Community Risk Assessment

Uttar Dhurung Union, Kutubdia, Cox's Bazar

November 2019

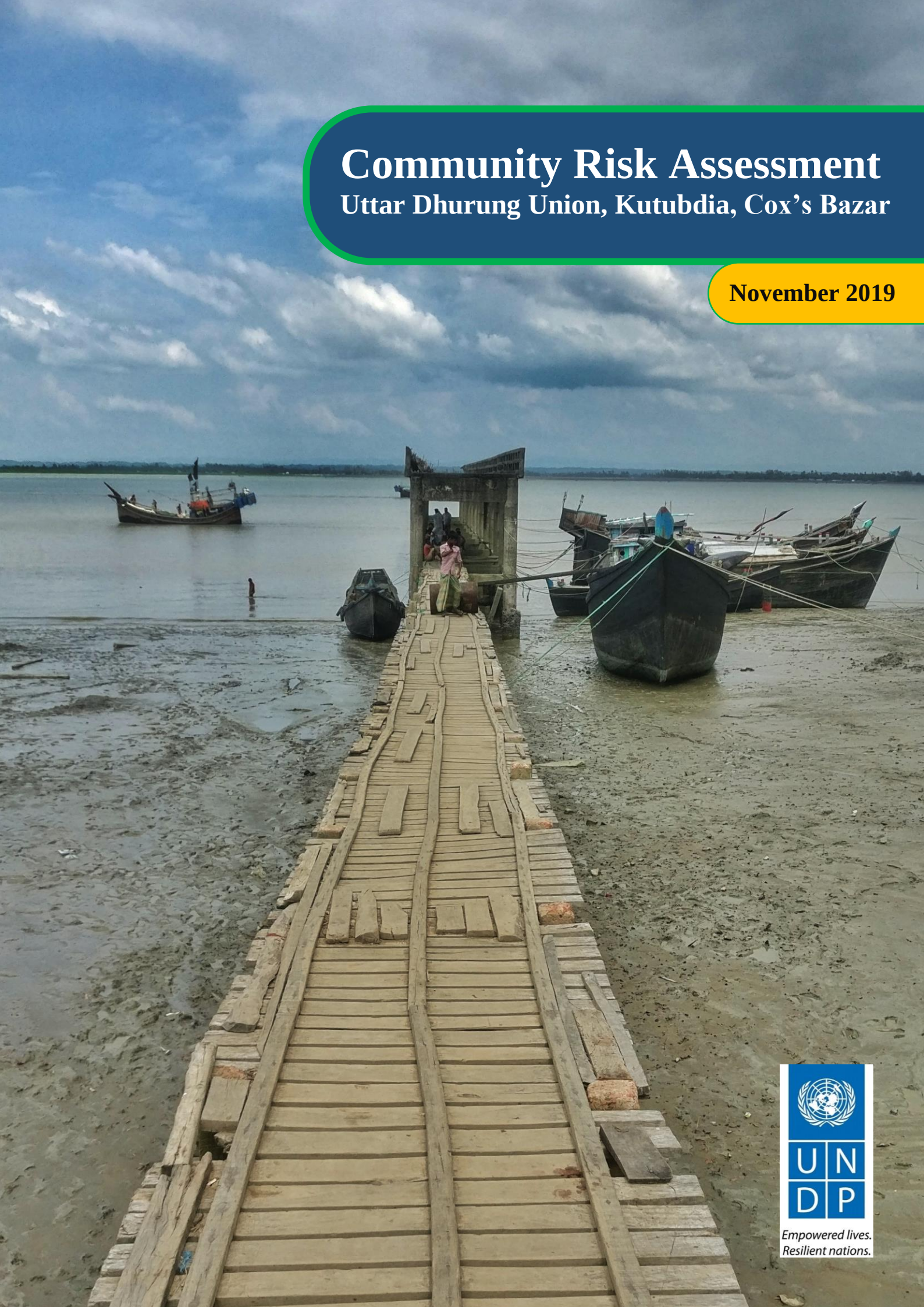

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Table of Contents

Table of Contents 3

List of Tables 4

List of Figures 4

Chapter 1: Introduction 6

1.1. A Short History of the Union 6

1.2. Demographic Information 8

1.3. Socio-Economic Condition of the Union 10

1.4. Local Resources 15

Chapter 2: Local Hazards and Vulnerabilities 15

2.1. Historical Analysis of Hazards 15

2.2. Hazard Venn and Calendar/Seasonality 19

2.3. Crop Seasonality and Exposure to Hazards 20

2.4. Land Use/ Land Cover Pattern 22

2.5. Livelihood Options and Vulnerability 24

2.6. Vulnerability of Population and Local Economy to Climatic Hazards 24

Chapter 3: Community Risks and Vulnerability 26

3.1. Sector Risks and Challenges 26

3.2. Challenges of High Priority 27

3.3. Sensitivity and Exposure Analysis 29

3.4. Adaptive Capacity 33

Chapter 4: Risk Reduction Options and Action Plan 33

4.1. Risk Reduction Options 33

4.2. Risk Reduction Action Plan 35

Chapter 5: Concluding Remarks 40

References 41

Annex A: Schedule of Map and CRA production 42

Annex B: FGD Checklist 43

Annex C: KII Checklist 45

Annex D: Photos of the Study Area 46

List of Tables

Table 1: Demographic and Socio-Economic Condition of Uttar Dhurung Union 14
Table 2: Hazard Calendar/ Seasonality of Uttar Dhurung Union 20
Table 3: Crop Calendar/ Seasonality of Uttar dhurung Union 21
Table 4: Risk Categories (CDMP, 2006) 27
Table 5: Risk statements with High Priority 27
Table 6: Sensitivity and Exposure Analysis 29
Table 7: Risk Reduction Action Plan of Uttar Dhurung Union 35
Table 8: List of FGDs 44
Table 9: List of KIIs 46

List of Figures

Figure 1: Base Map of Uttar Dhurung Union 7
Figure 2: Administrative Unit wise Male-Female Population (BBS, 2011) 9
Figure 3: Percentage of Population in the Age Group (BBS, 2011) 9
Figure 4: Distribution of Population aged 7 years and above by Literacy (BBS, 2011) 10
Figure 5: Percentage Distribution of Households by Type of Structure and Housing Tenancy Status (BBS, 2011) 11
Figure 6: Percentage Distribution of Households by Toilet Facility (BBS, 2011) 11
Figure 7: Percentage Distribution of Households by Source of Drinking Water (BBS, 2011) 12
Figure 8: Percentage Distribution of Electricity Connection (BBS, 2011) 12
Figure 9: Economic Status of People (Percentage) (Source: CRA field data) 13
Figure 10: Physical Elements of Uttar Dhurung Union (Source: CRA field data) 15
Figure 11: Hazard map of Uttar Dhurung Union (Source: Satellite imagery, community participation and field survey) 18
Figure 12: Hazard Venn of Uttar Dhurung Union (Source: CRA field data) 19

Figure 13: Percentage of Area in Different Land Uses (Source: CRA field data) 22
Figure 14: Landuse Map of Uttar Dhurung Union 23
Figure 15: Percentage of people engaged in different Employment (Source: CRA field data) 24
Figure 16: Food Production and Food Security (Source: CRA field data).....25
Figure 17: Schedule of map and CRA production.....42
Figure 18: Primary school cum cyclone shelter beside the embankment.....47
Figure 19: Left side of Road showing agriculture whereas the right side showing the salt fields 47
Figure 20: Kutcha road for going into a cluster village.....47
Figure 21: Salt storing techniques; salts are stored like this for several years 47
Figure 22: Kutcha road in ward 5 48
Figure 23: Broken part of the embankment in akbar balir ghat.....48
Figure 24: Broken part of the embankment in ward 1.....48
Figure 25: Broken part of the embankment in ward 1 and cluster villages are fully exposed.48

Chapter 1: Introduction

Community Risk Assessment (CRA) is the participatory process for assessing hazards, vulnerabilities, risks and coping ability of a community in response to the hazards and risks. CRA assists in the preparation of coping strategies and risk-reduction implementation plan as scientific information, predictions and participatory discourses are used to identify, analyse and evaluate risk environment of a particular community. A completed CRA informs on actions that are needed to manage the risk environment with the community. When a community is vulnerable to the disasters that are likely to happen and cause a great deal of damage to their livelihood and properties, CRA attempts to identify the most vulnerable areas and communities and evaluate the risks to enable risk reduction. The CRA method recognizes that the vulnerability, loss, reduction or mitigation strategy and coping mechanism vary from community to community and from group to group (e.g. women, persons with disability, landless persons, farmers-fisher folks) within a community. CRA thus ensures that the points of views of civil servants, disaster management professionals, community and other groups are reflected.

1.1. A Short History of the Union

Kutubdia, an islandic Upazila (administrative region) of Cox's Bazar district situated in the coastal eastern part of Bangladesh, is the study area for this research. Kutubdia has an area of 2,491.86 km^2. It is located near the basins of Matamuhuri and Shango. Banskhali Upazila of Chattogram District borders Kutubdia in the north, and Kutubdia's southeast is bounded by Moheskhali Upazila. The rest of Kutubdia is surrounded by the Bay of Bengal and by a 400-metre wide channel (Kutubdia Channel) that separates it from the mainland. The transportation between Kutubdia to the mainland is by boat – engine boat, 'Danish' boat (high-speed boat). Residents of Kutubdia are very poor, with most involved in agriculture, mainly in salt cultivation. During the British regime, a lighthouse was established at Kutubdia for the incoming ships to the Chittagong Port. The lighthouse is no longer in existence, due to land erosion by the Bay of Bengal. Uttar Dhurung Union (hereafter "the Union") is located in the northern side of Kutubdia Upazila, with an area of 11.53 km^2. The distance from the Upazila headquarters to the Union is about 8 km. The Union is bounded by Dakshin Dhurung and Lemshikhali Unions in the south; the Kutubdia Channel; Chonua Union of Bashkhali Upazila, Chittagong District in the east; and the Bay

Base Map: Uttar Dhurung Union, Kutubdia Upazila, Cox's Bazar

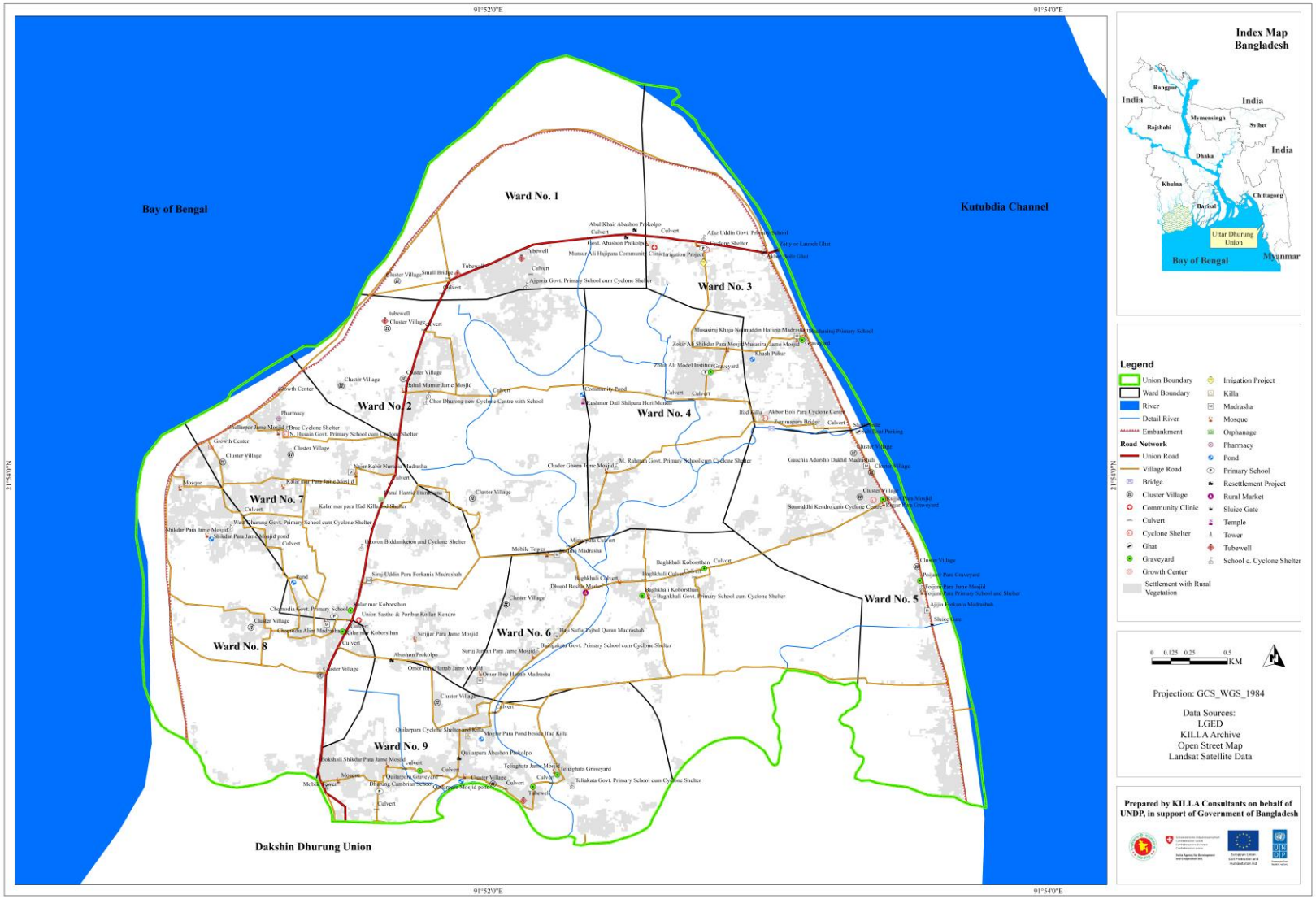

Figure 1: Base Map of Uttar Dhurung Union

of Bengal on the north and west sides. This whole Union is surrounded by water; the Bay of Bengal and the Kutubdia channel. The name 'Dhurung' is named after the Bengali word 'Khorsrota' (meaning 'flashy channel or current)' and later, it was formed into two separate Unions called 'Uttar Dhurung' and 'Dakkhin Dhurung' (Bangladesh National Portal, 2018). There are 9 wards in this Union and it is one of the biggest Unions of Kutubdia.

