

II. Damage estimation of the settlement area by flood

Figure 3-12 shows the spatial distribution of expected inundation areas with the settlement areas, and Figure 3-13 illustrates the estimated inundated areas of the settlement areas by union based on the calculated design flood level (24.38 MSL) at Chilmari station of BWDB. Comparing the affected settlement areas by union, Thanarhat has the largest areas (>650 ha), while the others range between 140 and 370 ha. However, settlements in unions like Ashtamir Char, Chilmari and Nayerhat are expected to be largely affected by deep inundation (>1.8 m), which is quite alarming to take into consideration for evacuation facilities. These unions are located in comparably lower elevation areas in dunes and thus are more prone to flooding.

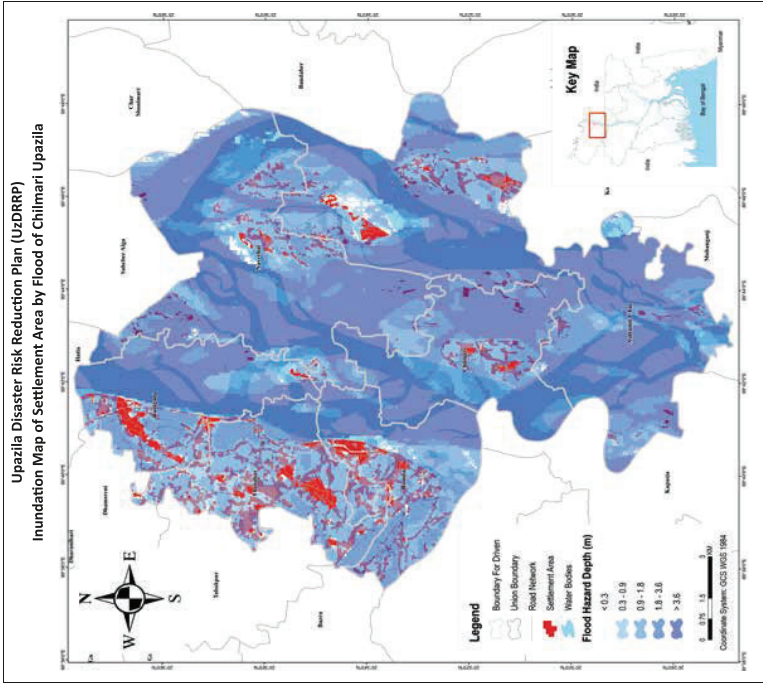


Figure 3-12. Inundated Settlement with danger water level of BWDB

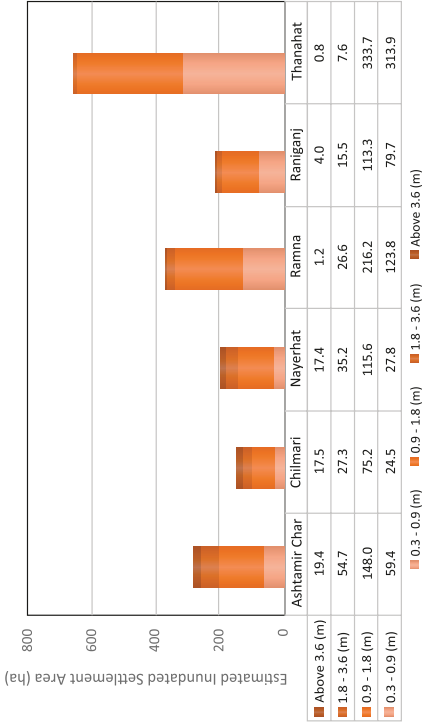


Figure 3-13. Inundated Area of Settlement at danger water level of Chilmari station of BWDB

II. Damage estimation of important facilities and infrastructures by flood

Figure 3-14, 3-15 and Table 3-4 illustrate the damage estimation of the important DRR-related facilities and infrastructures, namely roads and bridges, government offices, schools and shelters, and hospitals, in consideration of the disaster management and emergency operation. Roads are expected to be severely affected by flooding in all unions (>75% of road length), while the estimated flood damage to DRR-related public facilities is concentrated in four unions, which are Ashtamir, Chilmari, Nayerhat, and Ramna, at over 80%.

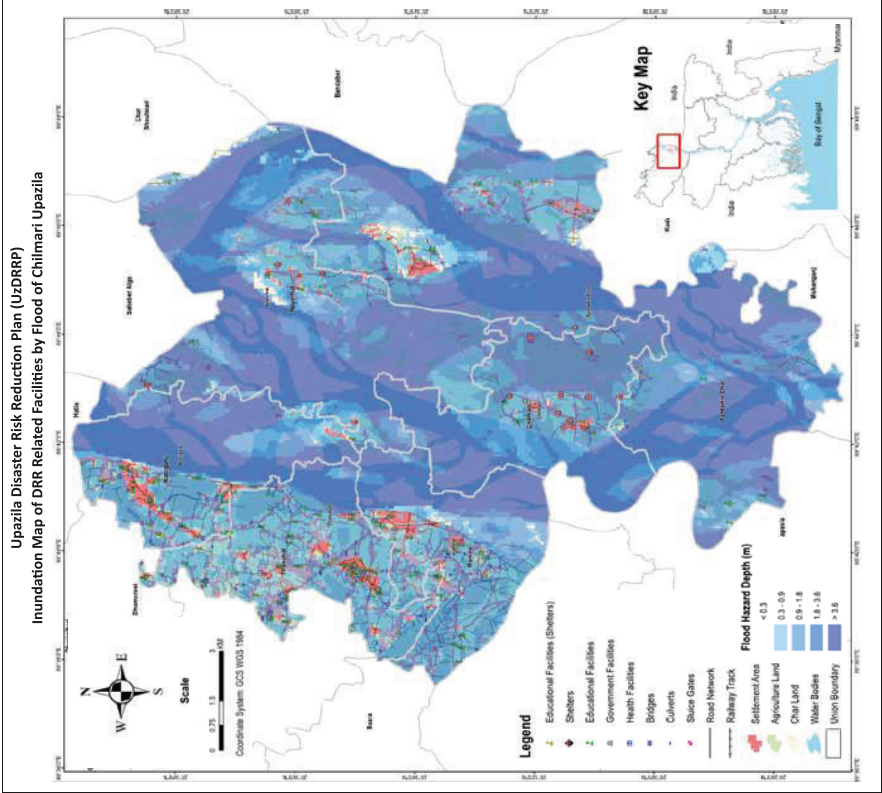


Figure 3-14. Inundated map of DRR-related facilities with danger water level by flood

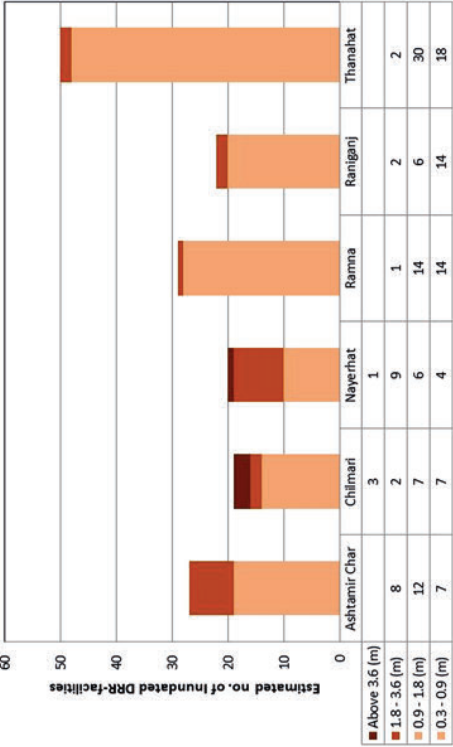


Figure 3-15. Inundated DRR-related facilities by flood in Chilmari Upazila

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

Union Name	Road Length (m)			RRR-related (important) facilities (no.)			(Reference) Bridges, Culverts and Sluice Gates		
	Total	Inundated (≥0.3m)	%	Total	Inundated (≥0.3m)	%	Total	Inundated (≥0.3m)	%
Ashtamir Char	32,009.8	24,865.9	77.7	30	27	90	3	2	66.7
Chilmari	19,332.7	17,700.6	91.6	19	19	100	1	1	100
Nayerhat	22,801.7	20,102.5	88.2	24	20	83.3	1	1	100
Ramna	99,130.1	90,133.5	91	36	29	80.6	18	15	83.3
Raniganj	48,219.9	36,636.5	76	41	22	53.7	15	12	80
Thanahat	131,365.4	114,388	87.1	92	50	54.3	36	36	100

3.3.2 River Erosion

(1) Hazard

Figure 3-16 shows the river erosion hazard map for Chilmari Upazila, using satellite images over the past years to identify the trends in riverbank erosion and then predict the risk areas during the next few years. Ashtamir Union is relatively at high risk of erosion, followed by Nayerhat, Chilmari, and Raniganj.

