International Journal of Humanities and Social Science Invention (IJHSSI)
ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714
www.ijhssi.org ||Volume 7 Issue 03 Ver. IV ||March. 2018 || PP.01-10

Pattern of Climate Change and Climate Change Induced Socio-Economic Vulnerability in Bangladesh: An Empirical Study

Md. Ohidujjaman
(Lecturer, Department of Sociology and Social Work, The People's University of Bangladesh, Bangladesh)
Corresponding author: Md. Ohidujjaman

ABSTRACT: *In the perspective of Climate Change, Bangladesh is likely to be one of the most vulnerable countries of the world. Now tropical cyclone, flood and tidal surge, salinity intrusion, rising temperature, decreasing rainfall, irregular weather pattern are the common phenomena in Bangladesh. As this is a sociological study, the focus is given on climate change induced socio-economic vulnerability. In the theoretical part, a strong relationship between climate change and poverty is shown where Ribot (2011) interrelated vulnerability and livelihood approaches and Blaikie (1994) defining vulnerability in the term of human dimension along as 'the capacity to anticipate, cope with, resist and recover from the impact of a natural hazard'. Poor are the most vulnerable due to climate change because their livelihoods are most affected due to their dependence on natural resources. The study made use of qualitative methods including in-depth interview (IDI), key informants interview (KII), focus group discussion (FGD), case study and observation. The main focus of this study is to overview of climate change pattern in the study area and elicit the socio-economic vulnerability of local people due to climate change.*

KEYWORDS *- Climate change; Vulnerability; Coastal area; Cyclone; Sidr; Aila; Bangladesh; etc.*

DATE OF SUBMISSION: 08-03-2018 DATE OF ACCEPTANCE: 23-03-2018

I. INTRODUCTION

Climate change has emerged as one of the most defining issues of twenty-first century. It is an extremely broad concept which encompasses a wide spectrum of negative human-induced effects on the world's environment. Bangladesh is likely to be one of the most vulnerable countries of the world in the event of climate change. Almost every sector of socio-economic life in Bangladesh is likely to be affected by climate change. Climate change is a major threat to sustainable growth and development in Bangladesh, and the achievement of the Millennium Development Goals: urgent action is needed. Although Bangladesh is the country least responsible for climate change, it is particularly vulnerable to the effects, including reduced agricultural production, worsening food security, the increased incidence of both flooding and drought, spreading disease and an increased risk of conflict over scarce land and water resources.(Rashid, 2009) According to the Third Assessment Report of IPCC (Intergovernmental Panel on Climate Change), South Asia is the most vulnerable region of the world to climate change impacts (McCarthy *et al*., 2001). The international community also recognizes that Bangladesh ranks high in the list of most vulnerable countries on earth. Bangladesh's high vulnerability to climate change is due to a number of hydro-geological and socio-economic factors that include: (a) its geographical location in South Asia; (b) its flat deltaic topography with very low elevation; (c) its extreme climate variability that is governed by monsoon and which results in acute water distribution over space and time; (d) its high population density and poverty incidence; and (e) its majority of population being dependent on crop agriculture which is highly influenced by climate variability and change. Despite the recent strides towards achieving sustainable development, Bangladesh's potential to sustain its development is faced with significant challenges posed by climate change (Ahmed and Haque, 2002). It is therefore of utmost importance to understand its vulnerability in terms of population and sectors at risk and its potential for adaptation to climate change.

Bangladesh is known a disaster-prone country, almost every year, the country experiences disasters of one kind or another—such as tropical cyclones, storm surges, coastal erosion, floods, and droughts—causing heavy loss of life and property and jeopardizing the development activities. The country is already beset with many problems like high population density (120 million people living in an area of 144 000 km2), shortage of land to accommodate the people, food insecurity, human health, illiteracy, and so forth. The abovementioned types of disasters make the problems all the more complicated.

