Community-led Housing Recovery Needs Assessment

North and northeastern floods 2022, Bangladesh

November 2022

Acknowledgement

Compliance with Ethics Principles

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Abbreviations

BBS	Bangladesh Bureau of Statistics
BDRCS	Bangladesh Red Crescent Society
CEGIS	Center for Environmental and Geographic Information Services
CGI	Corrugated Galvanized Iron
CSEB	Compressed Stabilized Earth Block
D-form	Form for Assessment of Damage and loss
FBCCI	Federation of Bangladesh Chambers of Commerce & Industry
FGDs	Focus Group Discussions
GBM	Ganges, Brahmaputra and Meghna
GiHA	Gender in Humanitarian Action
GoB	Government of Bangladesh
HBRI	Housing and Building Research Institute
HCTT	Humanitarian Coordination Task Team
HHs	Households
IFRC	International Federation of Red Cross and Red Crescent Societies
KII	Key Informant Interview
MCCI	Metropolitan Chamber of Commerce and Industry
NAWG	Needs Assessment Working Group
NGO	Non-Governmental Organizations
PDNA	Post-Disaster Needs Assessment
RCC	Reinforced Cement Concrete
SCB	Shelter Cluster Bangladesh
UN	United Nations
UNCERF	United Nations Central Emergency Response Fund
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNICEF	United Nations Children's Fund

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Executive Summary

Executive Summary

Floods 2002 and its impact

In the monsoon months of 2022, the north and north-eastern region of Bangladesh was hit by an unprecedented flood. It is considered as the worst flood, in last 122 years, to hit this part of the country. The flood affected 18 districts and the five worst affected districts were Sylhet, Sunamganj, Moulivazar, Habiganj and Netrokona. It led to loss of 12 lives and impacted 7.2 million people. According to government D-form 2022 assessment, the total damage is 67550.84 million BDT (equivalent to 722.24 million USD)[1].

Emergency response

The Government of Bangladesh together with the UN Agencies, the Red Crescent society, Chamber of commerce and industries, Civil society and other development partner responded immediately to provide cash grants, food, and non-food items to the affected population. Approximately 866,314 people were sheltered in Govt. and Non-Govt.shelter centres. UN supported the effort by providing food assistance, drinking water, cash, emergency drugs, water purification tablets, dignity and hygiene kits to the affected families and education support. The Humanitarian Response Plan launched flash appeal of US$ 58.4 million targeting 1.52 million people in five worst affected districts for July-December 2022[2].

Goal and objectives

The overarching purpose of this report is to analyze impact of the northeastern floods of 2022 on lives and livelihoods with the aim to provide strategic guidance on housing recovery and reconstruction using build back better principles.

The specific objectives are:

- To assess overall damage to housing sector and its impact on other sectors
- To identify underlying elements leading damage to houses and community infrastructure
- To provide strategic guidance on housing recovery and reconstruction programming and implementation including housing recovery principles, key elements of housing recovery programme, financial strategy and sample houses with building materials, cost and technical specifications

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1 source: D-form 2022
2 https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/hctt_flash_flood_2022_response_monitoring_dashboard_30_oct.pdf

Methodology and limitation

The study used primary and secondary data for qualitative and quantitative analysis of housing sector. The D-form 2022, the Government of Bangladesh disaster assessment format, was analyzed for sectoral including housing damage assessment. Eight focus group discussions and 15 key informant interviews were conducted in six subdistricts of the three most affected districts to validate D-form 2022 data and understand recovery priorities of the community. A technical assessment of housing and community infrastructure was also conducted to understand housing landscape of northeastern region, analyze underlying vulnerability and understand community priorities related to housing recovery.

Some of the limitations of the study include damage and loss estimates as D-form 2022 doesn't collect it separately unlike a standard post disaster needs assessment methodology. The technical assessment was conducted after 2-3 months of flooding, which impacted the quality of disaster impact assessment.

Sectoral and geographical analysis

Housing, agriculture and fisheries land, roads and bridges and WASH (water and sanitation) were the worst affected sectors. The combined damage to these sectors was to the tune of US$ 688.7 million , accounting for 95 percent of total damage. The damage to roads and bridges, agriculture with fisheries and housing were US$ 273.36 million, US$ 196.77 million and US$ 180.80 million respectively. The geographical analysis revelated that Sunamganj and Sylhet accounted for 23 and 22 percent of total damage respectively, thus these districts combined account for 45 percent of total damage. Sirajganj accounted for 9 percent of damage and Habiganj and Netrokona districts, each accounted for 8 percent of damage.

The primary and secondary schools were closed either due to inundation or were used as temporary evacuation shelter, thus it led to academic loss of several months for students and public examination was postponed. The health facility was overwhelmed as sub-district were and community clinics were flooded, and medical supplies washed away in some cases. In terms of infrastructure, roads and bridges including culverts impacted the movement of agriculture products and other goods. Netrokona district was worst affected in terms of damage to culverts. The damage to mobile towers and electricity impacted communication, thus affected accessing services. Sunamganj was worst affected in terms of damage to electricity sector, while Sunamganj

and Sylhet were worst affected in terms of impact to telecommunications.

The damage to agriculture and allied sector was severely impacted the community as there was standing crops at the time of floodings as 88,266 hectares of crop field with estimated 199820.84[3] metric ton of crop produce was damaged. The loss of chicken, ducks and other animals severely impacted the livelihoods of poor. Fishing sector being main livelihoods in hoar region was severely impacted and Sunamganj was the worst affected.

Impact to housing sector

The flood has damaged 186,703 houses of which 157,113 were Kutcha houses. Sunamganj and Sylhet were worst damaged with 56,062 and 48,066 damaged houses respectively. These two districts account for 45 percent of total number of houses damaged or destroyed. The analysis of damage pattern revealed that the damage to the plinth of Kutcha house was key. The extent of damage to plinth became the triggering factor for damage of other elements such as pillar, fence, roof, etc. Almost all kutcha plinths were damaged either partially or fully and more than 20% of which are beyond repair. The other underlying factors include location of the house and poor construction practices and building materials. The damage to housing had multi-dimensional impact safety and security of women and girls was highlighted by the community. Also, the house was used for storing seeds, livelihoods tools and undertaking small livelihoods activities and damage to housing has impacted it.

Community priorities for recovery

The floods impacted almost all development sectors and recovery intervention need to be multi-sectoral. The community priorities from conducted FGD, KII and Consultation related to flood recovery and reconstruction are

1. Housing: Assistance for housing recovery and reconstruction
2. WASH: Household WASH facilities
3. Livelihoods: Income generating activities, Employment generation, etc.
4. nfrastructural recovery (embankments, mosques, school buildings, connecting local bridges etc.)
5. Social safety net measures through cash grants or food supply
6. Livestock
7. Subsidized agricultural inputs and machineries
8. Access to soft loans or loans without interest

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[3] PDNA of Damage in Agricultural Sector, DAE, MoA

Housing recovery and reconstruction

Housing recovery and reconstruction is the highest priority of community and the estimated cost of housing recovery with build back better principles is estimated at 27,687million BDT (US$ 296.0 million). The housing recovery should be owner-driven, and government, technical agencies and development partners should facilitate the process. 'Core-housing' concept should determine financial assistance and it should be paid in installments to ensure progress as well as technical compliance. Mass awareness on flood resistant construction and usage of local material and appropriate technology should be part of the housing recovery. Capacity building of masons, carpenters and other construction workers shall be part of the housing recovery.

As a next step it is important to prepare a detailed housing recovery and reconstruction project document with multi-year programming and resources need to be mobilized and allocated. The institutional set-up for implementing and coordinating housing recovery programme under the leadership of government need to be created. The existing government institution shall be strengthened to coordinate and implement the programme. The identified institution shall be empowered to take quick decision and work in mission mode to implement the recovery programme. Technical guidance and capacity building on flood resistant housing construction should be part of the housing recovery programme. Mass awareness on build back better will help in better acceptance of resilient housing technology.

1. Background: North and Northeastern Flood 2022 and Recovery Assessment

1.1 Overview: The North and northeastern Flood of Bangladesh 2022

Bangladesh, the low-lying South Asian country, is characterized by more than 310 rivers[4] and various tributaries sourcing mainly from the Ganges, Brahmaputra, and Meghna (GBM) rivers. These form the world's largest delta system (GBM Delta) draining into the Bay of Bengal, which is also rendering the region among the most fertile globally.

Although since independence in 1971, the country has made significant progress in sustaining prosperous growth and reducing poverty, Bangladesh suffers from several physical, social, and environmental adverse factors. These devastating impacts on its people and economy put it amongst the world's most vulnerable countries. Due to low elevation, 25 to 30 percent of its all-land area is inundated during normal monsoon conditions, and cyclones, storm surges and flooding have led to nearly 520,000 recorded deaths over the past 40 years[5]. The country is also located in a seismically active zone and is further affected by erosion, land degradation, landslides, fires, extreme heat, and droughts, as well as potential tsunamis[6].

Distinguished by unique land types and hydrological features, the north-eastern region of Bangladesh consists of the idiosyncratic haors[7] (wetlands). It is thus extremely susceptible to flash floods, as intense rainfall in the neighboring hilly regions of the north-eastern parts of India[8], which receives the world's most rainfall in a calendar year, lie just north of this haor[9]. In dry seasons, it is used for cropping, and during the monsoon period, fishing remains the only viable livelihood option. Despite cultivating a single crop and the recurrence of flash floods, the Haor region still produces approximately 20% of the country's total staple food (rice), covers almost one fifth of its total land area, and supports twenty million people[10]. Given this context, it is certain that severe flooding in this region can greatly impact Bangladesh. Flood prevention in this area is an imperative and necessary process.

In recent decades, the northeastern region has witnessed rapid economic growth. The

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4 https://www.bwdb.gov.bd/rivers-information
5 https://app.adpc.net/bpp/
6 UNDRR (2020). Disaster Risk Reduction in Bangladesh: Status Report 2020. Bangkok, Thailand
7 CEGIS (2011) Center for Environmental and Geographic Information Services, Government of Bangladesh
8 Suman, A. & Bhattacharya, B. (2015), Flood characterisation of the Haor region of Bangladesh using flood index, Hydrology Research,

10 Kamruzzaman and Shaw (2018). Flood and Sustainable Agriculture in the Haor Basin of Bangladesh: A Review Paper

implementation of several development projects, including embankments, roads and highways, and housing settlements have gradually disconnected the flood plains from the river system. These structures have become obstructions to the free flow of water upstream to downstream and ultimately to the river system, posing grave threats to the wetlands[11]. To this end, several embankments have been constructed in the Haor wetland. Though these are intended to protect crops from flooding, they act as a barrier to the water flow. Moreover, during flashflood these embankments sometimes fail to withstand the tremendous pressure of downstream water flows, resulting in flooding. On top of this, the Haor region still lacks a credible flood warning system[12].
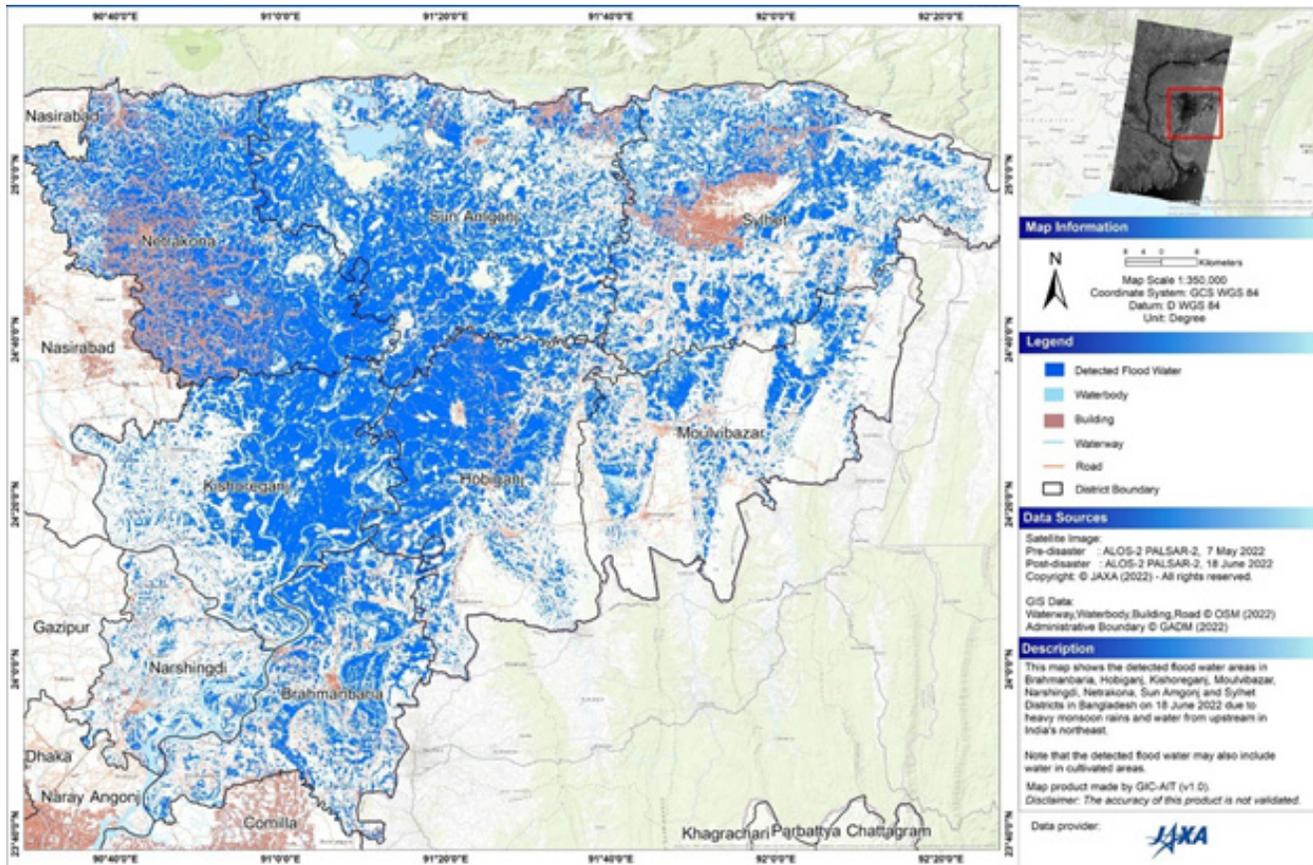
Figure 1 Inundated Area in Northeastern (Sylhet) Region in 2022 Flood and Study area for Recovery Assessment, Bangladesh (Source: UNOSAT 2022 and D-Form, DDM 2022)

In the monsoon months of 2022, a large part of the country's North-eastern region flooded at unprecedented levels. This has termed as the worst flood in 122 years in this part of Bangladesh[13]. Flash floods that started on 15 June swept away homes and inundated farmlands, forcing families to seek shelter on higher ground and temporary flood shelters. The extent of the flooding

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11 Zahid, O. (2022). Living with Floods and Reducing Vulnerability in Sylhet – Global Policy Institute.
12 Kamal, A. M. et al. (2018). Resilience to flash floods in wetland communities of northeastern Bangladesh. IJDRR
13 https://www.dhakatribune.com/nation/2022/06/18/state-minister-sylhet-sunamganj-floods-worst-in-122-years

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has surpassed that in decades including, the floods of 1998 and 2004. Moreover, the May floods struck over and above another unexpected flash flood at the North and Northeastern districts in June, further impairing the recovery process.

It has been estimated that 7.2 million people were affected by flooding and water congestion in northeastern districts, with 55 deaths[14]. It was reported that 89% area of Sunamganj, 72% of Sylhet, 70% of Habiganj, and 50% of Moulvibazar were submerged. The flood destroyed hundreds of thousands of hectares of agricultural lands, with farmers losing rice stocks, seed storage and other necessary valuables. This is expected to negatively impact paddy sowing in the coming agriculture season. Furthermore, public infrastructure such as roads, bridges, culverts, power transmission lines suffered extensive damage, along with widespread destruction of water points, sanitation facilities and housing.

1.2 Emergency Response

Government along with its responsible agencies have been actively engaged in carrying out immediate response measures in the flood affected areas. Many national and local organizations have provided cash grants, food, and non-food items to the flood victims. A major contribution came from the informal responders as well, i.e., crowdsourcing, charity, philanthropism etc.

Government Response

BDT 1.2 crore was disbursed from the Prime Minister's Relief and Welfare fund to support the flood affected people in Sylhet and Sunamganj districts. The government has provided different types of assistance to 47,705,982 flood affected people[15]. Furthermore, cooked food was distributed to 20,000 people every day for almost 07 days. A total of approximately 866,314 people stayed in public and private shelters.[16]

Response	Rice Response (In Metric ton)	Cash Response (in BDT)	Dry Food (packet/ sac)	Animal Food (in BDT)	Food for Children (in BDT)	TIN (Bundle)	Medical Teams	Renovation of Housing (in BDT)
Total	4400	84550000	123200	4000000	4000000	8000	2047	24000000

Figure 2 Immediate Response of GoB in North and Northeastern flood (from April 2022 to 25 July 2022 Source: NDRCC, DAE, DLS and DPHE report on from April to 25 July 2022))

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14 Key Immediate Need and Preliminary Impact Assessment (June 2022), NAWG
15 https://www.thedailystar.net/environment/climate-crisis/natural-disaster/news/flood-sylhet-sunamganj-pm-allocates-tk-12cr-3053016

Other International Development partners, Pool Fund, Crowdsourcing, Private Sectors, and other INGO/ NGOs have also stretched out their hands as response: UN CERF, SIDA, ECHO, BMGF, CHAF, USAID, DANIDA, Grameenphone, HSBC Bangladesh, Marks & Spencer, FCDO to name a few.

As per the 4W matrix of HCTT around 13.73 million USD response were mobilized[17]:

Type of Development Partners	BDT	US$	US$ (Million)
Institutional Fund	549826867.2	5745918	5.745918
Microcredit	4500000	47026.86	0.047027
Pool Fund	708532629	7404458	7.404458
Private Fund	223539196	2336077	2.336077
Publicly Raised Fund	322476568.5	3370013	3.370013
Grand Total	1808875261	18903493	18.90349

Figure 3 Resource Mobilized from Development Partners (Source: 4W Matrix by LTWG)

As per the needs assessment by the HCTT Response Plan (HRP)[18] based on the dire need of millions of affected people 58.4 million USD is required as response. However, more targeted response with sector specific needs assessment is required for the sustainable and resilient recovery.

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1.3 Aim, Objectives, and target audience of the Housing Recovery Needs Assessment

The overall aim of this housing recovery needs assessment is to analyze impact of flood on lives and livelihood with the objective to provide strategic guidance on housing recovery and reconstruction affected by the floods of 2022.

The specific objectives to achieve the overall goals are:

	To assess overall damage to housing sector and its wider impact
	To identify underlying factors for housing collapses and damages
	To provide recommendations on housing recovery and reconstruction programming and implementation including housing recovery principles, key elements of housing recovery programme, financial strategy and costing and sample houses with building materials and technical details

Figure 4 Methodology

Following are primarily targeted audience for planning, programming, implementation, monitoring, and resource mobilization for northeastern floods housing recovery

• National and local government

• Development Partners (UN agencies, BDRCs, I/NGOs, Development Banks etc.)

• Private sector/Construction companies interested in housing recovery

1.4 Methodology and Limitation

This study followed a mixed methods approach where both quantitative and qualitative analyses were carried out using information extracted from primary and secondary sources. Four approaches are used in this study:

01	Quantitative analysis of Damage information		**02**	D-form validation through 08 FGD and 15 KII
03	3 Consultations Workshop for Need Prioritization		**04**	Damage investigation and Technical Assessment on Housing
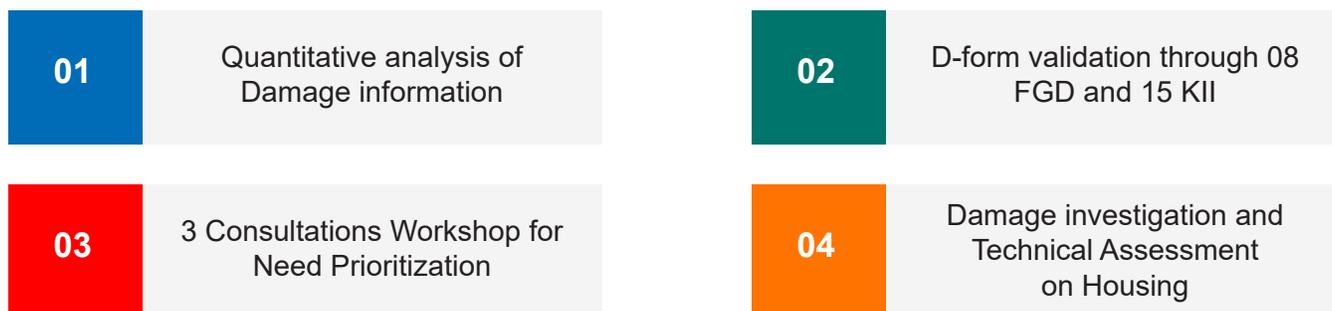
- Department of Disaster Management (DDM), Ministry of Disaster Management and Relief (MoDMR), Government of Bangladesh provided the D-Form 2022 with damage and loss data[19] (SOD 2019), which is designed to compile quantitative information on the damage incurred in the area. D-form 2022 data are collected at the household level by ward members to Union Parishad Chairmans, compiled at the Upazila (subdistrict) level and sent to national level. Through D-form 2022 the Govt. of Bangladesh (GoB) collects damage and loss data with 27 indicators at the Upazila level on any specific disaster. The data ranges from union/municipal ward to demographic information of affected population, housing and public service disruption, and agriculture farm, livestock asset damage to health and sanitation infrastructure etc. The study also used other assessment reports, and newspaper articles etc., apart from the D-form data

- To validate the D-form data and as well as understand community expectations and priorities about recovery, primary data was collected using qualitative checklists in Sylhet Sadar, Gowainghat, Sylhet District, Sunamganj Sadar, Chhatak in Sunamganj District and Kalmakanda, Madan in Netrokona District. 08 focus group discussions (FGDs) and 15 key informant interviews (KIIs) were carried out in 06 subdistricts of the three most affected districts among 32 high to moderately affected subdistricts.

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19 Standing Orders on Disaster, 2019, MoDMR
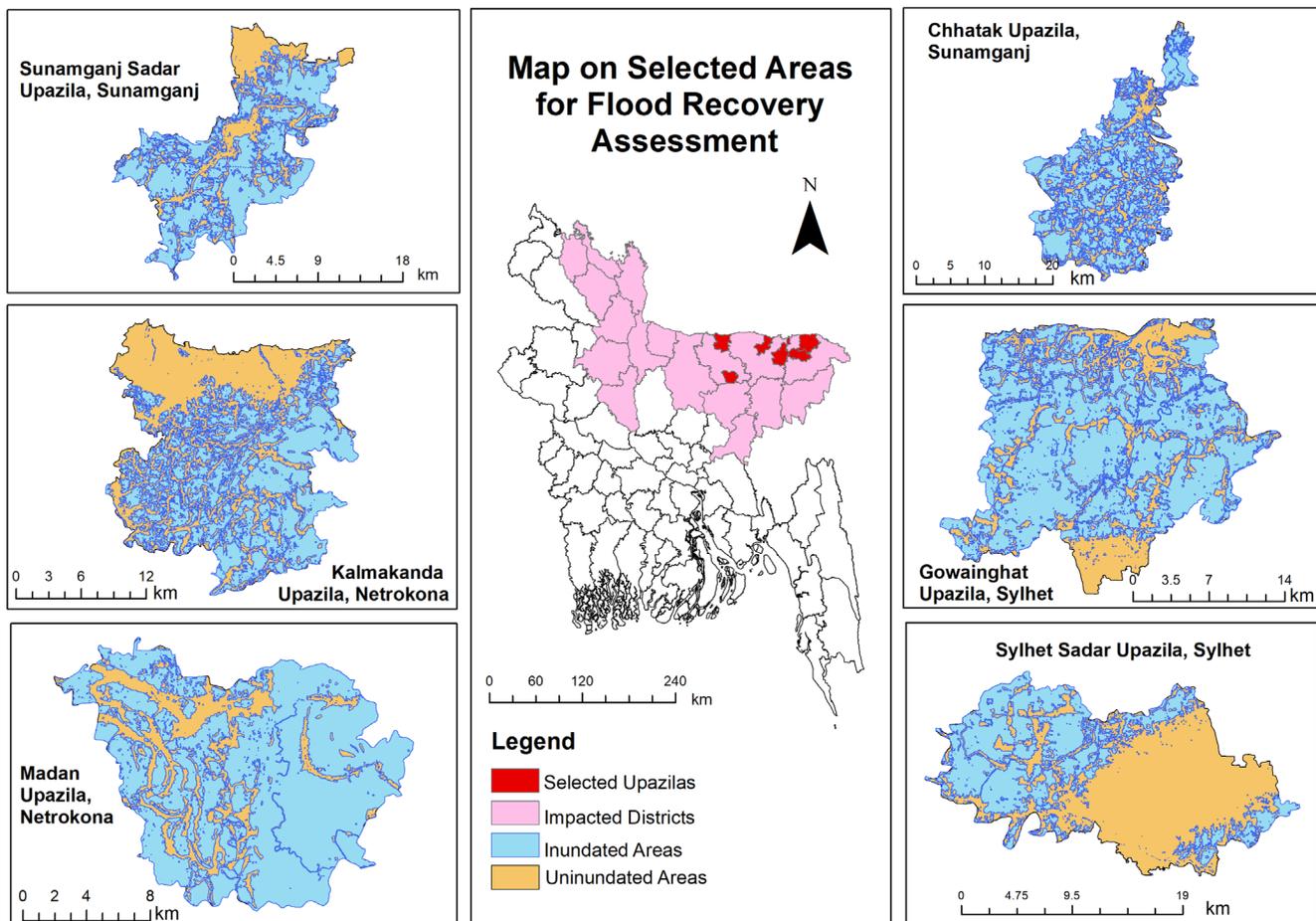
Figure 5 Selected Upazilas for Community-led Recovery Assessment (Map source: UNOSAT 2022)

- Three consultation workshops were held with the government officials from different department at the sub-district level (Gowainghat, Sunamganj Sadar and Madan). Through the workshop the key needs were prioritized.

- A technical field survey with a focus on damage recovery need assessment on the housing and community infrastructure was carried out.

Limitation

This study comes with some definite limitations

- The assessment was conducted after 2-3 months of the flood and there has been an organic recovery, as well as negative coping mechanism which may have impacted the damage data.

- The analysis is based on the D-form 2022, which is geared towards relief and rehabilitation, and does not calculate damage and loss separately,

- There is limited baseline data of housing typology of northeastern region, community level housing construction workers in terms of number of skilled workers, their skill sets, etc., which is essential for the comprehensive analysis

2. The North and Northeastern Flood 2022: The Impact derived from Damage Information from the GOB

Disasters leave lasting impact on infrastructure, disrupt basic services and cause loss of lives and livelihoods., A sector-wise damage assessment is imperative to lay the foundation for a comprehensive recovery program.

2.1 Analysis on the Prevalent Vulnerability of the Impacted Population

The north and northeastern flood has impacted a region which has prevalent vulnerability from various aspects. In terms of poverty, the percentages of poor population are 16.23% and 32.77% in Sylhet and Mymensingh division respectively. However, the Sulla upazilla of Sunamganj district shows an unprecedented level of poverty, which is 60.9%[20].

To assess patterns in between the flood's impact on affected household and the poverty levels of impacted districts, complementing poverty headcount ratios (HCRs) and the multidimensional poverty index (MPI)[21] with number of affected people are placed (See Annex: Table A.2.1.1.). Data shows that the areas with higher levels of poverty were also the areas with higher levels of affected households.

Sunamganj, which is the second worst affected district in terms of number of households affected, is the poorest district in the dataset, with an MPI score of 47.75. Moreover, Netrokona, Moulvibazar, Kurigram and Habiganj, which are amongst the topmost affected districts, also hold MPI scores at the higher end of the range. However, what is interesting is that Sylhet, which is the worst in terms of number of affected households has the lowest MPI score out of the top 6 affected districts. A similar observation is seen for Moulvibazar, which has an MPI of 28.95, which is lower than the MPI scores of many of the districts which were relatively much less affected. On top of this, Sylhet and Moulvibazar are also the districts which were on the lower end in terms of poverty HCRs. Despite the above-mentioned facts, establishing correlation does not provide answer to why despite being relatively less impoverished, these districts were also the hardest hit in terms of number of affected households by the flood.

The total size of affected area per district was calculated by adding together damages to urban, village charland, hills and haor-bills in that district. Each district was then given its share amongst the total size of affected area in km2 across all 18 districts. It appears that Sunamganj had the highest share of affected area at 21.9%, followed by Sylhet at 18.45%, Netrokona at 13.65%, Kishoreganj at 11% and Habiganj at 8% (See Annex: Table A.2.1.2)

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19 BBS Poverty Maps of Bangladesh (2016), http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/5695ab85_1403_483a_afb4_26dfd767df18/2021-02-22-16-57-c64fb3d272175e7efea0b02de6a23eaa.pdf
20 https://hdr.undp.org/content/2022-global-multidimensional-poverty-index-mpi#/indicies/MPI

Impact of Flood on Housing (Kutcha)

Legend

- Fully Damaged Houses
- Partially Damaged Houses

Number of Damaged Kutcha Houses

- 0 - 325
- 326 - 2015
- 2016 - 5247
- 5248 - 18415
- 18416 - 51155

Prevalent vulnerability in district with flood total affected population

Total Affected Populkation ■ MPI

Figure 6 Prevalent vulnerability next to flood affected districts

2.2 Sectoral Impact Induced from the Damage of North and Northeastern Flood

The value of total damage in each district is calculated by adding together that district's household level and community level damages. Across all districts, total damage amounted to around BDT 6,755 crores (722.24 million US).

Sectors	Damage (in million BDT)	Damage (in million US$)
Social Sectors	**17,649.86**	**188.71**
Housing	16,909.83	180.80
Health Infrastructure	52.65	0.56
Educational Infrastructure	557.27	5.96
Religious Infrastructure	130.12	1.39
Infrastructure Sectors	**29,257.35**	**312.81**
Transport	25,567.06	273.36
Energy & Electricity line	144.79	1.55
WASH (Toilets & Tube-wells)	3,536.19	37.81
Telecommunication (Mobile phone tower)	9.30	0.10
Productive Sectors	**18,763.83**	**200.62**
Agriculture Land	166,54.72	178.07
Fisheries Land	1,749.14	18.70
Fishing Equipment	38.75	0.41
Livestock	272.29	2.91
Farm and Off-farm Industries	48.94	0.52
Cross-Cutting Sectors1	**,879.80**	**20.10**
Forestry	58.86	0.63
Water Resources	1,820.94	19.47
Total Damage	**67,550.84**	**722.24**

Figure 7 Summary of the Damage from North and North-eastern flood 2022

Source: North and northeastern flood D-form 2022

The flash flood impacted 18 districts in north and northeastern region of Bangaldesh: Sylhet, Sunamganj, Habiganj, Moulavibajar, Kishoreganj, Mymensingh, Netrokona, Jamalpur, Sherpur, Bogura, Sirajganj, Lalmonirhat, Nilphamari, Kurigram, Gaibandha, Rangpur, Feni, and Brahmanbaria. Among these 18 impacted districts, the five that have been especially impacted are Sylhet, Sunamganj, Sirajganj, Habiganj and Netrokona. Housing, agriculture, road and bridges are among the most affected sectors in the recent North and northeastern flood.

According to the cost of damage of the flood, the top districts with the highest shares (See Annex: Table A.2.2.2) are Sunamganj share (23%), followed by Sylhet (22%), Sirajganj (9%), Habiganj (8%), and Netrokona (8%). This, combined with the field observations reckons that Sunamganj and Sylhet are the overall most affected districts.

The total cost of damages is sector-wise analysed, which are Social Sector, Infrastructure Sector, Productive sector, and cross cutting sector with many overlying issues, which are discussed in the next chapter.

