Community Risk Assessment (CRA) Report of Taitong Union, Pekua, Cox's Bazar

Disaster Risk Management in Cox's Bazar, UNDP

10/27/19

Table of Contents

Chapter 01-Introduction

CRA (Community Risk Assessment) is a participatory process for assessing hazards, vulnerabilities, risks, the ability to cope, the preparation of coping strategies, and the preparation of a risk reduction action plan by the local community. CRA uses scientific information, predictions, and participatory discourses to identify, analyze, and evaluate risk environment of a particular community and reach a consensus amongst the community on actions that are needed to manage the risk environment. This 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, and others) of the same community. Therefore, the representation ensures representation of disaster management professionals, community members and other groups and that their points of views are reflected. CRA encourages community participants to respect others' concerns and has been conducted in the Taitong Union of Pekua Upazila, Cox's Bazar. The report is based on the information collected from the field survey and secondary data sources (Comprehensive Disaster Management Programme (CDMP), 2006).

Cox's Bazar is well known in Bangladesh for the longest natural sea beach, not only in the country, but worldwide. It is also a very important fishing port and tourist attraction of the country. The unbroken, sandy beachfront is around 96 miles long with a gentle slope. Cox's Bazar is located in the southeast coast of Bangladesh with an area of 2491.86 square kmthe Bakkhali river in the North and East sides, the Jhilwanj Union on the South side, and the Bay of Bengal in the West side (Wikipedia, 2019a).

Being located in the coastal zone, the climate is a bit different from the whole country as it has extreme temperatures, heavy rainfall, excessive humidity, and seasonal variations. Since the area is located on the open coast, it is vulnerable to different hydro-meteorological hazards, such as cyclones with storm surges, landslides, excessive rainfall, and flash floods are very common hazards.. There are eight Upazilas in Cox's Bazar district and Pekua is one of them (Wikipedia, 2019a).

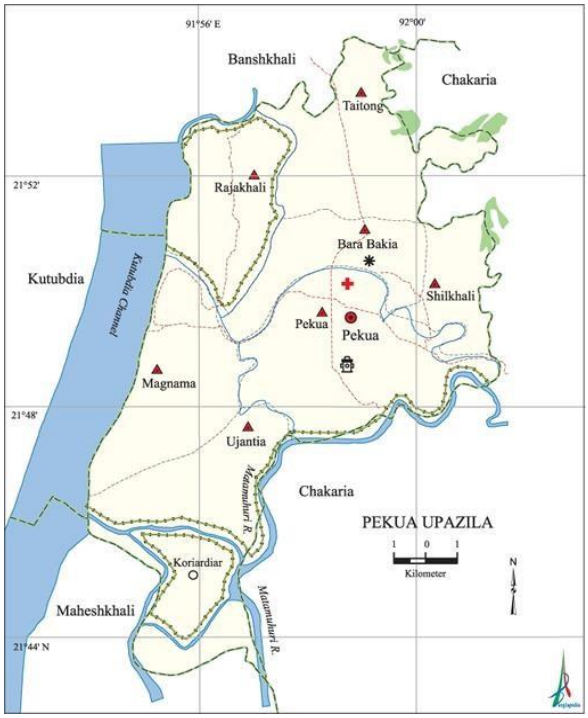


Figure 1: Upazila Map of Pekua. (Source: (Banglapedia, 2015))

Pekua is a Upazila of Cox's Bazar, which was formed in 2002, including seven unions of Chakaria (Bangladesh National Portal, 2019). The name of the Pekua Upazila has an interesting story. According to the locals, the coastal side of the area used to get muddy after tidal flows and it is termed as "Pek" (mud) locally. The name turned into "Pekua" after the local name "Pek" was termed. The Upazila is bounded by Chakaria on the East, Banshkhali and Chakaria on the North, Moheskhali on the South and, the Kutubdia

Channel on the West. There are not many rivers, but the Matamuhuri and Kutubdia channels are notable waterbodies which contribute to the area's water demand along with some different sized canals , among them Bhola khal (Banglapedia, 2015).

The Upazila consists of a total of seven unions, while the working stations of this project were in two unions named- Shilkhali and Taitong. The total area of the Upazila is about 139.68 km^2. The total population of the area is 1,71,538, where the male population is 86,310 and the female population is 85,228. The literacy rate of the Upazila is about 50.01% (BBS 2011). The Upazila is mostly dependent on agriculture for livelihood, however, fishery, poultry, and salt fields are also common in some areas. There are 298.26 km of Kuccha Road, 123.89 km herring bone bond road and 89.36 km Pucca Road in the Upazila (Bangladesh National Portal, 2019).

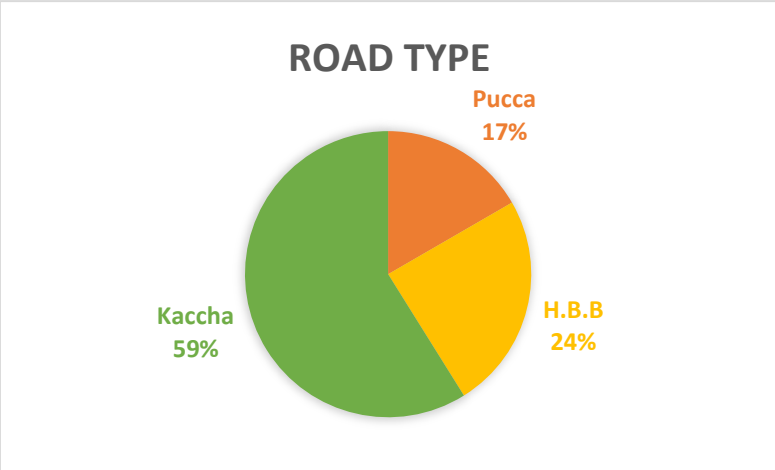


Figure 2: Road types of Pekua Upazila (Source: (Bangladesh National Portal, 2019))

At one time,the whole Upazila was connected only by waterways, but with time, it has developed road communication, which contributed to the economy of the Upazila. The Upazila is now well-connected with both Cox's Bazar Sadar (85 km) and Chittagong District (95 km) by road. The Pekua Upazila is also connected to Kutubdia Island by waterways (Bangladesh National Portal, 2019).

1.1 A Short History of the Union:

Taitong Union is a total of 2470 acres and embedded by Banskhali Upazila (Chattogram district) in the North, the Rajakhali Union in the West, Barbakiya Union in the South, and Chakoriya Upazila in the East. The number of total households of this union is 5667. The union has a total of nine wards and a population of 20,160 (The male population being 9,826 and the female being population 10,334) according to BBS 2011. The Union was under the Barabakia Union earlier, along with Shilkhali, but got detached and established as a separate union later in 1992 (Wikipedia, 2019b).

Although there is not much history of the Taitong Union, it has some interesting stories in locality regarding its naming. From the southern side of the Karnaphuli river to the far Arakan, the whole area was ruled by Buddhist monks. Soon after, the ethnic group "Mug" established the first settlement here. However, there are different opinions on the naming of Taitong. In the Mug or Chakma language, the word "tai"means the area and the word "tang"means forest or jungle, therefore, Taitong means the forest or mountainous area. This indicates that the area is formed by the Mug. Many people think that this history is reasonable. Another piece of information is that there was a Mug king named Tuai living in the area. His descendants used to refer to the area as "Tung" by their native language. The name Tuai Tung or Taitong originated in the name of that Tuai Mug king (Wikipedia, 2019b).

In addition, there are widespread reports that people used to cultivate in the forested lands by hill cutting and deforestation. The wild elephants, pigs, monkeys ,and other wild animals, which did great harm to the crops, prompted the area to be guarded day and night to protect the crops. They used to guard the area by using tall trees and bamboo, which was locally termed as "tong" or "tangi.

1.2 Demographic Information:

This section has been prepared using BBS 2011 information and the community risk assessment field survey. Taitong union is comprised of 18 villages, which include:

- Wahedpur
- Narayonpur
- Abdullahpur
- Jinnotpur
- Ramnagar
- Nowakandi
- Putiyapara
- Rajapur
- Subil
- Shibnagar
- Kanibil
- Tanachara
- Burirpar
- Sayadpur
- Hadipur
- Machuyabad
- Khalpara
- West-Pomkara

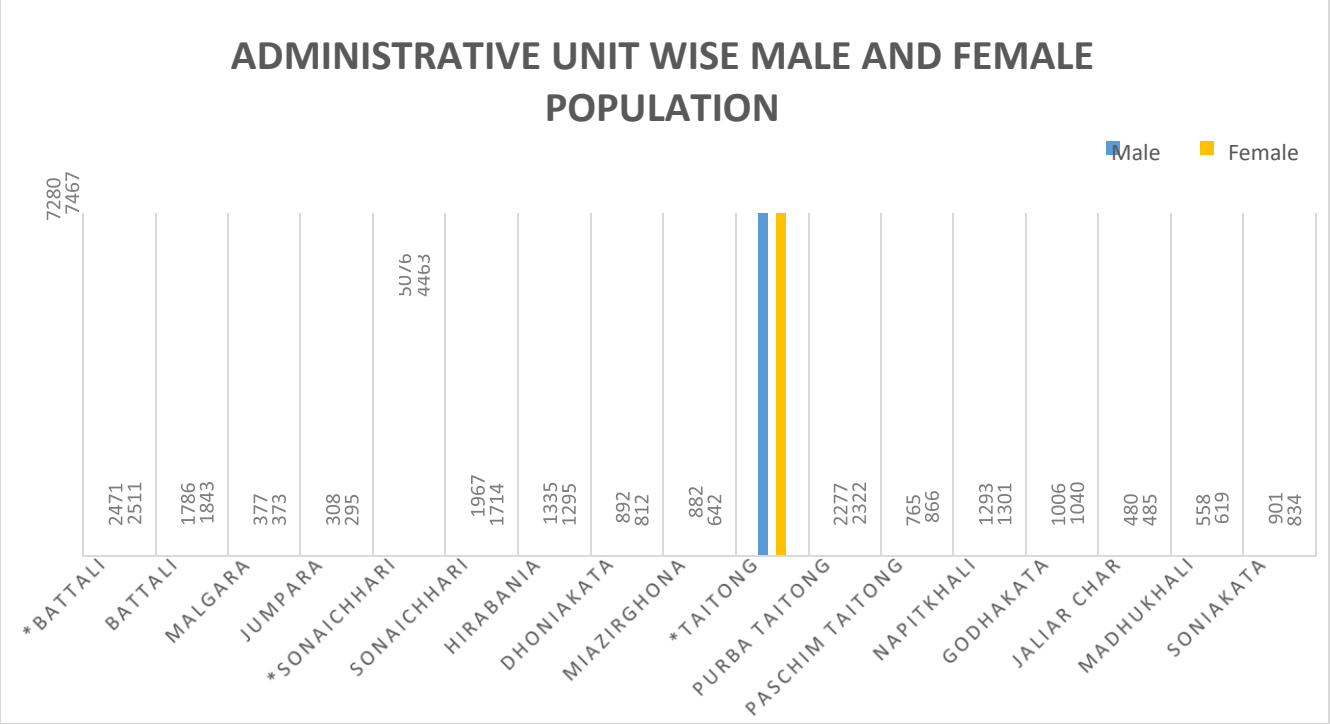


Figure 3: Administrative Unit wise Male and Female population. (Source: BBS, 2011)

The union has a larger female population than the male population, but the female population is not very active in economic works, they remain engaged mainly in household chores.

