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An Internal Environmental Displacement and Livelihood Security in Uttar Bedkashi Union of Bangladesh

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Abstract The climate change related hydro-meteorological disaster impacts in the coastal region of Bangladesh cause widespread loss of lives, damage of properties, infrastructure and degrade the entire environment and disrupt the ecosystem. Thus people lost their means of livelihoods, habitat, and finally they are forced to leave their land of origin. This study was aimed to investigate the factors that influence human displacement, their way of securing livelihood and how best can be reduce the vulnerability occur due to internal displacement in Uttar Bedkashi Union under Koyra Upazila in Khulna district of Bangladesh which was destroyed by super cyclone Sidr in 2007 and Aila in 2009 and caused human displacement and migration. Field investigation, focus group discussion, in-depth household survey, key informant interview and literature review methods were followed to collect primary and secondary data from January 2014 to June 2014. The study revealed that the land has become completely barren to all agricultural practices due to salinity intrusion caused by embankment failure resulted in long term saline water logging, demolish soil characteristics, creates sever unemployment problem, changed the ecosystem balance and this circumstance ultimately led people to temporary or permanent displacement to other regions to seek nonfarm livelihood e.g. paddy sowing/harvesting, rickshaw puller, day labor etc ranging from one week to a maximum of six months. But in the study area seasonal migration or internal displacement is established as a sustainable way of accessing the benefits of development in other regions; facilitates victim in reducing vulnerabilities, smoothing economic burden and earning remittances to invest in a better future and increased their adaptive capacity. Reclamation of the saline affected land and resumption of agriculture practice and creation of diversified livelihoods options can positively contribute to minimize climate induced human displacement in coastal Bangladesh.

Keywords: *Aila 2009, human displacement, livelihood and salinity*

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1. Introduction

"Although there is a growing awareness of the perils of climate change, it's likely impact on human displacement and mobility has received too little attention"-António Guterres, UN High Commissioner for Refugees [1]. According to the UN Secretary-General [2], IDPs are persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border.

Climate change is already undermining the livelihoods and security of many people. Over the last two decades the number of recorded natural disasters has doubled from some 200 to over 400 per year [1]. Nine out of every ten natural disasters today are climate-related [3]. The Representative of the Secretary-General on the Human Rights of Internally Displaced Persons, Walter Kälin [1], has identified five climate change-related scenarios-hydro-meteorological disasters; zones designated by Governments as being too high-risk and dangerous for human habitation; the case of 'sinking' small island states; and violent conflict triggered by a decrease in essential resources (e.g. water, land, food) owing to climate change that may directly or indirectly cause human displacement. In each of these scenarios, people may become displaced either within their own countries or across international borders.

Craig Johnstone, Deputy High Commissioner of UNHCR, says that "Our generation has failed to live up to its obligations to prevent climate change. We need urgently to prepare now for the human consequences of climate change." One of those consequences is the displacement of people from their homes, whether temporarily or permanently [4].

Cernea [5] defines risk as the possibility that a certain course of action will activate future injurious effects, losses and destruction and identifies eight risks that lead to the impoverishment of a community. These risks are

described as follows: When people are removed from their land and they are also removed from their main productive resource result '***Landlessness'***. In these circumstances both people's commercial activities and subsistence likelihoods are removed. When people losing employment is a very high risk in displacements and to create new job opportunities in a newly established community is very difficult and requires substantial capital is known as '***Joblessness'.*** The loss of a home or shelter is known as '***Homelessness'*** which is usually only temporary for many displaced people but, for some, homelessness can imply deterioration of their housing standards. When families lose economic power then ***Marginalization*** occurs. The forced removal of a community often increases the risk that people will temporarily or chronically be undernourished is known '***Food Insecurity'***, which reflects "calorie-protein intake levels below the minimum necessary for normal growth and work". Massive population displacement threatens to cause serious declines in health levels are known as '***Increased Morbidity and Mortality'***. ***The loss of access to common property and services*** such as pastures, forested lands, water bodies, burial grounds and quarries, results in the deterioration of income and livelihood levels of displaced communities. Displacement leads to '***Social disarticulation'***, which is when a community is displaced the existing social structures are torn apart. "It breaks up families and communities; it also dismantles patterns of social organization.

Bangladesh is a disaster prone country which suffers from various natural disasters like cyclone, flood, storm surges, river bank erosion, drought, landslide etc. [6,7]. It is now well recognized and accepted that frequencies and severities of different natural disasters [8] have been increasing day by day that ultimately resultant displacement and migration of population from its coastal areas in Bangladesh [9.10]. Various factors, for instance, geographical location, high population density, high levels of poverty, and the reliance of many livelihoods on climate-sensitive sectors, particularly rural agriculture and fisheries etc [11] make the coastal areas more vulnerable to natural disasters. About 18% of Bangladesh's land will be submerged if the sea level rises by one meter by 2050. Should this occur, it will result in the migration of almost 30 million people [12].

Different natural disasters cause widespread loss of lives, damage of properties, infrastructure and degrade the entire environment and disrupt the coastal ecosystem in the coastal Bangladesh [9]. Thus people of the coastal region have lost their means of livelihoods, habitat and finally they are forced to leave their land of origin and become migrants. For example; Cyclone, Aila, affected 3.9 million people and caused the loss of about 150,000 livestock, breaching 1,742 kilometers of embankments and displacing 76,478 families in Satkhira and Khulna alone (the two worst affected districts). Following Aila, there was a major increase in human migration from affected areas, with an estimated 100,000 people-primarily men looking for work - migrating from four Upazilas alone (Koyra, Paikgacha, Dacope and Batiaghata) [13,14].There is also increasing evidence that serious and relatively rapid alternations to ecosystems induced by climatic and anthropogenic factors will have direct and indirect impacts on societies which, when other coping mechanisms are overcome, will have no other option but migration as a permanent or temporary coping strategy [15].

