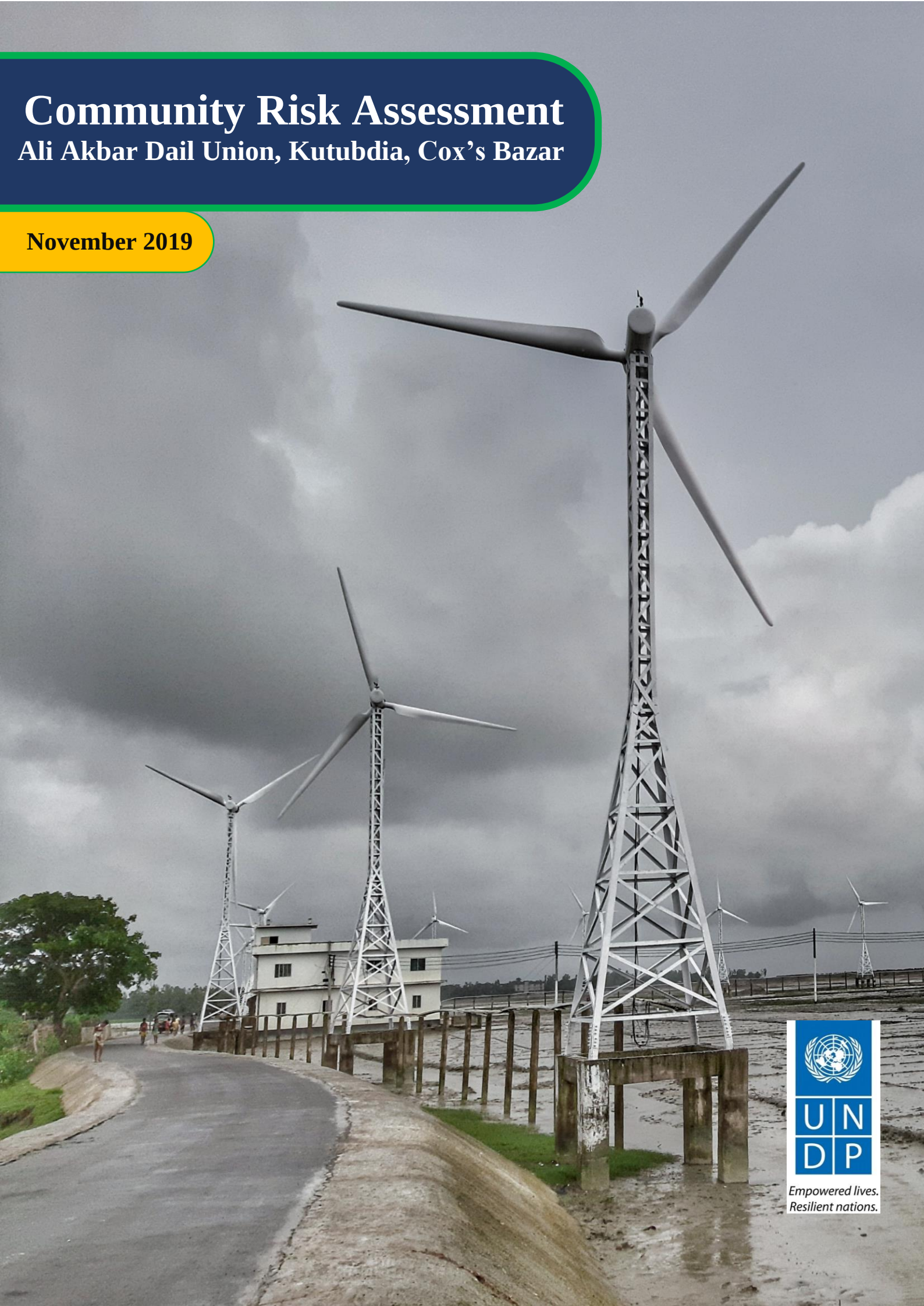
Community Risk Assessment

Ali Akbar Dail Union, Kutubdia, Cox's Bazar

November 2019



Empowered lives.
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Chapter 1: Introduction

Community risk assessment (CRA) is a participatory process for assessing hazards, vulnerabilities, risks, ability to cope, preparing coping strategies and the final preparation of a risk reduction implementation plan for a local community. Scientific information and predictions as well as participatory discourses are used in a CRA to identify, analyze and evaluate the risks of a particular community and to reach consensus amongst the community on actions to manage the identified risks. When a community is vulnerable to the disasters that are likely to happen and cause a great deal of damage to the livelihood and property, Community risk assessment tries to find out the most vulnerable individuals and evaluate the risks for assessing the appropriate strategy to create a barrier. The method recognizes that the vulnerability, loss, reduction or mitigation strategy and coping mechanism vary from community to community and group to group (women, person with disability, landless, farmers-fisher folks, etc.) of a same community. So it ensures representation of professional, community and other groups and that their points of views are reflected.

1.1. A short history of the Ali Akbar Dail Union

Kutubdia is the south-eastern island of Cox's Bazar. The area is prone to frequent cyclones and storm surges, which impact the inhabitants of Kutubdia Upazila. Kutubdia Island consists of six unions: Ali Akbar Dail, North Dhurung, South Dhurung, Lemshikhali, Kaiarbil and Baraghope. It has a population of 1,25,279 with a growth rate of 1.54% (BBS, 2011). During the British Regime a lighthouse was established at Kutubdia for incoming ships to the Chittagong Port. This lighthouse no longer stands with most of the land area of Kutubdia having been eroded by the Bay of Bengal.

Ali Akbar Dail is a highly aesthetic union like any other tourist place with an area of 2610 acres (10.56 km^2) (BBS, 2011). Ali Akbar Dail Union is located in the south of the Kutubdia Upazila. The distance from the upazila headquarters (Upazila Nirbahi Officer's office) to the union parishad is about 5 km. The union is bordered by Baraghope Union to the north; the Kutubdia Channel, Magnama and Uzantia unions of Pekua Upazila and Matarbari Union of Maheshkhali Upazila to the east; and the Bay of Bengal to the south and west. This Bay of Bengal which borders the union on two sides has a sandy beach similar to Cox's Bazar. The landscape of the union is varied, including beach, Jhau trees (Tamarisk trees), villages and salt farms. Due to sea erosion, the size of Ali Akbar Dail Union terrain has gradually reduced. In the last 70 years,

one-third of the union has been swept into the Bay of Bengal. Ali Akbar Dail has the exceptional and potential natural resource of wind for electricity generation. The maximum wind power obtained from Kutubdia is 138 W/m^2 (Mukut, Islam, & Alam, 2009). Compared to other coastal areas, Ali Akbar Dail has higher wind speed for power generation (Mukut, Islam, & Alam, 2009). In 2005, a wind power project was created on the west side of the Ali Akbar Dail Union Parishad building at Abdul Hadi Sikder para in Ward 3 along the banks of the Bay of Bengal. An additional wind power development was installed under the same project in 2015.

1.2. Demographic information

Ali Akbar Dail Union is the sixth union council under the Kutubdia Upazila. The administrative activities of the union are under Kutubdia police station situated in Baraghope Union. The union is part of the constituency Cox's Bazar-2, 295^{th} seat of the National Parliament. This Union is divided into two Mouzas: Ali Akbar Dail and Rajakhali (Bangladesh National Portal, 2017). The villages of this union are:

- Tek Para
- Khudiar Tek
- Nasiyar Para
- Haidar Para
- Fateh Ali Sikder Para
- Sandip Para
- Aniser Para
- East Tabalor Char
- West Tabalor Char