Damage in Social Sector

- Educational ($5.9M)
- Health ($0.5 M)
- Religious ($1.39 M)
- Housing ($180.8 M)

DAMAGE $189 M

Legend:
- Educational
- Health
- Religious
- Housing

Damage in Infrastructure Sector

- Transport ($273 M)
- Wash ($37.8 M)
- Energy & Electricity ($1.5M)
- Telecommunication ($0.1 M)

DAMAGE $313 M

Legend:
- Wash
- Energy & Electricity
- Telecommunication
- Transport

Damage in Productive Sector

- Fisheries Land ($18.7 M)
- Fishing Equipment ($0.4 M)
- Livestock ($2.9)
- Farm & Off-Farm Industries ($0.5 M)
- Agriculture Land ($178 M)

DAMAGE $201 M

Legend:
- Fisheries Land
- Fishing Equipment
- Livestock
- Farm & Off-Farm Industries
- Agricultural Land

Figure 8 Sector-wise distribution of Damage without the cross-cutting issues

2.2.1 Impact on Social Sectors:

Impact on Housing

As per data, the flood has devastating impact on Housing. Firstly, let's delineate the districts that had the highest share amongst all districts in terms of number of damaged houses, as shown in **Figure 7 (See Annex: table: A.2.2.1).**
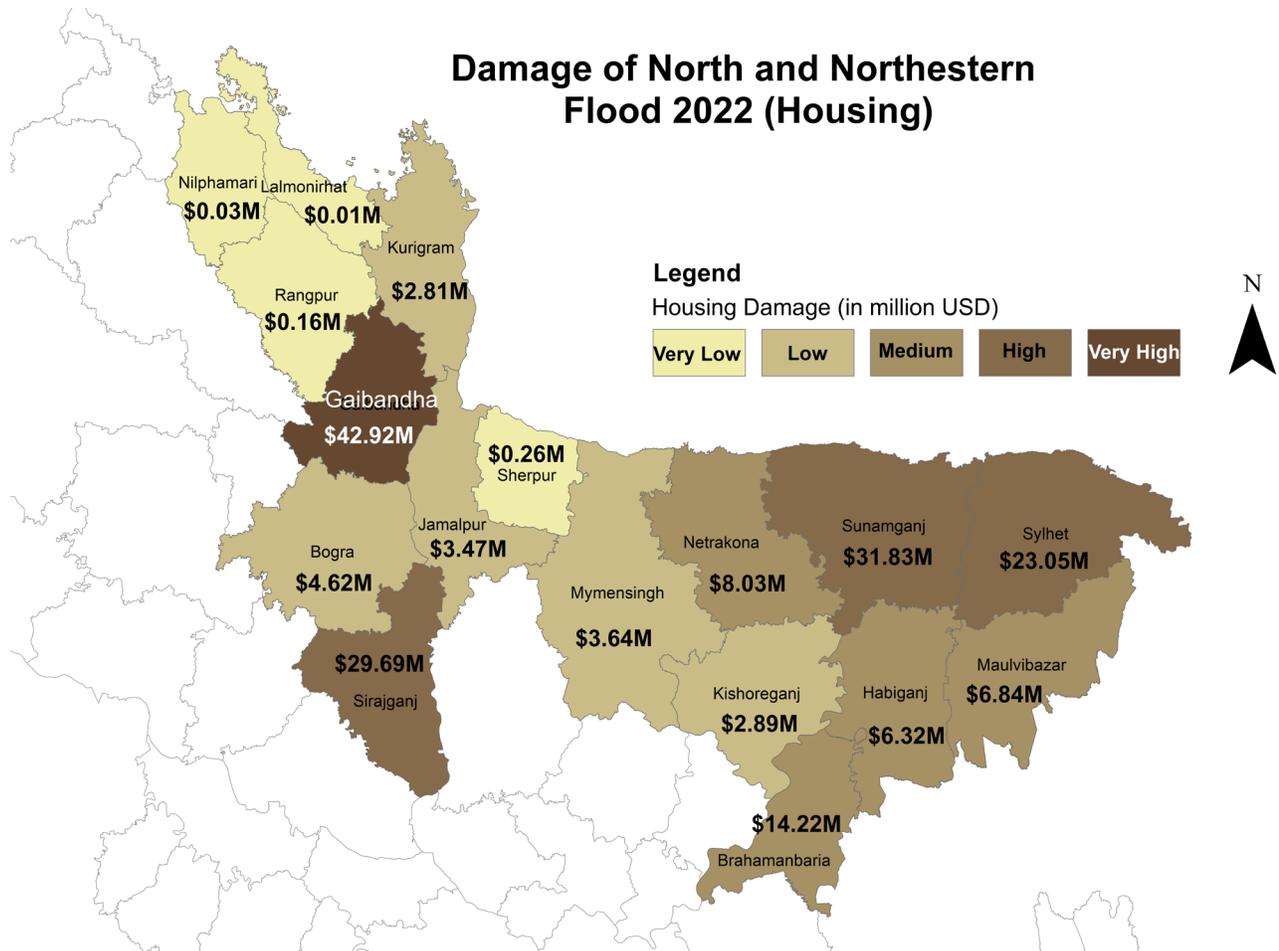
Figure 9 Damage of North and Northeastern flood 2022 (Housing), (Data Source: D form, Map Source: Author, 2022)

Data shows (Table A.2.2.1) Gaibandha had the highest cost of damaged houses at 23.7% followed by Sunamganj, Sirajganj and Sylhet at 17.6%, 16.4%, 12.07% respectively. . Collectively these 4 districts made up around 70% of total damage to housing amongst all 18 districts. The damage-specific analysis on housing is done in Chapter 3. The impact of households across these four districts was further disaggregated by the degree of impact, i.e., partially, and fully affected households. (See Annex Table A.3.2.1 and Table A.3.2.2) ;

The findings from the FGD and KII are that, even the houses made on elevated platforms sustained considerable damage, as the floodwater rose to a height beyond their assumption and washed away houses in low-lying areas. Overall housing damages from the flood include scouring of foundations, partially damaged walls, and inundation for days. Several houses in each of the locations were destroyed by the swift current of floodwater. Livestock, utensils, seeds, stocked paddy, books & other important documents were washed away in the flood and expensive furniture sustained partial or complete damage from being submerged under water for several days. The latrines were either washed away or damaged severely. Field observation finds that, even after three months of the flood, affected people haven't yet managed to repair or rebuild the toilet and open defecation has considerably increased.

Impact on Education, Religion and Health Infrastructure

The damage to infrastructure like School building or community clinic has short-term as well as long-term implications. The closure of school increases the risk of dropouts, child laborer and child marriages. D-form 2022 analysis suggests, Sunamganj is the worst affected districts that incurred a damage of 195.34 million BDT in terms of educational infrastructure damage followed by Netrokona (86.20 million BDT), Sylhet (82.46 million BDT), Sirajganj (58.90 milllionmillion BDT) and Moulvibazar (37.46 million BDT). (See Annex: Table A.2.2.2)

The flash flood of 2022 took a heavy toll on education with thousands of primary and secondary schools being closed down. The educational infrastructures in the north and northeastern regions were either inundated and became inaccessible or they were being used as shelters for the flood-affected people. The government of Bangladesh has established numerous multipurpose flood shelters across the country which during the normal time are used as educational institutes. Furthermore, the school buildings and equipment have also sustained damage from inundation and sheltering thousands of people. Classroom activities were suspended for months in some localities. Many students lost their textbooks and other documents in the floods. The SSC examinations which were supposed to start on the 19th of June were postponed considering the circumstances the students in the flood-affected regions were in.

But, many students, even after the allotment of new books, haven't joined schools after the floods. With the flood having an extensive impact on the earnings of the families, children were sent out to earn living and some female students were lost to child-marriage.

The religion infrastructures were mostly damaged in Sylhet Division with Sylhet district experiencing the highest damage (46.48 million BDT). The other highly affected districts were Sunamganj (44.37 million BDT), Moulvibajar (17.74 million BDT) and Habiganj (8.28 million BDT) (See

Annex: Table A.2.2.2). The findings from field observation indicate that, kutcha and semi-pucca mosques and temples in the villages were damaged the most in the flood.

The damage of health facilities can lead to increased infant and under five mortality rates. Religious places help in emotional healing of wider population including elders.

Results from D-form analysis found that, the health infrastructure accounted for the damage of 52.65 milllion BDT. Sylhet was the highest impacted district in terms of heatlh infrascure with a cost of 19.38 million BDT damage. Sunamganj incurred a damage of 16.25 million BDT whereas Kurigram incurred 6.80 million BDT of damage. (See Annex: Table A.2.2.2)
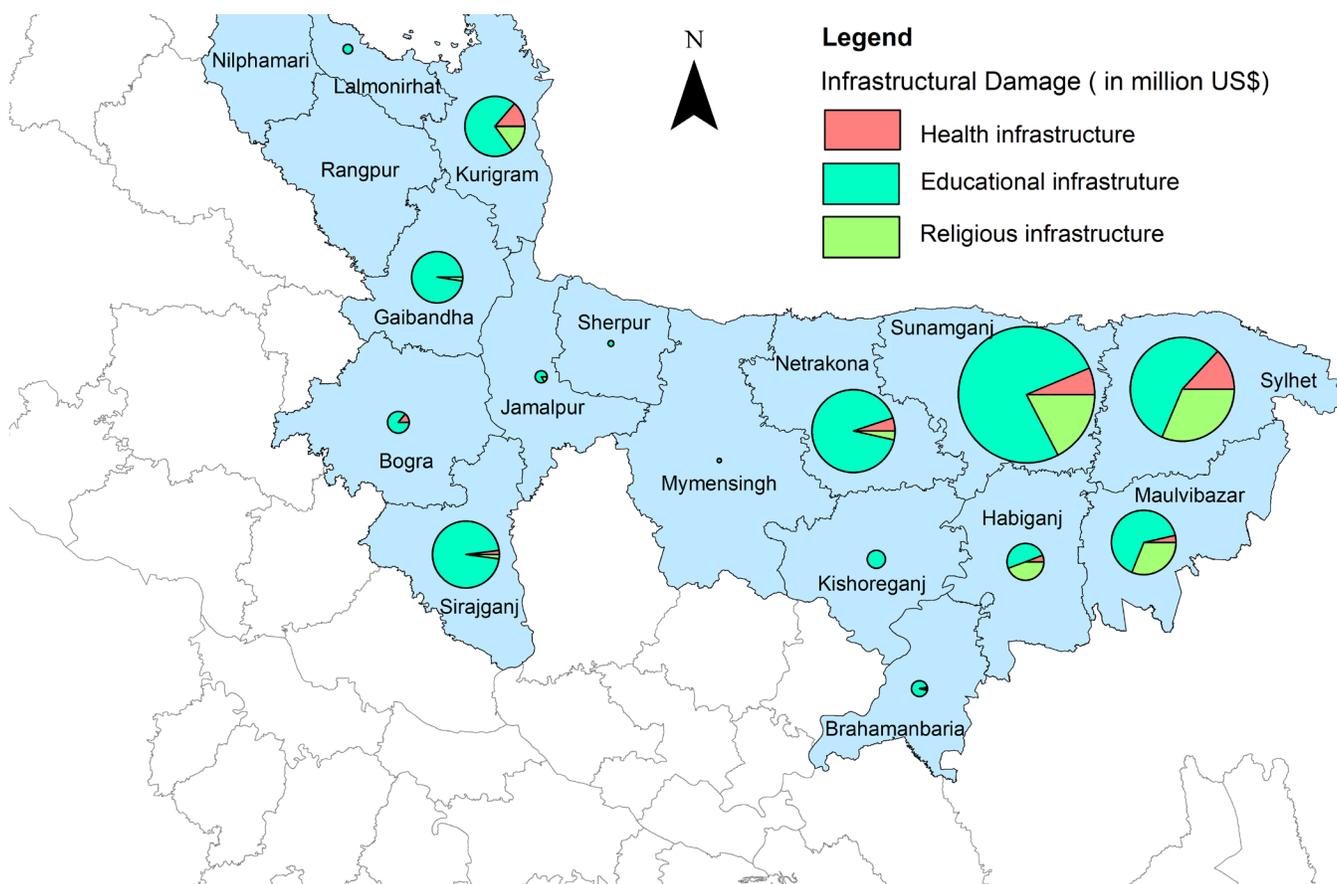
Figure 10 Damage of North and Northeastern Flood 2022:Infrastructure Sector (Data Source: D form, Map Source: Author, 2022)

Field investigations revealed that hospitals and other healthcare facilities were overcrowded, with local people evacuating into those buildings. The Upazila hospitals served as shelters in some areas. Some healthcare infrastructure sustained considerable damage with medical components being washed away by swift currents and through inundation. It became exceedingly difficult to find a doctor for the patients. Fever, skin disorders, and diarrhea were the most prevalent diseases resulting from the flood. Even if the patients were transported to hospitals, there was

little assurance they would receive adequate care. The absence of both medical professionals and appropriate facilities served as the principal barrier. One of the FGD participants described how his daughter contracted diarrhea, possibly from drinking the flood water. They could take her to the Upazila hospital, but it was overly crowded, and the doctor would visit only once a day.

There was scarcity of doctors at the Upazila and union levels. But as the water receded, health service delivery returned to normalcy with a lesser number of medical cases. Although diarrhea patients were found in every shelter and hospital during the flood, it was successfully contained and didn't create a big concern. In the aftermath of the flood, however, most of the affected population is passing a hard time accessing food and nutrition. Loss of income and livelihoods is posing a greater threat to their health. Especially, children are the worst sufferer.

2.2.2 Impact on Infrastructure Sectors: Water & Sanitation; Community Infrastructure; Energy & Electricity; Transport & Telecommunications

Impacts on WASH

At the wash facilities (safe drinking water points, toilet) are the most affected. From the Assessment it is found that WASH is one of the key Priority Needs. Therefore, the depiction shows the impact of flood on the WASH sector (Figure 9). Information obtained from D-form suggests that Sunamganj was the most affected area in terms of WASH facility which accounted for a damage of approximately 2087 million BDT. WASH facilities in districts like Moulvibajar, Habiganj and Sylhet were highly impacted as well. The damage to WASH facility can lead to contamination of water bodies, especially potable water, and can lead to outbreak of water borne diseases. The damage of WASH facilities in house premises or immediate neighborhood can impact safety and security of women and girls. As per the table A.2.1.3 Sunamganj (2087.85 million BDT) suffers from the highest damage WASH facility (Toilet and Tube-well), followed by Sylhet (553.26 million BDT), Moulavibazar (437.82 million BDT) and Habiganj (229. 78 million BDT).

Damage of North and Northeastern Flood 2022 (WASH)
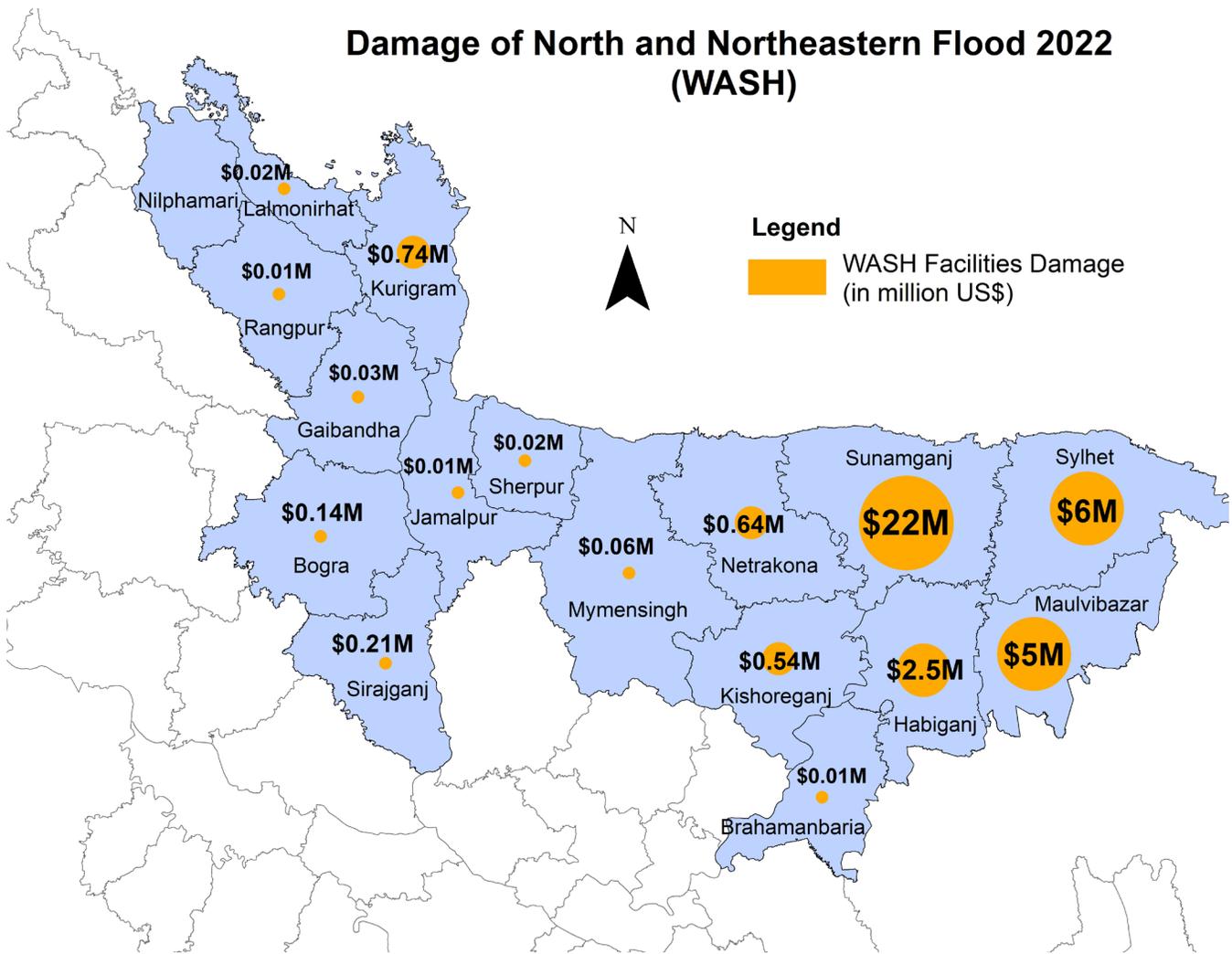
Figure 11 Damage of North and Northeastern flood: WASH (Toilets and Tube wells (Data Source: D form, Map Source: Author, 2022))

Validation assessment finds out that, after flood water receded, most of the tube-wells become unusable in the affected communities. While some continued purifying pond water, many started drinking directly from the sources. In the shelters affected people went without drinkable water for days until support arrived with water purification tablets. People are still suffering from lack of access to pure drinking water and damaged public toilets.

The Household (HH) WASH facility i.e., toilets was the worst affected sector in terms of number of people affected. Apart from immediate damage, it has high impact on safety and security, health and overall well-being of the affected population. The damage toilet has additional gender dimension as it disproportionally impacts women and girl. It is important to note that HH WASH facility is an immediate need.

Delay in recovery can lead to haphazard reconstruction or repair. Thus, reconstructed houses and HWF will be vulnerable to future floods, thus creating a vicious cycle of disaster and relief.

HH WASH Facility analysis highlighted that both the housing damage and HH WASH are similar, since the damage in housing is a damage in HH WASH facilities too. (See Annex Table WASH (A.2.2.3))

Impacts on Energy & Electricity, Transport & Telecommunications

Damage of North and Northeastern Flood 2022 (Transportation)

Lalmonirhat $0.11M
Nilphamari
Kurigram $2.8M
Rangpur
Gaibandha $0.7M
Sherpur $1.34M
$1.1M
Bogra $8.4M
Jamalpur
Netrakona $34.3M
Sunamganj $864M
Sylhet $102M
Mymensingh $0.77M
Sirajganj $2.8M
Kishoreganj $9.7M
Habiganj $10.5M
Maulvibazar $8.7M
Brahamanbaria $4.4M

N

Legend
Transportation Damage (in million US$)

| Very Low | Low | Medium | High | Very High |
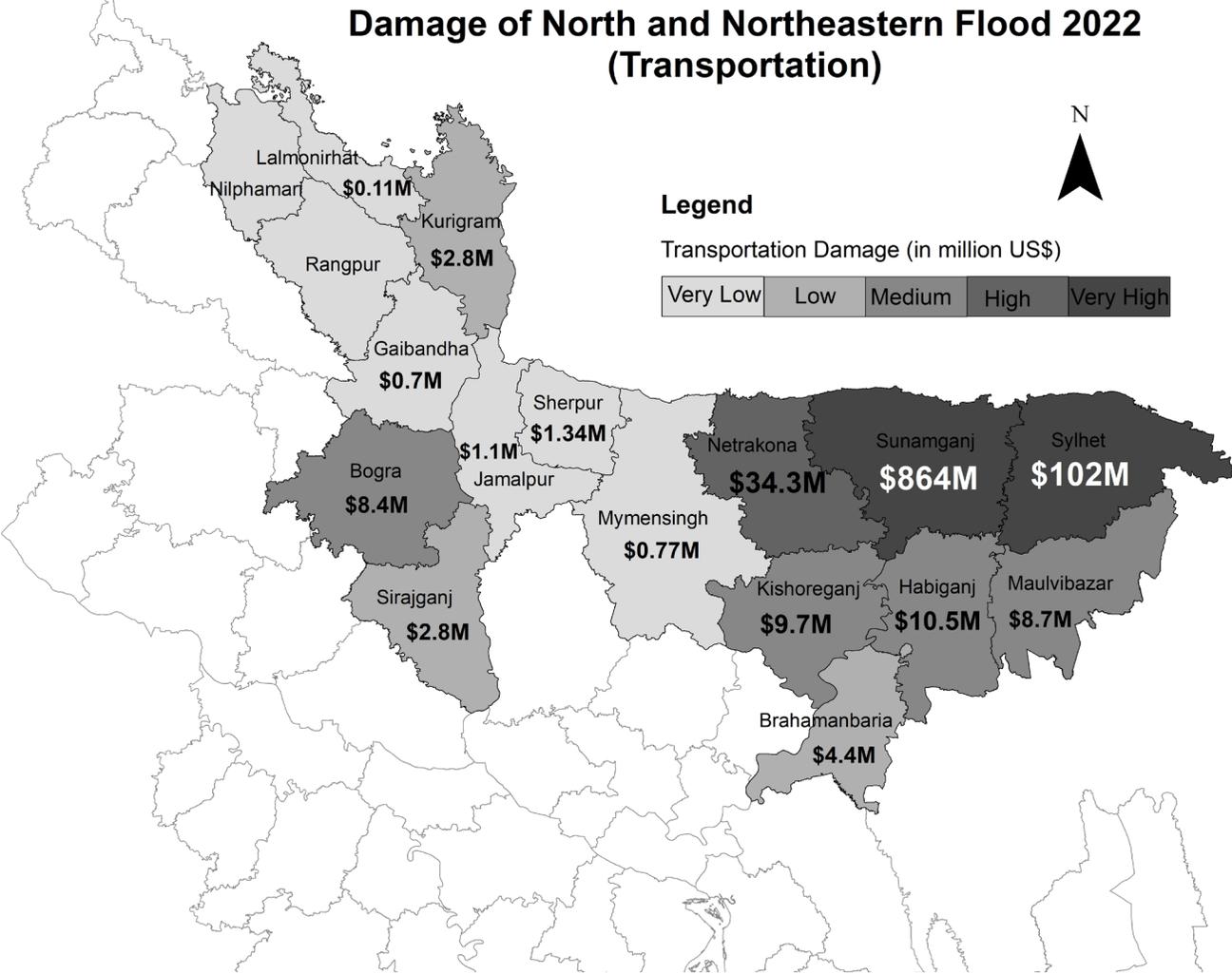
Figure 12 Damage of North and Northeastern Flood 2022 (Source: D-Form 2022), (Data Source: D form, Map Source: Author, 2022)

The roads and bridges sustained heavy damage affecting the transportation of goods and services. The damages on roads and bridges have sector-wide impact on goods and services transportation, thus leading to price-hike in one place while creating glut at another place. In the flood affected region, agriculture and fishery are key livelihood sources and these are highly perishable, hence roads and bridges are critical.

Overall, (partial and full) damage to roads emerges as the main type of damage to public infrastructure, followed by damage to electricity lines. On this front, Sylhet (9547 million BDT) suffered the greatest length of partial road damage followed by Sunamganj (8019 million BDT) and Netrokona (3205.62 million BDT). The districts of Habiganj, Moulvibazar, Kurigram and Kishoreganj also had significant amounts of road damage, although not as high (See Annex: Table A.2.2.4). Interestingly, Brahmanbaria also experienced a great amount of partial road damage.

Damage of Telecommunication
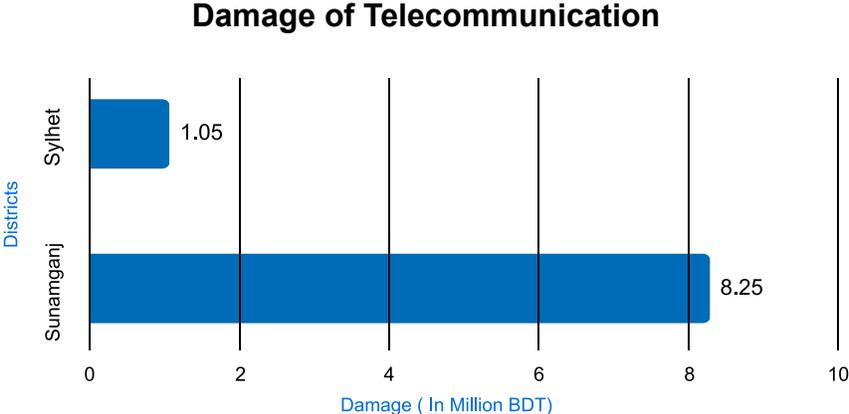
Figure 13 Damage to the Telecommunication sector, (Data Source: D form, Map Source: Author, 2022)

According to the Flood (2022) Damaged Rural Infrastructure Rehabilitation Project by LGED, for 3386 Km of Road rehabilitation, 3460 m of bridge/culvert Reconstruction/ Construction/ Rehabilitation and 472500 Sqm of slope protection work in Sylhet and Sunamganj, 354,552 Lakh BDT will be required.
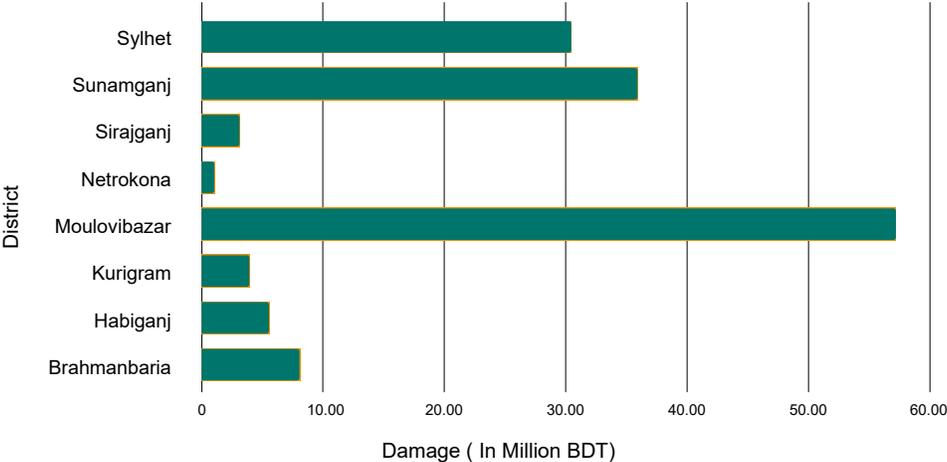
Figure 14 Damage of Energey and Electricity (Data Source: D form-2022)

Moulvibazar (57.10 million BDT) is the most affected district in terms of damage to electricity lines, followed by Sunamganj (35.83 million BDT), Sylhet (30.38 million BDT), and Brahmanbaria (8.01 million BDT). On another note, it also appears that only Sunamganj and Sylhet showed mobile tower damage. Netrokona, on the other hand, was worst affected in culvert damage, followed by Sylhet and Jamalpur.

The FGD respondents explained how the flood water inundated the asphalt roads and slowly breaking them down creating potholes here and there. During the flood, the communication system experienced a total collapse, as there were no electricity and people were out of mobile networks. Even the responsible government officials faced difficulty in receiving necessary information and communicating with the field level responders.

2.2.3 Productive Sector: Agriculture; Livestock, Fisheries Forestry; Commerce & Industry

Agriculture, Livestock and Food Security

The flood incurred a great impact on Agricultural Land, Livestock, and fishing facility. Land damage that refers to livestock, land, fishing equipment, contributed most to overall household-level damage (49.7%). This indicates that emphasis needs to be placed on aiding people recover land damage.
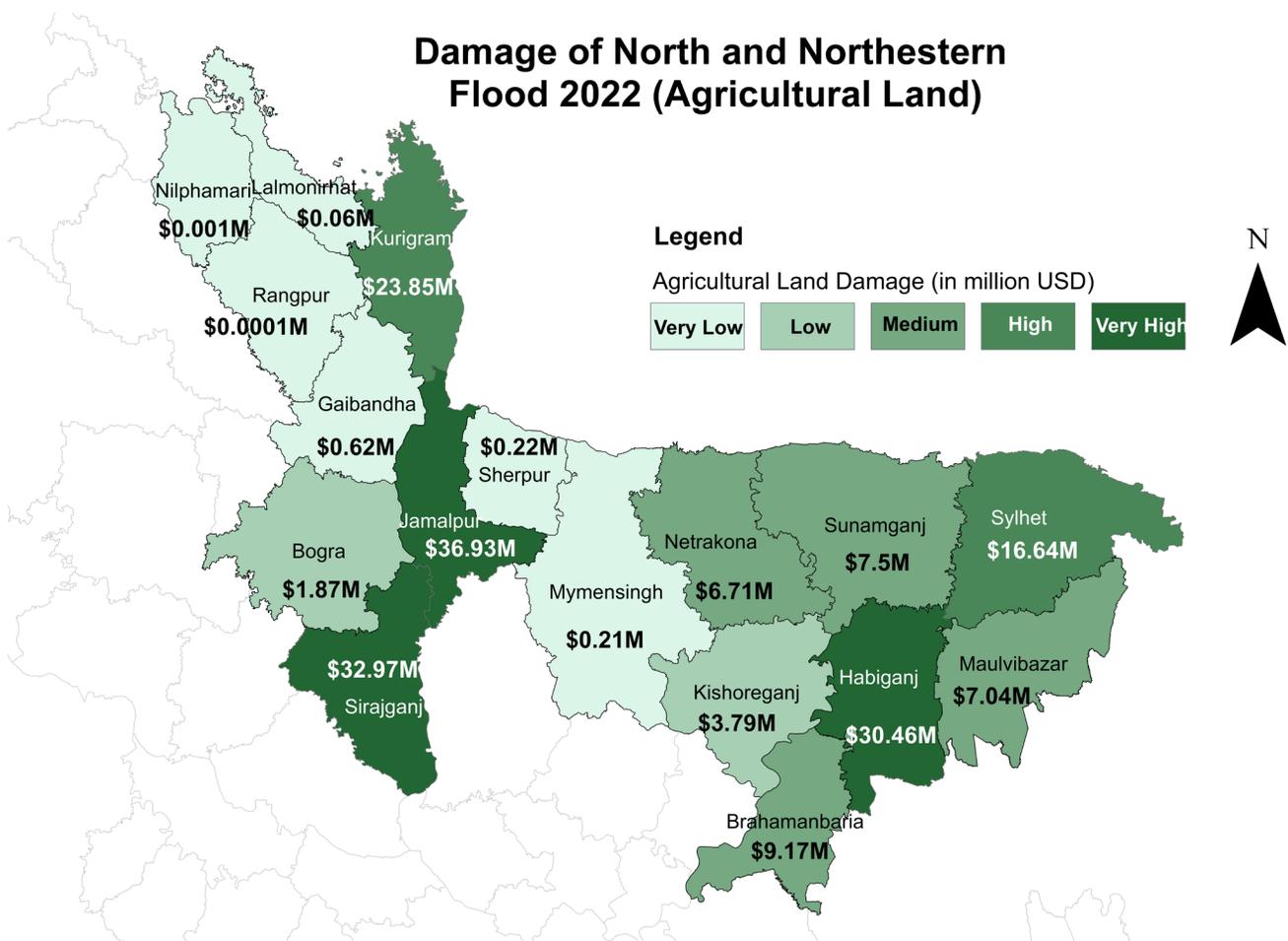
Figure 15 Damage of North and Northeastern Flood (Agricultural Land) (Data Source: D form, Map Source: Author, 2022)

Interestingly, Jamalpur district experienced the highest damage of approximately 3454 million BDT in terms of land (agriculture, seeds etc.). In Habiganj and Sirajganj the amount of damage rose to 3433 and 3084 million BDT respectively.