The cyclone and tidal surges collapsed the coastal embankments at several points and inundated vast areas [13] at coastal areas. The saline water intrusion in the agriculture land resulted in the unique livelihood, agriculture practice in the area was totally damaged. It is also reported that before the super cyclone Aila hit the coastal areas, the level of salinity was 12-16 ppt; after Aila it increased to 20–25 ppt [16]. The precarious situation created by Cyclone 'Aila' resulted in more than 400,000 people were displaced by the cyclone in the coastal areas of Bangladesh [17] and about 40,000 people migrated due to Cyclone 'Aila' from the Koyra upazila (sub-district) of Khulna District in Bangladesh [18]. Since this region after cyclone Aila become almost unproductive to cultivate crop and people become jobless; the present study focuses on the climate induced human displacement which should count the temporal boundaries from 2009- 2014. This study has been conducted in Uttar Bedkashi Union of Koyra Upazila in Khulna district. Presence of huge number of rivers net with active high tide, vicinity to the Bay of Bengal, weak and fragile infrastructure, poor socio-economic condition, high poverty rate, poor communication system and so on make the Uttar Bedkashi Union much more fragile and vulnerable to different natural disasters than other Unions of the Upazila [19,20,21]. The area is in the frontline with respect to the climate induced disaster vulnerability and resultant human migration in particular high tide and the severity of salinity makes it highly vulnerable. Despite wide coverage of recent reports warning about the massive potential flows of 'climate change refugees' in newspapers, magazines and other media, there remains a surprising lack of empirical evidence to support these claims [22]. To our knowledge, there is no in-depth research has been done so far to link this displacement/migration with natural disasters and how does natural disasters affect livelihood. Though the frequency and intensity of disaster has increased [23,24], there is no strong evidence that can claim that natural disasters influence migration. Migration of people has been taking place from coastal regions [23] but the pattern of migration and their way of livelihood were not well researched. Therefore, this study has been conducted aiming to identify the factors that influence human environmental displacement, their way of securing livelihood and how best can be reduce the vulnerability occur due to internal environmental displacement.

2. Methodology

2.1. Selection and Description of the Study Area

In comparison to other regions of Bangladesh the south-west coastal region is very much vulnerable to different natural disasters. Presence of huge number of rivers with active high tide, vicinity to the Bay of Bengal, weak and fragile infrastructure, poor socio-economic condition, high poverty rate, poor communication system and so on make the Uttar (North) Bedkashi Union (sub-sub-district) of Koyra Upazila (sub-district) under Khulna district (Figure 1)

much more fragile and vulnerable to disasters than other Unions of the Upazila. Given all these things make the study area, its people and infrastructure and properties susceptible to disasters. The Uttar Bedkashi Union is located only 4 Km south from the Koyra sadar upazila and it is only 20 km away from the world largest mangrove Sunderban. The study area is surrounded by Koyra sadar Union at north, south Bedkashi Union at south, Sundarbans and Shakbaria River at east and Kobadak River at west (Figure 1). The total area of the Union is 22.44 sq. kilometers; total population is 20,528; density is 677 per square kilometer. The area is in the frontline with respect to the climate induced vulnerability in particular high tide and the severity of salinity makes it highly vulnerable. The Bay of Bengal is only 20 km far from the area and the area is surrounded by two mighty rivers along the three sides. So many rivers are crossed across the study area and the Kobadak and Shakbaria river are flowing alongside the east and west part of the Union.

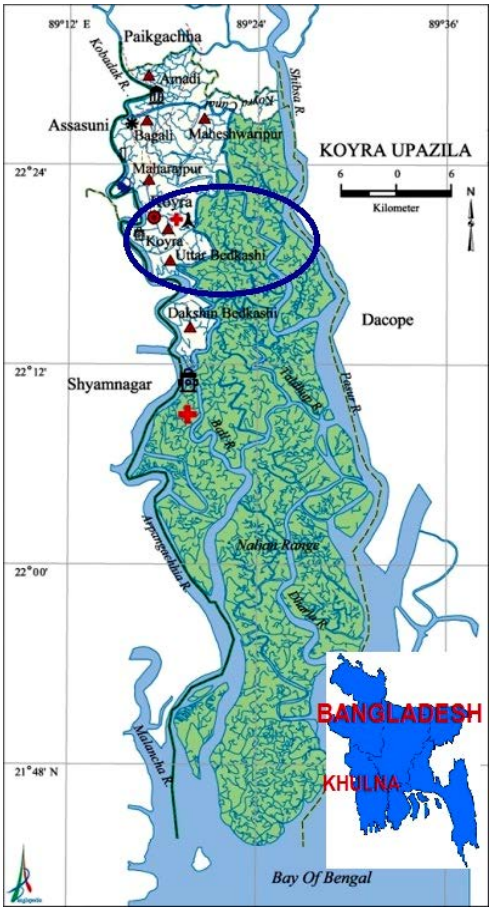

Figure 1. Location of study area -Uttar Bedkashi Union (blue circled) of Koyra Upazila in Khulna District of Bangladesh

These sorts of unique geophysical location and setting make the area very much vulnerable to different natural disasters like cyclone, storm surges, river bank erosion, tidal surges, tidal floods, saline water intrusion, fresh water scarcity, and so on [20,25]. The area was severely affected by the severe cyclone Sidr and Aila in 2007 and 2009 respectively.

2.2. Data Collection

Different research methods were applied purposefully during data collection, for example, field investigation in coastal villages; focus group discussion, in-depth household survey, key informant interview and intensive literature review. This research followed a semi-structured qualitative questionnaire (close and open ended), which had been pre-tested prior to the field work in order to improve its reliability and validity. The in-depth discussion with local people were conducted based on some criteria such as location close to the Bay of Bengal, close to Sundarbans mangrove forest, high risk of natural disaster and human induced land use changes. The questionnaire consists of questions which gives data to identify the determinants of migration from the study area. As this is an academic and time bounded research, stratified random sampling method was followed to fulfill research objectives in due time. Fifty four (54) households from 06 (six) villages (Gabbunia-12, Gazipara-12, Pathorkhali-10, Shakbaria-10, Horihorpur-5, Borobari-5) survey using the semi-structured questionnaire and six (06) in depth focus group discussion with village people were conducted. Seasonal/temporary migrants living in the villages and who intends to migrate were also considered and emphasized for the study. The questions were focused under three major categories viz., livelihood/economic activity; local environmental change, displacement status and pattern etc. A total of 04 (four) key informant interviews with notable stakeholders or leaders in the communities, school teachers, chairman of Bedkashi Union and aged people as well were conducted. The secondary data were collected through various institutes and key personals working with the issue and from different report, research articles, newspaper articles, public documents and internet websites; were analyzed and integrated with primary data.

3. Results and Discussion

3.1. Factors that Influenced Force Displacement

3.1.1. Demographic and Socio-economic Conditions

Socioeconomic status is a theoretical construct encompassing individual, household, and/or community access to resources and conceptualized as a combination of economic, social, and work status, measured by income or wealth, education, and occupation, respectively [26,27,28]. Analysis revealed the average family members' size in the study area was found as 5 i.e. 54% was 5; 24% was 4; 13% was 6 and 9% was 7. There were 59 % male and 41 % female; 47% were 31 to 45 years old; 33% were above 46 years and 20% were 15-30 years old. Levels of education of respondents were 60% secondary; 26% primary and 14% was no literacy. Lower levels of education among the poor and limited access to information reduces their ability to deal with disasters [29]. The ability of farming households to cope with disasters is also significantly impacted by family members' experiences and their economic context at the village level [30]. In one research [31] factors affecting crop diversification were analyzed and reported that size of land holding, age of respondent, education level of respondent, farming experience of respondent, off farm income of respondent etc are the main factor of crop diversification.