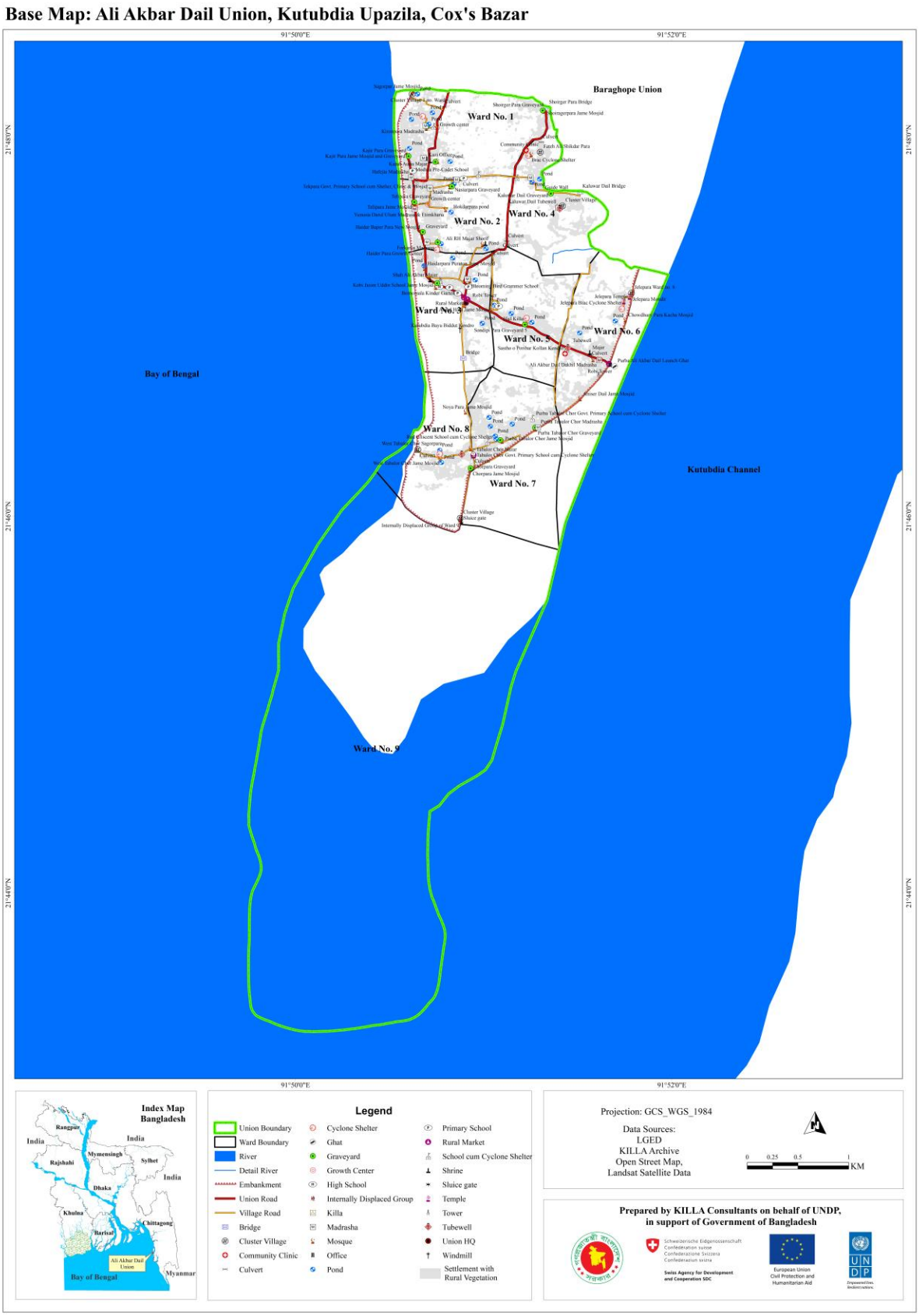

Figure 1: Base map of Ali Akbar Dail Union

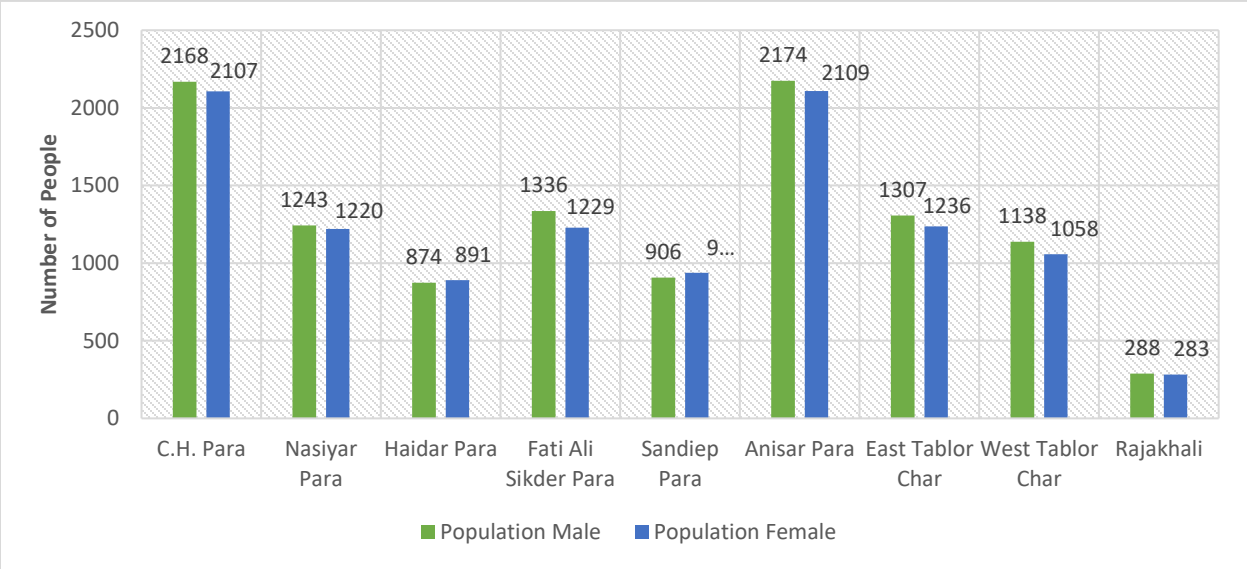

Figure 2:Administrative unit wise male-female population (BBS, 2011)

Ali Akbar Dail Union has a total of nine wards. According to the Population and Housing Census 2011, the total population of the union is 22,504 individuals in 4,298 households of which 11,434 individuals are males and 11,070 are females. The sex ratio of the union is 103 in 2011 which has decreased from 108 in 2001. The decadal population growth rate for the union is 16.84% and the annual compound growth rate is 1.54%. Since the 1950's the growth rate has been fluctuating over the decades until 2011 (BBS, 2011).

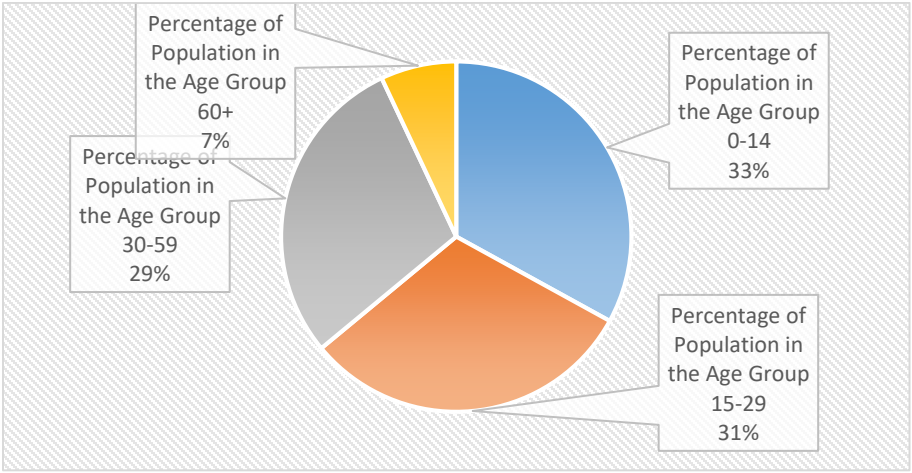

Figure 3: Percentage of population in the age group (BBS, 2011)

Figure 3 shows the distribution of the population according to age. Information is included by sex and age group as follows: 0-14 years (children), 15-29 years (early working age), 30-59 years (prime working age) and 60 years and over (elderly). According to the Population and Housing Census 2011, 33% of the total population were children, 31% were of early working age, 29% were of prime working age and 7% were elderly as per the previous definitions. In Ali Akbar Dail, the majority of the population are Muslim (93.57%) with the remainder of the population Hindi (6.43%). There are no ethnic minorities in this union. Total number of people with a disability is 787 (BBS, 2011).

1.3. Socio-economic condition of the union

Socio-economic condition is a combined economic and sociological measure of as individual's work experience and their economic and social position in relation to others, based on household income, education, occupation and life standards. It is more commonly used to depict an economic difference in community as a whole (Andrew, 2010).

- Literacy rate: Literacy rate in Ali Akbar Dail Union is 38.7%. Literacy rate is 40.2% for male and 37.2% for female, which shows the tendency that it is slightly lower for female (BBS, 2011).

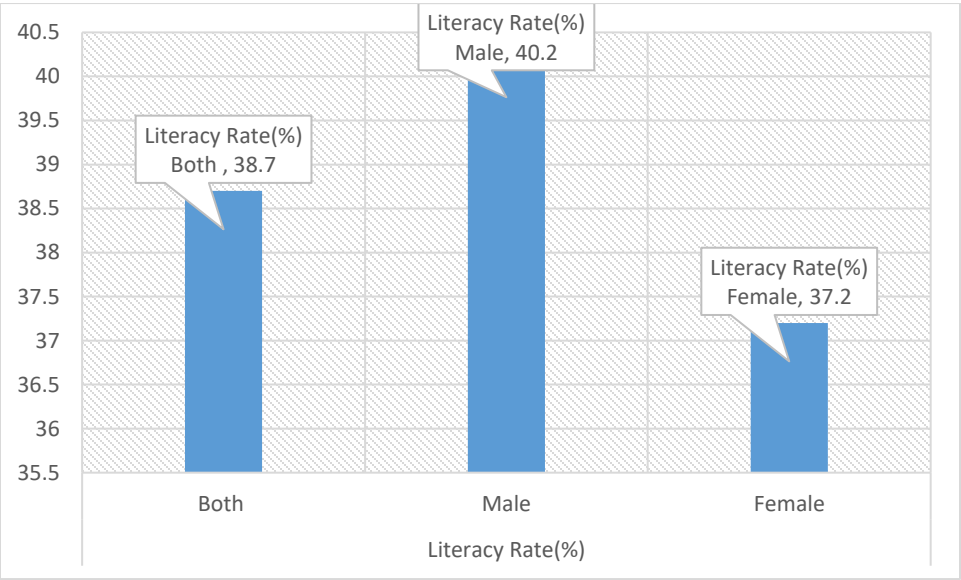

Figure 4: Distribution of population aged 7 years and above by literacy (BBS, 2011)

- Type of structure: In Ali Akbar Dail Union 7% of general households live in pucca and/or semi-pucca houses made of solid and permanent materials, 93% of households live in kutcha houses made of temporary natural material and/or jhupri (BBS, 2011).

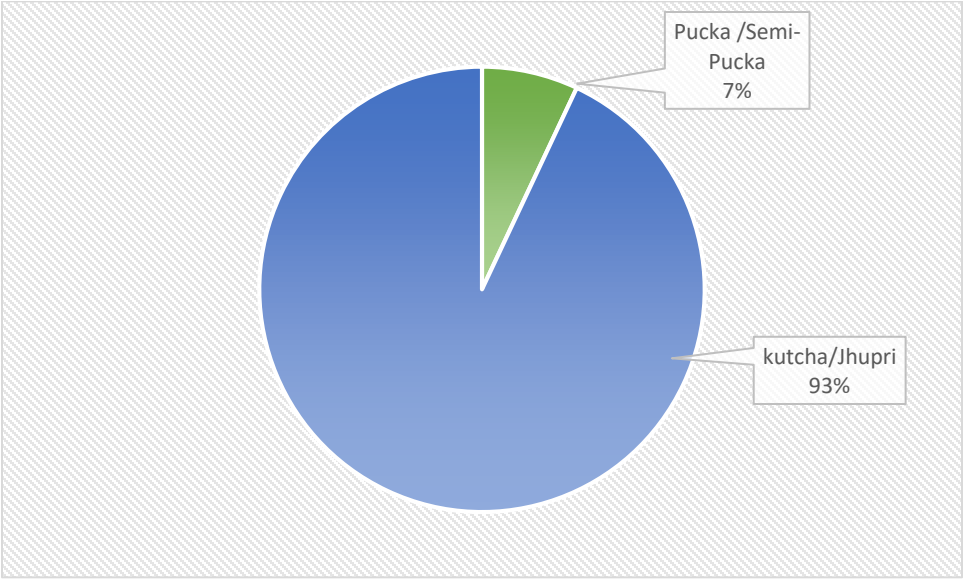

Figure 5: Percentage distribution of households by type of structure and housing tenancy status (BBS, 2011)

- Toilet facility: In Ali Akbar Dail Union 69.3% of general households a use sanitary latrine, 23.7% use a non-sanitary latrine and the remaining 7% have no toilet facility. The number of households with sanitary latrines is higher than households with non-sanitary latrines or no toilets facilities (BBS, 2011).

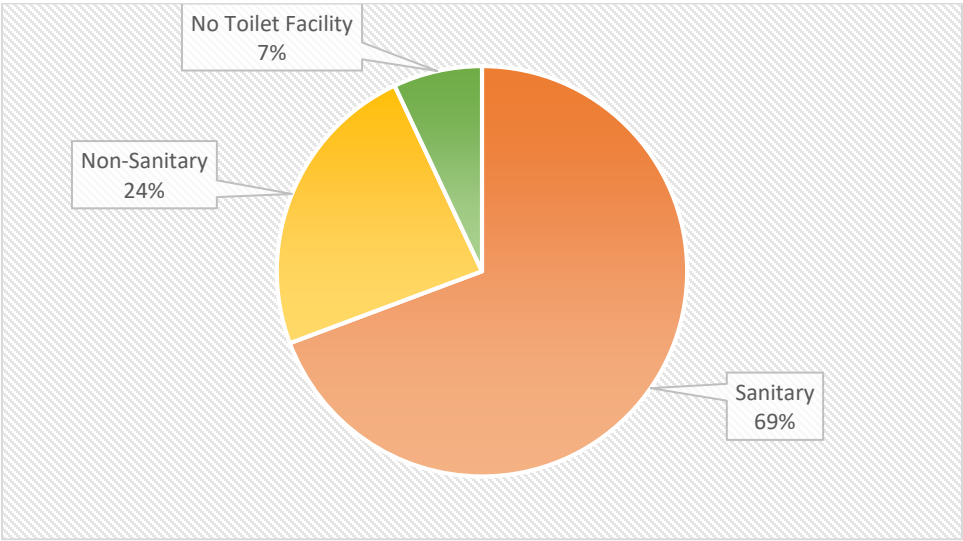

Figure 6: Percentage distribution of households by toilet facility (BBS, 2011)

- Source of drinking water: 91% of general households obtain their drinking water from tube-well, 1% from tap and the remaining 8% of households obtain water from other sources (pond, well, rainwater harvesting, pond sand filter) (BBS, 2011).