The crop fields in some areas are still underwater. The flood also destroyed homestead vegetable cultivation. The prices of food products skyrocketed right after the flood with no signs of coming down yet. Damage of stored crops and livestock has been threatening the food security in these regions. Sunamganj (107.23 million BDT), Brahmanbaria (79.96 million BDT), Netrokona (33.88 million BDT) and Sylhet (31.4 million BDT) are the worst impacted districts in terms of livestock. Rearing livestock has been a traditional practice for the rural people of Bangladesh. Chickens and ducks are rather common farm animals throughout the country with some families also breeding and raising cows.

Damage of North and Northestern Flood 2022 (Fishing Land)
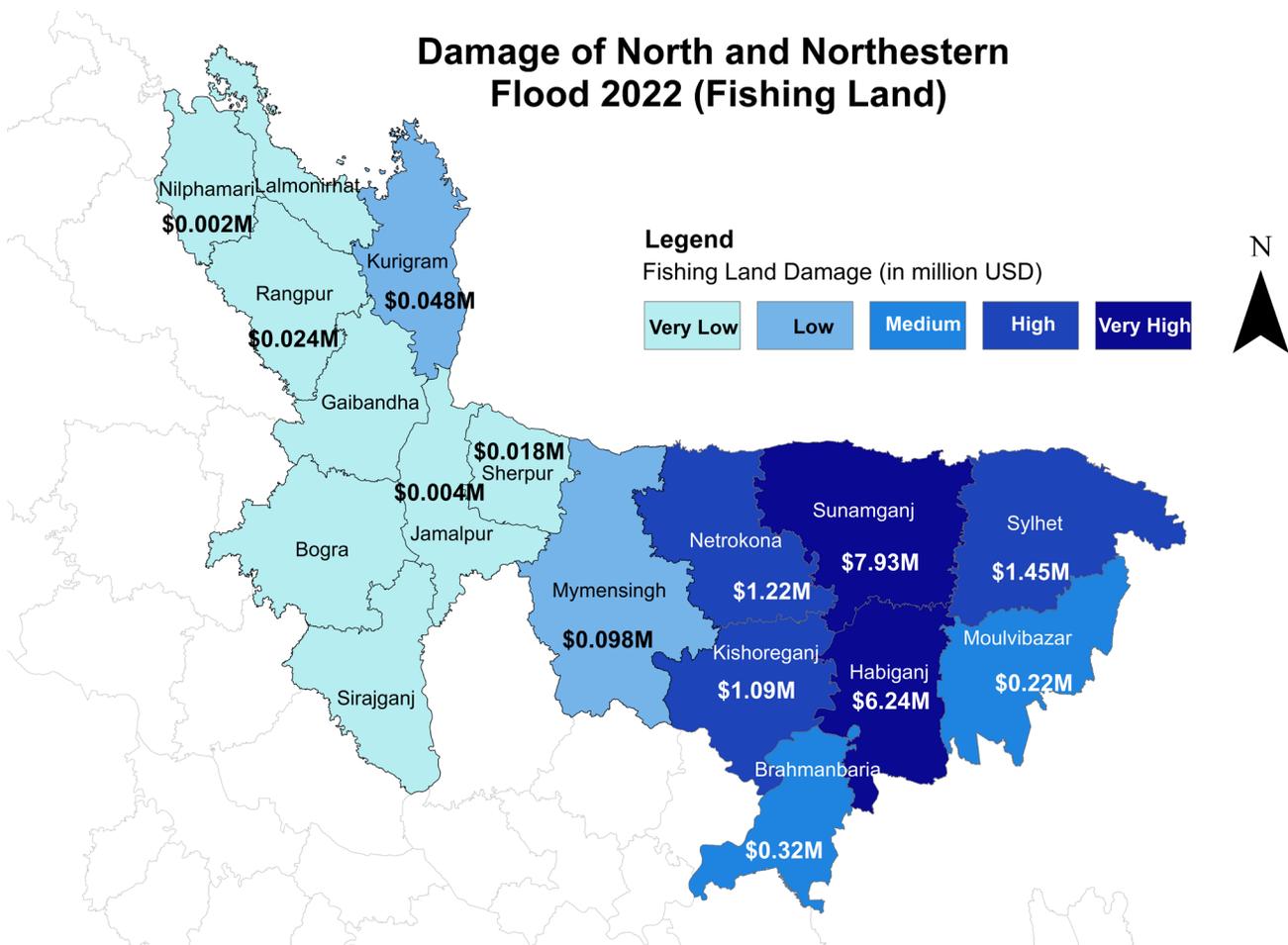
Figure 16 Damage of North and Northeastern Flood (Fisheries Land),
(Data Source: D form, Map Source: Author, 2022)

FGD and KII findings indicate that, a significant portion of inundation in Sylhet, Sunamganj and Netrokona districts, the farmers were preparing for Aush cultivation, but the flood water destroyed the Aush seed beds triggering a seed crisis for rice cultivation. The local people usually store rice in their houses on which they heavily rely during the monsoon periods during which

there is little scope for farming. The flood has washed away this rice storage along with the houses. And where the water stayed for days, it damaged those storages to the extent that they became unusable, leading the people to a severe food crisis

Livestock serves as the primary means of protein for poverty-ridden families after fish. Rearing and breeding livestock is a predominant feature of the local economy in Bangladesh. However, the flood has washed away all the ducks and chickens and a handful number of cows were killed as well. Lack of protein on the menu is now threatening their health with children becoming the most vulnerable ones.

As per the Needs Assessment conducted by the Department of Agricultural Extension (DAE), Ministry of Agriculture (MoA), total damaged crop field is 88,266 ha. and the total produced crop damage is 199820.84 MT.
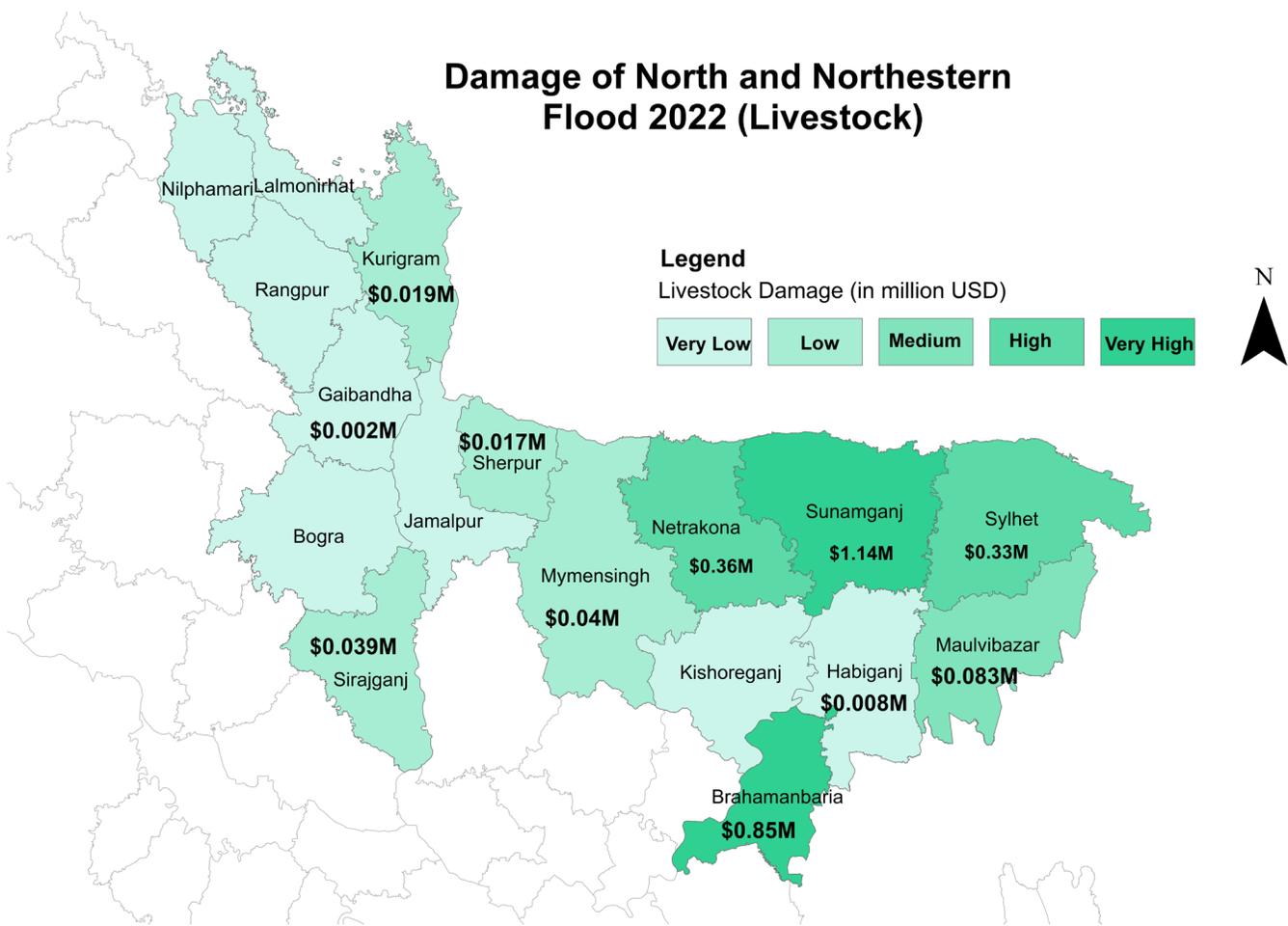
Figure 17 Damage of North and Northeastrn Flood 2022 (Livestock),(Data Source: D form, Map Source: Author, 2022)

As per the information acquired from D-form, the cost of damage to livestock asset rose to 107.23 million BDT in Sunamganj, the highest among all other districts. Brahmanbaria (79.96 million BDT), Netrokona (33.38 million BDT) and Sylhet (31.34 million BDT) are among the highly affected districts in damage to livelihood. (See Annex Table: Table A.2.2.6)

Findings from validation assessment affirmed that, although cow and goat rearing require large spaces and lots of labour, they are still prevalent in the haor regions of Sylhet, Sunamganj and Netrokona. With the abundance of water during the monsoon period small to large-scale duck farming is a rather common phenomenon in the North and northeastern regions. Chickens can be found in every household. Apart from helping the people financially, this livestock serves as a primary source of protein for them as well. But the flood has inflicted considerable damage to this economic activity of the rural people by washing away chickens and ducks. People took their cows and goats with them to the shelters and to high platforms. Nonetheless, countless cows and goats perished during and after the flood increasing the misery of the affected people.

In Bangladesh, haors are highly enriched in fish biodiversity and contribute to approximately 10% of the total capture fisheries production (Aziz et al., 2021) . In recent decades, man-made threats such as upstream dam construction, overfishing, use of illegal fishing gears, destruction of fish sanctuaries, and siltation have caused gradual degradation of ordinary habitats as well as decreasing aquatic diversity, a vital problem in Bangladesh (Islam et al., 2015; Pandit et al., 2015a)

(See Annex: Table on Livestock, Fishing equipment, farm and off-farm industry: A.2.2.6) Sunamganj suffered from high damage in fishing equipment and given the geographic context, fishing is one of the key livelihood options in Haor area.

Moulivibajar and Sylhet district sustained the highest farming damage. The flood had great impact on farm and off-farm industry has impact on food security, health, and livelihoods. The damage to farm products can have implication on next year cropping as farmers use the agriculture produce as seed for next season, thus its damage has impacts on next season.

Damage of Fishing Equipments
(in million Us$)

- Sylhet ($0.04 M)
- Kurigram ($0.04 M)
- Moulovibazar ($0.006 M)
- Netrokona ($0.06 M)
- Sirajganj ($0.005 M)
- Sunamganj ($0.25 M)

Figure 18 Cost of Damage in Fishing Equipments (Data Source: D form-2022)

Also, the daily-wage farm workers livelihoods are lost in case of no farm activity.

Damage of Farm and Off Farm Industry
(in million US$)

1%

22%

77%

- Moulovibazar
- Sirajganj
- Sylhet
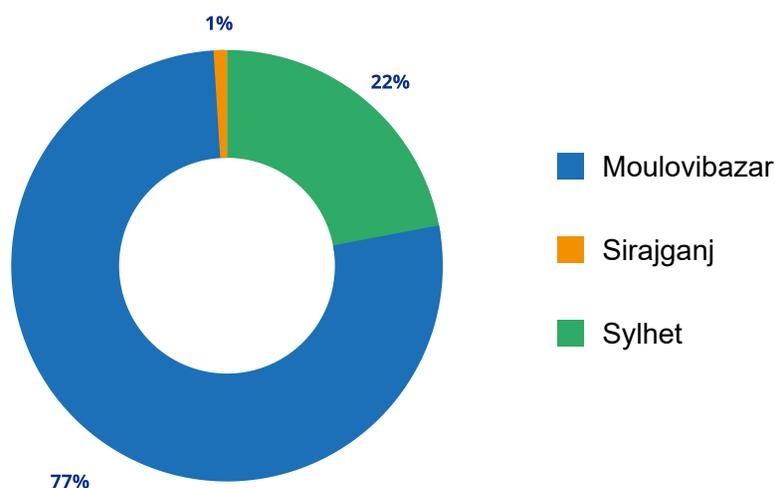
Figure 19 Cost of Damage in Farm and Off-farm Industry (Data Source: D form, Map Source: Author, 2022)

Findings from FGD and KII suggest that, in the aftermath of the flood, the rate of unemployment saw an upsurge in North and northeastern Bangladesh. The flood has impacted the business sector tremendously and many people lost their employment and other livelihood options. In an area with prevalent vulnerability, the flood has pushed back many into poverty. People are having difficulties meeting the basic needs of life and many are in dire need of a safety net of social protection. With increasing economic frailties, the affected population is gradually losing their access to food and other life needs.

Local Business, Commerce and Tourism

Tourism has been heavily impacted in Sylhet, Sunamganj and Netorkona since the spread of Covid-19. The recent floods have only made the situation worse. The roads are damaged, and bridges have collapsed in some locations preventing an upsurge of tourists to the popular destinations including Bichnakandi, Volaganj, Lalakhal, Swamp Forest in Sylhet, Tanguar haor, Jadukata river, Shimul Bagan in Sunamganj and Durgapur, Birishiri in Netrokona.

Local business and commerce came to a standstill for weeks as floodwater started inundating roads, markets and houses. Moving around became troublesome with boats turning out to be the only viable option for transportation. The local economy, plunged into a recession with zero economic activity around. Local aquaculture and poultry industry incurred the most severe damages, particularly in Sylhet and Sunamganj districts. Livelihood and income-generating activities were severely disrupted causing endless suffering for the local people. One KII of the study remarked the following,

"

"Electricity supplies were cut off; roads and bridges were damaged isolating the North and northeastern portion from other parts of the country. Exports, local trades and resource production observed a sharp decline within days. All sorts of economic activities were disrupted. Local markets were inundated causing damage to stored products. Fisheries and poultry farms were washed away. In a word, the flood has caused so much economic suffering that the people are still struggling to recover from the immense shock."

"Sylhet, Sunamganj and Netrokona districts hold several tourist attractions which draws millions of tourists every year boosting the local and national economy. In fact, tourism is one of the most significant economic activities in the Sylhet and Sunamganj districts. Thousands of people make their way of living out of this sector. After years of stagnation due to Covid-19, tourism had just started reaching its peak once again and in no time the worst flooding in 18 years again brought the sector to a standstill. Another KII stated,

"

"The flood has receded but the number of tourists are not increasing much. The people who depend on this sector for their livelihood are struggling immensely. Many small businesses have already perished."

2.2.4 Impact on Cross-cutting issues: Environment and Wildlife; Gender Equality and Inclusion; Local Governance

Environment and Wildlife

Forestry has environmental, health and livelihoods linkages. Forest and water resources, critical for livelihood, housing and daily chores were badly damaged during the flood. Sylhet alone endured the damage of 32.77 million BDT in forestry.
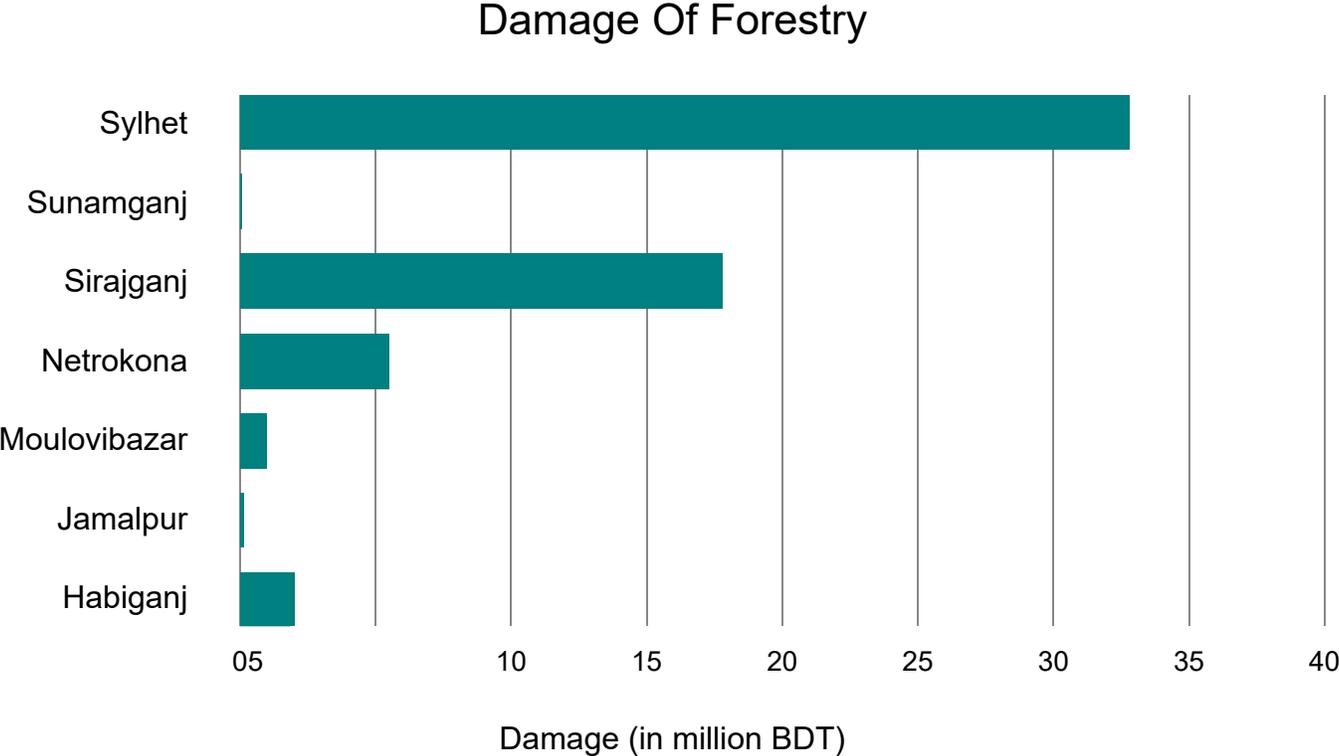
Damage Of Forestry

Figure 20 Damage in Forestry (Source: D-Form 2022)

Sunamganj was also affected the most in terms of impact of water resources. The district shares 0.33% of the total damage to water resources alone whereas Sylhet and Netrokona's share of damage are 0.23 and 0.14 respectively. (See Annex: Table: Water Point A.2.2.7)

Damage of North and Northeastern Flood 2022
(Water Resources)

Legend

Damage of Water Resources
(in million US$)

$0.05M — Nilphamari
$0.09M — Lalmonirhat
$0.27M — Kurigram
$1.5M — Rangpur
Gaibandha
$0.03M — Jamalpur
$0.18M — Sherpur
$0.01M — Bogra
Netrakona — Sunamganj
Sylhet
$2.7M
$6.4M
$4.5M
Mymensingh
$0.25M
Kishoreganj — Habiganj
Maulvibazar
$0.5M
$0.85M — Sirajganj
$1.1M
$0.8M
$0.21M — Brahamanbaria
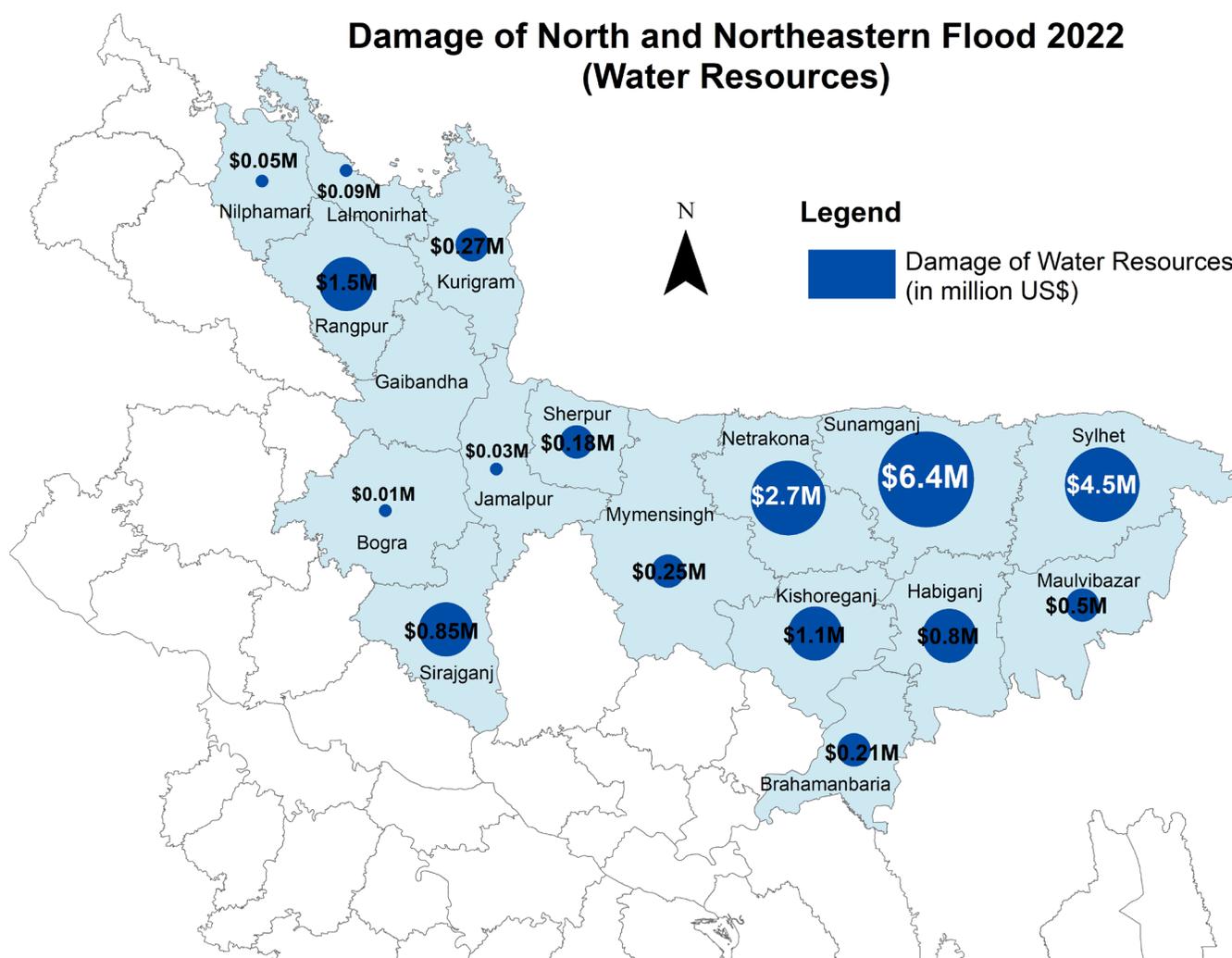
Figure 21 Damage of North and Northeastern flood 2022 (Water Resourcs),
(Data Source: D-Form 2022, Map Source: Author, 2022)

Humans are not the only victims of flooding. The animal population has likewise declined by the thousands. The wetlands in the North and northeastern regions are home to a variety of wildlife including mammals, birds and reptiles. The flood severely wrecked their habitats. Those who were fortunate enough to escape the water faced other threats, including humans and poaching. Habitat crises drove them near to human settlement which made them extremely vulnerable to poaching.

Having a proper investigation on the impact of flood on wildlife would give us a comprehensive picture. However, in certain locations, the flood has had disastrous environmental impacts. Roots of trees were starved of oxygen due to prolonged inundation and changes in soil conditions brought on by the persistent flooding. Forest and water resources, critical for livelihood, housing and daily chores were badly damaged during the flood.

Gender and Social Inclusion

This section discusses the effect of the flood on population disaggregated by sex. Broadly, the impact on individuals has been split into five categories: death, injury, being lost/missing, displacement from place of residence, and lastly, being affected without displacement, i.e., being home.

In terms of total number of affected men, Sunamganj had the highest share of number of individuals at 20%, followed by Netrokona at 19%, Sirajganj at 16.5%, and Sylhet at 16.2%. In Sunamganj, Netrokona, Sylhet, Bogura, Kishoreganj, Habiganj and Moulvibazar, the dominant effect for men was displacement. Sylhet had the highest number of injured men at 1,356, a great contrast to that of the other districts.

In terms of women affected, Sunamganj had the highest share (21%) followed by Sirajganj (18%), Netrokona (15.4%), and Sylhet (14.5%). When broken down into the five aforementioned categories, it appears that Sunamganj (21%), Netrokona (15%) and Sylhet (14.5%) the majority of women were displaced as opposed to any other categories (e.g., Missing or injured).

However, it appears that most women were affected by displacement, and this raises the question of protection issues prominently. Moreover, Sylhet had the highest number of injured women at 767, whereas almost all the other districts had almost no women injured. Although not in the top 3 districts in terms of number of women affected, the districts of Bogura (103,929), Kurigram (27,422), Kishoreganj (53,976), Habiganj (14,280) and Moulvibazar (6,910) also have a great number of displaced women (See Annex: Table A.2.2.8 and Table A.2.2.9).

Gender inequality is entrenched in our socioeconomic and cultural system with men exercising dominance over women. The flood has only exacerbated the underlying vulnerabilities of Children, women, lactating mothers, elderly people and persons with disabilities. The burden of crises fell entirely on the women during the flood.

And as the flood water receded, they now face the threat of malnourishment. Backyard economy, for instance, homestead gardens, poultry rearing and other livestock such as cows and goats which support the women financially were severely impacted by the flood. They are also facing difficulties in accessing services after the flood.

Impact of Flood on Children

As per an analysis by the Child Protection (CP) cluster, there exists a strong body of information on the occurrence of CP risks, with 9 out of 10 of children experiencing floods being afurther

affected by violence. Moreover, displaced women and children,including adolescents , face a multitude of risks that jeopardize their safety and wellbeing, due to the breakdown of community protection mechanisms, and increasing exposure to violence and levels of neglect. There are also unmet basic needs forcing children and their caregivers to adopt coping strategies that can result in exploitation and exacerbate their exposure to various forms of violence.

Sunamganj had the highest share of children affected at 40.5%, followed by Sirajganj at 16% and Netrokona at 15%. When broken down into the respective categories, Sylhet had the highest number of injured children at 312, followed by Moulvibazar at 213. Sunamganj, Netrokona, Kishoreganj, Sylhet, Kurigram, Habiganj, Moulvibazar, and Bogura were the top 8 districts in terms of greatest number of displaced children. Sirajganj, Jamalpur, Kurigram, Gaibandha, and Sherpur had relatively more children affected within their own homes. These observations are in line with those for men and women.

Impact on Persons with disabilities

Persons with Disabilities are already vulnerable to any kind of natural hazards due to a number existing barriers. When there is lack of proper safe evacuation, lost assistive devices, disruption in disability-specific healthcare need or higher susceptibility towards Gender Based Violence (GBV), both their exposure and vulnerability are higher. Sylhet had the highest share at 36.5%, followed by Sunamganj at 22.7% and Brahmanbaria at 22%. Therefore, more specific response and recovery interventions are requried.

Impact on the Local Governance

Government and non-government institutions, and offices also endured inundation and flood damage. The hospitals and other health dispensaries, Upazila buildings, government, and private-owned banks, and Upazila food storage in Sylhet, Sunamganj, and Netrokona went under flood water. Valuable documents, official records, and other expensive things were lost due to submergence. In fact, the national govt. struggled to connect with the local govt.
Local government offices were closed for several days which hampered flood relief and recovery programs in several locations. Lack of mobile network and internet connection hindered the flow of useful information from and to the affected regions. Although the impact on local governance of the flood was not acute, local government couldn't carry out their pre-planned interventions for weeks.

2.3 Community-led Recovery Need Prioritization

Persons with Disabilities are already vulnerable to any kind of natural hazards due to a number existing barriers. When there is lack of proper safe evacuation, lost assistive devices, disruption in disability-specific healthcare need or higher susceptibility towards Gender Based Violence (GBV), both their exposure and vulnerability are higher. Sylhet had the highest share at 36.5%, followed by Sunamganj at 22.7% and Brahmanbaria at 22%. Therefore, more specific response and recovery interventions are requried.

Box 1.1: Case story of Abdus Sattar and the impact of flood

Abdus Sabur is an inhabitant of Gowainghat Upazilla, Sylhet whose house was washed away during flood. His kutcha house that he built with 60,000 BDT could not withstand the flood. The flood water suddenly rose beyond their expectations and washed away all their belongings. With his wife and four (04) children, he had to take shelter in the upazilla health complex premise. He had to stay there for seven (07) days. He did not know what to do or where to go as he lost his house and assets. He did not receive any support from the government or any non-governmental organizations. He did not have any employment immediately after the flood. So, he chose to borrow an amount of 10,000 BDT with interest and build a temporary house. The temporary house that he has built now is very fragile and cannot be termed as a house in the proper sense. His children get drenched if there is any rain and also suffer the heat from the sunlight. There is no privacy as well. His families were forced to openly defecate for few months. Currently, he has managed to build a temporary latrine which does not have a pit. He is struggling to repay his loans along with many other difficulties.

The flood-affected communities in North and northeastern Bangladesh have been presented with countless challenges in the aftermath of the flood. To restore lives and livelihoods to normalcy the communities have set forth several recovery needs; on this front, the top three priorities are housing, WASH and building back roads/bridges.

The flood has damaged 186,703 houses of which 157,113 were Kutcha houses. Sunamganj and Sylhet were worst damaged with 56,062 and 48,066 damaged houses respectively. These two districts account for 45 percent of total number of houses damaged or destroyed. It is estimated that the housing sector sustained 34 million USD in damages[22].

The priorities below were validated through consultation workshops in Kolmakanda, Netrokona, Chatok Upazila, Sunamganj and Gowainghat Upazila, in Sylhet:

1.	**Assistance with housing repairment and reconstruction recovery**	
2.	**Household WASH facilities**	
3.	**Economic Recovery (Livelihood measures/ Income generating activities/ Employment opportunities)**	
4.	**Infrastructural recovery (embankments, mosques, school buildings, connecting local bridges etc.)**	
5.	**Strong social safety net measures (cash grants or food supply)**	
6.	**Distribution of livestock**	
7.	**Subsidized agricultural inputs and machineries**	
8.	**Access to soft loans or loans without interest**	

The priority needs were ranked through the community consultation workshop and district validation workshop.

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22 SCB-Shelter Cluster Bangladesh (2022).

3. Flood impact on Housing and community infrastructure

From the analysis of damage information received from GoB and the need prioritization with community consultation, it becomes clear that the housing recovery with a build back better approach is the priority. Therefore, UNDP Bangladesh has decided to dive deep into theHousing and community infrastructure, with its pre-flood context, post-flood damage assessment, recovery construction and financing strategy proposition.

3.1 Pre-flood context: Housing

Most of the Bangladesh's population resides in rural areas with most of the rural housing stock constructed by homeowners and occupiers themselves, based on their socio-economic condition, local traditions, locally available materials and the support of local labor with respective know how and technical skills. However, a substantial portion of the current rural housing scenario lies below standards and fails in providing a safe, healthy, and dignified living environment to its inhabitants.

There are some significant aspects of rural housing[23]:

Skills and knowledge:	Housing construction and future repairs are majorly done by the owners themselves. Although in rare occurrence, skilled labor is hired for specialized tasks such as chemical curing of bamboo and bricks, production of concrete, etc.
Material utilized:	The most traditional materials used in rural areas for housing construction are bamboo, timber, wood, various types of leaves and reeds, mud, tin sheets and types of netting. Rope is often used for joints and connections while plastic is used for technical detailing. Finishing and treatment of materials is commonly done by crude oil or tar. With a substantial increase in incomes of the rural population, the current housing stock is now a combination of the 'pucca' (strong, high-quality buildings made of durable materials), 'semi-pucca' and 'kutcha' (makeshift structures from not-durable materials) structures. Materials differ between regions and is defined by factors such as what is grown and produced locally, local purchase power, prevailing building practices, ease of transport, season etc.