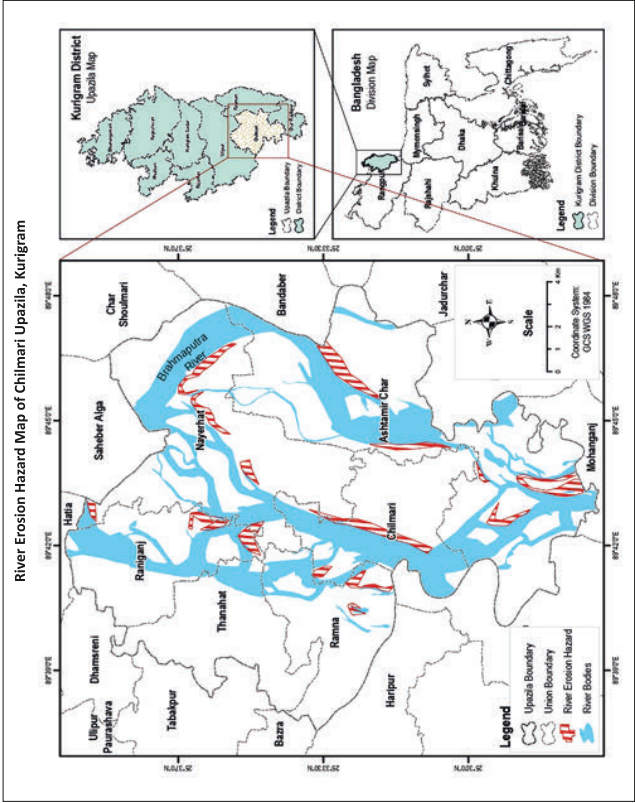


Figure 3-16. River erosion hazard map of Chilmari Upazila

(2) Disaster Risk

Among the unions in Chilmari Upazila, the settlement areas in Nayerhat are expected to be widely affected by river erosion. Approximately 34 ha of 162.1 ha (total settlement area) is predicted to be affected, equivalent to 16% of the area being eroded. Similarly, for agricultural land, in Chilmari union, 181 ha of 1935 ha (total agricultural land) will be affected by river erosion.

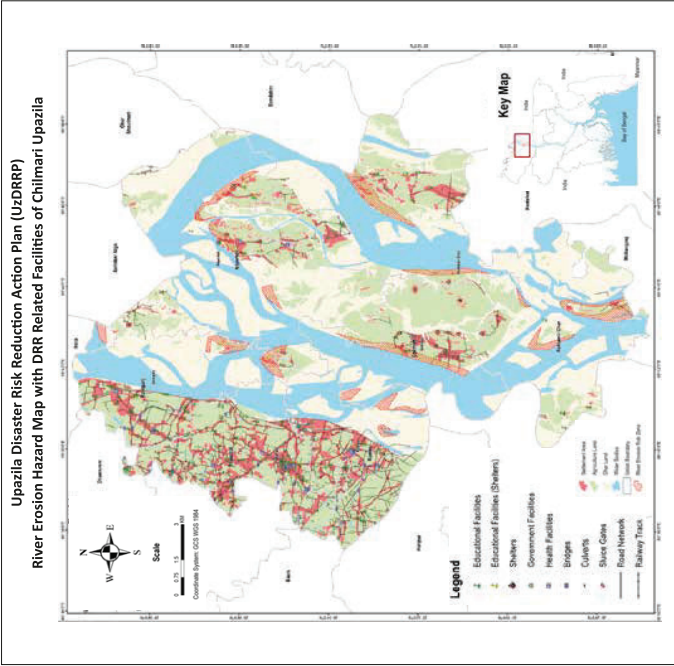


Figure 3-17. River erosion map with land use and DRR-related facilities of Chilmari Upazila

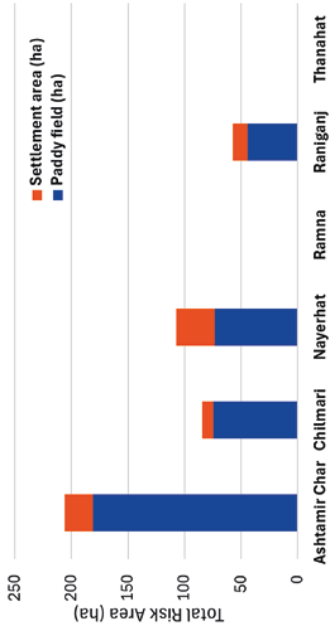


Figure 3-18. River erosion hazard risk on settlement areas and paddy fields in Chilmari

3.3.3 Earthquake Shaking

(1) Hazard

The earthquakes can be mainly caused by the collision of the Indian and Eurasian tectonic plates, which creates a complex fault system in the region. Figure 3-19 shows an average PGA (Peak Ground Acceleration on surface) of each union of Chilmari Upazila, which illustrates the earthquake shaking risk. According to this, the earthquake shaking risks of the unions of Nayerhat and Raniganj are relatively high.

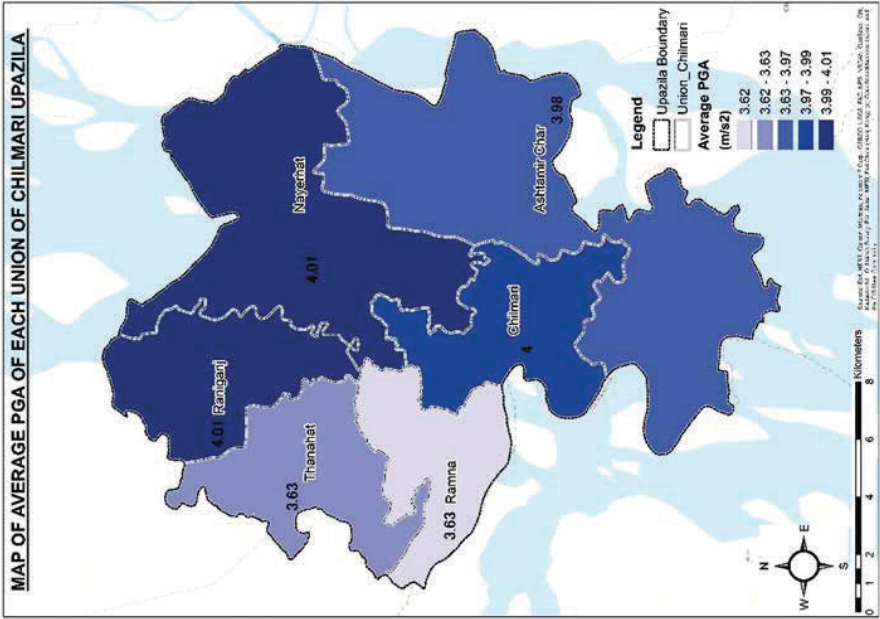


Figure 3-19. Average PGA of each Union of Chilmari Upazila

(2) Disaster Risk

The risk of earthquake shaking is high due to inadequate seismic resistant buildings in Chilmari Upazila. Figure 3-20, 3-21 and Table 3-5 show that Thanahat Union having the largest population in Chilmari Upazila, is expected to be most affected by the earthquake shaking, followed by Ramna and Raniganj Unions. The ratio of the affected households is the highest in Astamir Char, Chilmari and Nayerhat Unions (83%, Figure 3.18b). In general, the earthquake resistance measure is to strengthen the buildings.