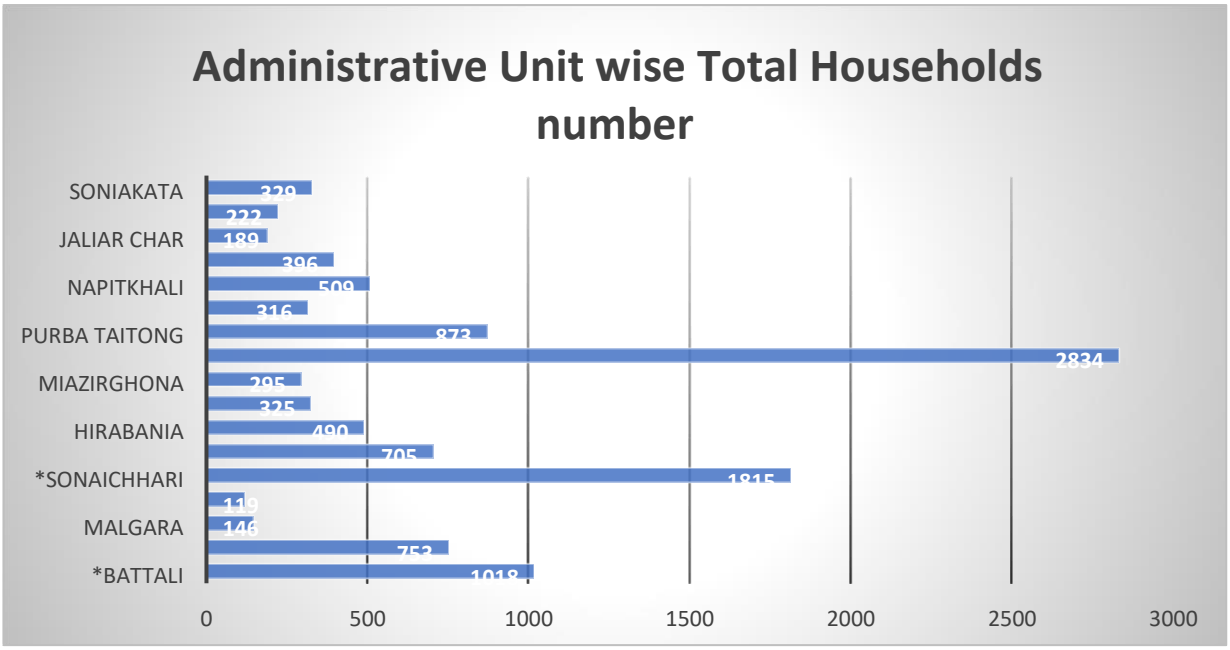


Figure 4: Administrative Unit wise Total Households number. (Source: BBS, 2011)

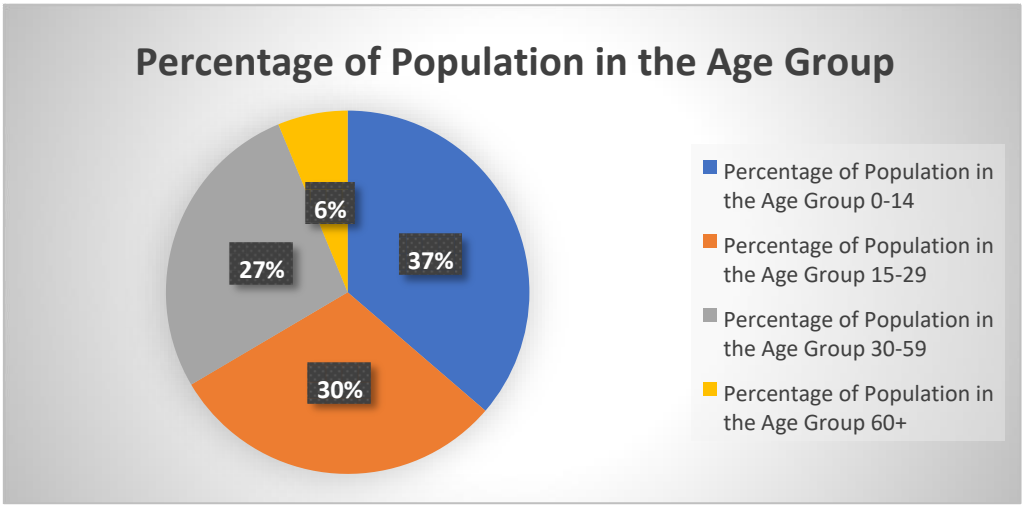


Figure 5: Percentage of Population in the Age Group. (Source: BBS, 2011)

This entry provides 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), 60 years and over (elderly). According to Population and Housing Census of 2011, 37% of the total population belonged to the children group, 30% belong to the early working age group, 27% belong to the prime working age group and 6% belong to the elderly group. While conducting the community risk assessment field survey, Muslims were found to be the majority and very little number of Hindu people living in the union. However, no ethnic minorities were found in this union in the course of the community riskm assessment.

1.3 Socio-Economic Condition of the Union

A socio-economic condition is an economic and sociological combined total measure of peoples 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. According to the Bangladesh Population and Housing Census 2011 Information and Field Survey, this section has been completed.

a. Literacy rate: The literacy rate in the Taitong Union is 33%. The literacy rate is 35% for males and 32% for females, which shows the tendency that it is slightly lower for females.

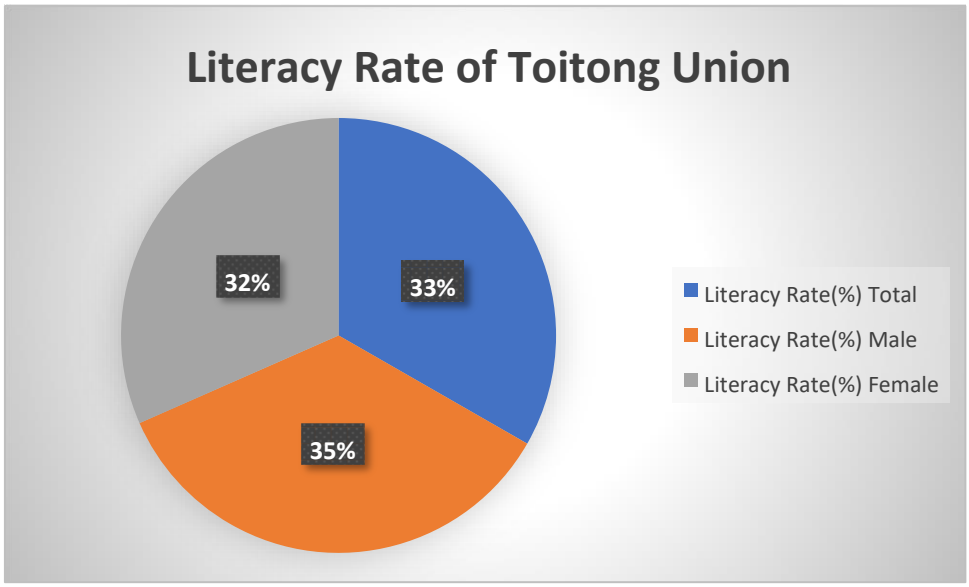


Figure 6: Literacy Rate of Taitong Union. (Source: BBS, 2011)

b. Type of structure: In the Taitong Union, 5% of general households live in pucca and/or semi-pucca house made of solid and permanent materials, 95% in kutcha 7ouse made of natural material and/or *jhupri*, made of temporary materials.

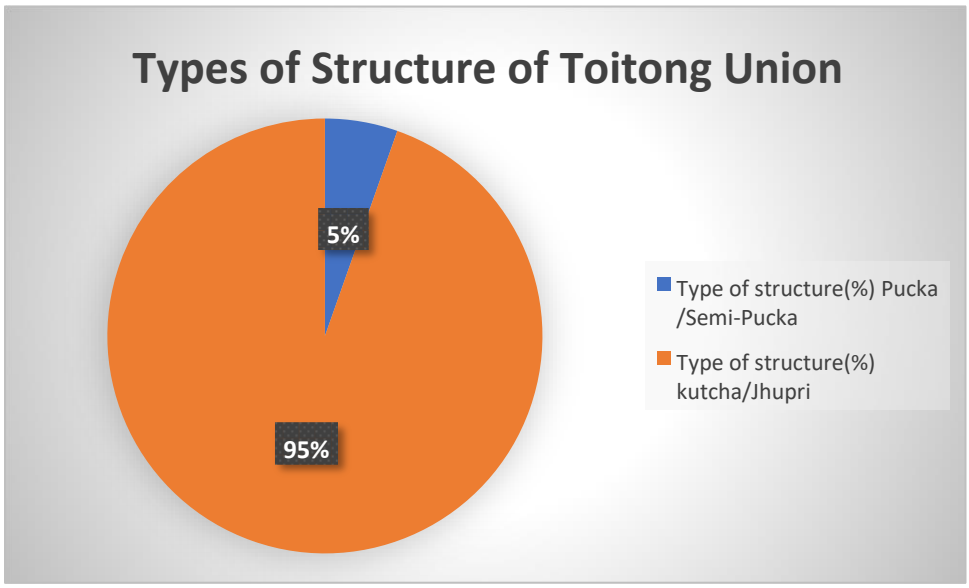


Figure 7: Types of Structure of Taitong Union. (Source: BBS, 2011)

c. Toilet facility: In the Taitong Union, 61.4% of general households use a sanitary latrine, 27.6 % use a non-sanitary latrine, and the remaining 10% have no toilet facility. The ratio of households with non-sanitary latrines and no toilets is lower than households with sanitary latrines.

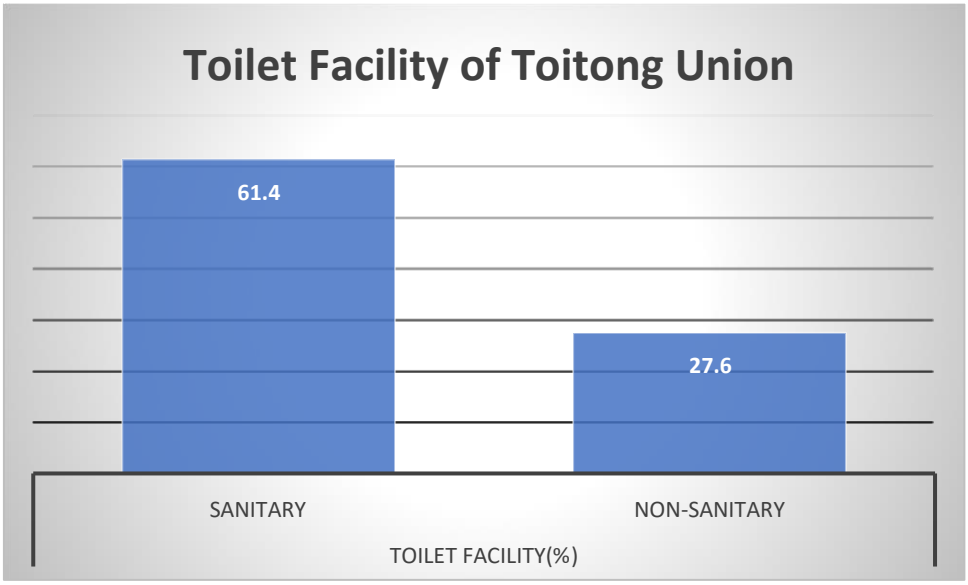


Figure 8: Toilet Facility of Taitong Union. (Source: BBS, 2011)

d. Source of drinking water: 96% of general households get water from a tube-well, 0.1% from tap and the remaining 4% of household get water from other sources (i.e. pond, well, rainwater harvesting, and Pond Sand Filter).

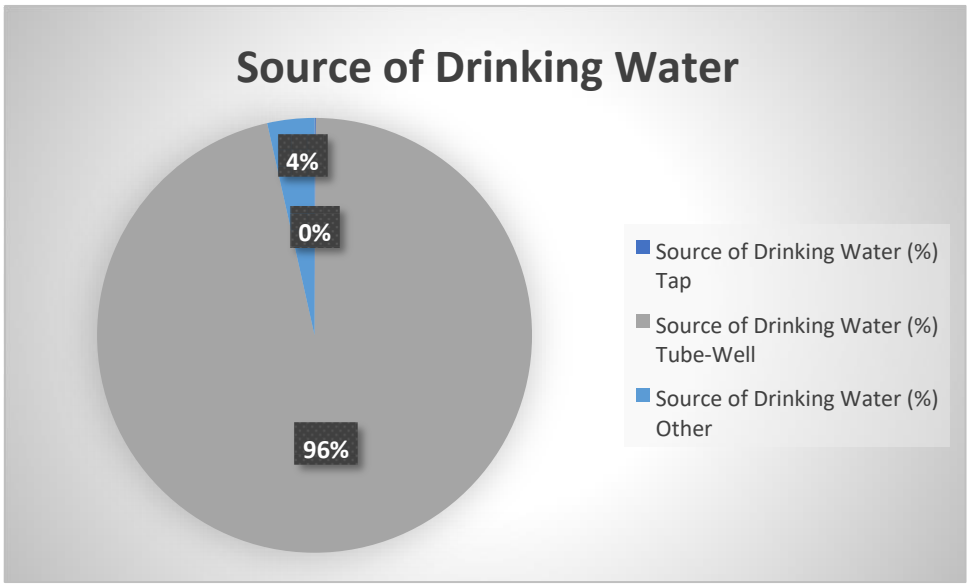


Figure 9: Source of Drinking Water. (BBS, 2011)

e. Electricity connection: The area has brought under the Rural Electrification Program. However, only 11.1% of households have electricity and the rest of the households have solar electricity or are without electricity. Some villages show higher percentage of electrification(i.e. 33.6% in Dhoniakata, 34.6% in Maizirghona, and 28% in Jaliar-char).