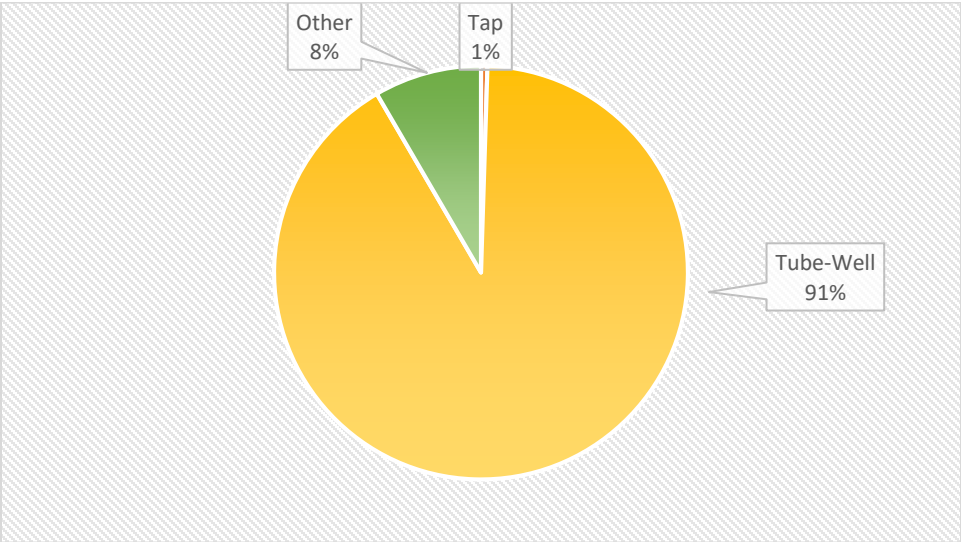

Figure 7: Percentage distribution of households by source of drinking water (BBS, 2011)

- Electricity connection: The area has been brought under the Rural Electrification Program. However, only 0.7% of general households in the upazila reported to have electricity connection in 2011 in comparison to 0.0% in 2001. Although the wind power station is located in the Kutubdia Upazila, residents are supplied electricity for three days in a month. Though some villages show a higher number of general households with electricity connection, such as 3.4% in Haidar Para and 1.7% in C.H. Para, the overall percentage of households with electricity connection is much lower across the union in average (BBS, 2011).

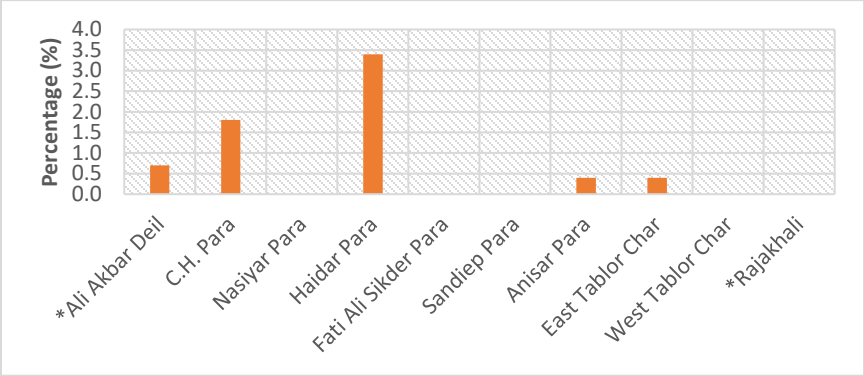

Figure 8: Percentage distribution of electricity connection (BBS, 2011)

- Poverty: According to the CRA field data, about 40% of the population is extremely poor, about 38% is poor, 20% is marginal poor and about 2% of the population of the entire region lives above the poverty level. Any kind of natural or manmade disaster further exacerbate economic situations.

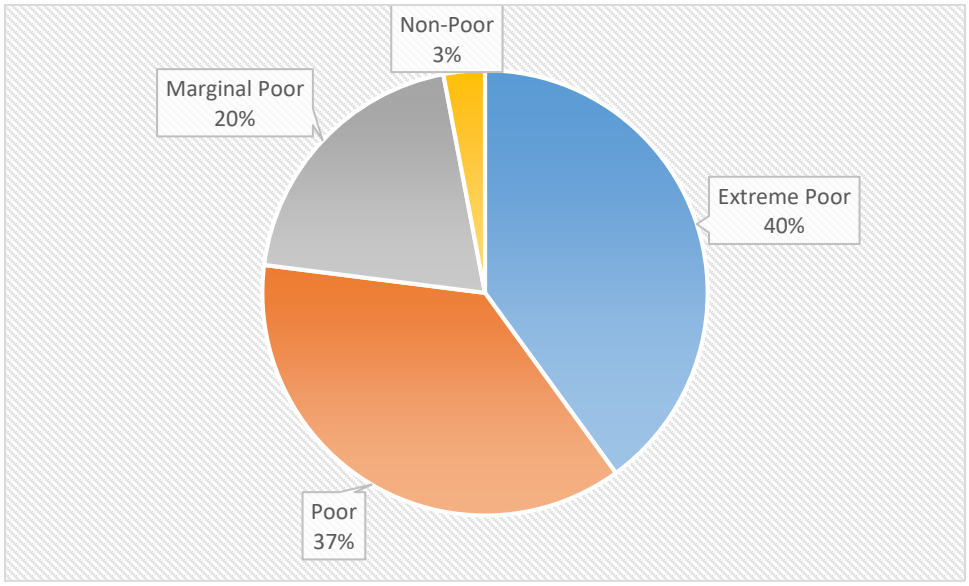

Figure 9: Economic status of people (percentage) (CRA field data)

In Ali Akbar Dail, urbanization is around 10%. But there is little difference between urban and rural areas. About 75% of residents are engaged in agriculture. Most are engaged in salt production or fishing, with 70% of the total population either directly or indirectly dependent on the fishing profession. This island is a large exporter of salt and fish to other upazilas. The main crops of the union are paddy, potato, watermelon, ginger, tomato, bean and betel nut. The main cultivated fruits are mango, banana, papaya, plum and coconut.

Table 1: Demographic and socio-economic conditions of Ali Akbar Dail Union

Administrative unit Residence community	**Area in acres**	**Total households**	**Population**		**Sex ratio**	**Population age in years (%)**				**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**	
Ali Akbar Dail Union total	**2610**	**4298**	**11434**	**11070**	**103**	**28.3**	**26.1**	**25.7**	**5.9**	**38.7**	**40.2**	**37.2**	**787**	**0.0**	**7.0**	**93.0**	**69.3**	**23.7**	**0.5**	**91.1**	**8.4**	**0.7**
*Ali Akbar Dail		4178	11146	10787	103	28.3	26	25.6	5.9	39.5	41.0	37.9			7.2	92.8	71.3	21.5	0.6	90.9	8.6	0.7
C.H. Para		832	2168	2107	103	29.2	24.5	26.2	5.6	41.9	44.2	39.6			11.0	89.1	73.7	11.4	0.1	84.7	15.1	1.8
Nasiyar Para		479	1243	1220	102	27.2	25.8	24.7	6	36.7	37.4	36.0			5.3	94.8	79.1	12.7	0.0	96.2	3.8	0.0
Haidar Para		325	874	891	98	27.1	26.3	26.5	4.8	29.1	29.3	28.8			7.7	92.3	80.9	18.8	0.0	99.4	0.6	3.4
Fati Ali Sikder Para		480	1336	1229	109	31.6	23.3	27.2	5.5	43.9	45.0	42.8			10.1	90.0	69.8	23.3	4.6	89.0	6.5	0.0
Sandiep Para		360	906	937	97	26.9	26.6	25.8	7.2	49.5	52.6	46.6			3.9	96.1	89.4	10.6	0.0	100.0	0.0	0.0
Anisar Para		829	2174	2109	103	26.6	28.4	25.2	6.4	45.7	48.4	43.0			8.5	91.6	68.1	26.0	0.0	82.6	17.4	0.4
East Tablor Char		467	1307	1236	106	29.7	25.3	26.3	5.1	30.1	30.9	29.3			3.4	96.6	81.4	9.2	0.0	97.6	2.4	0.4
West Tablor Char		406	1138	1058	108	27.6	28.3	23.4	6.3	31.1	31.5	30.7			3.0	97.0	29.8	67.5	0.0	93.3	6.7	0.0
*Rajakhali		120	288	283	102	29.1	31.5	24.4	4.6	9.1	8.0	10.3			1.7	98.3	0.0	99.2	0.0	100.0	0.0	0.0

*Mouza

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

1.4. Local resources

Ali Akbar Dail Union has a total of nine wards. According to CRA field data, total population is about 23 thousand and where male population is about 13 thousand and female is about 10 thousand. Ali Akbar Dail Union has several educational institutes and the literacy rate is about 75%. There are 14 educational institutes in the Ali Akbar Dail Union, consisting of eight government primary schools, two high schools, one college and three madrashas. Religious institute include 28 mosques, two temples, 14 graveyards and four shrines. For health facilities, there are three community clinics and one Red Crescent center. There are additional community infrastructure in place such as cyclone shelter, killa. All government primary schools, high schools and college in Ali Akbar Dail are used as cyclone shelters during the time of extreme natural disasters such as cyclones and storm surges. The most important and effective infrastructure of Ali Akbar Dail Union is the embankment that acts as barrier for saline water intrusion into the mainland and is used as road. The embankment is a one kilometer road running from Akbar Balir Ghat to Jelepara in Ward 6 and a 1.5 km road from Akbar Balir Ghat to the Charpara sluice gate in Ward 7. There are a considerable number of culverts and bridges in the union, some of which are partially damaged due to continuous contact with saline water.

