain transportation networks during flooding by improving evacuation systems and major roads. • Ensure early evacuation through warning	• Reduce flood damage to the entire area by stormwater drainage facilities and flood control facilities
	Along river	• Reduce at least the inundation risk of DRR-related facilities and the central city areas* of the Upazila by improving flood control in some priority areas and raising the land area of key facilities • Reduce damage to at least people and assets (e.g., property, livestock) and maintain transportation networks during flooding by improving evacuation systems and major roads. • Ensure early evacuation through warning	• Reduce flood damage to the entire area, including administration and commercial centers, key infrastructures, residential areas, and agricultural lands, by improving riverbank protection and land use along the river.
	Char area	• Minimize damage to at least people and assets (property, livestock, etc.) and maintain transportation networks during flooding by improving evacuation systems and major roads. • Ensure early evacuation through warning *Flood control measures to protect the Char area has not been currently planned.	• Minimize flood damage to specific areas and facilities (e.g., residential areas, administrative and commercial centers and key DRR facilities) by land raising and land use improvements.

Chapter 4: Disaster Risk Reduction Target

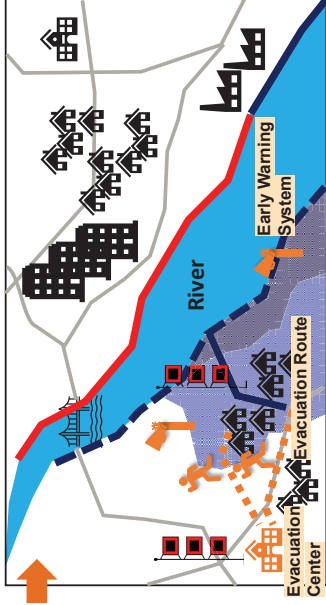
4.1 Disaster Risk Reduction Target

The steps to formulate the DRR target may follow the flow below



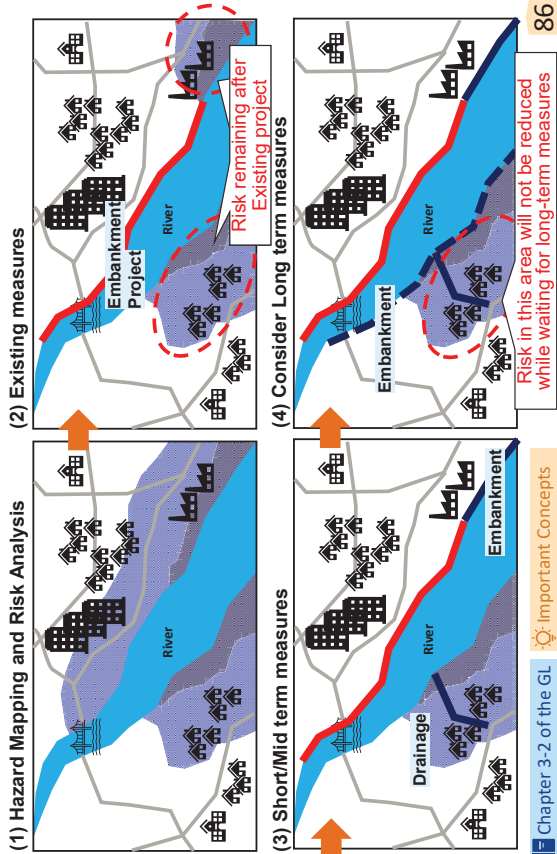
Chapter 4: Disaster Risk Reduction Target

Example process of considering measures to manage "Residual Risk"



Chapter 4: Disaster Risk Reduction Target

Example process of considering Measures to Reduce "Hazard Area"



Chapter 4: Disaster Risk Reduction Target

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

1. Bring the map used in the "Mapping Exercise 1"
2. Identify necessary measures to be done
3. Write "DRR target" for one hazard for one area



Point:

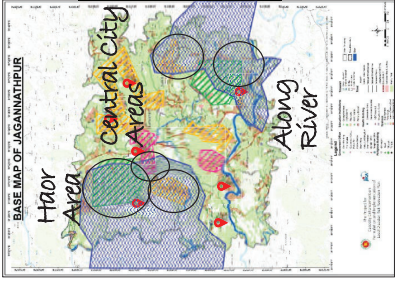
The exercise will practice the process to review the hazard situation to consider necessary measures and moreover, practice how to formulate "Disaster Risk Reduction target" based on the information summarized on the map

Chapter 4: Disaster Risk Reduction Target

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

1. Bring the map used in the "Mapping Exercise 1"

Base map
(from Mapping Exercise-2)



What to Prepare

- The exercise will use the base map with information input from the "Mapping Exercise 2"
- Sticker Notes and DRR Target Template will be used in this table top work

Worksheet



DRR Target Template

HAZARD	THREAT	DISASTER	DISASTER RISK
FLOODING			

Sticker Notes



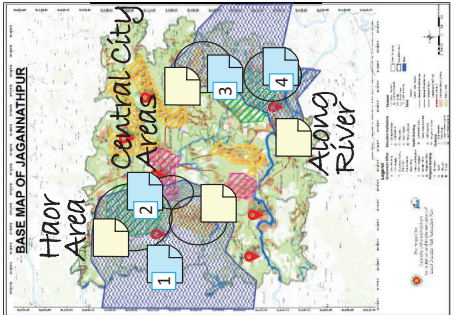
Exercise to Support GL

Practice Planning Activity

Chapter 4: Disaster Risk Reduction Target

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

2. Identify necessary measures to be done



What to do

- Post necessary measures to be conducted in the target area

Example:

- Drainage facility in the central city areas
- Heightening of main road in the central city areas to prevent flood water
- Establishment of new evacuation center in the central city areas
- Riverbank protection along the river
- River embankment along the river
- Heightening of Evacuation Route in the Hour area
- Ensure early evacuation through warning

Exercise to Support GL

Practice Planning Activity

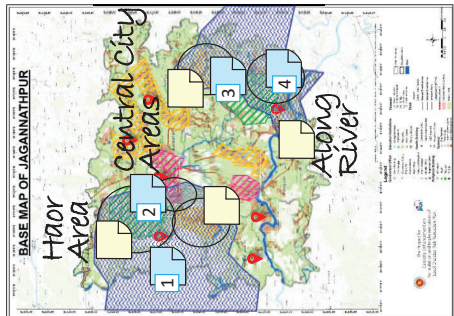
Chapter 4: Disaster Risk Reduction Target

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

3. Identify necessary measures to be done

What to do

- Describe the details on to the worksheet and put the same number on the map
- Consider various measures including structural and non-structural measures



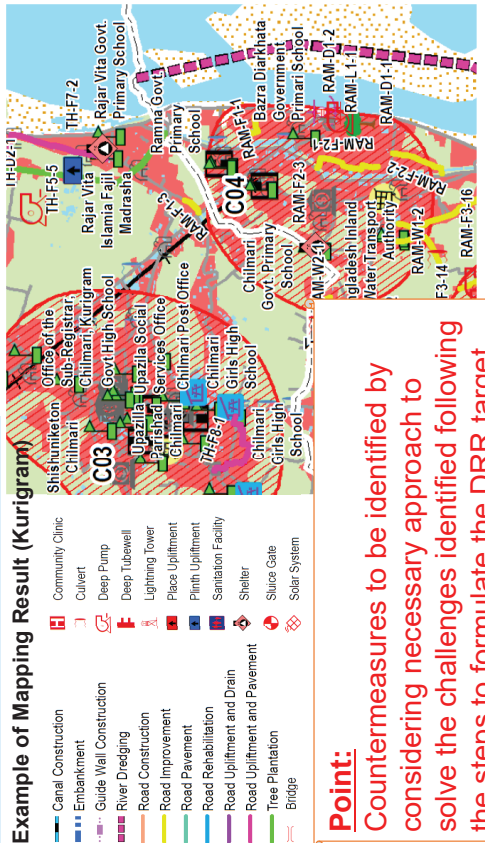
Session 4		
DRR Countermeasures (key questions: How to solve the issues? What is required to prevent the situation?)		
Proposal of DRR Countermeasures (e.g. Structural: Embankment, drainage facilities, shelters, bridges, roads etc., Non-structural: Resettlement, warning system, training/drill etc.,)	No. on the Map	
Embankment should be reconstructed	1	
Building assessment (seismic diagnosis) and retrofitting if necessary	2	

Exercise to Support GL

Practice Planning Activity

Chapter 4: Disaster Risk Reduction Target

Example of Mapping Result (Kurigram)



Point:
Countermeasures to be identified by considering necessary approach to solve the challenges identified following the steps to formulate the DRR target

Exercise to Support GL

Practice Planning Activity

Chapter 4: Disaster Risk Reduction Target

Mapping Exercise 2: Discuss Disaster Risk Reduction Targets

4. Write down "DRR target" for one hazard in a specific area

What to do

- Check the Challenge and Necessary Solution for each hazard / area
 - Central city areas where many important building exists is inundated frequently
 - Drainage facility in the central city areas
 - Heightening of main road in the central city areas to prevent flood water
 - Establishment of new evacuation center in the central city areas
- Fill in the DRR Target Template

Hazard	Area	DRR Target (Short and mid term)	DRR Target (Long term)
Flooding	Central City Area	• Reduce the inundation caused by urban flooding by drainage facilities in some priority areas • Ensure safe evacuation by establishing new evacuation center	• Reduce the inundation caused by flooding from Haor area by heightening of main roads to prevent flood water
	Haor Area		
River Erosion	Along River		

Exercise to Support GL

Practice Planning Activity

Chapter 5: Action Plan for DRR Measures

Chapter 5 of the UzDRRAP summarizes the action plan for disaster risk reduction measures toward the DRR target as Upazila.

The sections of Chapter 5 are as follows.

- 5.1 Current Status of Structural and Non-Structural Countermeasures
- 5.2 Action Plans for DRR Target
- 5.3 Monitoring and Updating of the Plan

Chapter 3-2 of the GL

Expected Output

Chapter 5: Action Plan for DRR Measures

5.1 Current Status of Structural and Non-Structural Countermeasures

Summarize the overview of structural and non-structural DRR measures to make sure which measures are being taken and which are not being taken to achieve the DRR targets set in Chapter 4.

Example for Structural countermeasures against Flood and River Erosion

Type of Countermeasures	Current status	Responsible Agency
Embankments/Dike/Slope protection (incl. sandbags)	✓	BWDB
Canal excavation and other river improvements (Widening and Deepening)	✓	BWDB
Sluice gates	✓	BWDB/LGED
Retarding basin/Reservoir	Not undertaken	BWDB
Drainage facilities (Pumping Station etc)	Not undertaken	Paurashava/DPHE/BWDB
Rubber dam	Not undertaken	BWDB/LGED

Include measures not proposed due to budget constraints or institutional and political bottlenecks

Include measures than have not yet been implemented or proposed and mention its status

Clearly identify the implementing agencies

Chapter 3-2 of the GL

Expected Output

Chapter 5: Action Plan for DRR Measures

5.1 Current Status of Structural and Non-Structural Countermeasures

Write out the description of proposed measures to provide guidelines for understanding the overall picture of current DRR measures and addressing remaining risks

Example in Cox's Bazar

Infrastructures for Protection & Control against Coastal Disasters	Type	Undertaken	Agency
	Dike (Polder)/Coastal Revetment	✓	BWDB
Infrastructures for Protection & Control against Sediment Disasters	Type	Undertaken	Agency
	Slope stabilization/Retaining walls	✓	LGED/DDM/Bazar Pourashava

BWDB plays a key role to construct and maintain the polders while guide walls have been constructed by the efforts of LGED, DDM, and Cox's Bazar Pourashava. Some of the coastal forests with pine trees have been developed by the BWDB efforts, however, due to the lack of awareness and poor coordination, those forests are not properly maintained, and some are deforested.

LGED and Cox's Bazar Pourashava are the responsible agencies to cope with sediment disasters such as rock failure. At this moment, LGED/DDM implemented some retaining wall construction along the beachside area to protect road infrastructure from rock falls. However, most of the rest of the areas left to be undertaken.

Emphasize the role of the implementing agencies: It is desirable to describe specific methods of cooperation between the implementing agencies

Prioritization of DRR: It is useful to include an explanation of the priority and urgency of implementation in the list of measures.

Example forms is provided as an APPENDIX of the training material => Check "Part-4" of this training material for details

Chapter 3-2 of the GL

Expected Output

Chapter 5: Action Plan for DRR Measures

5.2 Action Plans for DRR Target

Structure of action plan is a practical breakdown of the DRR targets in to “Target Hazard”, “Target Area”, “Objective”, and “Programs”

Structure of Action Plan (Example for River Erosion)

Target hazard		Challenges by Hazard		
Hazard	Area	Objective	Programs	Target area
		2-1. Urgently control the progress of riverbank erosion by emergency measures	A. Introduction of emergency measures (e.g., sandbags) for revetment, and dredging	Areas with recent significant erosion damage along rivers
DRR Target				
River Erosion	Along rivers	Urgently Control the progress of riverbank erosion by emergency measures at riverbanks and dredging in areas with recent significant erosion damage	Reduce the risk of riverbank erosion in the entire riverfront area through riverbank revetment and channel improvement, etc.	DRR Target (Long term)
	Char area		Reduce the risk of riverbank erosion in administrative and commercial centers through emergency measures and dredging of revetments in some areas	

Chapter 3-2 of the GL



Expected Output

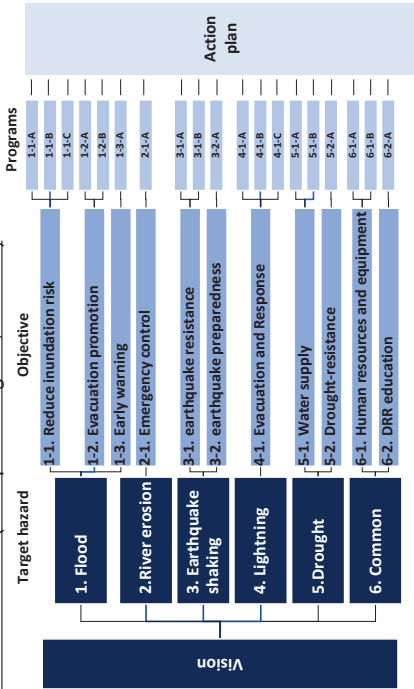
97

Chapter 5: Action Plan for DRR Measures

5.2 Action Plans for DRR Target

Overall structure of action plan will be like as bellow to cover targeted hazard with breakdown of Outcomes, Programs and Action Plan

Structure of Action Plan (example in Krigram, Chilmari)



Chapter 3-2 of the GL



Expected Output

98

Chapter 5: Action Plan for DRR Measures

5.2 Action Plans for DRR Target

Action implementation plan shall also be prepared to identify “responsible agency”, “ongoing activity or current status”, “Actions to be taken” and “Timeframe for achieving the action”.

2-1 Urgently control the progress of riverbank erosion by emergency measures

ID	Program	Target area	Implementation plan			
			Action	Responsible agency	Ongoing activity/ Current status	Timeframe for achieving the Action
2-1-A	Introduction of emergency measures (e.g., sandbags) for revetment, and dredging	Areas with recent significant erosion damage along rivers				
Action and Implementation plan			1) Sandbags/Geo-bag as emergency operation to ease the impact of riverbank erosion	BWDB	Ongoing Activity by O&M budget in Kurigram district but no activity in Chilmari Upazila	Securing budget Continuous work
			2) Protection Work for river erosion in Char area by Sandbags/Geo-bag	Local Government Agency, LGED and DDM	No regular activities	Securing budget Continuous work

Chapter 3-2 of the GL



Expected Output

99

Chapter 5: Action Plan for DRR Measures

5.2 Action Plans for DRR Target

Countermeasures map can also be prepared to provide visual summary.

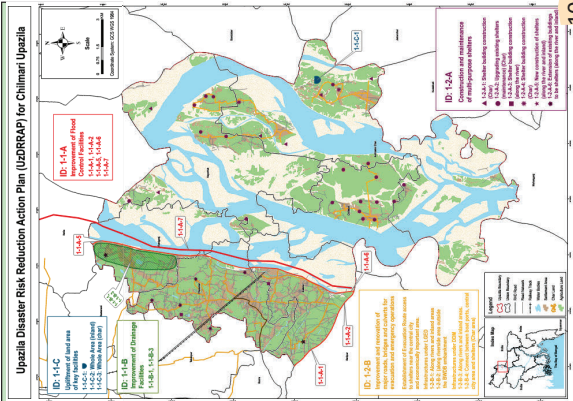
Items to be included on the map:

In addition to the actions plan identified, to effectively prioritize actions, the map should clearly indicate critical locations, such as:

- Evacuation centers.
- Densely populated areas (e.g., central urban areas).
- Boat terminals (Ghats).
- Main roads.

Hazards to visualize on map:

For hazards like earthquakes that affect wide areas or for non-structural measures where specific locations cannot be pinpointed, a location map is not necessary.



Chapter 3-2 of the GL

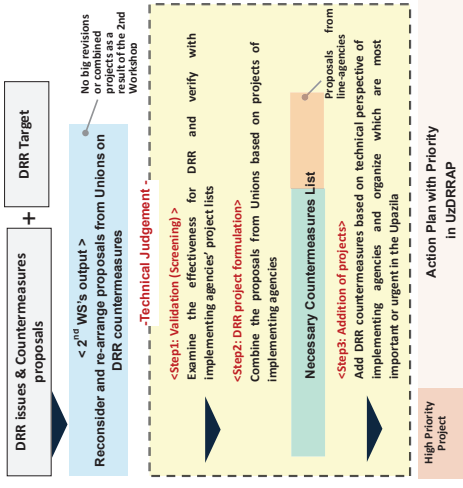


Expected Output

100

Chapter 5: Action Plan for DRR Measures

Bellow shows the process to finalize the countermeasure list. Consultation with line-agencies are critical for a feasible plan.



Chapter 3-2 of the GL

Important Concepts

Chapter 5: Action Plan for DRR Measures

Inter-Upazila Coordination and Infrastructure Consistency shall be considered carefully in the UzDRRAP Formulation.

DRR countermeasures should not be confined to a single Upazila but require coordination with adjacent Upazilas and District-level initiatives.

Especially for infrastructure development, consistency must be ensured through prior coordination, such as:

- Embankment continuity (e.g., between Ramu and Cox's Bazar)
- Road elevation and drainage systems

Institutionalize pre-consultation mechanisms through UzSC, District DMCs and DDM shall be considered.