II. RATIONALE OF THE STUDY

Bangladesh has already experienced with frequent natural disasters which causes millions of population displacements. (Roy, n.d) It is most vulnerable country for massive tropical cyclone which attacks in

every three years in an average and causes almost 60% of the total world"s death due to tropical cyclone. These result huge lives, livelihoods, houses and infrastructural damages in the coastal areas (Kumar, U., Baten, A., et.al, 2010). The recent devastating cyclone that is named Aila can be regarded as a perfect example. It caused massive loss of properties, infrastructure, social and economic disruption, environmental degradation in the coastal areas of Bangladesh which costs death of 190 people and effect on 4.82 million in total 11 coastal districts (Roy, n.d). About 160 millions of people are highly vulnerable to climate change and sea level rise where around 35 millions of people will be displaced from 19 coastal districts of Bangladesh if sea level rises by one meter (Roy, n.d cited by Rabbani 2009). In the monsoon period of the year 2007, over 85,000 houses were damaged and 1.2 million acres of crops were destroyed (PPCR, 2010). Again draught, riverbank erosion, salinity etc. also hampers the normal life of the country people and throw them towards the vulnerability. (Rahman and Chattapadhya, 2013) Bangladesh is one of the top 10 nations that are mostly vulnerable to climate change and by the end of the century; Bangladesh may be set to disappear under the waves. (Mahmood, 2012)

Sea level rise has already caused land erosion, increased salinity in coastal areas, and affected biodiversity leading to reduction of food production and fisheries in Bangladesh. Current sea-level rise trend suggests that 1meter increase in sea level will submerge around 18 percent of the country's coastal belt (Stern, 2007; Sarwar and Khan, 2007, cited in Khatun. M, 2013).

UNDP has identified Bangladesh to be the most vulnerable country in the world to tropical cyclones and the sixth most vulnerable country to floods* (see table below).

Most vulnerable countries to floods or cyclones (Deaths/100,000 people exposed to floods or cyclones)

	Floods			Cyclone	
1	Venezuela	4.9	1	Bangladesh	32.1
2	Afghanistan	4.4	2	India	
3	Pakistan	2.2	3	Philippines	8.3
4	China	1.4	4	Honduras	7.3
5	India	1.2	5	Vietnam	5.5
6	Bangladesh	1.1	6	Chaina	2.8

* Of major flood-affected countries reporting an average of over 200 deaths/year.

Source: UNDP (2004), A Global Report: Reducing Disaster Risk: A Challenge for Development
http://www.undp.org/bcpr

The latest World Bank report on climate change has warned Bangladesh of being one of the worst sufferers, saying that by 2100 the sea level will rise by up to 3 feet. The sea level rise will cause water scarcity and falling of crop yields, which will exacerbate hunger and poverty in Bangladesh according to the report. The report has also mentioned that the cities located in Bangladesh (and in some other countries) will become highly vulnerable due to the sea level rise. The Germany-based organizations, Potsdam Institute for Climate Impact Research and Climate Analytics, prepared the report for the World Bank. The World Bank and the German organizations do not know a very vital information that Bangladesh is an active delta. And due to that the lands of Bangladesh is rising 5 (five) millimetres, on average, a year. So by the year 2100, the lands of Bangladesh will rise 20 (twenty) inches or almost two feet. Not only that, every year Bangladesh gets twenty square miles of land, on average, by the process of erosion and accretion from the sea along its coastline. It means the coastline of the country will go forward quite a few miles from the present position pushing the sea back. So from the viewpoint of climate change, the picture of Bangladesh is not as gloomy as said by some international organizations. (Hasan 2012)

Table: Primary Environmental Disasters in Bangladesh

Common Disasters	Geographical Spreads
Sea Level Rise and Flood	One fourth of the total area inundated annually on average. May increase to 36% in case of severe flooding. Half of Bangladesh is less than 12.5 meters above the mean sea level.
Cyclone	On average, 1-3 severe to moderate storm every year. Some travel as far as 200 Km inland.
Drought	Common, despite the presence of abundant water resources, western regions are particularly vulnerable to drought.
River Bank Erosion	Recurrent in 35 sub-districts of Bangladesh.