1.2. Demographic Information

Uttar Dhurung Union is the first Union council under Kutubdia Upazila. The administrative activities of the Union are overseen by the Kutubdia police station in Baraghope Union. The Uttar Dhurung Union is part of the constituency of Cox's Bazar--2, 295th seat of the National Parliament. This Union is divided into two Mouzas (administrative district), i.e. Uttar Dhurung and Char Dhurung (Bangladesh National Portal, 2018). The villages of this Union are:

- Uttar Dhurung
- Kalarmar Para
- Char Dhurung
- Jummapara
- Teliyakata
- Paschim Dhurung
- Faizanipara
- Baingaghata
- Baghkhali

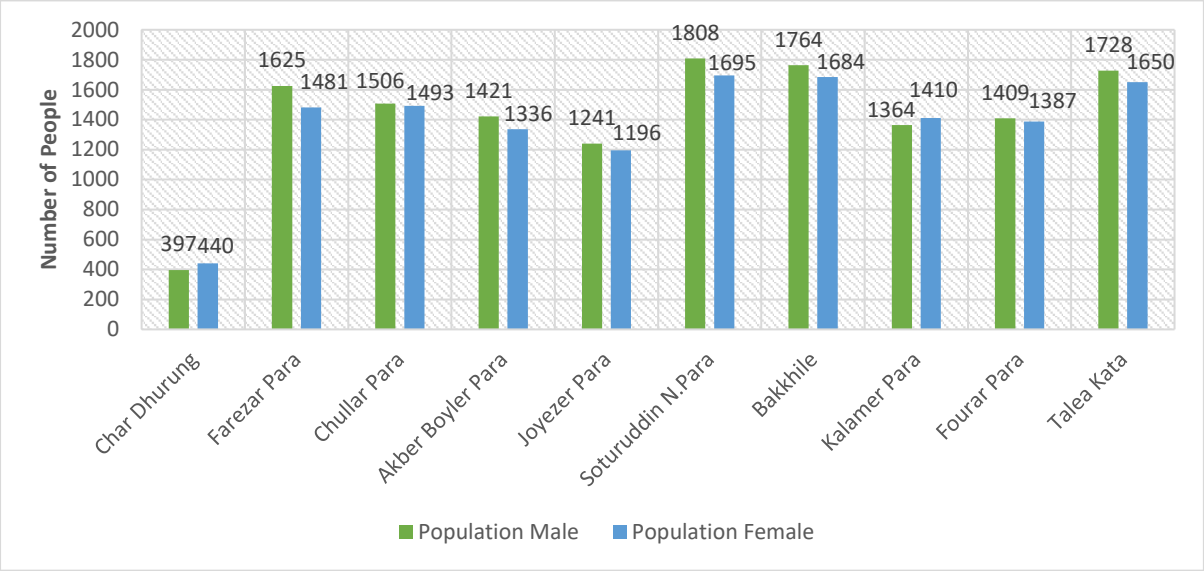

Figure 2: Administrative Unit wise Male-Female Population (BBS, 2011)

According to the Population and Housing Census 2011, the total population of the Union is 28,035 in 4.889 households. Of these, 14,263 are males and 13,772 are females. The male-to-female ratio of the Union is 1-to-1 in 2011 The decadal population growth rate for the Union is 17.45% and the annual compound growth rate is 1.62%. The growth rate has been fluctuating over the decades from 1951 to 2011 (BBS, 2011).

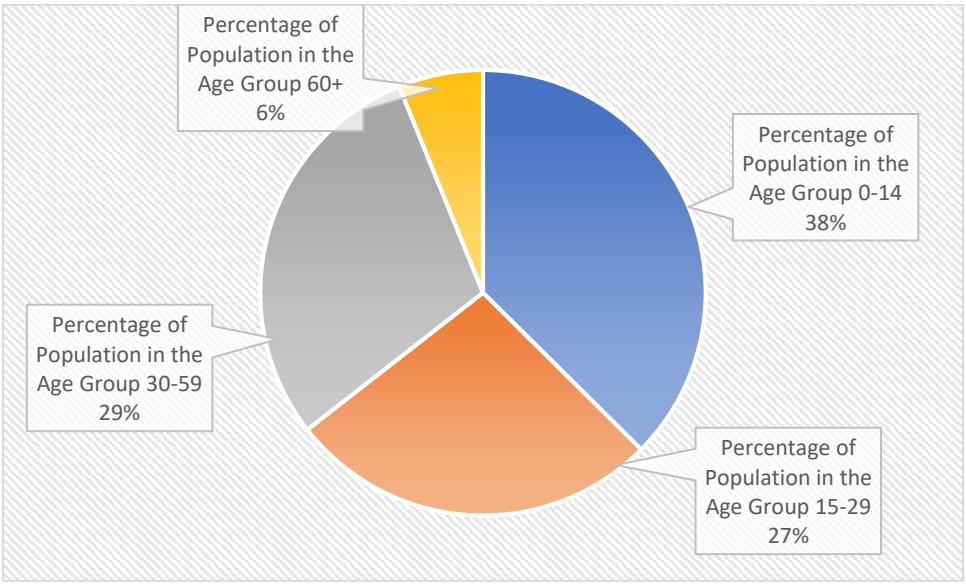

Figure 3: Percentage of Population in the Age Group (BBS, 2011)

This figure shows the distribution of the Union's population according to age. Age groups are categorised as follows: 0-14 years (children), 15-29 years (early working age), 30-59 years (prime working age), 60 years and over (elderly). According to the Population and Housing

Census 2011, 27% of the total population are children; 38% 15 to 29-year-olds; 29% of prime working age and 6% are elderly. Muslims are the majority (98.48%) of the population in Uttar Dhurung, followed by Hindus (1.52%). There are no ethnic minorities in this Union. The total number of people with disability is 364 (BBS, 2011).

1.3. Socio-Economic Condition of the Union

As per UNDRR (2019), "research suggests that disasters cause impoverishment, which can lead to a cycle of losses, poverty traps and a slowing of efforts to reduce poverty." Utilizing information collected from secondary data (BBS, November 2011) and the CRA field survey, the below section analyses the indicators of local socioeconomic conditions of Uttar Dhurung union, including infrastructure, housing stock, livelihoods, literacy and electrification.

a. Literacy rate: Literacy rate in Uttar Dhurung Union is 29.2%. Literacy rate is 29.9% for male and 28.5% for female (BBS, 2011).

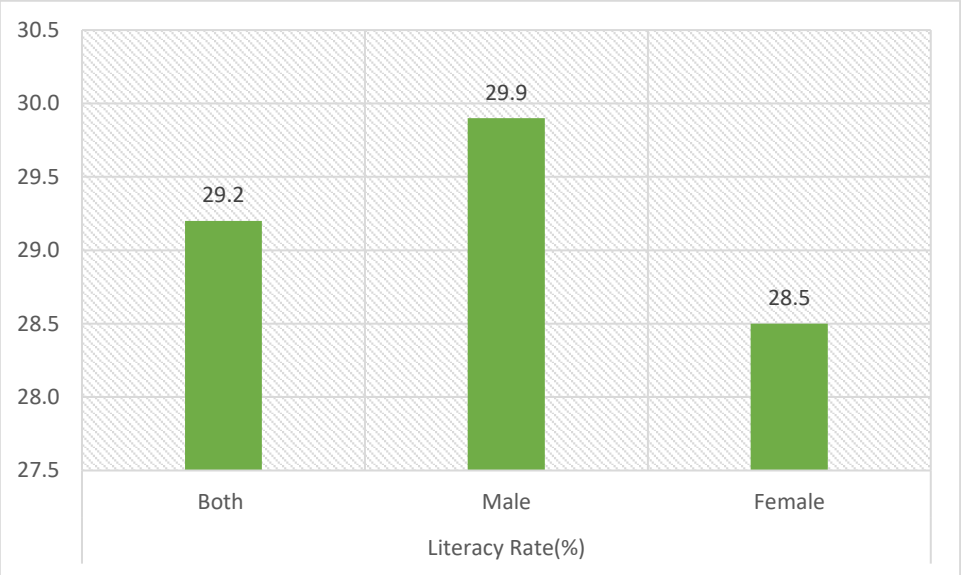

Figure 4: Distribution of Population aged 7 years and above by Literacy (BBS, 2011)

b. House Structure: In Uttar Dhurung Union, 97% of the general household live in kutcha house made of natural material and/or marginal material "jhupri" (such as bamboo, straw, solid waste, etc.), and the remaining 3% in pucca and/or semi-pucca house made of solid and permanent materials (BBS, 2011).

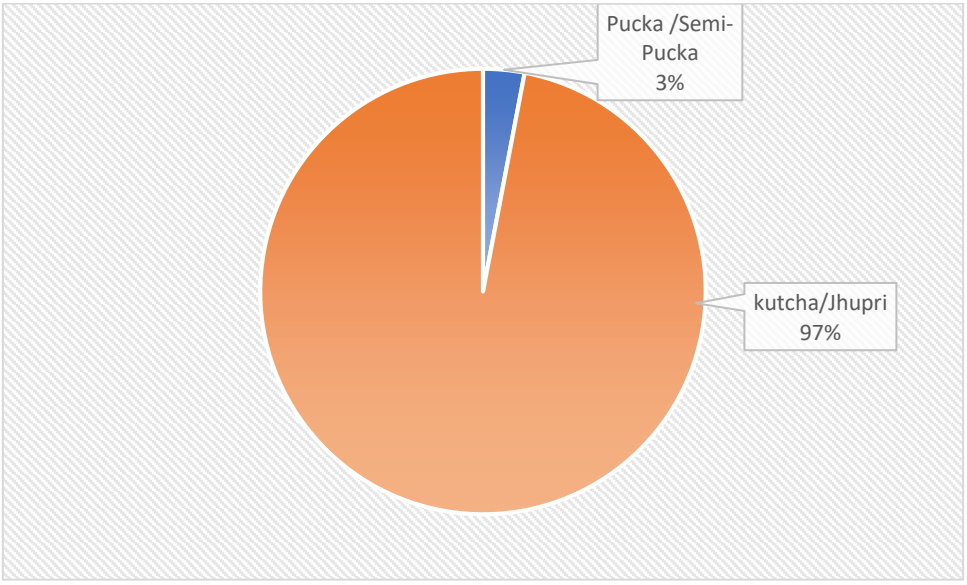

Figure 5: Percentage Distribution of Households by Type of Structure and Housing Tenancy Status (BBS, 2011)

c. Toilet Facility: In Uttar Dhurung Union, 93% of the general households use sanitary latrine and 7%, non-sanitary latrine. Ratio of households with non-sanitary latrines and no toilets to households with sanitary latrines is much lower than (BBS, 2011).