Chapter 3-2 of the GL

Important Concepts

Chapter 5: Action Plan for DRR Measures

Documentation Exercise: Action Plans for DRR Target

1. Review the "DRR target" written in the "Mapping Exercise 2"

2. Fill in the format of "Structure of Action Plan"

3. Fill in the format of "Action Implementation Plan"

Point:

The exercise will practice the process of planning and the structure of the action plan. The action plan written can be a rough idea but it is important to be familiarized with the templates and the process of filling up the templates

Exercise to Support GL

Practice Planning Activity

Chapter 5: Action Plan for DRR Measures

Documentation Exercise: Action Plans for DRR Target

1. Review the "DRR target" written in the "Mapping Exercise 2"

What to do

- Review the "DRR Target" template filled out in the "Mapping Exercise 2"

Hazard	Area	DRR Target (Short and mid term)	DRR Target (Long term)
Flooding	Central city Area	• Reduce the inundation caused by urban flooding by drainage facilities in some priority areas • Ensure safe evacuation by establishing new evacuation center	• Reduce the inundation caused by flooding from Haor area by heightening of main roads to prevent flood water
	Haor Area		
River Erosion	Along River		

- Check the "Action Plan for DRR target" Template

Target hazard	Challenges by Hazard	
	Objective	Target area
	Programs	

Exercise to Support GL

Practice Planning Activity

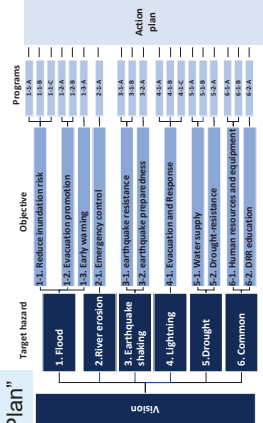
Chapter 5: Action Plan for DRR Measures

Documentation Exercise: Action Plans for DRR Target

2. Fill in the format of "Structure of Action Plan"

What to do

- Write the "Structure of Action Plan" template from the DRR target
- Understand the structure of the Action plan shown here consisting of "Objective", "Programs" for each target hazard



Target hazard	Challenges by Hazard		
	Objective	Programs	Target area
1. Flooding	1-1 Reduce the inundation caused by urban flooding	A: Drainage facilities in some priority areas	Central city Area
	1-2 Ensure safe evacuation	A: Establish new evacuation center	Central city Area
	1-3 Reduce the inundation caused by flooding from Haor area	A: Heightening of main roads to prevent flood water	Central city Area

Exercise to Support GL

Practice Planning Activity

105

Chapter 5: Action Plan for DRR Measures

Documentation Exercise: Action Plans for DRR Target

3. Fill in the format of "Action Implementation Plan"

What to do

- Write the "Action Implementation Plan" template

Objective ID	Program	Target area	Implementation plan			
			Action	Responsible agency	Ongoing activity/ Current status	Actions to be taken
1-1	1-1A	1-1A	Drainage facility implementation for the main channel, sluice gate connected with the river	BWDB	Ongoing Activity by BWDB	Securing budget
2-1	2-1A	2-1A	Secondary drainage network establishment	Local Government Agency	No regular activities	Securing budget

* Actual planning will be done through consultation with relevant agencies, in the exercise please be familiar with the process first

Exercise to Support GL

Practice Planning Activity

106

Best Practice in the Planning Process

UzDRRAP planning process will also enhance the coordination among implementing agencies. Some best practice through the planning activity in pilot Upazila has been summarized

Collaboration between LGED and PIO (Kurigram)

- Discussions on demarcation related to the development of evacuation routes and local roads.

Collaboration between BWDB and Paurashava

- Coordination between BWDB's main river dredging project and Paurashava's drainage infrastructure development project.

- Facilitation of Paurashava's understanding regarding land acquisition for BWDB-related projects.

Collaboration between BWDB and Donor-Funded Road Projects (JICA)

- Promotion of road development with the expectation that roads will also serve as embankments

Chapter 3-2 of the GL

Work for Planning

107

Chapter 5: Action Plan for DRR Measures

5.3 Monitoring and Updating of the Plan

Implementation status of the projects will be monitored to facilitate implementation by the implementing agencies supported by DDM and coordination in the central government level

Step1: UzSC in coordination with DDM to check the status (rate of progress) of the projects annually.

Status	F/S	DRR approved	ADP	Annual Budget
Continuing Project	+	+	+/-	+/-
Pipeline Project	+/-	-	-	-
New Project	-	-	-	-
Unknown	-	-	-	-

Step2: Coordination among agencies in the central level will confirm the effectiveness of existing projects and the need for new proposed projects.

Chapter 3-2 of the GL

Expected Output

108

Chapter 5: Action Plan for DRR Measures

5.3 Monitoring and Updating of the Plan

- Step3: For the items the needs for feasibility studies has been identified, the implementing agencies will hold preparatory discussion for the preparation of a DPP. This includes to obtain the budget for feasibility studies and reporting back the situation to relevant agencies in the central level.
- Step4: Based on the discussion among agencies in the central level, the UzSC will re-examine the need for new proposals.
- Step5: If any changes are identified, the UzSC will update the UzDRRAP

Part-3
Practical Guide for the
UzDRRAP formulation

Purpose of this Chapter:
To introduce the practical planning flow and process to formulate the UzDRRAP.

Organization Structure to Support Planning

Set up a Upazila Sub-Committee (SC) for particular purpose of UzDRRAP. DRRO or DC is expected to appoints members from UzDMC members and additional members or advisor if necessary

Role of the UzSC for UzDRRAP Formulation and Implementation

- (1) UzSC shall identify the hazards and risks in the surrounding area through meetings and supplemental studies and shall study the overall structural and non-structural measures required to reduce the disaster risk for the entire region including the target Upazila
- (2) UzSC will share the results of the risk analysis with Implementing agencies to establish quantitative DRR targets and identify priority DRR actions in vulnerable areas to achieve these targets, in light of the overall picture of the above measures.

Organization Structure to Support Planning

Set up a Upazila Sub-Committee (SC) for particular purpose of UzDRRAP. DRRO or DC is expected to appoints members from UzDMC members and additional members or advisor if necessary

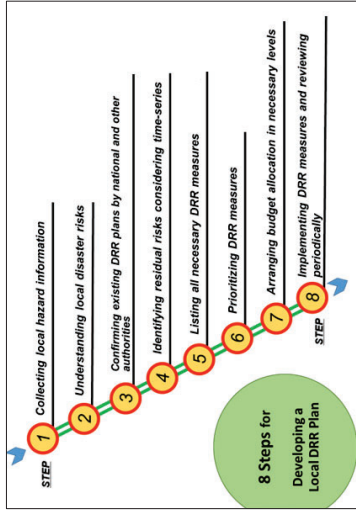
Role of the UzSC for UzDRRAP Formulation and Implementation

- (3) UzSC shall prepare Upazila Disaster Risk Reduction Plans in target Upazilas, identifying existing DPPs and pipeline and new projects related to DRR. UP's priority, some development projects which might affect people or increase disaster risk.
- (4) Coordinated with higher level offices of relevant agencies and UzSC shall monitor the implementing situation of proposed projects in the LDRRP for the purposes of promoting implementation of the prioritized projects.

Overall Planning Workflow

As for the guidance of the process for UzDRRP formulation, the “8-Step” method which was compiled by JICA can be a guidance for leaders and planners of local administrative organizations.

Flow of planning in the “8-steps” method

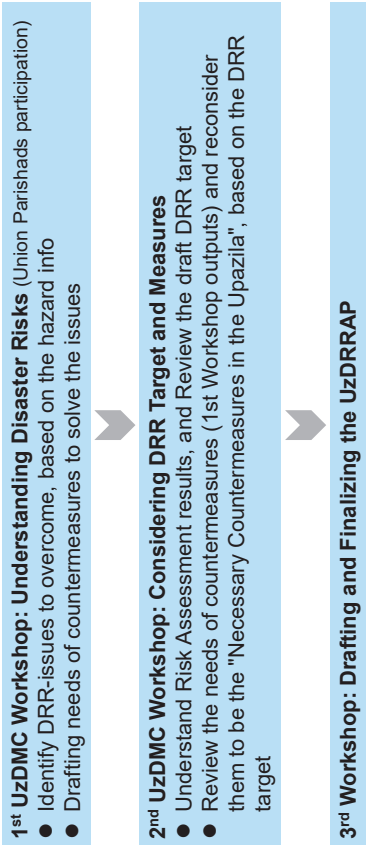


Chapter 3-3 of the GL

Important Concepts

Overall Planning Workflow

To facilitate the planning process, workshop using a table-top exercise method. The activity aims to build a collaborative system between related organizations and to promote common awareness of cross-sectoral Disaster risk reduction.

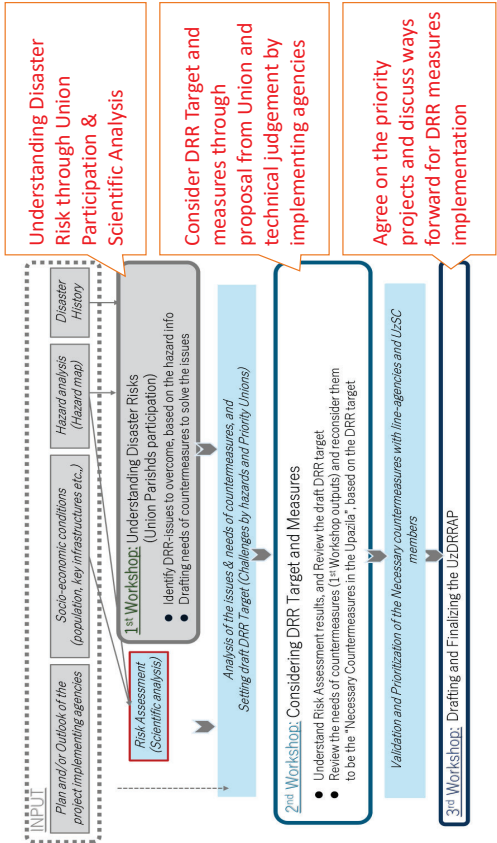


Chapter 3-3 of the GL

Process of Planning

Overall Planning Workflow

Point in each phases of workflow of UzDRRAP formulation process

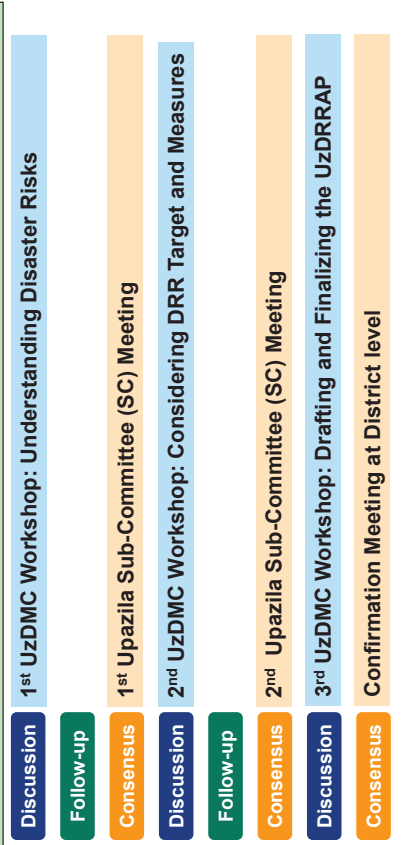


Chapter 3-3 of the GL

Process of Planning

Overall Planning Workflow

Local disaster risk reduction plan will be carried out by a process of “discussion” through workshops and “follow-up” work and “consensus building” through conducting upazila sub-committee meeting or coordination with relevant stakeholders

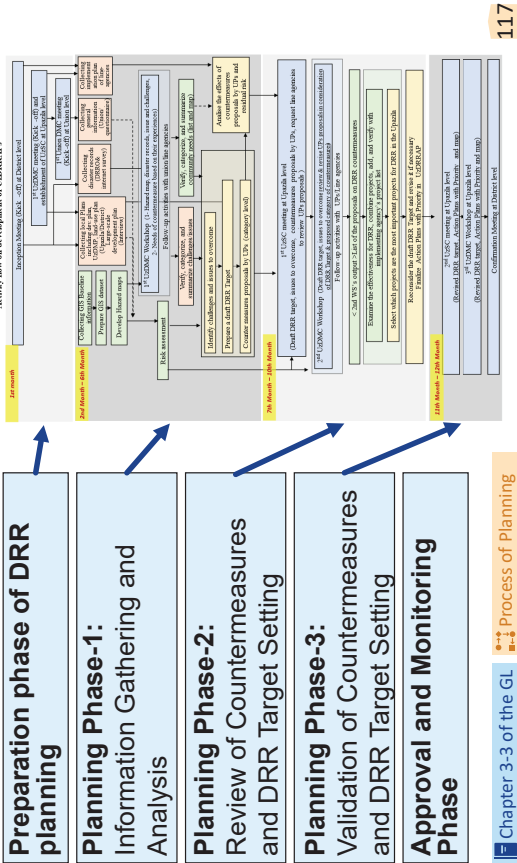


Chapter 3-3 of the GL

Process of Planning

UzDRRAP Planning Steps

The planning schedule can be divided into the following five phases



Preparation phase of DRR planning

Before conducting the inception meetings, DDM shall decide the District and Upazila to support the DRRAP formulation and then make contract with local consultants to support the process.

NOTES for the DDM officer

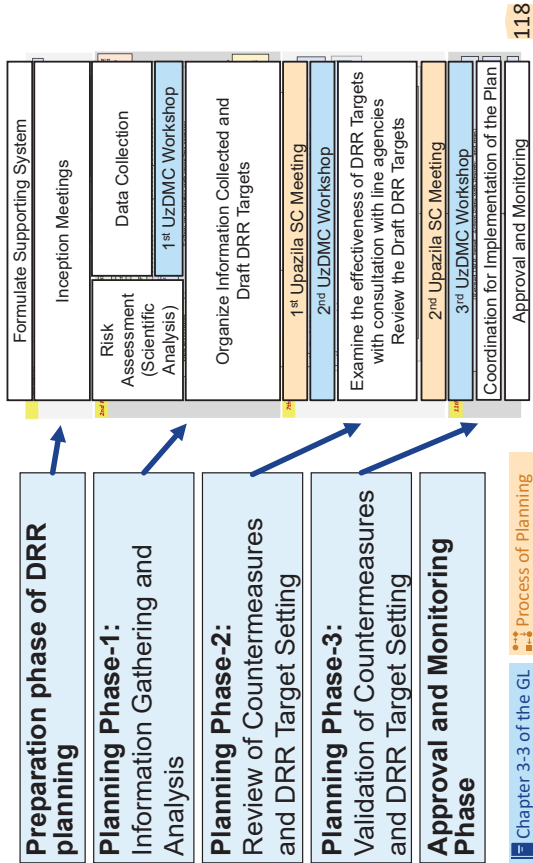
- UzDRRAP formulation includes various task to organizing workshops, collection and organizing various types of information, and writing the draft UzDRRAP.
- It is advised to utilize sub-contractor and DDM shall facilitate the process of sub-contracting the tasks.
- The guidance on this process will be provided by the “Operational Manual”.

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan Approval and Monitoring	

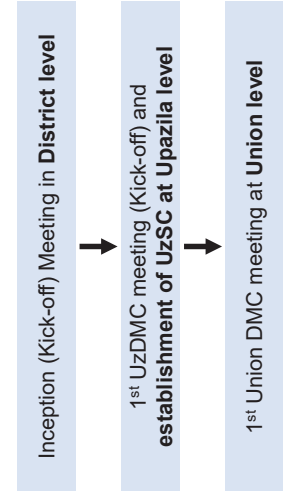
UzDRRAP Planning Steps

The planning schedule can be divided into the following five phases



Preparation phase of DRR planning

Inception (Kick-off) meeting shall be held in the district, UzDMC and Union DMC level to initiate the planning activities. In addition, the UzSC shall be established in the 1st UzDMC meeting



UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan Approval and Monitoring	

Preparation phase of DRR planning

The inception meeting (Kick-off) in the District level shall be hold to discuss the roles and responsibilities of the stakeholders.

Point:

It is important to include key officers(executive engineers) from line agencies at central and local level from the early stage to enhance cooperation.

Reference Documents:

- 001_Work3-1_Notice on Inception Meeting(DDMC).pdf
- 002_Work3-1_Notice on introducing about Project team/Consultant .pdf
- 003_Work3-1_Agenda for Inception Meeting(DDMC).docx
- 004_Work3-1_Inception_Introduction of the UzDRRP(Bangla).pptx
- 005_Work3-1_Inception_Introduction of the UzDRRP(en).pptx

Chapter 3-3 of the GL



Work for Planning

121

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	Risk Assessment (Scientific Analysis)
	Data Collection
Organize Information Collected and Draft DRR Targets	
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies	
Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-1

Relevant information for risk assessment shall be collected through document review, interviews to relevant agencies, and distribution of questionnaires to Union Parishads.

Data Collection

Local Plans including development plan, UzDMP, land-use plan (Upazila/District) Large-scale development plan (Interview)

General information (Union/ questionnaire)

Disaster records (DRRO & internet survey)

Implementation plan of line-agencies

Chapter 3-3 of the GL



Process of Planning

123

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	Risk Assessment (Scientific Analysis)
	Data Collection
Organize Information Collected and Draft DRR Targets	
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies	
Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Preparation phase of DRR planning

The 1st UzDMC meeting shall be held to establish the Upazila Sub-Committee, inviting DRRO and key person of DDMC and 1st Union DMC meeting shall be done for information sharing

Example Agenda / Program are provided in APPENDIX

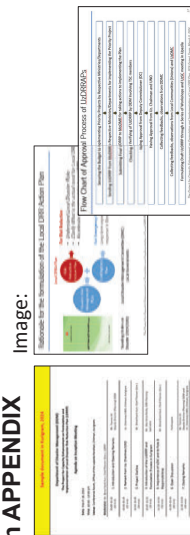


Image:

Reference Documents:

- 006_Work4-1_Agenda for Inception Meeting in UzDMC.docx
- 007_Work4-1_Notice on nominated members for UzSC .pdf

Chapter 3-3 of the GL



Work for Planning

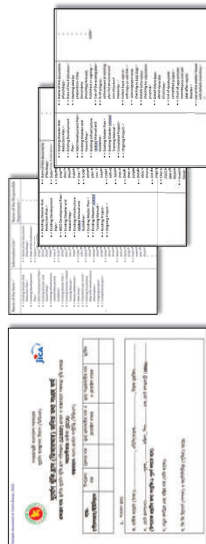
122

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	Risk Assessment (Scientific Analysis)
	Data Collection
Organize Information Collected and Draft DRR Targets	
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies	
Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-1

To facilitate the data collection activity through questionnaires to Union Parishads, "Data Collection Work Sheet for the Assessment in the Unions" is provided in the Appendix.



Reference Documents:

- 008_Work5-2_UNO Letter-to request information.pdf
- 009_Work5-2_Data collection list.docx
- 010_Work5-2_Data Collection format example (Bangla).pdf

Chapter 3-3 of the GL



Work for Planning

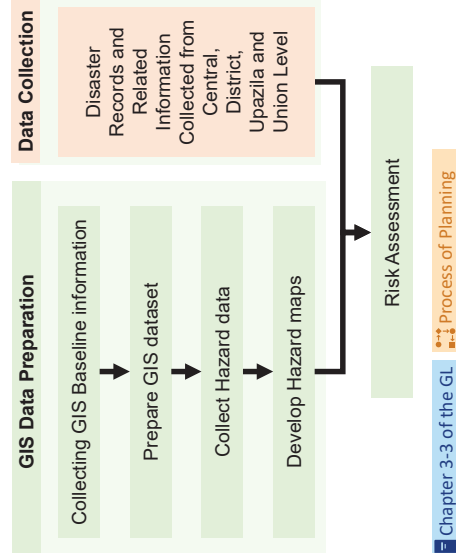
124

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	Risk Assessment (Scientific Analysis)
	Data Collection
Organize Information Collected and Draft DRR Targets	
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies	
Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-1

Combining the “Hazard” and the relevant data collected from the data collection activity, risk assessment will be conducted



= Chapter 3-3 of the GL

Planning Phase-1

Through the data collection process points mentioned below shall be confirmed carefully

Data Reliability and Sources

Data used in the UzDRRAP should be collected and verified through the following three layers and all figures and tables must cite data sources, including year and institution:

- Initial information collection at the community level (e.g., CRA)
- Verification at the Union DMC and local government workshops
- Scientific validation using public data sources (e.g., DRIP, GIS, remote sensing)

Gender consideration

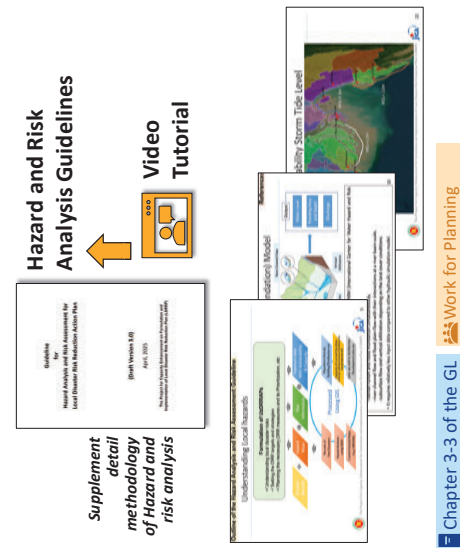
Information should be collected with attention to:

- Gender-specific disaster impacts (e.g., access to shelters, responsibilities)
- Mobility challenges of elderly and disabled individuals
- Gender-responsive evacuation and recovery planning

Chapter 3-3 of the GL

Planning Phase-1

The detail process to collecting “Hazard” information and conducting “Risk Assessment” using a GIS tools are provided in the “Hazard and Risk Analysis Guidelines” and the “Video Tutorial”

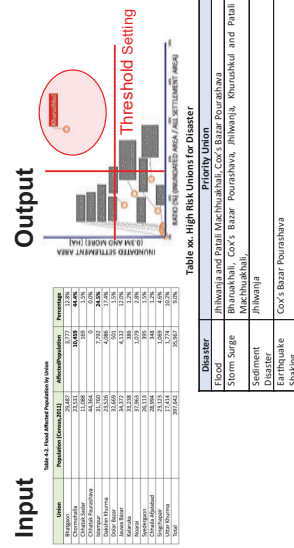


= Chapter 3-3 of the GL

Planning Phase-1

Tool to support the calculation of disaster risk (exposed population or area) will be provided in the APPENDIX to make it easy to identify the higher-risk unions as one of the outputs if disaster risk assessment

Disaster Risk Analysis Supporting Tool



Chapter 3-3 of the GL

Planning Phase-1

The 1st Workshop shall be held to share hazard map and disaster records and discuss issues and challenges.