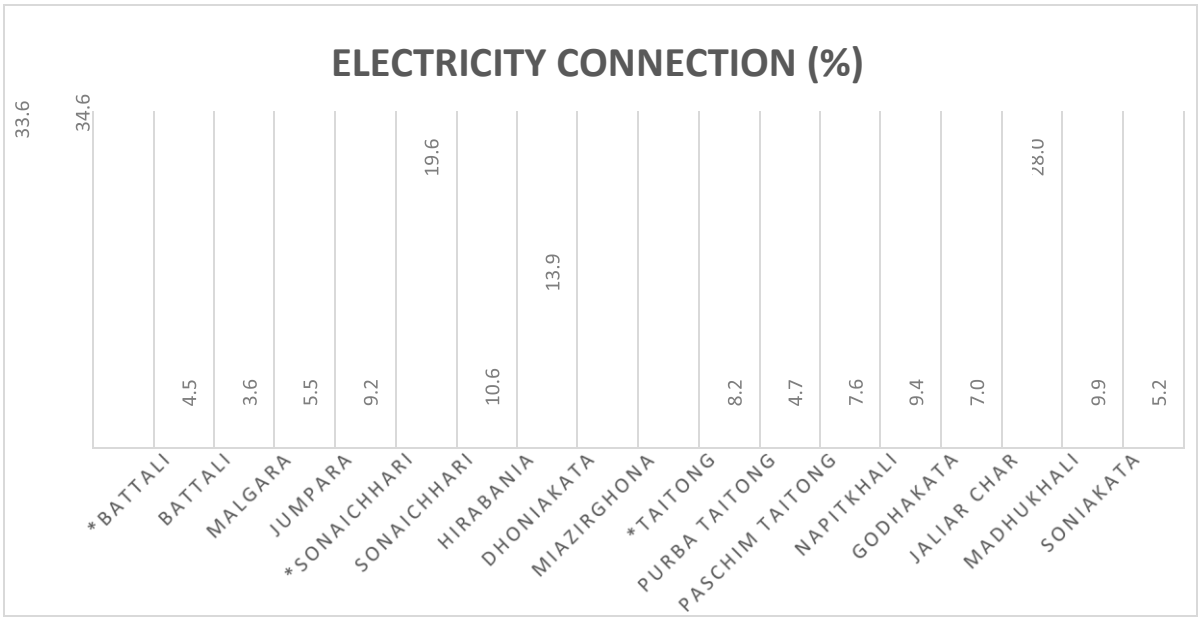


Figure 10: Administrative Unit wise electricity connection of Taitong. (Source: BBS, 2011)

f. Poverty: Based on the economic status of the area, 25% of people are classified as extremely poor, 20% are classified as poor, 20% are classified as marginal poor, and the remaining 35% are classified as wealthy in Taitong Union.

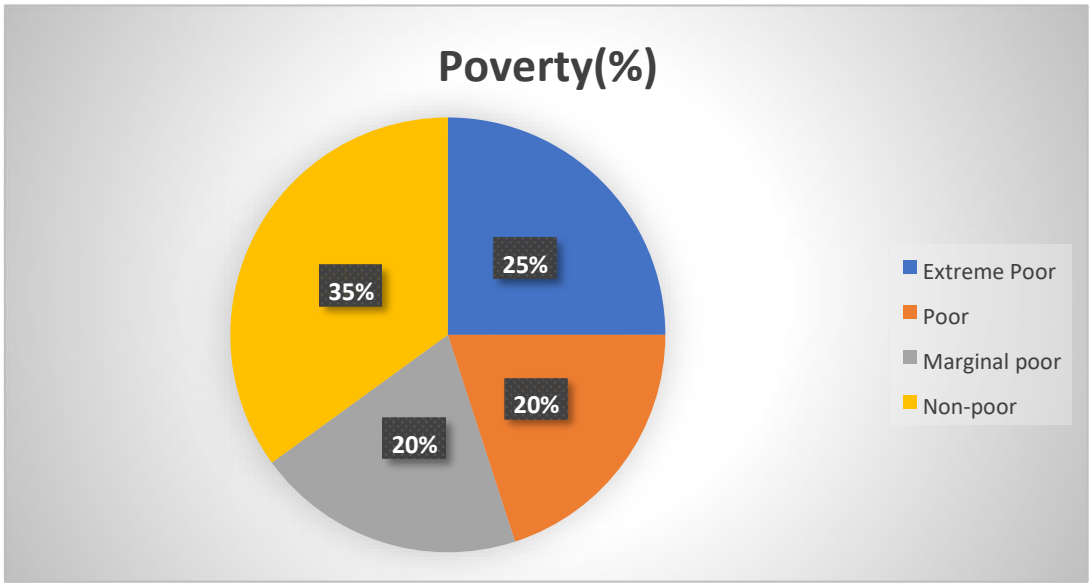


Figure 11: Socio-economic Conditions of Taitong Union. (Source: Field survey, 2019)

The economy of Taitong is more diversified as people are engaged in different occupations such as farming, fishery, salt cultivation, or vegetable cultivation. Nevertheless, there is little difference between urban and rural areas of Taitong. Urban residents are mostly engaged in service as working in NGOs, teaching, and fishery. About 80% of the people of this union are engaged in agriculture. Most of them work in agricultural land and salt production. Therefre, this profession dominates the economy of Taitong.

The population in the union are also engaged in fishing and 3% of the total population is either directly or indirectly dependent on the fishing profession. Main sources of income in this union are agriculture, non-agricultural laborer, industry, commerce, transport and communication, service, construction, religious services, rent and remittance, etc. The main crops are paddy, potato, mustard, chilly, sugarcane, wheat, betel leaf, and vegetables. Main fruits of the region include mango, jackfruit, litchi, banana, papaya, pineapple, guava,

and lemon. This union also has a few numbers of fisheries, dairies, and poultries. Noted manufactories are rice mills, sawmills, the salt industry, bakeries, cottage industries, goldsmiths, blacksmiths, and woodwork. Main exports include shrimp, salt, fish, betel leaf, and vegetables.

1.4 Local resources:

Among the 17 educational institutes, there are six public primary schools, one each of high school and college, one girls' Madrasa, and eight Madrasas were found while conducting field survey.

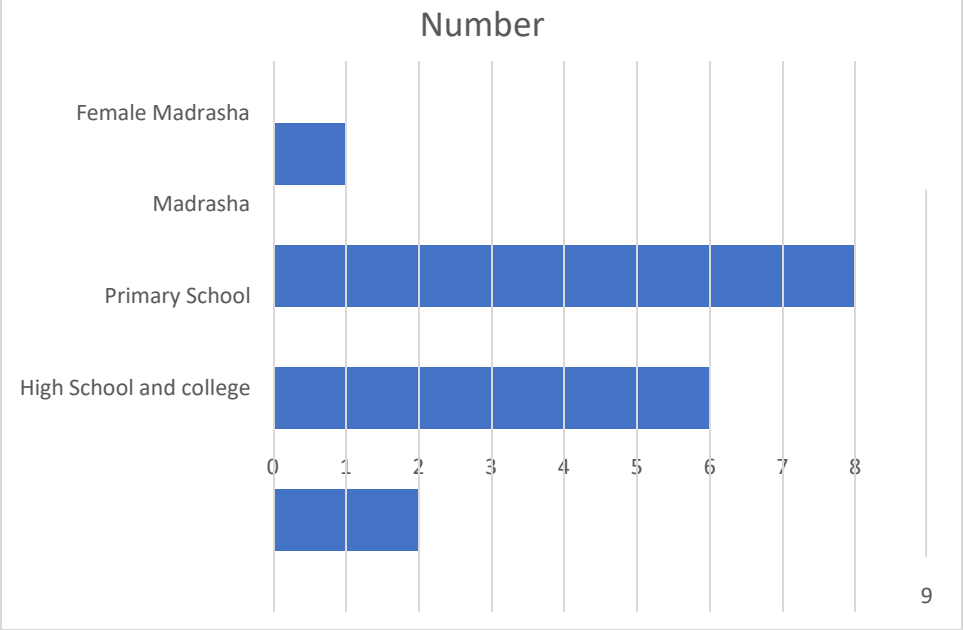


Figure 12: Number of educational institutes. (Source: Field survey, 2019)

Among all religious institutions, there are 20 mosques, 12 graveyards, and two temples. There is one community clinic, five markets, one bank, one post-office and three NGOs.

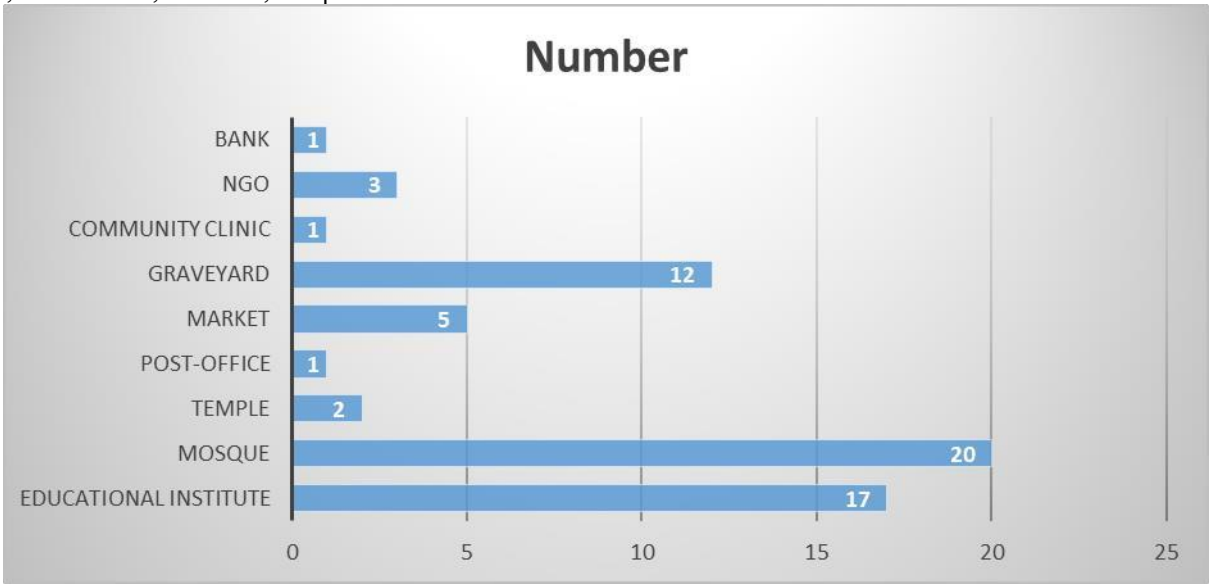


Figure 13: Number of Physical Structure. (Source: Field survey, 2019)

Main sources of income of this union are agriculture, non-agricultural laborer, industry, commerce, transport and communication, service, construction, religious service, rent and remittance and others. Main crops are paddy, potato, mustard, chilly; sugarcane, wheat, betel leaf, vegetables and main fruits are mango, jackfruit, litchi, banana, papaya, pineapple, guava, and lemon. This union also has a few numbers of fisheries, dairies,

and poultries. Noted manufactories are rice mills, sawmills, the salt industry, bakeries, cottage industries, goldsmiths, blacksmiths, and woodwork. Main exports include shrimp, salt, fish, betel leaf, and vegetables. Several NGOs like BRAC, ASA are working in this union.

Base Map: Taitong Union, Pekua Upazila, Cox's Bazar

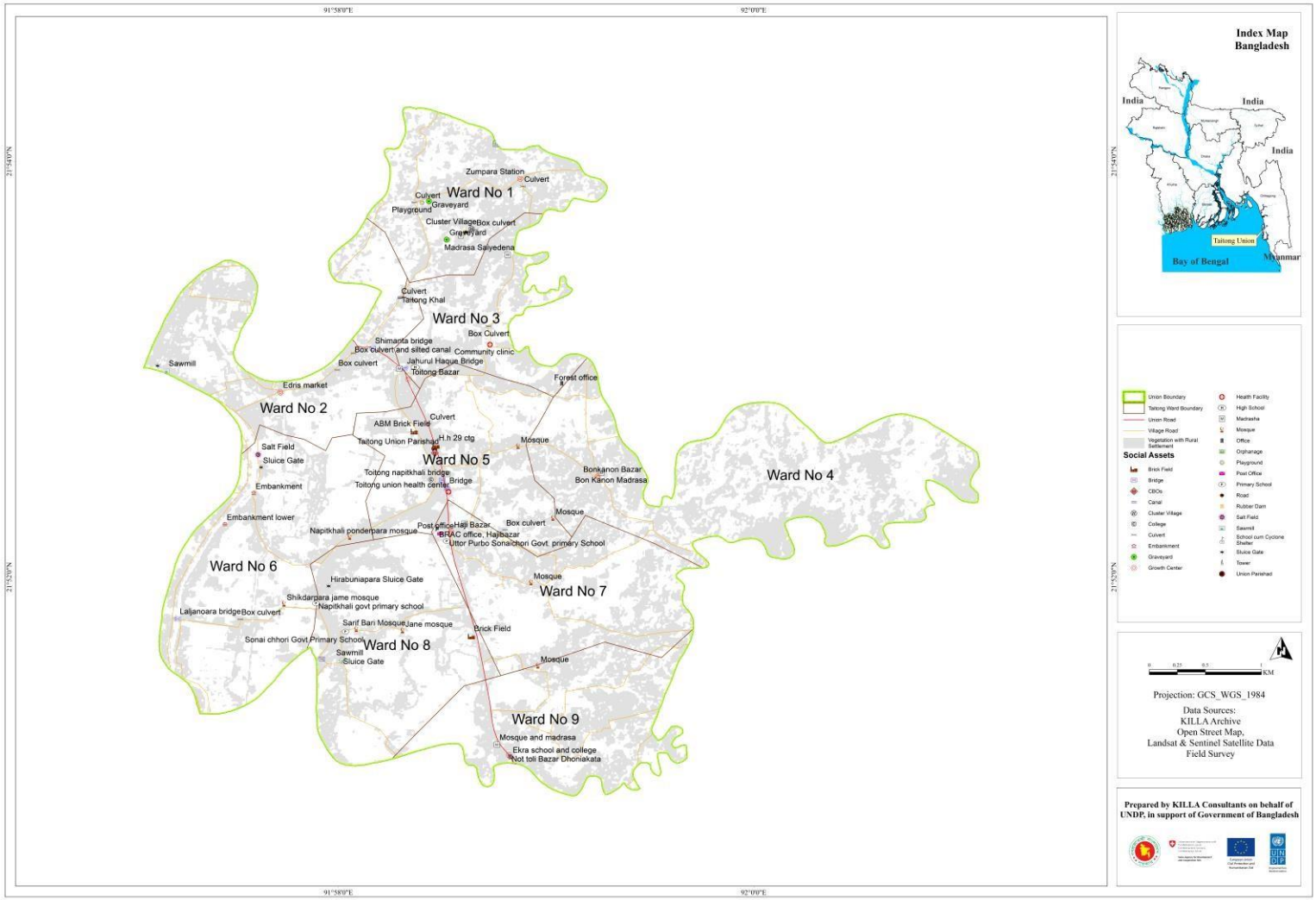


Figure 14: Base Map of the Union. (Source: Satellite data, open street map and field survey, 2019)