3.1.2 Natural calamities at Uttar Bedkashi Union

Due to topographical feature, the lands of Khulna district area are low lying and about 70% of lands are on flood plain basin [32]. He also reported that due to flood or other natural disasters these areas are subjected to flooding and water logging. Tidal flooding through a network of tidal creeks and drainage channels connected to the main river system submerges the soil and saturated them with soluble salts thereby rendering both the top and subsoil saline.

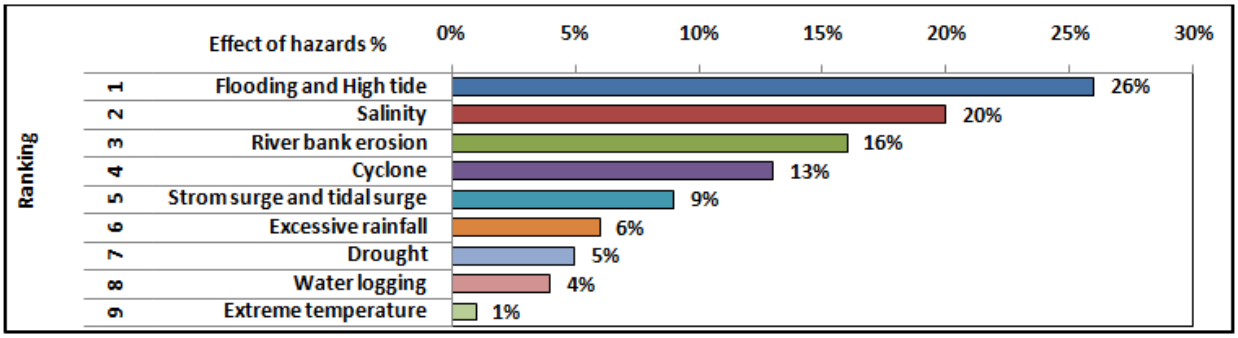

Figure 2. Most frequently occurring disaster according to their ranking in the study area

Figure 2 represents the most frequently occurring natural hazards of the study area, where we find that flooding and high tide (26%) and saline water intrusion (20%) are identified as the prominent two. Both high tide and saline water intrusion cause great misery for the people and made their agriculture practices very challenging and many instances agriculture land become totally barren to cultivate crops as well. Since local agriculture production and agriculture related activities are hampered so that people of the area are moving to other places for securing their livelihood. Results also indicated that among the hazards river bank erosion and cyclone have the second highest potentiality occupying scores are 16% and 13%. The storm surge, tidal surge, excessive rainfall, drought and water logging have more or less same potentiality score ranging from 9 to 4% (Figure 2) to make vulnerability in the study area. Extreme temperature has the lowest having score is 1%. These types of regular disastrous phenomena are damaging crops, livelihood, homes, roads and property whole year round with severity in the periods of April to May and September to November. The Bangladesh EACH-FOR case study found that flooding and bank erosion are a complex mix of natural and socioeconomic processes contributing to population displacement [33,34]. Combined with sea level rise, storm surges linked to cyclones could temporarily inundate large areas of Bangladesh—one study suggested that up to 25 percent of the country could experience such a scenario [35]. Freshly placed alluviums from upstream become saline as it comes in contact with the sea water and continues to be inundated during high tides and ingress of sea water through creeks that restrict normal crop production throughout the year [32]. Soil salinity is believed to be mainly responsible for low land use as well as cropping intensity in the area [36,37]. Due to drainage congestion, the area remains waterlogged, increasing the salinity [38]. Salinity caused decline in soil productivity and crop yield which results in severe degradation of bio-environment and ecology [39]. Scientists [32] suggested the sprinkler (dripping) irrigation system to provide a better control of water application rates to reduce the soil salinity level. After applying the sprinkler (dripping) irrigation system for three years continuously, the saline would remove from land. Proper drainage facilities should keep in the land to flow out the water. If the drainage system is zigzag type the water cannot move fast. Other management techniques can be taken like short time plants irrigation, selection of saline tolerant plants. Rain water using for irrigation is also a good technique.

3.1.3. Cyclone Aila Devastation in Bedkashi Union

The disaster history analysis of the Uttar Bedkashi Union for last 30 years revealed that, the two devastating disasters are 1988 cyclone and 2009 cyclone Aila. Beside these the super cyclone Sidr in 2007 also caused huge devastation in the area. According to the respondent's perceptions, cyclone Aila was the most devastating disasters the area faced forever. About 3,000 people of this Union were affected by cyclone Aila. Many children and women were affected by diarrhea as the post disaster epidemic; 90% of the household were affected; 95% crops and trees were severely damaged. Apart this different local infrastructure like school, mosques, culvert, bridge, embankment and many more are highly damaged. Fifty two km long ring polders were completely damaged. As a result saline water were intruded in the agricultural land, destroyed the standing crops and also deteriorate the soil properties and fertility at such a level that the land become unsuitable for further agriculture practices, even no grass for livestock grows. The saline water was stagnant for long time- about 1.5-2 years which deteriorates the soil condition and still now the soil and arable lands remain inundated and salinized -people cannot get involved in cultivation as previous. Fishermen's capture of fish has reduced remarkably. People had lost their horticulture and homestead garden which are not revive yet. Households (85%) were damaged partially and many other completely. People faced a great crisis as they had lost all of the domestic livestock after the Cyclone Aila. Low employment opportunities make many people jobless; poverty was rapidly increased and led to malnutrition and heath problem. People then started to move and displaced from their land of origin to other place for securing livelihood and better living. Study revealed that the most vulnerable villages are Gabbunia, Shakbaria, Ghatir Geri, Pathorkhali, Horihorpur Padam Pukur ,Borobari Botul Bazzar, Bedkashi, Katmarchar, Gazi Para, Hazatkhali, and lastly Sheikh Sarder Para. The present study was supported by CDMP [20] and their findings are

approximately same. About 7000 acres of cropland and white fish ponds (locally known as gher) have been destroyed and monitory loses raised up to 1.5 billion BDT [40]. Long term waterlogging caused damage to the seedlings, soil quality which affected the next crop cultivations. As a result, the chains of economic loss in the agricultural sector are continuing still today. Death of livestock and poultry were in Koyra was 6500; about 18,500 acres of grazing land been destroyed with an estimated damage of 1624 metric tons of livestock feed in Koyra and other surrounding Upazila. After Aila at least 10% of the total affected population took shelter in safe places like concrete made buildings and about 80% of them were forced to take shelter on the drier embankments and roads while the rest took shelter on tree tops and rafts nearby. At least 10,000 people were attacked by diarrhoea; 95% of the affected and waterlogged areas were out of the safe sanitation coverage. As the source of livelihood, Sundarbans were inundated with 6 m (20 ft) of water. About 45,000 people have migrated from Koyra Upazila; tidal surge induced by Aila washed away the earth-made houses and at least 90 percent of the families lost their households; lost their every day essentials like cooking equipments, earth-made burners, furniture and many others. Economic losses were about BDT 170 million. Loss of agriculture and further possibilities of agricultural failure were promoted people for large scale permanent displacement; people were seeking alternative livelihoods and at least 87% of the affected families in Koyra had no alternative source of income other than agriculture. Blockage on the income source was forced the people to leave their settlements and searched for jobs elsewhere. These have increased unemployment and displacement in the affected area.