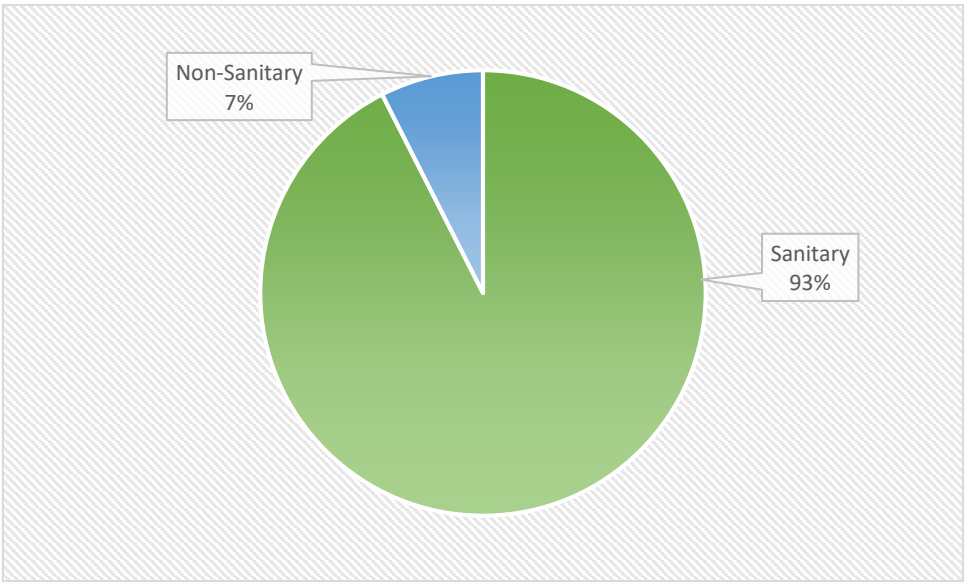

Figure 6: Percentage Distribution of Households by Toilet Facility (BBS, 2011)

d. Source of Drinking Water: 99% the general households get drinking water from tube-well, 0.2% from tap and the remaining 0.8% from other sources (i.e. pond; well; rainwater harvesting; pond sand filter) (BBS, 2011).

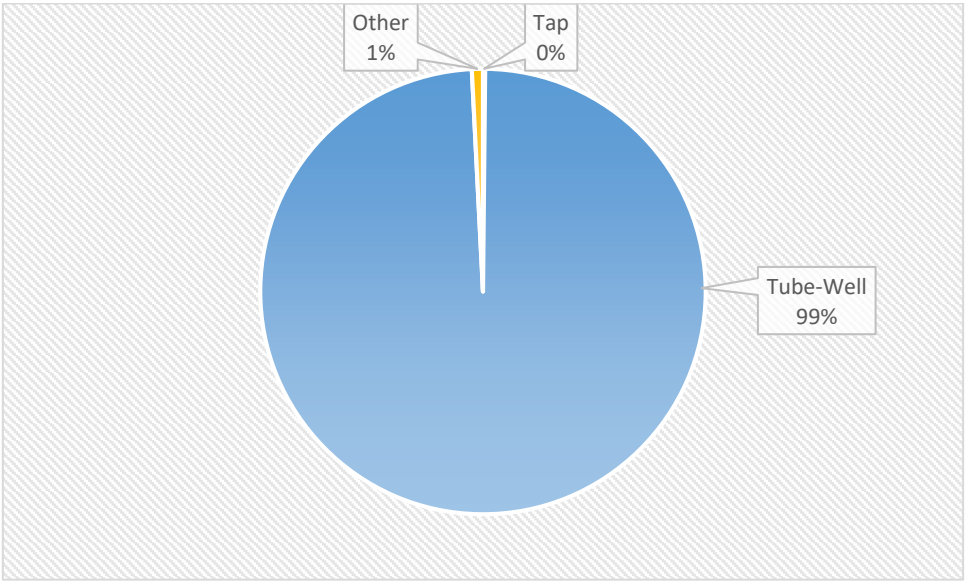

Figure 7: Percentage Distribution of Households by Source of Drinking Water (BBS, 2011)

e. Electricity: The Uttar Dhurung Union is under the Rural Electrification Program. However, only 11.6% of general households in the entire Upazila reported to have electricity in 2011, against 3.40% in 2001. Despite having a wind power station, people of Kutubdia Upazila get electricity for only three days in a month. Although some villages have better electricity access (i.e. 19.1% in Char dhurung, 16.6% in Chullar Para, 14.3% in Akbar Bolir Para and 16.9% in Soturuddin N. Para), the percentage of household with electricity access is much lower in this Union compared to the national average (BBS, 2011).

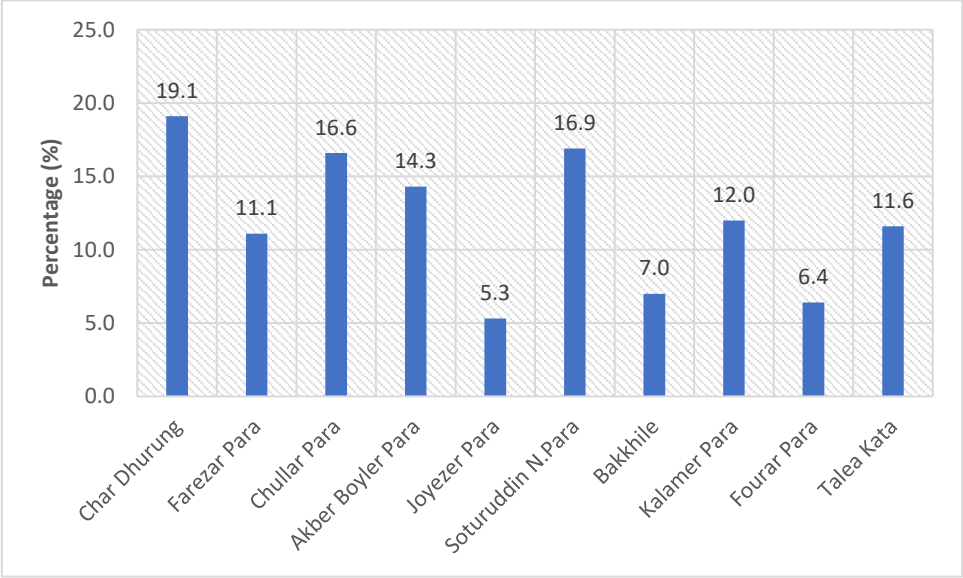

Figure 8: Percentage Distribution of Electricity Connection (BBS, 2011)

f. Poverty: About 50% of the population in Uttar Dhurung Union is extremely poor, about 15% considered poor, 15% are marginal poor and about 20% live above the poverty level. Disasters, both natural and man-made, make this situation worse (BBS, 2011).

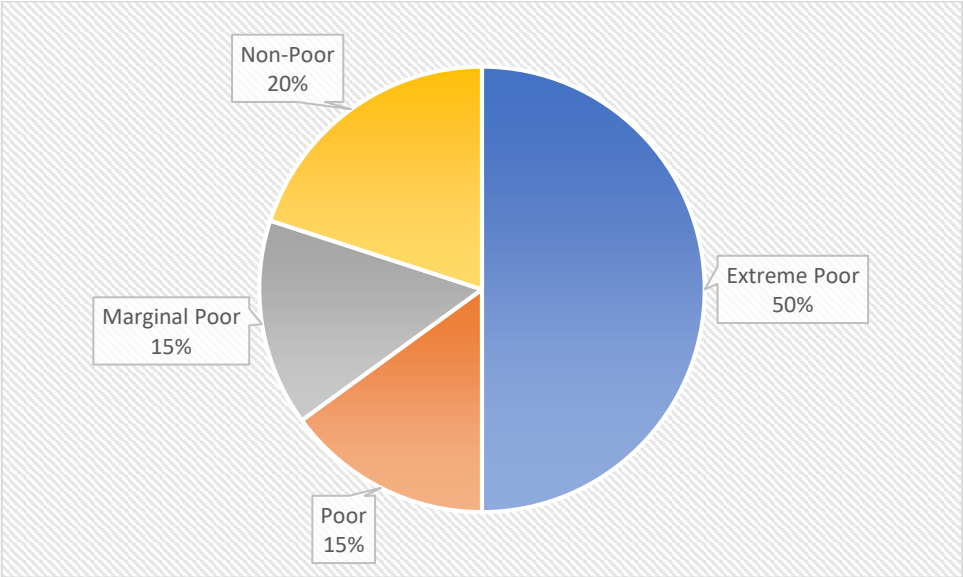

Figure 9: Economic Status of People (Percentage) (Source: CRA field data)

According to CRA field data, urbanization is around 10%. Yet, there is little difference between urban and rural areas. Kutubdia island exports salt and fish. The main occupation of this Union is fishing, farming and salt cultivation. Men are mostly engaged in this job. People tend to have more than one occupation but seasonal unemployment is prevailed. About 70% of the residents of this Union are engaged mostly in agriculture, in salt production. Hence, this profession dominates the economy of Kutubdia. Salt cultivation is a growing industry, but the local people do not get fair price from traders. The people are also engaged in fishing and 70% of the total population is either directly or indirectly dependent on the fishing profession.

Women are not seen working outside of their houses and many are full-time housewives. Girl's education is improving/increasingly accessible in this Union but there are not enough employment opportunities once they do finish school. The literacy rate among the local population is 65%, but according to the local community the migration rate is high due to seasonal unemployment. Access to health facilities is poor, and residents have to travel to Baraghope Union for health check-ups.

Table 1: Demographic and Socio-Economic Condition of Uttar Dhurung Union

Administrative Unit Residence Community	Area in Acres	Total Household	Population		Sex Ratio	Percentage of Population in the Age Group				Literacy Rate(%)			Number of People with Disability	Total Household (Ethnic Population)	Type of structure(%)		Toilet Facility(%)		Source of Drinking Water (%)			Electricity Connection (%)
			Male	Female		0-14	15-29	30-59	60+	Both	Male	Female			Pucka / Semi-Pucka	kutcha/Jhupri	Sanitary	Non-Sanitary	Tap	Tube-Well	Other	
Uttar Dhurung	2850	4889	14263	13772	104	31.7	22.9	24.9	5.2	29.2	29.9	28.5	364	0.0	3.3	96.8	92	5.5	0.2	99.7	0.1	11.6
*Char Dhurung		141	397	440	90	35.1	23.6	22.6	4	24.6	28.5	20.9			1.4	98.6	100	0	0.0	100.0	0.0	19.1
*Uttar Dhurung		4748	13866	13332	104	31.6	22.9	24.9	5.2	29.3	29.9	28.8			3.3	96.7	91.8	5.7	0.2	99.7	0.1	11.4
Farezar Para		541	1625	1481	110	31.6	23.8	25.5	5	32.7	33.5	31.7			0.8	99.3	97.7	0.6	0.9	99.1	0.0	11.1
Chullar Para		559	1506	1493	101	29	27.1	24.4	4.9	35.4	35.4	35.3			6.6	93.3	94.1	1.6	0.0	100.0	0.0	16.6
Akber Bolir Para		462	1421	1336	106	33	24	23.6	4.6	26.0	25.8	26.2			5.2	94.8	76.5	12.8	0.4	99.6	0.0	14.3
Joyezer Para		417	1241	1196	104	33.3	21	24.5	6	23.3	24.7	21.9			0.7	99.2	98.3	1.2	0.0	100.0	0.0	5.3
Soturuddin N.Para		583	1808	1695	107	30.8	22.4	25.7	4.9	33.0	32.8	33.1			2.5	97.4	83.6	14.8	0.0	100.0	0.0	16.9
Bakkhile		644	1764	1684	105	34.4	18.8	26	4.9	22.5	24.9	20.2			2.6	97.4	92.8	6.7	0.2	98.9	0.9	7.0
Kalarmarpara		463	1364	1410	97	28.4	24.4	25.8	6	28.7	28.2	29.2			5	95	97.6	1.3	0.0	100.0	0.0	12.0
Fourar Para		482	1409	1387	102	32.8	20.7	24.5	6.3	29.9	29.7	30.2			0.8	99.2	93.8	6	0.0	100.0	0.0	6.4
Talea Kata		597	1728	1650	105	31.1	24.5	23.8	5.3	30.9	31.9	29.8			4.6	95.3	92	4.9	0.0	100.0	0.0	11.6

* Mouza
Source: BBS "Population and Housing Census -2011 Community Report: Cox's Bazar (BBS, 2011)"

1.4. Local Resources

Uttar Dhurung Union is exposed to different types of hazards throughout the year. Among them are cyclone, storm surge, tidal flood, coastal erosion and waterlogging. As such, amenities and residents of Uttar Dhurung are susceptible to the effects of high salinity and coastal living. Most of the houses are made of marginal "jhupri" material and they do not have the capacity to stand the ocean waves and surges. Roads, on the other hand, are exposed to water loggings, storm surges and tidal floods. Soil quality deteriorates due to contact with salt water and roads thus need to be protected from the slopes. Building materials are also easily damaged due to high water salinity.