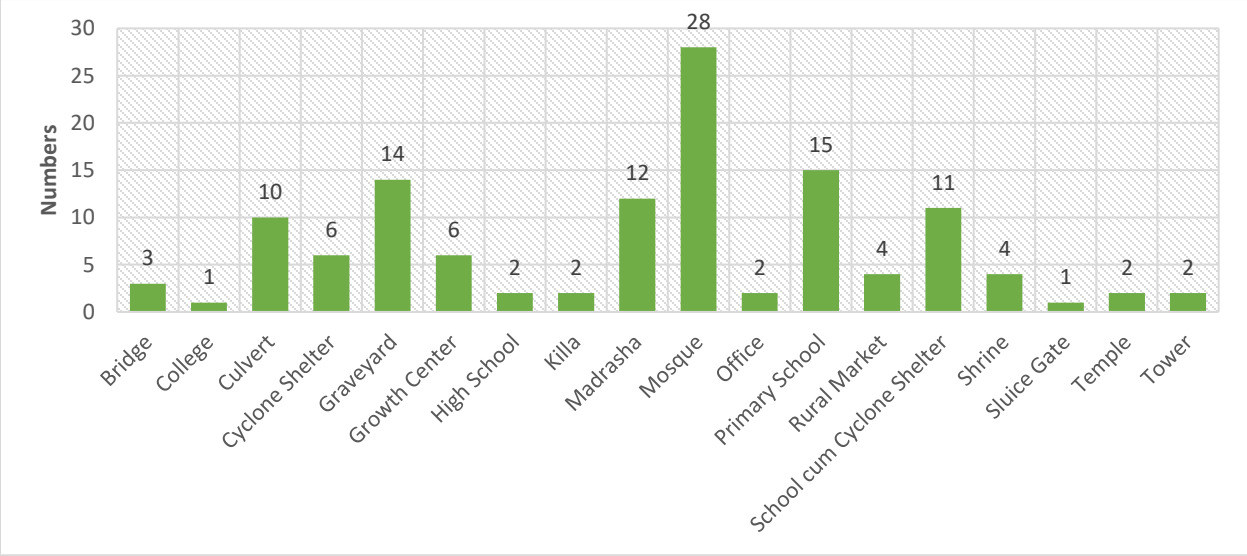

Figure 10: List of all physical elements in Ali Akbar Dail Union (CRA field data)

Chapter 2: Local hazard and vulnerabilities

In this segment, local hazards that are recurrent in the community and the characteristics determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards are identified.

2.1. Historical analysis of hazards

Kutubdia is extremely prone to natural disasters and is affected every year by cyclones and storm surges. In 1991 a cyclone caused at least 138,000 deaths with around 22,000 deaths occurring in Kutubdia, affecting many local families. Severe cyclones in the area affect the livelihoods and property of residents. Such as Cyclone Roanu in 2016 which brought a storm surge up to 7 feet above the astronomical tide, resulting in saline water intrusion (Tanim & Roy, 2013). The large amounts of vulnerable features (agricultural lands, clusters of jhupri type households, salt fields, physical infrastructures, embankment and roads) and the inadequate number of shelters make the area extremely vulnerable to natural disasters. In the case of a three-to-four-meter inundation, almost all kutcha roads and the majority of the households (approximately 80%) of Ali Akbar Dail Union will be flooded (Ahmed & Anwar, 2012). Another main problem of Ali Akbar Dail is continuous land erosion. Coastal land of the union is eroding in a rapid rate. The Coast Trust estimates that if erosion continues at the current rate, Kutubdia upazila will completely vanish from the map in the next 70 years. Erosion mainly occurs each year during the monsoon season due to high tides. A government built embankment has changed the rate of 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 Ali Akbar Dail in the past few years, making the union more vulnerable. In different sections of Kutubdia local people state that from 2006 to 2013 there was excessive erosion of land. With ongoing erosion due to stronger and bigger waves, the union continues to be inundated. Fishermen and salt-workers have been swamped by the storm surge and about 3,000 people have migrated from since 1991 (Tanim & Roy, 2013).

Government initiatives have included a marginal level of mangrove plantation, however these are being gradually destroyed by the shrimp culture and salt fields. The Water Development Board built 40 kilometers of embankment to protect Kutubdia from erosion, of which 24 kilometers were

damaged in the cyclone of 1991 and further damaged by Cyclone Roanu in 2006 and flooding in March 2019 (Ahmed & Anwar, 2012). Embankment of the east side was totally damaged. Agricultural land and households were affected by the event. All agricultural crops in the affected area were damaged due to saline water intrusion.

No scientific monitoring of sea-level rise has been done on Kutubdia, but an increase of nearly 8 mm a year has been recorded over the past 30 years at Cox's Bazar. This is nearly three times the average for Bangladesh and up to five times of the average sea-level rise globally (Tanim & Roy, 2013). In addition to continuous erosion, sea level rise also increases the vulnerability of the union. Although having lots of resources, people of this area can't utilize its resources properly. BRAC, Gana Swasthya Kendra, Prism Bangladesh, IFAD Unnayan Sahajogi Team, Grameen Bank, Coast, PKSF are organizations present in the area working to improve the livelihood and standard of living of local people. But people are making debt to return other debt. So they are in a cycle. Sometime their income is less than the expenditure. This situation is making them economically vulnerable. Besides, people of this area are detached from the mainland of Bangladesh. They have to cross the Kutubdia channel to do any kind of business or job in the main land. It takes around 40tk per person to cross the channel each time. So, if they can find some opportunity in the main land they do not find it feasible to cross the channel twice daily to do the job. They have to migrate there.

Due the previously mentioned vulnerabilities, people of this area consider migration. There are common kinds of migration seen in the union, including 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 particular destination) and seasonal migration (driven by seasonal peaks in labor demand, mostly in agriculture, but also because of climate).

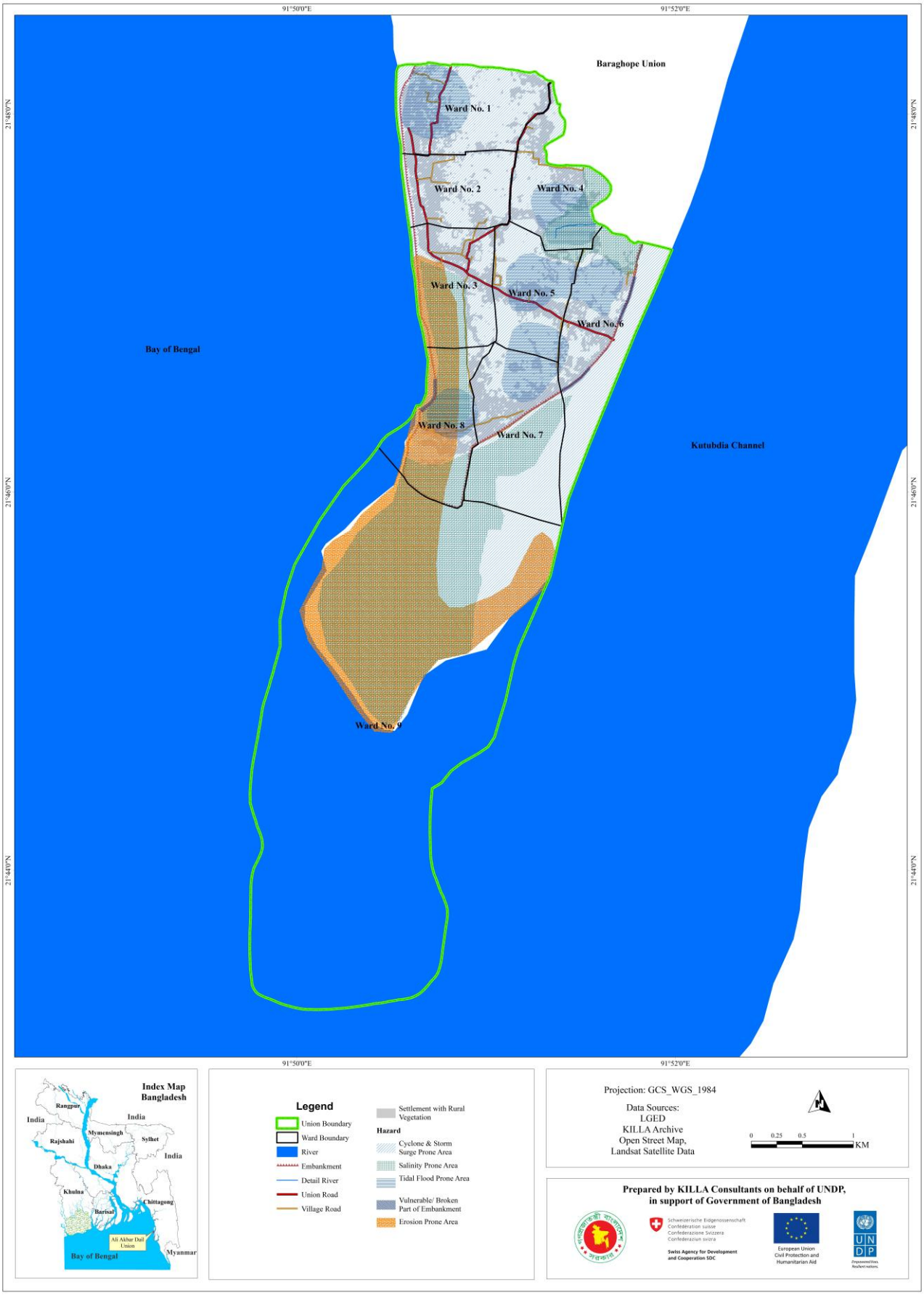

Figure 11: Hazard map of Ali Akbra Dail Union (Satellite imagery, community participation and field survey)

2.2. Hazard Venn and calendar/seasonality

A hazard Venn diagram is effective in showing the intensity and frequency of hazards that affect the region. Ali Akbar Dail Union is affected by many different kinds of hazards, among them cyclones and storm surges, tidal floods, embankment erosion and saline water intrusion are significant. In the hazard Venn, the size of the diagram will represent the intensity of the hazard and the distance from the union will represent the frequency of the hazard in that region. Ali Akbar Dail Union is exposed to the ocean through the partially damaged embankment. Each month there are two big high tides when saline water intrusion becomes a most crucial problem for farmers. Cyclones and storm surges occur with an interval of several years but with high intensity. Embankment erosion occurs constantly throughout the year with the concrete element of the embankment in contact with saline water.

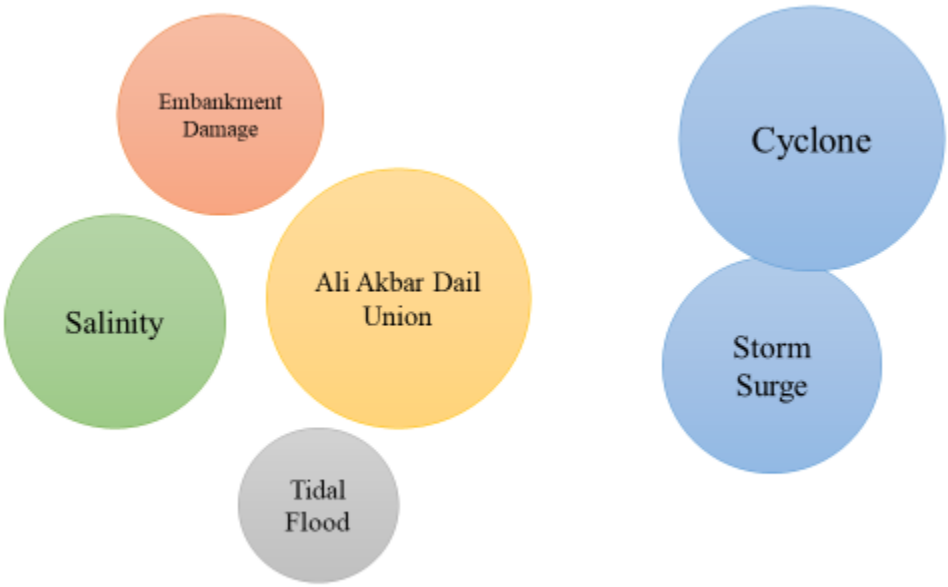

Figure 12: Hazard Venn of Ali Akbar Dail Union (CRA field data)

The hazard calendar is a list of significant hazards of the region with an indication of possible timelines and likelihood of occurrence throughout a year. In Ali Akbar Dail Union, cyclones occurs mostly between mid-June to mid-October (Bengali Ashar to Kartrik months). It is in these months that storm surges also mostly occur. Strom surges occur after a severe cyclone, with the

bulk amount of water coming from the ocean with the wind towards the mainland affecting everything in its path. Hail storms occurs mostly from mid-April to mid-June (Bengali Baishak to Jaishtha months). Saline water intrusion is another severe hazard in Ali Akbar Dail Union and occurs frequently over the year but mostly from the mid-April to mid-August (Bengali Baishak to Vadra months) due to severe high tides. Beach erosion continues throughout the year but mostly occurs in mid-June to mid-August (Bengali Ashar to Vadra months).