Source: Sharma and Hugo, 2009:4, Alam, 2003:432, Bangladesh Water Development Board, 2010:6, International Organization for Migration, 2010:28

Two recent key reports – The Intergovernmental Panel on Climate Change's 'Fifth Assessment Report' and World Bank's 'Turn Down the Heat' – reveal long-term implications for Bangladesh and its people from probable catastrophic impacts of climate change. Both paint a very dismal scenario of the future as climate change continues to take its toll. The earth faces a temperature rise of at least 2 degrees Celsius above pre-industrial levels requiring firm and coordinated action to benefit all countries. This was not the only bad news. The recently released sixth annual Climate Change Vulnerability Index, (Maple croft) revealed that Bangladesh would feel the economic impacts of climate change most intensely and that our capital Dhaka would be one of the five *most climate vulnerable cities in the world.* (World Bank, 2013) Higher population density increases vulnerability to climate change because more people are exposed to risk and opportunities for migration within a country are limited. The **per capita income** in Bangladesh is US$370. This ranks below average South Asian per capita income and per capita income for low income countries (World Bank, 2002). More than one-third (36%) of the people in Bangladesh live in **poverty**; in rural areas, it is 40%. About one-quarter of the country's GDP comes from **agriculture** (World Bank, 2002), which makes the country's economy relatively sensitive to climate variability and change.It is difficult to determine Bangladesh's potential to adapt to climate change, but several key statistics give some insight as to the state of its infrastructure and social and human capital.

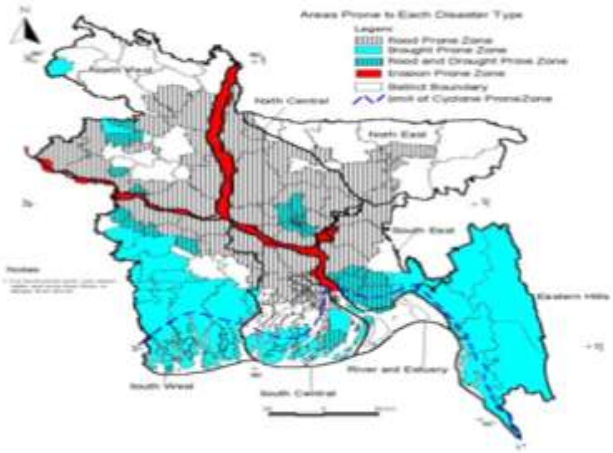

Figure 1: Vulnerable Areas of Bangladesh

Source: **M**inistry of Food and Disaster M**a**nagement, 200**7**:20

The country is vulnerable to sea level rise as 10% of the country is hardly 1 m above the mean sea level (MSL), and one-third is under tidal excursions. The country has 3 distinct coastal regions—western, central, and eastern coastal zones. The southwestern part of the region is covered by the largest mangrove forest of the world, popularly known as Sundarbans. The mangrove forests act as deterrents to the furiousness of tropical cyclones and storm surges. The central region has the combined flow of 3 mighty rivers—the Ganges, the Brahmaputra, and the Meghna (commonly known as the GBM river system and ranking as one of the largest river systems in the world). This region has seen the most disastrous effects of tropical cyclones and storm surges in the world and is very vulnerable to such calamities. (Rashed 1992) This study has covered 7 villages of Soudkhali Union in Sharankhola Upazila of Bagerhat district which lies in the southwestern coastal region in Bangladesh.

III. OPERATIONAL DEFINITION

Climate: Climate is a quantify of the average pattern of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological variables in a given region over long periods of time.

Climate Change: Climate Change refers to any change in climate over time, whether due to natural variability or as a result of human activity. Framework Convention on Climate Change (UNFCCC) define 'Climate Change' as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period.'

Vulnerability: *Vulnerability* refers to the inability to withstand the effects of a hostile environment.

According to IPCC Third Assessment Report, 2001 (cited in Islam. N, 2013) the term "vulnerability" means "the degree, to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes".

The term vulnerability is combined with three components which are exposure, sensitivity and adaptive capacity. Vulnerability is a function of potential impact (I) and adaptive capacity (AC) where potential impact shows the combination of exposure and sensitivity and vulnerability results impact minus adaptive capacity.(Islam, 2013)

V = f (I - AC) Where,

Exposure = Change in nature and degree of different climate variables Sensitivity = Reaction approach

Adaptive capacity = AC = Capacity of adaptation with the change Potential impact = I = Exposure + Sensitivity

Socio-economic Vulnerability: Social Vulnerability is one dimension of vulnerability to multiple stressors and shocks, including abuse, social exclusion and natural hazards. Socio-economic vulnerability refers to the inability of people, organizations, and societies to withstand adverse impacts from multiple stressors to which they are exposed.