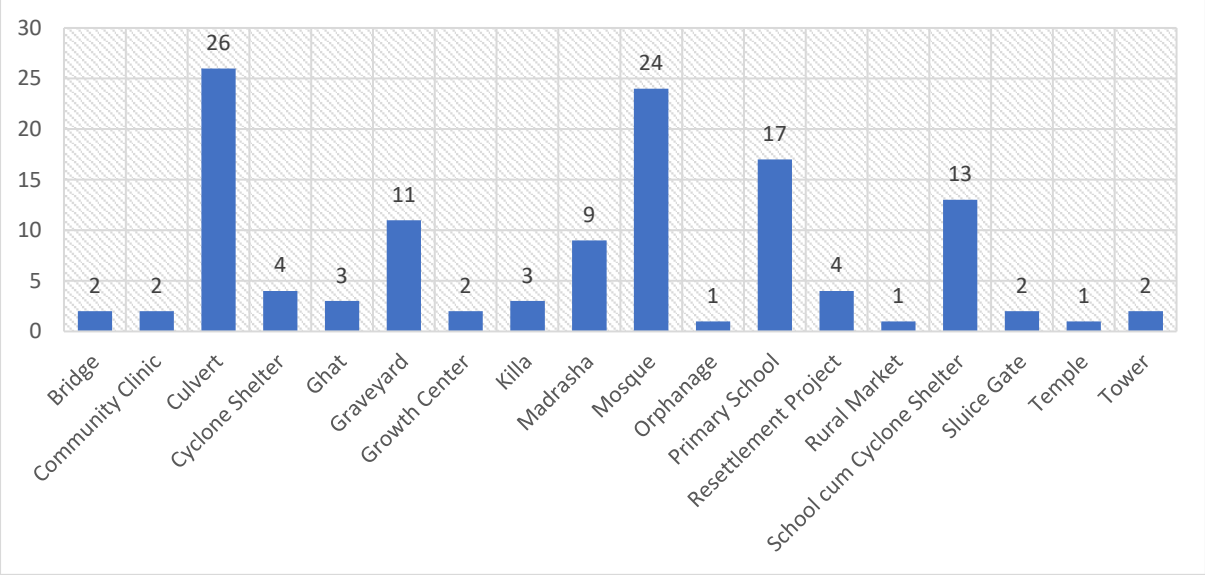

Figure 10: Physical Elements of Uttar Dhurung Union (Source: CRA field data)

Chapter 2: Local Hazards and Vulnerabilities

Local hazards that increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards are identified in this chapter.

2.1. Historical Analysis of Hazards

Kutubdia is extremely prone to natural disasters, mostly cyclone. In the 1991 cyclone, at least 138,000 people were killed with around 22,000 deaths in Kutubdia. In other severe cyclones, people in this area lost their properties. For example, the residents had a terrible experience of Cyclone Roanu in 2016 due of saline water intrusion and high wind speed. An astronomical

tide surged up to 7 feet high hit the island (Ahmed & Anwar, 2012). In the case of 3-4 metres of inundation, almost all the roads and all the settlements of Uttar Dhurung Union would be inundated. Another main problem of Uttar Dhurung is continuous land erosion at an alarming rate. The Coast Trust estimates that if the erosion continues at the same rate, Kutubdia Upazila will vanish from the map completely in 70 years. Erosion occurs every year during the high monsoon tides and a government-built embankment has changed the rate the erosion in recent years. But where the embankment does not exist or is broken, the sea continues to swallow up land. There is evidence that the rate of erosion has increased in Uttar Dhurung in the past few years, particularly from year 2006 to 2013. This erosion is making the Union more vulnerable.

With the ongoing erosion due to the stronger and bigger waves, the Union continues to be inundated. Fishermen and salt-farmers have been greatly affected by the storm surge and about 3,000 people have migrated from many villages since 1991 (Tanim & Roy, 2013). A limited amount of mangrove planting has happened as part of various government programmes. Mangroves are being destroyed gradually by shrimp farming and salt fields. The Water Development Board built 40 kilometres of embankment to protect Kutubdia from erosion, of which 24 kilometres have been damaged in the cyclone of 1991 (Tanim & Roy, 2013), and further damaged by Cyclone Roanu in 2016 and flooding in July 2019. Embankments of both the east and west sides are now totally damaged. Crops were damaged due to saline water intrusion after the flooding in 2019.

No scientific monitoring of sea-level rise has been done on Kutubdia, but nearly 8 mm of increment per year has been recorded over a period of 30 years at Cox's Bazar (Ahmed & Anwar, 2012). This is nearly three times the average for Bangladesh and up to five times of the world average sea-level rise (Ahmed & Anwar, 2012; Tanim & Roy, 2013). Besides the continuous erosion, the increase in sea level also increases the vulnerability of the Union. Due to these hazards, agricultural practices are converted into fishing and salt farming as they are more profitable. BRAC, Gana Swasthya Kendra, Prism Bangladesh, IFAD Unnayan Sahajogi Team, Grameen Bank, Coast, PKSF are among the organisations working in this area. The organisations are trying to improve the livelihood and standard of living of the local people. However, people are often in a cycle of debt, making them economically vulnerable. As residents people of this area are detached from the mainland of Bangladesh, they have to cross the Kutubdia Channel to do any kind of businesses or jobs in the main land. It is costly (about

40tk per person) to the locals to cross the Channel and so, if they can find work opportunities in the mainland, they prefer to do so over paying to Cross the channel twice daily. Due to these vulnerabilities, the local residents migrate if it is an affordable option. Common among them are 'step migration' (migration as occurring stage-by-stage as rural inhabitants move closer to urban areas of growth), 'chain migration' (migrants from a particular area follow others from that area to a specific destination), 'seasonal migration' (driven by seasonal peaks in labour demand, mostly in agriculture, or climate change).

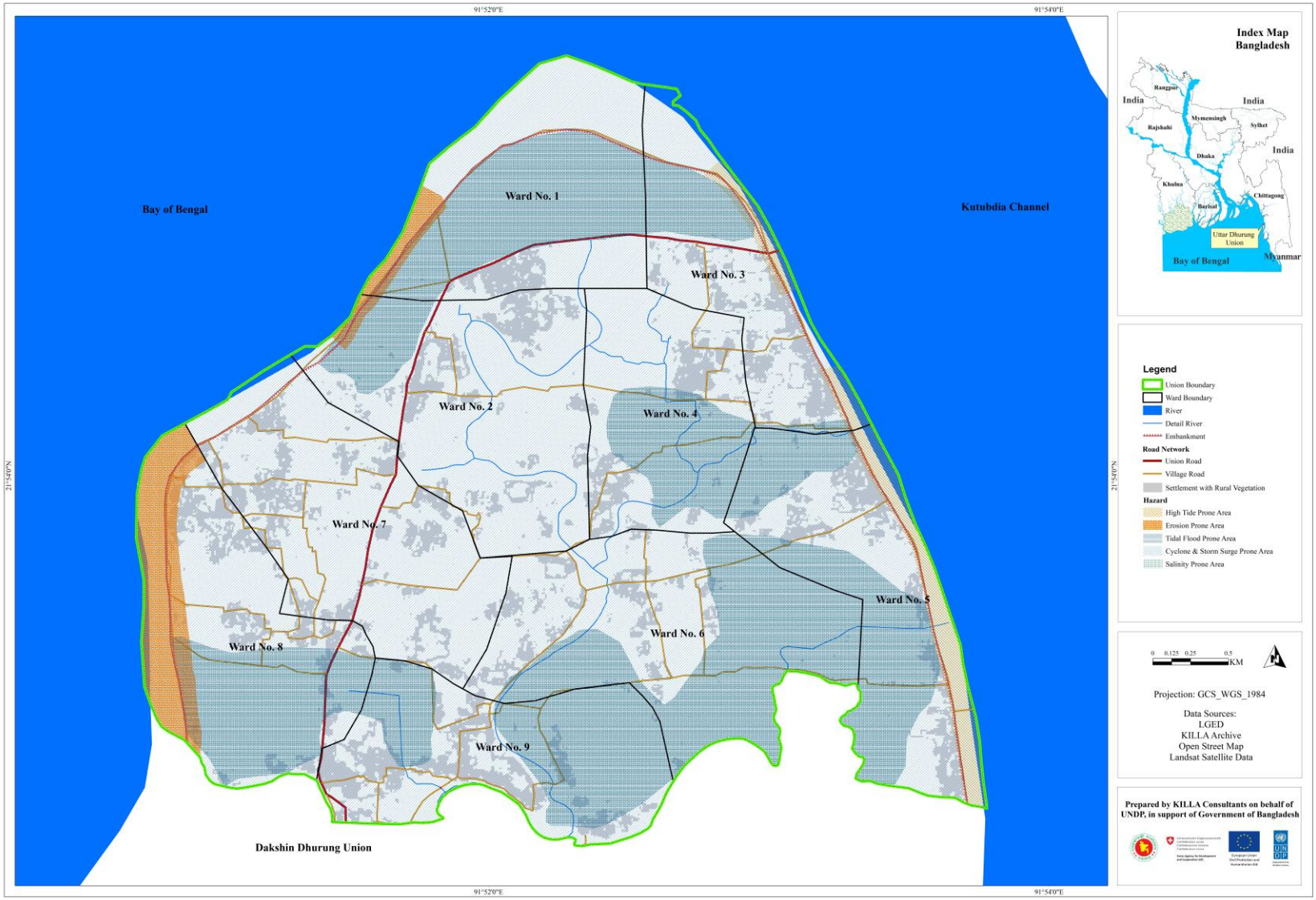

Figure 11: Hazard map of Uttar Dhurung Union (Source: Satellite imagery, community participation and field survey)

2.2. Hazard Venn and Calendar/Seasonality

Hazard Venn is very effective to show the intensity and frequency of the hazards in a region. Uttar Dhurung Union is affected by different kinds of hazards and significant among them are cyclone and storm surge, tidal flood, embankment erosion as well as saline water intrusion. On the Hazard Venn, size of the diagram represents the intensity of the hazard and the distance from the Union represents the frequency of the hazard in that region. Wards 1 and 2 of the Union is exposed to the ocean through the partially damaged embankment. There are two high tides every month and during that time, saline water is the most problematic for the farmers. The return period of cyclones and storm surges may be longer, however, the extent of damages caused are extensive. Embankment erosion happens throughout the year due to the concrete portion of the embankment coming into contact with the saline water and losing its capacity. Due to the high tides, agriculture, livestock and livelihood options are severely affected as damage is caused to the soil and water.

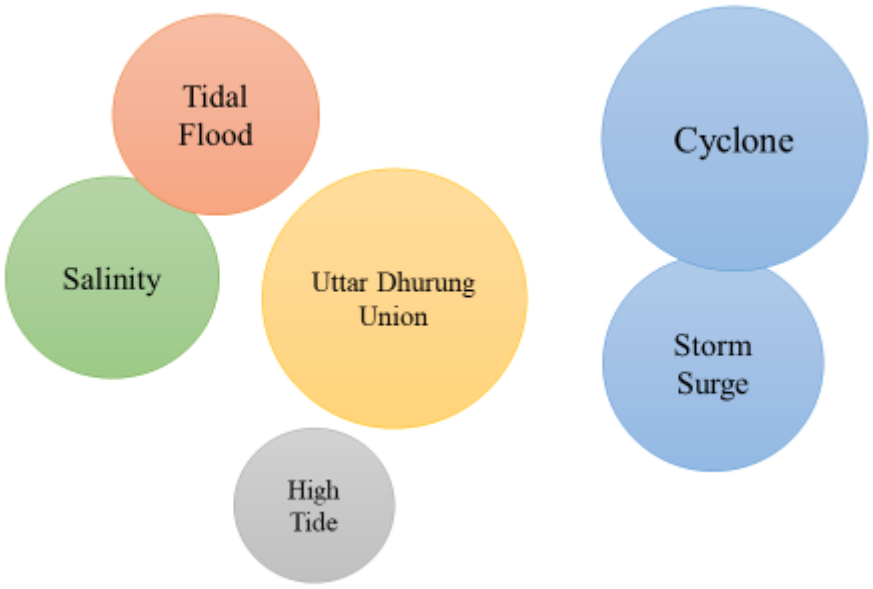

Figure 12: Hazard Venn of Uttar Dhurung Union (Source: CRA field data)

A hazard calendar is a list of all the significant hazards in a region with an indication of possible timeline and likelihood of occurrences throughout the year. In the Union, cyclone occurs more frequently between mid-June to mid-October (Ashar to Kartrik months on the Bengali calendar). Tidal wave is high during the monsoon season from mid-April to November (Baishakh to Agrahayon months on the Bengali calendar). Saline water intrusion, on the other hand, occurs over the year but more frequently from mid-April to mid-August (Baishak to

Vadra months on the Bengali calendar. Beach erosion continues throughout the year and mostly occurs from mid-June to mid-November (Ashar to Agrahayon months on the Bengali calendar).