Reference Documents:

- 011_Work6-1_Notice letter for 1st WS example.pdf
- 012_Work6-1_Agenda_1st Workshop.docx
- 013_Work6-1_Session2_1st Workshop (Bengala).ppt
- 014_Work6-1_Session2_1st Workshop.ppt
- 015_Work6-1_Session3-4_1st Workshop(Bangla).pptx
- 016_Work6-1_Basemap example in Kurigram.pdf
- 017_Work6-1_Union-wise Flood Hazard Map(Example in Kurigram).pdf
- 018_Work6-1_Union-wise River Erosion Hazard Map (example in Kurigram).pdf
- 019_Work6-1_Worksheet for Session3-4_WS1(Bengala).pptx
- 020_Work6-1_Worksheet for Session3-4_WS1.pptx
- 021_Work6-1_Time table (Facilitator's guide)_1st Workshop.docx
- 022_Work6-1_Worksheet for Session3-4_WS1-example.pptx

Chapter 3-3 of the GL



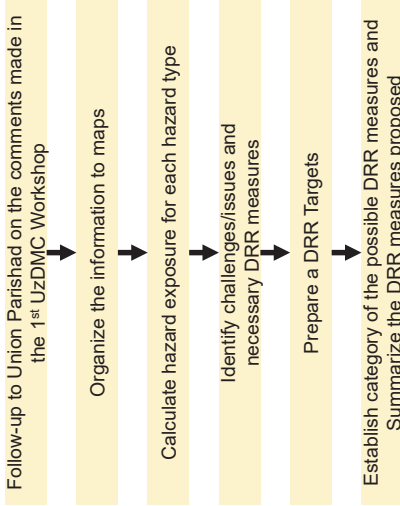
Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-1

After the 1st UzDMC workshop, follow-up activity shall be done and after organizing the information proceed to the preparation of DRR targets with the organized information



Chapter 3-3 of the GL



Work for Planning

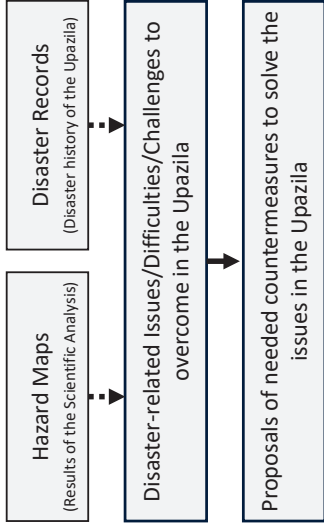
UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-1

In the workshop Table-top work will be done to discuss the disaster related issues and needed countermeasures to solve the issue

Flow of the Table-top work



*Detail process of Table-top work is provided in APPENDIX.
*Mapping Exercise 1 and 2 was done in the training to practice this process

Chapter 3-3 of the GL



Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-2

The 1st Upazila SC meeting shall be held to discuss on draft DRR Target and proposed DRR measures by Union Parishads

Reference Documents:

- 030_Work9-1_1st UzSC Meeting Notice (example).pdf
- 031_Work9-1_Agenda on 1st UzSC Meeting (example).docx
- 032_Work9-1_1st UzSC Meeting_(example).pptx
- 033_Work9-1_1st UzSC Meeting_ Upazila Challenges and Countermeasures Map (example).pdf
- 034_Work9-1_1st UzSC Meeting handout (Upazila-wise_Challenges and Countermeasures) (example).xlsx

Point:
UzSC shall request implementing agencies for necessary support to check and review the proposed DRR measures

Chapter 3-3 of the GL



Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-2

The 2nd UzDMC workshop shall be held to discuss Draft DRR target and proposed DRR measures with feedback of 1st UzSC meeting

Reference Documents:

- 035_Work10-1_2nd WS Notice.jpg
- 036_Work10-1_Agenda_2nd Workshop (Example).docx
- 037_Work10-1_2nd Workshop-Countermeasures list_ For new proposal worksheet.xlsx
- 038_Work10-1_2nd Workshop_PPT(Example).pptx
- 039_Work10-1_PPT on 2nd Workshop_(Example)(Bangla).pptx
- 040_Work10-1_Reference sheet_DRR Target_2nd Workshop_Kurigram Map(Example).pdf
- 041_Work10-1_Map for tabletop work_Union-wise Countermeasures Map(Example).pdf
- 041_Work10-1_Issues and Countermeasures Map (Example).pdf
- 043_Work10-1_Challenges and Countermeasures_Handout(example).pdf
- 044_Work10-1_Upazila-wise_Challenges and Countermeasures list(example).xlsx

Chapter 3-3 of the GL



Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-3

The 2nd UzSC meeting shall be held to confirm the DRR Targets and to share action plans to achieving DRR targets this result can also be informed to the central government organization

Reference Documents:

- 048_Work13-1_Agenda on UzSC (2nd) Meeting (Example).docx
- 049_Work13-1_PPT for 2nd UzSC Meeting (Example).pptx
- 050_Work13-1_2ndUzSC outline_(for facilitator).pptx
- 051_Work13-1_list of current countermeasures (for Chapter5-1).docx
- 052_Work15-1_Agenda on 2nd TSC Meeting.docx
- 053_Work15-1_PPT on TSC Meeting.pptx

Chapter 3-3 of the GL



Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-2

This process is important to verify with relevant stakeholders and implementing agencies to confirm the effectiveness of DRR Targets and the proposed DRR measures.

Examine the effectiveness for DRR, combine projects, add, and verify with implementing agency's project list

Review the DRR target and finalize the countermeasures list and map

Points to Consider in this Phase is mentioned in Slide 101 of this material

Chapter 5: Action Plan for DRR Measures

Below shows the process to finalize the countermeasure list. Consultation with line-agencies are critical for a feasible plan.



Chapter 3-3 of the GL



Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-3

Before holding the 3rd UzDMC workshop, documentation of the UzDRRAP and information sharing with the line ministries shall be promoted to brush up the plan

Drafting of UzDRRAP based on the organized information and result of discussion

Exchange opinion with central line ministries through Coordination system in the central level

Hold the 3rd UzDMC Workshop

Chapter 3-3 of the GL



Work for Planning

UzDRRAP Planning Steps

Formulate Supporting System	
Inception Meetings	
Risk Assessment (Scientific Analysis)	Data Collection
1 st UzDMC Workshop	
Organize Information Collected and Draft DRR Targets	
1 st Upazila SC Meeting	
2 nd UzDMC Workshop	
Examine the effectiveness of DRR Targets with consultation with line agencies Review the Draft DRR Targets	
2 nd Upazila SC Meeting	
3 rd UzDMC Workshop	
Coordination for Implementation of the Plan	
Approval and Monitoring	

Planning Phase-3

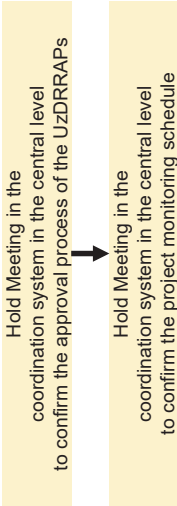
The 3rd UzDMC workshop shall be held to make consensus of all stakeholders on the UzDRRAP contents toward the approval process, district DMC meeting shall be held to confirm the outcome of the plan

Reference Documents:

- 054_Work17-1_Notice on DDMC meeting Example.pdf
- 055_Work17-1_DDMC Meeting Agend_Example.docx
- 056_Work17-1_PPT on DDMC Meeting Example(Bengal).pptx
- 057_Work17-1_PPT on DDMC Meeting Example(English).pptx
- 058_Work18-1_MoDMR Meeting Agenda for UzDRRAP.docx
- 059_Work18-1_WS MoDMR_Example for UzDRRAP.pptx

Approval and Monitoring Phase

To facilitate the approval of the UzDRRRRAP and to promote the implementation of the plan. Follow up activity shall be done including meeting in the coordination system in the central level



Part-4
Guide for the supporting tool
for the UzDRRAP Formulation

Purpose of this Chapter:
Provide information on supporting tool for UzDRRAP formulation which is attached to this training manual



Prepared through the Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan (LDRRP)

Supporting Tools for Planning Activity

Chapter 4 will provide a guidance on what kind of supporting tools are available and how it could be utilized in the planning process.

Chapter 4: Guide for the supporting tool for the UzDRRAP Formulation

- Outline of the Supporting Tools
- How to use the Supporting Tools
 - Scheduling Supporting Tool
 - Template of the UzDRRAP
 - Risk Assessment Support Tool
 - List of meeting documents for the work (PPTs, Communication Letter, Worksheets from Pilot Activities)

Supporting Tools for Planning Activity

“Meeting documents for the works” is listed by indicating the when to use the document by work number as mentioned in the flow below.

Formulate Supporting System		Work3: Inception meeting at District Level
Inception Meetings		Work4: 1st UzDMC meeting and 1 st Union DMC meeting
Risk Assessment (Scientific Analysis)	Data Collection	Work5: Data Collection
	1 st UzDMC Workshop	Work6: 1 st UzDMC Workshop
Organize Information Collected and Draft DRR Targets		Work7: Gathering and Organizing information
1 st Upazila SC Meeting	2 nd UzDMC Workshop	Work8: Risk Assessment and DRR Target Drafting
	2 nd UzDMC Workshop	Work9: 1 st Upazila SC Meeting
Examine the effectiveness of DRR Targets with consultation with line agencies and Review the Draft DRR Targets		Work10: 2 nd UzDMC Workshop
2 nd Upazila SC Meeting	3 rd UzDMC Workshop	Work11: Examine the effectiveness of DRR Targets with consultation with line agencies
	3 rd UzDMC Workshop	Work13: 2 nd UzSC Meeting
Coordination for Implementation of the Plan		Work15: Exchange of opinions with Central line ministries
Approval and Monitoring		Work17: District DMC Meeting, Work18: MoDMR Meeting

141

Supporting Tools for Planning Activity

List of Meeting documents for the works is as below

No.	Document Name	Remarks
Work 3	001_ Work3-1_ Notice on Inception Meeting(DDMC).pdf	No need risk assessment documents Prepared by DDM
	002_ Work3-1_ Notice on introducing about Project team/Consultant. pdf	
	003_ Work3-1_ Agenda for Inception Meeting(DDMC).docx	
	004_ Work3-1_ Inception. Introduction of the UzDRRAP(Bangla).pptx	
	005_ Work3-1_ Inception. Introduction of the UzDRRAP(en).pptx	
Work 4	006_ Work4-1_ Agenda for Inception Meeting in UzDMC.docx	Utilize documents in DDMC meeting Detailed Discussion about the UzSC by using SOD reference Information required can vary on natural, social and economic condition Prepared by sub-consultants
	007_ Work4-1_ Notice on nominated members for UzSC. pdf	
Work 5	008_ Work5-2_ UNO Letter-to request information.pdf	Prepared by sub-consultants
	009_ Work5-2_ data collection list.docx	
Work 6	010_ Work6-3_ Data Collection format example(Bangla).pdf	1.Hazard and risk analysis must be done before the material preparation 2.Related Maps for Workshop and workshops preparation by 3. If the target upazila has residual hazards and risks besides river erosion and flood hazard, it should be considered.
	011_ Work6-3_ Notice letter for 1st WS example.pdf	
	012_ Work6-1_ Agenda_1st Workshop.docx	
	013_ Work6-1_ Session2_1st Workshop (Bangla).ppt	
	014_ Work6-1_ Session2_1st Workshop.ppt	
	015_ Work6-1_ Session3-4_1st Workshop(Bangla).pptx	
	016_ Work6-1_ Basemap example in Kurigram.pdf	
	017_ Work6-1_ Union-wise Flood Hazard Map(Example in Kurigram).pdf	
	018_ Work6-1_ Union-wise River Erosion Hazard Map(example in Kurigram).pdf	
	019_ Work6-1_ Worksheet for Session3-4_ WS1(Bengla).pptx	
Work 7	020_ Work6-1_ Worksheet for Session3-4_ WS1.pptx	Prepared by DDM Summarised by sub contractor based on the instruction above
	021_ Work6-1_ Time table (Facilitator's guide)_1st Workshop.docx	
	022_ Work6-1_ Worksheet for Session3-4_ WS1-example.pptx	
Work 7	023_ Work7-1 and 2_ Tasks after the 1st workshops_Example instruction to sub contractor.docx	
	024_ Work7-1_1st WS Initial Findings and discussion.xlsx	

142

Supporting Tools for Planning Activity

List of Meeting documents for the works is as below

No.	Document Name	Remarks
Work 8	025_ Work8-1_ Affected area(settlement area and paddy fields)_ Example in Sunamganj.xlsx	Exposure analysis can be done during work 6 process with hazard analysis. See also the guidelines for risk assessment. Category of the countermeasures depends on analysis of issues and countermeasures summarized in the 1 st WS
	026_ Work8-1_ Exposure analysis (Example in Sunamganj).xlsx	
	027_ Work8-2 and 3_ Example of DRR Target description.docx	
	028_ Work8-2 and Union Hazard Data Verified maps for UDMC Workshop for Activity Sharing	
	029_ Work8-4_ Categorize Countermeasures (Structure of Action Plan).docx	
Work 9	030_ Work9-1_1st UzSC Meeting Notice (example in Kurigram).pdf	Challenge and proposed response map is prepared based on the table top exercises in the 1 st WS, discussing in DDM
	031_ Work9-1_ Agenda on 1st UzSC Meeting (example in Kurigram_ Ulipur).docx	
	032_ Work9-1_1st UzSC Meeting_ (Example in Kurigram_ ENG).pptx	
	033_ Work9-1_1st UzSC Meeting Upazila Challenges and Countermeasures Map (example in Kurigram).pdf	
	034_ Work9-1_1st UzSC Meeting handout (Upazila-wise Challenges and Countermeasures) (Example in Kurigram).xlsx	
Work 10	035_ Work10-1_ 2nd WS Notice.jpg	DRR target must be discussed and drafted in the DDM before the 2 nd WS. Sub consultant is instructed to prepare required map by DDM
	036_ Work10-1_ Agenda_2nd Workshop (Example in Kurigram).docx	
	037_ Work10-1_2nd Workshop-Countermeasures list For new proposal worksheet.xlsx	
	038_ Work10-1_2nd Workshop_PPT(Example in Kurigram_ ENG).pptx	
	039_ Work10-1_ PPT on 2nd Workshop_ (Example in Kurigram) (Bangla).pptx	
	040_ Work10-1_ Reference sheet_ DRR Target_ 2nd Workshop_ Kurigram	
	041_ Work10-1_ Map for tabletop work Union-wise Countermeasures Map(Example in Kurigram).pdf	
	041_ Work10-1_ Issues and Countermeasures Map (Example in Kurigram).pdf	
	043_ Work10-1_ Challenges and Countermeasures Handout(example in Kurigram).pdf	
	044_ Work10-1_ Upazila-wise_ Challenges and Countermeasures list(example in Kurigram).xlsx	

143

Supporting Tools for Planning Activity

List of Meeting documents for the works is as below

No.	Document Name	Remarks
Work 11	045_ Work11-1_ Materials for discussion Central City Area Map.pdf	Important assets in target area like central city area must be analyzed for prioritization of the proposals.
	046_ Work11-1_ Materials for discussion Proposed and Existing Shelter Location Map with Flood Hazard (Example).pdf	
	047_ Work11-1_ Proposed and Existing Shelter Location Map with River Erosion Hazard (Example).pdf	
Work 13	048_ Work13-3-1_ Agenda on UzSC (2nd) Meeting (Example in Kurigram_ Ulipur).docx	Individual meetings with relevant agencies to discuss realistic solution for the issues and challenges must be done in Work 12
	049_ Work13-1_ PPT for 2nd UzSC Meeting_ Kurigram Chinmari_ ENG.pptx	
	050_ Work13-1_ 2ndUzSC outline_ (for facilitator).pptx	
Work 15	051_ Work13-1_ list of current countermeasures (for Chapter5-1).docx	This example is not always consistent with solution in Kurigram example, however you can follow the intention of the meeting in Cox's Bazar example
	052_ Work15-1_ Agenda on 2nd TSC Meeting Example in Cox's Bazar.docx	
	053_ Work15-1_ PPT on TSC Meeting Example in Cox' Bazar.pptx	
Work 17	054_ Work17-1_ Notice on DDMC meeting Example in Sunamganj.pdf	The procedure for approval should be based on Bangladesh official manner. Document should be prepared by DDM
	055_ Work17-1_ DDMC Meeting Agenda Example in Sunamganj.docx	
	056_ Work17-1_ PPT on DDMC Meeting Example in Sunamganj(Bengal).pptx	
Work 18	057_ Work17-1_ PPT on DDMC Meeting Example in Sunamganj(English).pptx	
	058_ Work18-1_ MoDMR Meeting Agenda for UzDRRAP in Sunamganj.docx	
Work 18	059_ Work18-1_ WS MoDMR_ Example for UzDRRAP in Sunamganj.pptx	

144

APPENDIX 3-4

Developed UzDRRAPs (6 pilot upazilas)*

*This includes the Report on Hazard and Risk Assessment Results.

1) UzDRRAP of Cox's Bazar Sadar, Cox's Bazar

**Upazila Disaster Risk Reduction
Action Plan**

Cox's Bazar Sadar, Cox's Bazar

November 2023

**Upazila Disaster Management Committee
(UzDMC) of Cox's Bazar Sadar**

**Upazila Disaster Risk Reduction
Action Plan**

Cox's Bazar Sadar, Cox's Bazar

November 2023

**Upazila Disaster Management Committee
(UzDMC) of Cox's Bazar Sadar**

Preface

Bangladesh is one of the most disaster-prone countries in the world due to its geographical location. The frequency and intensity of disasters have been increased in recent years due to climate change as floods and storm surges are likely to become more severe with increases in intense tropical cyclones. Natural disasters cause not only direct physical damages to the lives and assets, but also indirect and consequent losses to various sectors such as agricultural sectors, food security, water, health and sanitation, significantly impacting economy and livelihood of the local communities. To tackle the situation, the government has achieved breakthroughs in disaster risk management by mentioning this as one of the top priorities, as described in the 8th Five Year Plan (July 2020- June 2025) “a sustainable development pathway resilient to disaster and climate change” as a core theme.

In order to accelerate the disaster resilience of the country, it is vital to develop and implement local disaster risk reduction strategies and plans as also indicated in the Sendai Framework for Disaster Risk Reduction 2025-2030. Expectedly, by adopting a local disaster risk reduction plan in every Upazila, it is possible to effectively reduce the damage and loss caused by disaster, and enhance continuous and sustainable development of the country's economy and therefore achieving Vision 2041 of the government.