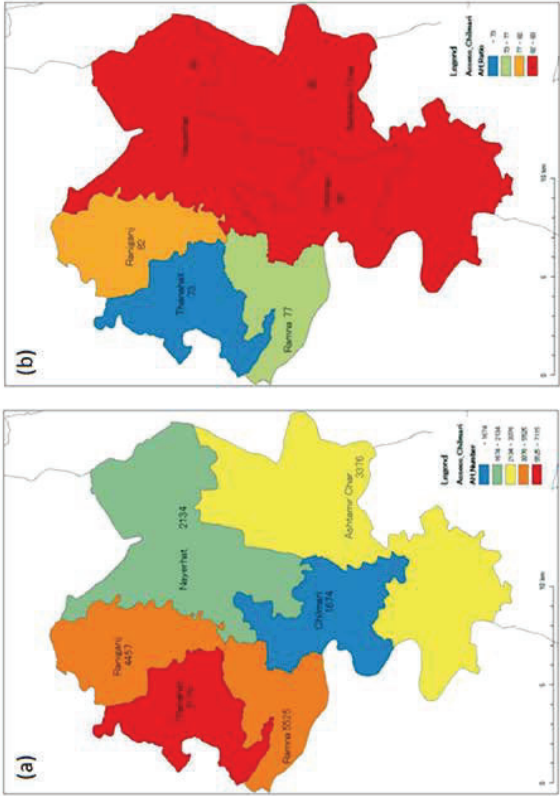


Figure 3-20. (a) Expected Number of Affected Households, (b) Expected ratio of affected households by earthquake shaking in Chilmari Upazila

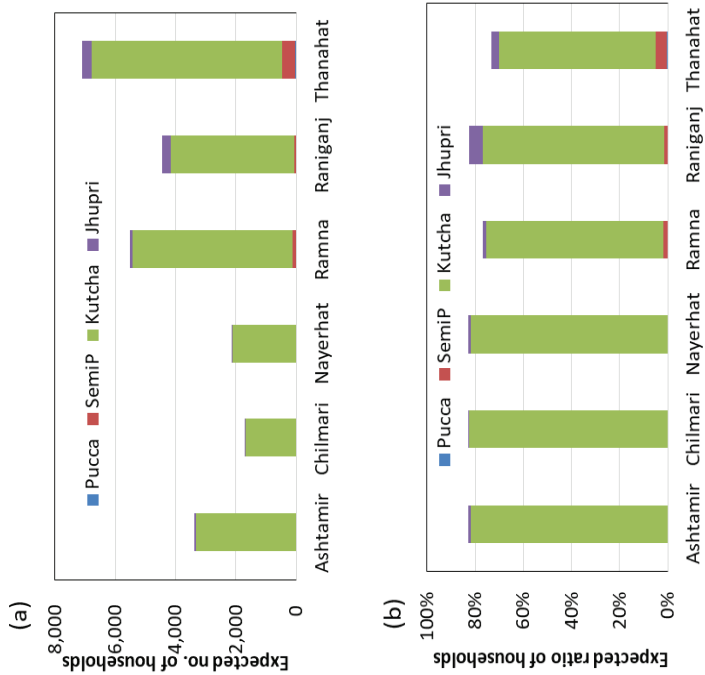


Figure 3-21. (a) Expected number of households, and (b) Expected ratio of households affected by earthquake in Chilmari Upazila

Table 3-5. Affected Household by Earthquake Shaking at Chilmari Upazila

Union	Expected No. of affected Household	Total Household (Census 2011)	Expected ratio of affected households (%)
Ashtamir Char	3376	4077	83%
Chilmari	1674	2024	83%
Nayerhat	2134	2574	83%
Ramna	5525	7188	77%
Raniganj	4457	5405	82%
Thanahat	7115	9698	73%

(2) Higher Risk Unions

Based on the scientific risk assessment results and DRR issues raised by the union parishad, the higher risk unions by flood were revealed as shown in Figure 3-23 and Table 3-6.

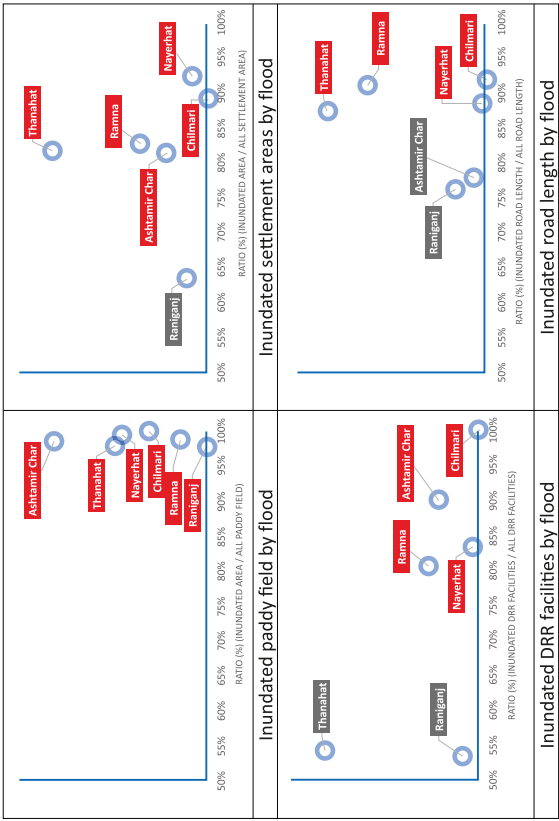


Figure 3-23. Higher risk unions for different disaster risks in Chilmari Upazila

Table 3-5. Affected Household by Earthquake Shaking at Chilmari Upazila

Issues	Higher risk union
Inundated paddy field	All Unions
Inundated settlement areas	Ashtamir Char, Chilmari, Nayarhat, Ramna, Thanahat
Inundated DRR facilities	Ashtamir Char, Chilmari, Nayarhat, Ramna
Inundated road length	Chilmari, Nayarhat, Ramna, Thanahat

3.4.2 River Erosion

(1) DRR Issues

The summary of the DRR issues given by the unions of Chilmari Upazila for river erosion is;

- Loss of houses, livestock housing, and farmland
- Loss and damage to educational facilities and schools
- Road collapses and resulting disruption of transportation systems