Chapter 02- Local Hazards and Vulnerabilities

2.1 Historical Analysis of Hazards:

The Taitong Union in Pekua Upazila is prone to flood due to being situated near the Bakkhali and Matamuhuri rivers, also the union is full of different sized Chhora, which accumulate into canals named Tilkhali, Taitong, and others. During monsoon season, heavy rain causes floods by overflowing the banks of these canals as they are highly silted and cannot hold a minimum level of water. Flash floods are also very common in this area as it is situated near the hilly region of Cox's Bazar hill tracks. Flash floods are very frequent and augment in magnitude when the hilly discharge added with the overflowing water of the canals and *chhoras*.

Heavy rainfall also acts as a primary hazard and triggers secondary hazards like landslides and flash floods. Moreover, this area is susceptible to landslides because of the soil structure of the area, though no historic landslide occurrence was reported. Soil texture of this area is compounded with very fine sediment, whenever there causes any heavy rain fall for a long period of time, which may result into landslides or land subsidence. Additionally, coastal floods, water logging, and salinity are endemic and recurrent natural hazard in this union because they are situated near the Kutubdia Channel. People of this area are used to coastal flooding and salinity. Water logging is not as common in the area, but causes much harm as there is the lack of sluice gate to discharge the tide water in low laying areas. Siltation in the canals also causes waterlogging in low lands by overflowing of canal water, which can cause damage to the arable land and sweet water sources of this union.

Bangladesh is part of the humid tropics, with the Himalayas on the North and the funnel-shaped coast touching the Bay of Bengal in the South. This peculiar geography of Bangladesh brings not only the life-giving monsoons but also catastrophic cyclone. This union is also inclined to cyclones due to being located near the coast of the Bay of Bengal. The deadliest cyclonic chaos that occurred in this area was after the 1991 cyclone, Gorky. It caused great damage to the local economy, property, lives, and livelihood. The May 1997 cyclone also affected thousands of structural properties, livestock, cropland, and human lives. The recent cyclones didn't follow this path, rather it affected the southwest coast so this area didn't face too much damage in recent times

due to cyclones. Cyclones normally occur during the pre-monsoon season from Baishak to Joistho and northeast monsoon from Ashwin (Mid-September) to Kartik (Mid-October) months.

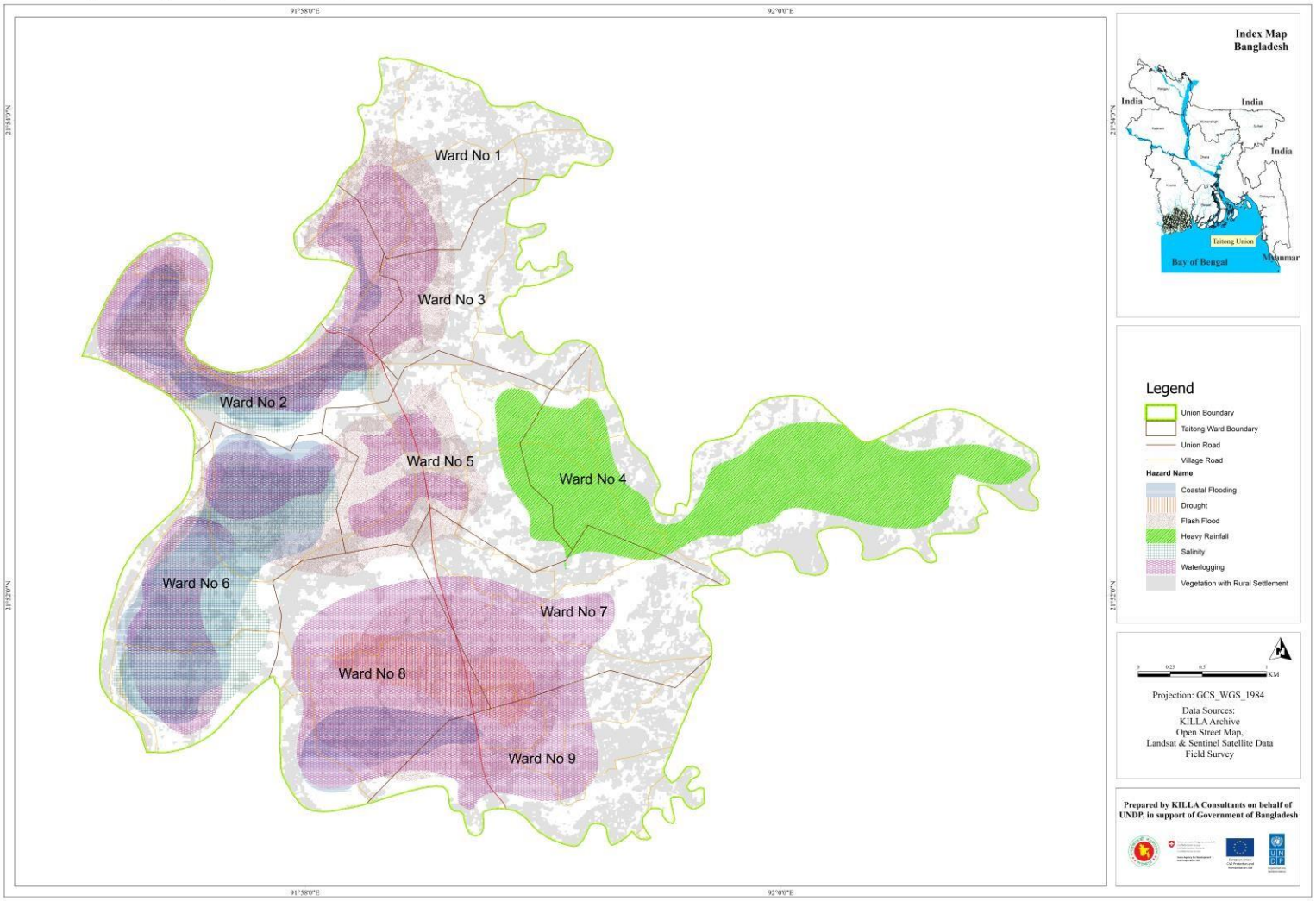


Figure 15: Hazard Map of Taitong. (Source: Satellite data, open street map, community participation and field survey, 2019)

2.2 Hazard Venn and Calendar/Seasonality

The Taitong Union is extensively exposed to flash floods, water logging, and costal floods throughout the whole monsoon season in *Ashar (Mid-June)* to *Kartik (Mid-October)* months. Coastal floods also occur during *Kartik (Mid-October)* to *Chaitra (Mid-March)*. Cyclones occur in *Baishakh (Mid-April)* to *Kartik (Mid-October)* months, salinity, and costal flood occurs simultaneously during *Baishakh (Mid-April)* to *Jaistha (Mid-May)* and *Falgun (MidFebruary)* to *Chaitra (Mid-March)* months.

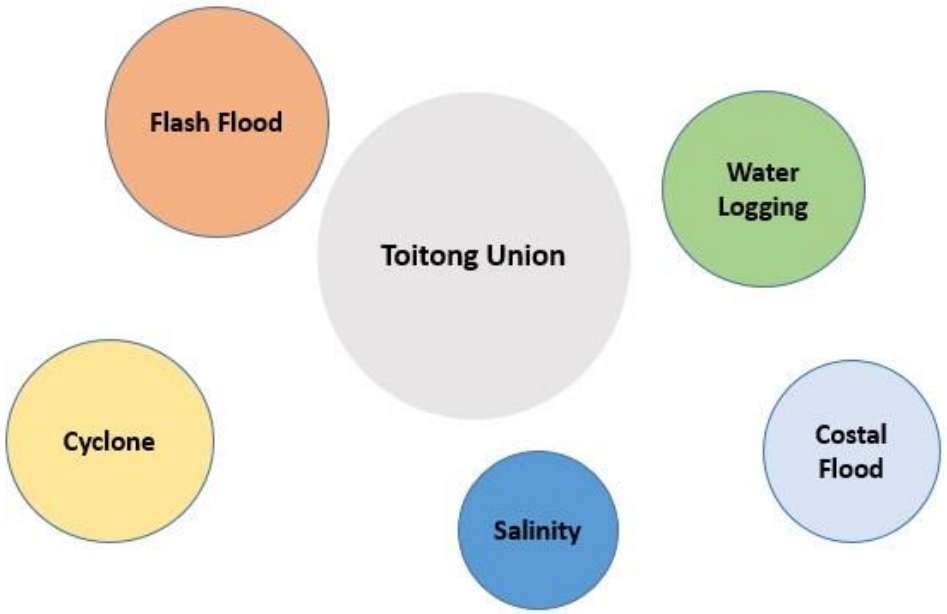
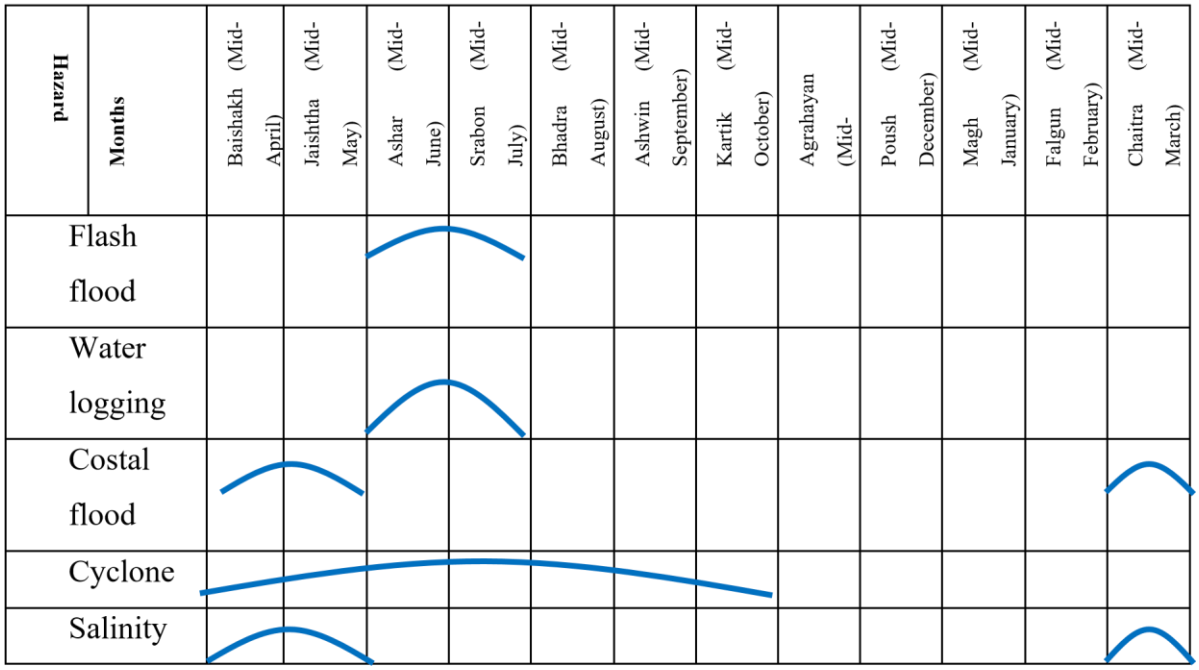


Figure 16: Hazard Venn of Taitong Union. (Source: Community Risk Assessment, 2019)

The above figure represents the hazard Venn Diagram of the Taitong Union. In this union, flash floods are a frequent hazard in the Taitong Union, which occurs almost every year. The intensity and extent of flash floods is also high and the loss due to this hazard is higher. Coastal flooding is also a common hazard in this union, although, it has low damaging capacity. Flash floods and coastal floods are the leading factors of two other hazards, which are salinity and water logging. Floodwater clogged in lower areas and cause slow intrusion of saline water into soil. Comparing with others hazards, the cyclone is less frequent in this union but when it is occurs, it causes moderate to severe destruction to this union.