In light of this, "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" has been implemented since December 2020 led by MoDMR and DDM, supported by the Japan International Cooperation Agency (JICA). In this Project, Upazila Disaster Risk Reduction Action Plans have been formulated in six pilot Upazilas of three districts, which are Cox's Bazar (Cox's Bazar Sadar and Chakria), Sunamganj (Chhatak and Jagannathpur) and Kurigram (Chilmari and Ulipur). These plans have been developed by unique approaches that are 1) Scientific analysis for local hazards; 2) Setting DRR targets based on risk quantification; 3) Involvement of project implementing agencies including BWDB, LGED, SoB, GSB, BMD, PWD, FSCD, and so on. These approaches have successfully established this effective plan and promote to execute projects to reduce disaster risk.

This plan is expected to save lives, livelihoods, and resources of the Upazila, as well as pave the way for the enhancing future development through disaster risk reduction in the country.

Implemented by the Department of Disaster Management (DDM)
Technical Assistance from the JICA Expert Team (JET) of "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" and Bangla-German Sampreeti (BGS)



Director General
Department Of
Disaster Management

Message

While Bangladesh is advancing rapidly on the path of development, natural disasters are hindering the ongoing dynamic development of Bangladesh. Although Bangladesh is disaster-prone due to geographical reasons, climate change adds insult to injury as one or the other disaster strikes the nation almost every year. As a result, the country's resources and lives are being lost on a large scale, which impedes the pace of development consequently. Natural disasters hampering sustainable development, therefore, make it impossible to achieve the desired progress.

In this context, the Bangladesh government has placed more importance on disaster risk reduction and pre-disaster investment, as well as in light of the Sendai Framework for Disaster Risk Reduction (SFDRR), the Ministry of Disaster Management and Relief (MoDMR) and the Department of Disaster Management (DDM) has taken a project named "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" with the support of JICA. This project is piloting the formulation of the local disaster risk reduction plans in six Upazilas of three districts which had been selected in consideration of the different types of hazards, namely Cox's Bazar, Sunamganj, and Kurigram. This pilot activity is finally aimed at the establishment of the mechanism to spread this initiative nationwide in the country, by the leadership of the MoDMR and the DDM.

The local Upazila Disaster Risk Reduction Action Plan (UzDRRAP) formulation is significantly vital for Upazilas with a view to eliminating the actual damage and loss in their areas. The planning in cooperation among related agencies can promote sufficient proactive disaster risk management that the Bangladesh government has also emphasized, instead of post-disaster response.

It is my great pleasure to implement this pilot project activity with the strong leadership of the Upazila DMC and other stakeholders. This plan will contribute a lot to achieving the vision of 2021 of the Bangladesh government. We are hopeful that the success of this pilot project will add a positive dimension to the development process and this process will later be expanded across the country.

Md. Mijanur Rahman
(Additional Secretary)



Project Director
LDRRP Project
and
Director

Planning & Development
Department Of Disaster Management

Message

Natural disaster is the main obstacle to the development of this beautiful land of natural beauty. Almost every year this country is affected by cyclones, storm surges, landslides, flash floods, seasonal floods, thunderstorms, lightning, and so on, due to its geographical location. The amount of damage to property, crops, houses and infrastructure caused by the disasters is retarding the development of the country, which results in a decrease in GDP as well as a great barrier to sustainable development.

In aspect to this and in light of the Sendai Framework for Disaster Risk Reduction (SFDRR), the Ministry of Disaster Management and Relief (MoDMR) and the Department of Disaster Management (DDM) initiated a project named "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" with the support of JICA. Under this project, six Upazilas of three districts, which are 1) Cox's Bazar Sadar and Chakaria Upazilas in Cox's Bazar District, 2) Chhatak and Jagannathpur Upazilas in Sunamganj District, and 3) Chilmari and Ulipur Upazilas in Kurigram District were selected as pilot sites in consideration of their different types of hazards due to their diverse geographical features, to formulate and implement the Upazila Disaster Risk Reduction Action Plans (UzDRRAPs). Since the project started in 2021, we have completed formulating the UzDRRAPs of Cox's Bazar and Sunamganj districts through the active participation of all stakeholders as this plan shows, and will start the project activities in Kurigram district soon in 2024. I firmly believe that the development and implementation of the UzDRRAP is significant for all Upazilas to reduce the rate of damage and loss of human and resources by disasters, which will support achieving the vision of 2021 of the Bangladesh government.

As a Project Director, it is my immense pleasure to accomplish this intended project activity through the strong leadership and guidance of the Upazila DMC and Union DMC, as well as the active participation and contributions of other DRR-related agencies. This plan will take us on the path of prosperity by reducing the disaster risks and will play a significant role in the development of the country.

Md. Firoz Uddin
(Additional Secretary)



Deputy Commissioner
Cox's Bazar District



Message

Cox's Bazar District is characterized by natural beauty, diverse special features surrounded by mountains, rivers and the sea. It is a district that has the longest beach in the world and is a source of the unique beauty of nature. Many institutions in the tourism industry have been established here. This area is bustling with domestic and foreign tourists throughout the year to enjoy the natural beauty as Cox's Bazar is famous as the healthiest place in Bangladesh. The present Government has taken a good number of development initiatives here such as Matarbari Deep Sea Port, Matarbari Ultra Super Critical Coal Fired Power Plant, Economic Zones, Unique Railway Station and Runway Extension Projects of Cox's Bazar International Airport etc.

This District consists of nine Upazilas (71 Unions) and four municipalities. Cox's Bazar is home to various tribes or ethnic groups which make the city more diverse and it is a beautiful place where people are living together with communal harmony. Due to the geographical situation, this District is a disaster-prone area because it is situated along the Bay of Bengal. Almost every year this District is affected by cyclones, storm surges, landslides and flash floods. Every year infrastructure, crops and homesteads are damaged and a significant number of resources are lost which is a great barrier to sustainable development. Therefore, I believe that the local Upazila Disaster Risk Reduction Action Plan formulation is very important for this area in order to reduce the rate of damage and loss. The Bangladesh Government has also emphasized proactive Disaster Risk Management (DRM) instead of Post Disaster Response.

It has come to my attention that the Ministry of Disaster Management and Relief (MoDMR) has taken a pilot project named "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" with the support of JICA and this project is piloting two Upazilas (Cox's Bazar Sadar and Chakaria Upazila) of Cox's Bazar district. The project activity was started in June 2022, and by this time already formulated the Upazila DRR Plan (UzDRRAP) of both Upazilas through the active participation of all stakeholders.

As a District Administrator, it is my pleasure to accomplish this intended project activity through the strong leadership and guidance of the Upazila administration and thanks to Upazila DMC, Union DMC and other stakeholders for their active participation and great effort in this innovative initiative which will reduce the rate of damage and loss of human and national resources by the disaster. I would like to express thanks to all the stakeholders for their relentless effort to formulate this UzDRRAP.

Muhammad Shaheen Imran



Upazila Chairman
Cox's Bazar Sadar Upazila
Cox's Bazar, Bangladesh



Message

Bangladesh is one of the most disaster-prone countries in the world due to its weather, climate and geographical characteristics. While almost all of the districts are affected by natural disasters in the country, Cox's Bazar is one of the most vulnerable districts to the calamities. As being a hilly and coastal area, most of the upazilas in the District are affected by natural disasters like floods, cyclones, storm surges, and landslides every year. Cox's Bazar Sadar Upazila, which is the center of the District, is surrounded by mountains, rivers and the sea; therefore, it remains in the said disaster risks around the year.

In light of Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030, "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" has been undertaken by the initiative of the Ministry of Disaster Management and Relief (MoDMR) along with the Department of Disaster Management (DDM) with the support of JICA (Japan International Cooperation Agency).

I appreciate that this Upazila Disaster Risk Reduction Action Plan (UzDRRAP) was formulated with active involvements of all stakeholders. Based on the scientific hazards and risk assessment, the plan was developed through a series of workshops and consultation with community people and line departments here. I hope that this plan will pave the way for the future in disaster risk reduction and encourage project implementing agencies and local communities to save life, livelihood and national resources in this Upazila.

I extended my sincere thanks and gratitude to all members of UzDMC, officials of line departments, UP Chairman and other stakeholders for their valuable contribution in developing this Plan for this Upazila.

Kwasarul Haque Jewel



Upazila Nirbahi Officer
Cox's Bazar Sadar
Cox's Bazar



Message

Cox's Bazar Sadar Upazila is situated on the coast of the Bay of Bengal in Cox's Bazar district under Chittagong division of the south-eastern part of Bangladesh. It is located 150 km south of the divisional headquarter city of Chittagong. It is bounded by Chakaria Upazila on the north, Ramu Upazila on the south and east, and Maheshkhali Upazila on the west. Topography of Cox's Bazar Sadar Upazila consists primarily of flat, low-lying plains with an elevation of lower than 20m except for the hilly area behind the beach. Therefore, the Upazila is vulnerable to flooding and landslides due to cyclones and storm surges, while these flat areas are suitable for agriculture, salt and shrimp farming, and settlement.

Despite being such an extreme disaster-prone area, no long-term planning or programs for disaster risk reduction had been undertaken for reducing the impact and damages of the disasters. In response to the situation, in December 2020, the Government of Bangladesh with the assistance of JICA together started "The Project for Capacity Enhancement on Formulation and Implementation of Local Disaster Risk Reduction Plan" aiming at reducing the risk of natural disasters by adopting local disaster risk reduction plan. For formulation of Upazila Disaster Risk Reduction Action Plan (UzDRRAP), project conducted risk and hazard assessment in the scientific manner, discussed the findings among the Upazila Disaster Management Committee (UzDMC) and the Upazila Sub-committee (UzSC) through a series of workshops, and combined the necessary DRR projects by having consultation with union and upazila officials and the line departments.

I believe that the implementation of this program, initiated by the Ministry of Disaster Management and Relief (MoDMR) and the Department of Disaster Management (DDM), will contribute significantly to the risk reduction of natural disasters in the Upazila. Based on the outcomes of this pilot project, this Upazila is now ready to under new projects on priority basis.

My sincere thanks and gratitude to all stakeholders, members of UzDMC, and officials of line departments for extending wholehearted cooperation and support with a view to preparing and formulation of UzDRRAP.


Mohammad Zakaria

Table of Contents

Chapter-1. Introduction	13
1.1 Purpose and aim of the Plan	13
1.2 Rationale for the formulation of the Plan	13
1.3 Relevance to other Upazila plans	14
1.4 Features of the Plan	14
1.5 Methodology for the development of the Plan	15
1.5.1 Institutional Arrangement	15
1.5.2 Planning Process and Methodology	16
Chapter-2. Geographic, Socio-economic, and Meteorological Conditions	18
2.1 Location and Geographic Conditions	18
2.1.1 Location of the Upazila	18
2.1.2 Topography of the Upazila	19
2.1.3 River System of the Upazila	19
2.2 Socio-economic Conditions	21
2.2.1 Demography	21
2.2.2 Economy and Industry	21
2.2.3 Urbanization	22
2.3 Meteorological Conditions	23
Chapter-3. Target Hazards and Disaster-prone Areas	24
3.1 Disaster Record of the Upazila	24
3.2 Target Hazards of this Plan	27
3.3 Hazard Map and Disaster-Prone Areas by Each Hazard	27
3.3.1 Flood	27
3.3.2 Storm Surge	29
3.3.3 Sediment Disasters	31
3.3.4 Earthquake Shaking	34
Chapter-4. Disaster Risk and DRR Targets of the Upazila	35
4.1 Disaster risk	35
4.1.1 Flood	35
4.1.2 Storm Surge	40
4.1.3 Sediment Disaster	46
4.1.4 Earthquake Shaking	49
4.2 Priority Unions for Disaster Risk Reduction	51
4.3 Disaster Risk Reduction Target	52
Chapter-5. Action Plan of DRR Countermeasures	54
5.1 Current Status and Issues of the Structural and Non-Structural Countermeasures	54
5.2 Prioritized projects for DRR Target	57
5.2.1 Prioritized Structural Countermeasures	58
5.2.2 Needed Non-Structural Countermeasures	65
5.3 Monitoring and Updating of the Plan	66
Attachment 1: Proposed countermeasure list	
Attachment 2: Member lists of UzDMC and UzSC	
Attachment 3: Activity photos	

Acronyms

ADP	Annual Development Programme
AGM	Annual General Meeting
BCC	Building Construction Committee
BCM	Billion Cubic Meters
BDRCS	Bangladesh Red Crescent Society
BGS	Bangla-German Sampreeti
BIWTA	Bangladesh Inland Water Transport Authority
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BRDB	Bangladesh Rural Development Board
BWDB	Bangladesh Water Development Board
BoS-MoP	(Bureau of Statistics) under the Ministry of Planning
CPP	Cyclone Preparedness Programme
CRA	Community Risk Assessment
DAE	Department of Agricultural Extension
DDM	Department of Disaster Management
DDMC	District Disaster Management Committee
DEM	Digital Elevation Model
DMC	Disaster Management Committee
DPHE	Department of Public Health Engineering
DPP	Development Project Proposal
DRM	Disaster Risk Management
DRMP	Disaster Risk Management Plan
DRR	Disaster Risk Reduction
ECHO	Directorate-General for European Civil Protection and Humanitarian Aid Operations
ERCC	Emergency Response Coordination Centre
FSCD	Fire Service and Civil Defence
GIS	Geographic Information System
GSB	Geology and Minerals of Bangladesh
GSD	Ground Sampling Distance
HYV	High-yielding variety
ID	Identity Document
INGO	International non-governmental organization
JET	JICA Expert Team
JICA	Japan International Cooperation Agency

LGED	Local Government Engineering Department
MoD	Ministry of Defence
MoDMR	Ministry of Disaster Management and Relief
MoE	Ministry of Education
MoF	Ministry of Finance
MoH&FW	Ministry of Health and Family Welfare
MoL	Ministry of Land
MoL&F	Ministry of Livestock and Fisheries
MoLGRD&C	Ministry of Local Government Rural Development and Cooperatives
MoPA	Ministry of Public Administration
MoSW	Ministry of Social Welfare
MoWA	Ministry of Women Affairs
MoY&S	Ministry of Youth and Sports
NGO	Non-governmental Organization
NPDM	National Plan for Disaster Management
PDB	Power Development Board
PGA	Peak Ground Acceleration
PIO	Project Implementation Officer
PWD	Public Works Department
REB	Rural Electrification Board
RRAP	Risk Reduction Action Plan
SDGs	Sustainable Development Goals
SFDRR	Sendai Framework for Disaster Risk Reduction
SOB	Survey of Bangladesh
SOD	Standing Orders on Disaster 2019
TSC	Technical Sub-Committee
UDD	Urban Development Directorate
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNO	Upazila Nirbahi Officer
UPs	Union Parishads
UzCC	Upazila Construction Committee
UzDMC	Upazila Disaster Management Committee
UzDMP	Upazila Disaster Management Plan
UzDRRAPs	Upazila Disaster Risk Reduction Action Plans
UzSC	Upazila Disaster Risk Reduction Action Plans Sub-Committee
VDP	Village Defence Party

Chapter-1. Introduction

1.1 Purpose and aim of the Plan

The purpose of the Cox's Bazar Sadar Upazila Disaster Risk Reduction Action Plan (UzDRRAP) is to identify necessary countermeasures against natural disasters and implement them in cooperation with relevant stakeholders to reduce disaster risks in the Upazila. This plan contributes to increasing investment in disaster risk reduction by ensuring a mechanism for project implementation of the line ministries' countermeasures and by promoting further funding from donor agencies.

1.2 Rationale for the formulation of the Plan

This Plan corresponds to the Risk Reduction Action Plan (RRAP) that is required to be developed as a part of the Disaster Risk Management Plan (DRMP) by Disaster Management Committees (DMC) at District, Upazila and Union DMCs, according to the Standing Orders on Disaster 2019 (SOD). In the SOD, it is recommended to prepare a RRAP by local DMCs, as well as a Contingency Plan. While the disaster response which is covered by the Contingency Plan has been relatively conducted as required in emergencies, risk reduction measures based on the objective hazard and risk assessment had not been sufficiently implemented at the Upazila level. In consideration of this situation and the importance of the DRR investment for the further development of the country, this plan, therefore, emphasises disaster risk reduction and proposes the necessary actions as a master plan corresponding to the RRAP of the Upazila Disaster Management Plan (UzDMP), which directly leads to the preparation of Development Project Proposals (DPPs) and Annual Development Programmes (ADPs).



Figure 1-1. Risk Reduction Action Plan in the SOD

The formulation of the UzDRRAP and the implementation of the countermeasures against disasters are in line with government strategies, policies, and plans of the country, as listed below.

- The Bangladesh Delta Plan 2100 mentions the importance of strengthening the disaster risk management and combating the effects of climate change.
- 8th Five Year Plan (July 2020-June 2025) emphasizes appropriate policy and institutional capacity building to address their concerns on climate-resilient development and disaster management at all levels of the government, especially at the local government level where most of the programmes are to be implemented.

- The National Plan for Disaster Management (NPDM 2021-2025) focuses on "Making disaster risk reduction a development practice to achieve resilient public investment and the SDGs" and "Building capacity and leadership to implement NPDM 2021-2025 at the national and local level".

In addition, from an international perspective, this plan directly contributes to the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR), specifically the Target (e) "To substantially increase the number of countries with national and local disaster risk reduction strategy".

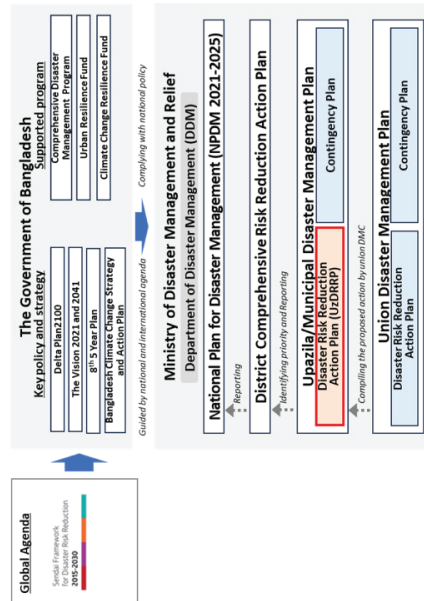


Figure 1-2. Relationship between national key policies and this plan

1.3 Relevance to other Upazila plans

Based on the Local Government (Upazila Parishad and Upazila Administration Reorganization) Act 1998 and the Local Government (Upazila Parishad) Act 2009, each Upazila shall prepare a development plan and land use plan. This plan and the proposed countermeasures against the disasters has been considered to ensure consistency with these plans in this Upazila.

1.4 Features of the Plan

The features of this plan are 1) Scientific Analysis for Local Hazards, 2) Setting DRR Targets based on Risk Quantification, and 3) Involvement of Project Implementing Agencies, which are expected to contribute to the actual execution of the effective countermeasures.

Feature 1: Scientific Analysis for Local Hazards:

The hazard maps were developed by simplified technical analysis, which processes are not adopted in the Community Risk Assessment (CRA), using observed disaster records of rainfall and tidal level, the Digital Elevation Model (DEM), and current hazard maps. The developed hazard maps represent the vulnerable areas of the Upazila, and help promote to objectively understand the hazard potential.

Feature 2: Setting DRR Targets based on Risk Quantification:

Risks in this Upazila were quantified based on risk quantification using the hazard maps and various factors such as natural conditions and socio-economic factors and visualized to share with relevant agencies. A DRR target was set in consideration of the result of identifying which areas are highly affected by potential hazards, by these risk quantifications.

Feature 3: Involvement of Project Implementing Agencies:

The Upazila Sub-Committee (UzSC), which is composed of the Upazila chairman, UNO, PIO, engineers from LGED, BWDB, and DPHE in the Upazila, Upazila officials, Union Parishad chairman, was established to identify disaster risks and consider priorities of countermeasures against the disasters at the Upazila level. Since the committee at the Upazila level does not have the authority to determine the countermeasures listed in the plan to be implemented, the members from the line ministries at the central level are involved in the planning processes to promote the schemes/projects listed in the UzDRRAP and secure budgets.