23 An overview of rural Housing in Bangladesh (Source: HBRI, 2018)

Housing design:	The housing design is influenced by landscape and climate, availability of materials, purchasing power, local building and living practices and cultural preferences. Majority are the result of decades of trial-and-error methods rather than engineered research.
Settlement plans:	The traditional settlement patterns contain inherent knowledge on disaster resilience, production of construction materials on the plot, providing space for livelihood activities etc. However, the increasing pressure on land compelled more people to occupy lands exposed to disaster.
Impact on the local construction industry:	In recent days new techniques, knowledge, materials etc. were introduced and adopted in rural areas, e.g., concrete, corrugated iron sheeting etc. Vocational training by local NGOs, government housing loan schemes, post-disaster model housing built by organizations also introduce new technologies and approaches. Various local stakeholders, housing programs by the GoB e.g., Asrayan program for the landless, Cluster Village approach, housing loan scheme by the central bank, development and humanitarian agencies are also active in construction of housing for the most vulnerable. Indigenous housing mechanisms are disappearing as a result of globalization and rapid socio-economic growth. Their only housing mechanism to protect themselves from flooding is the raising of the homestead plinth.

3.2 Impact of floods on housing

As we discussed above, the significant flood impact on housing and community infrastructure has made it a priority in recovery need. Field studies revealed that most of the affected people had kutcha houses and if they can manage, they opt for semi-pucca houses.

Although the World Bank data shows per capita income of each Bangladeshi is 2,503 USD (2021)[24], the majority of the FGD participants' monthly income hardly exceeds 10000 BDT (100 USD approx) per month. Having a semi-pucca house of their own seemed luxury to them. According to the response of one KII with the chairman from Kalmakanda Upazila, Netrokona.

> **"**
>
> *"People here can't even afford a proper meal 3 times a day let alone they can build a pucca house."*

They usually try to construct houses on high platforms or raise the homestead plinth to prevent floodwater from entering the house. But in the 2022 flood, the floodwater rose to a height beyond their imagination and washed away houses in low-lying areas. Elevated houises sustained considerable damage as well. Overall housing damages from the flood include scouring of foundations, partially damaged walls and inundation for days. Several houses in each of the locations were fully destroyed by the swift current of floodwater. Furniture sustained damage from being submerged under water for several days.

When a flood of such magnitude occurs, consequences become inevitable. Nevertheless, the reasons behind such profound impacts on housing is rooted in the vulnerable geographical location of the area and the use of low-cost housing materials. Floodwater and inundation damage those low-quality materials. Buildings on soft soils and inadequate foundation also expedite housing damages. One of the FGD participants from Sunamganj explained,

> **"**
>
> *"The force of water was so fierce this time that the kutcha houses were unable to withstand it. Houses constructed with bamboo fence were fully destroyed."*

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24 https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=BD

Impact of Flood on Housing (Kutcha)
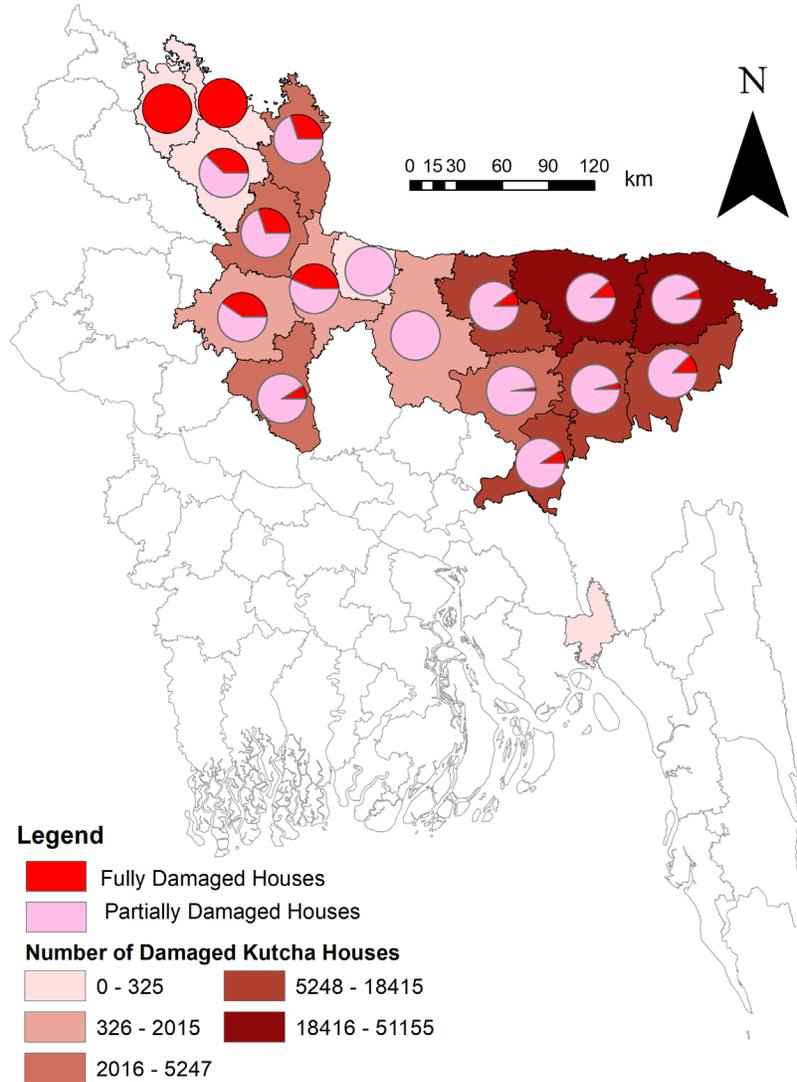
Figure 22 Impact of Flood on Housing (Kutcha) (Data Source: D form, Map Source: Author, 2022)

As the field study investigated, the flood's impact on housing was the most severe. People began living in partially damaged houses because they had no other option. The remnants of the houses that were washed away serve as a reminder of how powerful the flood was.

Hospitals and schools were mostly used as flood shelters. The equipment was damaged in some buildings but no severe damage to these infrastructures has been recorded. Kutcha and semi-pucca mosques and temples in the villages were damaged too in the flood.

The damage to housing directly impacts communities, as its destruction can threaten the physical, social, emotional, and economic condition of affected households.
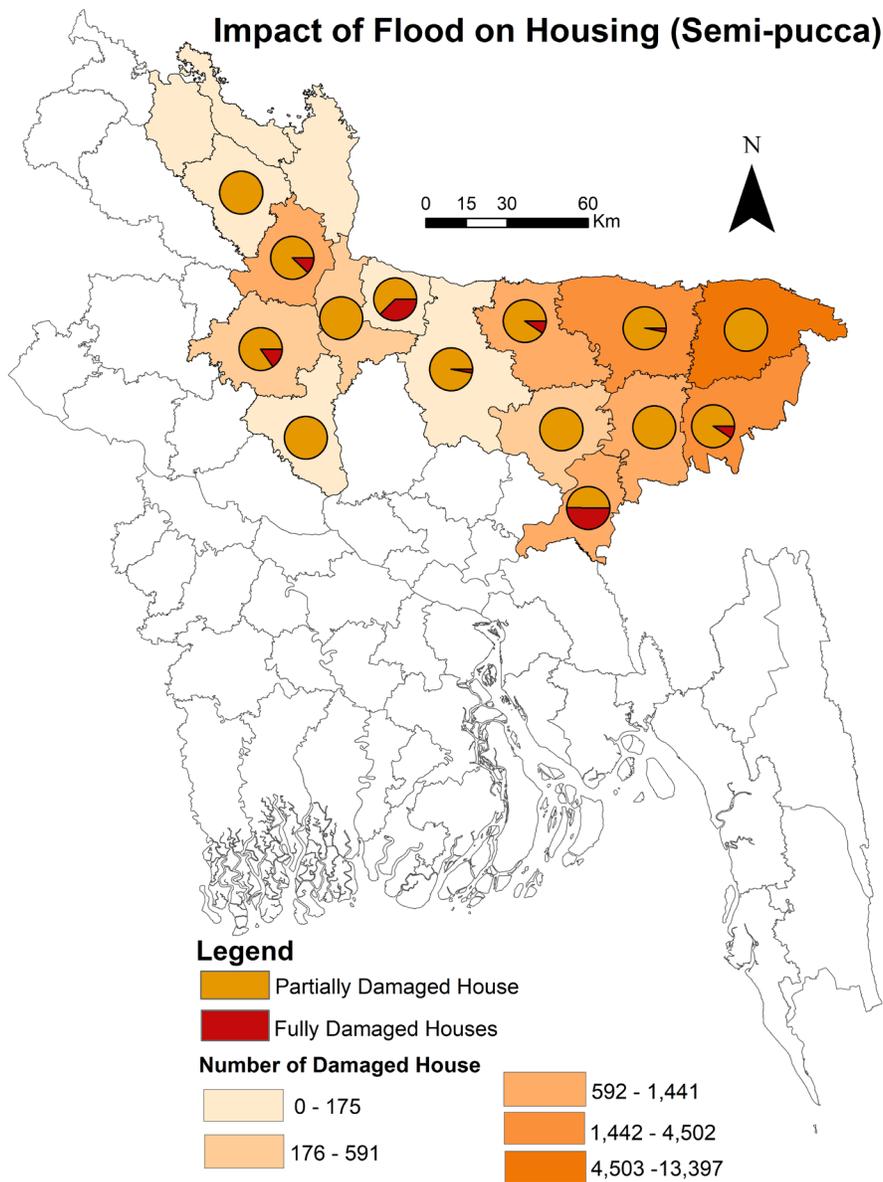
Housing and infrastructural damage is a cross-cutting area, and a portion of communities has shops or small-scale workshops within their own homes, which means that housing damages feeds into livelihood damages. necessitates that flood recovery processes prioritize the recovery of this sector. The damage to housing has also operates along the dimension of gender, as it can especially impact the physical and emotional safety of women and children. Moreover, the damage of sanitation facilities within the house impacts the health of families and women and their protection.
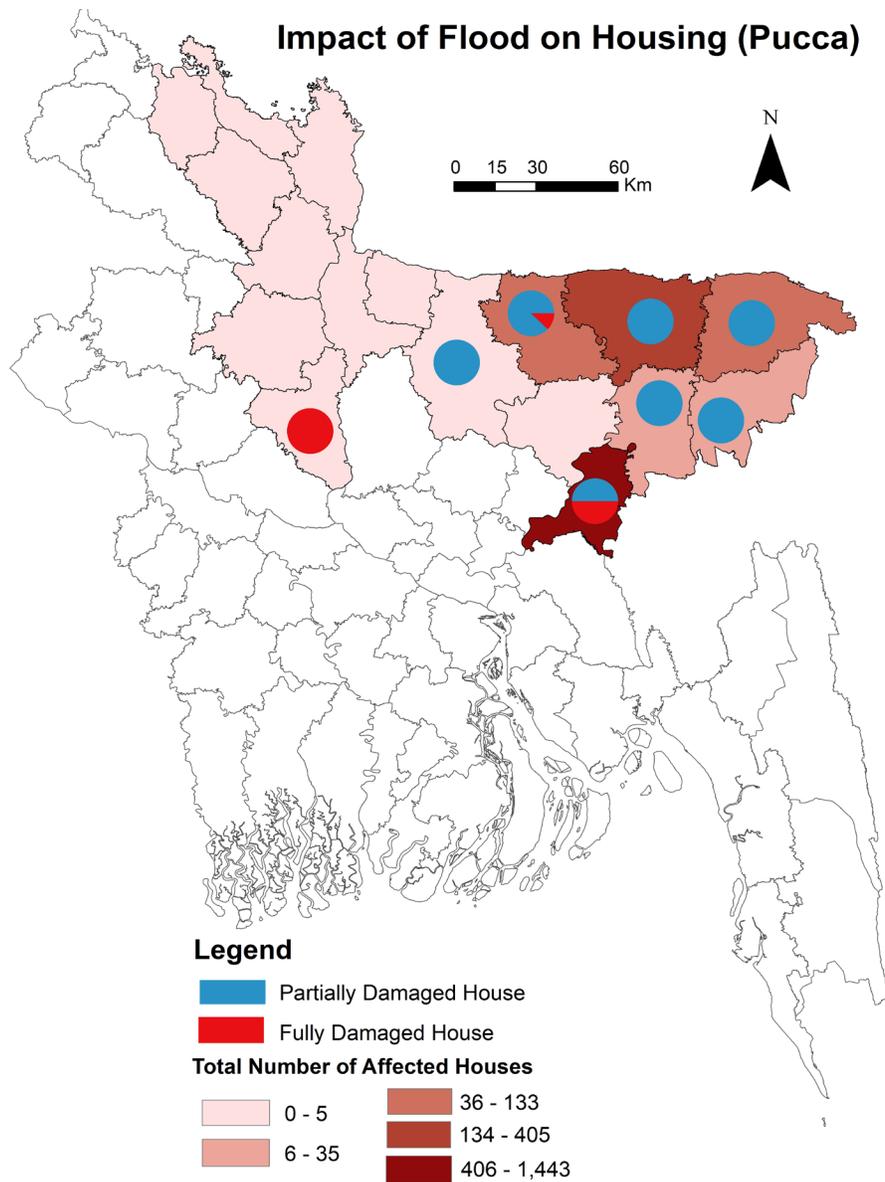
The flood impact on these three categories of houses as Kutcha, Semi-Pucca and Pucca. District-wise housing damage shows that most of the damages are in Sunamganj (30%), Sylhet (25.74%) and Habiganj (10.35%).

3.3 Housing damage analysis

From the field investigation it was found that, most of the houses suffered from the damage of kutcha plinth. Extent of plinth damage became the triggering factor for damage of other elements such as pillar, fence, roof etc. Almost all kutcha plinths were damaged either partially or fully and more than 20% of which are beyond repair.

Data analysis shows that about 94% of houses are Kutcha and only 6% semi-pucca. House building materials for Kutcha houses are mud for plinth, or bamboo or CI sheet for wall and CI sheet for roof. Post or pillars are from bamboo or wood or concrete. Mud plinth is most vulnerable to flood water. On the other hand, unreinforced pillar, wall and roof are vulnerable to wind force and flood water wave action.

Pucca plinths found resilient against flood in chatak and gowinghat but many pucca plinth collapsed in Kalmakanda upazila because of nearer location to hills. Flash flood water came from hill slope with tremendous force and many pucca plinths were collapsed either partially or fully. Moreover, CI sheet roof of semi-pucca houses is not always resilient to strong wind, if it is not engineered (Table 3.3.1)

Table: 3.3.1: Causes of damage of different house components	
House Components	**Causes of Damage**
Plinth	• Unprotected homestead • Prolonged duration of flood water • Non-resilient/vulnerable plinth materials • Non-durable, non- resistant plinth materials • Height of flood water • Cultural prospects
Structure	• Wave action of flood water • Wash out of plinth • Non-resilient/vulnerable plinth materials • Non-durable structural elements • Using unseasoned bamboo as structural element • Unskilled & poor structural methods

House Components	Causes of Damage
Fence	• Wave action of flood water • Non-resilient/vulnerable plinth materials • Non-durable, non- resistant fence materials • Wash out of plinth • Prolonged duration of flood water • Height of flood water
Roof	• Wash out of structure • Height of flood water • Non-resilient/vulnerable plinth materials

There are some other reasons which can be associated with the causes of overall damage, such as;

- Geolocation of the HHs
- Socio-cultural factors of the affected community
- Non-movability of house
- Hydrodynamics
- No previous experiences of such disasters in decades

3.4 Analysis of level of damages: housing

Undamaged Houses:

Undamaged houses were provided by 'Ashrayan Project' of the government where plinth and walls are made of clay brick and that of roof is CGI sheet.

Building Materials:

- Plinth: Clay Brick & Concrete
- Structure: Clay Brick or Concrete
- Fence: Clay Brick
- Roof: CI sheet on wooden frame.
  Socio-Economic Condition/ Occupation:
- Day Labour - 67%
- Fisherman - 33%

Monthly income: 12000-15000 BDT
Land ownership: Own land

Picture: Undamaged House

Partially damaged houses:

Almost all partially damaged houses were repaired with temporary materials which are not resistant to further disasters.

Building Materials:

- Plinth: Mud
- Structure: Concrete Post or Bamboo
- Fence: CI sheet, Bamboo & mud
- Roof: CI sheet

Socio-Economic Condition:
Monthly income: 5000-20000 BDT

Picture: Damaged House

Fully damaged houses

Building Materials:

- Plinth: Mud
- Structure: Bamboo
- Fence: Mud, bamboo, CI sheet
- Roof: CI sheet

Socio-Economic Condition:
Monthly income: 12000-15000 BDT

Picture: Fully damaged House

4. Housing and community infrastructure recovery: Approach and implementation

4.1 Key principles for Housing Recovery

The housing recovery and reconstruction programme should aim to support construction of 'core housing', which helps families to extend, renovate, repair, and retrofit with safer construction practices and technologies as afforded by their finances. This is otherwise known as "one room shelter", "seed house", or "starting house".

Primarily, core housing programs focus on plausible part of future permanent home of a disaster-affected family. It commonly consists of either a small but habitable section that can be designed to expand later, or the frame and foundations of a permanent home with only temporary claddings for walls, roofs, ceilings, or floors, designed to be upgraded later.

Many core-house designs are built on clear empty plots. In some cases, a remaining structurally safe room in a badly damaged house can be repaired to be the core room. Most core housing programs are based on the premise that once families are rehoused, they will return to work, earn remuneration and then gradually upgrade their homes. The programs also aim to provide a seed or starting point from which families can go on to recover on their own. At the same time, however, it is important to acknowledge that building a core house for a family who has no right of tenure may only exacerbate their situation, leaving them evicted at a later stage with no further support. Thus, the permanent nature of core houses implies the requirement of clear, long-term land tenure and the need to be engineered to be free from future risk. The Government of Bangladesh has identified 10 key principles for housing recovery, which are in line with international good practices on housing recovery and reconstruction as follows:

- The following guiding principles will be critical to ensure recovery and reconstruction efforts take a Consistent approach:

- Participatory, inclusive, and green recovery for long-term resilience.

- Pro-poor, pro-vulnerable, and gender-sensitive, targeting the most affected.

- Coordination of government tiers through centralized policy, planning, and coordination; and decentralized implementation.

- Bring a gender perspective to planning, implementation, monitoring and technical assistance; and Invest in nature-based solutions and ecosystem-based adaptation measures.

- Conflict-sensitive implementation.

- Prioritize institutional and regulatory reforms to ensure sustainability.

- Use of local materials, knowledge, skills, and labor.

- Avoid relocation as much as possible.

- Balance between public and private sector recovery.

4.2 Emphasis on synergies between humanitarian effort and recovery. sthe Key elements of housing recovery implementation

- Flexibility for housing recovery: Having options of owner-driven housing reconstruction to construction by a third party is empowering. The Owner-driven Reconstruction Policy with financial and technical assistance from the Government help community understand the importance of resilient housing.

- Public Private Partnership: Under this approach, Bangladesh Government can engage development partners, private sectors in housing recovery in North and northeastern areas. The partnership between the Bangladesh government and development partner/private sector will help in tapping best from both agencies for reconstruction.

- Construction material at affordable price at local level: During housing recovery phase, government can set up building construction material facilities at Upazila levels in the North and northeastern region. It has been observed that during to mass construction in limited duration, the cost of materials can go up. Government of Bangladesh can set up facilities and provide materials at government-controlled prices. Bangladesh government can negotiate the cost of materials directly with manufactures to reduce costs by bulk procurement.

- Green and sustainable materials for recovery: The housing recovery together with its periphery should promote usage of sustainable building materials. The materials recovered from debris should also be considered in recovery of housing programme. A technical guidance

note on usage of commonly recovered debris for usage should be prepared and widely disseminated. The housing design should be energy efficient through natural cooling options and proper lighting.

- Creating pool of trained manpower for resilient construction: The analysis of damaged houses revealed that poor construction was one the key reasons for damage to houses in the northeastern region. It is important to build capacity of local masons and carpenters in resilient housing construction and such skill will scare, when recovery will start in the flood affected region. The northeastern housing recovery programme should have provision for capacity building. It is important to note that this trained human resource can be further utilized in the Bangladesh government's housing construction programme.

- Awareness generation: A simple do's and don'ts on resilient housing construction practices will help in creating awareness on importance of resilience and it will create demand for flood resilient housing recovery.

- Gender empowerment: The housing recovery can be used as one of the mechanisms for gender empowerment. In case of housing assistance to northeastern flood affected population, the joint-ownership of reconstructed houses can be one of the criteria.

- Monitoring housing recovery and managing grievances: The financial assistance to community in installment, linked with quality and progress of construction will help in monitoring the housing recovery. It is equally important to create a system for receiving community concerns/grievance as housing recovery covering over 100,000 households is likely to have issues. Call centres can be one of the options for seeking community feedback on housing recovery.

4.3 Financing housing and community infrastructure recovery

Tools for financing housing recovery

Housing is one of the most cost intensive and challenging sectors in a recovery programme due to several factors including high number of affected houses, aim to upgrade damaged houses to multi-hazard resistant construction, housing is cost-intensive in nature as it involves physical as well as soft elements and low-penetration of risk transfer instruments.

The housing and community infrastructure recovery strategy is part of the overall disaster re-covery framework and strategy. Some of the tools used for financing disaster recovery including housing recovery by the government are as follows (Table 4.1)

(Table 4.3) Tools for financing disaster recovery/housing recovery	
Tool for financing recovery/ housing recovery	Description
Government reserve/ Budget contingencies	• Internal reserves and contingency budget lines provide the government (and local government) with flexibility in the event of a disaster • Contingency funds are rarely adequate to cover significant recovery needs, especially in municipal government • It is not earmarked only for disasters and may beexhausted before a disaster hit
Budget reallocation by Government	• Budget reallocation from development programmes to recovery programmes endangers development priorities • Sometime reallocation of budget can require high level approval, which may be cumbersome
Special taxes/ surcharges by Government	• Government imposes special tax or surcharge on specific services to fund disaster recovery • Broad base of contributors allows for a small increment with a high impact in the revenue for recovery
Emergency loan	• Government negotiates emergency loans with multilateral and other financial institutions to fund recovery • The negotiation process takes time. It is not rare that the actual reconstruction/recovery work starts six months after a disaster • Generally, such loans are soft loans

(Table 4.3) Tools for financing disaster recovery/housing recovery (Continued)	
Tool for financing recovery/ housing recovery	**Description**
Grant financing by donors	• One of the cheapest sources of financing post disaster • Many donors have well-established humanitarian programmes and can be quick to respond, particularly to support relief. Unfortunately, donor financing is plagued with limitations. • Donor funding after an event sometimes comes at the expense of pre-established programme and thus implies an opportunity cost • With limited resources, donors are rarely able to support larger reconstruction programme
Risk transfer/insurance	• Public and private assets can be insured, and it is in practice in many countries, though coverage is limited in developing countries • Help government to reduce impact of disasters on budget • Swiftly provides liquidity without access to credit market • Paying premiums can be a challenge for poor household
Event linked bonds	• Linked with disaster/events and gets triggered when an event meets certain pre-defined criteria • If the defined catastrophic event occurs, the bond issuer can withdraw funds to pay claims and part or all of interest and principal payments are forgiven • If the defined catastrophic event does not occur, the investors receive their principal plus interest • The typical maturity is 1–5 years with an average maturity of 3 years
Policy incentives	• Government provides tax holiday or reduce taxes to incentivize private sector to share recovery cost • Swiftly provides liquidity without access to credit market • Paying premiums can be a challenge for poor household

(Table 4.3) Tools for financing disaster recovery/housing recovery (Continued)	
Tool for financing recovery/ housing recovery	**Description**
Multi-donor Trust Funds	• It is vehicle for programming, channeling and tracking donor funding for recovery • A firm or donor or government can manage the fund • Establishing trust fund can be time-taking as it has several implications, hence it is important to setup in advance and activate once a disaster strike
Individual contribution	• The biggest contribution to recovery financing comes from the citizens within the country domestic and abroad • Remittances by relatives and friends are an important source

Source: World Bank, 2010[25]

Means of channeling housing recovery fund

The financing for houses and infrastructure affected during northeastern floods can follow the channels provided below, and each channel has its pros and cons.

- On-budget/on-treasury: This channel of financing has its advantage in terms of strong checks and balances and follows existing procedures of Bangladesh government. Funding for bulk housing recovery can use this channel.

- On-budget/off-treasury: This channel of fund flow reflects in government accounting system, but it has less administrative procedure. Housing recovery undertaken by charity institutions in partnership with government can use this channel.

- Off-budget/off-charity: This channel of financing is high flexible. It can be used by private sector, charity institutions and non-government organizations which adopts one or several villages for comprehensive housing recovery.

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25 https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=BD

- The population affected in northeastern region of Bangladesh have very limited resources and it occurred in the far end of 2 years of covid-19, which depleted even limited resources of the population. It is important to provide financial assistance to community for a core-multi-hazard resistant housing.

- The funding for multi-hazard housing and community infrastructure is key as area is prone to floods.

- Government can create several options for supporting housing recovery which enables development partners to support housing recovery with flexibility. These options include creating a trust fund for multi-donor funding, area adoption for housing recovery, technical assistance/capacity building support on housing and infrastructure, reallocation of housing budget/social welfare budget to flood affected areas, etc.

- The housing recovery financing in northeastern floods should be based on the principle of 'assistance' and 'not-compensation'. It entails that housing finance is to support community to repair/reconstruct core flood-resistant house and not compensate the damage of house during floods.

- The housing assistance should be in 2 to 3 installments and installment should be linked with quality control.

- The housing assistance should be flexible timeframe as community in northeastern region of Bangladesh is engaged in agriculture and fishery, which is seasonal.

- Housing and community infrastructure financing should include capacity building and awareness generation components as there is need for mass awareness on flood resistant construction. Also, local construction workers need to be trained in construction flood resistant housing.

4.4 Cost estimates of Bangladesh flood housing recovery

From the analysis it is obvious that many houses need recovery if not full reconstruction. Almost all kutcha houses were damaged either fully or partially and most of the dwellers found their house unlivable. The reconstructed house should embed the Build Back Better principle and cost estimates of houses include it.

Based on availability and local market prices of building material and labor, component wise recovery needs assessment for houses and toilets are given below:

Table 4.4 Unit cost for Housing Recovery as per Component

Components	Previous Material	Unit Cost	Proposed Meterial	Unit Cost	Comments
Foundation	No		Concrete block	80/- per sft	
Plinth	Mud	40/- per sft	Concrete block and cement morter	350/- per sft	
	Brick/concrete		Concrete block and cement morter	300/- per sft	
Column/Pillar	Bamboo	150/- per piece	Reinforced Concrete/ Ferrocement wrapped block work	1000/- per piece	
	RC 5	00/- per piece	Reinforced Concrete/ Ferrocement wrapped block work	1000/- per piece	
Wall/Fence	Ekra/Adra/Bamboo	10/- per sft	Block/Ferrocement	100/- per sft	
	CI sheet 4	0/- per sft	Block/Ferrocement	120/- per sft	
Roof	CI sheet & bamboo rafter	100/- per sft	CI Sheet & Steel angle rafter/Ferrocement	300/- per sft	Durability of CI sheet & steel angle rafter is more or less 15 years. On the other hand, durability of ferrocement roof is more than 30 years.
	CI sheet & wooden rafter	150/- per sft	CI Sheet & Steel angle rafter/Ferrocement	300/- per sft	Durability of CI sheet & steel angle rafter is more or less 15 years. On the other hand, durability of ferrocement roof is more than 30 years.

Toilet	Open				
	Concrete Ring-slab	3000/- each	Concrete/Ferrocement ring-slab	10,000/- each	Unit rate proposed on the basis of two pit system
	Saucer	500/- each			
Toilet Fence	Jute mat				
	CI sheet 3	0/- per sft	Concrete block/ Ferrocement	120/- per sft	
Toilet roof	CI sheet 6	0/- per sft	CI sheet/ Ferrocement	200/- per sft	
Door, window etc.	Wood & CI sheet	2500/- per piece	Plastic/ Ferrocement	6000/- per piece	

There are two types of cost estimates (build back better and build back as previous condition) are based on the following considerations:

- Based on D-Form template, damage types are considered Partially and Fully.
- Standard household size is considered 5 (five) as statistical medians of surveyed sample.
- Covered area for standard house considered 200 sft (18.5 m2) including Toilet.
- Partially damaged means 50% damage.
- Both partially and fully damaged kutcha house and toilet need to be built of same standard following 'Build back better' approach.

Housing reconstruction cost on average (per unit) estimates (in BDT) for housing and toilet using build back better principles

Damage Type	Pucca	Semi-pucca	Kutcha	Toilet
Partially	80,000.00	80,000.00	160,000.00	25,000.00
Fully	160,000.00	160,000.00	160,000.00	25,000.00

House Recovery (Repair) Cost in BDT (Build Back to the Previous Condition - approach):

Damage Type	Pucca	Semi-pucca	Kutcha	Toilet
Partially	80,000.00	65,000.00	36,000.00	4,000.00
Fully	160,000.00	130,000.00	72,000.00	8,000.00

Reconstruction material is available locally either someone goes for 'Build Back Better' strategy or a temporary repair. It requires building materials like cement, sand, wires, and re-bars. On the other hand, temporary measures require bamboo, wood, CI sheet, steel angle etc. The housing and toilet technical design options are at Annex B.

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Partially damaged houses have potential for rehabilitation with existing residual materials and/ or locally available materials. The damaged plinth may also be reconstructed either temporary or durable in nature.

5. Conclusion and General Recommendations and Way Forward

5.1 Housing: An outline of recovery plan

As a proposition for next steps, UNDP Bangladesh emphasizes on laying out a housing recovery and reconstruction plan under the leadership of the Government of Bangladesh. The resource mobilization for housing recovery programme should also kick start with readjustment of development budgets to housing recovery, diversion of housing projects to the flood affected region, donors, private sector, and other development partners. The total 27,687million BDT (US$ 296.0 million) (See Annex: Table A.5.1) housing recovery needs can be spread over 5-10 years as the housing recovery takes time. The proposed plan for housing for coming years is below:

	Recovery rate in %	Number of Fully Damaged Houses	Number of Partially Damaged Houses (50% recovery rate) with transitional approach	Number of Partially Damaged Houses (50% recovery rate) with Build Back Better Approach
Year 0-3	20%	3696	16822.3	16822.3
Year 3-5	30%	5544	25233.45	25233.45
Year 5 and beyond	50%	9240	42055.75	42055.75
total	100%	18480	84112	84112

Gradual rate of recovery is needed. It is assumed that within first 3 years 3696 houses will be recovered which were fully damaged. Within 5 years 5544 houses should be recovered and after 5 years rest 9240 houses will be recovered which were fully damaged. With the transitional approach within first 3 years 16823 houses will be recovered which were partially damaged. Within 5 years 25234 houses should be recovered and after 5 years rest 42056 houses will be recovered which were partially damaged. Same can be planned for the Build Back Better approach with a higher recovery cost.

It assumes that in year 3 the enabling environment for housing recovery will be the focus, while in year 5 construction activities will get momentum and in years to come the left over or laggard cases of housing recovery will happen. It is important to note that cost of capacity building, awareness generation, housing recovery monitoring and technical assistance and project management need to be calculated.

The housing recovery programme document should include programme policy and objectives, institutional set-up for housing recovery, implementation arrangements and monitoring and evaluation. The housing policy should be based on the concept of 'core housing' and 'owner-driven'

approach. The programme can be of 5 years and beyond duration as an owner-driven housing is a process-oriented approach. Government and development partners should play a facilitator's role to the process and create enabling environment by capacitating construction workers and creating awareness on flood resistant housing among masses.

5.2 Livelihood restoration and other sectoral priorities

Based on the community consultation, the following recommendations are proposed for livelihoods restoration and other sectoral recovery to restore normalcy to lives and livelihoods.

- Provide monetary and technical assistance for reconstructing and repairing damaged houses. Make sure that the houses are reconstructed with high-quality materials incorporating indigenous knowledge and practices. The wide range of solutions that are available to make the built environment more resilient to floods should be applied.

- Rehabilitate the roads, bridges, and culverts to ensure uninterrupted transportation of goods and services. The potholes in the asphalt roads should be filled. Washed-away roads, bridges and culverts are to be reconstructed.

- Repair the breached embankments. Reconstruct completely damaged embankments and community protection walls. Engage community people in such works to provide them with temporary means of living.