Table 1: Hazard Calendar of Taitong Union



The curve line and the straight line signify the intensity rate of different hazard events in different periods. The curve signifies the peak time of any particular hazard and as it goes down with time signifying that the hazard's intensity is decreasing. For example, flash floods start from Ashar (Mid-June) and lasts until Bhadra (Mid-August). The intensity of the cyclone is higher and these curves are exhibiting different scenario.

The Taitong Union is extensively exposed to flash floods, water logging, and costal flood throughout the whole monsoon season in Ashar (Mid-June) to Kartik (Mid-October) months. Coastal flood also occurs during Kartik (Mid-October) to Chaitra (Mid-March). Cyclone occurs in Baishakh to Kartik (Mid-October) months, salinity and costal flood occurs simultaneously during Baishakh to Jaistha (Mid-May) and Falgun (Mid-February) to Chaitra (Mid-March) months.

2.3 Crop seasonality and exposure to hazards

Crop seasonality is broadly classified in three classes depending on the cropping patterns (i.e. Rabi Crop (October – March), Kharif -1 (March – July), Kharif -2 (July – October)). Rabi crops consists of BR-28, Potato, Lolita, lata, Boroaye, Kakrul, Cucumber, Betel Leaf Korola. Kharip -1 crops consists of Betel leaf which actually a tri-season crop and Kharip -2 crops include paddy (BR-10, 11, 22, 49), Radish and Betel leaf.

Table 2: Crop Calendar of Taitong Union

Crop Name	*Baishakh Mid-April)*	*Jaishtha Mid-May)*	*Ashar (Mid-June)*	*Srabon (Mid-July)*	*Bhadra Mid-August)*	*Ashwin Mid-September)*	*Kartik (Mid-October)*	*Agrahayan Mid-November)*	*Poush (Mid-December)*	*Magh (Mid-January)*	*Falgun (Mid-February)*	*Chaitra Mid-March)*
BR-49,10,11,22												
BR-28												
Paijang rice Radish												

Betel leaf												
Potato Lolita Lata Plum Spiny gourd Cucumber Bitter gourd												

The above table shows that different types of crops are produced here in different periods. Each crop maintains a specific time scale. Crop seasonality is broadly classified in three classes depending on the cropping patterns i.e. Rabi Crop (October – March), Kharip -1 (March – July), Kharip -2 (July – October). Rabi crops consists of BR-28, Potato, Lolita, lata, Boroaye, Kakrul, Cucumber, Betel Leaf Korola. Kharip -1 crops consists of Betel leaf which actually a tri-season crop and Kharip -2 crops include paddy (BR-10, 11, 22, 49), Radish and Betel leaf. Rabi crops consists of BR-28, Potato, Lolita, lata, Boroaye, Kakrul, Cucumber, Betel Leaf Korola are mostly expose to Costal flood, and Salinity. On the other hand, Kharip -2 crops include paddy (BR-10, 11, 22, 49), Radish and Betel leaf are mostly expose to Water logging, cyclone and salinity.

Table 3: Hazard exposure to crop variety

Crop Season	**Crop Name**	**Hazard's Name**
Kharip-1(Chaitra (MidMarch)-Srabon (MidJuly))	Betel-leaf	Flash flood, Water logging, cyclone, Salinity
Kharip-2 (Srabon (Mid-July)-Kartik (Mid-October))	Paddy (BR-10, 11, 22, 49), Radish and Betel leaf	Flash flood, Water logging, cyclone
Rabi (Kartik (MidOctober)-Chaitra (MidMarch))	BR-28, Potato, Lolita, lata, Boroaye, Kakrul, Cucumber, Betel Leaf, Korola	Coastal flood, Salinity

2.4 Land Use Pattern:

The area is noticeably hilly and had forests all over that. People were less into building structures or cutting hill forests for cultivation in past times. But as time goes by people are more into economic activities so they cut down hills and clear forests to cultivate vegetables, betel leaf. Cropping in low lands has become a loss for them as hazards like flood, waterlogging affect the crops in low land more than in hills. So, they have taken it as an adaptive and alternative measures to minimize the loss. Also, in some areas where coastal flooding occurs, people have adopted salt cultivation along with crops (like in ward no 2, 6, 8). It has also changed the land use pattern of that area. With time it can be seen that agriculture has been taken over the forests; also, settlements increased along with it. Satellite image and field data have been used to develop the land use pattern in the union to demonstrate the change over time.

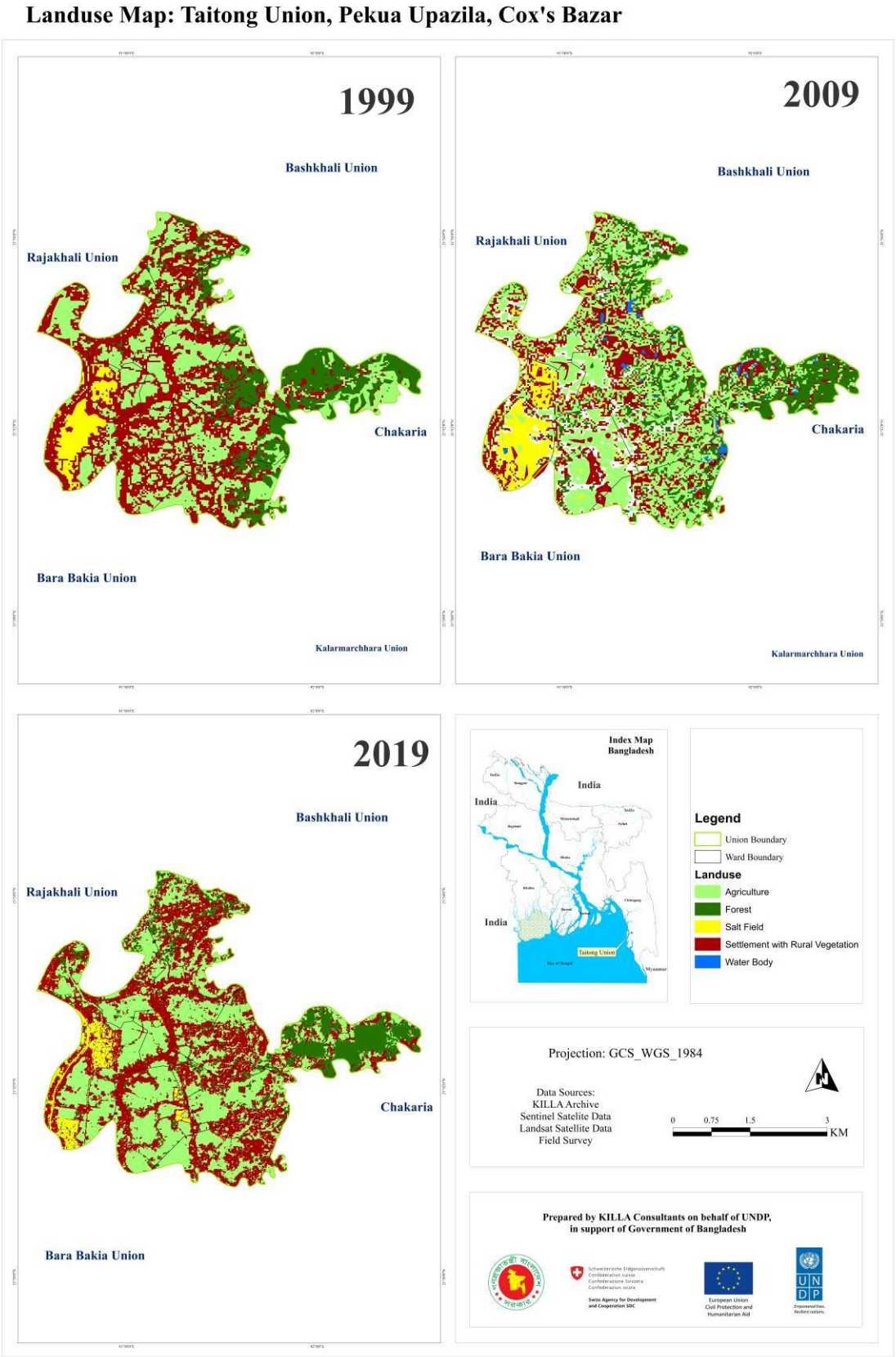


Figure 17: Land-use patterns of Taitong union. (Source: Satellite Data, Community Risk Assessment, 2019)

According to CRA data it found that land comprises of single cropland, double cropland, triple cropland, fallow land and other economic activities related land. In all ward almost 5% land is single cropland, 50% land is used

in double crop cultivation, around 32% land is used in triple crop cultivation, and 5% is fallow land. In all Wards 1% land is used in other economic activities and rest 1% are used as industrial activity.

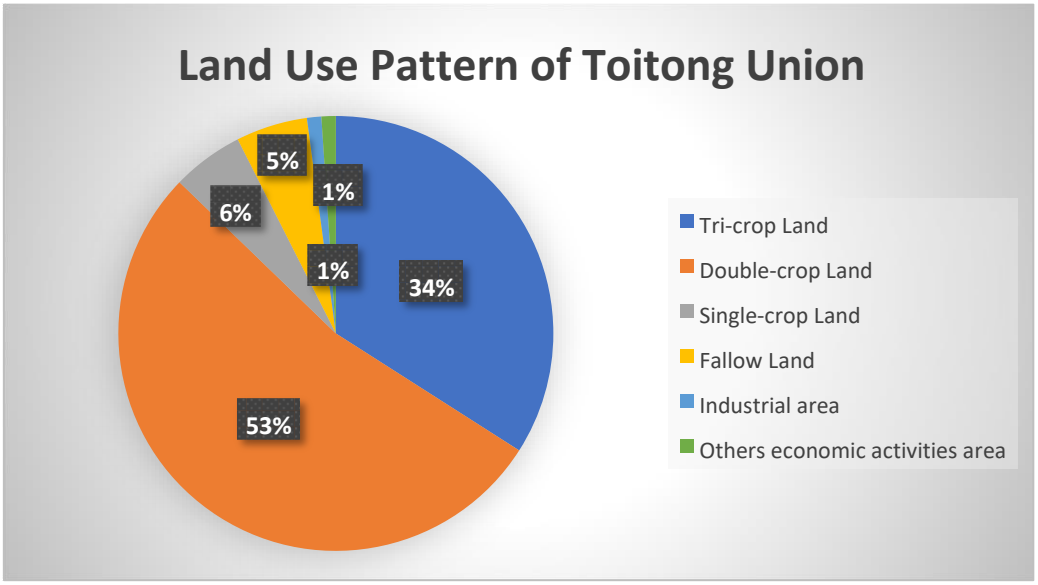


Figure 18: Land use Pattern. (Source: Field Survey, 2019)

2.5 Livelihood Options and Vulnerability

By analyzing the CRA data it can be seen that in Taitong Union, 80% people are involved in farming and the specific vulnerabilities of the group are poor irrigation, lack of flood water resistant varieties, unskilled labor, lack of technological intervention. Around 3% people are involved in fishing and their vulnerabilities are adapting old practices, lack of skill and awareness, market interpolation, location of pond, unskilled labor, poor technology. Approximately 5% people are involved in day laboring and their vulnerabilities are job sector affected by hazards, job unavailability, unskilled labor.

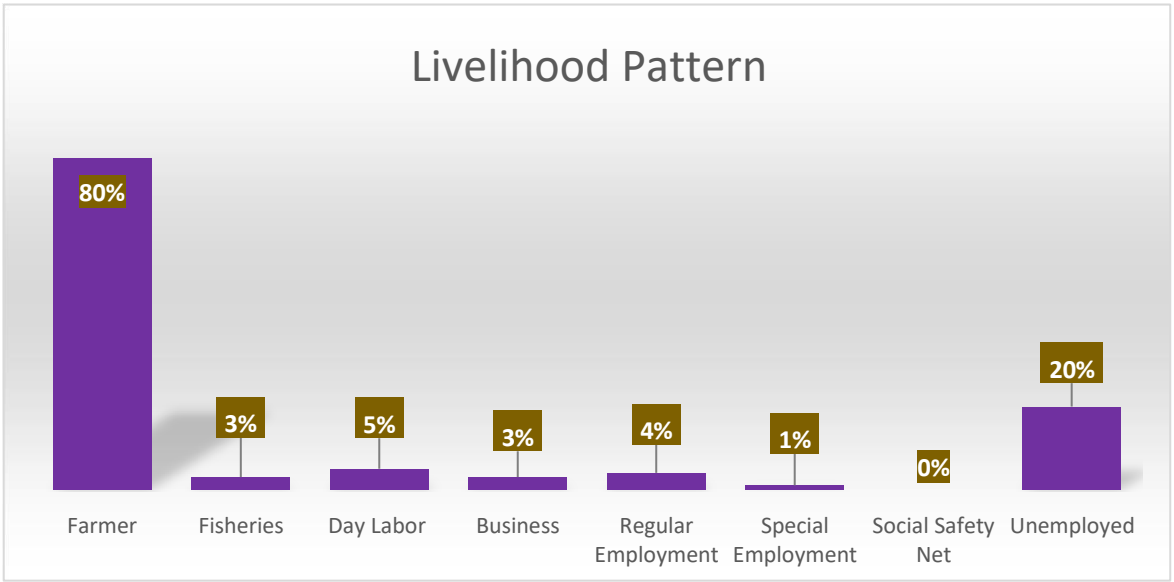


Figure 19: Livelihoods pattern of Taitong Union. (Source: Field Survey, 2019)

According to CRA data around 3% people are engaged in business and their transportation of goods affected by flood due to communication problem; business structure affected by flood and waterlogging. Around 5% people

are engaged in service and their main vulnerability is job security. About 20% of total population in this union are unemployed due to their negligence in education and responsibility.