1.5 Methodology for the development of the Plan

1.5.1 Institutional Arrangement

For the development of this Plan, an UzSC stipulated in the SOD was established in this Upazila. The roles and responsibilities of this committee are to:

- 1) Prepare this UzDRRAP by identifying existing DPPs and pipeline projects related to DRR, Union Parishads (UPs) priority, some development projects that might affect people or increase disaster risk;
- 2) Summarize DRR projects by examining needs of UPs and Risk Reduction Action Plans developed by UPs;
- 3) Identify possible DPP to be able to collaborate among line ministries on structural and non-structural measures to maximize the efficiency and effectiveness of DRR.

In addition to this UzSC at the Upazila level, Technical Sub Committee (TSC) was established to coordinate projects proposed by other Upazilas in addition to Cox's Bazar Sadar Upazila at the central level, implementation of the projects proposed in the UzDRRAP are determined by the line ministries at the central level. The roles and responsibilities of this TSC are to:

- 1) Summarize and monitor the progress DRR related projects based on the plans that UzSCs submitted;
- 2) Request line ministries on the possibility to do further investigation on DRR project needs based on the UzDRRAP;
- 3) Make efforts to integrate DRR ideas into DPP, ADP and SYP in Upazila and line ministries, considering disaster risk reduction target in the UzDRRAP;
- 4) Discuss among line ministries on development projects which might affect people or cause disaster;
- 5) Establish the guidelines and manuals to prepare Upazila Disaster Risk Reduction Action Plans;
- 6) Take an initiative to start up Upazila Sub Committees for preparation of the UzDRRAPs.

1.5.2 Planning Process and Methodology

This plan was established based on a combination of methods, namely JICA 8 steps and the CRA method which has been broadly utilized as a vulnerability assessment in the country, as shown in the figure below. For developing each chapter of this plan, the following methodology was introduced.

Chapter 2: Geographic, Socio-economic, and Meteorological Conditions

This chapter illustrates the characteristics of the Upazila, that is the conditions to develop the Action plan for DRR. The statistics data including the Census 2011 and meteorological data was collected and analyzed.

Chapter 3: Target Hazards and Disaster-prone Areas

This chapter explains the disaster records, target hazards, as well as disaster-prone areas by showing hazard maps. While disaster records of the Upazila were collected by the DRRRO of the district or online media sources, disaster-prone areas were identified through scientific analysis by utilizing data such as elevation data (DEM), probability rainfall data and sea water level data and so on. For flood, the RRI (Rainfall Runoff Inundation) model was introduced. These hazard maps were then confirmed in workshops where the UzDMC members participated.

Chapter 4: Disaster Risk and DRR Targets of the Upazila

This chapter describes the estimations of damages caused by each hazard. The damage estimations of flood and storm surge target paddy fields, settlement areas, as well as the important public facilities and infrastructures, while those for sediment disasters and earthquake shaking target settlement or households. These damages were estimated by overlaying hazard data with statistical data¹, and consequently confirmed by the UzDMC members and the UzSC members in workshops and meetings, along with the priority unions that were set by such disaster risk.

Chapter 5: Action Plan of DRR Countermeasures

This chapter shows the current status and issues of the countermeasures as well as the necessary projects for DRR. The current status of the countermeasures was identified and analyzed by consultation with UzDMC and UzSC members, while the necessary projects were proposed by the UzDMC members. The proposed projects were then validated with line agencies, and prioritized with UzDMC and UzSC members.

¹ The risk assessment was conducted in accordance with the developed guideline – Guideline on Hazard and Risk Assessment.

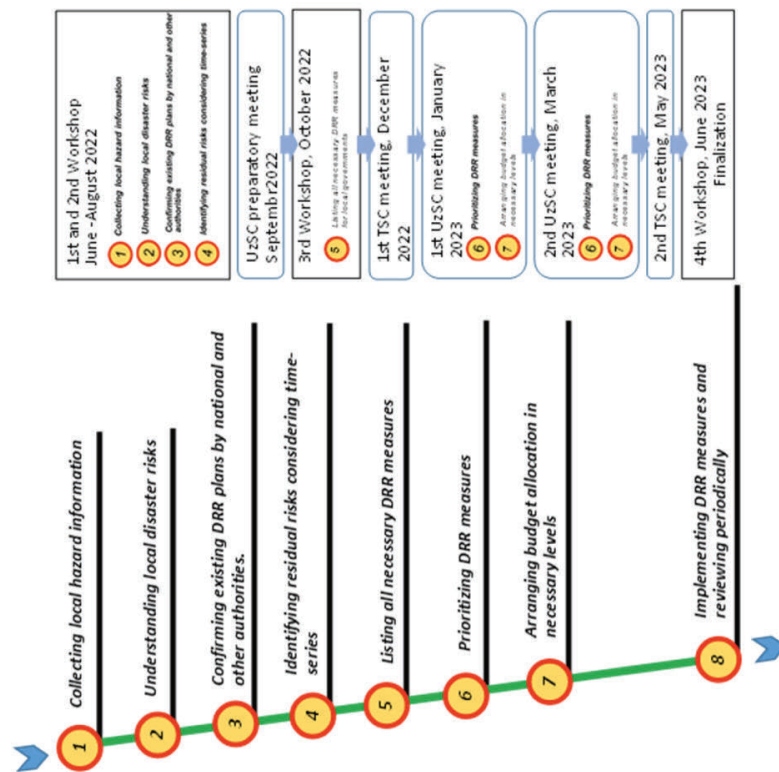


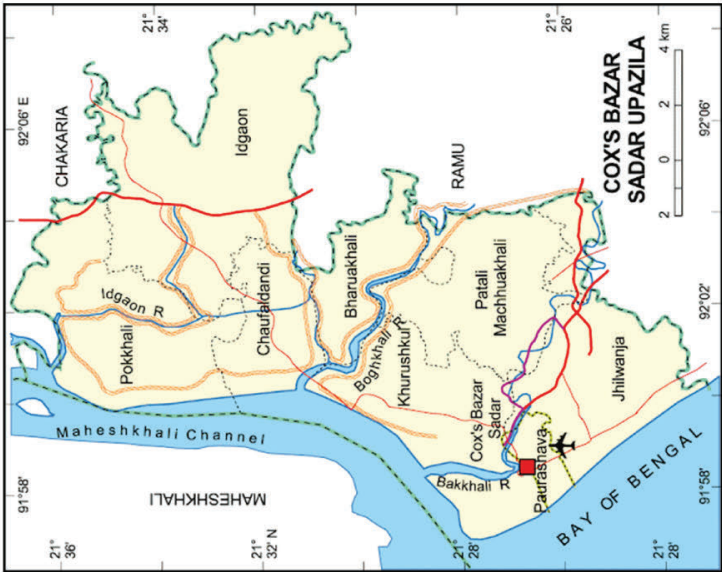
Figure 1-3. "8 Steps" for Upazila DRR Planning in case of this plan

Chapter-2. Geographic, Socio-economic, and Meteorological Conditions

2.1 Location and Geographic Conditions

2.1.1 Location of the Upazila

Cox's Bazar Sadar Upazila is situated on the coast of the Bay of Bengal in Cox's Bazar District under the Chattogram Division of the south-eastern part of Bangladesh. It is located 150 km south of the divisional headquarters city of Chittagong. It is bounded by Chakaria Upazila on the north, Ramu Upazila on the south and east, and Maheshkhali Upazila on the west (Figure 2-1.). The area of the Upazila is 201.55 km².



(Source: Maps of Bangladesh)

Figure 2-1. Location Map of Cox's Bazar Sadar Upazila

2.1.2 Topography of the Upazila

The topography of Cox's Bazar Sadar Upazila consists primarily of flat, low-lying plains with an elevation of less than 20 m except for the hilly area behind the beach (Figure 2-2.). Therefore, the Upazila is vulnerable to flooding due to cyclones and storm surges. The flat area is used for agriculture, salt and shrimp farming, and settlement. The coastal area is dominated by a long sandy beach, which stretches for about 120 km along the Bay of Bengal. The elevation of the hill area is approximately 50 m.



Figure 2-2. Topographic Map

2.1.3 River System of the Upazila

Cox's Bazar District has 5 major rivers: Matamuhuri River, Bakkhali River, Naf River, Reju Khal, and Moheshkhali and Kutubdia Channel (Figure 2-3.). The Bakkhali River is especially important among them upon considering the countermeasures against the disasters in the Upazila.

The river rises from the ranges that divide Chittagong from Arakan and flow north, then turns to the west, flows past Ramu Upazila and Cox's Bazar Sadar Upazila and falls into the Moheshkhali Channel. With a length of 69 km, it comprises a basin area of about 760 km² out of which approximately 510 km² is hilly.

It is an important source of water for irrigation and fishing for the local communities living in its vicinity. The river flows through the agricultural lands of Cox's Bazar Sadar Upazila, providing irrigation water to the paddy fields and other crops. It is also a habitat for various fish species, including hilsa, shrimp, and crabs, which are important for the local fishing industry.

It is a seasonal tidal river which remains almost dry in the winter season (January-April) and mostly active in the monsoon season (June-July-August). The annual average water availability in the Bakkhali River Basin is around 1.9 billion cubic meters (BCM). During pre-monsoon and monsoon, the river swells with heavy rainfall and can cause flooding in the surrounding areas. Flood water turns into waterlogging due to an inadequate drainage system for 3-4 days. Bank erosion occurs during flash floods on both banks of the river. The eroded sediment from the bank deposits in the river, which cause a morphological change in the river rapidly. This morphological change in the river is increasing flood damage in the area.

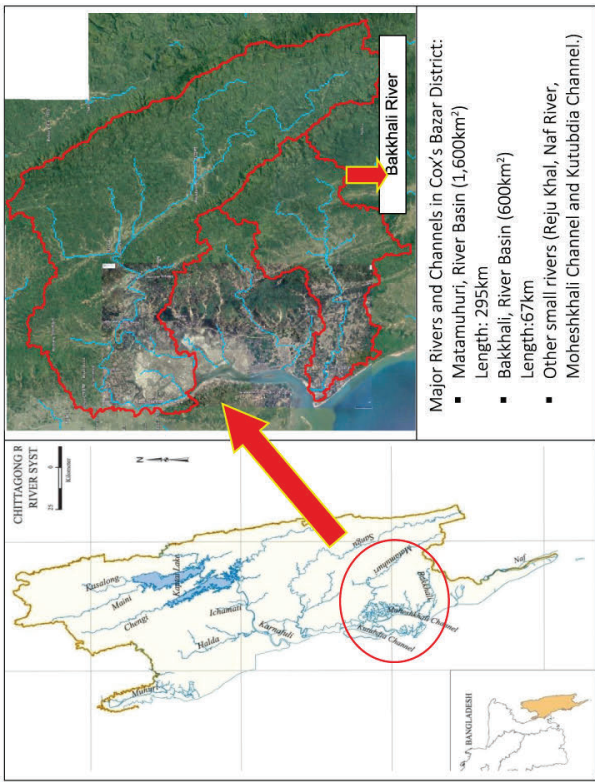


Figure 2-3. Major River and Channels of the Upazila

2.2 Socio-economic Conditions
2.2.1 Demography

Cox's Bazar Upazila is divided into ten unions: Bharuakhali, Chaufaldandi, Idgaon, Islamabad, Islampur, Jalalabad, Jhilwanja, Khurushkul, Patali Machhuakhali and Pokkhali. Cox's Bazar Paurashava is divided into 12 Wards and 97 Mahallas. The demography in Cox's Bazar Sadar Upazila is shown below. According to the census 2022, the total population of the Upazila is 566,905 people.

Table 2-1. Demography of the Upazila

Union Name ²	Total Area (km ²)	Total Population	Number of Households
Bharuakhali	13.67	26,662	6,060
Chaufaldandi	14.71	33,506	7,615
Cox's Bazar Paurashava	6.85	196,378	44,631
Idgaon	24.00	42,561	9,673
Islamabad	16.80	33,608	7,638
Islampur	14.70	26,762	6,082
Jalalabad	11.20	22,330	5,075
Jhilwanja	14.70	59,580	13,541
Khurushkul	23.67	54,958	12,490
Patali Machhuakhali	27.25	46,256	10,513
Pokkhali	34.00	24,304	5,524
Total	201.55	566,905	128,842

Source: Population & Housing Census 2022 and interview with Unions

2.2.2 Economy and Industry

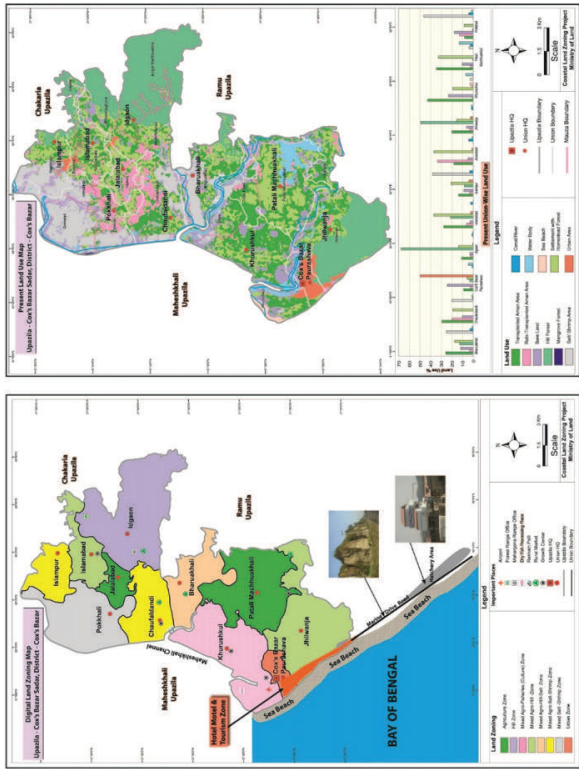
According to the Bangladesh Population Census, 2011, Cox's Bazar Sadar Upazila has the lowest poverty and extreme poverty headcount ratios in the District, at 26.2% and 12.2% respectively. These are also lower than the national averages of 31.5% and 17.6% respectively.

The tourism industry is one of the biggest income-driving industries in this Upazila because of its location as a popular coastal destination. According to Cox's Bazar Upazila Profiles (acaps, 2019), the tourism industry supports a diverse labor market, offering a wide range of opportunities for both unskilled and skilled workers. Consequently, migration from nearby areas to Cox's Bazar Sadar has resulted in increased labor competition and has increased pressure on existing resources, particularly housing.

In addition, agriculture contributes to the economy in Cox's Bazar Sadar Upazila. 15.67% of all labor households are agriculture labor households (Agriculture Census 2019). A variety of crops are produced here, namely local and HVV rice, wheat, vegetables, different fruits and others, which are sold both locally and to other parts of the country. Moreover, fishery in rivers, tributary channels and creeks and even from paddy fields during rainy seasons, prawn farming and salt production in the coastal area are important economic activities of the area.

The Upazila plans to strategically promote economic activities as shown in the land use zoning map below.

² Union Names within this plan are in accordance with and consistent with the names of the unions in the GIS data set of UN OCHA. However, the "Paurashava" was changed to the official name –"Paurashava" in this plan.



Source: Ministry of Land

Figure 2-4. Land Use Zoning Map by Ministry of Land, 2023

2.2.3 Urbanization

In recent years the urbanization rate in Cox's Bazar District has increased significantly. Especially, the rate of Cox's Bazar Sadar Upazila is 96.89%, which is extremely high compared to the average rate of Bangladesh of 28.37% (District Development Plan for Cox's Bazar-Phase I, 2019). Cox's Bazar Paurashava in the Upazila continues to attract the local population (floating) besides the tourist traffic. With the expanding network, the urban developments are in ribbon form, increasing pressure on the limited capacity of the road network. In addition, improvement of the drainage systems is required in urban settlements to address periodic flooding.

The central government will implement some mega projects such as the extension of the Airport and refueling station for international air traffic, improvement of the marine drive (coastal road) from Teknaf to Cox's Bazar, setting up of an economic zone in Teknaf and upgrade the beach in the area to international standard, construction of rail lines from Chattogram to Cox's Bazar, development of Eco-Tourism, construction of resilience house for the vulnerable families, which could accelerate further development and urbanization of the Upazila, and consequently expansion of the exposed areas by disasters

2.3 Meteorological Conditions

The climate of Cox's Bazar Sadar Upazila (District) is dominated by the tropical monsoon and is distinguished in 2 seasons: a rainy season and a dry season. The southwest monsoon brings the rainy season from May to October as shown in Figure 2-5. Then, the northeast monsoon flows and dries the area from November to April.

As shown in Figure 2-5, the Upazila has an annual rainfall of more than 3,000 mm. Most rainfall is concentrated during the rainy season, especially the 3 months between June and August, when half of the annual rainfall occurs. The heavy rainfall often devastates coastal Cox's Bazar Sadar Upazila and cause flooding in the area. In addition, tropical cyclones generally strike in two seasons, March through July and September through December. They also cause tremendous damage from the thunderstorms, violent winds, heavy rainfall bringing flooding and landslides, and storm surges.

Cox's Bazar Sadar Upazila (District) has a high temperature and high humidity climate. The average temperature reaches a maximum of 39.5°C in June, and a minimum of 11.80°C in January (Figure 2-6).

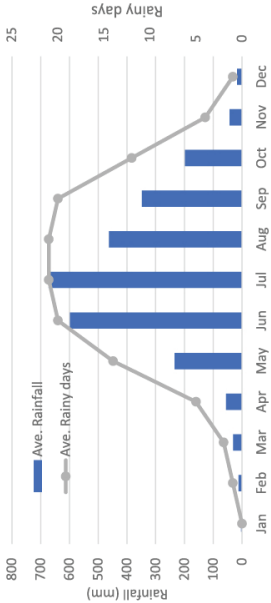


Figure 2-5. Average Annual Rainfall and Temperature

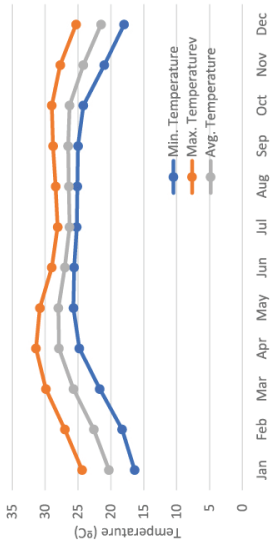


Figure 2-6. Average Temperature

Chapter-3. Target Hazards and Disaster-prone Areas

3.1 Disaster Record of the Upazila

Cox's Bazar District where Cox's Bazar Sadar Upazila is located, has experienced several disasters affecting the lives and livelihoods of the local communities, due to its topography and meteorology. The table below shows the disaster records in this Upazila. The most historic and destructive cyclone of 1991 caused a storm surge and fierce winds and severely affected Cox's Bazar District. In addition to the following, damage caused by lightning also occurs in the area.