Table 2: Hazard calendar/seasonality of Ali Akbar Dail 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												
Hail storm												
Flood												
Saline water intrusion												
Drought												

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: 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). Rabi crops consists of cucumber, brinjal and salt farming. Kharip-1 crops consist of rice (BRRI-28, BRRI-48, BRRI-58) and chili while Kharip-2 crops include tomato and different vegetables.

Table 3: Crop calendar/seasonality of Ali Akbar Dail Union

Crop season	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)
Kharip -1	BRRI-28	→		←			→				←		
	BRRI-48		←			→	←		→				
	BRRI-58		←				→						
	Chili	→										←	
Kharip -2	Tomato								←				→

Rabi	Cucumber						←	—	—	→			
	Brinjal						←	—	—	→			
	Salt farming	→						←	—	—	—	—	—

From the above-described crops, some of are more exposed to hazards due to their cropping season. Kharip-1 includes BRRI-28, BRRI-48 and BRRI-58 which have the same seasonality of cyclones and storm surges. In those months, the sea become rough and high tides often overflow the embankment resulting in saline water intrusion to agricultural land. Without proper and secured embankment, these crops are not well protected from hazards. Salt farming is another main occupation in the Ali Akbar Dail Union, for which rainfall and saline water intrusion into the field is the most alarming for salt farmers. This extra water slows down the salt farming process and destroys salt stored in the fields.

2.4. Landuse / land cover pattern

In the Ali Akbar Dail Union about 40% of the land is cultivated. The cultivated land includes tri-cropping, bi-cropping and single cropping agricultural fields. The agricultural sector is vulnerable to many hazards. Most significant is saline water intrusion, due to the current embankment. Saline water intrusion mainly occurs during the bi-monthly high tide, locally called "Joo". Other vulnerabilities in the agricultural sector include lack of proper cultivation knowledge. Salt farming is also included in the agricultural sector and almost 30% of land is used in salt farming. In this sector, rainfall is the most significant vulnerability, delaying the process of salt cultivation. Coastal afforestation covers almost 8% of the western part of the union alongside the sea, with mangrove plantation introduced by the government after Cyclone Roanu in 2016. Settlements are mostly beside the roads and embankments and cover 20% of land.

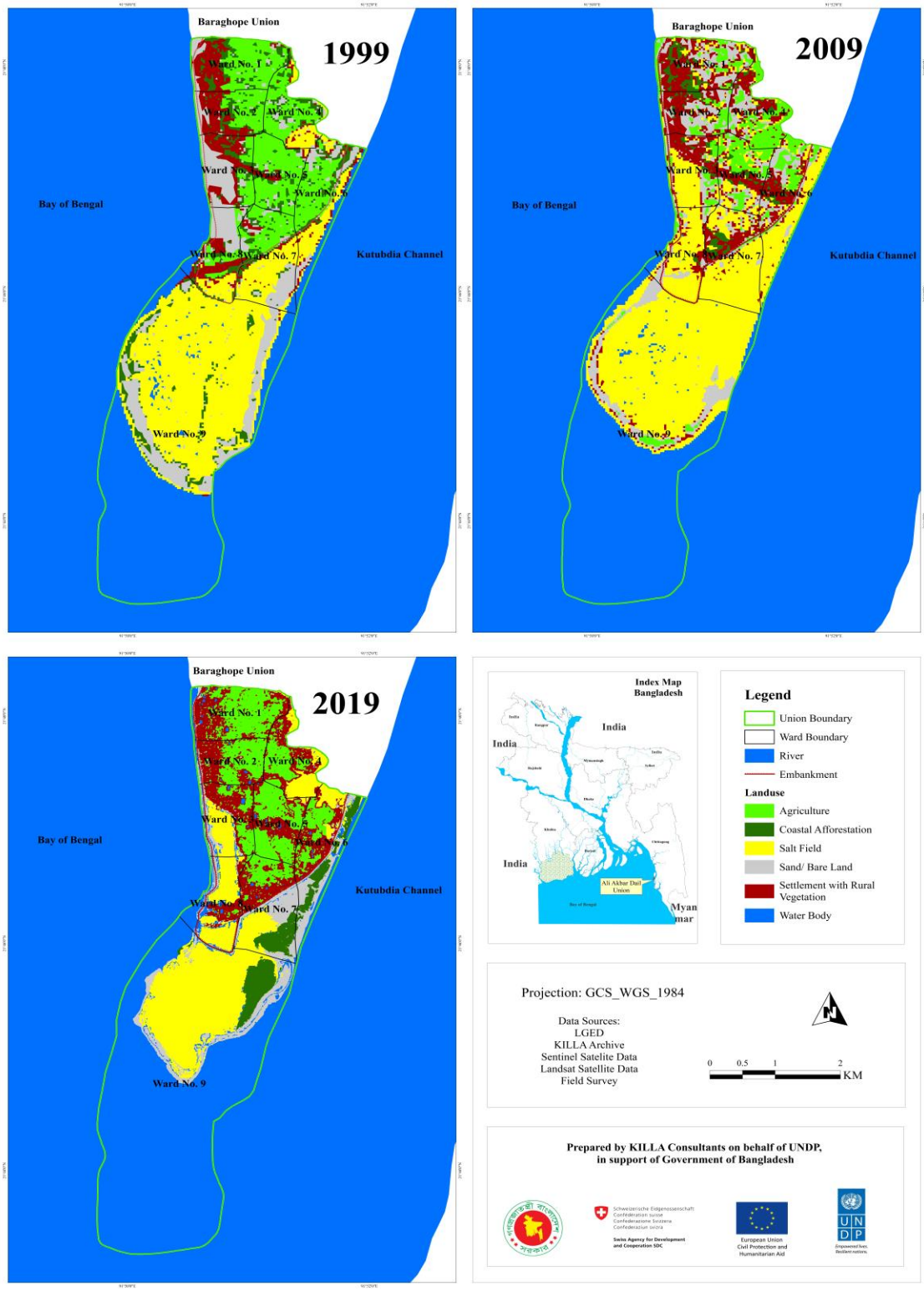

Figure 13: Landuse map of Ali Akbar Dail Union

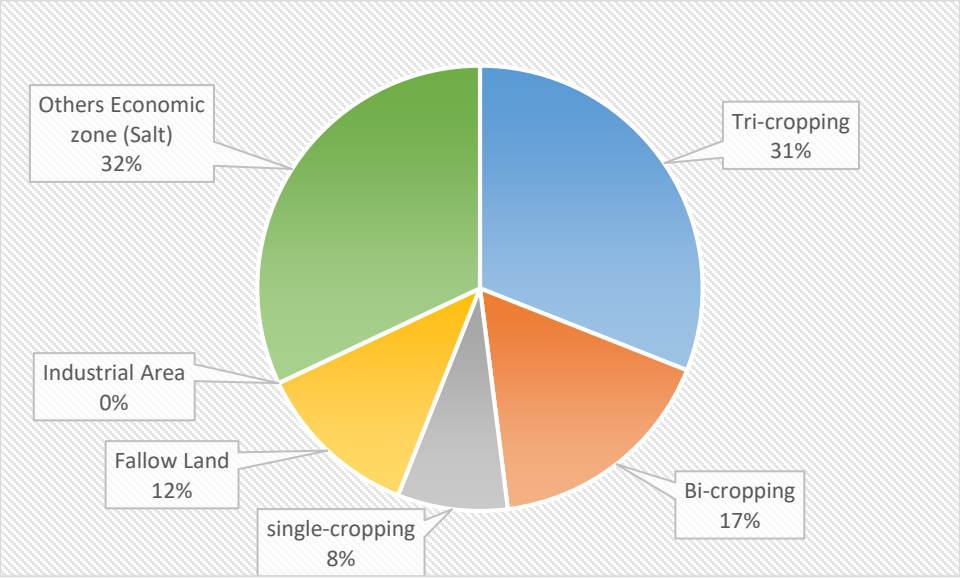

Figure 14: Percentage of area in different land uses (CRA field data)

2.5. Livelihood options and vulnerabilities

There are a limited number of livelihood options for the population of Ali Akbar Dail Union. According to the local people Ali Akbar Dail Union maintains a very narrow marketplace and for this there is no hope for business. The people of Ali Akbar Dail Union mostly connected to agriculture and fishing. In the agriculture section, cropping and salt farming are significant while fishing is the main livelihood option for the population of the Ali Akbar Dail Union. However, there are some barriers related to the fishing sector, such as fishing in the deep sea requiring specific equipment and a well-structured boat. But most of the people in the Ali Akbar Dail Union live below poverty line. According to the Ali Akbar Dail Union Chairman, about 40% of people are extremely poor and about 38% people are poor. In Ali Akbar Dail Union daily labour or contract labour is another option for livelihood, this is also possible in the agricultural and fishery sectors.

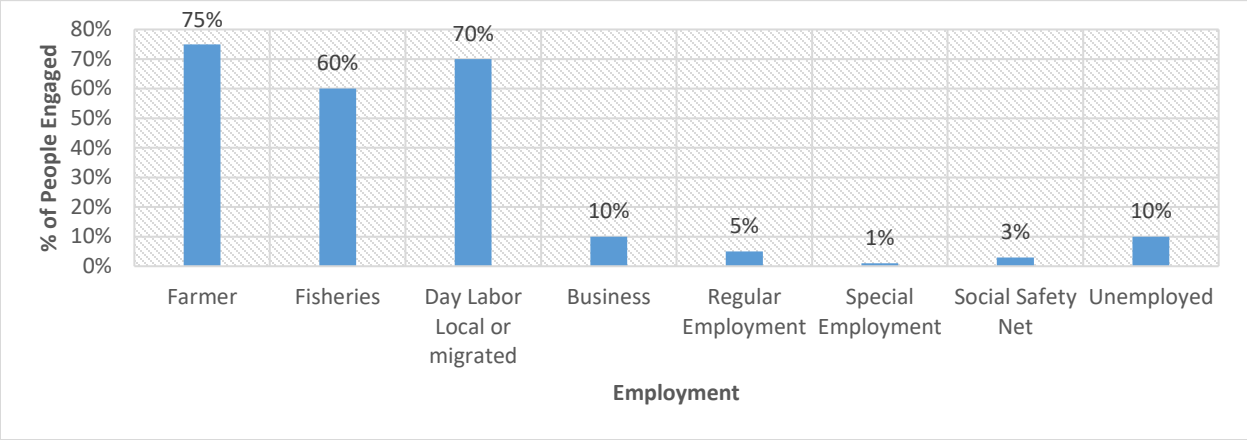

Figure 15: Percentage of people engaged in different employment (CRA field data)

About 75% of the population of the Ali Akbar Dail Union are connected to the broad agricultural sector. In the fishing sector, most fisherman works for investors. The lack of proper equipment is a major barrier to livelihood in this sector. Additionally, natural calamities can destroy boats entirely and every year a significant number of fisherman loss their lives at sea. Poor communication systems with the base center adds to this vulnerability.