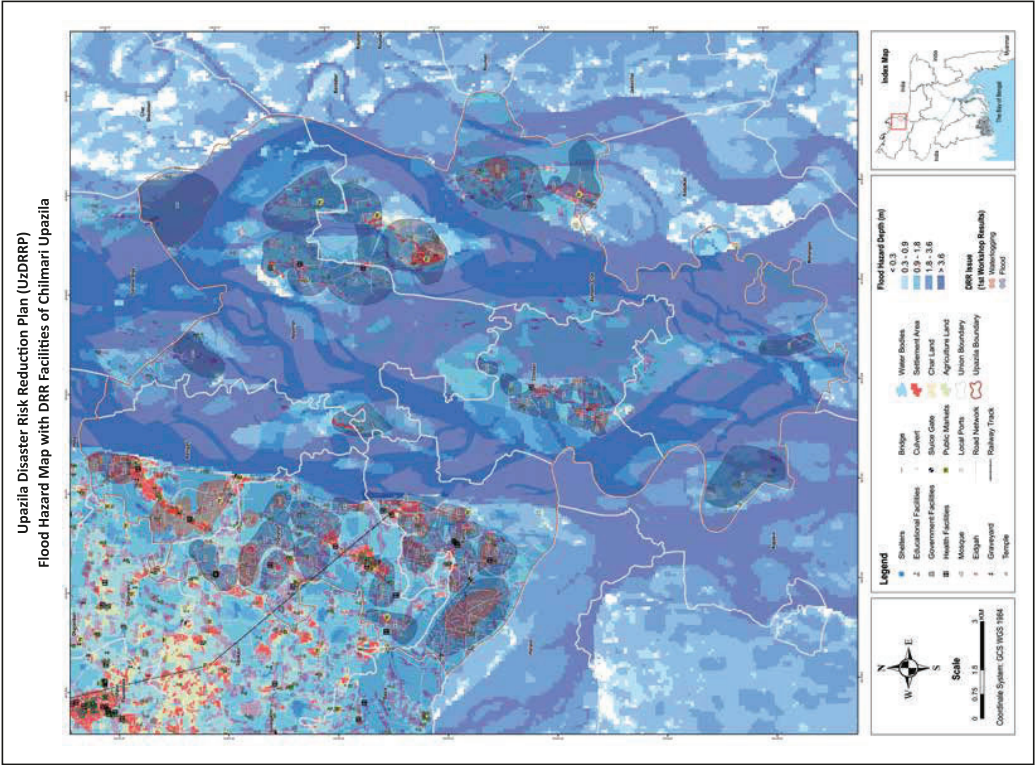


Figure 3-22. Flood hazard map with DRR issue in Chilmari Upazila

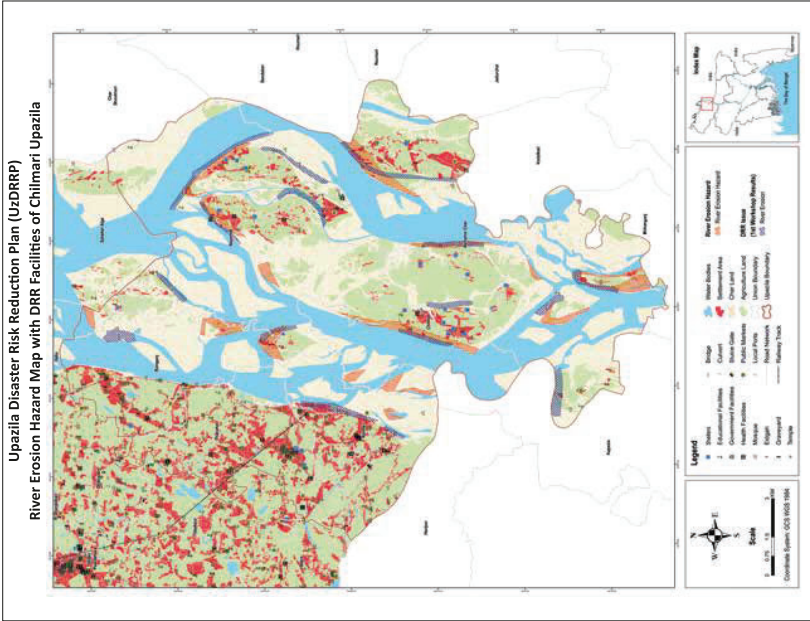


Figure 3-24. River erosion hazard map with DRR issue

(2) Higher Risk Unions

Based on the scientific risk assessment results and DRR issues raised by the union parishad, the higher risk unions by river erosion were **Ashtamir Char, Chilmari, Nayarithat and Raniganj**.

3.4.3 Others

The summary of the DRR issues given by the unions of Chilmari Upazila for other disasters is;

- Loss of life, livestock and injuries due to lightning strikes
- Damage to crops due to lightning strikes
- Reduction in crop production due to lack of water (for drought)
- Increased rearing costs and food shortages for people and livestock due to lack of adequate grass and feed (for drought)

Chapter-4. DRR Target of the Upazila

4.1 Vision

The estimated human and economic damages by each disaster will be reduced by 50% within 10 years (from 2025 to 2035).

4.2 Challenges by Hazard

In order to accomplish the above vision effectively with the limited budget and human resources, the following challenges were identified by hazard.

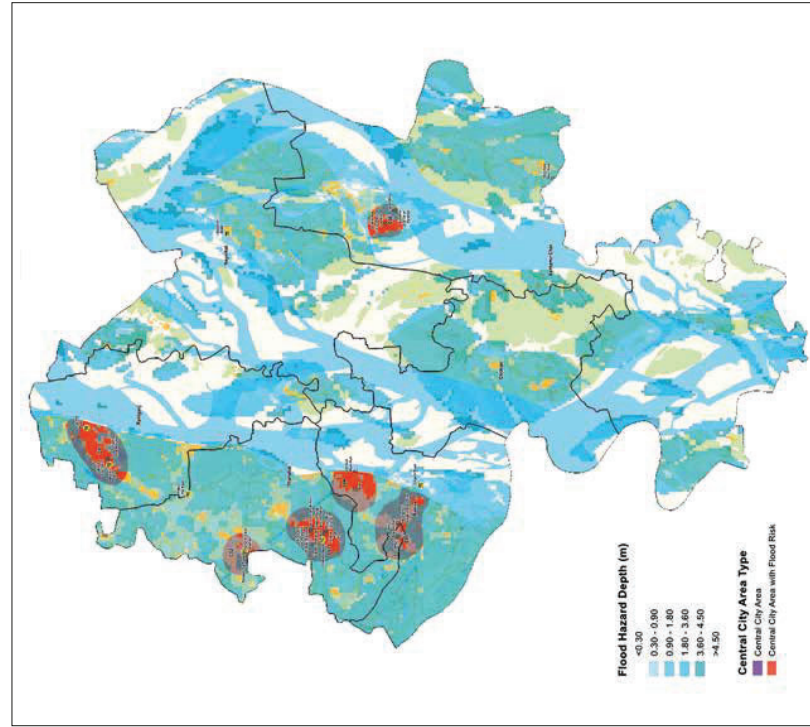
Hazard	Target Area	Challenges by Hazard (Countermeasures policy)	
		Short-to-Mid term	Long term
Flood	Inland area	• Reduce at least the inundation risk of DRR-related facilities (e.g., government, medical care, education, and sanitation) and the central city areas* of the Upazila by improving flood control 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	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.

Hazard	Target Area	Challenges by Hazard (Countermeasures policy)	
		Short-to-Mid term	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
Earthquake Shaking	All areas	- Promote compliance with building standards and seismic diagnostics - Raise awareness of earthquake risks and promote preparedness at home and in the community	Ensure earthquake resilience of buildings and infrastructure through seismic retrofitting, and proactive measures such as redundancy and alternative measures of the infrastructure
Drought	All areas	Promote to expand and improve irrigation and water storage facilities to provide stable water to the fields and for livestock, and to convert to drought-resistant crops and agricultural methods.	
Lightning	All areas	- Reduce damage to human life and livestock by establishing and maintaining lightning arresters and evacuation shelters (people, livestock) - Raise awareness of how to evacuate and cope with lightning strikes.	
Common	All areas	- Foster human resources through disaster management training and drills, as well as prepare material and equipment to enable rapid disaster response. - Provide DRR education and public awareness raising to encourage citizens to appropriately understand the hazard risk and prepare for the evacuation and disaster response, regardless of ages or gender.	

* Notes: DRR-related facilities and the central city area:

- DRR-related facilities: the facilities where the government agencies and community leaders will use before, during, and after disasters for disaster preparedness and response.
- Central city area: the areas with a specifically concentration of city markets, river ports, and government facilities in proximity to or within the settlement areas. These areas are referred to as the important areas in the Upazila in consideration of the DRR, and therefore should be protected in a priority manner. The following are the recognized areas in the Upazila.

Figure 4.1. Chilmari Central city area on the scientific flood hazard map



Central city area list:

- C01 Raniganj Central City Area
- C02 Thanahat Central City Area
- C03 Chilmari Central City Area
- C04 Chilmari River Port Area
- C05 Ramna Central City Area
- C06 Ashtamir Char Central City Area

*Red color areas have high inundation risks of flooding

Chapter-5. Action Plan of DRR Countermeasures

5.1 Current status of the general DRR Countermeasures in the Upazila

This Chapter explains the current status of general DRR-related countermeasures and the responsible agencies in the upazila by hazard.

5.1.1 Structural countermeasures against Flood and River Erosion

BWDB is making efforts to mitigate inundation and erosion through various types of countermeasures, including embankment construction, small canal excavation, and sluice gates, while drain constructions have been conducted by DPHE. Retarding basin and reservoir are not commonly applied, and there is no reservoir in the Upazila. In addition, BWDB constructed several dams in different areas of the Upazila to protect the paddy fields.

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	DPHE/BWDB/LGED
Rubber dam	✓	BWDB/LGED

5.1.2 Countermeasure against Earthquake Shaking

In this area, most of the building structures are low-rise. There is the Upazila Construction Committee, which is responsible for supervising the building standards (BNBC-2020) in the design and construction of urban and rural areas. This Upazila has some old building infrastructures. After the Building Assessment (Seismic diagnosis) conducted by PWD, if required, PWD can suggest retrofit⁸.