Table 2: Hazard Calendar/ Seasonality of Uttar Dhurung Union

Hazard	Baishak (Mid-April)	Jaishtha (Mid-May)	Ashar (Mid-June)	Srabon (Mid-July)	Vadra (Mid-August)	Ashin (Mid-September)	Kartrik (Mid-October)	Agrahayon (Mid-November)	Poush (Mid-December)	Magh (Mid-January)	Falgun (Mid-February)	Chaitra (Mid-March)
Cyclone												
Storm Surge												
Nor'westers												
Tidal Flood												
Saline water intrusion												
Erosion												

2.3. Crop Seasonality and Exposure to Hazards

The Crop Calendar is a tool that provides timely information about seeds to promote local crop production. It contains information on planting, sowing and harvesting periods of locally adapted crops in specific agro-ecological zones. Crop seasonality is broadly classified in three classes depending on the cropping patterns, i.e. Rabi Crop (mid-October to mid-March, or Kartrik to Chaitra months), Kharip -1 (mid-March to mid-July, or Baishak to Srabon months), and Kharip -2 (Mid-July to Mid-October, or Srabon to Kartrik months).

In Kutubdia, farmers normally cultivate 3 types of rice (ie. Aush, Amon, Boro). Aush is cultivated from Boishakh to Vadra (mid-April to mid-August), Amon is cultivated from Ashin to Agrahayon (mid-September to mid-November) and Boro is cultivated from Poush to Chaitra in Bengali calendar (mid-December to mid-February). In Rabi season (from Agrohayan to Falgun, mid-December to mid-February), farmers cultivate vegetables. About 30% crop get damaged by natural hazards every year. Paddy is damaged by saline water from the embankment whereas during its cultivation period, the rice type Aush get affected mostly by the monsoonal tide and cyclone.

Table 3: Crop Calendar/ Seasonality of Uttar dhurung Union

Crop Name	Baishak (Mid-April)	Jaishtha (Mid-May)	Ashar (Mid-June)	Srabon (Mid-July)	Vadra (Mid-August)	Ashin (Mid-September)	Kartrik (Mid-October)	Agrahayon (Mid-November)	Poush (Mid-December)	Magh (Mid-January)	Falgun (Mid-February)	Chaitra (Mid-March)
Aush	←	—	—	—	→							
Amon						←	—	→				
Boro									←	—	—	→
Chili	→										←	—
Tomato								←	—	—	—	→
Cucumber						←	—	—	→			
Pumpkin								←	—	—	—	→
Eggplant								←	—	—	—	→
Salt Farming	→						←	—	—	—	—	—

From the above-described crops some of are more exposed to the hazard because of the cultivating season. Aush cultivation period is during high tides, when the embankment overflows. As a result, saline water intrudes the agricultural land. Without proper and secure embankments, crops are not well protected from the hazards. As a result, the salt farming process is also greatly affected as it is slowed down.

2.4. Land Use/ Land Cover Pattern

In the Union, about 34% of the land is cultivated land utilised as tri-cropping, bi-cropping and single cropping agricultural fields. Due to natural hazards, total agricultural land areas is reducing on a daily basis.

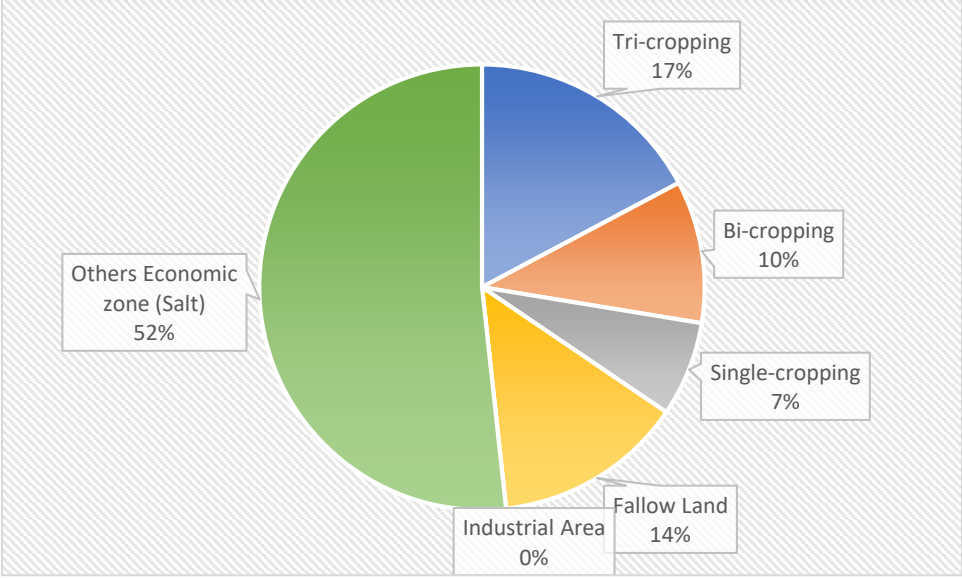

Figure 13: Percentage of Area in Different Land Uses (Source: CRA field data)

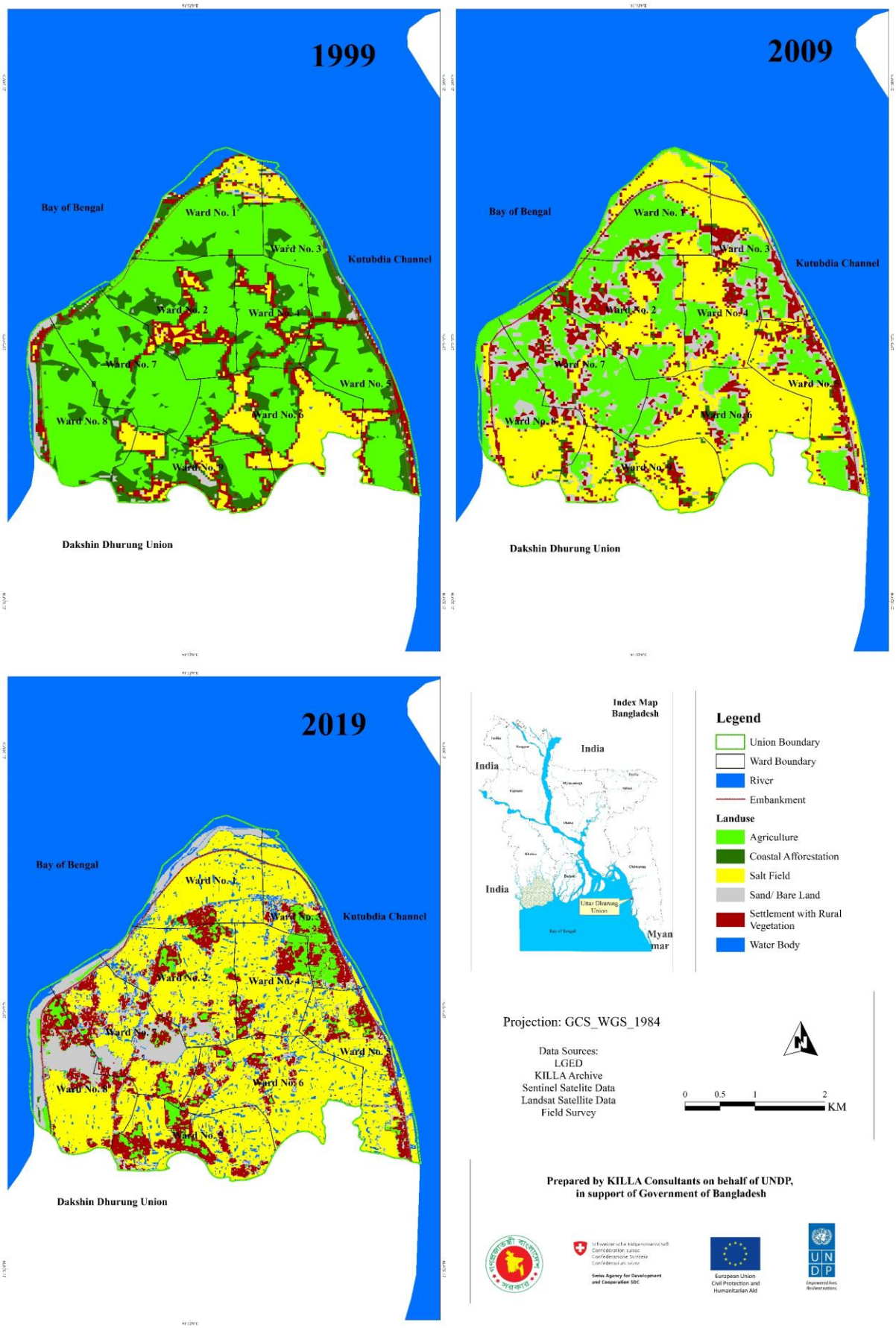

Figure 14: Landuse Map of Uttar Dhurung Union

2.5. Livelihood Options and Vulnerability

According to local people, there were more farmers about 10 years ago as compared to the present. This is because many farmers changed their occupation to salt farming, fishery or migrate due to saline intrusion in their lands. Before saline intrusion there were more paddy field than salt field. But now farmers are bound to cultivate salt as the land is unable to bear crop. Also, cultivation of fishes is reduced drastically because fresh water is now salted. So, in the past there were more farmers now there are more salt cultivators. However, salt farming is not profitable. The Upazila Agriculture Officer said, "Rice cultivation not only helps with food security for residents, but also livestock." From the CRA field data, only 20% people are economically stable in the Upazila/the Union. As a result, majority of the population is involved in multiple occupations depending on the season, weather, and labour market.

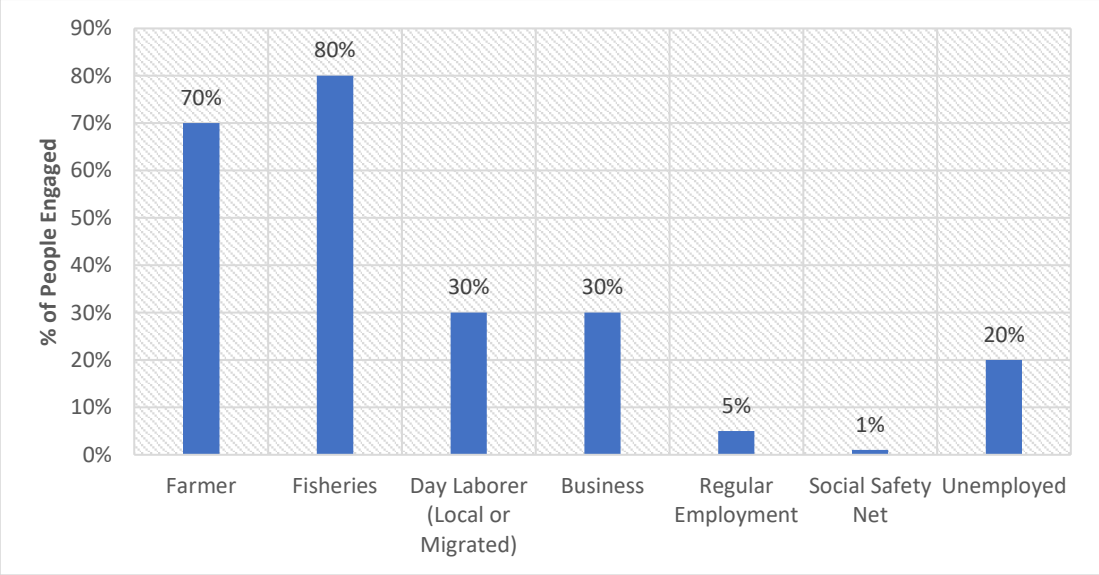

Figure 15: Percentage of people engaged in different Employment (Source: CRA field data)

2.6. Vulnerability of Population and Local Economy to Climatic Hazards

Specific population groups have specific vulnerabilities according to their inherent habits, characteristics and livelihood patterns. On the basis of CRA in three unions of Kutubdia (Baraghope, Uttar Dhurung and Ali Akbar Deil) overall, the below section gives an overview of local population groups' and local economy vulnerabilities in Baraghope.

For the male population, vulnerability to climatic hazards include physical and mental stress related to providing for the family as a family head. The female population faces challenges in maintaining the household, childcare, adherence to local traditions, and gender discrimination,

particularly when it comes to evacuating to cyclone shelters. Long hair and saree can deter swimming. For children, vulnerabilities include inability to swim, lack of life saving skills, physical, intellectual and emotional immaturity as well as lack of experience dealing with extreme weather. Disabled individuals are highly vulnerable to climatic hazards as they need of assistance for movement and other activities, having not enough support and respect in the local community.