2.6. Vulnerability of population and local economy to climatic hazards

The vulnerability of the population includes different individual vulnerabilities for members of the community such as male, female, children, disabled male or female etc. For the male population, vulnerability to climatic hazards include responsibility to the family as a family head, tendency to protect the property and leaving for the shelter center at last. For the female population, vulnerability includes responsibility toward the care of children, affection towards the home and refusing to leave the house and traditional dress such as saree and long hair (can be an impediment to swimming). For children, vulnerabilities include being unable to swim, economical dependency and lack of experience. Disabled individuals are also highly vulnerable to climatic hazards, especially if they require mobility assistance.

Climatic hazard includes cyclones, thunderstorms, tornadoes, drought, rain, hail, temperature and air pollution etc. Population lifestyle and the local economy is affected by these climatic hazards., with the local economy dependent on the agricultural and fishing sectors. Bi- monthly high tides are increasing and with the embankment not creating an adequate barrier between the sea and land

for protection. When saline water enters agricultural land it damages crops affecting the local economy and lowering the living standard of the people connected to the sector.

As mentioned by the survey respondents in Ali Akbar Dail Union, there are only two sources of food: purchase and own production. According to survey results, 80% of households mentioned purchasing as their main food source. Only 20% of households have their own production as their main food source. As most of the households food source is purchased, market access is very crucial for food security in the area. An increase in food prices or a drop in income due to any man made or natural disaster has a large negative impact on the food security for low-income groups in the union. According to CRA field data, almost 60% of households are close to their source of drinking water i.e. within 150 feet. On the other hand, 40% households had to collect drinking water from the source greater than 150 feet away. The main source of drinking water was deep tube-well (85%) and shallow tube-well (15%) as reported by the locals.

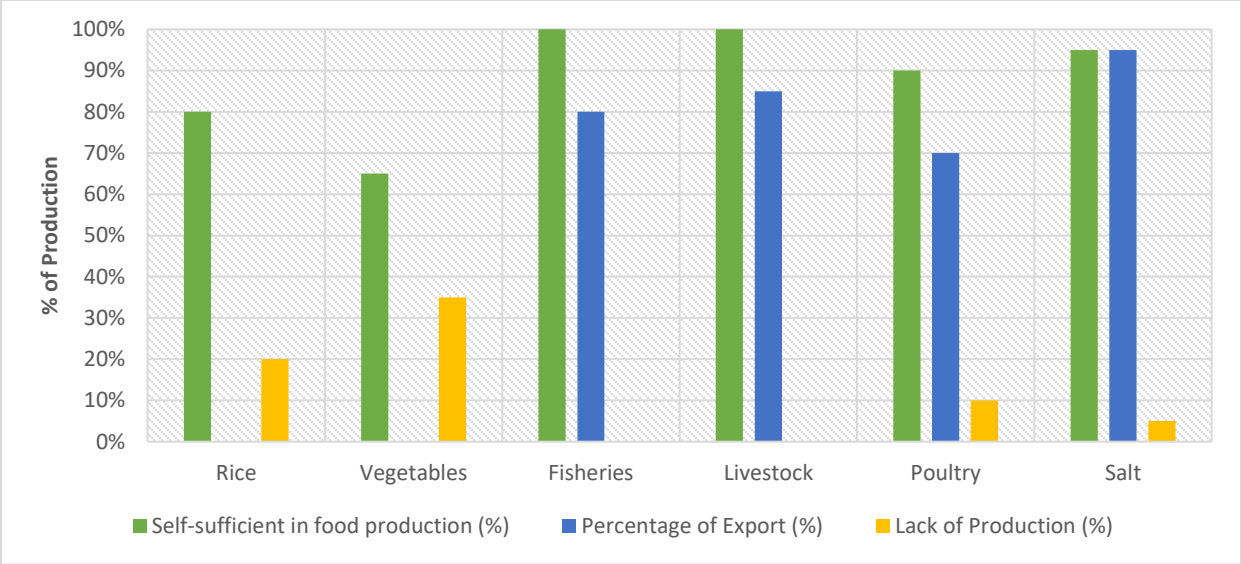

Figure 16: Food production and food security (CRA field data)

In the union, crop and vegetable cultivation, livestock, fishery and poultry sectors are the most common for food production and food sufficiency. Rice production is 80% self-sufficient, meaning the demand for rice is moderately meet. Rice production is sometimes affected by tidal floods and salinity. Vegetable cultivation can meet the local demand by 65% with the rest needing to be imported from outside of the union. Vegetable production also gets affected by salinity and tidal floods. The fishery sector is 100% self-sufficient with 80% of product exported in other upazilas.

This sector has no production deficiency as fishermen go to sea for catching fishes. The poultry sector is 90% self-sufficient with 10% of production needing to be fulfilled from other sources. The poultyu sector also faces problems such as diseases, storm surges and tidal floods. The CRA field study findings showed that in almost 90% of households women including girls were solely responsible to collect drinking water from the source. This particular task is gender biased and calls for special attention to reduce the burden of women.

Chapter 3: Community Risk and Vulnerabilities

In this chapter, risk statement for different sectors of Ali Akbar union and their consequences, risk statements with high priority as well as sensitivity and exposure analysis would be described.

3.1. Sector wise risk and consequences

Risk and consequences are different for different hazard sector. But all the hazard comes with some risk and consequences. In Ali Akbar Dail Union, hazards can be classified into four main categories: cyclones, storm surge, saline water intrusion and high tide. Each hazard poses different risks and consequences for local settlements.

Cyclones are the climatic hazard with the highest intensity and can cause severe damage to the local community and impact local livelihood options. Previous cyclones have demonstrated the extent of damage that can be caused. Cyclone Gorky in 1991 was devastating, with every family in the union experiencing loss of live or effects. The most recent cyclone in the Ali Akbar Dail Union was Cyclone Roanu in 2016. Among all the Unions of Kutubdia, the Ali Akbar Dail Union was most affected, with wards number 2, 3, 4 and 5 severely impacted. Most of the agricultural land and salt farms were completely destroyed. Salt farming lands are situated adjacent to the ocean, causing them to be highly vulnerable to damage from cyclones. Al Quranul Karim Hafezia Madrasa and Kutub Awlia Kindergarten are situated near the embankment and is of high risk to climatic hazard through both location and structural build.

Storm surges occur following a cyclone and result in a large amount of water coming onto the mainland. Most of the wards in Ali Akbar Dail Union such as wards 3,4,5 and 6 have comparatively low-lying land which is vulnerable to flooding with saline water. All settlements and cultivated land would be affected.

Saline water intrusion is the most frequent and damaging hazard to the Ali Akbar Dail Union. Most of the villages in the Ali Akbar Dail Union are situated adjacent to the ocean with the embankment being crucial protection. However, in many places the embankment is severely damaged and saline water enters twice a month during the neap tide. Saline water intrusion is harmful to embankment material and effects agricultural and salt farming land. Saline water intrusion decreases soil fertility causing the affected land to be unusable to any crop for years following. Only heavy rainfall can reduce the saline proportion in the land. Land owners may start cultivating salt on the affected land as it is comparatively profitable to traditional cropping.

3.2. Risk statements with high priority

According to the CRA guideline prepared by CDMP risk can be categorized into four stages by ranking consequences and likelihood as listed 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 field survey elements at risk have been identified. This section states the level of risk and potential damage for the identified elements. To identify the risk rating of all risk statements, consequences and likelihood are multiplied to categorize the high rated risks among all risks of the union. Some high rated risks are listed in Table 5.

Table 5: Risk statements with high priority

Element	Risk statement	Consequences	Risk rating
Madrasha	Haydarpara Forkania Madrasha in Ward 3 would be severely damaged if a cyclone occurs, more than 400 students would not be able to study	Doors, windows and shed would be torn off	1

Cluster village	Due to poor structure and consecutive natural disasters, the settlements of Ward 8 were severally damaged by Cyclone Roanu. If cyclone and high tide occur in Ward 8, the settlements would be severely damaged with approximately 1000 people losing their homes	People will lose their home and property	2
School	If a cyclone occurs, Madina Pre-Cadet School in Ward 2 would be severely damaged and more than 300 students would not be able to study	Education system of the region will be interrupted	3
School	If a cyclone occurs, Blooming Bird Grammar School in Ward 3 would be severely damaged and more than 200 students would not be able to study	Education system of the region will be interrupted	4
Sluice gate	Due to poor structural condition and high water pressure, the water outlet of Ward 7 is moderately damaged. If a cyclone and high tide occur in this area, the water outlet will be damaged and restrict water flow in the salt field	Loss of shelter, security crisis during disaster, health and sanitation problem, disruption of social activities	5
School	Adorsho Kindergarten School in Ward 3 would be moderately damaged if a cyclone occurs. Doors, windows and rooftop would be affected as well as more than 200 students would not be able to study	Tin shed torn off	6
School	Khudiartek Primary School in Ward 5 would be severely damaged if a cyclone occurs and more than 600 students would not be able to study	Education system will be hampered	7
Bridge	One side of the bridge in Ward 6 has been damaged already by soil erosion and if a storm surge occurs the bridge would be severely damaged resulting in communication problem for at least 1500 people	Communication problem	8
Bridge	One side of the bridge in Ward 8 was broken completely in the 2019 flood and communication has since been disrupted for the surrounding people. If a tidal flood occurs again the bridge would face catastrophic damage	Communication system will be disrupted	9
Mosque	Shagorpara Jame Mosque situated near the ocean in Ward 2 would be moderately damaged if a cyclone occurred, doors, windows and rooftop would be affected due to vulnerable condition	People of that region would not be able to perform religious activity	10
School	If a cyclone occurs, Bornomala Kindergarten School in Ward 3 would be moderately damaged and more than 200 students would not be able to study	Doors and windows will be damaged	11
Ghat	If a cyclone occurs, Ali Akbar Dail Launch Ghat in Ward 6 would be severely damaged and most of the piers would be likely to collapse, as well as more than 8000 people affected by disrupted communication	Communication problem	12
Market	If a cyclone and storm surge occurs, Tabalor Char Bazar in Ward 7 would be severely damaged and more than 200 people would lose their livelihoods and 2000 people would face difficulties buying and selling goods	Shortage of necessary goods	13