Type of Countermeasures	Current status	Responsible Agency
Compliance with the building standards (BNBC-2020)	✓	BCC/UzCC
Building Assessment (Seismic diagnosis)	Unknown	PWD
Seismic retrofitting of facilities and Infrastructures	Not undertaken	LGED/PWD
Drill and awareness training	✓	DDM/FSCD/NGO's

5.1.3 Countermeasure against Drought and Lighting

BWDB, BADC, and DPHE are making efforts to mitigate the drought through various types of countermeasures, like shallow tubewell, deep tubewell, channel excavation, irrigation projects, drinking water supply projects, etc. In the Char area, BADC has been providing the solar motor pump for irrigation

⁸ Retrofitting to cope with earthquake shaking is the process of modifying existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes

purposes. In this area, reservoirs are not commonly applied, and there is no reservoir in the Upazila. BADC has some programs for conversion to drought-resistant crops and agricultural methods. DDM has no lightning project in this Upazila.

Type of Countermeasures	Current status	Responsible Agency
Lightning arrester	Not undertaken	DDM
Well development	Not undertaken	DPHE/BADC
Reservoir	Not undertaken	DPHE/BADC
Repeat irrigation (e.g. pumps)	✓	BADC
Conversion to drought-resistant crops and agricultural methods	✓	BADC
Tree Plantation (Palm Tree)	Not undertaken	DDM/ Forest Department(FD)

5.1.4 Emergency Operations before, during, and after disasters

Shelter: Mujib Killah (2 in total) and Multipurpose Shelters like High School/College cum Shelter house (4 in total) are constructed by DDM and Primary school cum shelter house are constructed by LGED in this Upazila.

Transportation: LGED is the main responsible agency for developing and maintaining the listed road and transportation infrastructure. In addition, DDM also develops the HBB, CC road and Earthen road. In the Char areas, DDM develop the main connectivity in this upazila.

Drainage system: Improvement of the drainage system is important to prevent prolonged inland flooding and waterlogging. LGED and DPHE cope with the challenges of installing and rehabilitating drainage systems in urban and rural areas separately. There is no master plan for the drainage system in this Upazila.

Water and sanitation: Water and sanitation infrastructures are critical to provide safe water and maintain the living environment hygiene. DPHE is the main agency to cope with water-related issues to prevent the secondary effects of the disaster.

Type of Countermeasures	Current status	Responsible Agency
Shelters (incl. lightning shelter house)/Mujib Killah	✓	DDM/ LGED
Roads	✓	DDM/LGED
Bridges	✓	
Culverts	✓	
Drains	✓	DPHE/LGED
Facilities for Water (e.g., Tube well, Pipeline and sanitation)	✓	DPHE/NGOs

5.1.5 Non-structural Countermeasures against Disasters

(1) Land use planning

The urbanization control areas are supposed to restrict or regulate the development and conversion of land use, especially in the Char areas that are prone to floods, erosion and environmental degradation. However, the implementation and enforcement of the urbanization control in Kurigram are weak due to a lack of coordination among different agencies, political interference, population pressure, and poor awareness among the people.

To cope with this, it needs more vertical coordination and connection between governmental policy, district plan and strategy, and stakeholders in Union Parishads and Upazila administration. It's worth discussing in the UzSC continuously.

Type of Countermeasures	Current status	Responsible Agency
Urbanization control	Unknown	Upazila/UDD/DDM
Raising land area of specific facilities	✓	
Resettlement/Relocation	Unknown	
Designating special warning areas	Unknown	

(2) Early warning information and communications

The broadcasting system is utilized by BWDB, DRRO, and PIO. BWDB collects meteorological information through the line ministries. Mainly in the rainy season, DRRO, along with the PIO office, informs about rainfall and water level at the district level. The district office (DRRO) informs DDM and MoDMR of those issues.

Type of Countermeasures	Current status	Responsible Agency
Installation of the monitoring system for rainfall and/or water level	✓	BMD/BIWTA/BWDB/DDM
Flood forecasting and warning system, including community radio	✓	BWDB/ FFWC
Telecommunication system for search and rescue	✓	BTRC/DDM

(3) Disaster management training, drills and equipment

Disaster preparedness and response drills are conducted before the flood season. Regional evacuation drills are conducted once a year at the Union level. Disaster management training for UDMC members is conducted at least once a year.

Type of Countermeasures	Current status	Responsible Agency
Identification of evacuation routes	Unknown	UzDMC/UDMC/LGED/DDM/FSCD
Disaster response and/or evacuation drill	Unknown	DDM/FSCD/UzDMC
Preparation of SOP for emergency operation	Unknown	DDM/Donor
Inventory preparation on vulnerable infrastructure, such as hospitals, water wells, and schools, based on the risk map	Unknown	UDD/PWD/FSCD/DMC
Training on DRR, simulation and exercise	Unknown	DDM/FSCD
Preparation of equipment for emergency operation	✓	DDM/FSCD/ DGHS

(4) Raising public awareness and disaster education

Disaster education is provided irregularly in both primary and secondary school classes. Awareness raising for disaster risk reduction is mainly conducted through TV and Radio, however, in some areas, NGOs conduct courtyard meetings, simulations, drills, etc. when support by donors is available.

Several unions have emergency disaster preparedness equipment and emergency warehouses for stockpiled materials in the event of a disaster, and they are not functioning well due to a lack of coordination.

Type of Countermeasures	Current status	Responsible Agency
Publication of hazard maps and DRR educational materials	Unknown	DDM
Disaster preparedness education in school	✓	DoPE/DoEE
Awareness-raising activities on disasters to the public	✓	DDM
DRR awareness-related billboard and signs	✓	DDM/NGOs

5.2 Action Plan in line with the DRR Target (Short-to-mid-term)

This Chapter describes the structures of the Action plan aiming at the achievement of the Vision (see Chapter 4), and Action plans in short to mid-term under the Programs in the upazila.

Vision	Target hazard	Policies	Challenges by Hazard Programs	Target area
The estimated human and economic damages by each disaster are reduced by 50% within 10 years (from 2025 to 2035).	1. Flood: To ensure protection of human lives and properties (livestock) from flooding	1-1. Reduce at least inundation risks of DRR-related facilities and Central city areas	A. Improvement of flood control facilities in some priority areas B. Improvement of drainage facilities in some priority areas C. Raising of land area of key facilities/ Relocation to elevation areas	Inland areas, areas along rivers Inland areas
		1-2. Reduce/minimize damage to at least people and assets by improving evacuation systems and maintaining transportation networks	A. Construction and maintenance (incl. raising lands) of multi-purpose shelters B. Improvement and renovation of major roads, bridges, and culverts for evacuation and emergency operations	Inland areas, areas along rivers, Char areas
		1-3. Ensure early evacuation through warning	A. Development and operation of early warning networks	
	2. River Erosion: To mitigate direct damage to residence and properties against river erosion	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
		3. Earthquake Shaking: To establish a resilient Upazila to withstand earthquakes	3-1. Enhance earthquake resistance	All areas
			3-2. Promote earthquake preparedness at home and in the community	All areas

Vision	Target hazard	Challenges by Hazard	Target area
4. Lightning: To reduce direct damage to people and livestock caused by lightning strikes	4-1. Promote appropriate response and evacuation for lightning strikes	Policies A. Installation and maintenance of lightning arresters / evacuation shelters for people and livestock	All areas
	5-1. Provide stable water supply for the fields and livestock	Programs A. Expansion and improvement of irrigation facilities (e.g., pumps, well development) / water storage facilities (e.g., reservoir)	
5. Drought: To mitigate the impact of drought on people and livestock	5-2. Promote drought-resistant crops and agricultural methods	A. Conversion and/or introduction of drought-resistant crops and agricultural methods	All areas
	6-1. Foster human resources and prepare equipment to enable rapid disaster response	A. Implementation of disaster management training and drills	All areas
6. Common: To build communities capable of quick and appropriate disaster response	6-2. Encourage people to prepare for the evacuation and disaster response	B. Preparedness of the materials and equipment for disaster response A. Provide DRR education and public awareness raising activities	All areas