IV. METHODOLOGY

Methodology is the whole procedure of research work that defines how we go about studying any phenomenon. As the study requires the detail about the pattern of climate change and the socio-economic vulnerability of local people due to climate change, qualitative approach has been used. The study areas were seven villages including South-Soudkhali, North-Soudkhali, Bakultola, Sonatola, Chaltabunia, Bogi and Tafalbari at Soudkhali Union in Sharankhola Upazila in Bagerhat district. Primary data have been collected from the respondents through in-depth interview schedule and Focus Group Discussion (FGD). Secondary data have been collected from related journals, books, papers, documents from local authority and other literature. An in-depth interview schedule was developed in Bangla to collect data directly from respondents under this study; tape recorder have been used for FGDs. Focus Group Discussion (FGD) were conducted to know collective information and opinion about the pattern of climate change on that area and the socio-economic vulnerability of the local people caused by it.

Objectives, research questions, and methods: A matrix

Specific objective	Major research question	Approach and methods
To identify the pattern of climate change in the study area.	What is the nature of climate change in the study area?	➢ Qualitative approach ➢ In-depth interview ➢ FGD ➢ Secondary information ➢ Reports and documents
To elicit the Socio-economic vulnerability of local people due to climate change.	How much local people are socioeconomically vulnerable due to climate change?	➢ Qualitative approach ➢ Case Study ➢ Observation ➢ FGD ➢ Reports and documents

V. THEORITICAL FRAMEWORK

Climate change present hazards to individuals and societies as a whole. According to Ribot are the damages shaped by the social, political and economic vulnerabilities of people and societies and climate events are transformed into differentiated outcomes via social structure. It is contingent on social inequality, unequal access to resources, poverty, poor infrastructure, lack of representation, and inadequate systems of social security, early warning, and planning. Ribot rightly opines that there in general is insufficient knowledge on the social dimensions of climate change vulnerability and he works with multiple vulnerabilities in different environmental and political-economical contexts to create an overall understanding of vulnerability (Ribot, 2011).

Ribot suggests a social constructivist approach and a focus on the multiple causes to single outcomes. In line with the social constructivists, Ribot defines climate stresses as external phenomena. He perceives the risk of disaster and suffering as social and places the vulnerability within the social system. In the integrative approach, vulnerability is seen as depending on both physical and human factors, and internal and external aspects perceived as separate dimensions of vulnerability, inspired by the IPCC (Ribot, 2011). A causality-based approach can be taken and causes of vulnerability are traced in specific instances of risk. This approach looks into why a given individual, household, group, nation, or region is vulnerable to certain damages (Ribot, 2009). Poverty is one of the conditions affecting vulnerability the most. Poor are often least able to rebound from stress and regularly live in unsafe environments often hit by floods and droughts. They moreover frequently lack insurance to help to recover losses and do seldom have influence to demand action from their government as the weak within a society tend to be of lower priority for those in power. Their everyday conditions are hence bad even in the absence of climate stress (Ribot, 2011). Women, minorities and other marginalized populations are especially vulnerable as they are sharing many of the living-circumstances of the poor.Blaikie et al. recognize that vulnerability to hazards and risk not only affect one's ability to cope with a disaster, but also affect a person's means for mitigation (pre-disaster event) and recovery (post-disaster event). If social vulnerability creates hazard and risk emanation, then mitigative measures and improved recovery efforts aimed at vulnerability should help minimize loss. Yet, here is the political paradox: mitigation can imply a present problem in the hazard control system with some social groups more susceptible than others to particular risks from hazards. Such efforts in hazard mitigation can uncover sensitive social issues placing power-elites and other influential stakeholders in difficult political circumstances. Socially unsafe conditions include risks to local economies, inadequacies in disaster preparedness measures, and the like. Consequently, Blaikie et al. explain that those at low economic levels tend to have less power over their sociopolitical and physical environs then the well-to-do. As a result of this disparity, risk vulnerability is greater for them. According to the authors of *At Risk*, natural hazards on one side of the Pressure and Release (PAR) Model put pressure on people and resources that are vulnerable. On the other side of the PAR model, root causes, dynamic pressures, and unsafe conditions also apply pressure to those in vulnerability. The authors argue that root causes, such as limited access to power and resources, manifest a progression in vulnerability through dynamic pressures like inadequacies in training, local institutional systems, or ethical standards in government. Blaikie et al. further contend that these dynamic pressures produce unsafe conditions in the physical and social environments of those persons and groups most susceptible to vulnerability to risk. In recent years there has been a welcome growth in the literature on disasters that recognises the significance of people's vulnerability to hazards, rather than retaining a narrow focus on the hazards themselves (Mitchell (ed.), 1998; Hewitt, 1997; Blaikie et al, 1994; Varley (ed.), 1994; Twigg & Bhatt, 1998). If we accept the equation that **Disaster = Hazard + Vulnerable** people, then we clearly need to know as much about vulnerability as we do about hazards. More than that, we need to know a great deal more about the interaction of hazards and people's vulnerability.