2.6 Vulnerability of Population and Local Economy to Climate Hazards

Population Specific Vulnerability

Specific population groups have specific vulnerabilities. These are given below:

Male: Decreasing of monthly income, lack of income sources, physical and mental pressure and poor communication and transportation system.
Female: Being physically weaker, dressing practice (sari), social status, women's health and special needs.
Child (Boy): Being dependent on his/her parents or guardians for fulfilling basic needs, lack of life saving skills, physical, intellectual and emotional immaturity and unprotected from violence and lack of child friendly space.
Child (Girl): Being dependent on his/her parents or guardians for fulfilling basic needs, lack of life saving skills, physical, intellectual and emotional immaturity and social barrier and lastly unprotected from violence and lack of child friendly space.
Person with Disabilities (Male): Need of assistance for movement and other activities, having not enough support, unprotected from violence and having not enough importance.
Person with Disabilities (Female): Need of assistance for movement and other activities, having not enough importance, having not enough support and Unprotected from violence and social barrier.
Farmer (Male): Lack of agricultural knowledge, lack of knowledge of new agricultural and biological technologies to cope with different climatic diversities, not having enough financial support for the protection of agricultural product and having no access to available agricultural information.
Agricultural-laborer (Male): Having no work for a long period of time, dependence on primitive or traditional ways which is not much efficient, lack of access to modern technology and being under-paid.
Agricultural-laborer (Female): Having no work for a long period of time, dependence on primitive or traditional ways which is not much efficient, lack of access to modern technology and being under-paid.
Fisher Folk (Male): Not having enough personal protection during fishing, lack of robust communication system to get timely warning and being unaware of self-safety.
Day laborer (Male): Being under-paid, having no work for a long period of time and unwillingness of doing agricultural production.
Day laborer (female): Being under-paid, having no work for a long period of time, less physical ability to withstand extreme labor and unprotected from violence and discrimination.
Small Traders (Male): Having no business continuity plan and disruption and hardship in communication and transportation.
Small Traders (Female): Having no business continuity plan and disruption and hardship in communication and transportation

Food production and Food security

Food production in the union includes crop, livestock and fisheries. Among them: rice production is 90% self-sufficient which means the production in union can meet up 90% of its demand, no rice has been exported in previous year and 10% production deficiency occurs. Other crops like vegetables is 100% self-sufficient and they exported vegetables outside the union by 50% in previous year and didn't face any deficit till now in this production. Even some vegetables like papaya get exported to Chittagong according to the farmers. In Fisheries sector self-sufficient production is 40%, and production deficiency is 60%. Livestock and poultry production are around 70-80%, where 40% is exported outside the union and this sector faces 20-30% production deficit.

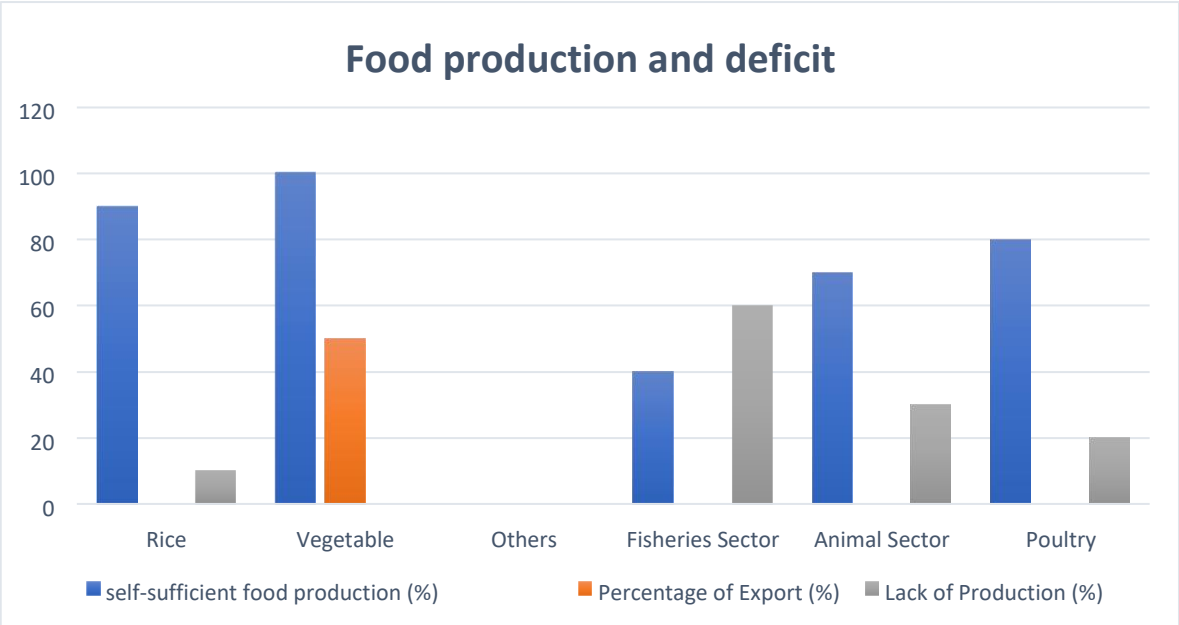


Figure 20: Food production and production deficit (Source: Field survey, 2019)

Chapter 03- Community Risks and Vulnerability

In this chapter, Risk Statement for different elements of Taitong union, Risk Rating and Risk prioritization analysis as well as Sensitivity and exposure analysis would be described.

3.1 Sector wise risks and consequences

Agriculture: Within agricultural sector, crop production (especially paddy) and other vegetables are severely affected by flash flood, water logging, salinity and coastal flood. Flash flood occurs in the month of Ashar (Mid-June) to Srabon (Mid-July). Coastal flood occurs in the month of Chaitra (Mid-March) to Jaishtha (Mid-May), and these two hazards simultaneously increase the potentiality of water logging. As a result, water logging causes gradually intrusion of saline water within the arable land. Therefore, arable lands were found to be decreased day by day according to the study and people altering their occupation from agriculture to salt cultivation. Crop damage and decreasing the arable land are provoking different types of problem like food production and production deficiency, price hike, and unemployment problem.
Betel leaf cultivation is also common in this union and this agricultural sector is mostly exposed to pest attack and illegal hill cutting along with flash flood. Therefore, betel leaf production is decreasing comparing to the past and it prompts price hike.

Transportation: Transportation sector consists of roads (both paved and unpaved), bridges, culverts. Roads (both paved and unpaved) are mostly exposed to the flash flood and coastal flood. During monsoon, heavy rain combined with the flash flood water, which overflow the bank of the small canals *("Chhora"* in local term) and overwhelming most of the roads, bridges and culverts. Moreover, most of the culverts of this union are narrow which are unable to discharge rushing torrent and inundate the roads for several or prolong time. Coastal flood occurs in the moth of Kartik (Mid-October) to Jaistha (Mid-May) which also overflows the canal-banks and submerged the roads bridges and culverts and others transportation structure. Furthermore, there have a very little number of sluice gates to discharge the floodwater. As a result, these hazards cause severe disruption in communication sectors. Populaces are encounter different kinds of difficulties to moves from one place to another, and, students are unable to go to school. Farmers and traders also face problem to transporting their goods and raw materials.

Physical Structure: Physical elements are incorporated with hospitals, educational institutes, mosque, temple, clinics, tubewells and sanitary-latrines which are mostly exposed to flash flood. However, cyclone and coastal flood also poses slight damage to them. Cyclone is also very infrequent in this union and it occurs in the month of Baishakh to Kartik (Mid-October).

Those hazards will result in difficulties in the purpose of the building's/elements uses. For example, education or study disruption would occur if an educational institute get damage or inundate. People face drinking water problem if tubewells get damage or inundated.

Natural Elements: Natural elements in this union are composed of canals, hills and agricultural lands. Siltation and encroachment of canals bank are the salient causes of maximizing the effect of any hazard like flash flood, waterlogging. As the depth of the canals has decreased as a result of siltation and width of the canals also decreased by bank encroachment, the water carrying capacity of the canals narrowed. Consequently, when heavy rain and flash flood occurs, amounts of rainwater and floodwater go far beyond the carrying capacity of the canals and inundate the abutting agricultural, physical, natural or others elements. On the other hand, hills are exposed to illegal cutting and such activity roots erosion of hill soil and its compactness which may trigger landslide. It also creates hindrance to smooth betel leaf cultivation by narrowing down the cultivating land. The equilibrium of natural environment also hampers because of such actions. Prolong standing of saline and floodwater causes reduction of crop production and decreases the amount of arable land.

Poultry and Fisheries: Poultry and fisheries are exposed to flash flood. Most of the poultry farms are located in shallow ground and some of the farms are located very close to the canals where the potentiality of affecting by flood is very high. Therefore, when any flash flood occurs in Ashar (Mid-June) to Srabon (Mid-July) month, these poultry farm are mostly affected, poultry-populations and farm infrastructure are damaged, and damp milieu poses different types of maladies of poultry populations. In fisheries sectors, most of the fish farms and their encasement are not located in suitable height. As a result, flash flood washes away the fish and damages instruments of the farm. Floodwater also pollutes the fisheries waters and different types of skin infections of fishes are outbreak.

Health-sector risks: Disaster revel different types of health hazards during and after it occurs. Peoples of this union are also expose to different types of health hazard during and after disasters. Floodwater is accountable for out-breaking different types of water borne diseases like diarrhea, cholera, typhoid and others. People also suffer from different types of skin problem because of saline water and stagnant water. People who are involved in salt cultivation also incline to different types of skin problem. These health problems are cutbacks extra expenses from the victims.

3.2 Risk Statements with High Priority Risk:

According to CRA Guideline prepared by CDMP risk can be categorized into four stages by pair ranking consequences and likelihood, which are given below (Comprehensive Disaster Management Programme (CDMP), 2006).

Table 4: Risk Categories

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, the elements at risk have been identified. Here which elements are more at risk and how much damage it would cause have been stated in this section. 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 stated below:

Table 5: Risk Statement with rating

Elements	**Risk Statement**	**Consequences**	**Risk Rating** (Likelihood x Consequences)

Primary School	Taitong Primary and High School in ward no 3 was affected minor by Aila but it is at medium risk if any cyclone with intensity like Aila or more occurs again.	Students of the locality will be unable to continue their study, educational elements will be destructed, school program will be stopped for unlimited time.	11
Madrasa	Qasimul Quran Daril Ulum Madrasa in ward no 2 was majorly affected by flash flood previous year, also affected moderately by cyclone Fani and at high risk for such kind of hazard events.	About 250-300 students of the locality will be unable to continue their study, decrease in the literacy rate of the union.	1
Madrasa	Bottoli Shafikia Dakhil Madrasa in ward no 2 was moderately affected during flash flood 2018 and cyclone Fani and is at high risk for further hazardous events like this.	About 250-300 students of the locality will be unable to continue their study, decrease in the literacy rate of the union.	7
Madrasa and orphanage	Mohammedia Taimul Quran Madrasa and Orphanage in ward no 1 was affected majorly flash flood in 2018 and at high risk for such kind of hazard.	About 200 students will have interruption in study and 50 to 60 orphans will lose their habitat.	9
Growth center	Jumpara station located in ward no 1 affected by flash flood in 2018 and is at moderate risk for flash flood.	About 15-20 shops will be destroyed, local economy will be affected, increase in poverty.	8
Madrasa	Sayyidina Abdullah Ibn Abbas Madrasa was moderately affected during flash flood 2018 and is at high risk of flooding with same or higher intensity.	About 250-300 students of the locality will be unable to continue their study, decrease in the literacy rate of the union.	8
Culvert	Box Culvert situated in ward no 5, near ward no 7 was affected majorly by flash flood in 2018 and at extreme risk for such events.	Disrupted communication, more than 1000 people would face difficulties in moving and local economy would hamper as well.	1
Growth center	The Bonkanon bazar in ward no 2 was minorly affected during cyclone Fani and is at medium risk for such hazards.	About 15-20 shops will be destroyed, local economy will be affected, increase in poverty.	10