- Ensure food security and nutritional requirements of the affected population. Provide essential food packages to the most vulnerable households. Pregnant women, lactating mothers, children and elderly people should get priority in receiving food items.

- Contain price hikes of goods and services within the affected communities. Ensure ongoing monitoring of the prices of food and agricultural items. If needed, mobile courts should be imposed.

- Engage more men and women from the affected population in cash-for-work schemes. Engage them in rebuilding breached embankments and other community infrastructures.

- Provide multi-purpose emergency cash grants to the most vulnerable households. Priority should be given to female-headed households, pregnant women, households with children, and people with disabilities to protect them from harmful coping strategies.

- Give away livestock to ensure the productivity of the households. Livestock is essential to the subsistence of the poor. Households can rely on their livestock for a reliable supply of food and an ongoing source of income.

- Provide fodder to the cattle rearers to fight the cattle-feed crisis. Many have been forced to sell their cows, buffaloes, and even goats due to a lack of cattle feed. Free or inexpensive feed should be transported to the impacted areas.

- Provide agricultural equipment to the farmers. Seeds, fertilizers and other essential items required for revitalizing agricultural activities in the affected communities should be transferred immediately. Support the women to grow homestead vegetables.

- Reconstruct safe drinking water points. Several drinking water points, such as tube wells and water pumps, should be installed to prevent water-borne diseases from drinking pond and river water.

- Reconstruct damaged sanitation facilities. To fight the sanitation crisis after the flood and to protect the health of the affected population measures to repair and reconstruct latrines and bathrooms should be considered immediately.

- Ensure health facilities towards the affected communities. To restrain malnutrition and other communicable diseases, emergency healthcare services should be provided to flood victims. Awareness programs regarding water-borne diseases need to be conducted at the community level.

- Ensure compensation for schools and other educational institutions. Damaged equipment should be replaced or repaired. The dropout rate has increased after the flood. Proper incentives should be given to the families of the children to ensure their presence of them in the schools.

- Prepare a checklist for the responsible officials The government officials i.e., Executive Officer at the Upazila level known as UNO, Upazila Chairman or Union chairman should be provided with a checklist and a to-do list to check certain facilities and critical infrastructures during a disaster.

- Conduct Training Programs for the Government and other responsible Officials It is important to communicate the urgency of acting promptly during any disaster. The officials even the DRRO, PIO lack proper knowledge on supporting the person with disability, elderly and pregnant or lactating women.

5.3 Strengthening disaster risk management for building resilience

- Establish a proper response coordination system among relevant stakeholders

The stakeholders responsible for preparedness, response and recovery are but not limited to –

1.   Government/Autonomous Organizations–
    a)   Ministry of Disaster Management and Relief
    b)   Department of Disaster Management (DRRO and PIO Office at the district and upazilla level included)
    c)   Bangladesh Meteorological Department (BDM)
    d)   Flood Forecasting & Warning Centre (FFWC)
    e)   Local government (UN Office, DAE, Agriculture, Livestock and other departments)
    f)   Bangladesh Water Development Board
    g)   Local Government Engineering Department
    h)   Bangladesh Army, Navy and Airforce
    i)   Bangladesh Police
    j)   Ansar and VDP
2.   UN Agencies/INGO/RCRC Movement
3.   National and Local NGOs
4.   Private Organizations
5.   Informal Responders

A lack of communication and collaboration is evident among all the stakeholders. Establishing a proper ICS during response an organogram of information flow during other phases of disaster, other than just following the Military Civil Collaboration as per the Standing Orders on Disaster (SOD) should enhance a speedy recovery should a similar event takes place in the future.

- **Initiate the excavation of the rivers and canals**. Regular dredging and deepening of river-beds will ensure adequate drainage of water and sediments towards lower elevations without overwhelming the banks. Excavation will increase the capacities of the water bodies to sustain an overflow of water.

- **Establish zoning and land use planning in the wetlands.** Generate digital elevation maps (DEM) and watersheds & drainage basin maps for the flood-affected area. Allow houses to be built only on elevated locations.

- **Replace bituminous and asphalt roads with CC (Cement Concrete) and RCC (Reinforced Cement Concrete) roads.** Bituminous roads can't withstand water-logging, get eroded by flowing water and creates potholes. Whereas, CC And RCC roads are ideal in terms of longevity for wetland areas.

- **Construct and renovate crop protection embankments.** Fortify slope protection walls to safeguard communities from erosion and flooding. Build new ones with CC blocks where they are needed.

- **Build Mujib Forts (shelters) in flood-affected regions.** Mujib Forts will offer a safe place for the people and their cattle during emergencies like flash floods.

- **Conduct Environmental Impact Assessments (EIA) and Social Impact Assessments (SIA) of every project proposed for the wetland area.** Do not introduce projects with negative consequences to the geomorphology and drainage system of specific regions.

- **Increase the number of flood shelters.** Establish sufficient multi-purpose flood shelters to protect the vulnerable population and mitigate their sufferings while these structures can also serve as schools after floods.

- **Introduce advanced and multi-hazard Early Warning System (EWS)**. Appropriate warnings in advance of imminent threats will allow local people and officials for a better preparation and mitigation of probable shocks. Increase the capacity of Bangladesh Meteorological Department (BMD) to predict and disseminate hazard information more efficiently.

- **Introduce satellite-based communication during emergencies**. Damage of electricity and mobile phone network often create communication difficulties. Satellite communication can solve this problem.

- **Introduce water ambulance in the wetlands**. Make use of the water ambulances to ensure healthcare services to the people of the wetlands, especially during floods and other emergencies when moving patients to and from different becomes difficult through regular transportation.

- **Increase employment opportunities for the people of the affected regions**. Sustainable livelihoods or income sources will significantly reduce the impact of floods on the affected population.

- **Introduce agriculture-based training.** To maximize agriculture production in northeastern Bangladesh, where the majority of the farmers grow only one crop a year, there is a need to invest in introducing new agriculture practices and build capacity of the farmers.

- **Increase facilities for the farmers.** Provide them with essential training on farming, and benefit them through subsidies on seeds and fertilizer to help them increase production. Establish irrigation systems to support agricultural practices during dry periods.

- **Ensure quality of education in schools and other educational settings.** Incorporate Disaster Risk Reduction (DRR) into the school curriculum. Teach the students about the measures they need to consider before, during and after a flood. Ask them to share the knowledge with their families.

- **Operationalize Disaster Management Ward Committee.** Engage the committees in community-based awareness-raising workshops. Enable them to act by granting some political and administrative autonomy.

- **Create a pool of volunteers for flood management.** The success of Bangladesh's Cyclone Preparedness Program in managing cyclones is time tested and has been globally acknowledged. This system has been established in the coastal districts of Bangladesh. It is important to create a volunteer system for flood management covering flood risk prone areas as floods are becoming frequent and devastating and with projected climate scenarios, it is likely to become more intense in future.
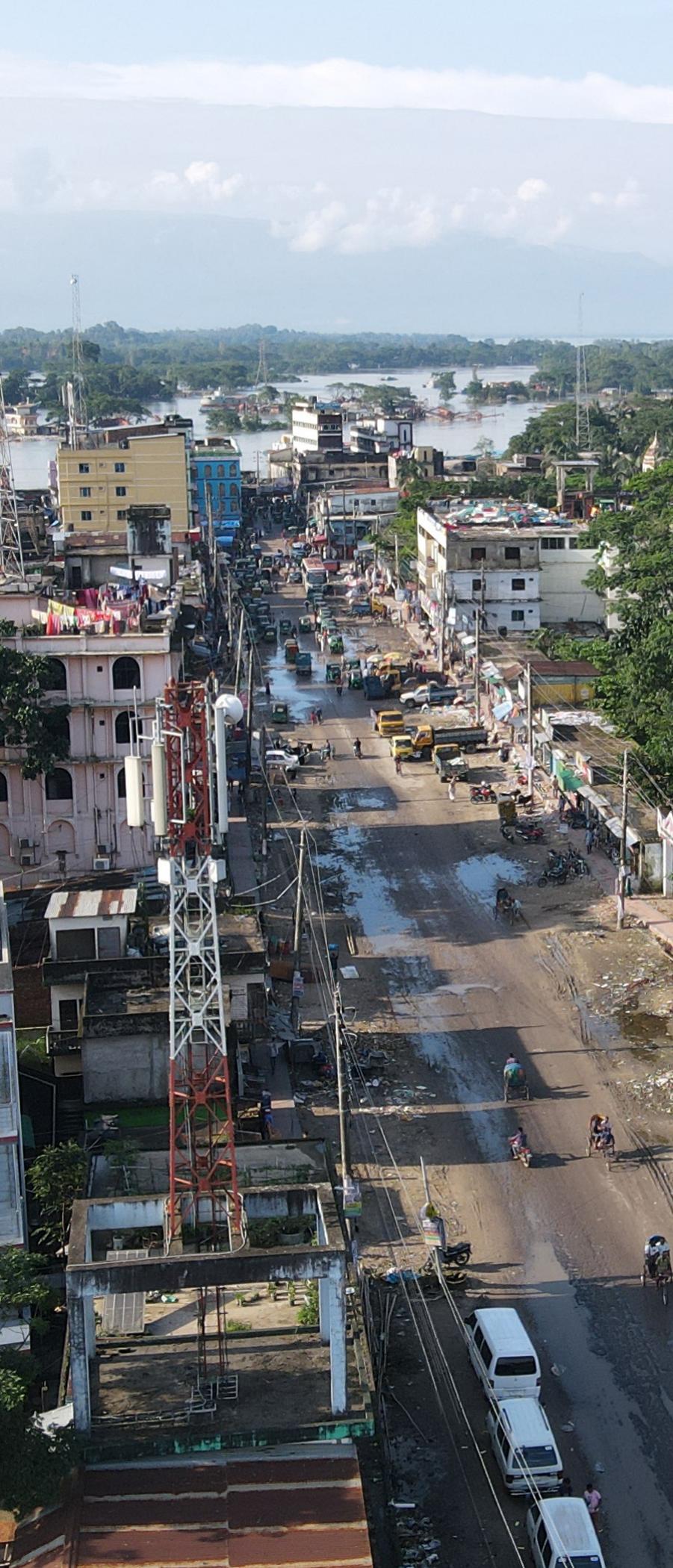
Annex A

A.1 Graphs and Tables

Table A.2.1.1: Total affected households and household census with poverty head count ratio (HCR) as well as Multi-dimensional Poverty Index (MPI)

District	Fully Affected	Partial Affected	Total	Share (%)	District HH (census)		Poverty (HCR)		MPI
					No. of household	Affected (%)	Lower	Upper	
Sylhet	8270	257257	265527	31.45	596081	44.55	8.8	13.00	27.61
Sunamganj	61191	83621	144812	17.15	440332	32.89	19.3	26.00	47.75
Netrokona	15123	90369	105492	12.50	479146	22.02	15.6	34.00	40.72
Moulvibazar	41985	49124	91109	10.79	361177	25.23	7	11.00	28.95
Kurigram	989	39245	40234	4.77	508045	7.92	53.9	70.80	34.1
Habiganj	5716	31891	37607	4.45	393302	9.56	9.9	13.40	43.24
Jamalpur	1573	35624	37197	4.41	563367	6.60	35.2	52.50	33.53
Sirajganj	337	35595	35932	4.26	714971	5.03	12.4	30.50	35.1
Lalmonirhat	51	20174	20225	2.40	290444	6.96	23	42.00	34.79
Mymensingh	220	19220	19440	2.30	1155436	1.68	9.6	22.00	35.57
Gaibandha	1764	16045	17809	2.11	612283	2.91	28.9	46.70	32.11
Kishoreganj	8675	5496	14171	1.68	627322	2.26	34.1	53.50	36.38
Bogura	212	9020	9232	1.09	867137	1.06	13.5	27.20	28.9
Nilphamari	8	2842	2850	0.34	421572	0.68	14.2	32.30	30.01
Sherpur	50	1330	1380	0.16	341443	0.40	24.3	41.30	41.94
Brahmanbaria	0	745	745	0.09	538937	0.14	4.6	10.30	30.02
Feni	0	500	500	0.06	277665	0.18	3.4	8.10	14.07
Rangpur	0	0	0	0.00	720180	0.00	27	43.80	30.63
Total	146164	698098	844262	100					

Source: GED, BD Planning Commission 2019

Table A.2.1.2: Number of severely affected and total area (square KM) affected

District	No. Union/ Ward	Urban	Village	Charland	Hills	Haor-Bills	All	Share (%)
Sunamganj	74	75	1835	0	2	1306	3219	21.85
Sylhet	92	118	1842	6.3	5.9	747	2718	18.45
Netrokona	6	63	1213	4.1	43	689	2011	13.65
Kishoreganj	46	5	607	0	0	1008	1620	10.99
Habiganj	43	12	479	0	0	692	1183	8.09
Moulovibazar	27	31	378	0	57	308	774	5.25
Kurigram	49	0	326	377	0	0	703	4.77
Sirajganj	5	2	202	342	0	9	554	3.76
Bogura	2	12	185	252	0	2.8	451	3.06
Lalmonirhat	17	0	139	150	0	0	290	1.97
Brahmanbaria	0	1.5	230	0	0	34	266	1.81
Sherpur	3	2	244	0	2	10	238	1.62
Jamalpur	16	4	95	124	0	13	237	1.61
Gaibandha	5	0	80	128	0	0	207	1.40
Mymensingh	7	2	145	0	55	0	202	1.37
Rangpur	4	0	10	0	25	0	35	0.24
Nilphamari	0	0	13	8.2	0	0	21	0.14
Feni	0	1	2	0	1	2	6	0.04
Total	396	328.5	8005	1391.6	190.9	4820.8	17435	100

Source: D-Form 2022

Table A.2.2.1: Housing Damage Cost due to flood

District	In million BDT	In million USD	Share %
Bogra	432.2	4.6	2.6%
Brahmanbaria	1329.6	14.2	7.9%
Feni	0.0	0.0	0.0%
Gaibandha	4014.7	42.9	23.7%
Habiganj	591.4	6.3	3.5%
Jamalpur	324.4	3.5	1.9%
Kishoreganj	270	2.9	1.6%
Kurigram	262.7	2.8	1.6%
Lalmonihat	1.0	0.0	0.0%
Moulovibazar	639.6	6.8	3.8%
Mymensingh	340.9	3.6	2.0%
Netrokona	751.9	8.0	4.4%
Nilphamari	2.4	0.0	0.0%
Rangpur	15.0	0.2	0.1%
Sherpur	23.9	0.3	0.1%
Sirajganj	2776.8	29.7	16.4%
Sunamganj	2977.5	31.8	17.6%
Sylhet	2155.9	23.0	12.7%
Total	16909.8	180.8	100.0%

Table A.2.2.1: Housing Damage Cost due to flood

Table A.2.2.2: Impact on Education, Religion & Health Infrastructure

District	Religious infrastructure (in million BDT)	Share (%)	Education infrastructure (in million BDT)	Share (%)	Health infrastructure (in million BDT)	Share (%)
Bogura	0.00	0.00	5.55	0.01	0.90	0.02
Brahmanbaria	0.13	0.00	3.22	0.01	0.10	0.00
Feni	0.00	0.00	0.00	0.00	0.00	0.00
Gaibandha	0.86	0.01	35.35	0.06	0.00	0.00
Habiganj	8.28	0.06	9.30	0.02	1.08	0.02
Jamalpur	0.33	0.00	1.70	0.00	0.00	0.00
Kishoreganj	0.00	0.00	4.50	0.01	0.00	0.00
Kurigram	7.41	0.06	35.30	0.06	6.80	0.13
Lalmonirhat	0.00	0.00	1.30	0.00	0.00	0.00
Moulvibazar	17.74	0.14	37.46	0.07	2.05	0.04
Mymensingh	0.00	0.00	0.25	0.00	0.00	0.00
Netrokona	3.29	0.03	86.20	0.15	4.85	0.09
Nilphamari	0.00	0.00	0.00	0.00	0.00	0.00
Rangpur	0.00	0.00	0.00	0.00	0.00	0.00
Sherpur	0.00	0.00	0.46	0.00	0.00	0.00
Sirajganj	1.25	0.01	58.90	0.11	1.25	0.02
Sunamganj	44.37	0.34	195.34	0.35	16.25	0.31
Sylhet	46.48	0.36	82.46	0.15	19.38	0.37
Total (in million BDT)	130.12	1.00	557.27	1.00	52.65	1.00

Source: D-Form information 2022

Table A.2.2.3: Impact on WASH (Toilets & Tube-wells)

District	WASH (in million BDT)	WASH (in million US$)	Share (%)
Bogura	12.84	0.14	0.004
Brahmanbaria	0.57	0.01	0.000
Feni	0.00	0.00	0.000
Gaibandha	3.19	0.03	0.001
Habiganj	229.78	2.46	0.065
Jamalpur	1.33	0.01	0.000
Kishoreganj	50.72	0.54	0.014
Kurigram	69.32	0.74	0.020
Lalmonirhat	1.83	0.02	0.001
Moulvibazar	437.82	4.68	0.124
Mymensingh	5.75	0.06	0.002
Netrokona	59.52	0.64	0.017
Nilphamari	0.00	0.00	0.000
Rangpur	1.08	0.01	0.000
Sherpur	1.45	0.02	0.000
Sirajganj	19.88	0.21	0.006
Sunamganj	2087.85	22.32	0.590
Sylhet	553.26	5.92	0.156
Total	3536.19	37.81	1.00

Source: D-Form information 2022

Table A.2.2.4: Impact on Transport

District	Transport (in million BDT)	Transport (in million US$)	Share (%)
Bogura	787.20	8.42	0.031
Brahmanbaria	407.65	4.36	0.016
Feni	0.00	0.00	0.000
Gaibandha	65.00	0.69	0.003
Habiganj	981.62	10.50	0.038
Jamalpur	100.53	1.07	0.004
Kishoreganj	910.91	9.74	0.036
Kurigram	261.02	2.79	0.010
Lalmonirhat	10.40	0.11	0.000
Moulvibazar	816.79	8.73	0.032
Mymensingh	71.65	0.77	0.003
Netrokona	3205.62	34.27	0.125
Nilphamari	0.00	0.00	0.000
Rangpur	0.00	0.00	0.000
Sherpur	125.20	1.34	0.005
Sirajganj	257.06	2.75	0.010
Sunamganj	8019.23	85.74	0.314
Sylhet	9547.18	102.08	0.373
Total	25567.06	273.36	1.000

Source: D-Form information 2022

Table A.2.2.5: Impact on Agricultural and Fisheries Land

District	Agricultural Land			Fisheries Land		
	in million BDT	in million USD	% Share	in million BDT	in million USD	% Share
Bogura	175.06	1.87	1.05	0.00	0.00	0.00
Brahmanbaria	857.84	9.17	5.15	30.40	0.33	1.74
Gaibandha	57.87	0.62	0.35	0.00	0.00	0.00
Habiganj	2849.52	30.47	17.11	584.06	6.24	33.39
Jamalpur	3454.25	36.93	20.74	0.38	0.00	0.02
Kishoreganj	354.71	3.79	2.13	102.11	1.09	5.84
Kurigram	2231.02	23.85	13.40	4.50	0.05	0.26
Lalmonirhat	5.92	0.06	0.04	0.00	0.00	0.00
Moulvibazar	658.14	7.04	3.95	21.08	0.23	1.21
Mymensingh	19.53	0.21	0.12	9.19	0.10	0.53
Netrokona	627.57	6.71	3.77	114.98	1.23	6.57
Nilphamari	0.17	0.00	0.00	0.22	0.00	0.01
Rangpur	0.01	0.00	0.00	2.30	0.02	0.13
Sherpur	20.98	0.22	0.13	1.72	0.02	0.10
Sirajganj	3084.24	32.98	18.52	0.00	0.00	0.00
Sunamganj	701.11	7.50	4.21	741.65	7.93	42.40
Sylhet	1556.80	16.64	9.35	136.54	1.46	7.81
Total	16654.72	178.07	100	1749.14	18.70	100

Source: D-Form information 2022

Table A.2.2.6: Impact on Livestock, Fisheries Equipment, Farm and Off-farm Industry

District	Livestock			Fishing Equipment			Farm and Off-Farm Industry		
	in million BDT	in million USD	% Share	in million BDT	in million USD	% Share	in million BDT	in million USD	% Share
Bogura	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brahmanbaria	79.96	0.85	29.36	0.00	0.00	0.00	0.00	0.00	0.00
Gaibandha	0.21	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Habiganj	0.80	0.01	0.30	0.00	0.00	0.00	0.00	0.00	0.00

Table A.2.2.6: Impact on Livestock, Fisheries Equipment, Farm and Off-farm Industry(Continued)

Jamalpur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kishoreganj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kurigram	1.81	0.02	0.66	3.80	0.04	9.81	0.00	0.00	0.00
Lalmonirhat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Moulvibazar	7.84	0.08	2.88	0.63	0.01	1.63	37.50	0.40	76.62
Mymensingh	3.95	0.04	1.45	0.00	0.00	0.00	0.00	0.00	0.00
Netrokona	33.88	0.36	12.44	5.85	0.06	15.09	0.00	0.00	0.00
Nilphamari	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rangpur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sherpur	1.62	0.02	0.60	0.00	0.00	0.00	0.00	0.00	0.00
Sirajganj	3.66	0.04	1.34	0.47	0.01	1.21	0.54	0.01	1.10
Sunamganj	107.23	1.15	39.38	24.06	0.26	62.08	0.00	0.00	0.00
Sylhet	31.34	0.34	11.51	3.94	0.04	10.18	10.90	0.12	22.27
Total	272.29	2.91	100	38.76	0.41	100	48.94	0.52	100

Source: D-Form information 2022

Table A.2.2.7: Impact on Water Resources

District	Water Resource (in million BDT)	Water Resource (in million US$)	Share (%)
Bogura	0.53	0.006	0.00
Brahmanbaria	19.90	0.213	0.01
Feni	0.00	0.000	0.00
Gaibandha	0.00	0.000	0.00
Habiganj	74.35	0.795	0.04
Jamalpur	3.20	0.034	0.00
Kishoreganj	99.70	1.066	0.05
Kurigram	25.17	0.269	0.01
Lalmonirhat	8.46	0.090	0.00
Moulvibazar	46.95	0.502	0.03

Table A.2.2.7: Impact on Water Resources (Continued)

Mymensingh	23.50	0.251	0.01
Netrokona	256.41	2.741	0.14
Nilphamari	4.50	0.048	0.00
Rangpur	140.00	1.497	0.08
Sherpur	16.52	0.177	0.01
Sirajganj	79.35	0.848	0.04
Sunamganj	599.21	6.407	0.33
Sylhet	423.18	4.525	0.23
Total	1820.94	19.47	1.00

Source: D-Form information 2022

Table A.2.2.8: Number of women affected

District	Died	Injured	Lost	Displaced	Own home	Total	Share
Sunamganj	0	6	1	233536	0	233543	21.44
Sirajganj	0	0	0	1750	196582	198332	18.21
Netrokona	2	5	0	167701	0	167708	15.40
Sylhet	1	767	0	157088	0	157856	14.49
Bogra	0	0	0	103929	0	103929	9.54
Kurigram	0	0	0	27422	75643	103065	9.46
Kishoreganj	0	0	0	53976	0	53976	4.96
Jamalpur	0	0	0	240	31300	31540	2.90
Gaibandha	0	0	0	588	13823	14411	1.32
Habiganj	0	0	0	14280	0	14280	1.31
Moulvibazar	0	0	0	6910	0	6910	0.63
Sherpur	0	0	0	25	2780	2805	0.26
Brahmanbaria	0	0	0	680	0	680	0.06
Nilphamari	0	0	0	12	200	212	0.02
Feni	0	0	0	0	0	0	0
Lalmonirhat	0	0	0	0	0	0	0
Mymensingh	0	0	0	0	0	0	0
Rangpur	0	0	0	0	0	0	0
Total	3	778	1	768137	320328	1089247	100.00

Source: D-Form information 2022

Table A.2.2.9: Number of men affected

District	Died	Injured	Lost	Displaced	Own home	Total	Share
Sunamganj	0	10	0	239089	0	239099	19.57
Netrokona	2	15	0	228907	0	228924	18.73
Sirajganj	0	0	0	1870	199367	201237	16.47
Sylhet	5	1356	0	196244	0	197605	16.17
Kurigram	0	0	0	40529	69159	109688	8.98
Bogra	0	0	0	105512	0	105512	8.63
Kishoreganj	0	0	0	51607	0	51607	4.22
Jamalpur	0	0	0	270	31321	31591	2.59
Gaibandha	0	0	0	622	30019	30641	2.51
Habiganj	0	0	0	13827	0	13827	1.13
Moulvibazar	0	186	0	8085	0	8271	0.68
Sherpur	0	0	0	25	3085	3110	0.25
Brahmanbaria	0	0	0	630	0	630	0.05
Nilphamari	0	0	0	11	200	211	0.02
Feni	0	0	0	0	0	0	0
Lalmonirhat	0	0	0	0	0	0	0
Mymensingh	0	0	0	0	0	0	0
Rangpur	0	0	0	0	0	0	0
Total	7	1567	0	887228	333151	1221953	100.00

Source: D-Form information 2022

Table: A.2.2.10: Number of children affected

District	Died	Injured	Lost	Displaced	Own home	Total	Share
Sunamganj	0	0	0	193887	0	193887	40.50
Sirajganj	0	0	0	300	75433	75733	15.82
Netrokona	1	10	0	70185	0	70196	14.66
Kishoreganj	0	0	0	38856	0	38856	8.12
Sylhet	0	312	0	35860	0	36172	7.56
Jamalpur	0	0	0	169	21136	21305	4.45
Kurigram	0	0	0	4720	16153	20873	4.36
Habiganj	1	0	0	9098	0	9099	1.90

Table: A.2.2.10: Number of children affected (Continued)

Habiganj	1	0	0	9098	0	9099	1.90
Moulvibazar	0	213	0	4037	0	4250	0.89
Gaibandha	0	0	0	226	3946	4172	0.87
Bogra	0	0	0	3423	0	3423	0.72
Sherpur	0	0	0	10	515	525	0.11
Brahmanbaria	0	0	0	175	0	175	0.04
Nilphamari	0	0	0	14	0	14	0.00
Feni	0	0	0	0	0	0	0
Lalmonirhat	0	0	0	0	0	0	0
Mymensingh	0	0	0	0	0	0	0
Rangpur	0	0	0	0	0	0	0
Total	2	535	0	360960	117183	478680	100.00

Source: D-Form information 2022

Table A.2.2.11: Number of affected persons with disability

District	Women	Men	Child	Total	Share
Sylhet	5647	7909	4434	17990	36.47
Sunamganj	3801	4540	2854	11195	22.70
Brahmanbaria	3997	6185	693	10875	22.05
Kurigram	1083	1679	533	3295	6.68
Kishoreganj	983	1813	287	3083	6.25
Netrokona	370	516	143	1029	2.09
Moulvibazar	130	155	544	829	1.68
Habiganj	177	180	49	406	0.82
Bogra	102	70	155	327	0.66
Jamalpur	79	100	2	181	0.37
Gaibandha	32	57	17	106	0.21
Sirajganj	2	6	2	10	0.02
Feni	0	0	0	0	0
Lalmonirhat	0	0	0	0	0
Mymensingh	0	0	0	0	0
Nilphamari	0	0	0	0	0
Rangpur	0	0	0	0	0
Sherpur	0	0	0	0	0
Total	16403	23210	9713	49326	100.00

Source: D-Form information 2022

Table A.3.2.1: Total number of house damages (District wise)

District	Pucca			Semi- pucca			Kutcha			All	
	Fully	Partially	Total	Fully	Partially	Total	Fully	Partially	Total	Total	Share (%)
Sunamganj		405	405	135	4367	4502	5935	45220	51155	56062	30.03
Sylhet	1	132	133	10	13387	13397	2225	32311	34536	48066	25.74
Habiganj		27	27		886	886	733	17682	18415	19328	10.35
Moulvibazar		35	35	343	3285	3628	1358	9271	10629	14292	7.65
Netrokona	15	109	124	101	951	1052	1234	10809	12043	13219	7.08
Brahmanbaria	721	722	1443	725	716	1441	829	8210	9039	11923	6.39
Sirajganj	1		1		25	25	467	4780	5247	5273	2.82
Gaibandha				112	810	922	1099	2561	3660	4582	2.45
Kishoreganj					352	352	89	3770	3859	4211	2.26
Kurigram							989	2287	3276	3276	1.75
Mymensingh		5	5	5	170	175	10	2005	2015	2195	1.18
Jamalpur					380	380	617	798	1415	1795	0.96
Bogura				91	500	591	450	670	1120	1711	0.92
Rangpur					50	50	120	200	320	370	0.20
Sherpur				6	10	16		325	325	341	0.18
Lalmonirhat							51		51	51	0.03
Nilphamari							8		8	8	0.00
Feni											
Total	738	1435	2173	1528	25889	27417	16214	140899	157113	186703	100.00

Source: D-Form information 2022

Table A.3.2.2: Total House Damages (in million BDT)

District	Pucca		Semi-pucca		Kutcha		Total	% Share
	Fully	Partially	Fully	Partially	Fully	Partially		
Bogura			13.65	25.00	360.00	33.50	432.15	2.56
Brahmanbaria	520.72	52.27	52.71	52.13	59.71	592.11	1329.64	7.86
Feni								0
Gaibandha			627.20	3280.50	40.10	66.95	4014.74	23.74
Habiganj		2.70		54.01	54.24	480.48	591.42	3.50
Jamalpur				4.56	308.50	11.29	324.35	1.92
Kishoreganj				52.70	8.60	209.28	270.58	1.60
Kurigram					148.35	114.35	262.70	1.55
Lalmonirhat					1.02		1.02	0.01
Moulvibazar		5.25	85.75	162.08	146.55	239.97	639.60	3.78
Mymensingh		0.50	2.50	16.30	1.00	320.60	340.90	2.02
Netrokona	14.25	45.45	26.25	61.64	200.39	403.33	751.31	4.44
Nilphamari					2.40		2.40	0.01
Rangpur				5.00	6.00	4.00	15.00	0.09
Sherpur			0.30	2.00	6.00	21.63	23.93	0.14
Sirajganj	4.00			7.50	26.34	2738.94	2776.78	16.42

Table A.3.2.2: Total House Damages (in million BDT) (Continued)

Sunamganj		19.25	23.40	205.80	785.12	1943.92	2977.48	17.61
Sylhet	2.50	12.30	5.00	908.13	133.56	1094.36	2155.86	12.75
Total (in million BDT)	541.47	118.47	836.76	4837.33	2281.87	8274.68	16909.83	100
Total (in million US$)	5.79	1.27	8.95	51.72	24.40	88.47	180.80	100

Source: D-Form information 2022

Table A.1.4: Cost of Damage of Hospital, Clinic and Community Clinic

Districts	Hospital Fully Destroyed	Hospital Partially Damaged	Clinic Fully Destroyed	Clinic Partially Damaged	Community Clinic Fully Destroyed	Community Clinic Partially Damaged
Bogura	0	0	0	0	0	900000
Brahmanbaria	0	0	0	0	0	100000
Feni	0	0	0	0	0	0
Gaibandha	0	0	0	0	0	0
Habiganj	0	0	0	0	0	1075000
Jamalpur	0	0	0	0	0	0
Kishoreganj	0	0	0	0	0	0
Kurigram	0	0	0	945000	3750000	2100000
Lalmonirhat	0	0	0	0	0	0
Moulvibazar	0	500000	0	0	0	1550000
Mymensingh	0	0	0	0	0	0
Netrokona	0	200000	0	4100000	0	550000
Nilphamari	0	0	0	0	0	0
Rangpur	0	0	0	0	0	0
Sherpur	0	0	0	0	0	0
Sirajganj	0	0	0	50000	0	1200000
Sunamganj	0	1100000	0	1900000	0	13245000
Sylhet	50000	7900000	0	1000000	1440000	8990000
Total	50000	9700000	0	7995000	5190000	29710000

Source: D-Form information 2022

Table A.1.5: Number of Unions severely affected and total area (square KM) affected

District	No. Union/ward	Urban	Village	Charland	Hills	Haor-Bills	All	Share
Sunamganj	74	75	1835	0	2	1306	3219	21.85
Sylhet	92	118	1842	6.3	5.9	747	2718	18.45
Netrokona	6	63	1213	4.1	43	689	2011	13.65
Kishoreganj	46	5	607	0	0	1008	1620	10.99
Habiganj	43	12	479.00	0	0	692	1183	8.03
Moulvibazar	27	31	378	0	57	308	774	5.25
Kurigram	49	0	326	377	0	0	703	4.77
Sirajganj	5	2	202	342	0	9	554	3.76
Bogura	2	12	185	252	0	2.8	451	3.06
Lalmonirhat	17	0	139	150	0	0	290	1.97
Brahmanbaria	0	1.5	230	0	0	34	266	1.81
Sherpur	3	2	224	0	2	10	238	1.62
Jamalpur	16	4	95.00	124	0	13	237	1.61
Gaibandha	5	0	80	128	0	0	207	1.40
Mymensingh	7	2	145	0	55	0	202	1.37
Rangpur	4	0	10	0	25	0	35	0.24
Nilphamari	0	0	13	8.2	0	0	21	0.14
Feni	0	1	2	0	1	2	6	0.04
Total	**396**	**328.5**	**8005**	**1391.6**	**190.9**	**4820.8**	**14735**	**100**

Source: D-Form information 2022

Table: A.5.1: Cost of Housing Recovery

Build Back Better Approach									
Damage Type	Number of House Damage: Pucca	Estimated cost: Pucca	Estimated total Cost: Pucca	Number of House Damage: Semi-Pucca	Estimated cost: Semi-pucca	Estimated Total Cost: Semi-pucca	Number of House Damage: Kutcha	Estimated cost: Kutcha*	Estimated total Cost: Kutcha
Partially Unit cost	1,435	80,000	114,800,000	25,889	80,000	2,071,120,000	140,899	160,000	22,543,840,000
Fully Unit cost	738	160,000	590,400,000	1,528	160,000	244,480,000	16,214	160,000	2,594,240,000
Total			705,200,000			2,315,600,000			25,138,080,000
Sum Total (in million BDT)	27,687								
Sum Total (in million USD)	296								
Build Back to the Previous Condition - Repair approach									
Damage type	Number of House Damage: Pucca	Estimated cost: Pucca	Estimated total Cost: Pucca	Number of House Damage: Semi-pucca	Estimated cost: Semi-pucca	Estimated total Cost: Semi pucca	Number of House Damage: Kutcha	Estimated cost: Kutcha	Estimated total cost: Kutcha
Partially	1,435	80,000	114,800,000	25,889	65,000	1,682,785,000	140,899	36,000	5,072,364,000
Fully	738	160,000	118,080,000	1,528	130,000	198,640,000	16,214	72,000	1,167,408,000
Total			232,880,000			1,881,425,000			6,239,772,000
Sum total (in million BDT)	8,354								

Source: D-Form information 2022

Annex B

B. Technical designs: Housing and community infrastructure

B.1. Design consideration

The aim is to promote a culture of sustainable shelter construction practice through disaster recovery endeavors that not only is resilient but also durable, environment friendly, requiring simple manufacture technique (locally replicable) and cost effective considering the life cycle and social cost in the long run. Within these concepts, design proposals include the following basic considerations-

Material and Construction Technology

Ferrocement technology, Compressed Stabilized Earth Block (CSEB), and Concrete block are proposed for the construction of shelters. These technologies are sustainable in comparison with the conventional ones involving forest products (wood, bamboo), agricultural topsoil (burnt brick) and also CGI sheets that has multiple negative impacts (I e. heat gain, short life span, accidents, etc.). Primarily because-

First, the alternative techniques are disaster resilient due its resistance to flood water and wave actions (durable structure) as well as earthquake (the region is highly vulnerable to earthquake as well).