3.2. Agriculture Land Size and Fertility

The coastal region covers about 20% of the country, from which cultivable lands are more than 30% [32]. Most of the respondents of this study mention that they are small farmer with having little agriculture land. Many have no agriculture land at all. They are tenant farmers and they work on other fields. Most cases it was found that people have only household land.

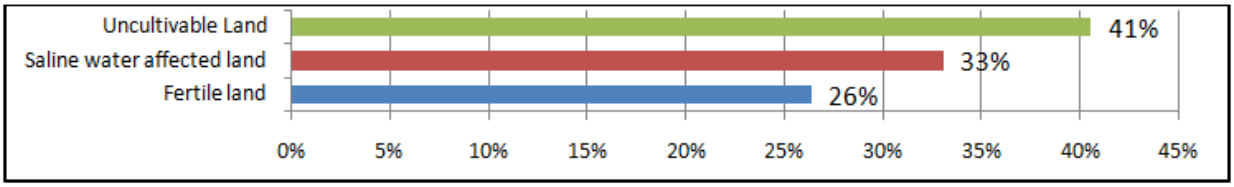

Figure 3. Land fertility status of the study area

Regarding total cultivable lands of respondent famers 65% owned bellow 50 decimal or landless, 27% above 101 decimal and 08% from 51 to 100 decimal cultivable lands. Considering homestead area- 49% farmers have up to 10 decimal cultivable lands. Previous researcher commented from their research [41] that Bangladesh is a land scarce country where per capita cultivated land is only 12.5 decimals. On average landless farmers owned up to 0.22 acre land where family size is 4.8. The net amount of area in crop farming of the country was found declining because of land-loss from river and coastal erosions and agricultural land being used for urbanization [42].

In the locality the more important question is the fertility status of the existence land. It is imperative to disclose that after the devastating natural disaster super cyclone Aila in 2009 most of the agriculture land of this area was inundated and logged for a long time by saline water. As a result most of the agriculture land was barren to cultivate crop. Respondents said that most (76%) of the land they have are highly affected by saline water and not suitable for crop cultivation. Figure 3 represents that only 26% land is remaining fertile and 33% land is seriously affected by saline water and rest of 41% of land already becomes uncultivable. During the natural calamities tidal flooding through a network of tidal creeks and drainage channels connected to the main river system inundates the soil and impregnates them with soluble salts thereby rendering both the top and subsoil saline [43]. Other researcher [44] found that the soil salinity level of the coastal Sathkhira adjacent to Khulna district shrimp-Boro rice cropping system was higher than that of Aman rice-Boro over the consecutive years of 2010, 2011 and 2012. Soil salinity obstructs the soil nutrients from being taken up by the rice plants since salinity changes the osmotic pressure of the soil solution system [32]. Salinity causes unfavorable environment and hydrological situation that restrict the normal crop production throughout the year. Saline soils contain soluble salts in quantities that affect plant growth adversely.

3.3. Livelihood Diversification

Risk mitigation techniques in agriculture and presented that the most commonly applied risk management strategy is diversification and risk-averse farmers particularly diversify their crop and livestock productions. By doing so, loss in one sector is relatively covered by productivity of the other sectors [45]. FGD, household survey and KII revealed that most of the people of the study area directly or indirectly depend on agriculture and agriculture related sub sector like fisheries, farm labor, fish fry collection etc for their livelihood.

Table 1 showed the local livelihood activities of the Uttar Bedkashi Union formulated by the respondents. In the study area data analysis found that two main livelihood patterns, the Aman -Boro rice-Fellow-other nonfarm job and the Boro rice- Shrimp-other nonfarm job livelihood patterns were mainly practiced by the local farmers in the study area. The farmers used to grow a single crop of Aman rice in the rainy season and in the winter they grow boro rice. But shrimp farmers grow only Aman rice. Poor and landless farmers grow only Aman rice during rainy season and they used to sell their works to other farmers. As a result of livelihood loss due to salinity, the community people have became dependent on

fishing and daily labor. Researcher's [46] suggested diversification of crops as a risk reduction tool and inclusion of several species in a crop production plan can have the advantage of buffering low price in a specific crop. Farmers try to minimize risk from various sources in their own way, often by adjusting the cropping pattern and/or cropping season [47].

Table 1. Typical livelihood activities calendar of the displaced people in the study area

Livelihood and months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Boro (winter) paddy sowing	Higher											Higher
Boro paddy harvesting				Higher								
Aman (rainy) paddy sowing						Higher						
Brick field				Higher						Higher		
Aman paddy harvesting											Higher	
Wood processing work	Higher										Higher	
Earth work	Higher											
Rickshaw pulling		Lower					Higher				Lower	
Garments factory		Lower					Higher				Lower	
Sea port		Lower					Higher				Lower	
Day labor		Lower					Higher				Lower	

Bedkashi is the inhabitant of marginal people living in extreme poverty, major occupational groups were identified -agriculture production (59%); agriculture labor (2%); day labor (13%); transport driving (6%); fish fry/crab collection and shrimp farming business (pond aquaculture) (11%) etc (Figure 4). People who had no agriculture land would work as labor to others land thus securing the livelihood. People who are involved with the agriculture practice and worked as agriculture labor both have lost their local on-farm and nonfarm livelihood opportunities and other sources of income. So that people were imposed by the nature to change their locality for securing their livelihood. Previous researchers [32] reported that the economic activities of the population in this zone are fishing, agriculture, shrimp culture etc.

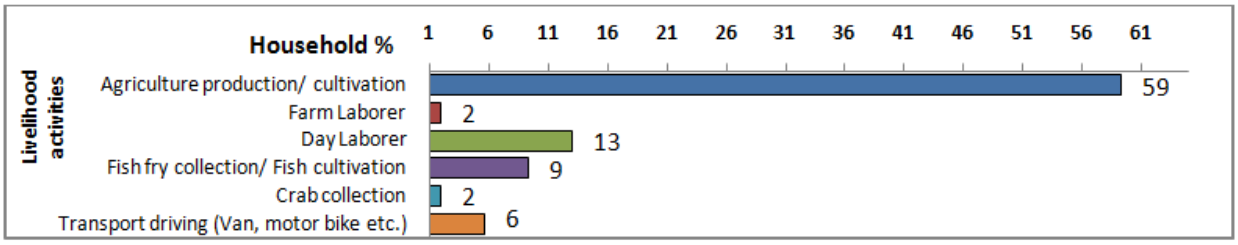

Figure 4. Primary occupation status of households

3.4. Challenges and Livelihood Difficulties of the Displaced Vulnerable People

The capacity of poor people to negotiate access to resources, assets and claims (i.e. to realize entitlements) determines their level of livelihood security [48,49,50]. This section has discussed the livelihood insecurity and difficulties of the displaced people. Agriculture is the main source of livelihood for 1.3 billion smallholder farmers worldwide [51] and is highly vulnerable to climate change, particularly in the tropics [52]. It is important to consider that most of the people are depended on diversified livelihood those are very climate-sensitive and already thrust in great uncertainty. Due to salinity increased in the water channels soil had got salinity that makes agricultural production almost impossible. Livestock (90%) or aquatic poultry (92%) rearing also has experienced a radical decrease. Elevation of tides also increased due to sea level rise and river bed siltation.