Madrasa	The Bonkanon Shaytul Ulum Junior Dakhil Madrasa in ward no 4 was moderately affected in SIDR and is at high risk of any cyclone like SIDR or higher intensity hazard.	About 250-300 students of the locality will be unable to continue their study, decrease in the literacy rate of the union.	6
Madrasa and orphanage	Ahliya Islam Jamiya Girls' Madrasa in ward no 7 was moderately affected by cyclone Roanu and at high risk for any category 3 or more cyclonic hazard.	About 150 students will be deprived from study and 30 to 40 orphans will lose their habitat.	6

Mosque	The mosque located in ward no 5 (near ward no 3 and 4) was moderately affected by SIDR and is at high risk of further damage by such hazards.	The religious activities of local people will be hampered.	5
Culvert	Box Culvert situated in ward no 5, near ward no 7 was affected majorly by flash flood in 2018 and at extreme risk for such events.	Disrupted communication, more than 1000 people would face difficulties in moving and local economy would hamper as well.	2
Madrasa and Orphanage	Taitong Arabia Jameul Ulum Madrasa and Orphanage in ward no 5 was moderately affected by cyclone Roanu but is at high risk of any cyclone like SIDR.	About 200 students will have interruption in study and 50 to 60 orphans will lose their habitat.	6
Primary School	Napitkhali Govt Primary School in ward no 6 was minorly affected by flash flood in 2018 and is at medium risk for any flash flood in future.	About 150-200 students would face interruption in study and educational materials and important documents will be damaged.	9
Mosque	Napitkhali-Pendarpara Jame Mosque in ward no 6 was moderately affected by cyclone SIDR and is at medium risk of flash flood and cyclonic hazards.	The religious activities of local people will be hampered.	6
Sluice gate	The 100 years old sluice gate in Kotapara near WAPDA embankment in ward no 6 gets affected by coastal flood and is at high risk of coastal flooding.	The local irrigation and other water related activities will be hampered.	3
Agricultural land	Agricultural land in ward no 4, 5 and 6 was	Around 800-1000 acres of agricultural land will	4

	moderately affected by cyclone Fani and flash flood in 2018 and at high risk for such hazardous events.	be submerged if any flash flood occurs like previous year.	
Growth center	The Hajibazar market was minorly affected by cyclone Fani and is at medium risk of any cyclonic hazard.	About 15-20 shops will be destroyed, local economy will be affected, increase in poverty.	6
Brick field	The MPM brick field in ward no 8 faces waterlogging during rainy season which causes moderate to major damage and is at high risk of waterlogging.	The local economy will get hampered, people working in the brick field would remain unemployed or get poor wages.	2
Mosque	Dhoniakata Central Jame Mosque in ward no 9 was minorly affected by flood in 2018 and is at high risk of flooding in future.	The religious activities of local people will be hampered.	5
Primary School	West Sonai chhori Govt. Primary School in ward no 8 was catastrophically affected by cyclone SIDR in 2007 and at extreme risk for such kind of hazard.	About 150-200 students would face interruption in study and educational materials and important documents will be damaged.	1
Mosque	Nurujjane Rayer Jame Mosque in ward no 7 was moderately affected by SIDR and is at high risk on any cyclone like SIDR in future.	The religious activities of local people will be hampered.	3
Fishery (*Gher)*	Fishery (*Gher*) beside Hazibazar market in ward no 8 was majorly affected by flood in 2018 and is at high risk of flooding.	This fishery was submerged by 50% in previous flood and it would cause around a 50% of economic loss	1
		for the owner, the labors would face decrease in wages, poverty increase.	
Betel-leaf garden	Betel leaf cultivation in ward no 7, 8 and 9 was moderately affected by cyclone SIDR and are at high risk of further cyclonic hazards with same intensity or more.	Around 100 acres of betel-leaf garden will be affected., local economic loss, price hike of betel leaf.	1

3.3 Sensitivity and Exposure Analysis

Table 6: Exposure and Sensitivity Analysis

(Sensitivity Analysis)					
Elements name	**(Risk Statement)**	**(Main Elements)**	**(Sensitivity -1)**	**(Sensitivity -2)**	**(Sensitivity -3)**
School	Taitong Primary and High School in ward no 3 was affected minor by Aila but it is at medium risk if any cyclone with intensity like Aila or more occurs again.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Madrasa	Qasimul Quran Daril Ulum Madrasa in ward no 2 was majorly affected by flash flood previous year, also affected moderately by cyclone Fani and at high risk for such kind of hazard events.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Madrasa	Bottoli Shafikia Dakhil Madrasa in ward no 2 was moderately affected during flash flood 2018 and cyclone Fani and is at high risk for further hazardous events like this.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Madrasa and Orphanage	Mohammedia Taimul Quran Madrasa and	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	

	Orphanage in ward no 1 was affected majorly flash flood in 2018 and at high risk for such kind of hazard.	Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Growth center	Jumpara station located in ward no 1 affected by flash flood in 2018 and is at moderate risk for flash flood.	Infrastructure	Flood water	Height	
		Goods and Merchandise	Flood water	Watercurrent	
		Raw material's	Flood water	Watercurrent	Fungal attack
		Tin, wooden materials and furniture	Types and quality	Floodwater	
Madrasa	Sayyidina Abdullah Ibn Abbas Madrasa was moderately affected during flash flood 2018 and is at high risk of flooding with same or higher intensity.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Growth center	The Bonkanon bazar in ward no 2 was minorly affected during cyclone Fani and is at medium risk for such hazards.	Infrastructure	Flood water	Height	
		Goods and Merchandise	Flood water	Torrent	
		Raw material's	Flood water	Torrent	Fungal attack
		Tin and wooden materials and furniture	Types and quality	Floodwater	
Madrasa	The Bonkanon Shaytul Ulum Junior Dakhil	Building Materials	Quality	Strength	

	Madrasa in ward no 4 was moderately affected in SIDR and is at high risk of any cyclone like SIDR or higher intensity hazard.	Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Madrasa and Orphanage	Ahliya Islam Jamiya Girls' Madrasa in ward no 7 was moderately affected by cyclone Roanu and at high risk for any category 3 or more cyclonic hazard.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
Mosque	The mosque located in ward no 5 (near ward no 3 and 4) was moderately affected by SIDR and is at high risk of further damage by such hazards.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
Culvert	Box Culvert situated in ward no 5, near ward no 7 was affected majorly by flash flood in 2018 and at extreme risk for such events.	Cement and concrete and steel	Quality	Strength	
		Slab	Height and width	Floodwater	
		Approach Ramp	Elevation	Finishing	
Madrasa and Orphanage	Taitong Arabia Jameul Ulum Madrasa and Orphanage in ward no 5 was	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	

	moderately affected by cyclone Roanu but is at high risk of any cyclone like SIDR.	Equipment's	Types and quality	Flooding	
School	Napitkhali Govt Primary School in ward no 6 was minorly affected by flash flood in 2018 and is at medium risk for any flash flood in future.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Mosque	Napitkhali-Pendarpara Jame Mosque in ward no 6 was moderately affected by cyclone SIDR and is at medium risk of flash flood and cyclonic hazards.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Sluice gate	The 100 years old sluice gate in Kotapara near WAPDA embankment in ward no 6 gets	Construction Materials	Quality	Installation type	
		Sluice gate door	Quality	installation procedure	
	affected by coastal flood and is at high risk of coastal flooding.				
Agricultura l land	Agricultural land in ward no 4, 5 and 6 was moderately affected by cyclone Fani	Land	Flood and saline water	Inundation	Nutrients

	and flash flood in 2018 and at high risk for such hazardous events.	Crops	Flood and saline water	Inundation	Lasting of floodwater
Growth center	The Hajibazar market was minorly affected by cyclone Fani and is at medium risk of any cyclonic hazard.	Infrastructure	Flood water	Height	
		Goods and Merchandise	Flood water	Torrent	
		Raw material's	Flood water	Torrent	Fungal attack
		Tin and wooden materials and furniture	Types and quality	Floodwater	
Brick Field	The MPM brick field in ward no 8 faces waterlogging during rainy season which causes moderate to major damage and is at high risk of waterlogging.	Soil and Coal	Floodwater	Inundation	Quality
		Open yard	Soil type	Elevation	Flooding
		Bricks and Raw Bricks	Floodwater		
		Equipment's and tools	Floodwater	Quality	
Mosque	Dhoniakata Central Jame Mosque in ward no 9 was minorly affected by flood in 2018 and is at high	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
	risk of flooding in future.	Yard/Ground	Flooding	Soil type	Height
School	West Sonai chhori Govt. Primary School in ward no 8 was catastrophically affected by	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	

	cyclone SIDR in 2007 and at extreme risk for such kind of hazard.	Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Mosque	Nurujjane Rayer Jame Mosque in ward no 7 was moderately affected by SIDR and is at high risk on any cyclone like SIDR in future.	Building Materials	Quality	Strength	
		Building	location and extended	Elevation	
		Equipment's	Types and quality	Flooding	
		Yard/Ground	Flooding	Soil type	Height
Fishery *(Gher)*	Fishery (*Gher*) beside Hazibazar market in ward no 8 was majorly affected by flood in 2018 and is at high risk of flooding.	Equipment's and tools	Quality	Floodwater	Saline water
		Fishes	Saline water	Floodwater	Infection
		Structure	Floodwater	Quality	
Betel-leaf garden	Betel leaf cultivation in ward no 7, 8 and 9 was moderately affected by cyclone SIDR and are at high risk of further cyclonic hazards with same intensity or more.	Land	heavy rain	Hill-cutting	Nutrients
		Crops	Pest-attack		

3.4 Adaptive Capacity

1. People switching their occupation from crop cultivation to salt cultivation because of saline water intrusion.
2. Farmer are shifting their occupation to day laborer and others, because of decreasing crop production and lessening of paddies prices.
3. People increase their houses' heights by themselves in order to keep themselves safe from flash flood.
4. People have started using lower area ("beel" in local term) for crop cultivation. When floodwater accumulates there, no fertilizer is needed for cultivation as the land gets silted naturally. It is being common and prevalent in recent times.

5. Once those people are simultaneously cultivated paddy, and betel leaves, now they are fully dependent on only betel-leaves, because this small hilly area are much better to cultivate betel-leaves than paddy and betel-leaves cultivation free from flash flood, too.
6. By taking assistances from NGOs and other poor people (especially women's) are able to commence different home-crafts activities, which also make them more resilient.
7. People are also adopting poultry and hatcheries by the assistance of different NGOs and organization.
8. Farmers are adopting different types of crop varieties of paddy and vegetables in order to cope with climate change. They are also changing their cropping pattern in order to combat with natural hazards by altering rice into vegetables, salt cultivation and also fishery and poultry farming are increasing.

Chapter 04- Risk Reduction Options and Action Plan

4.1 Risk Reduction Option

There are several risk reduction options including exposure reduction and sensitivity reduction of the elements due to hazard. Planting the salt tolerant rice varieties, such as (BRRI dhan-47, 53, 54), production of *sada mota* varieties of rice seedlings in the second week of Sravan month, and planting first in the month of Ashwin are also considering as risk reduction options. To reduce the exposure of the crops, paddy and vegetables can be cultivated in high land that is not prone to coastal flooding, water logging and to protect the harvest from hailstorm, early harvesting varieties of paddy should be planted. Keep rainwater in ponds, ponds, canals and canals. Cultivation of mustard and grapes without cultivating. Where the water is accumulated in the tide, the bed is used for the cultivation of vegetables and fruits in the sorjan process. Watermelon, luffa, bitter gourd, cucumber and pumpkin are cultivated in early period of time than traditional ones to avoid loss of hydrometeorological hazards. So that the drought or drought-related salinity will not damage them. To reduce the sensitivity of the crops, flood tolerant verities can be introduced and as well as farmers need to be well trained about plantation, irrigation and harvesting so that they can prevent any type of pest attacks, fungal infections and take proper necessary steps to get a good harvest.

To reduce the exposure of roads (both paved and unpaved), bridges and culverts, embankment in both side of the river must be installed as well as road height must be increased so that it will not be inundated during severe costal flood, high tide or cyclonic situation. Canals must be dredged in winter so the canal can sustain all the extra water during rainy season which can help reduce water logging, coastal flood. For sensitivity reduction of roads, plantation of trees can be helpful. Trees should be planted on the both side of the roads, embankments. As for embankments, there should be proper slope and approach road. Grass carpeting on embankments and roadside and installation of guide wall in vulnerable places must be introduced.

Physical elements or buildings i.e. educational institutes, offices, religious institutes and health complexes, should be constructed on existing high lands and must be pucca so that the exposure due to hazards may get reduced. To reduce the sensitivity, good building material must be used in the construction, floor must be covered with concrete and tree plantation on open places around the physical elements must be followed.
Moreover, installing a community-based early warning system can reduce the risks of hydrometeorological hazards like cyclone, flash flood. Risk transfer mechanisms for life, assets and livelihood should be introduced.