Second, the technologies are environment friendly as they consciously avoid the use of materials responsible for environmental pollution and damage of forest and agricultural lands. Also energy consumption involved is minimum compared to the traditional technologies (i.e. burnt bricks, CGI sheets).

Third, considering the extent of maintenance and risk of destruction (vulnerability) involved with temporary materials in long term, the proposed technologies are cost effective.
Finally, with simple manufacture and construction techniques these technologies can utilize local labor, and also, the participation of beneficiaries themselves, hence, are potential of enhancing community engagement. With the absence of construction techniques (i.e. RCC pillar) requiring professional expertise and proper monitoring on the field, the proposed designs are very effective in terms of quality control and maintenance, simultaneously.

Disaster
Resilient

Durable
Resistant to Flood water and
wave action.

Sustainable

Environment friendly
Energy efficient.

Cost
Effective

Minimum maintenance
Engagement of local
labor and skill.

Easy
Manufacture

Quality control
Replicable techniques
Local participation
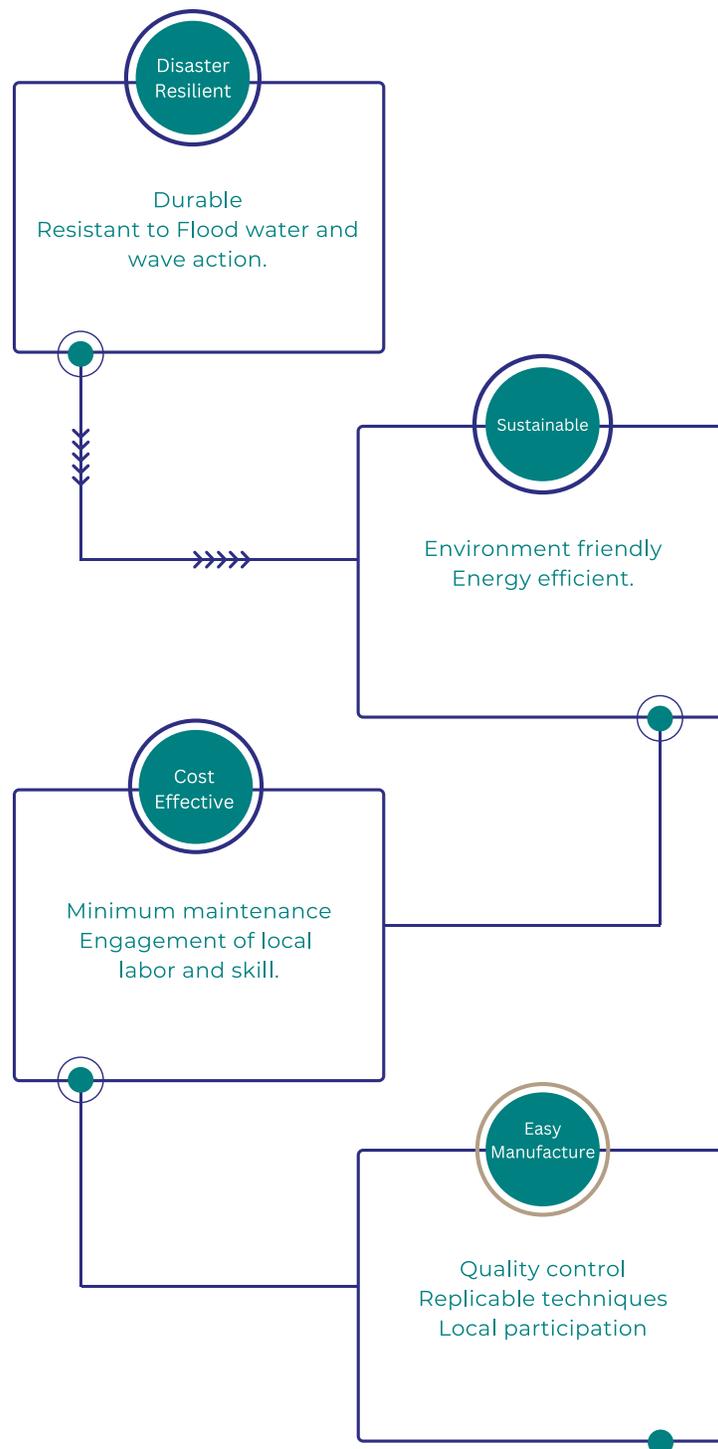
1. Resilience against the impacts
2. Introduction of low impact building material and construction technology
3. Development of standardized and labor friendly prefabricated mode of construction using minimum/economic building elements
4. Addressing contextual issues
5. Climate responsive design approach

Space Requirement and Layout:

40 square feet per person is considered as the standard unit for space (by area) fulfilling the sphere standard of minimum 3.5 m2 per person. Survey findings suggest that 6-member household is most commonly found in the area, and accordingly, the dwelling area is derived as such, that, it can accommodate members in multiple of two (i.e., 4, 6, 8) to allow greater flexibility on the field.

Primarily, a core module of 9' X 9' is proposed considering the best possible options for internal space organizations and furniture layout, as well as structural benefits. Through adding multiple core units in an incremental manner, options for (gradual) larger units can be produced. The incremental modular design allows greater scope and easier options to fit with the diverse needs on the field (household size and land size, for example). The core unit, additionally, can also serve as the core house or starting house concept for the beneficiaries—more rooms can be added in time in the similar manner by the users themselves depending on their financial capacity and needs.

Also, the provision of a service core (toilet and store) and a veranda unit are proposed (9' X 4.5') following the same manner, so that agencies according to their budget and capacity can decide whether to include the service core or not. A repetitive modular design thus enables the decision making easier on the field by allowing to choose the best possible options according to the needs of the beneficiaries, household size, and agencies' budget.
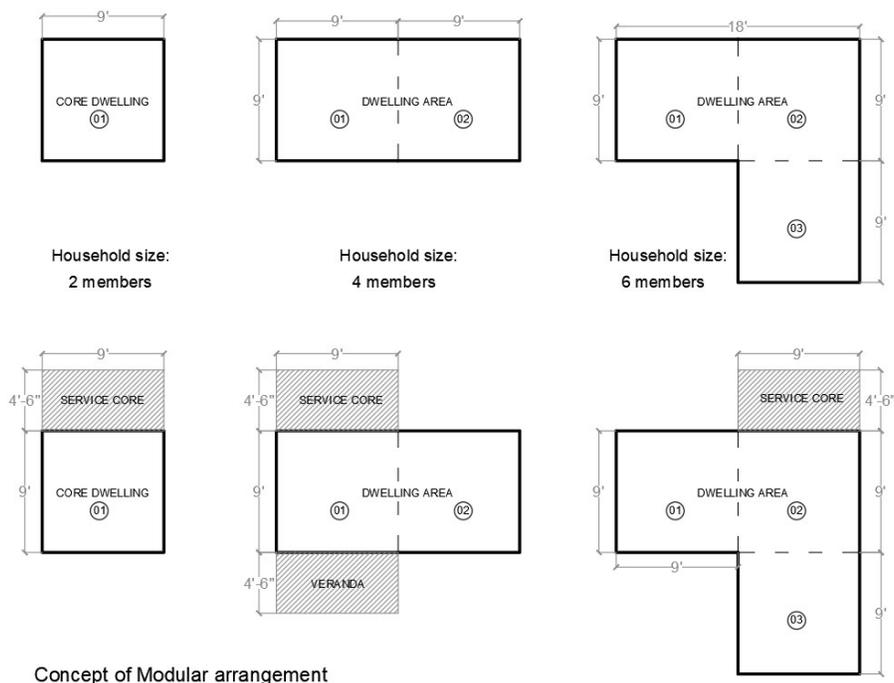
Figure 5.1: Schematic layout showing different modular arrangement of dwelling and service core

B.2 Proposed Building Typology

Building typologies are derived primarily based on the nature of development such as, individual house construction and mass housing construction. For the first, very low tech and available materials are proposed that are mostly cast-in-situ techniques, whereas, for the second type pre-cast technologies are proposed. Precast technologies are proposed keeping in mind the concept of mass housing construction. Pre-cast technologies are efficient in terms of time and quality control.

Both pitch roof & vaulted roof are recommended for each type model. The vaulted roof has some advantages over pitch by allowing more rooms for storage which, in time of flood, can provide temporary shelter for the members. The vaulted roof also provides an escape door which in normal time will serve as a clerestory window.
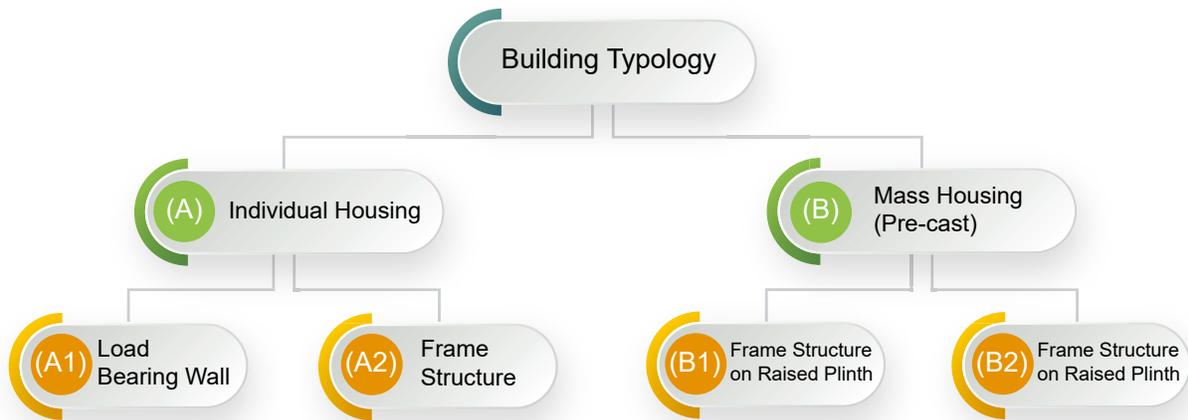
(i) Model A1 (Load Bearing):

Core Unit (9'x 9')

Core Unit   Core Unit + Toilet   Core Unit + Toilet + Veranda
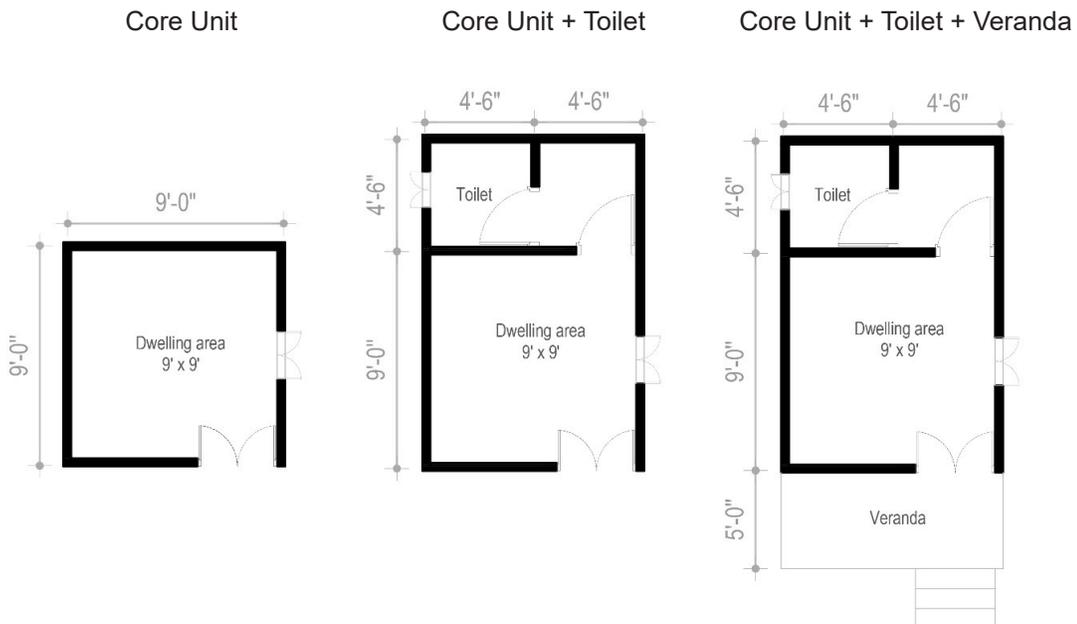
Area	85 sft	129 sft	166 sft
Cost	85,000/-	135,000/-	150,000/-

Pitch Roof:

Vault Roof:

(ii) Model A1 (Load Bearing)

Unit for 4-member household

Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda
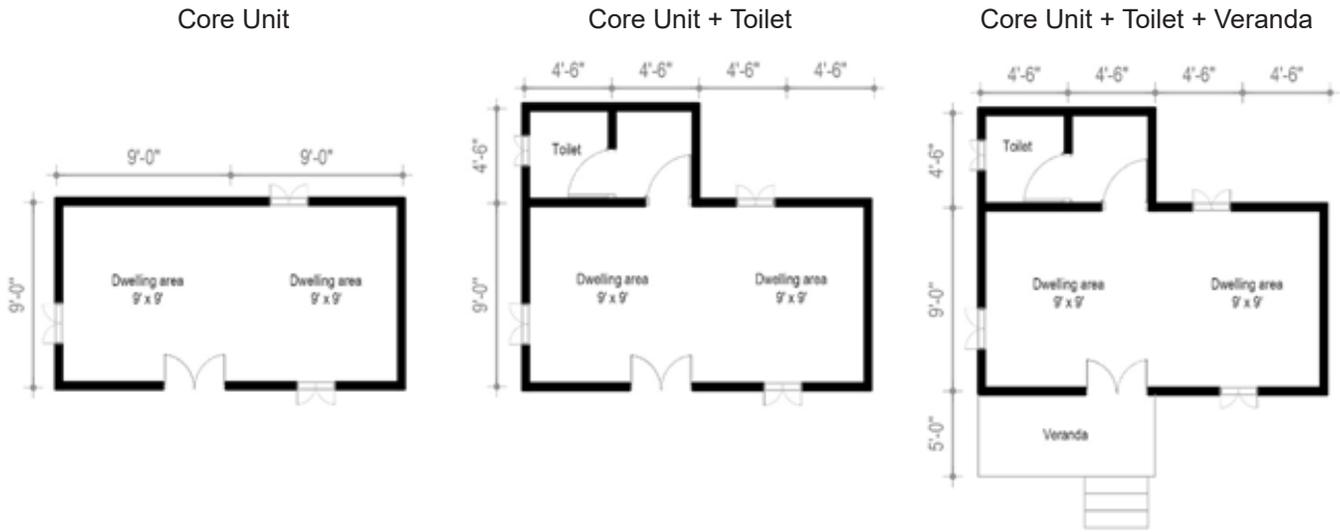
Area	168 sft	212 sft	249 sft
Cost	170,000/-	220,000/-	225,000/-

Pitch Roof:

Vault Roof:

(iii)   Model A1 (Load Bearing)

Unit for 6-member household

Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda
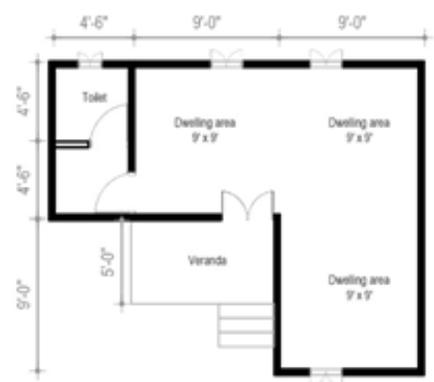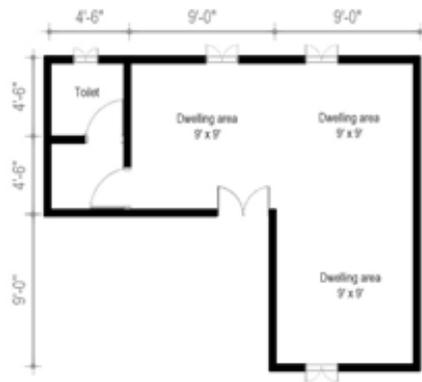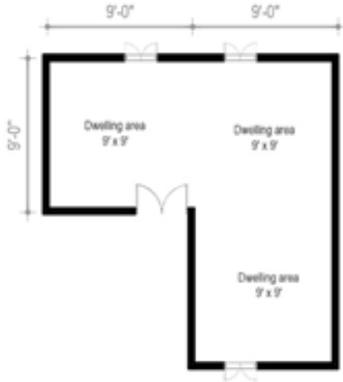
Area	252 sft	296 sft	333 sft
Cost	260,000/-	300,000/-	310,000/-

Pitch Roof:

Vault Roof:

(iv) Model A1 (Load Bearing)

Unit for 4-member household

Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda
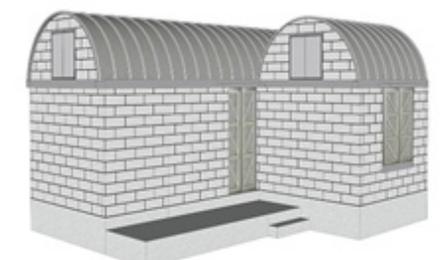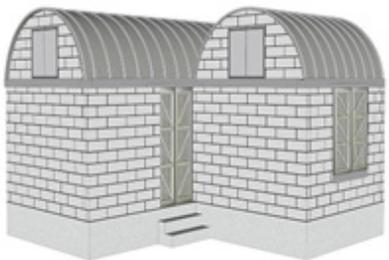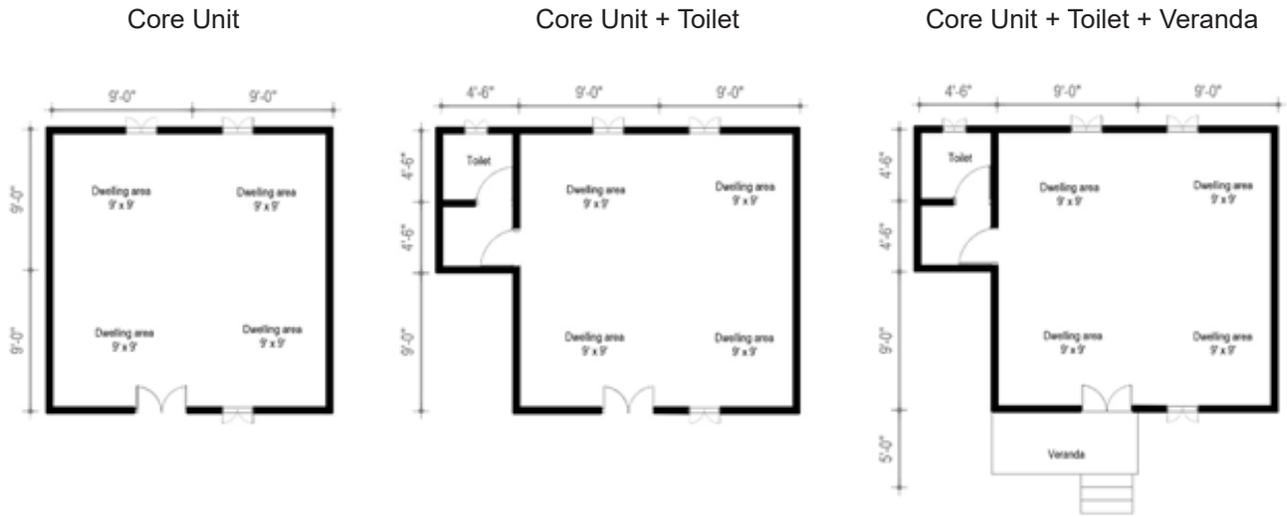
Area	333 sft	377 sft	414 sft
Cost	340,000/-	385,000/-	400,000/-

Pitch Roof:
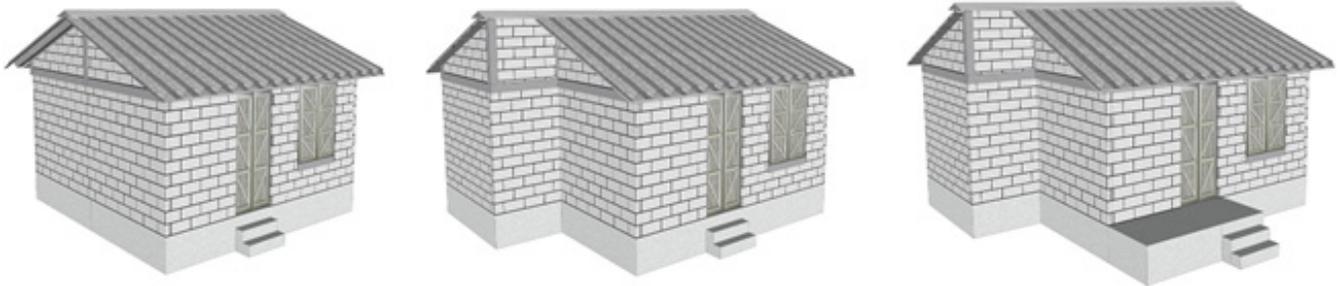
Vault Roof:
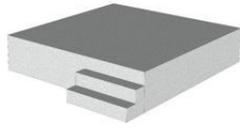
99

Phases of Construction

1st phase
Durable Plinth construction

As most of the earthenplinths are the main causes of failure of the whole structure by being washed out in flood water, it is imperative with the notion of build back better that the plinth is made durable so that at least the vita remains intact for any future repairing and construction
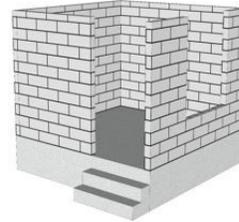
2nd phase
Walling

In the next phase, walls can be raised exactly above the plinth protection layer that has a shallow foundation and hence no reconstruction of plinth is required

3rd phase
Roofing

Finally, a durable roofing technique can be added above the walls with adequate beams

Escape exit

Continuous Tie/Lintel

Plinth Protection Wall

Vaulted roof

Ferrocement Window Frame

Concrete Hollow Block/ CSEB

100

Model A2 (Frame Structure)

Unit for 4-member household

Two types of techniques are proposed for frame structure models following the similar layouts. Combination of these blocks to form a column with minimum reinforcement enables a very simple technique of construction. The frame structure allows the users with greater scope of expansion and re-organization of rooms according to their needs and preferences. With the core frame constructed, users can add walling materials according to their capacity and even with temporary materials (i.e. ikra) the model with a durable plinth, frame and roof will serve as the durable core. The proposed blocks are-Interlocking block and Hollow block of Concrete/CSEB.

1st phase

Durable Plinth construction

As most of the earthenplinths are the main causes of failure of the whole structure by being washed out in flood water, it is imperative with the notion of build back better that the plinth is made durable so that at least the vita remains intact for any future repairing and construction

2nd phase

Frame Construction

In the next phase, frames will be erected above the outmost walled layer for plinth protection which has a shallow foundation and hence no reconstruction of plinth is required. The users according to their capacity will build an envelop

3rd phase

Roofing

The next phase involves the construction of durable roof so that even if the wall is temporary, the frame and roof will remain intact in flood so further damage will be very minimum to the whole shelter requiring only a replacing of the walls. The frame structure without fixed and durable partition walls allow the users greater scope to expand and re-organize rooms according to their needs and preferences

4th phase

Walling

For the frame structure the final phase can rest with the users- the construction of durable wall. Agencies can also provide durable walling as per their capacity.

Model B Mass Housing Concept

Provision of precast technologies are proposed keeping in mind the concept of mass housing construction. Ferrocement Column, Ferrocement wall panel and ferrocement roof are the major three components of pre-cast models. Pre-cast technologies are efficient in terms of time and quality control. Ferro cement technology is proposed in particular for TYPE B.

Concept of Pre-cast Stilt House

The stilt house concept is primarily considered as such that families living on the ground level can take shelter upstairs during flood. This provision has been kept as a model for multi-family units that can provide safe abode during flood period by enabling the use of toilet and also kitchen on the common space (stair lobby) for families whose kitchens are on the ground in usual time. A two story unit can serve as one house model for an extended family, and multiple such units can connect with a common stair and lobby where the toilet can be placed to serve even during flood time. Or, a family can occupy the units on the ground level and another family on the upper level. During flood, it is found common in the areas to take shelter in other's houses that are minimum affected.
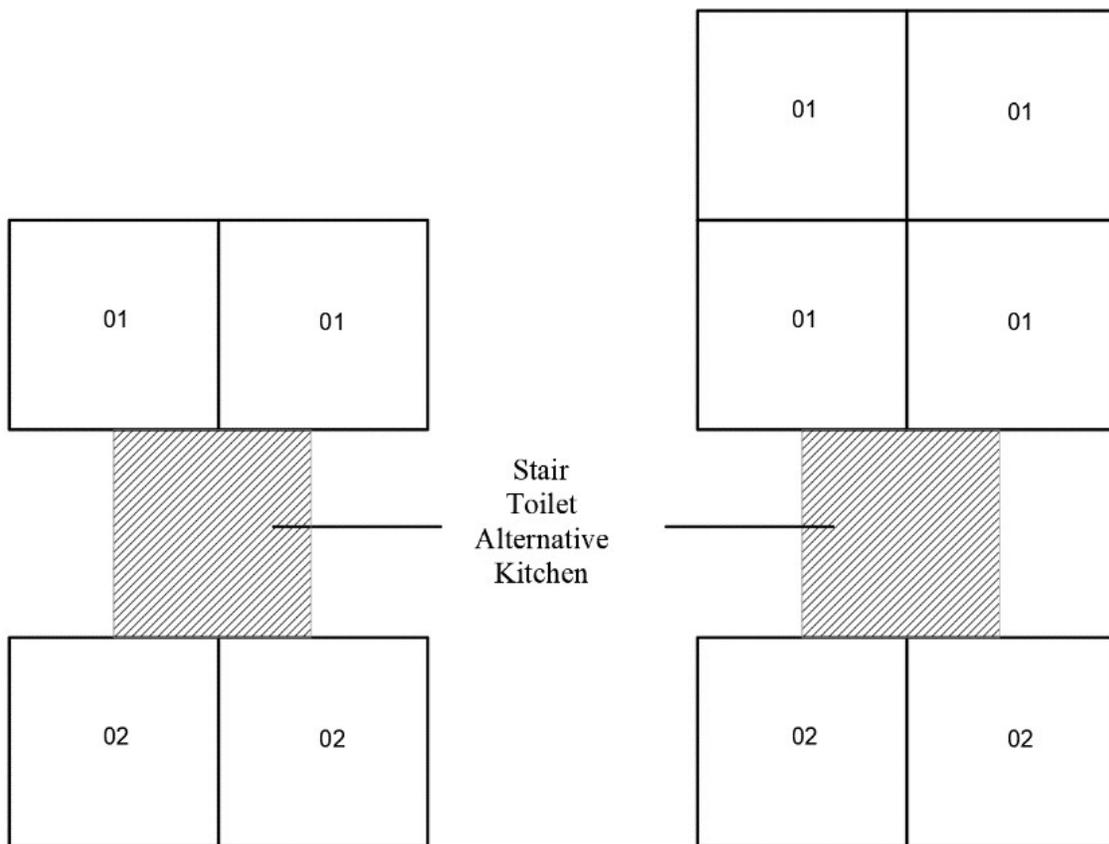
(i) Model B1 (Frame structure):

Core Unit (9'x 9')

Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda

9'-0"

9'-0"

Dwelling area
9' x 9'

4'-6" 4'-6"

4'-6"

9'-0"

Toilet

Dwelling area
9' x 9'

4'-6" 4'-6"

4'-6"

9'-0"

5'-0"

Toilet

Dwelling area
9' x 9'
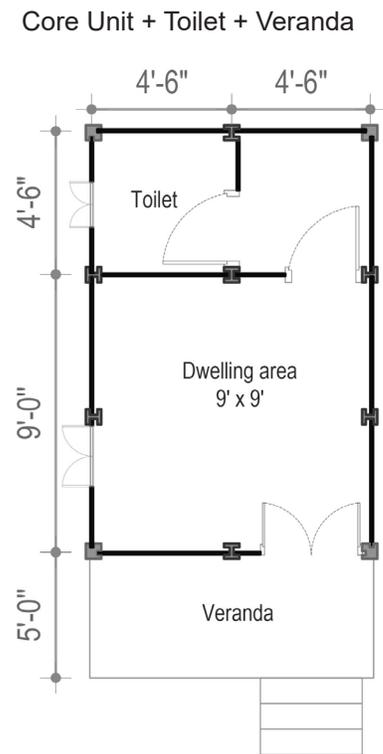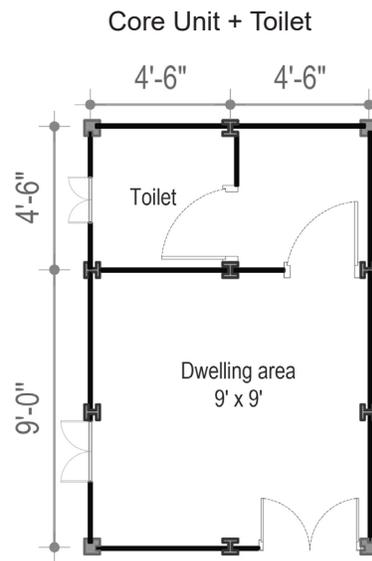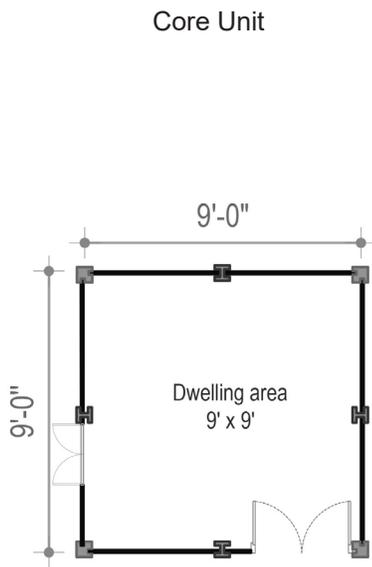
Veranda