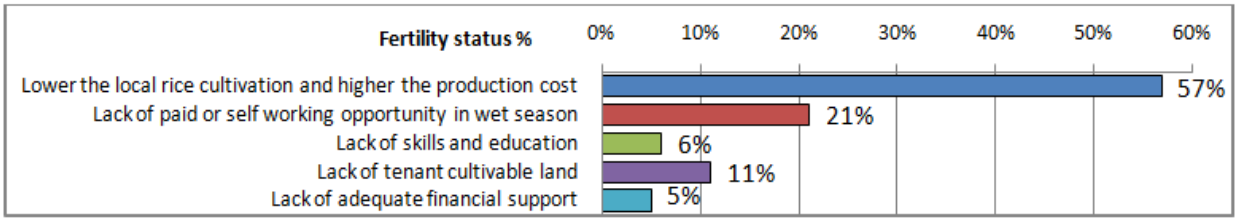

Figure 5. Challenges and livelihood difficulties of the vulnerable people

In the study area livelihood difficulties faced by the community were analyzed and revealed that contribution of the highest challenge and difficulties were (Figure 5) the high salinity caused in destruction of crop, rice, vegetable, pulses cultivation, even no grass for livestock grows. This results in inactivity of all alternative income

generations and adaptation options, and high (57%) production cost than the pre cyclone Aila; lack of paid or self working opportunity (21%); lack of skills and education (6%) in new adopted livelihood; lack of tenant cultivable land (11%) due to extensive shrimp cultivation; and lack of adequate financial support (5%). In these situations what could be done to improve the livelihood condition of the people where general income generating options activities also do not work.

Cernea [5] identified eight risks that lead to the hardship of the displaced community are landlessness; joblessness; homelessness; marginalization; food insecurity; high morbidity and mortality; loss of access to common property and services; and social disarticulation. These eight risks are interconnected and tend to be forced on a vulnerable community. Study in the Bedkashi Union area revealed that the victim community is exposed by all these eight risks concurrently and result in the highest impoverishment and social degeneration of the displaced community. Cyclone Sidr in 2007 and Aila in 2009 imposed the community in landless; jobless; homeless; marginalized; food insecurity; high morbidity and mortality due to various water borne diseases; loss of access to common property and services because they are displaced; and social disarticulation due to the lack of identity in a new environment. In one research [53] identified the challenges and job difficulties of the vulnerable people of Uttar Bedkashi Union and reported that the lower rice cultivation, farming cost minimizations, little work in rainy season, salinity intrusion, lack of skills and education, inadequate capital, natural disaster (cyclone, water logging etc) and less labor intensive shrimp cultivation are the major livelihood challenges and difficulties for local people. Working in earthwork for embankments or polders in different GO and NGO projects, and fishing is now the only provisions for them to survive [54].

3.5. Annual Per Capita Income

Literature on socio economic status measurement distinguishes between wealth, or accumulated financial resources, and income, a measure of shorter-term access to capital [27]. One of the most important aspects found in the study area is that in most cases income earning person in the family was one, which made their income more vulnerable and uncertain.

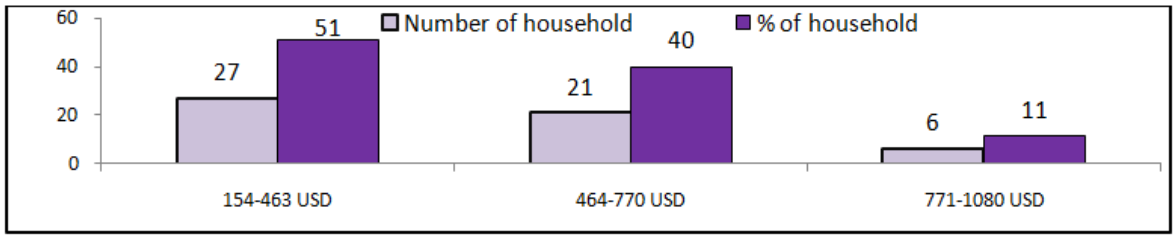

Figure 6. Annual per capita income status of household of Uttar Bedkashi Union

According to World Bank [55] calculation Gross National Per Capita Income of Bangladesh in 2014 was 1080 US dollar. The study reveals that very poor monthly family income status in the study area and it varies family to family. In the study area 51% respondent's annual income was below 463 US Dollar, 40% was maximum 770 US Dollar and 11% was above 1080 US Dollar (Figure 6). FGD indicated that one of the factors behind this low family income is the lack of local employment opportunity. Lower levels of adaptive capacity in developing countries are very often associated with poverty [56,57]. Other researcher [29] reported that environmental degradation is one of the main reasons behind the greater poverty in Khulna region. After the cyclone Aila 2009 most of the people become jobless since the agriculture practice in the area was totally damaged due to saline water intrusion. Lack of local employment opportunity force people to leave the study area and migrate to those areas where income generating opportunities are prevailing. Also people in this region are mainly small farmers, agricultural laborers and fishermen whose livelihoods depend on natural resources. Moreover, a combination of poverty, lack of resources, population growth and institutional inaptitude make people more susceptible to natural disasters, resulting in population displacement.

3.6 Other Displacement Factors in the study Area

3.6.1. Housing System

Low family income status affects the other family welfare sectors very significantly. The housing pattern in the study area is very poor. This study finds that most of the houses are hut (70.58%) -made of polythene and gole pata, and rests of the houses are Kachan or pit (made of mud and bamboo). Al these scenarios told the tale of local peoples being a climate victim. Since the study area is vulnerable to violent cyclone and storm surges, so that these types of houses in most cases seriously affected by cyclone, storm surge, storm wind, flood etc. It is found that more than 90% of households were damaged completely and rests of others were damaged partially by the severe cyclone Aila in 2009. Researchers [40] reported that tidal surge induced by Aila washed away the earth-made houses of the poor communities and at least 90 percent of the families lost their households. Along with those, they lost their every day essentials like cooking equipments, earth-made burners (locally known as Chula), furniture and many others. Economic losses were about BDT 170 million.