Climatic hazards includes cyclone; thunderstorms; tornadoes; drought; rain; hail; wide range of temperature change and air pollution. Due to these kinds of climatic hazard population lifestyle and the local economy is affected as it is dependent on the agricultural and fishing sectors. Height of monthly high tide is increasing day by day and the embankment is not good enough to create a barrier between the sea and mainland for the protection. When saline water enters into the agricultural land then there is no hope for those crop and the cropland will be totally damaged. This is damaging the local economy and lowering the living standard of the related people to those sectors. Price of groceries fluctuates due to the natural hazards, causing a big negative impact on the food security of low-income groups in the Union.

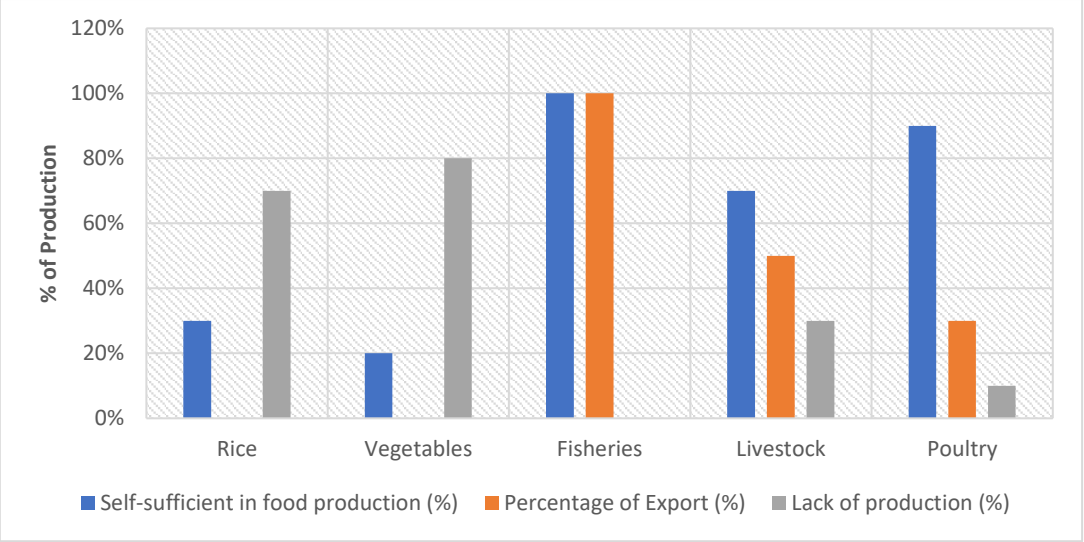

Figure 16: Food Production and Food Security (Source: CRA field data)

People living in Ward 1 and 2 are more vulnerable to climatic hazards as they are exposed to the embankment near the sea (found from Local Government Engineering Department). In these Wards, men take shelter in cyclone shelters and this causes overpopulation in the shelters. Women on the other hand, face lack of independent income in the absence/after death of a male head of household, social norms deterring them from going to shelter and reproductive health complications. People with disability cannot get to the shelters without assistance. Ethnic

minorities in Uttar Dhurang face discrimination when seeking shelter. Farmers lose cultivable lands due to saline intrusion and face loss of income. Agricultural labourers are the worst affected by climatic hazard as many do not have the skills to engage in other occupations. Salt farmers also face challenges because the salt cultivation process can be interrupted by water intrusion caused by broken embankments. As salt farming requires a long time, salt farmers also face prolonged periods of unemployment.

Chapter 3: Community Risks and Vulnerability

This chapter focuses on the vulnerability and risks faced by the local community as a whole and discusses the adaptive capacity of the community.

3.1. Sector Risks and Challenges

Risks and challenges of local economy:

i. 70% farmers face production deficiency because of water salinity, unfair pricing of rice, dependency on river water and high rate of crop damage (approximately 30% each year). As a result, a great number of farmers are forced to switch their occupation.
ii. Most of the people (about 80%) are engaged in fishery and are in high risk of occupational insecurity due to hazardous weather and fish scarcity due to climate change.
iii. Day labourers face lack of employment and do not get fair wages.
iv. Businessmen face moderate damage due to syndication with no policy.

Risks and challenges in education sector:

i. Inundation and damage to primary and secondary schools disrupt education during events and create unsafe, low-quality educational environments afterwards. In this union, this has notably included:
    a. Afasuddin Government Primary School was inundated by Cyclone Roanu (2016). Toilets become unusable and are still not reconstructed up until this day.
    b. Musa Siraj Hafijia Madrassa collapsed because of weak infrastructure and faces a high possibility of destruction by any future events of cyclone.
    c. Dhurung Cambrian School's roof was damaged and mud floor was washed away. This school is still running with old infrastructure with at least 200 students and it might collapse anytime.

d. Foyjunir Para Primary School was inundated and the pillars are damaged and can collapse anytime.

Risks and challenges in food production now compared to the recent past, as per the local community:

i. 30% Rice are produced now, down from 40% to meet actual demand.
ii. Only 5% vegetables are produced now, a stark contrast to 15% of total demand.
iii. 30% livestock are reared, yet their daily produce can either be found at a high price at the market or not sold at all.

3.2. Challenges of High Priority

According to the CRA Guideline prepared by CDMP, risks can be categorized into four stages by pair ranking consequences and likelihood, which are given below (CDMP, 2006):

Table 4: Risk Categories (CDMP, 2006)

Extreme Risk	Immediate action is needed without any delay.
High Risk	Immediate action needed with proper consultation.
Medium Risk	Frequent observation and measures needed.
Low Risk	Annual observation needed; measures could be taken.

Through the CRA field survey, the elements at risk have been identified by the community. The risk rating is calculated by multiplying the consequences and likelihood of the risk. Elements of highly rated risks are shown below, with reference to Cyclone Gorky (1991) and Cyclone Roanu (2016) scenarios:

Table 5: Risk statements with High Priority

Elements	Risk Statement	Consequences	Risk Rating
Sluice Gate	Sluice Gate in Ward 3 wass broken after Cyclone Gorky and a twice monthly 2-metre high tide, and if a tidal surge like Cyclone Roanu occurs, 100% of the paddy field in Ward 3 will be severely damaged.	Economic loss; livelihood impact; food insecurity; agricultural loss	1
Embankment	Embankment covering Wards 1, 3 and 7 were broken severely by Cyclone Roanu. If a cyclone were to occur again, all physical structures and households will be severely damaged.	Economic loss, institutional damage, educational and social impact	2
School	Dhurung Cambrian School in Ward 9 was severely affected by Cyclone Roanu, when roof was damaged and mud floor	Education gap of the students	3

	was washed away. If a cyclone as strong as like Roanu occurs again, this school will be catastrophically damaged and more that 400 students will not be able to continure their studies.		
Ghat	Salt port in Ward 5 is used for salt trade loading and supplying. The port was completely damaged by Cyclone Roanu as the sluice gate and embankment in Ward 5 were damaged. If a cyclone like Roanu occurs again, there will be further damages.	Economic impact, livelihood impact	4
Resettlement Project	Abul Khayer Resettlement Project in Ward 3 was a cluster village before 1991. After the 1991 cyclone, it was rehabilitated. If a cyclone like Gorky occurs in the following years it would be severely damaged and inundated.	Social impact; economic impact; loan/debt, difficulties in leading normal life	5
Ghat	If a Cyclone like Roanu occurs in following years, Akbar Balir Ghat in Ward 3 will be severely damaged with many piers collapsed, affecting more than 7000 due to disruption in communication.	Disrupted communication, local trade get affected, economic loss	6
School	Should a cyclone with the strength of Roanu strikes again, Uttaran Biddya Niketan in Ward 7 will be severely damaged and more than 600 students will not be able to attend school.	Education gap of the students	7
Mosque	If a Cyclone like Roanu occurs in following years, Kalarmar Jame Mosque in Ward 8 would be moderately damaged due to its poor structural materials.	Heritage loss	8
Cluster Village	About 90% houses situated in Wards 3 and 5 were completely destroyed by Cyclone Gorky. If a similar cyclone occurs again, these cluster villages will be severely damaged.	Social impact, economic impact	9
School	Afasuddin Government Primary School in Ward 3 was severely inundated during the time of Roanu, and if a cyclone like Roanu occurs again it will be severely inundated, affecting more than 400 students.	Institutional damage, economic loss	10
Sluice Gate	Sluice gate in Ward 1 is broken after Cyclone Gorky and a 2-metre high tide occurs twice every month, and if a tidal surge like Cyclone Roanu occurs, it would not control the tide water intrusion and people living here cannot produce paddy due to salt water intrusion.	Scarcity of food for livestock and poultry, economic loss, environmental loss	11
Madrasha	Musa Siraj Hafejia Madrasha in Ward 3 will be severely damaged and the education of more than 400 students will be disrupted.	Education disrupted, infrastructural damage, education gap	12
Bridge	Jumma Para Bridge in Ward 5 will be moderately damaged if a cyclone like Roanu occurs following a storm surge.	communication disruption, local trade get affected by the disruption of communication, economic loss	13
Madrasha	Somudia Alim Madrasha in Ward 8 will be severely damaged and more than 400 students will not be able to attend school if a cyclone like Roanu occurs again.	Education disruption, infrastructural damage, education gap	14
Community Clinic	If cyclone like Gorky occurs in this area, Union Health and family Planning Centre in Ward 7 will be moderately	Health impact on community	15

	damaged and more than 1500 people willd not be able receive emergency and primary health treatments.		
Mosque	If a cyclone like Roanu occurs in following years, Foyjunir Para Jame Mosque in Ward 5 will be moderately damaged.	Social impact, institutional damage	16
Community Clinic	If cyclone like Gorky occurs in this area, Monsur Ali Hajir Para Community Clinic in Ward 3 will be moderately damaged and more than 2000 people will not be able take emergency and primary health treatments.	Health impact on community	17
Madrasha	Gausia Adorsho Dakhil Madrasha in Ward 3 will be severely damaged if a cyclone like Roanu strikes again, causing disruption to the education of more than 300 students.	Institutional damage	18
Mosque	If a cyclone like Roanu occurs in following years, Rujjarpara Jame Mosque in Ward 5 will be moderately damaged due to its poor structural built.	Structural damage, social impact	19
Settlement	About 90% houses in Wards 1 and 2 were completely destroyed by Cyclone Gorky and if a similar cyclone occurs again, these cluster villages will be severely damaged.	Social impact, economic impact	20

3.3. Sensitivity and Exposure Analysis

Table 6: Sensitivity and Exposure Analysis

Elements	Risk Statement	Exposure to Hazards	Key Components	Sensitivity 1	Sensitivity 2	Sensitivity 3
Sluice Gate	Sluice gate in Ward 3 is broken after Cyclone Gorky and a 2-metre hight tide occurs twice every month, and if a tidal surge like Cyclone Roanu occurs 100% of the paddy field in ward 3 would be severely damaged	Cyclone Storm Surge Tidal Flood Erosion	RCC	Materials	Construction Quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
Embankment	Embankment covering Wards 1, 3 and 7 were broken severely by Cyclone Roanu and if a cyclone occurs again, every physical structure and household will be severely damaged.	Cyclone Storm Surge Tidal Flood Erosion	Brick (Guide wall)	Quality	Base materials	Stability
			Soil	Cohesion	Soil type	Soil texture
School	Dhurung Cambrian School in Ward 9 was severely affected by Cyclone Roanu, when roof was damaged and mud floor was washed away. If a cyclone as strong as like Roanu occurs again, this school will be catastrophically damaged and	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Storage Environment
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	

	more that 400 students will not be able to continure their studies.					
Ghat	Salt port in Ward 5 is used for salt trade loading and supplying. The port was completely damaged by Cyclone Roanu as the sluice gate and embankment in Ward 5 were damaged. If a cyclone like Roanu occurs again, there will be further damages.	Cyclone Storm Surge Tidal Flood Erosion	Boats	Washes Away	Breaks Apart	
			RCC	Materials	Constructio n Quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
Resettlem ent Project	Abul Khayer Resettlement Project in Ward 3 was a cluster village before 1991. After the 1991 cyclone, it was rehabilitated. If a cyclone like Gorky occurs in the following years it would be severely damaged and inundated.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Storage Environme nt
			Wood	Highly sensitive to Water	Less strength	
			Brick	Quality	Base materials	Stability
			RCC	Materials	Constructio n Quality	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Ghat	If a Cyclone like Roanu occurs in following years, Akbar Balir Ghat in Ward 3 will be severely damaged with many piers collapsed, affecting more than 7000 due to disruption in communication.	Cyclone Storm Surge Tidal Flood Erosion	Boats	Washes Away	Breaks Apart	
			RCC	Materials	Constructio n Quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
School	Should a cyclone with the strength of Roanu strikes again, Uttaran Biddya Niketan in Ward 7 will be severely damaged and more than 600 students will not be able to attend school.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Storage Environme nt
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Mosque	If a Cyclone like Roanu occurs in following years, Kalarmar Jame Mosque in Ward 8 would be moderately damaged due to its poor structural materials.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Storage Environme nt
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Cluster Village	About 90% houses situated in Wards 3 and 5 were completely destroyed by Cyclone Gorky. If a	Cyclone	Furniture	Highly sensitive to Water	Perishable	Quality

	similar cyclone occurs again, these cluster villages will be severely damaged.	Storm Surge Tidal Flood	Wood	Highly sensitive to Water	Less strength	
			Brick	Quality	Base materials	Stability
			RCC	Materials	Construction Quality	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
School	Afasuddin Government Primary School in Ward 3 was severely inundated during the time of Roanu, and if a cyclone like Roanu occurs again it will be severely inundated, affecting more than 400 students.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Quality
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
			Brick	Quality	Base materials	Stability
			RCC	Materials	Construction Quality	
Sluice Gate	Sluice gate in Ward 1 is broken after Cyclone Gorky and a 2-metre high tide occurs twice every month, and if a tidal surge like Cyclone Roanu occurs, it would not control the tide water intrusion and people living here cannot produce paddy due to salt water intrusion.	Cyclone Storm Surge Tidal Flood Erosion	RCC	Materials	Construction Quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
Madrasha	Musa Siraj Hafejia Madrasha in Ward 3 will be severely damaged and the education of more than 400 students will be disrupted.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Quality
			Wood	Highly sensitive to Water	Less strength	
			Brick	Quality	Base materials	Stability
			RCC	Materials	Construction Quality	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Bridge	Jumma Para Bridge in Ward 5 will be moderately damaged if a cyclone like Roanu occurs following a storm surge.	Cyclone Storm Surge Tidal Flood	Brick (Guide wall)	Quality	Base materials	Stability
			Soil	Cohesion	Soil type	Soil texture
			RCC	Materials	Construction Quality	