Mosque	If a cyclone occurs, East Tabalor Char Jame Mosque in Ward 7 would be moderately damaged	People will not be able to perform religious activity	14
School	If a cyclone occurs, Kutub Awlia Kindergarten in Ward 1 would be moderately damaged and more than 200 students would not be able to study		15
Madrasha	If a cyclone occurs, Al Quranul Karim Hafejia Madrasha in Ward 1 would be severely damaged and more than 600 students would not be able to study. A storm surge would inundate the whole compound	Tin shed and wall will be affected	16
Market	If a cyclone occurs, Launch Ghat Bazar in Ward 6 would be severely damaged and more than 300 people would lose their livelihoods and 2500 people would face difficulties buying and selling goods	Economical damage	17
Temple	If a cyclone occurs, Jelepara Temple in Ward 6 would be moderately damaged interrupting the religious activity of approximately 1000 people living in Jelepara	Religious activity will be interrupted	18
Mosque	If a cyclone occurs, Kaluar Dail Jame Mosque in Ward 4 would be moderately damaged	Religious activity will be interrupted	19
Embankment	If shoreline erosion and a cyclone occurs, the embankment of the western shoreline in Ward 8 and the embankment of the eastern shoreline in Ward 7 would be severely damaged and settlements, agriculture, salt fields and other institutions would be damages	Damage to the economy and social structure	20
Community clinic	If a cyclone occurs, Ali Akbar Dail Public Health Care Center in Ward 8 will be moderately damaged and more than 2000 people would not receive emergency and primary health treatments		21

3.3. Sensitivity and exposure analysis

Table 6: Sensitivity and exposure analysis

Element	Risk statement	Exposure to hazards	Key components	Sensitivity 1	Sensitivity 2	Sensitivity 3
Madrasha	Haydarpara Forkania Madrasha in Ward 3 would be severely damaged if a cyclone occurs, more than 400 students would not be able to study	Cyclone Storm surge Tidal flood	Furniture	Highly sensitive to water	Perishable	
			Wood	Highly sensitive to water	Less strength	
			Sn sheet	Highly sensitive to water	Highly corrosion prone	
Cluster Village	Due to poor structure and consecutive natural disasters, the settlements of Ward 8 were	Cyclone	Furniture	Highly sensitive to water	Perishable	Quality

	severally damaged by cyclone Roanu. If a cyclone and high tide occur in Ward 8, the settlements would be severely damaged and approximately 1000 people would lose their households	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	If a cyclone occurs , Madina Pre-Cadet School in Ward 2 would be severely damaged and more than 300 students would not be able to study	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	
School	If a cyclone occurs, Blooming Bird Grammar School in Ward 3 would be severely damaged and more than 200 students would not be able to study	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	
Sluice Gate	Due to poor structural condition and high water pressure, the water outlet of Ward 7 is moderately damaged. If a cyclone and high tide occur in this area, the water outlet will be damaged and restrict water flow in the salt field	Cyclone Storm surge Tidal flood	RCC	Materials	Construction quality	
			Brick	Quality	Base materials	Stability
			Base soil	Cohesion	Soil type	Soil texture
School	Adarsho Kindergarten School in Ward 3 would be moderately damaged if a cyclone occurs. Doors, windows and rooftop would be affected as well as more than 200 students would not be able to study	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	
School	Khudiartek Primary School in Ward 5 would be severely damaged if a cyclone occurs	Cyclone	Furniture	Highly sensitive to water	Perishable	Quality

	and more than 600 students would not be able to study	Storm surge Tidal flood	Wood	Highly sensitive to water	Less strength	
			Brick	Quality	Base materials	Stability
			RCC	Materials	Constructi on quality	
			Sn sheet	Highly sensitive to water	Highly corrosion prone	
Bridge	One side of the bridge in Ward 6 has been damaged already by soil erosion and if a storm surge occurs the bridge would be severely damaged resulting in communication problem for at least 1500 people One side of the bridge in Ward 6 has been damaged already by soil erosion and if a storm surge occurs the bridge would be severely damaged resulting in communication problem for at least 1500 people	Cyclone Storm surge Tidal flood	Brick (guide wall)	Quality	Base materials	Stability
			Soil	Cohesion	Soil type	Soil texture
			RCC	Materials	Constructi on quality	
Bridge	One side of the bridge in Ward 8 was broken completely in the 2019 flood and communication has since been disrupted for the surrounding people. If a tidal flood occurs again the bridge would face catastrophic damage	Cyclone Storm surge Tidal flood	Brick (guide wall)	Quality	Base materials	Stability
			Soil	Cohesion	Soil type	Soil texture
			RCC	Materials	Constructi on quality	
Mosque	Shagorpara Jame Mosque situated near the ocean in Ward 2 would be moderately damaged if a cyclone occurred, doors, windows and rooftop would be affected due to vulnerable condition	Cyclone Storm surge Tidal flood	Furnitu re	Highly sensitive to water	Perishable	Quality
			Wood	Highly sensitive to water	Less strength	
			Sn sheet	Highly sensitive to water	Highly corrosion prone	
School	If a cyclone occurs, Bornomala Kindergarten School in Ward 3 would be moderately damaged and more than 200 students would not be able to study	Cyclone Storm surge Tidal flood	Furnitu re	Highly sensitive to water	Perishable	Quality
			Wood	Highly sensitive to water	Less strength	
			Sn sheet	Highly sensitive to water	Highly corrosion prone	

Ghat	If a cyclone occurs, Ali Akbar Dail Launch Ghat in Ward 6 would be severely damaged and most of the piers would be likely to collapse, as well as more than 8000 people would be affected by disrupted communication	Cyclone Storm surge Tidal flood Erosion	Boats	Washes Away	Breaks apart	
			RCC	Materials	Construction quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture
Market	If a cyclone occurs, Tabalor Char Bazar in Ward 7 would be severely damaged and more than 200 people would lose their livelihoods and 2000 people would face difficulties buying and selling goods	Cyclone Storm surge Tidal flood	Goods	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	
Mosque	If a cyclone occurs, East Tabalor Char Jame Mosque in Ward 7 would 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	
School	If a cyclone occurs, Kutub Awlia Kindergarten in Ward 1 would be moderately damaged and more than 200 students would not be able to study	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	
Madrasha	If a cyclone occurs, Al Quranul Karim Hafejia Madrasha in Ward 1 would be severely damaged and more than 600 students would not be able to study. A storm surge would inundate the whole compound	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	
Market	If a cyclone occurs, Launch Ghat Bazar in Ward 6 would be severely damaged and more than 300 people would lose their livelihoods and 2500 people would face difficulties buying and selling goods	Cyclone Storm surge Tidal flood	Goods	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	
Temple	If a cyclone occurs, Jelepara Temple in Ward 6 would be moderately damaged interrupting the religious activity of approximately 1000 people living in Jelepara	Cyclone Storm surge Tidal flood	Furniture	Highly sensitive to water	Perishable	Quality
			Brick	Quality	Base materials	Stability
			RCC	Materials	Construction quality	
Mosque	If a cyclone occurs, Kaluar Dail Jame Mosque in Ward 4 would 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	
Embankment	If shoreline erosion and a cyclone occurs, the embankment of the western shoreline in Ward 8 and the embankment of the eastern shoreline in Ward 7 would be severely damaged and settlements, agriculture, salt fields and other institutions would be damages	Cyclone Storm surge Tidal flood Erosion	Brick (guide wall)	Quality	Base materials	Stability
			Soil	Cohesion	Soil type	Soil texture
Community Clinic	If shoreline erosion and a cyclone occurs, the embankment of the western shoreline in Ward 8 and the embankment of the eastern shoreline in Ward 7 would be severely damaged and settlements, agriculture, salt	Cyclone Storm surge Tidal flood	RCC	Materials	Construction quality	
			Brick	Quality	Base materials	Stability
			Base Soil	Cohesion	Soil type	Soil texture

	fields and other institutions would be damages					

3.4. Adaptive capacity

The people of Ali Akbar Dail Union maintain different types of adaptive mechanisms for reducing their exposure and sensitivity of the community and settlement to hazards. These mechanisms have been adopted by the population of Ali Akbar Dail Union through their experience with previous hazards.

The residents of the region elevate their houses or other settlements by 10-12 feet off the ground to protect from being submerged by saline water in the case of high tide or mild cyclones. The ocean embankment is six feet high. Indigenous knowledge in housing practice is another example of adaptive capacity for this region. Most of the people of Ali Akbar Dail Union take place in the shelter center during a severe storm surge or cyclone. People tends to build their houses near the embankment and the height of houses are significantly low. In a traditional house, the height between the floor and roof is about 10-12 feet but here the height of the roof is about 3-3.5 ft. A cluster house was identified in Ward 8, where the houses were about same height with a big roof. Sometimes they build chou-chala house that protect their house from cyclonic wind.

Vegetation coverage is another adaptive capacity for the people of this region. People plant additional trees around their house to create a barrier for protection during any hazardous period. The green barrier of vegetation reduces the impact of wind. Additionally, vegetation also helps to reduce soil erosion. Coastal erosion is a significant problem in the Ali Akbar Dail Union and most residents use this vegetation to reduce the level soil erosion to a minimum.

Core houses are observed in the Ali Akbar Dail Union. People build core houses in the inner part of their main house, with the height of the core house being quite shorter than the traditional house. The outer shell of the main house protects life and property from cyclonic wind.

Additional adaptive capacities are is salt saving techniques and coping strategies to conserve food, water and essential items. About 70% of people in the Ali Akbar Dail Union are involved with salt cultivation. To conserve salt before or during a hazard they dig a large hole in the corner of the salt field. This kind of hole is also used for conserving food and valuable property during hazard periods but are usually found near a house.

Chapter 4: Risk reduction options and action plan

In this chapter, risk reduction options and the risk reduction action plan will be discussed focusing on activities including how and where they should be done.

4.1. Risk reduction options

Ali Akbar Dail 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 a number of concerns through which various risk faced by the union can be minimized by a significant margin.

Ali Akbar Dail Union is surrounded by an embankment which protects most elements from cyclones and high tides. The current height of the embankment is approximately 6 feet but this is not sufficient to protect the union. The height of the embankment should be of at least 30 feet in order to create a barrier against severe cyclonse that may occur in this region. There are a number of rivers that extend from the mainland into the sea. The banks of these rivers should be protected by a concrete block. Daily high tides make the river banks vulnerable to erosion. Concrete blocks should be installed followed by toe protection. The plantation of trees may assist soil erosion in the sloppy land. Saline water reacts with the building block material and decreases the material's potential. For this reason, building material must be kept at a safe distance from saline water. Sandy soil is more sensitive to saline water and wave action than clay material, thereforethe embankment should be built with clay material rather than sandy soil. Geotubes can be effective in the protection of the embankment. The top and front side of the embankment should be covered by geotubes to help reduce erosion. A guide wall should be constructed around the road or agricultural lands which are in direct contact with saline water.

Electricity plays a great role in increasing the living standard of a region. The residents of the Ali Akbar Dail Union are deprived of this facility despite an electricity generating windmill being in place. The capacity of the windmill should be increased in order to provide a better supply of electricity. The windmill should be activated at all times, especially during the night to capture high speed air flows in the Kutubdia Upazila that occur at nighttime. The different procedure of electricity power station should be mandated according to the local people.

The identified risk reduction options are as follows:

i. Embankment repair

ii. Increasing embankment height up to 30 feet
iii. Protecting embankment by concrete block
iv. Increasing electricity power generation
v. Road construction
vi. Guide wall on both side of the road
vii. Installing Geotube in Seaside of the Embankment in the way that ocean current first hits the Geotube
viii. Repairing sluice gates
ix. Repair old cyclone shelters
x. Vertical extension of cyclone shelter
xi. Vertical extension of building in Killa
xii. Mangrove plantation
xiii. Saline tolerant crop production
xiv. Embankment and road construction
xv. Increasing height of homestead
xvi. Improving communication system

4.2. Risk reduction action plan

The risk reduction action plan was made through the participatory process of the CRA. It was validated in both a union workshop by the chairman and members and in an upzila workshop by the UNO and members of the Disaster Management Committee.