3.6.2. Water and Sanitation Facility

Water and sanitation facility is a good indicator of the socio-economic status of a region [58]. Water and sanitation facilities in the study area were not good. Many people are out of this basic facility-still practice open defecation. Figure 7 represents the sanitation status and water sources of the study area. It is found that in the

study area 95% of people are using deep tube well water but they claimed that the water is very much saline and not suitable to drink. They are affected by different diseases by taking this saline containing water.

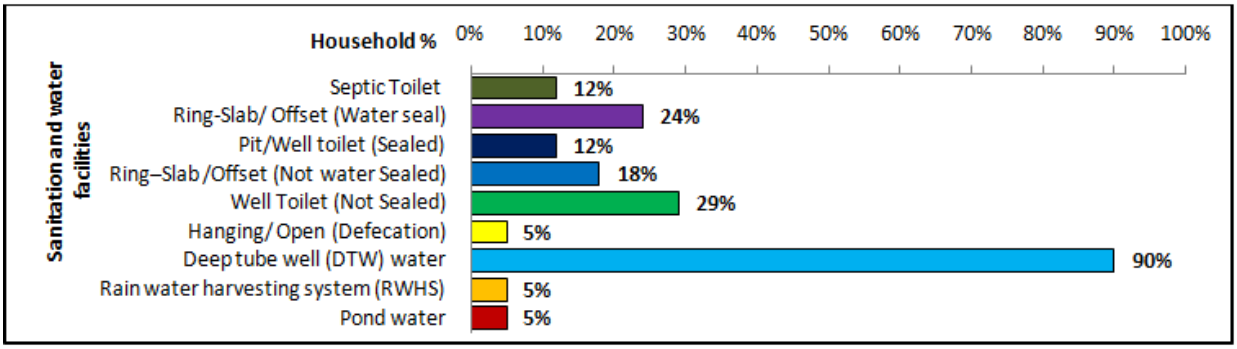

Figure 7. Sanitation (toilet) facility and sources of used water at Uttar Bedkashi Union

After Aila, 2009 in Koyra at least 10,000 people were attacked by diarrhoea. At least 95 percent of the affected and waterlogged areas were out of the safe sanitation coverage [40]. Previous researchers [59] reported that after Aila 2009 due to inundation (98%) of water sources for households are now using rain water as a primary source (100%), on the other hand, sweet pond water (77.14%) and Pressure Sand Water Filter -PSF (22.86%) water are being used as a secondary source of drinking water and cooking. In case of washing and bathing, community people are mostly using river water (average 80%) and pond water (average 20%). Household water management is mostly done by female. The main type of latrines used in the locality is hanging toilet (61.42%) and children feces (100%) are dumped into the river which is so unhygienic for the people. The outbreak of water-borne diseases like skin diseases, diarrhea, and dysentery are in severe level in the study area. In order to develop water supply and sanitation system, community prefers more water tanks to be installed and water storage drams to be provided and embankments to be reconstructed in their first priority.

3.6.3. Rural Electrification Facility

Electricity is an essential service for life. Electrification status has significant impacts on socio-economic development. But household in the study (Figure 8) area is significantly deprived of grid line electric supply. Only 35.29% of households are enjoying electricity facility but rests of 54.70% are remaining non-electrified. Most interesting thing is that most of the household are using solar household system arranged by own. The following pie chart shows that 83.33% households are using solar household system and only 16.67% are using national grid line.

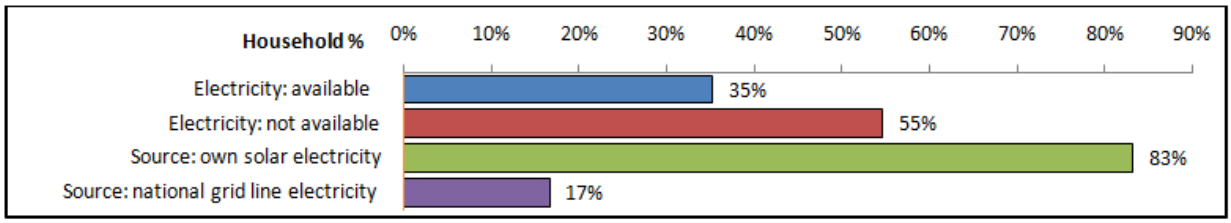

Figure 8. Sources and uses of electricity of households in the Uttar Bedkashi Union

3.7. Displacement Trends and Types of Livelihood

Previous researchers [60] discussed on the motivations of migrants and said that three types of migration can be distinguished: enforced migration, voluntary migration and distress migration. The first is decided upon by external powers. Resettlement programmes of governments for instance fall into this category. The second is the outcome of a decision-making process of migrants and their families. Migration due to drought, crop failure and famine is, among other causes covered by this category. On the other hand, it is encouraged by push or distress factors at home such as lack of employment, low wage rates, agricultural failure, debt, drought and natural calamities [61]. Large numbers of the poor in labour and farming communities to migrate from their home to far off places in search of employment [62] and large, internal migrants are unskilled and semi-skilled workers from lower income groups who could be able to improve their economic position or income scale after migration. A recent report by UNDP exposed the same that without migration amajority of the poor would not be able to spend on health, consumption and other basic needs, and would face the risk of sliding deeper into poverty [63]. Previous research [29] reveal that on an average 25%, 3% and 2% populations are displaced from different natural calamities like floods, droughts and cyclones. The estimation of future displacement [29] reveals that approximately 49 million, 63 million and 78 million people might be displaced in 2010, 2015 and 2020 respectively.

Table 2 showed the pattern and scale of displacement due to various effects of hazards and Table 3 indicated the displacement seasons, their destination, length of stay and type of works they did. Study revealed that permanent displacement from the study area is very negligible. The preferred choice for the vulnerable people for instance, 1-2 family members and groups of people from the area is to

displace to outside e.g. urban, semi-urban, regionally even other villages when work is not available in the locality. Significant seasonal displacement have been taking place during the rainy season, however people used to change their living place any time in the year ranging from 1 week to maximum 24 weeks. People used to go the nearby villages mainly for earth work for 1-2 days.