Table 3-1. Disaster Record in Cox's Bazar Sadar, Cox's Bazar since 1970

No.	Year	Upazila	Damage
1. Flood			
(1)	Jun. 2007	Chakaria, Ramu, Sadar and Teknaf Upazilas	Cause: Flash flood by heavy rain Affected families: 25,695 people ³ Casualty: 15 dead people and 2 injured people
(2) ⁴	Jun. 2010	Kutubdia, Moneshkhali, Sadar, Pekua, Chakaria and Teknaf Upazilas	Cause: Collapse of embankment along the Bay Affected population: 11,545 people Casualty: 51 dead people Damaged House: More than 800 Damaged Infrastructures: More than 10 km stretch of coastal embankment, school, tube well, and pond Other Damage: livestock, crop, and shrimp/fish culture
(3)	Jul. 2019	7 Upazilas (No detailed information)	Cause: Heavy rain Affected population: 41,280 people ⁵ Casualty: 1 dead people Damaged Infrastructures: river dam and road Other Damage: seed bed
(4)	Jul. 2021	Ukhia and Teknaf Upazilas	Inundation area: 36km ²
(5)	August 2023	Cox's Bazar Sadar Upazila ⁶	Cause: Heavy rainfall Affected Area: 34,234 sq. km Affected HHs: 0 nos. Affected Crops Land: 670 hectors Nos. of Tube-well and Latrine Damaged: Deep Tube well-0, Shallow Tube well-0, Hand Tube well-0 and Latrine-0.
2. Cyclone			
(1)	Nov. 1970	-	Cyclone Bhola No detail information in Cox's Bazar District
(2) ⁷	Nov. 1983	Kutubdia, Teknaf, Ukhia Upazila	Cyclone near Cox's Bazar Casualty: 300 missing fishermen (incl. other Districts) Damaged House: 2,000

³ Floods Landslides and Tornadoes Appeal no. MDRBD002, <https://reliefweb.int/report/bangladesh/bangladesh-floods-landslides-and-tornadoes-appeal-no-mdrbd002>

⁴ District Disaster Management Plan for Cox's Bazar, 2014, and Bangladesh: Situation Report No.175 – Flood <https://reliefweb.int/report/bangladesh/bangladesh-situation-report-no175-flood>

⁵ Nirapad, Monsoon Flood Situation, July 16, 2019

⁶ According to the D-form of Cox's Bazar Sadar Upazila, EOC,DDM.

⁷ <https://colonge.com/bhola-cyclone-the-devasted-natural-disaster-in-bangladesh-in-1970/>

No.	Year	Upazila	Damage
(3)	Apr. 1991	8 Upazilas (No detailed information)	Cyclone Gorky Affected population: 1,121,689 people Casualty: 135,000 to 145,000 dead people ⁸ Damaged Infrastructures: road, bridge, culvert, dam, and school Other Damage: electricity, telecommunication system, industry, livestock, crops/land, salt field, shrimp/fish culture, and natural resources
(4)	Apr. 1994	8 Upazilas (No detailed information)	Cox's Bazar Cyclone Affected population: 390,615 people Casualty: 127 dead people Damaged Infrastructures: road, dam, and school Other Damage: livestock, crops, and shrimp/fish culture
(5)	Nov. 1995	-	Cyclone near Cox's Bazar Casualty: 650 dead people Other Damage: livestock
(6)	May 1997	8 Upazilas (No detailed information)	Cyclone "One Bravo" Affected population: 1,132,174 people Casualty: 34 dead people and 3,516 injured people Damaged Infrastructures: bridge, culvert, dam, and school Other Damage: livestock and shrimp/fish culture
(7)	Nov. 2007	8 Upazilas (No detailed information)	Cyclone "Sidr" Affected population: 855 people. Casualty: 7 dead people Damaged Infrastructures: road, dam, and school Other Damage: livestock Other Damage: livestock and shrimp/fish culture
(8) ⁹	Apr. 2009	Sadar, Ramu, Chakaria, Pekua, Moheshkhali and Kutubdia Upazilas	Cyclone Bijli Affected population: 29,165 people Casualty: 2 dead people Damaged Infrastructures: road and dam Other Damage: crops and salt field
(9)	May 2009	5 Upazilas (No detailed information)	Cyclone Aila Affected population: 77,500 people Casualty: 3 dead people Damaged Infrastructures: embankment Other Damage: crops and salt field
(10)	Jul. 2015	-	Cyclone Komen Affected population: 270,000 people Casualty: 4 dead people

⁸ <https://www.history.com/topics/natural-disasters-and-environment/bangladesh-cyclone-of-1991>

⁹ Bangladesh: Disaster Management Information Centre situation report 20 Apr 2009, 11:30 <https://reliefweb.int/report/bangladesh/bangladesh-disaster-management-information-centre-situation-report-20-apr-2009>

¹⁰ Tropical Cyclone Komen (ECHO Daily Flash of 31 July 2015) <https://reliefweb.int/report/bangladesh/bangladesh-india-myanmarburma-tropical-cyclone-komen-echo-daily-flash-31-july-2015>

No.	Year	Upazila	Damage
(11)	May 2016	-	Cyclone Roanu Affected population: 8,250 people ¹¹ Casualty: 3 dead people
(12)	May 2017	Kutubdia, Moheshkhali, Pekua, Ramu, Ukhia, Teknaf Upazilas	Cyclone Mora Affected population: 500,000 people (evacuees from storm surge) Casualty: 5 dead people, 10 injured people and at least 21 missing fishermen Damaged House: 17,000 ¹²
(13)	May 2019	-	Cyclone Fani No detail information for Cox's Bazar District
(14)	May 2020	-	Cyclone Amphan with flooding and landslide No detail information for Cox's Bazar District
(15)	May 2021	Chakaria, Pekua, Cox's Bazar Sadar, Teknaf and St. Martin Upazilas	Cyclone Yaas Damaged Infrastructures: coastal structures, dunes and jetties
(16)	May 2023	-	Cyclone Mocha No detail information for Cox's Bazar District
3. Landslide			
(1)	Jul. 2003	-	Cause: Heavy rain Casualty: at least 6 people ¹³
(2)	Jul. 2008	Teknaf Upazila	Cause: Heavy rain Casualty: at least 10 dead and injured people ¹⁴
(3)	Jun. 2010	Ukhia Upazila	Cause: Heavy rain Casualty: at least 20 dead people ¹⁵
(4)	Jun. 2017	-	Cause: Cyclone Mora Casualty: 2 dead people ¹⁶
4. Earthquake			
(1)	Jul. 1999	Moheshkhali Upazila	Magnitude: 5.2 ¹⁷ Casualty: 6 dead people and over 200 injured people Damaged House: More than 700
(2)	Jul. 2003	City of Cox's Bazar and Moheshkhali Union	Magnitude: 5.7 ¹⁸ Buildings developed cracks.

¹¹ Bangladesh meteorological Department (2017), Report on Cyclone 'Roanu' (Bangladesh meteorological Department)

¹² Bangladesh | 2017 Severe Cyclonic Storm Mora
<https://reliefweb.int/report/bangladesh/bangladesh-2017-severe-cyclonic-storm-mora-office-un-resident-coordinator-flash-0>

¹³ <https://reliefweb.int/report/bangladesh/landslide-kills-six-southeast-bangladesh>

¹⁴ <https://reliefweb.int/report/bangladesh/landslide-kills-10-bangladesh-several-injured>

¹⁵ Bangladesh: Landslides - Situation Report No.176, <https://reliefweb.int/report/bangladesh/bangladesh-landslides-situation-report-no176>

¹⁶ Emergency Response Coordination Centre (ERCC) – DG ECHO Daily Map | 14/06/2017

¹⁷ <https://reliefweb.int/map/bangladesh/bangladesh-landslides-dg-echo-daily-map-14062017>

¹⁸ <https://earthquake.usgs.gov/earthquakes/eventpage/usp0009bys/executive>

¹⁹ <https://earthquake.usgs.gov/earthquakes/eventpage/usp000c3ex/executive>

3.2 Target Hazards of this Plan

Apart from the above, there are several types of other disasters that can also cause damage to this Upazila. This Plan targets all the possible hazards in the Upazila including lightning and drought, whereas it was decided that the following hazards were objectively and scientifically analyzed and shown by maps to identify the spatial distribution of hazard potential in the Upazila in terms of relatively frequency and potential for occurrence.

- Flood
- Storm surge
- Sediment disaster
- Earthquake Shaking

3.3 Hazard Map and Disaster-Prone Areas by Each Hazard

3.3.1 Flood

Figure 3-1 shows a flood hazard map for Cox's Bazar Sadar Upazila estimated by using a 2-days rainfall of a 20-year return period. According to the map, the area along the Bakkhali River is most prone to flooding in Cox's Bazar Sadar Upazila. Especially, in Patali Machhuakhali Union, the depth of flooding is generally more than 1.8 m. The Union is situated in the downstream section and low-lying areas of the Bakkhali River basin, where the flat terrain prevents smooth drainage. Some areas of Jhilwanja Union, Khurushkul Union and Cox's Bazar Paurashava are also affected by river flooding, although the extent of flooding is not as large. Since these areas are situated near the mouth of the Bakkhali River, the flow of floodwater is significantly affected by the tidal level, which sometimes prevents smooth drainage of floodwater. The flood with a depth of more than 0.3 m spreads at the Bharuakhali Khal side of Chauhaidandi and Bharuakhali Unions. Islamabad and Idgaon unions are less prone to flooding. They are largely located at higher elevation areas, thus less likely to be affected by river flooding. In terms of river flooding, Islampur and Pokkhali Unions are less prone to flooding because there are no major rivers situated in these Unions. However, it does not mean these areas are completely safe against flood disasters.

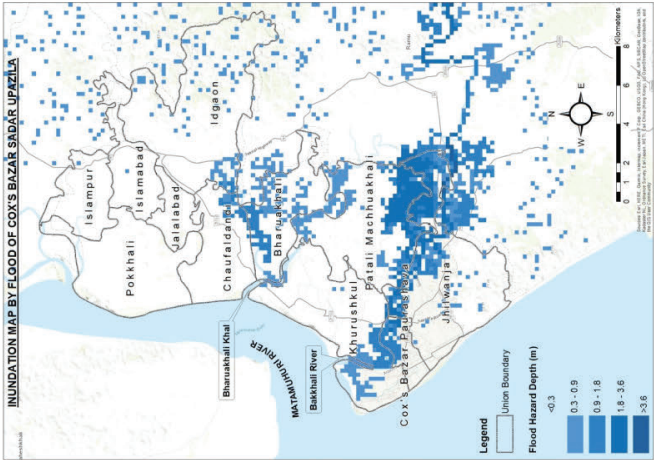


Figure 3-1. River Floods Hazard map in Cox's Bazar Sadar

Analysis:
Probability year:2-days Rainfall for 20-year Return Period (427mm; Ref. JICA Study for Matarbari Sea Port in 2018)
Landform: Satellite-based DEM (AW3D)
Land Cover (Soil Condition): Bangladesh Soil Map available on-line

Notes:

1. The hazard was estimated under no existing embankments of polders.
2. The hazard analysis and risk assessment (Chapter 4.1.1) introduced in this plan does not consider the possible effects of the climate change.
3. When viewing the flood hazard map, users are recommended to consider the elevation of their houses or unions and compare them with the flood depths indicated in the map.
4. Overlaying evacuation routes and shelter locations with the map, is helpful to identify where and how to evacuate before and during flood events.

Figure 3-2 shows a 50-year probability and 100-year probability flood hazard map for this Upazila. As these maps show, the flood affected areas along the Bakkhali River are likely to expand with deeper depth of inundation, especially at Patali Machhuakhali Union. For other Unions, especially in Bharuakhali, the extent of flooding is not much different compared to the situation with a 20-year probability flood, but the risk to human life is considered to be higher due to the increase in the area with flood depth of 0.9 m or greater.

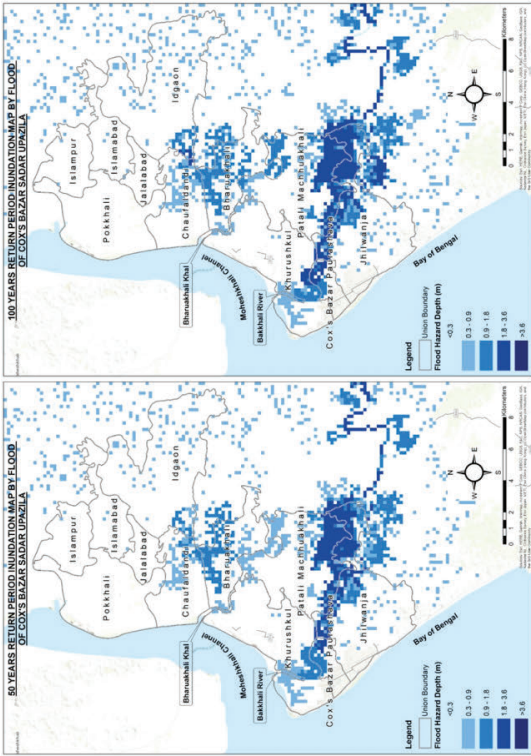


Figure 3-2. River floods hazard maps of large-scale disasters
(Left: 50-year return period, Right:100-year return period)

Analysis:
Probability year:2-days Rainfall for 50-year Return Period and 100-year Return Period (50-year - 469mm, 100-year - 511mm; Ref. JICA Study for Matarbari Sea Port in 2018)
Landform: Satellite-based DEM (AW3D)
Land Cover (Soil Condition): Bangladesh Soil Map available on-line

Notes: See the Notes of Figure 3-1

3.3.2 Storm Surge

Figure 3-3 shows a 20-year probability storm surge hazard map for Cox's Bazar Sadar Upazila. According to the map, the following areas are vulnerable to inundation by the storm surge: 1) the area surrounding the airport, 2) the area along Bakkhali River, 3) the area along Bharuakhali Khal, and 4) the area along Moheshkhali Channel. The area surrounding the airport in Khurushkul Union is inundated with a depth of

more than 1.0 m since it is a low-lying area located at the river mouth of the Bakkhali River. The areas along the Bakkhali River are inundated by more than 1.0 m due to the storm surge running up the river. Especially, in Patali Machhuakhali Union, the inundated area spreads in low-lying areas of the polder through the canals connected to the Bakkhali River. In addition to these areas, the area along Bharuakhali Khal is affected by the storm surge running up the river and canals. The cause of inundation in Islampur Union is the same. The inundation in the area along the Moheshkhali Channel of Pokkhali Union is caused by the storm surge running up the Channel. The inundated area is not extended along the Bay of Bengal in Jhiliwanja Union because the hill is located behind the coastline.

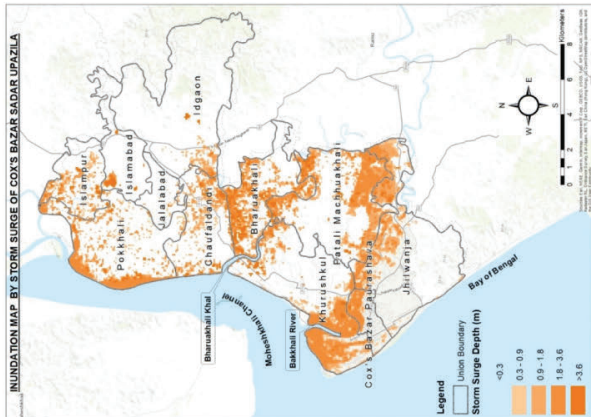


Figure 3-3. Storm Surge Hazard map in Cox's Bazar Sadar

Analysis:
Probability year: 20-year probability storm surge estimated based on probabilistic analysis by using the historical tide observation data.
Landform: Satellite-based DEM (AW3D)

Notes:

1. The results of the probabilistic analysis might be changed if a severe disaster occurs. The inundation area might be larger if much larger disasters are considered.
2. Hazard was estimated under no existing embankments of polders.
3. The water level is assumed completely flat from coastline to inland.
4. The hazard analysis and risk assessment (Chapter 4.1.2) introduced in this plan does not consider the possible effects of the climate change.

Figure 3-4 shows a 50-year probability and 100-year probability of storm surge hazard map for this Upazila. As these maps shows, the storm surge affected areas are almost the same as those of 20-year probability storm surge, although the inundation depth and area are gradually increased. The reason is because the slope of the probability function of storm surge is relatively gentle based on the results of tide observation.

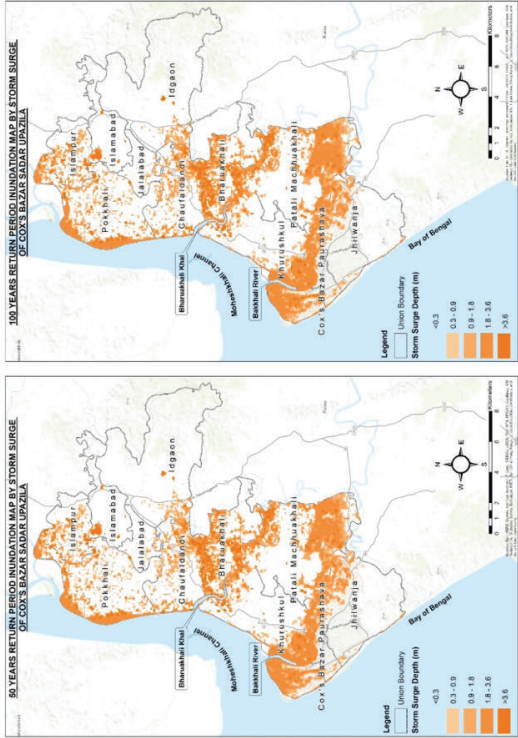


Figure 3-4. Storm surge hazard maps of large-scale disasters
(Left: 50 year return period, Right: 100 year return period)

Analysis:
Probability year: 50-year and 100-year probability storm surge estimated based on probabilistic analysis by using the historical tide observation data.
Landform: Satellite-based DEM (AW3D)
Note: See the Notes of Figure 3-3

3.3.3 Sediment Disasters

3.3.3.1 Slope Failure

According to the slope failure hazard map shown in Figure 3-5, in Cox's Bazar Sadar Upazila, slope failure can occur mainly in Jhiliwanja Union and the eastern area of Idgaon Union with steep slopes. In these areas, it is observed that many steep slopes have been formed by slope cutting for road and house and building construction without any countermeasure. The mechanisms of disasters are mainly slope failures behind roads and settlements and falling rocks and fallen trees from the upper slopes, triggered by above-normal rainfall and earthquakes.

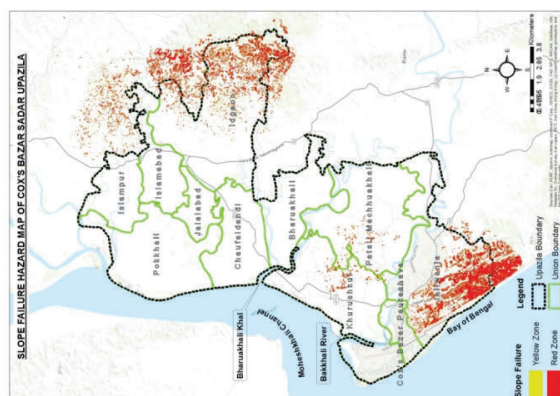


Figure 3-5. Slope Failure Hazard Map in Cox's Bazar Sadar

<Red Zone:>
Area where there is a high risk of damage to buildings and threat to people. The force acting on buildings due to moving debris and earth of landslides in the Red Zone is expected to be larger than the resistance capacity of normal buildings. Therefore, normal buildings in Red Zone would be completely destroyed by the moving debris and earth of landslide.

<Yellow zone:>
Area that is susceptible to landslide. The resistance capacity of normal buildings in Yellow Zone is expected to be larger than the force acting on buildings due to the moving debris and earth of landslide.

Analysis:

Hazard zone: Calculated by using GIS software and an application elaborated by the Project Team
Landform: Elevation data that was elaborated using spot height, and contour data obtained from digital 1/25,000 topographic map of SOB. (Resolution: 5m)

Notes:

1. It is a simplified method to calculate Hazard Zones (Red and Yellow zones) based only on topographic information.
2. The map shows areas where disaster can occur triggered by heavy rain fall and earthquake.
3. It is recommended to monitor precursor phenomenon such as small rocks falling from the slope, occurrence of cracks in the cliff, water gushing out from the cliff, spring water drying up, river water turbidity (muddy water flow), etc.

3.3.3.2 Debris Flow

The debris flow can occur in the southeastern area of Jhiliwanja Union, near the border between Cox's Bazar Sadar and Ramu Upazilas, the area surrounded by the roads N1 and Z1132 in Chaufaldandi and Idgaon Unions, and the southeastern and northern areas in Idgaon Union.



Figure 3-6. Debris Flow Hazard Map in Cox's Bazar Sadar

Analysis:

The algorithm to calculate debris flow hazard levels is based on Flow-R algorithm.