Table 7: Risk reduction action plan of Ali Akbar Dail 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. North side of Kironpara and Barabagha in Ward 1 2. South western side of Haiderpara in Ward 3 3. West side of Telipara in Ward 2 4. North side of Purba Ali Akbar Dail (Jelepara in Ward 6) 5. West side of Tabalor Char in Ward 8	N/A	Labor force must be collected from local people
2	Increasing embankment height up to 30 feet	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED)	2019-2020	Participation with local people. Ensure slope and toe protection with required width as height increases	1. North side of Kironpara and Barabagha in Ward 1 2. South western side of Haiderpara in Ward 3 3. West side of Telipara in Ward 2 4. North side of Purba Ali Akbar Dail (Jelepara in Ward 6) 5. West side of Tabalor Char in Ward 8	N/A	Labor force must be collected from local people
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. North side of Kironpara and Barabagha in Ward 1 2. South western side of Haiderpara in Ward 3 3. West side of Telipara in Ward 2 4. North side of Purba Ali Akbar Dail (Jelepara in Ward 6)	N/A	Labor force must be collected from local people. Not to use locally available sands for construction as sand is saline and it would

					5. West side of Tabalor Char in Ward 8		affect the integrity of the structure
4	Increasing electricity power generation	Bangladesh Power Development Board (BPDB), Ministry of Power, Energy and Mineral Resources (MPEMR), Bangladesh Power Division, Upazila Parishad	2019-2020	Participation with local people. Ensuring sustainability and durability of electricity supplies	1. Windmill area in Ward 3	N/A	
5	Road construction	Upazila Parishad, Local Government Engineering Department (LGED), government/non-government organization	2019-2020	Use local labor, locally available soil and other materials. Ensure sustainability. Increase the height of the road	1. 1 km Kironpara Road up to embankment in Ward 1 2. 1 km Abdul Hadi Shikdar Para Road (north side of Jasim Uddin School) in Ward 3	N/A	Labor force must be collected from local people. Use locally available construction materials
6	Guide wall on both sides of the road	Upazila Parishad, Local Government Engineering Department (LGED), government/non-government organization	2019-2020	Use local labor, locally available soil and other materials. Ensure sustainability	1. 1 km Kironpara Road up to embankment in Ward 1 2. 1 km Abdul Hadi Shikdar Para Road (north side of Jasim Uddin School) in Ward 3	N/A	Labor force must be collected from local people. Not to use locally available sands for construction as sand is saline and it would affect the integrity of the structure
7	Installing geotube in seaside of the embankment in the way that ocean current	Bangladesh Water Development Board (BWDB)/ Local Government Engineering Department (LGED)	2019-2020	Participation with local people. Using locally available resources (sand). Ensure high	1. North side of Kironpara and Barabagha in Ward 1 2. South western side of Haiderpara in Ward 3 3. West side of Telipara in Ward 2	N/A	Labor force must be collected from local people. Use locally available construction materials

	first hits the geotube			quality of geobag material	4. North side of Purba Ali Akbar Dail (Jelepara in Ward 6) 5. West side of Tabalor Char in Ward 8		
8	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 Tabalor Char Road in the boundary of Ward 3 and Ward 8 2. Kulatuli Road sluice gate in Ward 6	N/A	Not to use locally available sands for construction as sand is saline and it would affect the integrity of the structure
9	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 7	N/A	Not to use locally available 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	1. Killa in the East side of Haidarpara in Ward 3 2. Killa in Sondipipara in Ward 5	N/A	Not to use locally available sands for construction as sand is saline and it would affect the integrity of the structure

				efficiency, safety and accessibility			
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, non-governmental organizations, 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. Ward 9 mangrove plantation project area 2. Western part of Ward 6 and Ward 7 3. Eastern part of Ward 3 and Ward 8	N/A	Labor force must be collected from local people. Enhancing socio-economics benefits to local communities 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 labor. Ensure sustainability and productivity. Using early rainfall before monsoon for cultivation and irrigation	1. Introducing saline tolerant crops for the farmers of wards 3, 4, 5 and 6	N/A	Ensure food and nutrition security for people of the coastal area
13	Embankment and road construction	Bangladesh Water Development Board (BWDB)/ Local Government Engineering	2019-2020	Use local labor, locally available soil and other materials. Ensure sustainability.	1. North side of Kironpara and Barabagha in Ward 1 2. South western side of Haiderpara in Ward 3 3. West side of Telipara in Ward 2	N/A	Labor force must be collected from local people. Use locally available

		Department (LGED), Upazila Parishad, development partners		Increase the height of the road	4. North side of Purba Ali Akbar Dail (Jelepara in Ward 6) 5. West side of Tabalor Char in Ward 8		construction materials
14	Increasing height of homestead	Upazila Parishad, government/non-government organization	2019-2020	Use local labor, locally available soil and other materials. Ensure sustainability. Ensure the settlement height is the higher than the 100-year return period of inundation	1. Households of cluster villages of Tabalor Char in Ward 1 and Ward 2 2. Households of cluster villages of Jelepara in Ward 6	N/A	Labor force must be collected from local people. Use locally available construction materials
15	Improving communication system	Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Upazila Parishad, development partners	2019-2020	Use local labor, locally available soil and other materials. Ensure sustainability	1. Improving communication system in wards 3, 4, and 6	N/A	Enhancing socio-economics benefits to local communities from tourism

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 the local government. Through writing a detailed investigation of the risks faced by those living in Ali Akbar Dail Union in Kutubdia, the community members were provided with information they themselves compiled. The study was participatory in design through incorporating community members into the survey team. Thus, the primary information gathered in the field was from people who actually live with these risks. The findings presented in this report are intended as a guide for implementing the risk reduction imperatives identified during the community-based risk assessment. These are intended to prevent and mitigate hazards, and to reduce vulnerability in the Ali Akbar Dail Union.

According to local people, key informants, respective government organizations and other stakeholders, this union is most vulnerable to cyclones, storm surges, tidal floods and salinity. Moreover, the magnitude of these hazards become greater due to the poor maintenance of embankments and the unions geographic location. Due to high salinity conditions, agriculture does not occur and people are dependent on salt cultivation and shrimp farming. Therefore, they are dependent on a highly vulnerable source of income. This is further compounded by poor infrastructure, with the main protection embankment damaged by high tidal currents and floods in 2019. Long-term planning and studies can help development efforts to be more successful 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

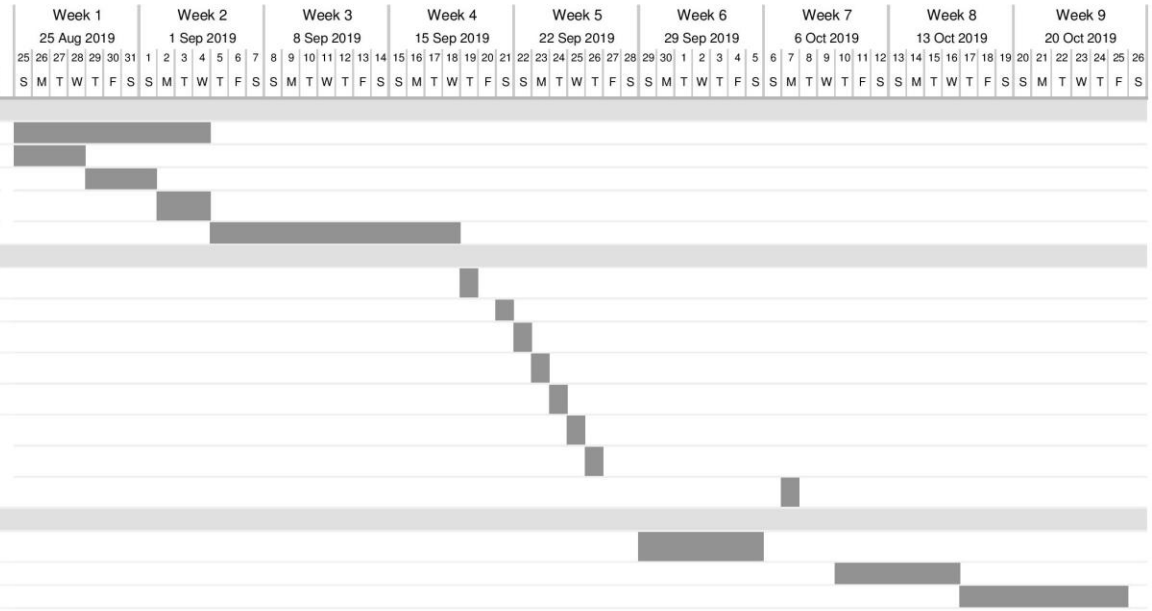

Figure 17: Schedule of map and CRA production

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 gone lost? What are the challenges faced by the 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 (Ten / twenty years before from now) 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 change of magnitude of causing damages? Or they are the same as before? From your experiences do you predict that the type of hazards might be changed in future (ten to twenty 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 discussions were conducted on 22 September 2019.

Table 8: List of FGDs

FGD No	Community	Location	Ward No	Number of participants
1	Farmers	Hokdarpara	2	10
2	Minor community (Hindus)	Jelepara	6	10
3	Salt farmers	Shoirgerpara	1	10
4	Different occupational people	Kaluardail	4	9
5	People occupied in different services	Launch Ghat Bazar	6	8
6	Women community	Sondipipara	5	10
7	Unprivileged people group	Tabalor Char	7, 8	8
8	Rural market/shop owners	Haidarpara	3	9
9	Hatchery and fishery owner/labor community	Launch Ghat Bazar	6	10

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	Nurus Safa B. Com	Chairman, Ali Akbar Dail	23 September 2019
2	Rezaul Karim	Secretary, Ali Akbar Dail	23 September 2019
3	Terkul Islam	Headmaster, Saiful Huda Government Primary School	23 September 2019
4	Nasima Aktar	Reserved Seat Member of Ward 1,2,3	23 September 2019
5	Mahbuba Khanom	Reserved Seat Member of Ward 4,5,6	23 September 2019
6	Kofiluddin	Union Leader, Ansar and VDP	23 September 2019

Annex D: Photos of field study area

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

Figure 18: Brac Cyclone Shelter

Figure 19: Deep tubewell where water is flowing nonstop

Figure 20: Cyclone Shelter in Killa

Figure 21: Gonosastho Cyclone Shelter

Figure 22: Broken part of the embankment in Ali Akbar Dail launch ghat

Figure 23: Broken part of wmbankment beside Jelepara

Figure 24: Only 2 houses of ward 9 that wa shifted in ward 8 after 2016 Roanu

Figure 25: Only High School of Ali Akbar Dail Union

Figure 26: Cyclone Shelter in Killa that has no soil support in the base of the shelter

Figure 27: Mosque that can be used as Cyclone Shelter

Figure 28: This Madrasha Building is very old and should be condemned due to its poor structural condition

Figure 29: Broken part of the embankment in ward 8

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