Table 2. Impacts, pattern (temporary/permanent/short distance/long distance) and scale of displacement due to disaster at Uttar Bedkashi Union

Disaster Event	Impacts and pattern of displacement	Scale
Tidal flood /High Tide	**Impacts**: Destroys homes, crops, fisheries and fresh water sources; and habitats. Severely hampers livelihood opportunities; Creates water logging and increases soil salinity. **Displacement:** Generally temporary. Also leads to short-distance permanent migration.	**Small**
Saline water intrusion and salinity	**Impacts**: Soil salinity leaves agricultural land unsuitable for production, damage fresh water fisheries; drinking water scarcity; leads to conversion of agricultural land to brackish water shrimp farming causing mass unemployment. **Displacement:** Temporary and permanent.	**Large**
River Erosion	**Impacts**: Makes people landless and homeless and affects severely livelihoods; Causes huge economic losses. **Displacement:** Permanent.	**Large**
Tropical cyclone	**Impacts**: Damages and destroys crops, household and domestic asset; causes deaths and makes displacement and homeless. **Displacement:** Mass temporary and forces permanent	**Large**
Storm surge and tidal surge	**Impacts**: Flooded by tidal surges and storm surge water caused sea water intrusion aggravating the situation of salinity ingression on the agriculture land made the farmers landless or owner of infertile land, and thus contaminated by all kinds of solid waste; having no alternative fresh water sources apart from rain water. Farmers sell the infertile land to rich people who convert them into shrimp enclosure results shrinking livelihoods. **Displacement:** Generally temporary. Also leads to short-distance permanent displacement.	**Moderate**
Excessive rainfall and water logging	**Impacts**: Heavy downpour damages standing Aman crops, vegetables, flooded the area and isolated the houses, and damaged mud houses and hut, shrimp enclosures also went under water and washed away, also causes crisis in animal feed. As a result local people lost their livelihood opportunities and other sources of income. **Displacement:** Temporary and short distance permanent displacement	**Moderate**
Drought and extreme temperature	**Impacts**: Increased salinity in the water and land, severely decrease the sources of drinking and other useable water for agriculture production etc. **Displacement:** Temporary.	**Moderate**

The study area was experienced (Table 3) recurrent floods, tidal flood, severe cyclones, water logging, salinity intrusions, droughts, river bank erosion, excessive rainfall which results their settlement not suitable to live and induce mass population displacement. Also revealed the common patterns-both temporary and permanent displacement and also of seasonal displacement due to different hazards. Many of the poor living in underdeveloped areas, seasonal migration and commuting are the only ways of accessing the benefits of growth in other locations. Migration has helped them in managing risk, smoothing consumption, and earning to invest in a better future [64]. It was reported that seasonal migration on the basis of three elements: (i) a lack of alternatives in origin areas which force entire families to migrate in search of work, (ii) work which is based on indebtedness generates little or no surplus for the laborers at the end of the season, and is merely for survival and (iii) work which involves large-scale violation of labor laws [65].

Table 3. Destination, length of stay and type of livelihood activities at different months of displacement after Aila, 2009

Months when victim people leave (displaced) their houses	Types of livelihood activities performed	Length of stay (week)	Name of destinations (different district and regions of Bangladesh)
December- January	Boro (winter-irrigated) rice sowing	3 to 6	Gopalgonj, Faridpur, Madaripur, Narail, Netrokona, Sylhet, Noakhali,Jessore, Bagherhat, Barisal.
April- May	Boro rice harvesting	3 to 6	
July-August	Aman (Rain-fed) rice sowing	3 to 6	Jessore, Magura, Narail, Barisal, Pirojpur.
October-November to April-May	Brick field	20 to 24	Dhaka, Barisal, Narail, Khulna, Faridpur, Noakhali, Patuakhali
November- December	Aman rice harvesting	3 to 6	Jessore, Magura, Narail, Barisal, Patuakhali
November-March	Wood processing work (with handy chainsaw)	4 to 8	Bagerhat, Barguna, Gopalgonj, Barisal
January-May	Earth work	2 to 12	Khulna, Bagerhat, Sathkhira

In previous research revealed that [29] average 2% (3 million) in cyclone, 25% (39 million) in flood, 0.1% (50,000) in river bank erosion and 3% (5 million) in drought respectively are displaced over the years in Bangladesh. It is evident that flood is the major natural threat that induces huge population displacement, followed by droughts, cyclones and river bank erosion. Flood results in long term water logging and inundation-made the local people take apart from the non-flooded area and situation became worsen to live in their own land without livelihood. Analysis discovered that people used to displace any time of the year for searching livelihood like earth works, day labor and rickshaw pulling in the city and other villages; when there is no work available in the locality mainly in rainy season or just for additional income (without regular employment). Research analysis of the Bangladesh bureau of statistics revealed that in Khulna and Barisal are vulnerable to multiple harsh conditions (flood, cyclone, tidal surge, salinity). Consequently, the poverty level of these areas is found to be higher (52% in Barisal, 51% in Rajshahi and 46% in Khulna) compared to other areas of Bangladesh [66] and

this higher poverty level imposed the local people to have displaced round the year searching for suitable livelihood. Due to limited scope of employments (off-farming economic sector), the livelihood diversification in the study areas has become one of the major challenges [67]. It has been revealed that seasonal displaced people's destinations are concentrated into in country regional locations- South-Western (Bagherhat, Barguna, Barisal, Faridpur, Gopalgonj, Khulna, Patuakhali, Pirojpur, Sathkhira), Central (Dhaka, Faridpur, Gopalgonj, Madaripur, Magura), North-Eastern (Netrokona, Sylhet) and South-Eastern (Chittagong, Chittagong Hill tract, Netrokona, Noakhali) regions for work, although the people mostly prefer the nearby/regional locations. In other research [53] also supported these findings and reported that destinations of the seasonal displaced people's are South-Western, Central, North-Eastern and South-Eastern regions of the country. In depth household survey revealed that the displaced people take a break of 1-2 weeks for visiting family (transfer of remittances as well) when they stay longer than 8 to 12 weeks. Some people might respond to climatic stressors by moving away temporarily to find work during difficult times. The climate change induced displacement in Bangladesh and suggested that to secure livelihoods is the utmost necessity and the demands of the local poor that can be ensured through improving dissemination of knowledge [29]. Therefore, ensuring economic stability through alternative livelihoods can contain people in their homeland and protect displacement. Also access to information and proper training along with greater participation of women will facilitate capacity building.

3.8. Economic Benefits of Livelihood Activities at Displaced Regions

Deshingkar [64] defined seasonal migration as a temporary move from and followed by return to the normal place of residence, for purposes of employment. This study reveals that some households barely manage to raise themselves above existing survival levels, while others accumulate wealth over time. However, what is clear is that most would be worse off if they were depending solely on local employment. In one study [68] discussed that migration is a decision that impacts the welfare of the household, the home community, and in the end the whole economy in various ways. However, we need ample literature to judge whether the welfare implications of the temporary rural to urban migration is positive and sizable in the context of rural development.