Area	85 sft	129 sft	166 sft
Cost	95,000/-	142,000/-	155,000/-

Pitch Roof:
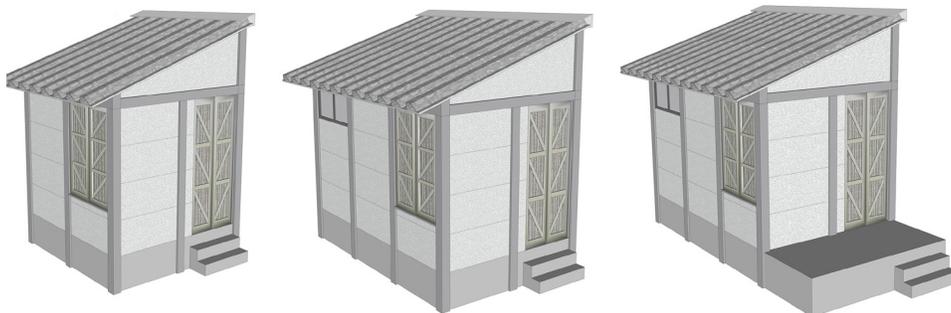
Vault Roof:

(ii) Model B1 (Frame structure)

Unit for 4-member household
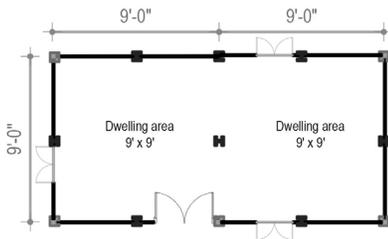
Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda
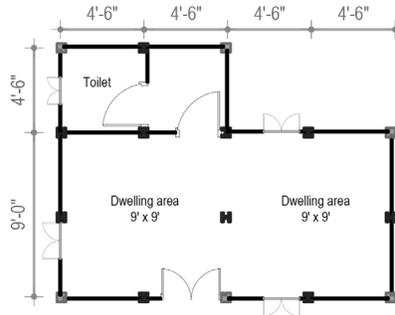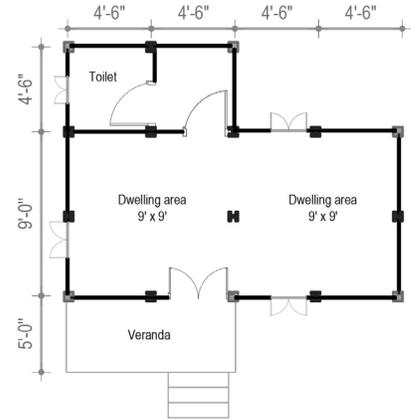
Area	168 sft	212 sft	249 sft
Cost	190,000/-	240,000/-	260,000/-

Pitch Roof:
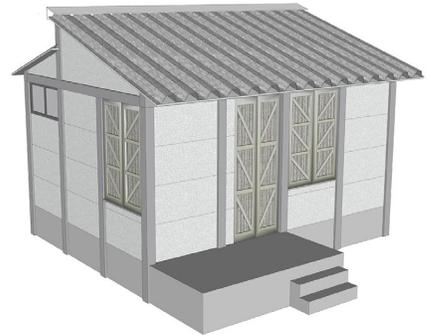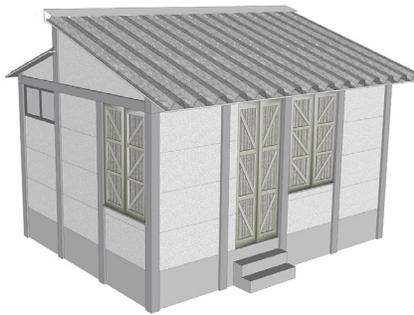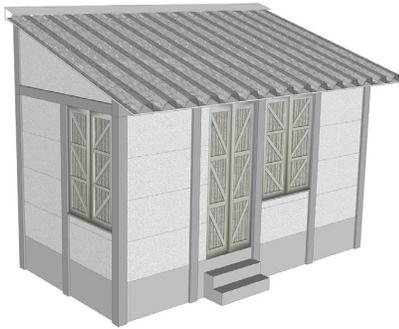
Vault Roof:
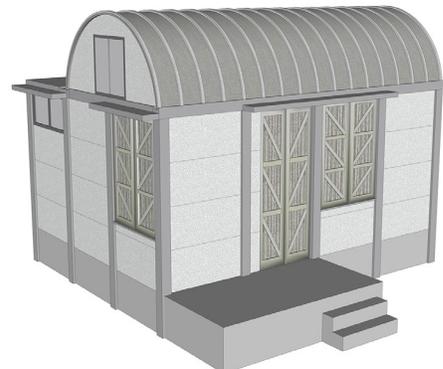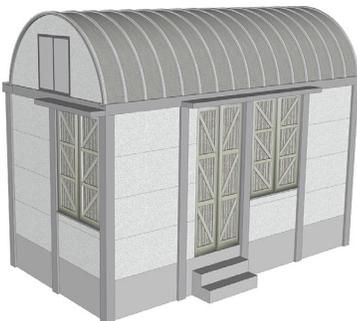
(iii) Model B1 (Frame structure)

Unit for 6-member household
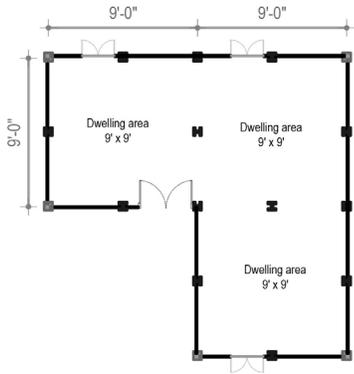
	Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda
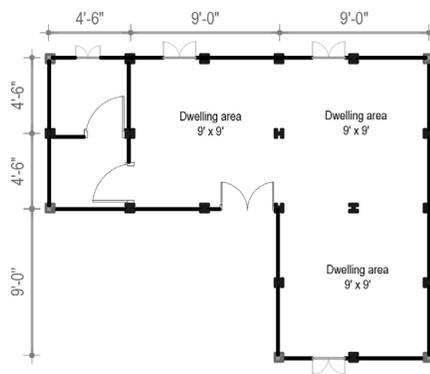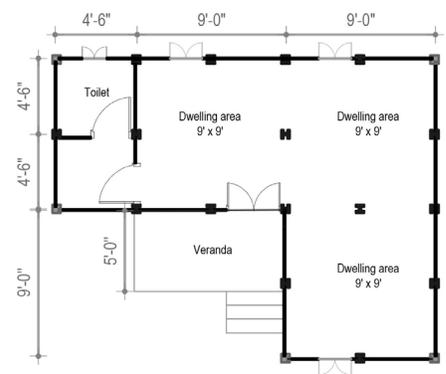
Area	252 sft	296 sft	333 sft
Cost	285,000/-	350,000/-	360,000/-

Pitch Roof:
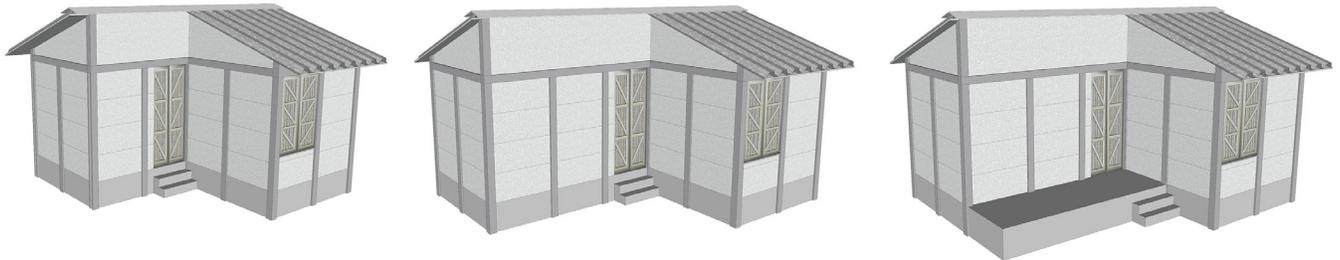
Vault Roof:

(iv) Model B1 (Frame structure)

8-member household equivalent to the area considered in ASHRAYAN

Core Unit	Core Unit + Toilet	Core Unit + Toilet + Veranda
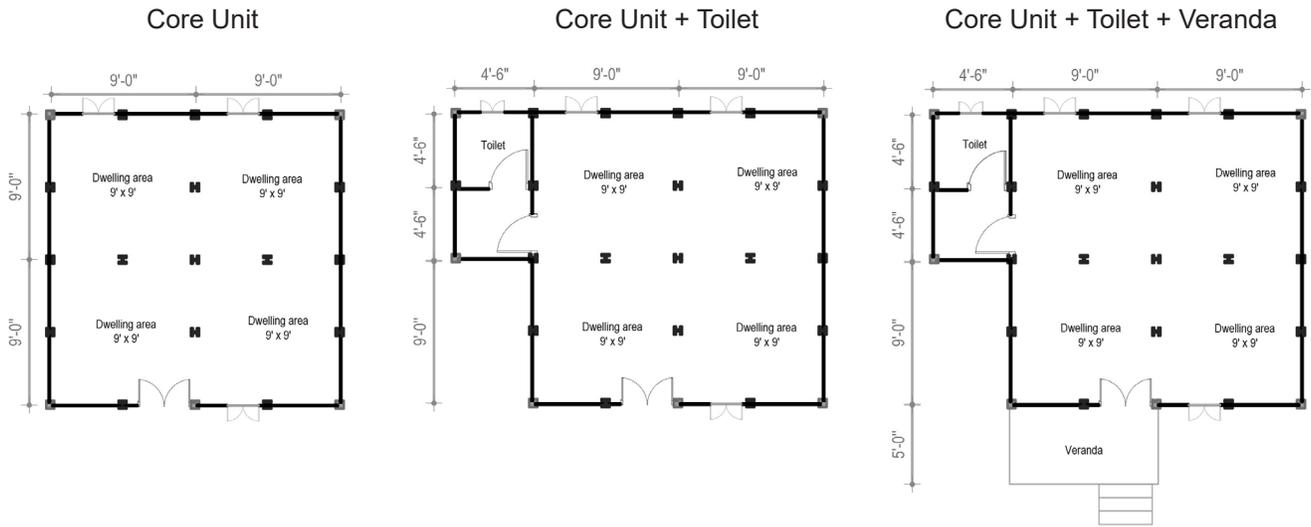
Area	333 sft	377 sft	414 sft
Cost	320,000/-	430,000/-	460,000/-

Pitch Roof:

Vault Roof:

Phases of Construction

1st phase
Durable Plinth construction

As most of the earthen plinths are the main causes of failure of the whole structure by being washed out in flood water, it is imperative with the notion of build back better that the plinth is made durable so that at least the vita remains intact for any future repairing and construction

2nd phase
Frame Construction

In the next phase, frames will be erected above the outmost walled layer for plinth protection which has a shallow foundation and hence no reconstruction of plinth is required. The users according to their capacity will build an envelop

3rd phase
Roofing

The next phase involves the construction of durable roof so that even if the wall is temporary, the frame and roof will remain intact in flood so further damage will be very minimum to the whole shelter requiring only a replacing of the walls. The frame structure without fixed and durable partition walls allow the users greater scope to expand and re-organize rooms according to their needs and preferences


4th phase
Walling

For the frame structure the final phase can rest with the users- the construction of durable wall. Agencies can also provide durable walling as per their capacity

Continuous Tie/Lintel

Plinth Protection Wall

Ferrocement folded plate

Ferrocement I-section Column

Ferro cement Pannel wall

(v) Model B1 (Pre-cast Frame Structure on Raised Plinth)

8-member household equivalent to the area considered in ASHRAYAN
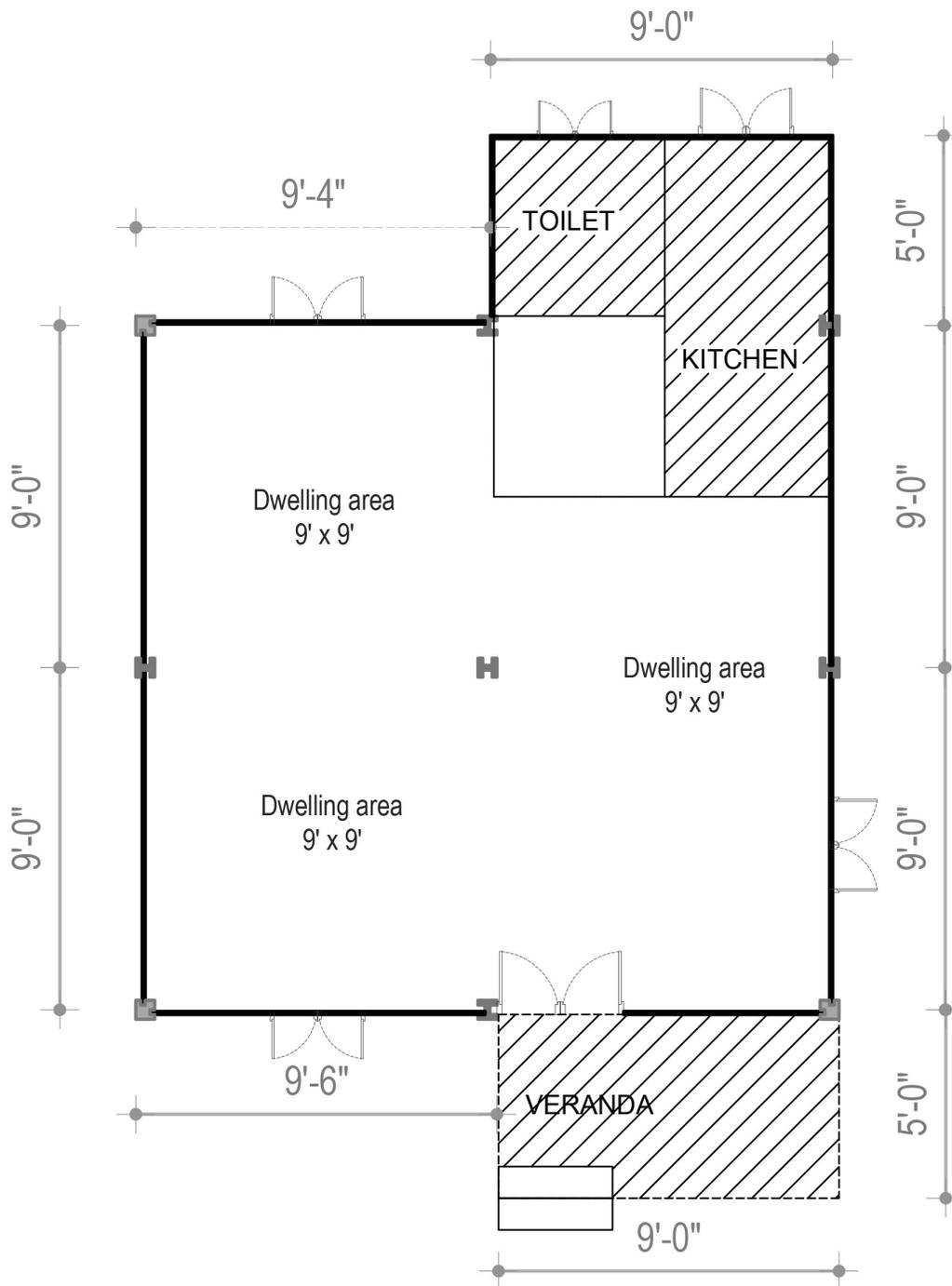
Area	432
Cost	460,000/-

Pitch Roof:

Vault Roof:

Phases of Construction


1st phase
Durable Plinth construction

As most of the earthenplinths are the main causes of failure of the whole structure by being washed out in flood water, it is imperative with the notion of build back better that the plinth is made durable so that at least the vita remains intact for any future repairing and construction

2nd phase
Frame Construction

In the next phase, frames will be erected above the outmost walled layer for plinth protection which has a shallow foundation and hence no reconstruction of plinth is required. The users according to their capacity will build an envelop

3rd phase
Roofing

The next phase involves the construction of durable roof so that even if the wall is temporary, the frame and roof will remain intact in flood so further damage will be very minimum to the whole shelter requiring only a replacing of the walls. The frame structure without fixed and durable partition walls allow the users greater scope to expand and re-organize rooms according to their needs and preferences

4th phase
Walling

For the frame structure the final phase can rest with the users- the construction of durable wall. Agencies can also provide durable walling as per their capacity.


Escape exit

Continuous Tie/Lintel

Ferrocement I Section Column

Plinth Protection Wall

Vaulted roof

Ferrocement Window Frame

Ferrocement panel

Model B2 (Stilt House)

Unit for 8-10 member household

(i)

1st Floor plan
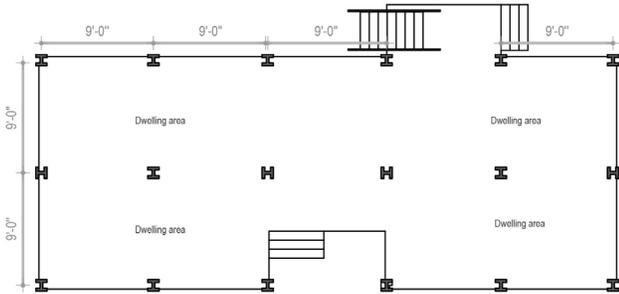
2nd Floor plan
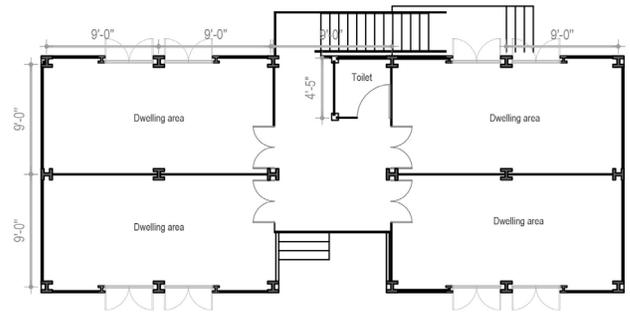
Area	Cost
1405	1055,000/-

(ii)

1st Floor plan
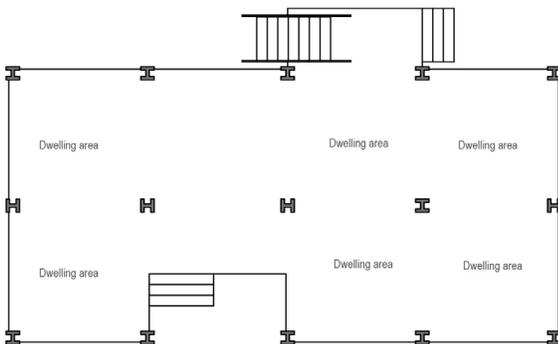
2nd Floor plan
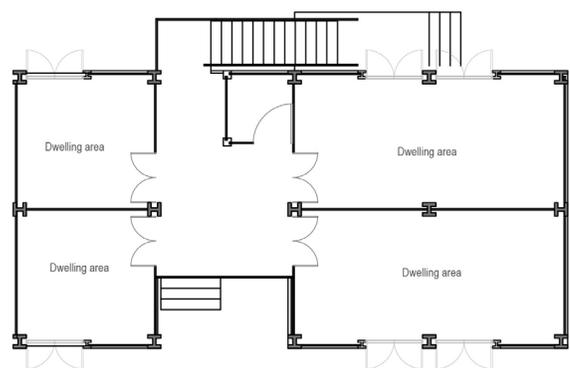
Area	Cost
1117	840,000/-

(iii)

1st Floor plan
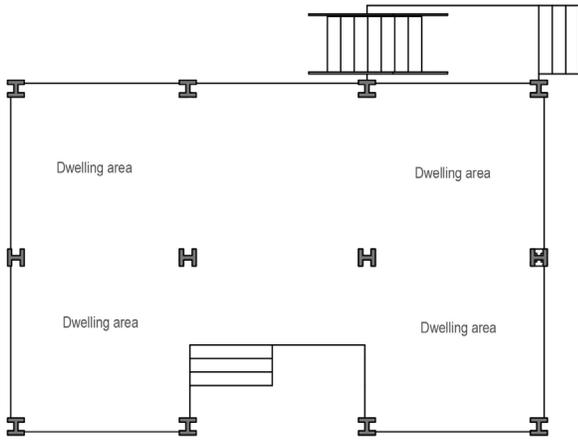
2nd Floor plan
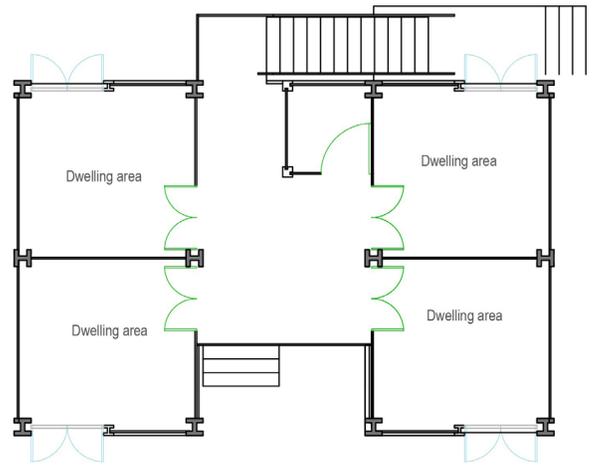
| Area	Cost
832	680,000/-

1st phase

Durable Plinth construction

As most of the earthen plinths are the main causes of failure of the whole structure by being washed out in flood water, it is imperative with the notion of build back better that the plinth is made durable so that at least the vita remains intact for any future repairing and construction

2nd phase

Frame Construction

In the next phase, frames will be erected above the outmost walled layer for plinth protection which has a shallow foundation and hence no reconstruction of plinth is required. The users according to their capacity will build an envelop

3rd phase

Roofing

The next phase involves the construction of durable roof so that even if the wall is temporary, the frame and roof will remain intact in flood so further damage will be very minimum to the whole shelter requiring only a replacing of the walls. The frame structure without fixed and durable partition walls allow the users greater scope to expand and re-organize rooms according to their needs and preferences


4th phase

Walling

For the frame structure the final phase can rest with the users- the construction of durable wall. Agencies can also provide durable walling as per their capacity

Escape exit

Continuous Tie/Lintel

Ferrocement I-section column

Plinth Protection Wall

Vaulted roof

Ferrocement window frame

Temporary Facade

5.4 Infrastructure and ancillary

Toilet Model- Dual Pit Latrine

- Toilet unit at higher grounds free of flooding with stabilized plinth
- Two dry pits are employed; effluent runs off to another when one is filled
- Pit is constructed of circular Ferro cement rings
- Pits are covered with Ferro cement lids

Pit

Pit Dia 3'-0"

Control Switch

Pit

Toilet Plan (4'-5" X 4'-5")

Water tank

Double pit

Toilet pan

Loft space for both normal & emergency time

Escape exit

Common Space

Common toilet

Tubewell
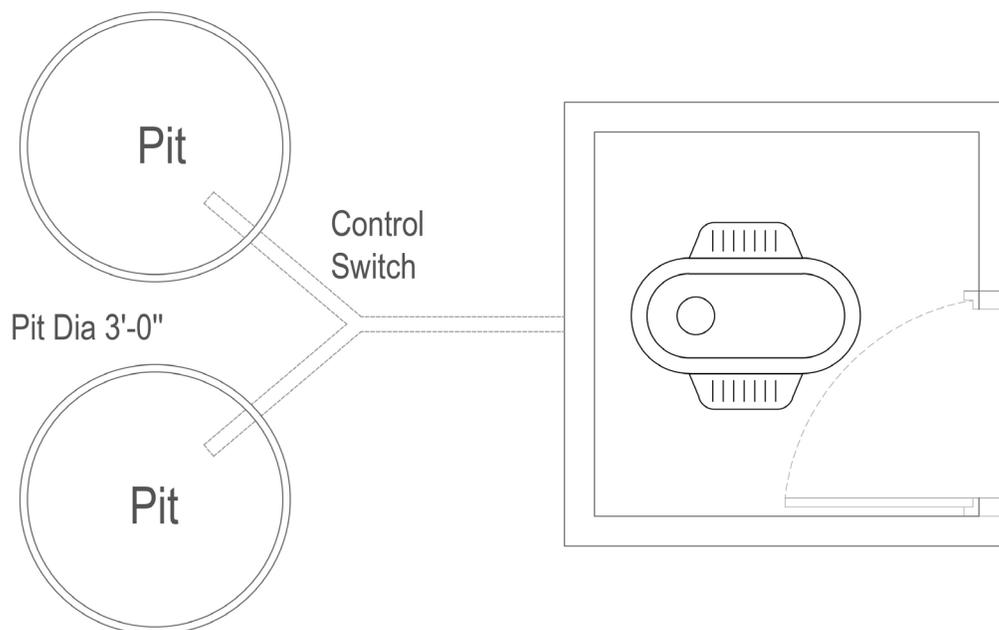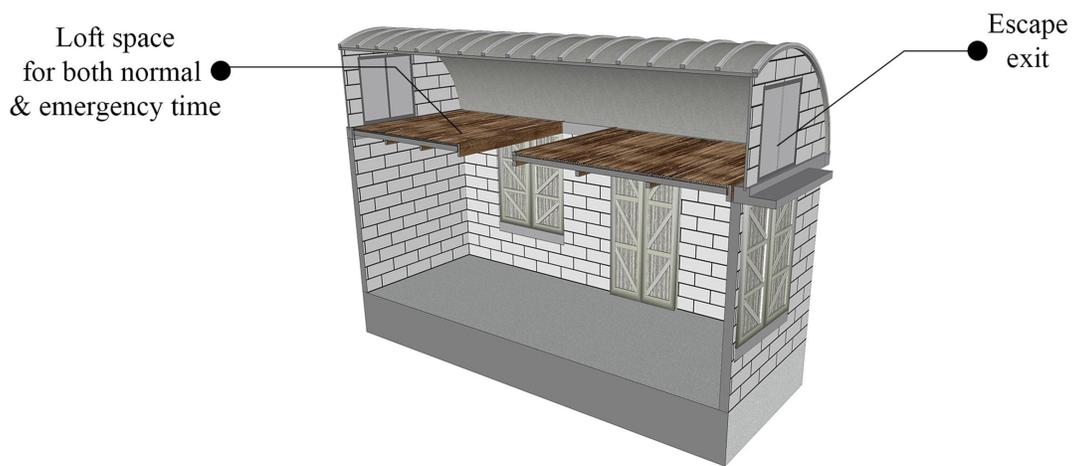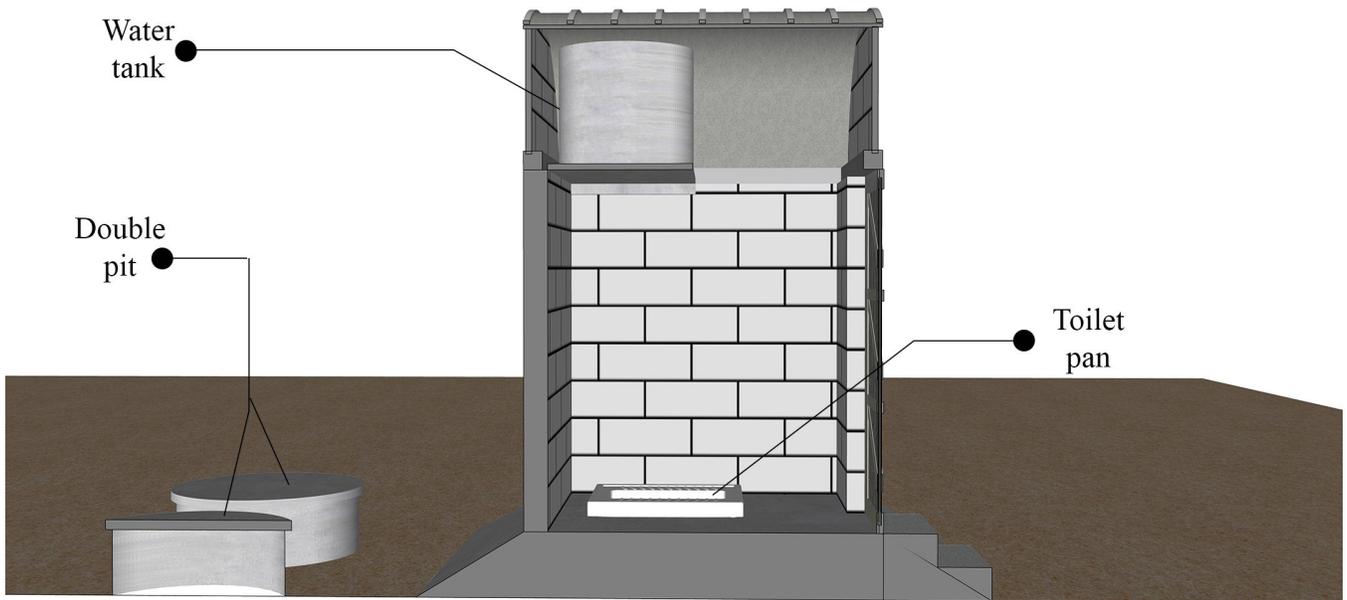
B.3 Pilot Construction with Alternative Building Technologies

Two single story houses were constructed following the alternative technology and materials to physically demonstrate the new concepts of design and construction techniques. The premise is in Purbachal, Dhaka and open for visitors. The technologies used per building components are mentioned below.