Briefly, the main risk reduction options are as follows: Livelihood elements:

- Introducing early harvesting varieties of paddy
- Alternative crop cultivation

Physical elements:

- Canal dredging and inhibiting illegal canal encroachment.
- Elevation of canal banks should be increased
- Hill conservation and preventing them from cutting.
- Plantation of trees, which roots can be ingrained deeply and endure the forces of water.
- Construction of flood resilient structures.
- Raising the height of roads, embankments and plinth of other buildings and settlements.
- Proper planning and construction of retaining wall.
- Proper and timely maintenance of the embankments and roads.
- Tree plantation on both sides of roads, canals and beside other critical structure.

- Hammering of unpaved roads.

Life and asset elements:

- Improved community based early warning system.
- Risk transfer mechanisms for life, assets and livelihoods.
- Providing proper training to improve agricultural knowledge.
- Providing mass education and professional training.

4.2 Risk Reduction Action Plan:

The risk reduction action plan was developed by analyzing and comparing the data collected from the field during the CRA process. This action plan is the accumulated result of the community's perception through their active participation during the field survey, interviewing key informant persons like CPP volunteer, UP secretary, and agriculture officer to figure out the existing problems and their opinion about how to reduce the risks and the field facilitators perception of the whole union and the analysis conducted by the CRA consultants.

Table 7: Risk Reduction Action Plan

Serial	Risk Reduction options	done by whom	When will be done?	How will be done	Where will be done	Probable Cost	Things to be considered for implementation
1	Canal Dredging	SKS, UP, LGED, and non-government organizations as Brac, ASA.	October 2019-May 2020	Making a volunteer teams, with the help of UP.	*Tilkhali, Taitong Khal* and different sized *chhoras* situated in the union.		Community people would be available as labors if offered decent wages.
2	Eradication of illegal construction from the canal	LGED, UP, community people, and non-government organizations as Brac, ASA.	As soon as possible	Village Development Committee, with the help of local government and community people.	Above *Taitong, Tilkhali* canals		Using local human resources through raising awareness, relocation of residents of illegal construction
3	Taking steps to stop illegal hill cutting	Forest department, UP, community people and nongovernment organizations as Brac, ASA	As soon as possible	Village Development Committee, with the help of local government and community people.	In different wards like 3, 4, 5, 7.		Using local human resources through raising awareness, alternative livelihood and habitat options for community living in hilly areas
4	Renovation of different institutional structure and their Equipment's	SKS, LGRD, UP and non-government organizations as Brac, ASA	October 2019-May 2020	Making a volunteer team, with the help of UP.	In different wards		Local people can be employed as labor, available local soil

5	Renovation of old sluice gates and construction of new Sluice gate	LGED, UP and non-government organizations as Brac, ASA	October 2019-May 2020	Village Development Committee, Making a volunteer team, with the help of UP.	In different wards- 1, 2, 3, 6, 8.		Available local soil and labor
6	Ensuring approach ramp for every bridges and culverts	SKS, LGRD, UP and nongovernment organizations as Brac, ASA	October 2019-May 2020	Making a volunteer team, with the help of UP.	Bridges situated in different wards- 2, 3, 5, 6, 8.		Local people can be employed as labor, available local soil
7	Raising awareness and knowledge towards using proper pesticides and chemicals	Agriculture officer, UP, local experienced people and nongovernment organizations as Brac, ASA	October 2019-May 2020	With the help of UP and community people.	In different wards- 3, 4, 5, 6, 7.		Ensuring modern training to local people
8	Distribution of short-term rice variety	Agriculture officer, UP, SKS and nongovernment organizations as Brac, ASA	October 2019-February 2020	Making a volunteer team, with the help of UP.	In different wards- 2, 4, 5, 6.		Ensuring all deprived people to be aided

9	Retaining wall construction for different roads and canal areas.	LGRD, SKS, UP and nongovernment organizations as Brac, ASA	October 2019-May 2020	Village Development Committee, Making a volunteer team, with the help of UP and community people	By the roads in different wards, near cluster villages.		Available local soil and labor
10	Distribution of flood tolerant rice variety	Agriculture officer, UP, local experienced people and nongovernment organizations as Brac, ASA	October 2019-February 2020	Village Development Committee, Making a volunteer team, with the help of UP.	In different wards- 4, 5, 7, 8, 9.		Ensuring all deprived people to be aided
11	Tree plantation	Forest department, UP, SKS, community people and nongovernment organizations as Brac, ASA	As soon as possible	Village Development Committee, Making a volunteer team, with the help of UP and community people	Embankment, on the bank of canals		Available community people can be used through raising awareness
12	Ensure first aid facility for any emergency situation for every educational institute	UP, BFSCD, SKS and different non-government organizations	As soon as possible	Surveying with the help of Village Development Committee and making volunteer team.	Educational institutes in different wards		Selection by ward wise surveying
13	Increasing the elevation of different infrastructure and houses	SKS, UP, Department of Social Services, LGRD and non-governmental organizations such as Brac, ASA	October 2019-May 2020	Selection of houses with the help of VDC (Village Development Committee), with the help of VDC and UP.	In different wards- 1, 2, 5, 6, 8, 9.		Available soil and labor

Chapter 05- Conclusions

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 risks faced by those living in the Taitong Union in Pekua, the community members are now provided with information they themselves have compiled about the risk of this union. The study conducted was participatory in design, incorporating community members into the survey team, thus providing primary information gathered in the field with people who actually live with this risk.

In order to prevent and mitigate quotidian hazards and to reduce community vulnerability, 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 the Taitong Union. According to the local people, government delegate and local knowledgeable persons, this union is mostly vulnerable to flash flood and coastal flood, which are frequent hazards and mostly occur in monsoon and pre-monsoon. Moreover, the magnitude of those hazards become greater because of the poor maintenance of the drainage system and it's geographic location (hilly and near to sea coast). Every canal's ("*Chhora*" in local term) shallower due to siltation and illegal encroachment of canal banks. Therefore, during monsoon these canals lose their water carrying the capacity and flooded adjacent agricultural lands, fisheries, houses, institutions, and other critical structures. On the other hand, water-logging and salinity are the secondary hazards, which occur when floodwaters are unable to discharge and are clogged in some particular lower areas. As a result, saline water intrusion occurs in agricultural lands and sweet-water sources, which causes a decrease of arable land and crop production and other socio-economic disruption. In short, long-term planning and studies can make development works more fruitful in the future.

Bibliography

Bangladesh National Portal. (2019, November). এক নজরে পেকুয়া উেরজলা. Retrieved from http://pekua.coxsbazar.gov.bd/site/page/8ce08e11-2144-11e7-8f57-286ed488c766/%E0%A6%8F%E0%A6%95%20%E0%A6%A8%E0%A6%9C%E0%A6%B0%E0%A7%87%20%E0%A6%AA%E0%A7%87%E0%A6%95%E0%A7%81%E0%A7%9F%E0%A6%BE

Bangladesh National Portal. (2019, November 13). পেকুয়া উেরজলাে েটভূমি. Retrieved from Pekua Upazila: http://pekua.coxsbazar.gov.bd/

Banglapedia. (2015, April). *Pekua Upazila - Banglapedia*. Retrieved from http://en.banglapedia.org/index.php?title=Pekua_Upazila

BBS. (November 2014). *Bangladesh Population and Housing Census 2011; Community Report; Zila: Cox's Bazar.* Ministry of Planning. Bangladesh Bureau of Statistics.

Comprehensive Disaster Management Programme (CDMP). (2006). *A FACILITATORS GUIDEBOOK FOR COMMUNITY RISK ASSESSMENT AND RISK REDUCTION ACTION PLAN.*

Wikipedia. (2019a, November). *Cox's Bazar - Wikipedia*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Cox%27s_Bazar

Wikipedia. (2019b, August). টটটং ইউমনয়ন. Retrieved from Wikipedia: https://bn.wikipedia.org/wiki/টটটং_ইউমনয়ন

Wikipedia. (2019c, November). *Socioeconomic status*. Retrieved from https://en.wikipedia.org/wiki/Socioeconomic_status

ANNEX- I

FGD checklist: The Focus Group Discussion was conducted on 22 September, 2019. FGD is done consisting of an 8 to 10 people group.

FGD No	Community	Location	Ward No
1	Community of diversified occupation	West Taitong Sher Ali Master Para	2
2	Farmers community	Adjacent to Laaljan Para bridge	6
3	Community of women in low land	Hirabuniya	8
4	Vegetable farmers in hilly area	Jumpara	1
5	Relocated people group	Shonaichhori Moulovi para	7
6	Recently migrated	Dhaniakata Purbapara	9
7	Vulnerable women community in hilly area	Dhaniakata	9
8	Labor group	Hajibazar	8
9	Hindu community	Taitong bazar	9

KII Checklist: The Key Informant Interview was conducted on 23 September 2019.

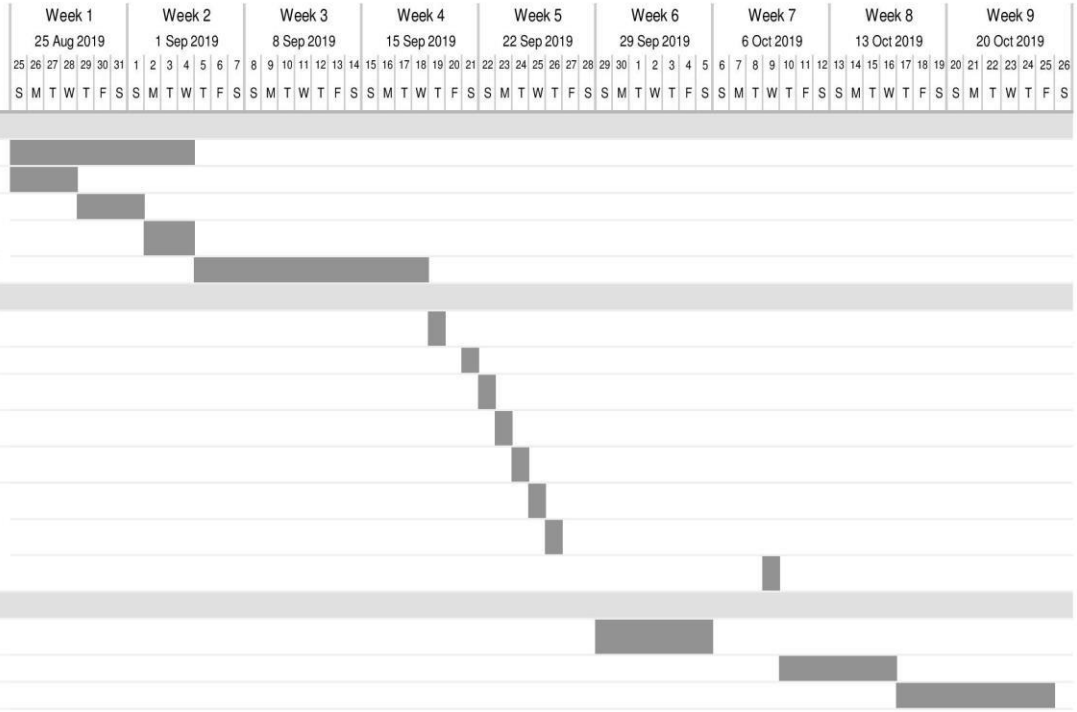
KII No	Name	Designation
1	Md. Abdul Mabud	CPP team leader, Taitong
2	Saber Ahmed	Superintendent, Shafiqia Dakhil Madrasa, Taitong
3	Md. Abdul Alim	Secretary, Union Parishad, Taitong
4	Mokaddes Mohammed Rasel	Sub-assistant Agriculture Officer, Taitong
5	Hameeda Begum	Team leader, Ansar-VDP, Taitong
6	Dr. Nurul Kabir	Chairman, Shonaichhori Rubber Dam Project, Taitong

Schedule of Maps 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	Wed 10-09-19	Wed 10-09-19	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



ANNEX- II

Photo Gallery: The photos are taken throughout the CRA process conducted from 21 September 2019 to 26 September 2019.

Figure 1: Jonaimura road in ward no 5 (left), another vulnerable road in ward no 5 (right); both are prone to flooding.

Figure 2: WAPDA embankment in ward no 6, prone to coastal flooding.

Figure 3: road to Jumpara from ward no 1 to 3 (left); road from ward 3 to 4 (right); both are prone to flood, flash flood.

Figure 4: Broken guide wall beside Nonaichori canal in ward no 2 (left), rubber dam in ward no 6 which needs attention (right).

Figure 5: Madrasaye Saiyedena in ward no 3 (left) which was damaged by cyclone SIDR; Mohammedia Talimul Quran madrasa in ward no 1 (right) which is prone to flash flood.

Figure 6: highly sedimented canal, this part flows through ward no 2 but the whole union is facing the same problem of siltation.

Figure 7: Kotapara in ward no 6 (left) causes flooding because of sedimentation; bridge situated in ward no1, prone to flooding (right).

Figure 8: Kashemul Ulum madrasa in ward no 2, highly prone to flood and flash flood.

Figure 9: Focus Group Discussion at Jumpara (left) and Hajibazar (right)

Figure 10: Key Informant Interview of a CPP Volunteer.

Figure 11: Conduction of workshop in Union Parishad.