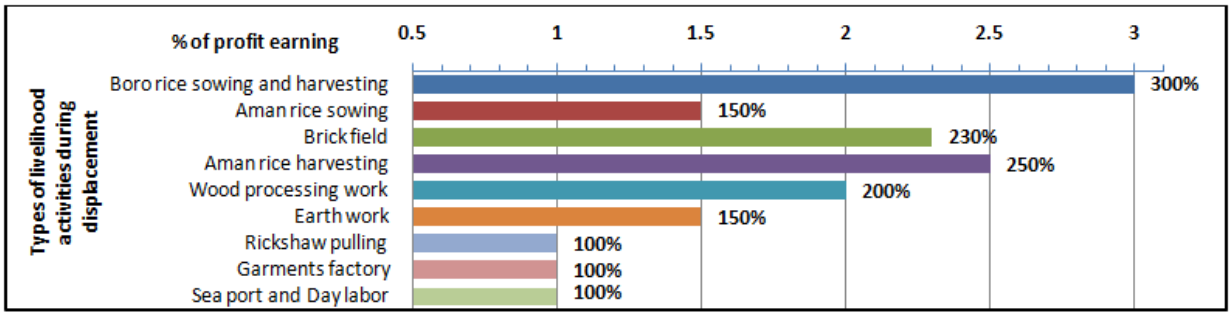

Figure 9. Statement of profit earning (%) from livelihood activities during displacement

Local people have identified two major reasons of displaced from coastal areas: one is gradual climate change induced disasters losses and the second is economic reasons or income opportunities. Local vulnerability e.g. saline water intruded agriculture land and disaster leads to increased poverty or reduces their capacity to cope with the situation. Thus people migrate for short term income-supporting resources. Cost-benefit of livelihood activities at displaced regions were analyzed (Figure 9) and revealed that in case of seasonal displacements, people prioritize economic benefits and distance of travel. For the rice sowing and harvesting group, they even traveled a long distance to north-eastern corner of the country e.g. Sylhet, Netrokona because of the high benefit from Boro cultivation in the recent times (300%). However, for the case of Aman, they mostly prefer regional locations-earned profits are 150% from sowing and 250% from harvesting. The case is quite similar with brick field group because they travelled to other parts of the country and earned profit about 230%. Crop harvesting is the most popular type of livelihood, as they brought the rice as salary into their house to ensure food security. All the seasonal group displacement and those that remain in the villages are used to displace during the rainy season for short term work as day labor in Khulna (preferred), Dhaka, and Chittagong and earned profit about 100%. Two major findings are that: people are now displaced to other Aman harvesting regions during November to January for work and earned 250% profit, but before the super cyclone Aila in 2009 they did the same work in their own locality and earned less profit. Another finding is that people used to displaced for short term livelihood when regular employment is not available in the locality (e.g. rainy season, after sowing season of rice), even if they had good conditions in their origin, they temporarily move for additional income and earned on average or 176% profit, so that they can invest this money to buy lands, to support better their family and provide education for children. Tthe socio-economic and demographic consequences of migration based on sample surveys and concluded that rural-urban mi- grants are relatively better educated than the national population found that the rural migrants in the city are hard working and contribute significantly in daily life [69].

3.9. Local Adaptations Practices

There were distinct changes of frequency and intensity of climate change induced disasters which might have combined effect on human environment in the study area. To reduce the impact of these changes and to survive in the time of displacement local community, governments,

as well as non government's organizations have undertaken some adaptation measures. FGDs, physical visits and discussion with local national and international stakeholders and review of the available literatures, some excited adaptation or innovative mitigation practices have been identified and documented.

3.9.1. Displacement is An Important Strategy for Many Victims in Securing Livelihood

In the section number 3.8 we have discussed about how the displaced and non displaced people uplifted their economic capacity to cope with adverse situation. On an average during temporarily movement for additional income they earned approximately 176% more profit then investment and invest this money to buy lands, to support better their family and provide education for children. Researchers have pointed out that migration away from affected areas can act to reduce per capita demand on what may become increasingly scarce resources, that remittances returned by migrants to their home regions can increase adaptive capacity there, and that returning migrants may also act as agents of positive change and sources of valuable information [70,71,72].

3.9.2. Agricultural Related Adaptation Strategy

Farmers are practicing adaptive agriculture like – selection of salinity and submergence tolerant vegetable, crop and fodder cultivation, duck and poultry rearing, indigenous fish culture, micro gardening, homestead gardening, raised seedbeds, earthen pot vegetables gardening, pond management with fish-duck-vegetable, rice-fish cultivation, container gardening in broken earthen pots, bamboos (for long rooted plant), jute bags, poly bags etc.; floating vegetable and seedling gardening on water hyacinth, bamboo, plantain raft etc. Poor farmers get about 50% percent [73] of their food and cash from homestead-based food production system likely to growing vegetables and fruits, rearing livestock, poultry and fishes and rising different varieties of trees and plants around the household that provide major share of livelihood especially for the poor farmers.

3.9.3. Non Agricultural Related Strategy

Before Aila women in the study area worked as fish processor-drying, curing and marketing of fish. Now they are involved in making handicrafts, net, baskets, brooms, mats and embroidery, preparing puffed rice to sell, selling green vegetable, ferrying cloth, ferrying cosmetics, grocery shop, tea stall etc. Local survivors have started to street selling of goods and services, construction work, domestic service etc. These income generation activities form the basis of survival and provide them minimal levels of economic and cultural capital.

3.9.4. Improvement of off Farm Skills and Capacity

In spite of accelerated salinity intrusion and erosion related to stronger and higher tides, villagers are determined to stay and pursue their livelihoods as long as possible. Therefore, local people are getting vocational training from different NGOs and results in learning new technologies, skills, capabilities relevant to their urban settings and thus creating new business and employment. NGOs working in the study area are providing support by soft loan, helping in linkage with service providers and marketing facilities. Capacity to cope is increasingly seen as a key component of a household's or community's level of vulnerability [74]. Success or failure of a society's response to disasters depends to a large extent on individuals' capability to cope with adverse situations. Therefore increasing households' disaster preparedness may be crucial to saving lives and mitigating damages.

4. Conclusions and Recommendation

The study was mainly conducted to identify the factors that influence human displacement, to investigate how natural disaster forced human displacement in coastal Uttar Bedkashi Union and the pattern of displacements and finally to recommend some measures that can be used to minimize displacement in coastal region of Bangladesh. Natural disasters namely river bank erosion, saline water intrusion, cyclone and storm surges, tidal flooding, water logging, excessive rainfall, high tide, extreme temperatures creates climate induced displaced in Uttar Bedkashi Union. The impacts of these climate induced hazards appear as obvious and explicit. Saline water intrusion directly hampered the agriculture production activities, destroyed the horticulture and homestead garden; reduced destroying cultivable agriculture land, and livestock and poultry rearing in the study. All these problems made the people's livelihood insecure; as a result people are obligated to leave the land of origin. Though the impact of other disasters like riverbank erosion, tidal flooding, high tide, extreme temperature not directly hampering as saline water intrusion, cyclone and storm surge done, but it has indirect impact and worsen the overall condition. People who had self-sustaining agriculture system before and they maintain their livelihood with that totally diminished and periled by different climate induced disasters in particular the cyclone Aila in 2009. The study suggests that reclamation of the saline affected land and resumption of innovative agriculture practice and creation of diversified livelihoods options can positively contribute to minimize climate induced human displacement in coastal Bangladesh.

Statement of Competing Interests

The authors have no competing interests.

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