Madrasha	Somudia Alim Madrasha in Ward 8 will be severely damaged and more than 400 students will not be able to attend school if a cyclone like Roanu occurs again.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Quality
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Community Clinic	If cyclone like Gorky occurs in this area, Union Health and family Planning Centre in Ward 7 will be moderately damaged and more than 1500 people willd not be able receive emergency and primary health treatments.	Cyclone Storm Surge Tidal Flood	RCC	Materials	Constructio n Quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
Mosque	If a cyclone like Roanu occurs in following years, Foyjunir Para Jame Mosque in Ward 5 will be moderately damaged.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Quality
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Community Clinic	If cyclone like Gorky occurs in this area, Monsur Ali Hajir Para Community Clinic in Ward 3 will be moderately damaged and more than 2000 people will not be able take emergency and primary health treatments.	Cyclone Storm Surge Tidal Flood	RCC	Materials	Constructio n Quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
Madrasha	Gausia Adorsho Dakhil Madrasha in Ward 3 will be severely damaged if a cyclone like Roanu strikes again, causing disruption to the education of more than 300 students.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Quality
			Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Mosque	If a cyclone like Roanu occurs in following years, Rujjarpara Jame Mosque in Ward 5 will be moderately damaged due to its poor structural built.	Cyclone Storm Surge Tidal Flood	Wood	Highly sensitive to Water	Less strength	
			Sn Sheet	Highly sensitive to Water	Highly Corrosion Prone	
Settlement	About 90% houses in Wards 1 and 2 were completely destroyed by Cyclone Gorky and if a similar cyclone occurs again, these cluster villages will be severely damaged.	Cyclone Storm Surge Tidal Flood	Furniture	Highly sensitive to Water	Perishable	Quality
			Wood	Highly sensitive to Water	Less strength	

		Erosion	Sn Sheet	Highly sensitive to Water	Highly rosion Prone	

3.4. Adaptive Capacity

As it is not possible to make or implement policies without knowing the real scenario and staying in the affected areas, first-hand experience could best inform disaster management. The coastal community, for example, uses their experience to cope with misfortunes caused by cyclones. The adaptive capacity of the people of Uttar Dhurung helps them continue their residency in the area:

i. The women store dry food and tied them up to the trees during cyclones.
ii. Farmers shift their livelihood options from paddy to salt cultivation.

Chapter 4: Risk Reduction Options and Action Plan

In this Chapter, risk reduction options and action plan is discussed, focusing on how and where they will be implemented.

4.1. Risk Reduction Options

Uttar Dhurung Union is exposed to a number of hazards. Hazards make people more vulnerable if appropriate steps are not taken at the right time. There are number concerns through which various risk of the elements of this Union can be minimized to a significant margin.

Uttar Dhurung Union is surrounded by the embankment and most of the elements are protected by the embankment from cyclones and high tides. The current height of the embankment is about 6 ft, but this is not sufficient as at least 30 ft is needed to create a barrier against severe cyclones in this region. There is number of channels that originated from the sea and extend to the mainland. Bank of these channels should be protected by concrete blocks. These channel banks are vulnerable to riverbank erosion due to daily high tides. Tree plantation might be helpful to protect against soil erosion in the sloppy land. Concrete blocks should be installed followed by toe protection. As saline water reacts with the building block material and decreases the material potential, building material have to be kept in a safe distance from the

saline water. Sandy soil is more sensitive to saline water and waves than clay and hence, clay material, clay instead of sands should be used to build the embankment. Geo tubes can also be effective in the protection of embankment. The top and front sides should be covered by the geo tubes for reduction of erosion. Guide wall should be constructed around the road or agricultural land which is in direct contact with the saline water.

The risk reduction options are:

i. Embankment repair
ii. Increasing embankment height up to 30 ft
iii. Protecting embankment by concrete block
iv. Road construction
v. Guide wall on both sides of the road
vi. Installing geotubes on the sea side of the embankment in the way that ocean current first hits the geotubes
vii. Repairing Sluice Gates
viii. Repair old cyclone shelters
ix. Vertical extension of cyclone shelters
x. Vertical extension of building in Killa
xi. Mangrove plantation
xii. Saline tolerant crop production
xiii. Embankment cum road construction
xiv. Increasing height of homestead

4.2. Risk Reduction Action Plan

The risk reduction action plan was in participation of CRA and validated by the Union's Chairman and Members and the Upzila's UNO and Disaster Management Committee Members.

Table 7: Risk Reduction Action Plan of Uttar Dhurung Union

Serial	List of jobs that can be locally implemented	Who will do it	When will it be done	How will it be done	Where will it be done	Estimated cost	Other Considerations
1	Embankment Repair	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED)	2019-2020	Participation with local people. Ensure slope and toe protection.	1. East side of Kaisarpara Village in Ward 1 2. West Char Dhurung Village in Ward 1 3. East Char Dhurung Village in Ward 3 4. Miajirpara Village in Ward 8	N/A	If the local community contributes labour voluntarily, it may done without budget. If not, budget for labour is needed.
2	Increasing Embankment Height up to 30 feet	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED)	2019-2020	Participation of local people. Ensure slope and toe protection with required width as height increases.	1. East side of Kaisarpara Village in Ward 1 2. West Char Dhurung Village in Ward 1 3. East Char Dhurung Village in Ward 3 4. Miajirpara Village in Ward 8	N/A	If the local community contributes labour voluntarily, it may done without budget. If not, budget for labour is needed.
3	Protecting Embankment by Concrete Block	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED)	2019-2020	Participation with local people. Ensure slope and toe protection.	1. Embankment in Wards 1, 2, 3, 5, 7 and 8	N/A	If the local community contributes labour voluntarily, it may done without budget. If not, budget for labour is needed. Not to use sands for construction as sand is

							saline and it would affect the integrity of the structure.
4	Road Construction	Upazila Parishad, Local Government Engineering Department (LGED), Government/ Non-Government Organization	2019-2020	Use local labour, locally available soil and other materials. Ensure sustainability. Increase the height of the road.	1. 2 km Miarakata Road Starting from Ward 8 to the embankment of Ward 7 2. 1 km Teillarpara Road starting from the embankment of Ward 7 to Azam Road of Ward 2 3. 2.5 km Jummapara Road from Mirakhali Road of Ward 5 to Akbar Balir Para in ward 3 4. 0.5 km Chairman Road from Azam Road of Ward 2 to N. Hussain Government Primary School in Ward 2 5. 1.5 km Zahir Ali Shikdar Para Road starting from Azam Road in Ward 3 to Somudia Road in Ward 4	N/A	If the local community contributes labour voluntarily, it may done without budget. If not, budget for labour is needed. Use locally available construction materials.
5	Guide wall on both side of the road	Upazila Parishad, Local Government Engineering Department (LGED), Government/ Non-Government Organization	2019-2020	Use local labour, locally available soil and other materials. Ensure sustainability.	1. 2 km Miarakata Road Starting from Ward 8 to the embankment of Ward 7 2. 1 km Teillarpara Road starting from the embankment of Ward 7 to Azam Road of Ward 2	N/A	If the local community contributes labour voluntarily, it may done without budget. If not, budget for labour is needed. Not to use sands for construction as sand is saline and it would affect

					3. 2.5 km Jummapara Road from Mirakhali Road of Ward 5 to Akbar Balir Para in Ward 3 4. 0.5 km Chairman Road from Azam Road of Ward 2 to N. Hussain Government Primary School in Ward 2 5. 1.5 km Zahir Ali Shikdar Para Road starting from Azam Road in Ward 3 to Somudia Road in Ward 4		the integrity of the structure.
6	Installing Geotube in Seaside of the Embankment in the way that ocean current first hits the geotube	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED)	2019-2020	Participation of local people. Using locally available resources (sand). Ensuring the high quality of geotube material.	1. East side of Kaisarpara Village in Ward 1 2. West Char Dhurung Village in Ward 1 3. East Char Dhurung Village in Ward 3 4. Miajirpara Village in Ward 8	N/A	If the local community contributes labour voluntarily, it may done without budget. If not, budget for labour is needed.
7	Repairing Sluice Gates	Upazila Parishad, Bangladesh Water Development Board (BWDB), Development Partners	2019-2020	Ensure the conveyance capacity of the flood flow. Proper monitoring of opening and closing the gate.	1. Sluice Gate in north side of Gausia Dakhil Madrasha and south side of Akbar Balir Para in the boundary of Ward 5 and Ward 3 2. Sluice Gate of Fayjuni Para in Ward 5	N/A	Not to use sands for construction as sand is saline and it would affect the integrity of the structure.

8	Repair old Cyclone Shelters	Upazila Parishad, Local Government Engineering Department (LGED), Ministry of Disaster Management and Relief (MoDMR), Government/ Non-Government Organization	2019-2020	Basement and plinth protection and repairing the concrete beams and columns of the building. Increase the basement height. Ensure regular maintenance. Multipurpose uses of shelters.	1. Red Crescent Cyclone Shelter in Ward 2	N/A	Not to use sands for construction as sand is saline and it would affect the integrity of the structure.
9	Vertical Extension of Cyclone Shelter	Upazila Parishad, Local Government Engineering Department (LGED), Ministry of Disaster Management and Relief (MoDMR), Government/ Non-Government Organization	2019-2020	Capitalising on the remaining buildable space characteristic of many cyclone shelters. At the same time, refurbishing the housing block and improving standards of efficiency, safety and accessibility.	1. Asgaria Govt. Primary School cum Cyclone Shelter in Ward 1 2. Musa Siraj Govt. Primary School cum Cyclone Shelter in Ward 3 3. Afasuddin Govt. Primary School cum Cyclone Shelter in Ward 3 4. Somudia Govt. Primary School cum Cyclone Shelter in Ward 8	N/A	Not to use sands for construction as sand is saline and it would affect the integrity of the structure.
10	Vertical Extension of Building in Killa	Upazila Parishad, Local Government Engineering Department (LGED), Ministry of Disaster Management and Relief (MoDMR), Government/ Non-Government Organization	2019-2020	Capitalizing on the remaining buildable space characteristic of many cyclone shelters. At the same time, refurbishing the housing block and improving standards of efficiency, safety and accessibility	1. Akbar Balir Para Killa in Ward 3 2. Kalar Mar para Killa in ward 7 3. Quilarpara Killa in ward 9	N/A	Not to use locally available sands for construction as sand is saline and it will affect the integrity of the structure.