Material & Technology

1. Foundation:
    a. Cement Stabilized Soil
    b. Concrete block & Interlocking CSEB

2. Plinth:
    a. Compacted fine sand fill
    b. Stabilized fine sand
    c. Ferro concrete

3. Wall: Concrete block & CSEB
4. Lintel: Pre-cast Ferro-cement
5. Roof: Pre-cast Ferro-cement
6. Door Window: Pre-cast Ferro-cement

B.4 Structural details (Load bearing- single story)

Foundations & Plinth:

Plinth Details

2" Cement Concrete (1:2:4)

3" Cement Stabilized Fine Sand

Compacted Fine Sand FM≥0.8

2"

3"

2'-0"

FGL(±0)

Solid Block Wall

2'-3"

3" Cement Concrete (1:2:4)

1'-0"

New Construction

10 Gap filled with mortar (1:3)

Ferrocement Block (500x500x40)

75 Stablized Sand(1:15)

Compacted Sand FM≥0.8

75 CC (1:3:6)

75 Stablized fine Sand/Soil(1:20)
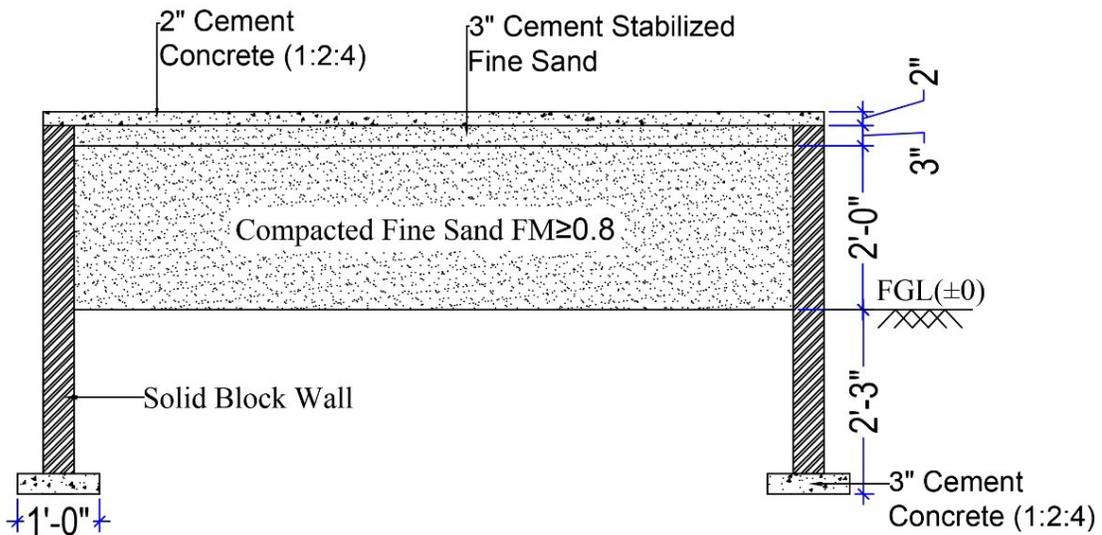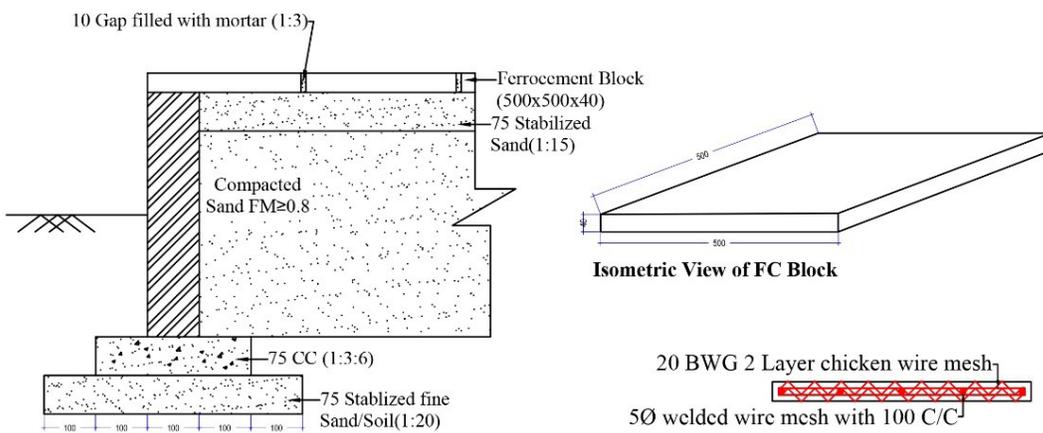
Alternative method using FC block

Isometric View of FC Block

20 BWG 2 Layer chicken wire mesh

5Ø welded wire mesh with 100 C/C

Re-bar Detail

Plinth Upgrading

2" Cement Concrete (1:2:4) · 3" Cement Stabilized Fine Sand · Compacted Fine Sand (Variable) · Compacted Existing Plinth · 2" · 3" · 2'-0" · FGL(±0) · Solid Block Wall · 2'-3" · 3" Cement Concrete (1:2:4) · 1'-0"

Existing Plinth

2" Cement Concrete (1:2:4) · 3" Cement Stabilized Fine Sand · Compacted Fine Sand · Compacted Existing Plinth · 2" · 3" · 2'-0" · FGL(±0) · Solid Block Wall · 2'-3" · 3" Cement Concrete (1:2:4) · 1'-0"

Damaged Plinth

B.5 Structural details (Frame structure- single story)

Column Beam Details:

Column Beam Detail
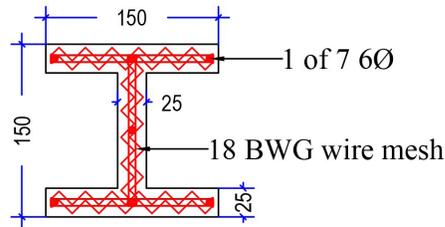
Details of Column (150x150)

- **Mix proportion 1:2 (Sand FM≥2.5)**
- **Clear Cover to main bar=7mm**
- **Clear Cover to wire mesh=5mm**
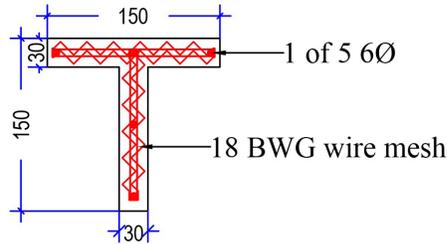
Top Beam for Vaulted Roof
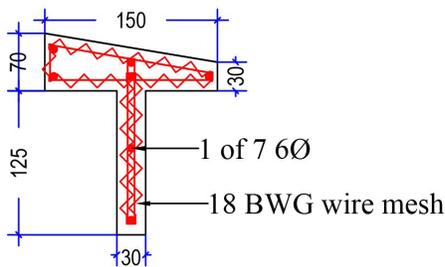
Top Beam for Pitch Roof
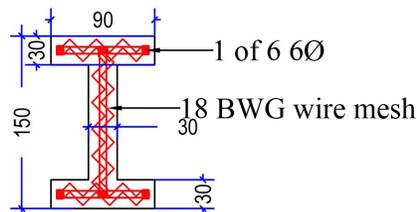
Tie Beam

Column and Pillar Details

150

150

30 40
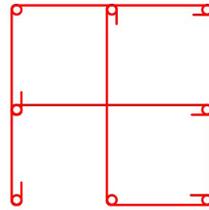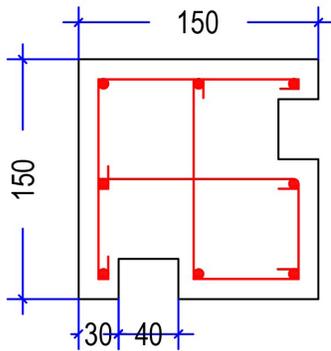
Tie arrangement

Main bar 8Ø
Tie bar 4Ø@75 C/C

Details of Corner Column (150x150)

- **Mix proportion 1:3 (Sand FM≥2.5)**
- **Clear Cover to main bar=10mm**

1 of 4 10Ø bar

240

240

240
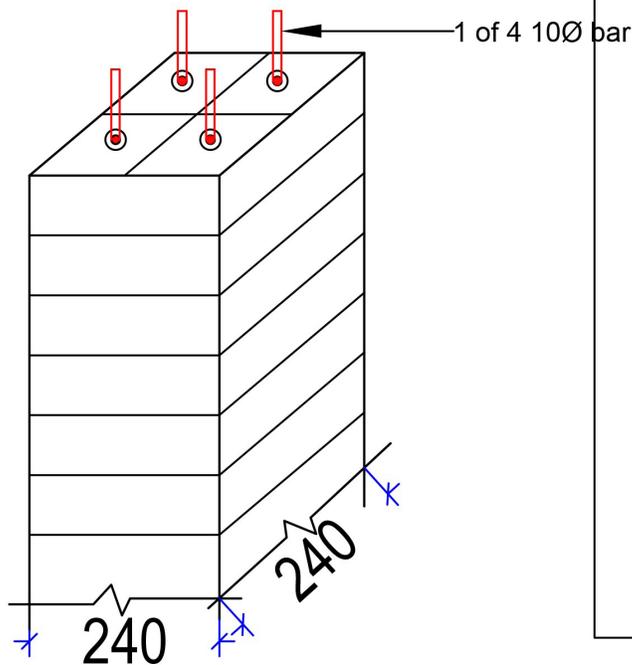
Reinforced Block Pillar
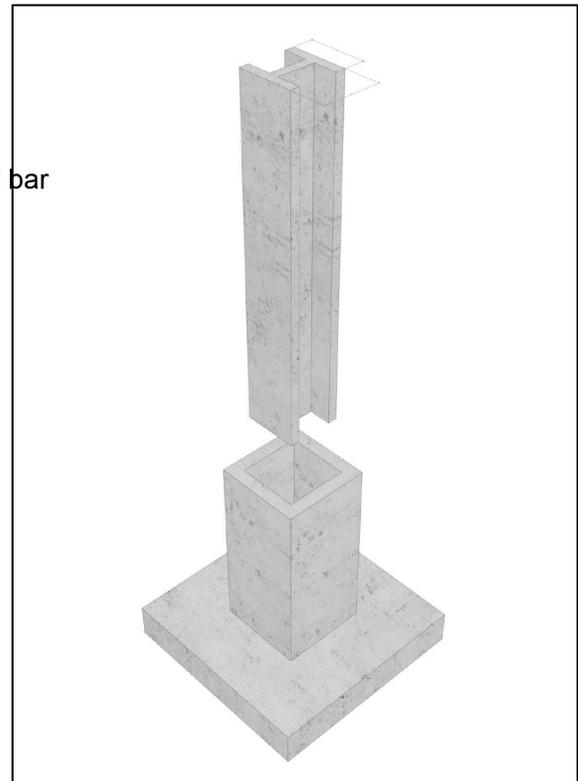
Pocket Footing and Column

B.6 Structural details (Stilt house)

Footing Details:
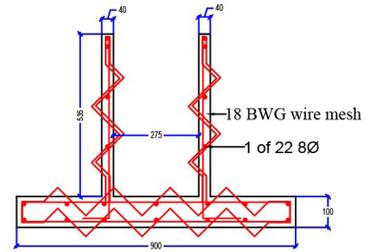
Footing Re-bar Details
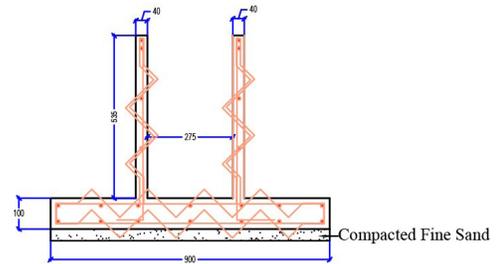
Footing F1
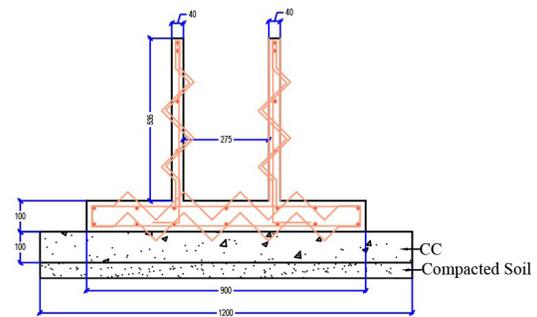
Footing F2
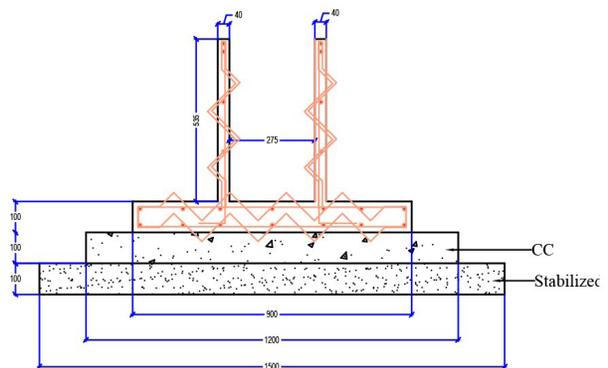
Footing F3
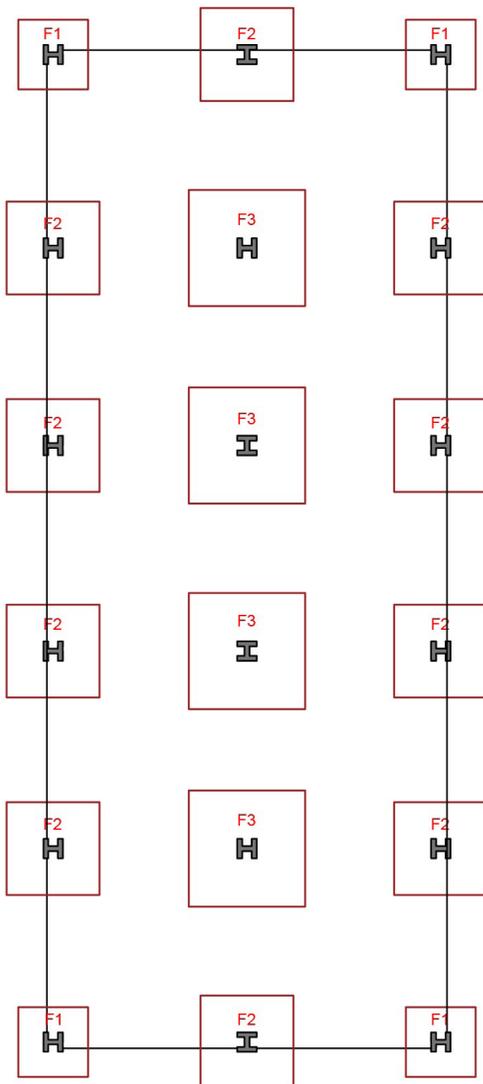
Column and Joint Details

5Ø @ 100 C/C

5mm Clear Cover

18 BWG Wire mesh

1 of 28 6Ø

Details of Column (250x250)

- **Mix proportion 1:2 (Sand FM≥2.5)**
- **Clear Cover to main bar=8mm**
- **Clear Cover to wire mesh=5mm**
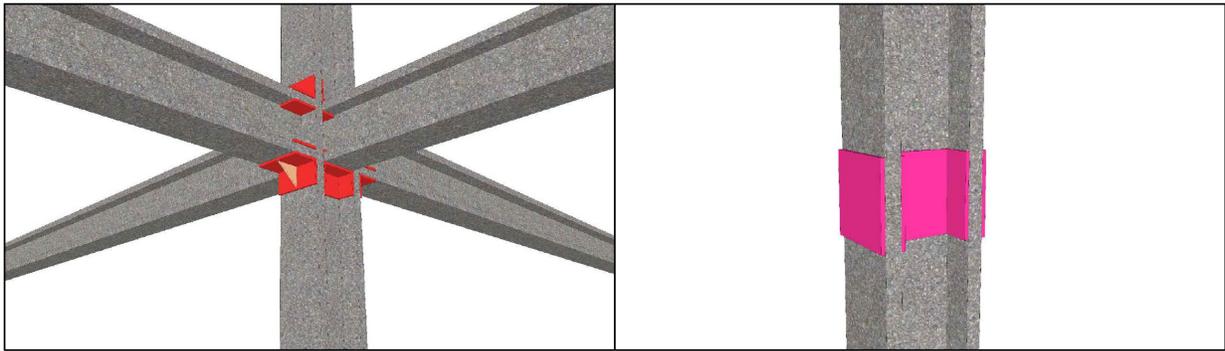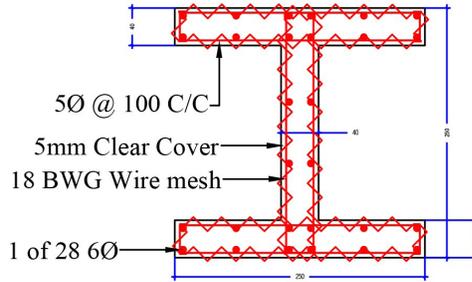
Beam-Column Joint
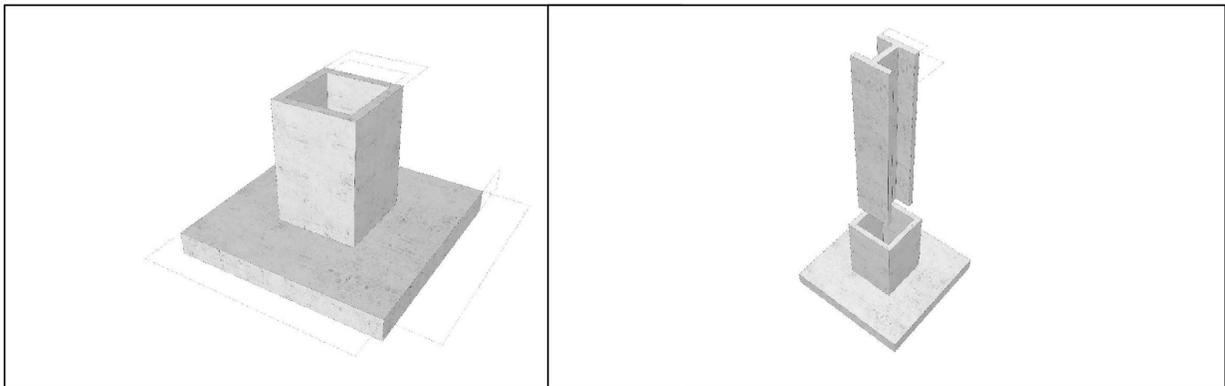
Pocket Footing and Column

Floor & Roof structure:

Folded Plate Roof Detail
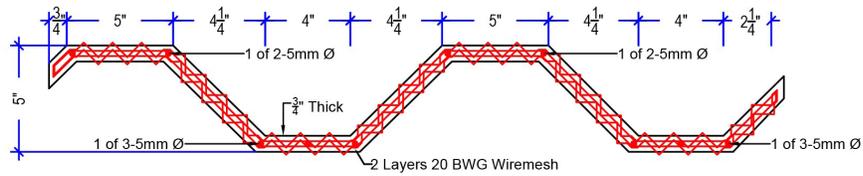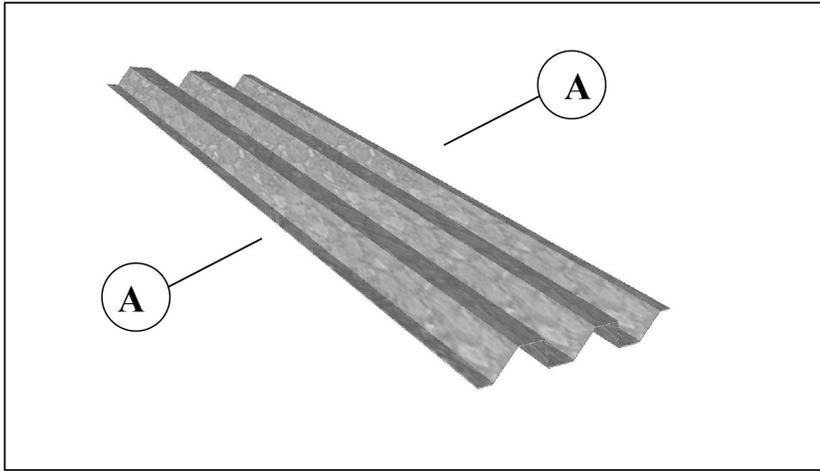
Section A-A
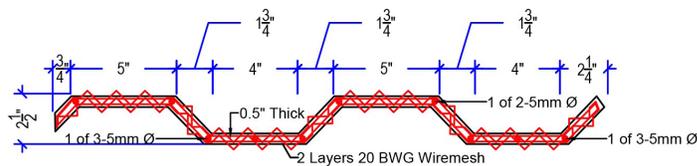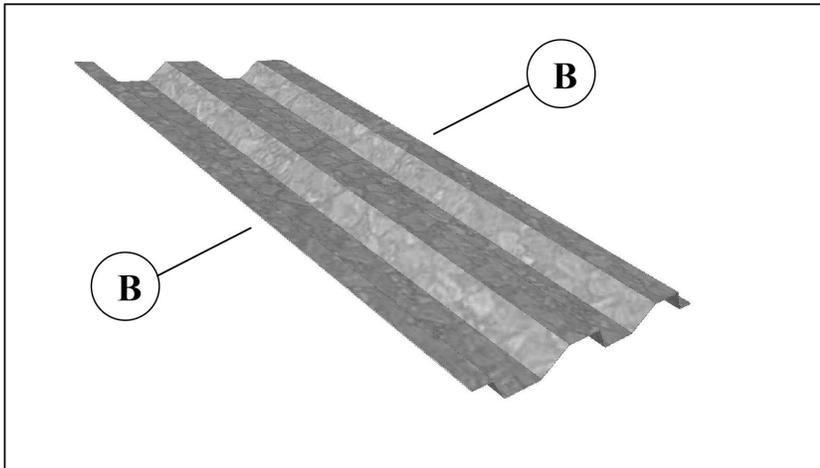
Section B-B

Floor & Roof structure:
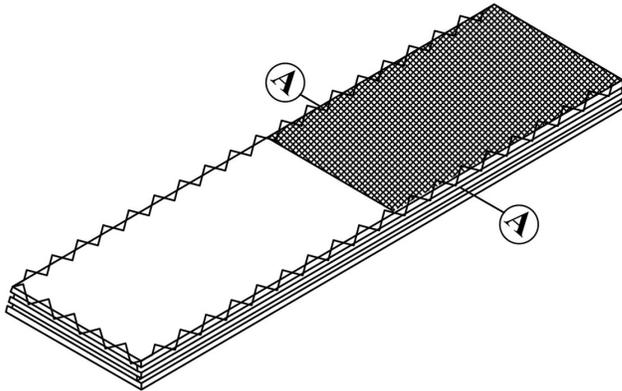
Isometric View of FC Channel
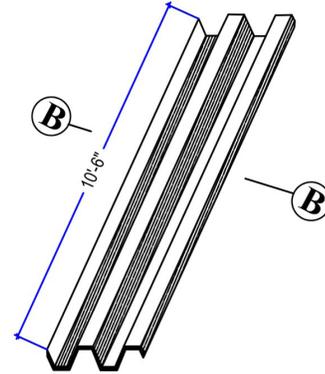
Isometric View of Folded Plate

2 layer of wiremesh 18 BWG
0.5"X0.5" C/C Bothways

$\frac{3}{4}$" Thickness

10 mm Ø.

Section A-A

1 of 2-5mm Ø

1 of 2-5mm Ø

$\frac{3}{4}$" Thick

1 of 3-5mm Ø

2 Layers 20 BWG Wiremesh

1 of 3-5mm Ø
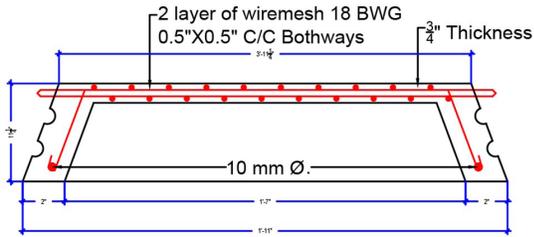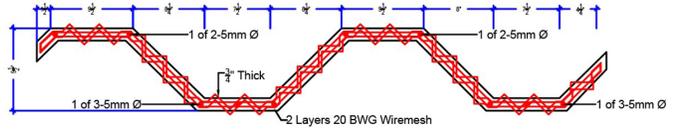
Section B-B

Annex C

C. 1 Focus Group Discussion

FGD Participant Data
FGD 1

Community: Lengura
Upazila: Gowainghat
District: Sylhet
Date: 13.10.22
Time Duration: 12:00 – 1: 00
No of male Participants: 0
No of Female Participants: 10
Were Vulnerable groups present (elderly, Person with disability etc.)? ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/ Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Farhana Begum	F	27	BA	Housewife	6000	6000	Semi -Pucca
02	Sayeeda Begum	F	50	None	Housewife	7000	7000	Kutcha
03	Moriom	F	18	Class 5	Housewife	6000	6000	Kutcha
04	Shahana Begum	F	30	Class 7	Housewife	6000	6000	Semi-Pucca
05	Ayesha Begum	F	35	None	Day Labor	5000	5000	Kutcha
06	Rokeya	F	25	Class 7	Housewife	7000	7000	Kutcha
07	Nilufa Begum	F	45	None	Housewife	6000	6000	Kutcha
08	Rubina Begum	F	29	Class 5	Housewife	6000	6000	Semi-Pucca
09	Romana Begum	F	30	Class 5	Housewife	6000	6000	Kutcha
10	Hajera Begum	F	27	Class 8	Housewife	6000	6000	Semi-Pucca

FGD 2

Community: Lengura
Upazila: Gowainghat
District: Sylhet
Date: 13.10.22
Time Duration: 13:05 – 14: 00
No of male Participants: 08
No of Female Participants: 0
Were Vulnerable groups present (elderly, Person with disability etc.)? ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Siraj Uddin	M	80	None	None/Dependent	4000	4000	Kutcha
02	Jomir Uddin	M	55	Class 2	Porter	4000	4000	Kutcha
03	Fazlur Rahman	M	60	None	None/Dependent	12000	12000	Kutcha
04	Abdus Sabur	M	65	Class 2	None/ Dependent	6500	6500	Kutcha
05	Yousuf Ali	M	65	None	Sells lands to Survive	9000	9000	Pucca
06	Hasan Ahmed	M	24	Class 5	Day labor	4000	4000	Kutcha
07	Sukkur Rahman Sabuz	M	17	Class 4	Mason	7000	7000	Kutcha
08	Ekhlasur Rahman	M	25	None	Mason	5000	5000	Kutcha

FGD 3

Community: Hatkhola
Upazila: Sylhet Sadar
District: Sylhet
Date: 14.10.22
Time Duration: 10:30 – 11: 45
No of male Participants: 08
No of Female Participants: 0
Were Vulnerable groups present (elderly, Person with disability etc.)?   ☒ Yes   ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Kamruzzaman	M	42	Class 8	Small Business	10000	10000	Pucca
02	Shamim Ahmed	M	26	Madrasah	Madrasah Teacher	10000	10000	Pucca
03	Md. Abdus Sukur	M	40	Madrasah	Auto Driver	12000	12000	Kutcha
04	Abdus Shahid	M	60	None	Farmer	6000	6000	Pucca
05	Md. Moin Uddin	M	60	SSC	Farmer + Day Labor	50000 (20 persons)	50000	Pucca
06	Arbhushan	M	50	None	Farmer	4000	4000	Kutcha
07	Abdur Rahman Almas	M	59	Class 8	Tailor	5000	5000	Kutcha
08	Hossain Al Mahmud	M	41	Madrasah	Imam + Farmer	9000	9000	Pucca

FGD 4

Community: Barkhapan
Upazila: Kalmakanda
District: Netrokona
Date: 15.10.22
Time Duration: 1:15 – 2: 30
No of male Participants: 05
No of Female Participants: 05
Were Vulnerable groups present (elderly, Person with disability etc.)?   ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Mainuddin Biswash	M	58	Class 2	Union Member (1 no ward)	16000	16000	Kutcha
02	Debashish Chandra	M	45	HSC	Union Member (2 no ward)	15000	12000	Semi-Pucca
03	Bishwash Sarker	M	61	Class 8	Farmer	30000	30000	Kutcha
04	Mithu Kanti Talukder	M	50	Class 5	Farmer	8000	8000	Kutcha
05	Lovely Akter	F	35	Class 5	Union Member	20000	15000	Kutcha
06	Jhalak Sarker	M	27	HSC	Union Member	25000	30000	Kutcha
07	Nomita Rani	F	30	None	Housewife	15000	15000	Kutcha
08	Shirin Akter	F	40	None	Housewife	10000	Dependent on Brother + Loan	Kutcha
09	Nasrin Begum	F	40	Class 5	Housewife	10000	6000	Kutcha
10	Diba Rani Sarker	F	45	Class 2	Housewife	7000	6000	Kutcha

FGD 5

Community: Gobindosree, Monika
Upazila: Madan
District: Netrokona
Date: 16.10.22
Time Duration: 12:15 – 1: 15
No of male Participants: 05
No of Female Participants: 05
Were Vulnerable groups present (elderly, Person with disability etc.)? ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/ Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Faruk Ear Ahmed	M	68	SSC	Retired	20000	20000	Pucca
02	Sojida	F	35	None	Day Labor	8000	8000	Kutcha
03	Monowara	F	50	None	Day Labor	3000	3000	Kutcha (in poor condition)
04	Rina	F	45	None	Farmer	30000	25000	Kutcha
05	Majid Akter	F	50	None	Houswife	25000	20000	Kutcha
06	Md. Akkas Mia	M	55	None	Housewife	10000	6000 + Loan	Semi-Pucca
07	Nazmul Islam	M	41	Class 7	Farmer	12000	8000 + Loan	Kutcha
08	Haji Kanchan Mia	M	65	None	Dependent	10000	10000	Kutcha
09	Lahela Akter	F	40	None	Housewife	15000	15000	Kutcha
10	Parimal Chandra	M	40	Class 5	Village Police	10000	10000	Kutcha

FGD 6

Community: Lakkhansree
Upazila: Sunamganj Sadar
District: Sunamganj
Date: 16.10.22
Time Duration: 16.10.22
No of male Participants: 10
No of Female Participants: 00
Were Vulnerable groups present (elderly, Person with disability etc.)? ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/ Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Nurul Islam	M	45	Class 3	Farmer	5000	5000	Kutcha
02	Md. Kamal Uddin	M	50	None	Farmer	7000	7000	Kutcha
03	Moin Uddin	M	55	Class 5	Shopkeeper	5000	5000	Kutcha
04	Abdul Mannan	M	55	Class 1	Day Labor	8000	8000	Semi-Pucca
05	Abdul Goni	M	35	None	Day Labor	5000	5000	Kutcha
06	Monjur Ali	M	40	Class 7	Farmer	12000	12000	Semi-Pucca
07	Abdul Baser	M	40	None	Farmer	6000	6000	Kutcha
08	Md. Abdul Karim	M	30	None	Dependent	10000	10000	Semi-Pucca
09	Md. jakaria	M	40	Class 2	Farmer	6000	6000	Kutcha
10	Sobor Ali	M	45	None	Day Labor	8000	8000	Semi-Pucca

FGD 7

Community: Lakkhansree Union
Upazila: Sunamganj Sadar
District: Sunamganj
Date: 17.10.22
Time Duration: 12:00 – 1:00
No of male Participants: 05
No of Female Participants: 21
Were Vulnerable groups present (elderly, Person with disability etc.)? ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Mst. Amena Begum	F	45	Class 3	Housewife	7000	7000	Kutcha
02	Khodeza Begum	F	40	None	Housewife	7000	7000	Kutcha
03	Sadika Begum	F	30	None	Housewife	20000	15000	Semi-pucca
04	Nazma	F	30	Class 3	Housewife	6000	6000	Semi-Pucca
05	Selina Begum	F	50	None	Day Labor	5000	5000	Kutcha
06	Minara	F	55	None	Housewife	10000	10000	Kutcha
07	Somola	F	55	None	Day Labor	5000	5000	Kutcha
08	Jahera Begum	F	60	None	Housewife	10000	10000	Semi-Pucca
09	Khush Nahar	F	35	Class 5	Housewife	6000	6000	Kutcha
10	Beauty	F	33	None	UP Member	15000	12000	Semi-Pucca

FGD 8

Community: Chhatak
Upazila: Chhatak
District: Sunamganj
Date: 16.10.22
Time Duration: 17.10.22
No of male Participants: 05
No of Female Participants: 05
Were Vulnerable groups present (elderly, Person with disability etc.)? ☒ Yes ☐No

SI	Name of the Participants	Sex	Age	Education	Occupation/Income Resource	Monthly HH Expenditure	Monthly HH Income	Housing Structure Type
01	Mukhlesur	M	44	Class 5	Farmer	15000	15000	Kutha
02	Khelada Begum	F	50	None	Housewife	5000	5000	Kutcha
03	Rojina	F	35	Class 8	Housewife	12000	12000	Kutcha
04	Hajera	F	50	None	Housewife	5000	5000	Semi-Pucca
05	Tajirun Nesa	F	55	None	Day Labor	8000	8000	Kutcha
06	Indraful	F	40	Class 5	Day Labor	8000	8000	Semi-Pucca
07	Aftab Ali	M	47	Class 2	Farmer	10000	10000	Kutcha
08	Abdur Rahman	M	28	HSC	Auto Driver	10000	10000	Semi-Pucca
09	Saidur Rahman	M	27	HSC	Business	15000	15000	Kutcha
10	Afzal Ahmed	M	35	SSC	Business	20000	20000	Semi-Pucca

C.2 Key Informant Interview

KII Schedule

KII-1

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
12.10.22	District Relief and Rehabilitation Officer, Sylhet District	11-00 AM	12-00 AM

KII-2

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
12.10.22	Sub-Assistant Engineer, LGED, Sylhet Sadar	2-00 PM	2-30 PM

KII-3

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
12.10.22	Officer, Department of Agricultural Extension, Sylhet Sadar	2-40 PM	3-15 PM

KII-4

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
12.10.22	Education Officer, Sylhet Sadar	3-30 PM	4-00 PM

KII-5

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
13.10.22	Upazilla Nirbahi Officer, Gowainghat Upazilla, Sylhet	10-45 AM	11-30 AM

KII-6

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
13.10.22	Upazilla Chairman, Gowainghat Upazilla, Sylhet	11-00 AM	11-30 AM

KII-7

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
14.10.22	Union Chairman, Sylhet Sadar Upazilla	9-00 AM	10-00 AM

KII-8

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
14.10.22	Representative, Local NGO	10-30 AM	11-00 AM

KII-9

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
15.10.22	Project Implementation Officer (PIO), Chhatak Upazilla, Sunamganj	10-30 AM	11-00 AM

KII-10

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
14.10.22	Representative, Mason Group	10-30 AM	11-00 AM

KII-11

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
15.10.22	Manager, BRAC	10-30 AM	11-00 AM

KII-12

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
16.10.22	Upazilla Nirbahi Officer, Sunamganj Sadar	10-30 AM	11-00 AM

KII-13

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
16.10.22	Project Implementation Officer, Kalmakanda Upazilla, Netrokona	11-30 AM	12-00 PM

KII-14

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
17.10.22	Chairman, Gobindrossi Union Parishad, Madan Upazilla, Netrokona	1-00 PM	1-30 PM

KII-15

Date and Time	Key Informant	Duration of Interview/Discussion Session	
		Starting Time	Finishing Time
17.10.22	Project Implementation Officer, Madan Upazilla, Netrokona	2-00 PM	3-00 PM

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