Figure 5-1. Structure of the Action Plan

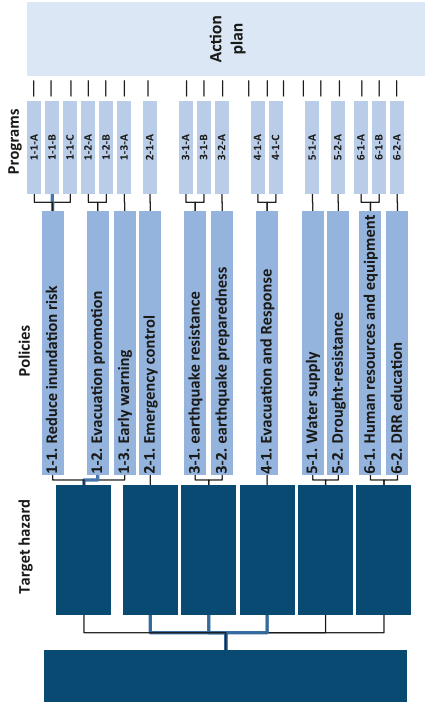


Figure 5-2. Structure of the Action Plan



Figure 5-3. Map of the Action plan for Chilmari Upazila

1. Flood: To ensure protection of human lives and properties from flooding

The target area borders large rivers and is particularly affected by flood damage. Therefore, the challenges for flood hazards are prioritized to minimize human and property damage, as well as to mitigate flood risk and inland waterlogging.

Priority targets in the target area include flood risk reduction, enhanced drainage functions, and human and property damage reduction, including the development of evacuation systems.

Specific measures to reduce flood risks and enhance drainage include the following.

- Improvement of flood control facilities along rivers and in inland areas
- Improvement of drainage facilities in inland areas
- Raising of land area of key facilities

In addition, the following efforts will be prioritized to mitigate human and property damage

- Construction and maintenance of multi-purpose shelters
- Improvement and renovation of major roads, bridges, and culverts for evacuation and emergency operations
- Development and operation of early warning networks

1-1- Reduce at least inundation risks of DRR-related facilities and central city areas

ID	1-1-A	Program				Improvement of flood control facilities in some priority areas				Target area			
										Inland areas, areas along rivers			
Action										Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action
Action along the Teesta River										BWDB	DPP has not been submitted.	Securing the fund (4,000 million TK)	6 years
1)	Riverbank protection works on the left bank of the Teesta River	[Second priority]	Revetment work (13,550 km)										
2)	Riverbank protection works on the right bank of Jamuna and Brahmaputra River	[First priority]	Revetment work from Ranigali to Ramna (16.2km) (Both in Chilmari and Ulipur)										
3)	Riverbank protection works on the left bank of Jamuna and Brahmaputra River	Protection work from Nayachar to Old Brahmaputra Offtake (17.5 km)											
4)	Riverbank protection works on the left bank of Jamuna and Brahmaputra River	Protection work from Shaheber Alga BGB Camp to Bolodhari Ghat (13 km)											
5)	Dredging the river on regular basis to maintain Navigation route for national and international (along the Dharla river, Jamuna River and Brahmaputra River) (*This work is not along the river but inside the river)												
Remarks													
In Chilmari Upazila, embankment or river protection in the Char area was proposed by the Unions. However, in the Char area, BWDB doesn't have any plans for permanent embankment installation in the Char area because it is out of the BWDB's working scope. Due to some technical or engineering limitations, permanent embankment installation is not considered in the Char Area. Therefore, the local government may take the initiative to install temporary embankments, which are described in Program ID 2-1-A.													
Along the Tista River, BWDB has the plan to install an embankment and revetment, but there were no proposals from the Unions. Along the Jamuna and Brahmaputra Rivers, BWDB has a plan for a project, as shown above, where the proposals from the Union (IDs A5-R2-1 and NA-F4-9) can be covered.													

ID	1-1-C	Program	Raising of the land area of key facilities/ Relocation to elevation areas		Target area	Inland areas, areas along rivers			Implementation plan			Timeframe for achieving the Action
Action			Responsible agency	Ongoing activity/Current status	Actions to be taken	Urgent	3 years	Urgent	3 years	Urgent	3 years	Long term
Action and Implementation plan	1)	Raising the High school fields (A5-F2-13) with school infrastructure development work	DDM+EED	Education activity is ongoing, but it suffers waterlogging	Enlisting DDP	Urgent	3 years	Urgent	3 years	Urgent	3 years	Long term
	2)	Deep tube well development (Raising the platform of the tube well facilities) (Inland area) to supply safe drinking water in Ramna, Raniganj and Thanahat Union	DPHE	The platform of existing tube wells is vulnerable to flooding. (79 deep tube wells have been inundated during the last flood)	Need detailed design	Urgent	3 years	Urgent	3 years	Urgent	3 years	Long term
	3)	Improve shallow tube well (Char) to supply safe drinking water	DPHE	Only shallow tube wells are available, in char area, without riverbank protection deep tube well is not possible to be installed.	Riverbank protection so as to be able to install deep tube well	Long term		Urgent	3 years	Urgent	3 years	Long term
	4)	Improvement of Fakirer Hat rural market by land uplifting	LGED	The existing market is on low-lying land and lacks drainage. It is very important economically, but it does not operate during heavy rain and floods.	Improve by Raising the land with drainage facilities	Urgent	3 years	Urgent	3 years	Urgent	3 years	Long term
	Remarks											
Solution for TH-F5-5 (inundation in the school area in Thanahat) is covered by program ID 1-2-A												
Since A5-F5-3 is private institution land, it is out of scope for government agencies. This can be solved by NGOs or local arrangements.												
A5-F2-13 is a high priority project, since it is in the central city of the Char area and works as a Multi-purpose Shelter while it is vulnerable.												
Therefore, the timeframe was set within 3 years.												
IDs NA-F4-8, RAM-F4-11, RAM-F4-6 (sanitation facilities) will be covered by program 1-2-A												
For IDs A5-F1-8, A5-F2-12, A5-F2-14 (inundation of graveyards), UDMC members may select the specific sections within the proposed graveyard that need to be raised and that will be only used during flooding for burials. All proposed locations are in the Char area, which should be solved by local arrangements												

ID	Program	Target area	Implementation plan				
1-1-B	Improvement of drainage facilities in some priority areas	Inland areas					
			Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action
Action and Implementation plan	1)	Canal excavation to reduce waterlogging in 3 locations of Raniganj union of Chilmari Upazila	BWDB	Consideration of local needs located on private land, and this area has no discharge path	UzSC and UDMC need to find a feasible solution. As a reference for Shalmara low land purpose feasible solution is in Action ID 1-1-B-3.	UzSC and UDMC need to find a feasible solution. As a reference for Shalmara low land purpose feasible solution is in Action ID 1-1-B-3.	10 years
	2)	drainage system in the city area, Chilmari Upazila (Detailed design)	LGED	No drainage in the central city area	UzSC and UDMC need to prepare a drainage master plan and take necessary measures to improve the drainage system.	UzSC and UDMC need to prepare a drainage master plan and take necessary measures to improve the drainage system.	10 years
	3)	Canal excavation to reduce waterlogging in Raniganj area at Shalmara lowland in Ward no 01 (RAN-W1-1)	DDM	This area has no discharge path	Install new box culverts on Fakirhat Ghat to Achar as a house road	Install new box culverts on Fakirhat Ghat to Achar as a house road	3 years
Remarks							
The actions reflect the Union's proposal IDs RAN-W1-1, RAN-W2-1, and RAN-W3-1.							
These proposals are related to canal excavation. To cope with the issues, instead of canal development, DDM proposed action 1-1-B-3.							
The above canal excavation proposals are on private land, therefore, the land needs to be acquired by the government. This action will be further considered in the future master plan of LGED.							
The criteria for selecting projects for the improvement of drainage facilities are :							
- Technically feasible outfall selection. - Connected or linked with a waterlogging area. - Linked with other primary, secondary and tertiary drains.							
Obstacle: BWDB is considering the above canal excavations that were also proposed by unions in Chilmari and Ulipur, however, these countermeasures have not been done yet since most of the proposals are located on private lands.							