3.3.4 Earthquake Shaking

Figure 3-7 shows an earthquake shaking hazard map for Cox's Bazar Sadar Upazila. The earthquakes in Cox's Bazar District can be mainly caused by the collision of the Indian and Eurasian tectonic plates, which creates a complex fault system in the region. The southwestern unions including Cox's Bazar Paurashava, Khurshkul and Jhilwanja Unions, and the northeastern unions including Islamabad and Idgaon Unions, are estimated with relatively weak shaking rather than other unions including Islampur, Pokkhali, Jalalabad, Chaulaidandi, Bharuakhali and Patali Machhuakhali Unions.

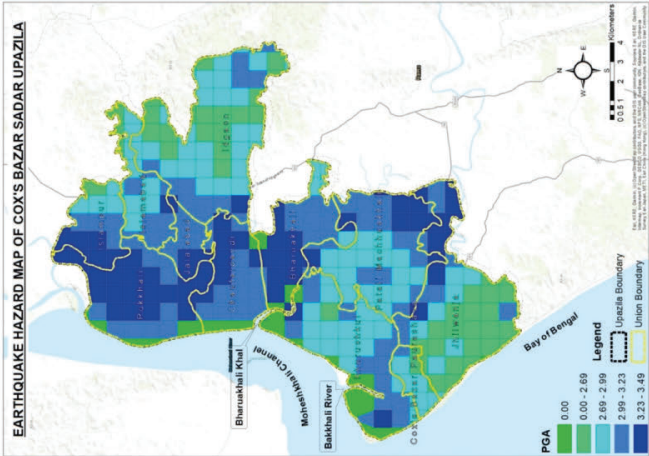


Figure 3-7. Earthquake Hazard map in Cox's Bazar Sadar

Analysis: The PGA was estimated considering the ground conditions in Cox's Bazar Sadar Upazila based on the seismic zoning described in the Bangladesh National Building Code (BNBC) 2020.
Vs30 model: the time-averaged shear-wave velocity to 30 m depth <<https://earthquake.usgs.gov/data/vs30/>>
Formula for estimation of the surface soil amplification factor: Midorikawa et al. (1994) <https://isee.kenken.go.jp/eqflow/reference/4_1.htm>

Notes:

1. Hazard maps are not perfect. Actual situations may not follow the hazard maps exactly.
2. Each union shows also various PGA values based on its characteristic local topography and on-site sediment conditions.
3. The estimated results should be re-calculated if the reference data or assumptions are updated.

Chapter-4. Disaster Risk and DRR Targets of the Upazila

4.1 Disaster risk

4.1.1 Flood

The flood risk in the Upazila was estimated focusing on three major assets to be protected: paddy fields, settlement areas, as well as important infrastructures and public facilities. By overlaying the flood hazard map on these areas, the affected areas can be identified.

In general, the countermeasures against floods include 1) river and canal improvement such as construction of embankments, dredging and widening to increase flow capacity, 2) construction of retarding basins/reservoirs to temporarily store a portion of flood water, and 3) drainage improvement such as installation of sluice gates and pumping stations to drain the flood water to nearby rivers.

(1) Damage estimation of paddy field affected by flood

As shown in Figure 4-1 and Figure 4-2, the most vulnerable unions to flooding are Jhilwanja and Patali Machhuakhali Upazilas along Bakkhali River, due to the flooding of the river and canals in the polder connected to Bakkhali River. The inundation areas are approximately 390 m2 and 490 m2, respectively. Especially, 57 % of the inundated area in Patali Machhuakhali Upazila has a flooding depth of more than 1.8m.

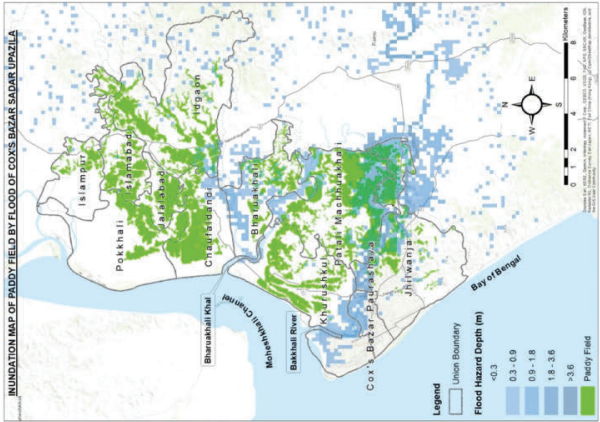


Figure 4-1. Inundated Paddy Field by 20-year Return Period Flood

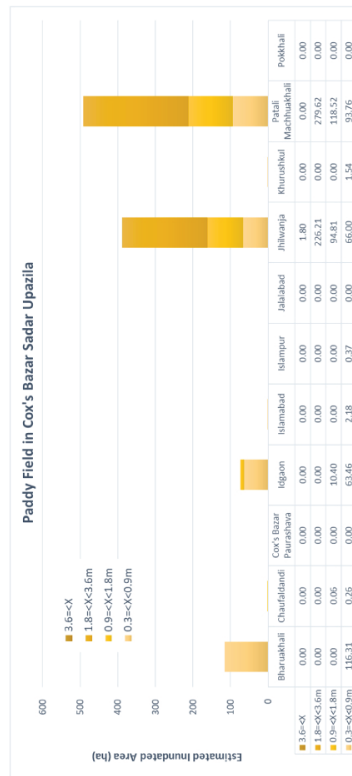


Figure 4-2. Inundated Area of Paddy Field by 20-year return period flood

Total Economic loss estimated based on the areas of the inundated paddy fields, reaches about 209 million Taka. Patali Machhuakhali Union is most affected with about 96 million, followed by Jhilwanja Union with 76 million Taka.

Table 4-1. Estimated Economic Loss by Flood

Union	Area of Inundated Paddy Field (≥ 0.3m) [ha]	Ratio (Inundated Area / All Paddy Field)	Estimated Economic Loss [Thousand Taka]
Bharauskhali	116.31	30.8%	22,674
Chaukaidandi	0.32	0.1%	63
Cox's Bazar Paurashava	0.00	-	0
Idgaon	73.86	9.3%	14,399
Islambad	2.18	0.5%	426
Islampur	0.37	0.3%	73
Jalalabad	0.00	0.0%	0
Jhilwanja	388.83	69.8%	75,802
Khurushkul	1.54	0.3%	301
Patali Machhuakhali	491.90	42.2%	95,896
Pokkhali	0.00	0.0%	0
Total	1,075.32	30.8%	209,633

Notes: 1. 5.57 ton/ha of rice yield was used to estimate amount of affected rice production, which is based on data in "Yearly Production and Damage Report on Agriculture of Cox's Bazar Sadar Upazila, DAE" (2019, 2020 and 2021). <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0261128>

2. The Unit price of rice was calculated with the data above (Note 1), to be 35 Taka/kg.

(2) Damage estimation of settlement area by flood

Figure 4-3 shows that the area around the airport on the left side of the Bakkhali River mouth and the area on the right side of the Bakkhali River are most severely affected by the flooding of the river and canals in the polder connected to the river. Comparing the affected settlement areas by the union, Jhilwanja and Patali Machhuakhali Unions are the most affected with approximately 250 m² and 130 m², respectively. The flooding depth in the Upazila ranges from 0.3 m to 3.6 m in most areas.

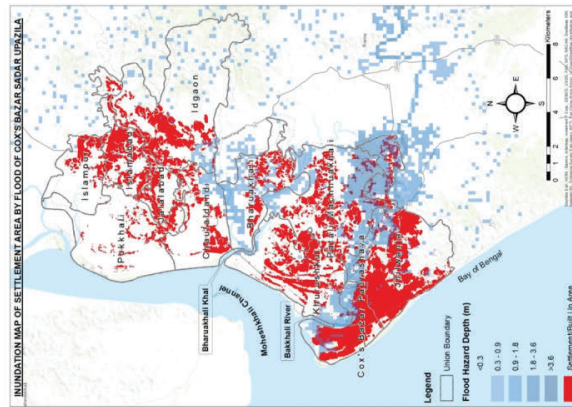


Figure 4-3. Inundated Settlement by 20-Year Return Period Flood

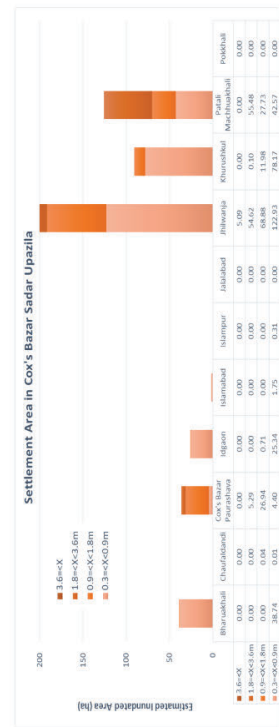


Figure 4-4. Inundated Area of Settlement by 20-Year Return Period Flood

In terms of the population numbers, Cox's Bazar Paurashava is the most vulnerable to flooding, while the Union with the highest percentage of affected population is Jhilwanja Union (Figure 4-5 and Table 4-2).

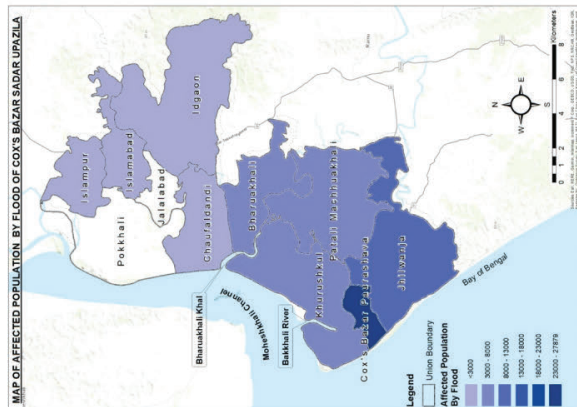


Figure 4-5. Affected Population by 20-Year Return Period Flood

Union	Population (Census, 2022)	Affected Population	Percentage
Bharauchhali	26,662	3,409	12.8%
Chaurajidangi	33,506	6	0.0%
Cox's Bazar Paurashava	196,378	27,879	14.2%
Idgaon	42,561	1,746	4.1%
Islamabad	33,608	126	0.4%
Islampur	26,762	45	0.2%
Jalalabad	22,330	0	0.0%
Jhilwanja	59,580	10,815	18.2%
Khurushkul	54,958	5,054	9.2%
Patali Machhuakhali	46,256	7,547	16.3%
Pokkhali	24,304	0	0.0%
Total	566,905	56,627	10.0%

(3) Damage estimation of important facilities and infrastructures by flood

Figure 4-6 and Table 4-3 illustrates the damage estimation of the DRR-related important facilities and infrastructures in this Upazila, namely roads and bridges, government offices, schools and shelters, and hospitals, in consideration of the disaster management and emergency operation. As the Figure and the Table show, roads and public facilities in Jhilwanja Union, Patali Machhuakhali Union, and Bharauchhali Union are relatively severely affected by the flood.

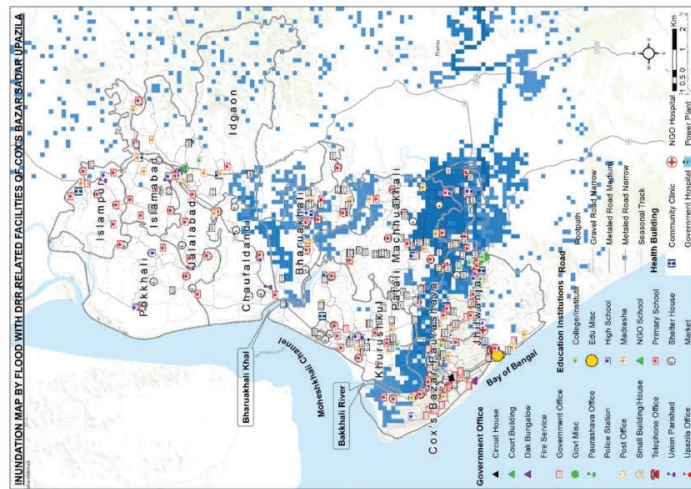


Figure 4-6. Inundation map by flood with DRR-related facilities and infrastructures¹⁹

¹⁹ In this analysis, the facilities means government facilities (government office, government miscellaneous buildings, Paurashava office, Upazila office, Union Parishad office, fire service, police station, telephone office), education institutions (college/institute, educational miscellaneous buildings, high school, Madrasah, NGO school, Primary school), Shelter House, and health building (Community clinic, Government hospitals, NGO hospital), and Power plant that are in the dataset of SOB. The data may not show all the current facilities and infrastructures and does not always show the exact locations due to its research/published year and its data scale.

Data source: SOB: "This map sheet has been compiled by digital photogrammetric method using colored aerial photographs of 50cm GSD taken during 2010-12 and also SPOT imagery of 2.5 m resolution acquired in 2011 and verified on the ground during 2014-2015.
Flood hazard map of 20-year return period (see Chapter 3.3.1)

Table 4-3. Flood affected facilities and infrastructure by Union

Union Name	Road length (m)		RRR-related important facilities (no.)		(Reference) Bridges	
	Total	Inundated (≥ 0.3m)	Total	Inundated (≥ 0.3m)	Total	Inundated (≥ 0.3m)
Bharuakhali	69,997.7	27,421.1	39.2%	23	3	13.0%
Chaufaldandi	42,182.3	0.0	0.0%	15	0	0.0%
Cox's Bazar Paurashava	44,150.5	7,475.2	16.9%	51	6	11.8%
Idgaon	60,085.6	2,904.6	4.8%	16	1	6.3%
Islamabad	35,619.8	0.0	0.0%	20	0	0.0%
Islampur	18,163.4	0.0	0.0%	15	0	0.0%
Jalalabad	3,334.9	0.0	0.0%	4	0	0.0%
Jhilwanja	104,207.7	35,853.8	34.4%	78	11	14.1%
Khurushkul	63,941.0	7,079.3	11.1%	47	0	0.0%
Patali Machhuakhali	51,539.0	12,562.3	24.4%	36	7	19.4%
Pokkhali	18,564.6	0.0	0.0%	16	0	0.0%

4.1.2 Storm Surge

The storm surge risk in the Upazila was estimated focusing on three major assets to be protected: paddy fields, settlement areas, as well as important infrastructures and public facilities. By overlaying the storm surge map on these areas, the affected areas can be identified.

Generally, the countermeasures against storm surges include 1) the construction of dyke, seawall/guide wall and revetments along the coastline to protect inland areas, and 2) the construction of river embankments to prevent rivers from overtopping when seawater runs up through rivers.

(1) Damage estimation of paddy field affected by storm surge

As shown in Figure 4-7 and Figure 4-8, the most vulnerable unions to storm surge are Patali Machhuakhali and Jhilwanja Unions along Bakkhali River, due to the flooding of the river and canals in the polder connected to Bakkhali River. The inundation areas are approximately 670 m² and 400 m², respectively. Especially, half of the area in Patali Machhuakhali Union has a flooding depth of more than 1.8m.

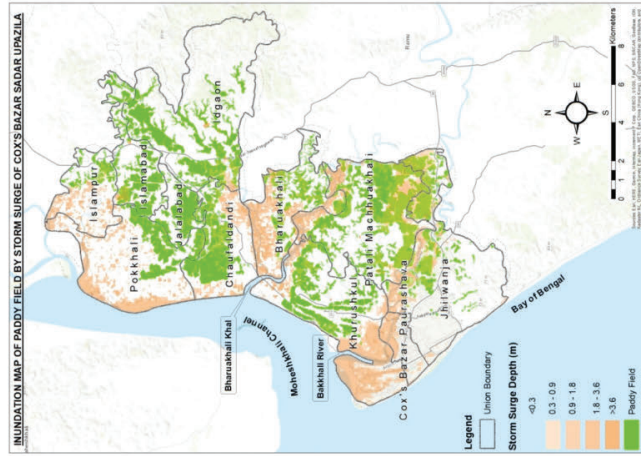


Figure 4-7. Inundated Paddy Field by 20-Year Return Period Storm Surge

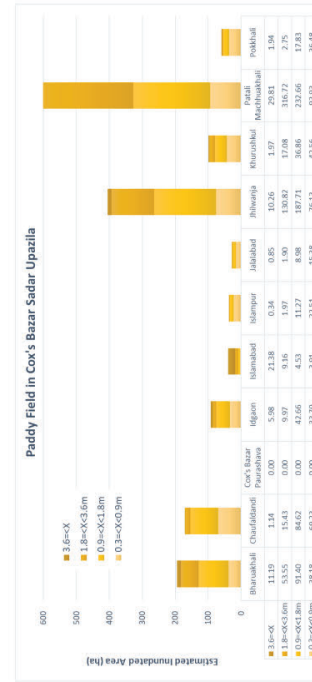


Figure 4-8. Inundated Area of Paddy Field by 20-year Return Period Storm Surge

Total Economic loss estimated based on the areas of the inundated paddy fields, reaches about 350 million Taka. Patali Machhuakhali Union is most affected with about 131 million, followed by Jhilwanja Union with 79 million Taka.

Table 4-4. Estimated Economic Loss by Storm Surge

Union	Area of Inundated Paddy Field (≥ 0.3m) [ha]	Ratio All Paddy Field	Estimated Economic Loss [Thousand Taka]
Bharuakhali	194.32	51.4%	37,882
Chauldandi	170.43	29.2%	33,225
Cox's Bazar Paurashava	0.00	-	0
Idgaon	92.32	11.6%	17,997
Islamabad	38.98	9.5%	7,600
Islampur	36.09	28.7%	7,036
Jalalabad	27.11	9.8%	5,286
Jhilwanja	404.92	72.7%	78,939
Khurushkul	98.48	18.0%	19,198
Patali Machhuakhali	673.11	57.8%	131,223
Pokkhali	59.00	15.6%	11,502
Total	1,794.76	34.4%	349,888

Notes: 1. 5.57 ton/ha of rice yield was used to estimate amount of affected rice production, which is based on data in "Yearly Production and Damage Report on Agriculture of Cox's Bazar Sadar Upazila, DAE" (2019, 2020 and 2021).
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0261128
2. The Unit price of rice was calculated with the data above (Note 1), to be 35 Taka/kg.

(2) Damage estimation of settlement area by storm surge

Figure 4-9 shows that the area around the airport on the left side of the Bakkhali River mouth and the area on the right side of Bakkhali River, are most severely affected by the flooding of the river and canals in the polder connected to the river. Comparing the affected settlement areas by the Union, Khurushkul and Patali Machhuakhali Unions are the most affected with approximately 270 m² and 110 m², respectively. The flooding depth in the Upazila ranges from 0.3 m to 3.6 m in most areas.

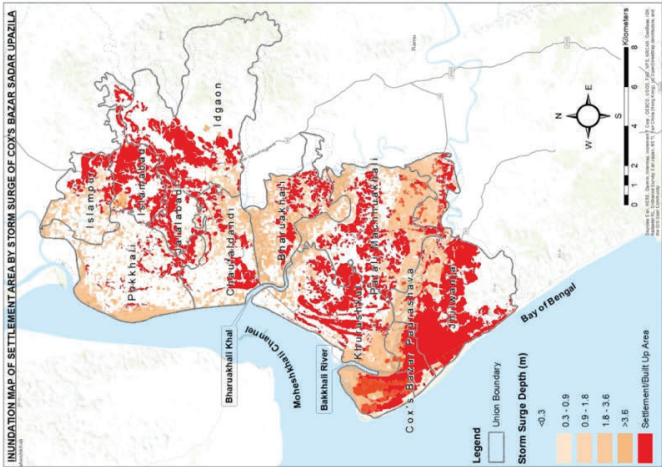


Figure 4-9. Inundated Settlement by 20-year Return Period Storm Surge

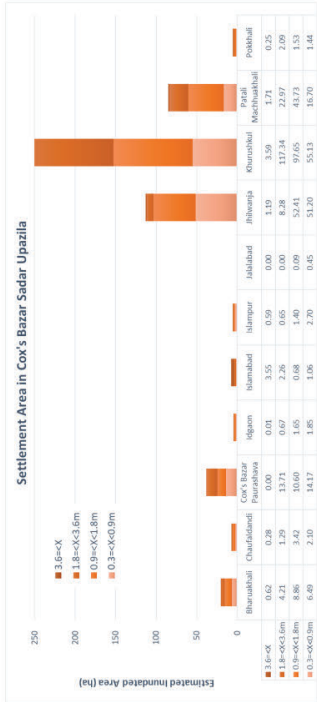


Figure 4-10. Inundated Area of Settlement by 20-year Return Period Storm Surge

In terms of the population numbers, Cox's Bazar Paurashava is the most vulnerable to flooding, while the Union with the highest percentage of affected population is Khurushkul Union (Figure 4-11 and Table 4-5).