11	Mangrove Plantation	Bangladesh Forest Department, Ministry of Environment, Forest and Climate Change (MOEF), Department of Environment (DoE), Bangladesh Forest Industries Development Corporation (BFIDC), Upazila Parishad, NGOs, Development Partners	2019-2020	Local participation in coastal greenbelt management. Ensure long-term maintenance and inter-sectoral coordination. Integrating community-based adaptation into afforestation and reforestation.	1. Northern Part of Wards 1 and 3 beside Bay of Bengal. 2. Eastern Side of Ward 8, beside Bay of Bengal.	N/A	Labour force must be sourced locally. Enhance socio-economics benefits of local communities by utilizing resources from the forests.
12	Saline Tolerant Crop Production	Bangladesh Agricultural Development Corporation (BADC), Ministry of Agriculture (MoA), Department of Agricultural Extension (DAE), Krishi Gobeshona Foundation (KGF), Upazila Parishad	2019-2020	Use local labour. Ensure sustainability and productivity. Using early rainfall before monsoon for cultivation and irrigation.	1. Introducing saline tolerant crops for farmers of Wards 3, 4, 7 and 9.	N/A	Ensure food and nutrition security for people in coastal areas.
13	Embankment cum Road Construction	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED), Upazila Parishad, Development Partners	2019-2020	Use local labour, locally available soil and other materials. Ensure sustainability. Increase the height of the road.	1. Starting from Akbar Balir Para in Ward 3 to Faijunir Para in Ward 5 2. Starting from Kaisarpara in ward 1 to Shikdar Para in Ward 8.	N/A	Labour force must be sourced locally. Use locally available construction materials.
14	Increasing height of Homestead	Upazila Parishad, Government/ Non-Government Organization	2019-2020	Use local labour, locally available soil and other materials. Ensure sustainability. Ensure the settlement height is the higher than 100 year return period inundation	1. Households of cluster villages in Wards 1 and 2.	N/A	Labour force must be sourced locally. Use locally available construction materials.

Chapter 5: Concluding Remarks

Conducting a CRA in vulnerable areas with high risks can be very informative and beneficial to community members, local stakeholders and local government. Through writing a detailed investigation of risks faced by those living in Uttar Dhurung Union in Kutubdia, the community members are now provided with information they themselves have compiled about the risks of this Union. The study conducted was participatory in design and incorporated community members into the survey team. This thus provides primary information gathered in the field with people who actually live with the risks discussed. The findings presented in this report are intended as a guide in addressing the risk reduction imperatives identified during the community-based risk assessment in Uttar Dhurung Union in order to prevent and mitigate hazards and to reduce the vulnerability.

According to the local people, key informants and respective government, collaborating organizations and other stakeholders, this Union is mostly vulnerable to cyclones, storm surges, tidal floods and water salinity. The magnitude of these hazards become greater because of the poor maintenance of embankments and their geographic locations. Therefore, people are dependent on salt cultivation and fishing economically. Dependency on such high vulnerable income sources threatens the life and livelihoods of the people. In addition, the poor infrastructure (jhupri type settlements) and built structure in vulnerable places makes the available resources more and more vulnerable. The main protection embankment was damaged by high tidal current and flood this year and so, the exposure of the tidal flood and storm surge increased. In short, making a sustainable embankment surrounding the Upazila and proper monitoring and further studies to crosscheck the quality and astronomical tide scenarios as well as modeling of the hazards for the Upazila can make development works in this area more fruitful in the future.

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Annex A: Schedule of Map and CRA production

UNDP

Project Start Date 8/25/2019 (Sunday)
Project Manager Cathrine Tranberg Haarsaker

No.	TASK	START	END	DAYS	% DONE	WORK DAYS
1	**Pre-CRA Activities**		-			-
1.1	Mapping	Sun 8/25/19	Wed 9/04/19	11	100%	8
1.1.1	Base Map	Sun 8/25/19	Wed 8/28/19	4	100%	3
1.1.2	Google Map	Thu 8/29/19	Sun 9/01/19	4	100%	2
1.1.3	Landuse Map of 1999, 2009, 2019	Mon 9/02/19	Wed 9/04/19	3	100%	3
1.2	Field Preparation	Thu 9/05/19	Wed 9/18/19	14	100%	10
2	**CRA Field Activities**		-			-
2.1	Travel (Dhaka-Cox's Bazar)	Thu 9/19/19	Thu 9/19/19	1	100%	1
2.2	Village Transect	Sat 9/21/19	Sat 9/21/19	1	100%	0
2.3	FGD (Focus Group Discussion)	Sun 9/22/19	Sun 9/22/19	1	100%	0
2.4	KII (Key Informant Interview)	Mon 9/23/19	Mon 9/23/19	1	100%	1
2.5	LGD (Large Group Discussion)	Tue 9/24/19	Tue 9/24/19	1	100%	1
2.6	Validation Workshop with UDMC	Wed 9/25/19	Wed 9/25/19	1	100%	1
2.7	Travel (Cox's Bazar-Dhaka)	Thu 9/26/19	Thu 9/26/19	1	100%	1
2.8	Validation Workshop with UzDMC	Mon 10/07/19	Mon 10/07/19	1	100%	0
3	**CRA Report Writing**		-			-
3.1	Map Updating & Correction	Sun 9/29/19	Sat 10/05/19	7	100%	5
3.2	Data Analysis	Thu 10/10/19	Wed 10/16/19	7	100%	5
3.3	Report Writing	Thu 10/17/19	Fri 10/25/19	9	100%	7

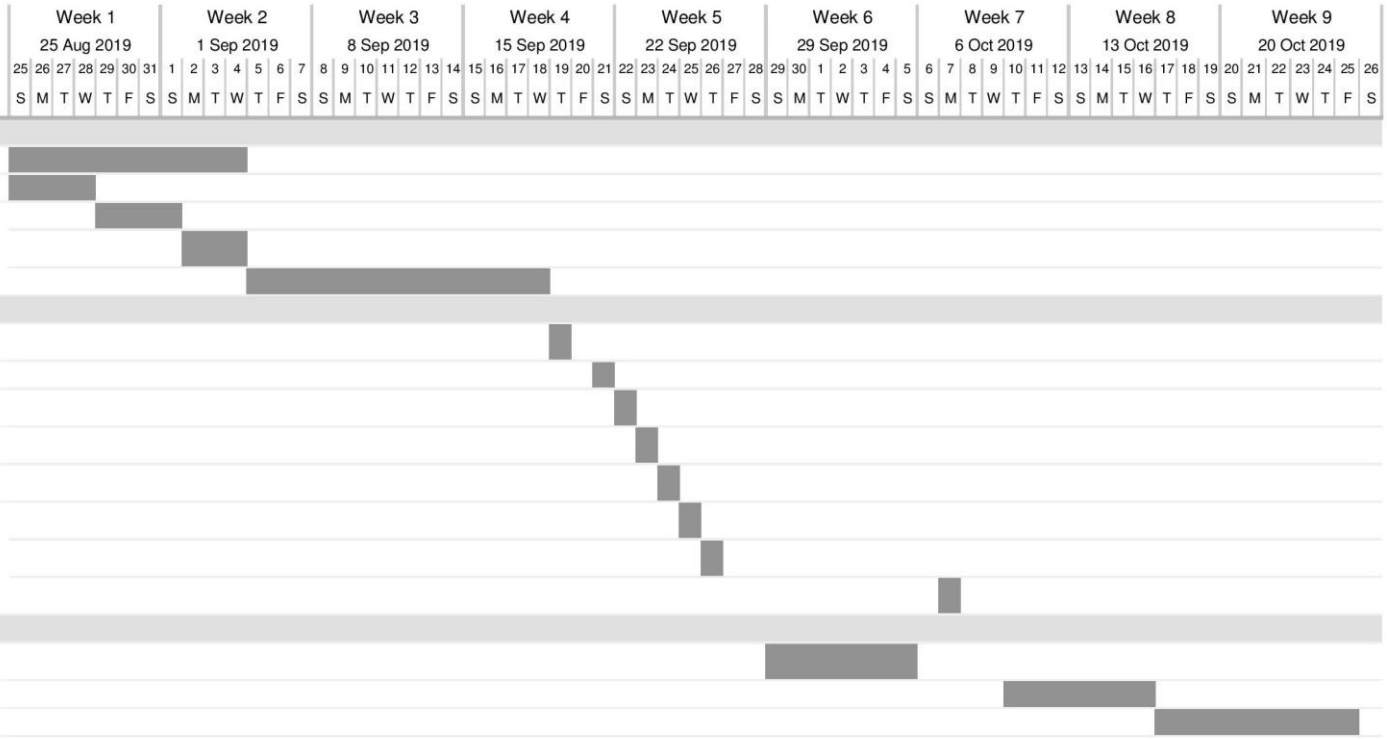

Figure 17: Schedule of map and CRA production

Annex B: FGD Checklist

Livelihood Options, Challenges & opportunities: What are the major occupations in this area? What are the new occupations that have been adopted by the people of this area for their livelihood? What are the occupations that disappeared? What are the challenges faced in existing occupations? Do you predict any future challenges for the existing occupations? If so, do you think there might be new occupations evolved? What might be those new occupations?

Hazard (past, present and future): In the past (10 to 20 years ago), what sort of hazards caused disastrous situation in your area? What are the hazards currently causing the same? If the hazards are the same, do you notice any change in the magnitude of damages or they stayed the same as they were in the past? From your experiences, do you predict changes in the type of hazards in the future (10 to 20 years from now)? If so, what might be the new hazards?

Here are some examples of different type of hazards as ready reference: natural (cyclone; flood; erosion; heat stress; storm surge; storm; strong winds (tornado); earthquake; drought (monga), human induced (river bank erosion, pollution of water supply), biological (spread of disease, pests or contaminants among plants, animals or people), and technological (failure of socio-technical systems related to agriculture, food processing and storage, communications, industrial sites, infrastructure and transportation).

The Focus Group Discussion was conducted on 22 September, 2019.

Table 8: List of FGDs

FGD No	Community	Location	Ward No	Number of Participants
1	Farmers	Zokir Ali Shikdarpara	4	10
2	Labour community	Akbar Balir Ghat	3	10
3	Salt farmers	Char Dhurung	2	10
4	Different occupational people	Kalarmarpara	7	8
5	People occupied in different services	Miazirpara	8	8
6	Women Community	Zohir Ali Shikdarpara	5	10
7	Unprivileged group	Kaisarpara	1, 2	9
8	Rural market/shop owners	Dhurol Boshir Market	6	10
9	Hatchery and fishery owner/ fisher folks	Akbar Balir Ghat	3	9

Annex C: KII Checklist

Respondent Name (s)	Village	Date
Interviewer (s)		

1. What are the main changes that have taken place in the locality in the last few years? When did they take place (approximately what year)? What are the causes of these changes? What have been the effects of these changes on the community?
2. Have you noticed changes in (i) flooding, (ii) rainfall, (iii) drought (*monga*), (iv) cyclone, (v) tornado, (vi) storms, (vii) river bank erosion and (viii) salinity intrusion in the last few years?
3. If yes, ask for each of the changes -

   How is it (are they) different from original situation?

   How measured (indicator)?

   When did you first notice the change (year, if possible) and Where?

   What do you think are the main causes or reasons for the change?

   What are the effects of the change that you have seen so far?

   What areas in the Union/ aspects of life will be vulnerable to this change?

   What will be the likely effects in the medium to long term? How would you rate the consequence of this change (Not Bad, Bad, Very Bad, Plenty Bad)?

   What do you think is/are the best way(s) to cope with such change?

   What should Government/ UP council do? What should Community groups do (specify)?

   What should family/individuals do? How have people coped with such change(s) in the past?

   Can such traditional coping mechanisms be applied in the present context (Elaborate)?
4. List 5 practices, which contribute to increase the vulnerability of our environment. Detail the effect of each practice. What can be done to increase public awareness of the negative effects of such practices?
5. List 5 practices/ cultural values/institutions, which can contribute to increasing the robustness and resilience of the Union to the impacts of climate and other changes? Detail how each can be harnessed to the Union adaptation efforts

The Key Informant Interviews were conducted on 23 September 2019.

Table 9: List of KIIs

KII No	Name	Designation	Date Interviewed
1	Shahriar Chowdhury	Chairman, Uttar Dhurung	23 September, 2019
2	. Reza Mehedi Farshad	Upazila Agricultural officer	23 September, 2019
3	Ahmad Hossain	Uttoron Bidya Niketon	23 September, 2019
4	Md. Osman	Union team leader, CPP	23 September, 2019
5	Md. Kaysarul Islam	Union Health and Family Planning Officer	23 September, 2019
6	Hosne Ara	Union Leader, Ansar & VDP	23 September, 2019

Annex D: Photos of the Study Area

The photos were taken throughout the CRA process conducted from 21 September, 2019 to 26 September, 2019

Figure 18: Primary school cum cyclone shelter beside the embankment

Figure 19: Left side of Road showing agriculture whereas the right side showing the salt fields

Figure 20: Kutcha road for going into a cluster village

Figure 21: Salt storing techniques; salts are stored like this for several years

Figure 22: Kutcha road in ward 5

Figure 23: Broken part of the embankment in akbar balir ghat

Figure 24: Broken part of the embankment in ward 1

Figure 25: Broken part of the embankment in ward 1 and cluster villages are fully exposed


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