1-2. Reduce/minimize damage to at least people and assets by improving evacuation systems and maintaining transportation networks

ID	1-2-A	Program				Target area
Inland areas, areas along rivers, and Char areas						Action and Implementation plan
Construction and maintenance (incl. raising lands) of multi-purpose shelters						
Implementation plan						
Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action	Target area	
1) Multi-purpose Shelter building construction	DDM	Existing schools	Enlisting DPP	5 years	• Near the Union office in the central city area • Existing High schools and colleges [Priority shelters to be constructed] (considering design fit to char) The shelter to be constructed is/are located at ➤ Notarkandi High School	
2) Upgrading existing shelters (maintenance) (Char)	DDM	No Existing infrastructure	Enlisting DPP for Shelter Center preparation	10 years	• Near the Union office in the central city area [Priority shelters to be constructed] The shelter to be constructed is/are located at ➤ Behind Bahar Uddin Sachib's house ➤ Saidur wholesaler's house in Ward no 2. ➤ Beside Manik Mia's house in Ward no 2. ➤ Aminul's House Kheyra Ghat adjacent ➤ Kajol Danga adjacent	
• Near the Union office in the central city area ➤ Shakhahat Shelter Project ➤ Bisharpara Shelter Project ➤ Khawriachor Shelter Project ➤ Khruachor Shelter Project ➤ Dokhin Owar Shelter Project ➤ Dokhin Feiska Potropata Shelter Project ➤ Amtoia Shelter Project ➤ Khawriachor-2 ➤ Bisharpara-2 ➤ Uttor Korai Borishal ➤ Dhushmara ➤ Chor Feiska Babod Hatha boshe ➤ Chalipara	DDM	Permanent shelters for poor people	Securing the maintenance fund from DDM	5 years		

Implementation plan					
Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action	
3) Multi-purpose Shelter building construction (along the river)	DDM	Existing High schools	Enlisting DPP	10 years	• Existing schools and colleges - Near the Union office in the central city area - The shelter to be constructed is/are located at - Chilmari high school - Balabari BL high School
4) Multi-purpose Shelter building construction (considering design fit to char) (Char)	LGED	Existing Primary schools with poor structure	Ditto	5 years	
5) New construction of multi-purpose shelters (along the river and inland)	LGED	Existing Primary schools with poor structure	Ditto	5 years	
					• Existing Primary schools - Near the Union office in central city area - The shelter to be constructed is/are located at - Salipara Govt. Primary School - Kalikapur Govt. primary school
					• Existing Primary schools - Near the Union office in central city area - The shelter to be constructed is/are located at - Chor Patrokhata Gov. Primary school. - Mojartari Govt. Primary school
		Existing Primary school cum shelter	DPP submitted	3 years	

ID	Program	Target area	Implementation plan					
1-2-B	Improvement and renovation of major roads, bridges, and culverts for evacuation and emergency operations	Inland areas, areas along rivers, Char areas	Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action	
			1) Establishment of the evacuation routes in the Upazila, including the access route to the shelters near the central city areas and economically important areas (Along rivers and inland areas) [First Priority Roads] • Highway linking C05 to C03 • Highway linking C01 to C02, which is connected to Riverport No.1 • Highway linking C04 to C05, which is connected to Riverport No.2 [Second priority roads] • Road linking Riverport No.3 to C05 • Other economically important roads connected to the waterlogging area [Third priority roads] • Roads in the inundated settlement area which are connected to first and second priority roads	LGED	The condition of roads as evacuation routes is as follows. 149095003, and 149092004: good condition, but protection work is not sufficient. Rd. 149093003, 149094019, and 149092009: Need to be rehabilitated Rd. 149092006 and 149092001: Upazila connecting road, protection work is not sufficient Some portion needs to be improved to connect with the Shundulganj Bridge.	❖ Slope protection or strengthening ❖ Increasing road height ❖ Sufficient water passing structures like bridge, culverts, U-Drain, etc. ❖ Sand Piling or piling for road strengthening ❖ RCC Pavement ❖ Roadside drain ❖ Approach road slope protection	DRR consideration in both design and construction, following the "Build Back Better" strategy to be sustainable.	10 years
			2) Establishment of the evacuation facility in the Upazila, including the access route to the shelters near the central city areas and economically important area (along the riverside area outside the BWDB embankment, southern part of Ramna Union) [First priority] • Construction of the bridge connected to Ward 9 of Ramna Union Parishad and C05	LGED	The 62m bridge construction is ongoing. The road condition is not good, which is connected to the bridge and C05. Road construction as a second BWDB embankment, will be priority, connected to C05 and the	DRR consideration in both design and construction, following the "Build Back Better" strategy to be sustainable.	10 years	

Remarks	Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action
Program ID 1-2-A-1 and 1-2-A-4 are reflected in the union proposal for the Char area. In the implementation period of this multipurpose Shelter house, DDM and LGED will consider the Char design. Multi-purpose shelter selection Criteria of priority action are as follows: - Avoid private land - Avoid areas that can be impacted by riverbank erosion - Near the central city area - Existing good infrastructure Multi-purpose shelter construction purpose necessary coordination: - DDM/PIO needs to communicate with EED, which manages colleges and high schools - LGED needs to communicate with EED, which manages primary schools. The total number of affected people by flood was 121,826 in 2020 in Chilmari Upazila according to the D-form. On the other hand, the combined capacity of the shelter houses is currently 10,282 people. Thus, there is a need to increase the capacity of shelter houses by approx. 110,000 people that is accommodated by the plan above.	6) Extension of existing buildings to be multi-purpose shelters (along the river and inland) [Priority shelters to be constructed] - Existing Primary schools - Near the Union office in central city area The shelter to be constructed is/are located at ➤ Radhaballab Kalir Path Govt Primary school ➤ Mozaidanga Govt. Primary School ➤ Adhikarpura Govt. Primary School ➤ Balabari hut 2 no Govt. Primary School ➤ Rajarita Govt. Primary School	LGED	Existing Primary schools	Ditto	10 years
7) Activate and strengthen the capacity of shelter (school) management committee		DDM supported by NGOs	At this moment, there is no activity.	Provide practical training to the committee members with the support of NGOs	Long term

Implementation plan				
Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action
• Roads connected to C05 and BWDB [Third priority roads] • Roads in the inundated settlement area • Establishments of the evacuation routes in the Upazila, including the access route to the shelters near the central city areas and economically important areas (Along rivers and inland areas) • Shelter house and central city connecting roads • Roads in the inundated settlement area which are connected to the Union roads, developed /paved village roads	DDM	The road type is HBB and Earthen. DDM doesn't have a database regarding road conditions. (*need DDM).	DRR consideration in both design and construction, following the "Build Back Better" strategy to be sustainable.	10 years
				5 years
4) Establishment of the roads which connect between boat ports, central city area and shelters (Char area) • [First priority roads] • Inside the C06 road • Road from existing shelter houses to c/Boat port • Existing and proposed shelter houses connecting the road up to the Ghat/boat port and the central city area	DDM	Road type is HBB and Earthen. Road condition is bad.	DRR and Char consideration in both design and construction, following the "Build Back Better" to be sustainable.	5 years
5) Regular maintenance work of the navigation route in the Jamuna River	BIWTA	No excavation work	Securing O&M budget	Continuous work
6) Construction of a Light House for the navigation route in the Jamuna River	BIWTA	No existing Light House	Enlisting DPP	3 years