It is crucial to recognize that vulnerability is balanced by peoples' capabilities and resilience, and that if they are perceived only or mainly as victims then the problem of what causes vulnerability may be evaded. Vulnerability analysis is developed from a range of socio-economic approaches to hazards and what we could call 'the disaster of everyday life' (Blaikie et al, 1994; Cannon 1994). Vulnerability analysis begins with the crucial acceptance that vulnerability is often part of the normal, becoming apparent and obvious to some only with the impact of a hazard. It overlaps with and is derived from other perspectives including (among others) Amartya Sen's work on famine and entitlements (Dreze and Sen, 1989). It is vital to recognise that vulnerability should be treated as a condition of people that derives from their political-economic position.

VI. FINDINGS OF THE STUDY

1. Pattern of Climate Change:

This section presents the Nature of Climate Change in Soudkhali Union including frequency of cyclone, flood, salinity intrusion, rainfall, temperature rising, irregular weather etc .

1.1 Frequent tropical cyclone

Some recent scientific studies suggest that increases in the frequency and intensity of tropical cyclones in the last 35 years can be attributed in part to global climate change (Emanuel 2005; Webster et al. 2005; Bengtsson, Rogers, and Roeckner 2006) One effect of climate change is predicted to be an increase in the intensity of tropical storms, implying further cyclone damage for Bangladesh. Cyclones can be accompanied by extremely strong winds, as in Cyclone SIDR in 2007. Another factor that makes cyclones deadly is the accompanying storm surges that sometimes occur, water travelling upstream from the sea at high speeds, surging through canals and waterways. Such surges are especially prevalent in the Bay of Bengal because it narrows towards the north, providing a 'funnel' for strong winds and weather. These surges can damage embankments and cause a

great deal of damage at short notice, far inland. Storm surge damage would be intensified if the sea level is higher.

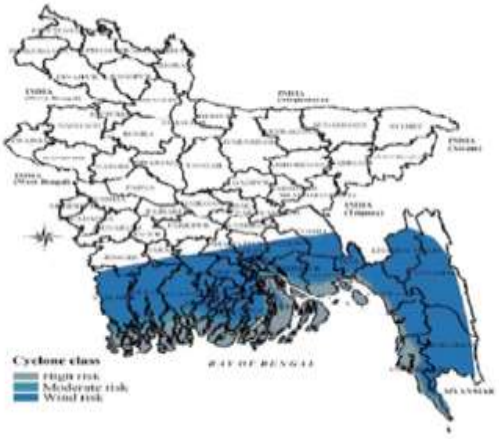

Figure 2: Typical Cyclone Affected Areas of Bangladesh

Source: Climate Change Cell, Comprehensive Disaster Management Project, 2006

Soudkhali Union has been affected by cyclone in several times including cyclone AILA and SIDR in 2007 and 2009 respectably. All the informants of the study area informed that in the last few years cyclone hit more frequent than the past. Abdur Rahman Mollah (65) a local *jotdar* (owner of large farming lands in Chaltabunia village) said, "In my 65 years life I have seen lots of cyclone but I have not seen such types of big cyclone like SIDR and AILA. Cyclone SIDR was massive and it took lots of lives". From different repots and documents it is evident that Soudkhali Union experienced 10 big cyclone histories in the last 20 years. Respondents said that most of the cyclones in recent years come with 10-20 feet high tidal surge which washes away all of their crops, livestock even human life which adds on to exiting vulnerability and makes post disaster coping difficult.