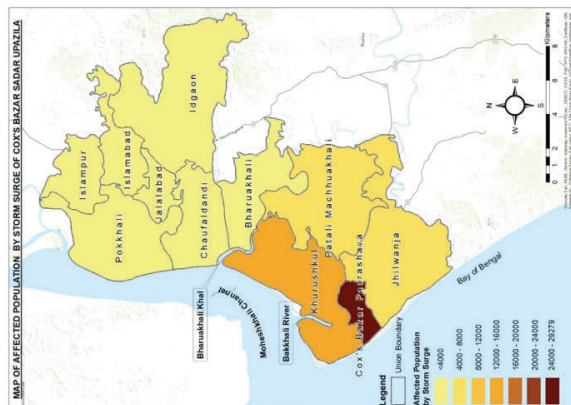


Figure 4-11. Affected Population by 20-Year Return Period Storm Surge

Table 4-5. Storm Surge Affected Population by Union

Union	Population (Census, 2022)	Affected Population	Percentage
Bharuakhali	26,662	1,775	6.7%
Chaufaldandi	33,506	774	2.3%
Cox's Bazar Paurashava	196,378	29,279	14.9%
Idgaon	42,561	280	0.7%
Islamabad	33,608	544	1.6%
Islampur	26,762	776	2.9%
Jalalabad	22,330	56	0.2%
Jhilwanja	59,580	4,862	8.2%
Khurushkul	54,958	15,328	27.9%
Patali Machhuakhali	46,256	5,107	11.0%
Pokkhali	24,304	643	2.6%
Total	566,429	59,424	10.5%

(3) Damage estimation of important facilities and infrastructures by Storm Surge

Figure 4-12 and Table 4-6 illustrate the damage estimation of the DRR-related important facilities and infrastructures in this Upazila, namely roads and bridges, government offices, schools and shelters, and hospitals, which is in consideration of the disaster management and emergency operation. As the Figure and the Table show, while roads in Chaufaldandi and Pokkhali are expected to relatively be severely affected by storm surge, public facilities are more at risk in Patali Machhuakhali Union and Khurushkul Union.

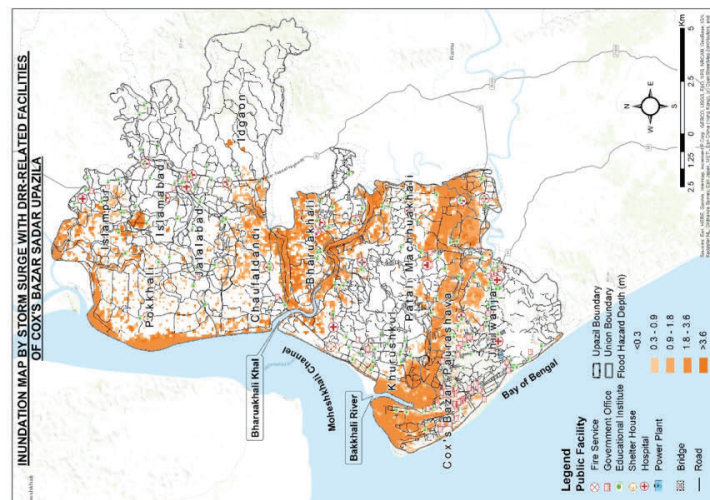


Figure 4-12. Inundation map by storm surge with DRR-related facilities and infrastructures²⁰

²⁰ In this analysis, the facilities means government facilities (government office, government miscellaneous buildings, Paurashava office, Upazila office, Union Parishad office, fire service, police station, telephone office), education institutions (college/institute, educational miscellaneous buildings, high school, Madrasa, NGO school, Primary school), Shelter House, and health building (Community clinic, Government hospitals, NGO hospital), and Power plant that are in the dataset of SOB. The data may not show all the current facilities and infrastructures and does not always show the exact locations due to its research/published year and its data scale.

Data source: SOB: "This map sheet has been compiled by digital photogrammetric method using colored aerial photographs of 50cm GSD taken during 2010-12 and also SPOT imagery of 2.5 m resolution acquired in 2011 and verified on the ground during 2014-2015.
Storm Surge hazard map of 20-year return period (see Chapter 3.3.2)

Table 4-6. Storm Surge affected facilities and infrastructure by Union

Union Name	Road length (m)			DRR-related Important facilities (no.)			(Reference) Bridges		
	Total	Inundated (≥ 0.3m)	Total	Total	Inundated (≥ 0.3m)	%	Total	Inundated (≥ 0.3m)	%
Bharuakhali	69,997.7	54,972.3	78.5%	23	0	0.0%	10	2	20.0%
Chaufaldandi	42,182.3	36,443.9	86.4%	15	1	6.7%	1	0	0.0%
Cox's Bazar Paurashava	44,150.5	31,506.7	71.4%	51	1	2.0%	4	0	0.0%
Idgaon	60,085.6	23,233.0	38.7%	16	0	0.0%	6	0	0.0%
Islamabad	35,619.8	13,192.8	37.0%	20	1	5.0%	2	0	0.0%
Islampur	18,163.4	12,293.0	67.7%	15	1	6.7%	1	0	0.0%
Jalalabad	3,334.9	821.3	24.6%	4	0	0.0%	0	0	0.0%
Jhiliwanja	104,207.7	63,141.7	60.6%	78	7	9.0%	23	5	21.7%
Khurushkul	63,941.0	29,546.4	46.2%	47	6	12.8%	15	1	6.7%
Patali Machhuakhali	51,539.0	35,133.4	68.2%	36	4	11.1%	32	9	28.1%
Pokkhali	18,564.6	16,039.7	86.4%	16	0	0.0%	1	0	0.0%

4.1.3 Sediment Disaster

Figure 4-13 shows that, in Cox's Bazar Sadar Upazila, sediment disaster risk is concentrated around the south area of the upazila, namely Jhiliwanja Union. In this Union, about 15.9% of settlement area, which is 220.49ha, was evaluated as the red and yellow zones (high risk areas) and it was estimated that approximately 9,500 people live in the area (Figure 4-15 and Table 4-7). Especially, 70 % of affected people are included in the red zone.

Generally, the countermeasures against sediment disasters include 1) slope stabilization /Retaining walls and rock-fall prevention to protect settlement areas from slope failures and rock-falling, and 2) restrictions on development activities.

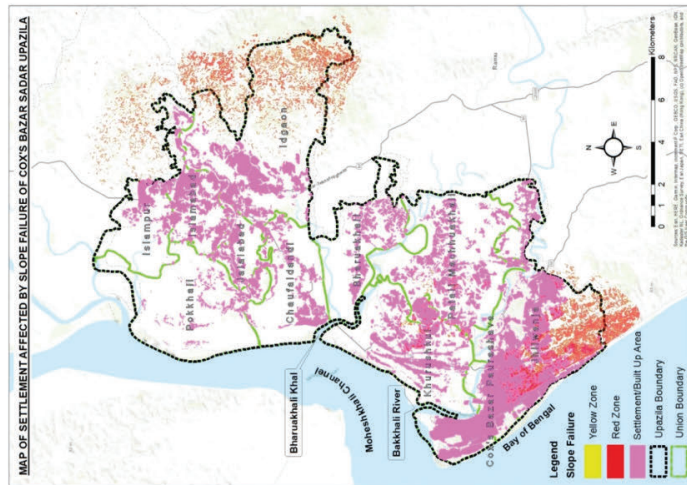


Figure 4-13. Affected Settlement by Slope Failure

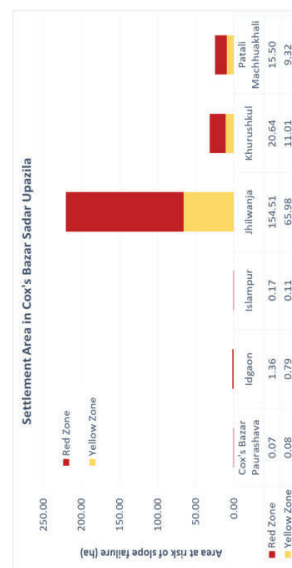


Figure 4-14. Settlement Area Affected by Slope Failure

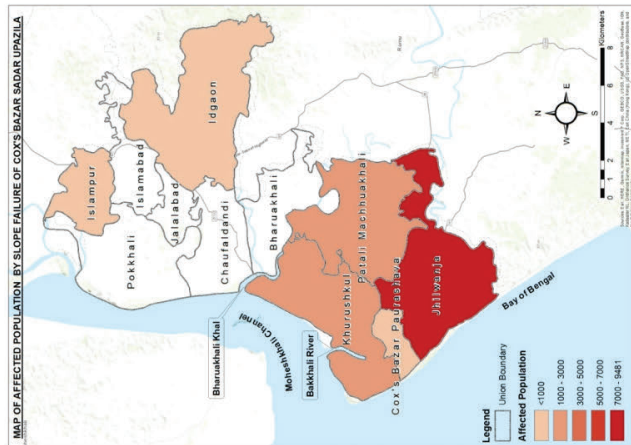


Figure 4-15. Affected Population by Slope Failure

Table 4-7. Damage by Slope Failure

Union	Potential Area (Red+Yellow) [ha]	Ratio (Potential Area / Settlement Area)	Estimated Affected Population
Bharuakhali	0.00	0.0%	0
Chaufaldandi	0.00	0.0%	0
Cox's Bazar Paurashava	0.14	0.1%	109
Idgaon	2.15	0.3%	144
Islamabad	0.00	0.0%	0
Islampur	0.28	0.2%	41
Jalalabad	0.00	0.0%	0
Jhiliwanja	220.49	15.9%	9,481
Khurushkul	31.64	3.2%	1,772
Patali Machhuakhali	24.81	3.2%	1,489
Pokkhali	0.00	0.0%	0

4.1.4 Earthquake Shaking

The risk of earthquake shaking is high due to inadequate seismic resistant buildings in Cox's Bazar Sadar. Figure 4-16 and Table 4-9 shows that Cox's Bazar Paurashava having the largest population in Cox's Bazar District, is most affected by the earthquake shaking, followed by Patali Machhuakhali, Khurushkul, and Jhiliwanja Unions. The ratio of the affected households is highest in Patali Machhuakhali Union. In general, the earthquake resistance measure is to strengthen the buildings, which depends on the economic conditions of each government and household.

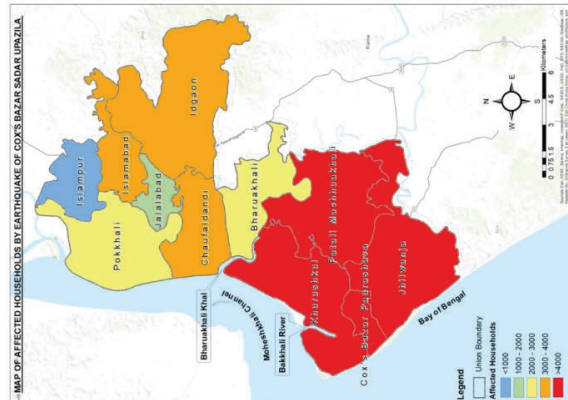


Figure 4-16. Number of Affected Households

Notes: Notes:

1. The concrete values of the average PGA on unions are estimated with variation between 2.84 m/s² and 3.29 m/s².
2. Grade 4 and 5 of the building damage degree in Figure 4-15, was used for estimation of the earthquake risk.
3. The number of affected households was estimated by assuming that one household uses one building based on the number of households and ratio of house types in the Population & Housing Census 2011 below.

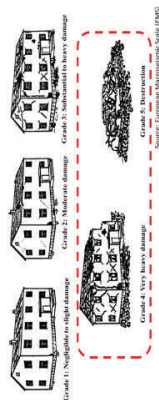


Figure 4-17. Building Damage Degree

Table 4-8. Percentage of Type of Structure and Number of Households

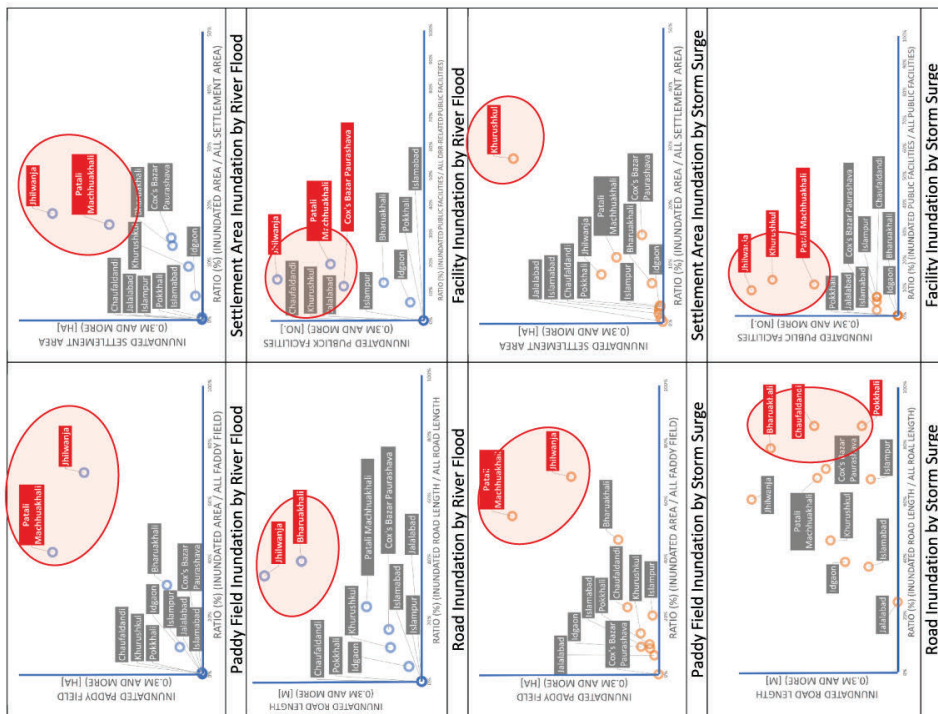
Administrative Unit Residence Community	Number of Households	Percentage of Type of Structure		
		Pucca	Semi_pucca	Kutcha
Cox's Bazar Sadar Upazila Total	81523	11.8	20.4	98.2
Cox's Bazar Paurashava	30374	23.8	30.1	34.1
Bharuakhali Union Total	3939	6.9	10.6	76.2
Chaulaidandi Union Total	9195	0.2	13.7	18.8
Idgaon Union Total	9984	8.5	24.6	68.1
Islampur Union Total	3626	0.3	8.6	73.6
Islamabad Union Total	9275	0.8	16.0	76.2
Jalalabad Union Total	3048	11.4	21.0	60.6
Jhilwanja Union Total	1352	9.1	20.5	96.3
Khurushkul Union Total	6807	3.6	10.2	78.3
Patali Machhuakhali Union Total	6103	0.9	21.9	68.1
Pokkhali Union Total	3820	7.6	16.0	69.6

Table 4-9. Affected Household by Earthquake Shaking

Union	Households (Census, 2011)	Affected Households	Percentage
Bharuakhali	3,939	2,529	64.2%
Chaulaidandi	5,195	3,348	64.5%
Cox's Bazar Paurashava	30,374	13,119	43.2%
Idgaon	5,984	3,109	52.0%
Islamabad	3,626	2,418	66.7%
Islampur	5,275	3,001	56.9%
Jalalabad	3,048	1,791	58.8%
Jhilwanja	7,352	4,011	54.6%
Khurushkul	6,807	4,325	63.5%
Patali Machhuakhali	6,103	4,372	71.6%
Pokkhali	3,820	2,437	63.8%

4.2 Priority Unions for Disaster Risk Reduction

Based on Chapter 4.1, this plan identified high disaster risk unions as the priority unions by disaster. According to the relation between the affected area or population and its ratio in Figure 4-18, the identified priority unions by disaster are shown in Table 4-10. Cox's Bazar Paurashava is included in priority unions of flood and storm surge since it has a much larger affected population compared with other Upazilas.



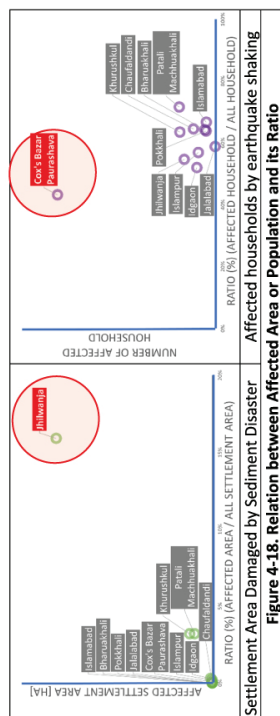


Table 4-10. Priority Unions for Disaster Risk Reduction

Disaster	Priority Union
Flood	Jhilwanja, Patali Machhuakhali, Cox's Bazar Paurashava, Bharuakhali
Storm Surge	Bharuakhali, Cox's Bazar Paurashava, Jhilwanja, Khurushkul, Patali Machhuakhali, Pokhali, Chauhdandi
Sediment Disaster	Jhilwanja
Earthquake Shaking	Cox's Bazar Paurashava

4.3 Disaster Risk Reduction Target

In the risk analysis in Chapter 4.1, the damages by disaster have been calculated. In consideration of this objective estimated results, the target to reduce damages is set as follows.

[Disaster Risk Reduction Target - Mission]

The estimated human and economic damages by each disaster are reduced by 50% within 10 years (from 2023 to 2033).

In order to accomplish the above mission effectively with the limited budget and human resources, the following concrete countermeasures and areas were identified as prioritized areas, based on the risk assessment result identified in Chapter 4.1 and 4.2, as well as consultation results with the UzSC members.

[Disaster Risk Reduction Target- Concrete measures]

- (1) Intensive implementation of countermeasures against disasters in high-risk areas

- 1) Promotion of countermeasures to **reduce inundated area by floods**

- Cox's Bazar Paurashava
- Jhilwanja
- Patali Machhuakhali
- Bharuakhali
- Pokhali

- 2) Promotion of countermeasures to **reduce inundated area by storm surge**

- Cox's Bazar Paurashava
- Bharuakhali
- Jhilwanja
- Khurushkul
- Patali Machhuakhali
- Pokhali
- Chauhdandi

- 3) Promotion of countermeasures to **reduce affected area by slope failure**

- Jhilwanja

- 4) Promotion of countermeasures to **prevent building collapse by earthquake shaking**

- Cox's Bazar Paurashava

- 5) Promotion of improvement of the infrastructure **for emergency operation**

- Cox's Bazar Paurashava
- Bharuakhali
- Jhilwanja
- Khurushkul
- Patali Machhuakhali
- Pokhali
- Chauhdandi

- (2) Comprehensive improvement of the capacity for disaster risk reduction to respond to residual risks and large-scale disasters

- 1) Review of land use plan and restriction of development activities

- Cox's Bazar Paurashava
- Bharuakhali
- Jhilwanja
- Khurushkul
- Patali Machhuakhali
- Pokhali
- Chauhdandi

- 2) Improvement of early warning information and communication system

- All unions

- 3) Implementation of disaster management training and materials

- All unions

- 4) Implementation of education and awareness raising for DRR

- All unions