Implementation plan				
Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action
- LGED ID:149094007, 149094008, 149094009, 149094010, 149094011, 149094012, 149094013, 149094014, 149094015, 149094016, 149094017, 149094018, 149094019, 149094020, 149094021, 149094022, 149094023, 149094024, 149094025, 149094026, 149094027, 149094028, 149094029, 149094030, 149094031, 149094032, 149094033, 149094034, 149094035, 149094036, 149094037, 149094038, 149094039, 149094040, 149094041, 149094042, 149094043, 149094044, 149094045, 149094046, 149094047, 149094048, 149094049, 149094050, 149094051, 149094052, 149094053, 149094054, 149094055, 149094056, 149094057, 149094058, 149094059, 149094060, 149094061, 149094062, 149094063, 149094064, 149094065, 149094066, 149094067, 149094068, 149094069, 149094070, 149094071, 149094072, 149094073, 149094074, 149094075, 149094076, 149094077, 149094078, 149094079, 149094080, 149094081, 149094082, 149094083, 149094084, 149094085, 149094086, 149094087, 149094088, 149094089, 149094090, 149094091, 149094092, 149094093, 149094094, 149094095, 149094096, 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ID	1-3-A	Program		Development and operation of early warning networks		Target area		All areas		Implementation plan			
Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action	Urgent	Urgent	Action and implementation plan	2) Equip early warning materials to be able to assist UDMC	DDM	No boats and vehicles Arranged by hiring them	Need to procure at least 6 boats and one pickup for the whole Upazila	Urgent	Remarks
1) The flood early warning system based on FFWC information is strengthened	DDM	No mobile app	- Develop a mobile app for multi-hazard purposes, connected with an automatic information system to be able to provide flood warnings to the public. - Establish a community-based early warning message dissemination system by volunteers, including the use of technology (e.g., WhatsApp) and local communication networks with the support of local government and NGO. - Provide necessary training and materials to volunteers - Install community-readable flood markers in the key locations with the support of NGOs				- Capacitate disaster volunteers by providing training and materials - Establish or reactivate a community-led disaster early warning system - Capacitate disaster volunteers by providing training and materials	2) Equip early warning materials to be able to assist UDMC	DDM	No boats and vehicles Arranged by hiring them	Need to procure at least 6 boats and one pickup for the whole Upazila	Urgent	For 1), No demand from the Union Parishads, but proposed by DDM For 2), Proposed by DDM

1-3 Ensure early evacuation through warning

2. River Erosion: To mitigate direct damage to residence and properties against river erosion

This area is located upstream of the confluence of the Teesta and Jamuna Rivers and has been severely affected by large-scale river channel transitions and riverbank erosion. As risk reduction measures, emergency measures against riverbank erosion and dredging to control the erosion progression in the affected areas and the central city areas are important challenges.

In addition, revetment and channel rehabilitation to reduce the risk of erosion along the river are also important efforts in the area.

Specific measures include the introduction of emergency measures for revetment and dredging. Through these measures, flood damage will be reduced.

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

ID	2-1-A	Introduction of emergency measures (e.g., sandbags) for revegetment, and dredging			Target area	Program	Remarks
Areas with recent significant erosion damage along rivers							
Implementation plan							
Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action	Continuous work	Continuous work	
	BWDB	Ongoing Activity by O&M budget in Kurigram district, but no activity in Chilmari Upazila	Securing budget	Continuous work			
	Local Government Agency, LGED and DDM	No regular activities	Securing budget	Continuous work			
	Char area by Sandbags/Geo-bags						
2) Protection Work for river erosion in the							
1) Placing Sandbags/Geo-bags as an emergency operation to ease the impact of riverbank erosion,							
Char area by Sandbags/Geo-bags							
Program 1-1-A for the Jarna riverbank contributes to preventing riverbank erosion to some extent.							
Program 2-1-A-2 reflects union proposals that are related to the embankment or protection work s at the Char area. Reflecting to the Union's proposal ID NA-R1-1, NA-R1-2, NA-R2-1, CH-R1-1, CH-R2-1, AS-R1-1, AS-R1-2, AS-R1-3, RAN-R1-1, NA-P4-10. DDM and LGED have proposed budget allocation to the upazila -level offices to provide emergency support to prevent erosion by installing temporary protection.							

3. Earthquake Shaking: To establish a resilient Upazila to withstand earthquakes

The risk of earthquake shaking disasters is a common issue in all areas. It is important to strengthen the earthquake resistance of buildings and infrastructure against earthquakes, as well as to raise awareness and understanding of earthquake risk and preparedness in local communities.

Specific measures to strengthen earthquake resistance include promoting compliance with building standards and seismic diagnostics.

In addition, to promote earthquake preparedness in local communities, priority is given to implementing projects aimed at raising awareness of earthquake risk and earthquake preparedness among households, schools, and local communities.

4. Lightning: To reduce direct damage to people and livestock caused by lightning strikes

The risk of lightning disasters is common throughout the target area. Mitigating the impact on human lives and livestock is an important issue, requiring the installation of lightning arresters and the implementation of awareness-raising activities.

As countermeasures against lightning disasters, priority is given to the protection of human lives and livestock through the installation and maintenance of lightning arresters and shelters within the union, as well as the implementation of educational programs on how to evacuate in case of lightning damage within union and what to do in the event of a lightning strike.

5. Drought: To mitigate the impact of drought on people and livestock

The risk of drought disasters is a common challenge throughout the area. A stable water supply for fields and livestock is a key issue.

Priority measures include expanding and improving irrigation and water storage facilities, shifting to drought-resistant crops, and promoting changes in agricultural practices.

Specific initiatives include the development of irrigation capacity in the Char areas and inland areas to mitigate economic losses due to drought, the development of deep wells and supply networks in rural and urban areas of Upazila to ensure a safe drinking water supply, and conversion projects to drought-resistant crops and agricultural methods

6. Common: To build communities capable of quick and appropriate disaster response

In common with risks from all disaster types, human resource development, disaster risk reduction education, and public awareness raising are important issues for disaster risk reduction.

To enable rapid disaster response, it is necessary to develop specialized human resources through the provision of materials and equipment, and disaster risk reduction training.

In addition, to ensure that citizens of all ages and genders have an appropriate understanding of disaster risks and prepare to take evacuation actions and respond to disasters appropriately, priority should be given to disaster risk reduction education and the implementation of training programs aimed at raising public awareness.

4-1-A	Program	All areas		Installation and maintenance of lightning arresters / evacuation shelters for people and livestock						
	Target area									
	Action and Implementation	Action	Responsible agency	Ongoing activity/Current status	Implementation plan	Timeframe for achieving the Action				
							1) Install lightning arrester in all Unions	2) Construction of lightning-safe shelters for farmers		
							DDM	No Shelter	Based on the capacity, install them in all unions	DDM. Government Agencies with technical assistance from DDM. can be implemented by NGOs/CBOs/Local Government Agencies with technical assistance from DDM.
							DDM	No Shelter	Based on the capacity, install them in all unions	DDM. Government Agencies with technical assistance from DDM. can be implemented by NGOs/CBOs/Local Government Agencies with technical assistance from DDM.
						10 years				
						3 years				

4. Lightning: To reduce direct damage to people and livestock caused by lightning strikes

4-1 Promote appropriate response and evacuation for lightning strikes

ID	3-2-A	Program	A. Awareness raising of earthquake risks and preparedness at home, schools, and communities				
Target area			All areas				
Action and Implementation			Awareness raising for earthquake preparedness in all Unions	DDM	No program	Awareness-raising activity program must be prepared	Long term project, 10 years
Remarks			No proposal from the Union Parishads, proposed by DDM - Awareness raising program for the people of the Paurashava and Union on the construction of earthquake -resilient infrastructure. - Awareness raising program for BCC, Upazila, and Paurashava Building Approval Committee, regarding ensuring the Building Code, different acts, and rules by capacity building of the code enforcement committee.				

3-2 Promote earthquake preparedness at home and in the community

ID	Program	Target area	Action and Implementation plan					Remarks
3-1-B	B. Implementation of the seismic diagnosis	All areas	Action	Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action	No proposal from the Union Parishads Identification and retrofitting of existing important facilities based on seismic diagnosis are required for schools, hospitals, shelters, and infrastructure such as bridges, roads, embankments/dykes for saving lives and evacuation during and after the earthquakes.

ID	3-1-A	Program	All areas		Target area	Action and Implementation	Remarks					
A. Promotion of compliance with the building standard (BNBC 2020)												
	3-1-A		All areas	Target area	Implementation plan	Action	Promotion of compliance with the building standard (BNBC 2020) - Training program - Evaluation & Monitoring	No proposal from the Union Parishads and line agencies				
									Responsible agency	Ongoing activity/Current status	Actions to be taken	Timeframe for achieving the Action

3. Earthquake Shaking: To establish a resilient Upazila to withstand earthquakes

3-1. Enhance earthquake resistance