1.2 Salinity intrusion

Sea level rise is a grave threat to Bangladesh. The IPCC Fourth Assessment Report, revisited in late 2009 by the BBC, shows that sea levels could rise 28-43cm before 2100 due to climate change. According to the 2007 Fourth Assessment Report, sea level rise is caused partly by the expansion of water due to higher temperatures, and partly by increased glacier melt. In Bangladesh this is exacerbated by geological/tectonic factors – the country is subsiding, in effect tilting towards the east. This means that the sea level may in effect reach twice as high as it would 'only' from climate change.(IPCC Working Group II report 2007:chapter 10, section 10.6.1)"In the last couple of years I could not get my deserving crops though fertilizer and modern farming methods have been used more than the previous time" said Anwer Hossain Mollah (75), an experienced farmer in South-Soudkhali village. He claimed that salinity intrusion in soil and water is the main cause of his less production.

1.3 Flooding and siltation of river

Climate change – rising temperatures causing glaciers to melt – combined with deforestation in the Himalayas would increase the risk of flooding. As a delta system Bangladesh seriously suffers for being in downstream when upstream countries construct dams or open flood gates. Communication and negotiation about dams has not always been satisfactory. Riverbank erosion is another current problem: vulnerable people live and farm on the banks of rivers, which are sometimes washed away by the current. Abdur Rohim (35), an experienced young fisherman in North-Soudkhali said, "the deepness of Boleshor River (the biggest river of Shoronkhola) is gradually decreasing, so that I do not get much fishes but my father got plenty of fishes from this river." *"Siltation of Baleshor River bed is the prime cause of tidal surge and temporary flood in Soudkhali Union."* Said Abul Kashem (38), senior teacher of Sundarbon Secondary School. "Because of siltation on river bed, Baleshor River cannot keep much water" he added.

1.4 Drought or deficiency in rainfall

Drought is an abnormal condition where there is lack of sufficient water to meet the normal needs of agriculture, livestock, industry, or for human use. While generally associated with semi-arid or desert climates, drought can also occur in areas that normally enjoy adequate rainfall, and moisture levels (ADB, 1991). Drought is the result of insufficient or no rainfall for an extended period, and causes a considerable hydrological (water) imbalance. The ensuing water shortage leads to stream flow reduction, depletion of ground water and soil moisture, and hence, crop damage. In drought conditions, evaporation and transpiration exceed normal levels. If

it continues for a prolonged period, a serious threat is posed to agricultural production. In agricultural context drought affects the rice production most. Drought conditions due to deficiency in rainfall affect different parts of Bangladesh mostly during the pre- monsoon and post-monsoon periods. Aleya Begum (47), female UP member of Soudkhali Union Parishad said, "Rain does not come in time in the last couple of years." "Farmers don't get sufficient water in the harvesting time" she added. "I did not see these types of weather in my whole life. In my childhood I saw heavy rainfall from the month Baishakh to Aushin. But in the last couple of years I've not noticed much downpour even in monsoon period." Said Mohammed Abu Talib (78), an old fisherman in Sonatala village.

1.5 Irregular weather patterns and rising temperatures

Six Bangladeshi seasons are disappearing which is also experienced by the people of Soudkhali Union. Rabea Begum(45) mentioned "We used to have six seasons, now we only have three. Summer, winter and the rainy season" said Jahangir Alom Khan (67), a village doctor in Gabtola village, noticed that the winter arrives later and is milder: "When I was growing up, we used to need sweaters at this time of year [November]. Now we still have to run the fans." In the FGD most of the informants said that the monsoon is arriving late rand that rains are less frequent but heavier. This means a great deal of uncertainty and vulnerability in the agricultural planting cycle: "Farmers sowed in the spring as usual but then there was heavy rain and all their seeds were destroyed" said Anwer Hossain Mollah (75) an old farmer. Irregular weather obviously increases the risks for farming and cause food insecurity.

2. Climate Change Induced Socio-economic Vulnerability

2.1 Poverty and food crisis

Generally the local villagers of Bangladesh live in vulnerable condition. Most of them cannot fulfill their regular needs and most of them are living below poverty line. Moreover climate change brings extra burden. Cyclones bring severe winds, storm surges, and flood that impact on lives, crops and property. *"I lost my husband during Cyclone SIDR. He was a fisherman and in November 15, 2007 he was in river with his fishing boat, from that time he was disappeared. He was the only earning member in my family. After cyclone Sidr I am facing a lot of problem with my two young children. Our small hut was washed out. Now I am working as a day laborer but it is becoming tough to me to fulfill basic needs of my children. My parents are making pressure on me to get marry for the second time but I am afraid about my children"* said Hosne Ara Begum (30*). "Now we are living in abject poverty"* she added. *"We had no cloth to wear in the consecutive couple of days after cyclone Sidr"* Said Abdul Mazid (47), a small shopkeeper in Bakultala village. *"Actually we had nothing, no food, no cloth, no shelter, no security really it was a terrible situation"* he added. Anower Hossain Mollah (75) says, *"During cyclone SIDR all of my ripe crops washed out and it was a huge loss for me. But after cyclone Aila I have noticed salinity intrusion in soil and water, so that farming is becoming more and more difficult to us. Though modern methods and fertilizer has been used in farming but we cannot get our deserving crops or production*."

Most of the farmer said that agriculture production is gradually decreasing because of climate change. As a result the income of farmer is gradually reducing and they are fallen down in extreme poverty. On the other hand because of decreasing productivity of food government is compelled to import food from foreign country by spending high price, for this reason we can see food crisis in our country.

2.2 Loss of family members: lose of human resource

Vulnerability does not mean only loss of physical assets/resources nut also human resource and psychological loss. Cyclone SIDR took lots of human life in Soudkhali Union. It is really tough to find out a single family who has not lost a single family member in this area.

"I have lost 11 family members in SIDR, my father, mother, 3 sisters, 2 brothers, 2 sons and 2 uncles. I don't know how could I alive? I was totally mad. I could not remember anything. It would be better if I was one of them" said Peara Begum (40) from South-Soudkhali village. She was crying. "I cannot sleep at night till now" she added.

Jahangir Alom Khan (67), now a village doctor, who had lost his wife and only one daughter during cyclone SIDR said, "I was totally imbalanced; I could not talk for 7 days." It was a great tragedy in my life" he added. I got heart attack in three times in the last 4 years.

2.3 Unexpected equality and change of social position (patron-client relationship)

Unexpected equality, through change of social position due to climate vulnerability is appeared everywhere in Soudkhali Union. Traditional patron client relationship has been changed as rich households and large landlords due to climate vulnerability have been shifted to lower income group. Rezia Begum (50) says, "Now we all are equal, we are living in same types of house." "Cyclone SIDR & AILA eliminated all appeared differences between rich and poor" she added. JahanhirAlom Khan (67), was a Union Parishad Member and his

father had been acting as an elected Chairman of Southkhali Union Parishad for 40 years. Before cyclone SIDR he was one of the richest men in Southkhali union. But during cyclone SIDR he had lost everything including his wife and only one daughter. His two big shrimp farms were totally washed out by tidal surge of SIDR. He and his two sons were severely injured. He had nothing except some lands. Because of his social status he could not go for relief. He said, "How could I or my sons stand for relief with my servant and day laborer?" So that he did not get relief properly. "I had a paka house (tin-shed building) but the day after cyclone SIDR I found some bricks only." "My house, furniture and all necessary equipment were totally washed out. I have become a floating person" he added.

2.4 Social insecurity and Identity Crisis

Identity crisis is one of the major consequences of cyclone SIDR. "At least 100 children could not find their parents after cyclone SIDR. Now they are living at different orphanage" said Mr. Kamrul Hassan, executive officer of Sharankhola Upazila Parishad. In this circumstance we see that a number of young children are growing up without any specific identity. "Even some of them don't know the name of their parents" added Mr. Hassan.

Rabia Begum, 55 years old widow lives at Sonatola village, who had lost her only one son and her son's wife during SIDR and now she is living with her little granddaughter (5) years expresses her sorrows, "It is really tough to me to look after my grandson but I love him so much as he does. May be I am alive because of this Angel" she said. But whenever she was asked her about the future of her grandson then she expressed her worries or uncertainty with tears, "I don't know about his future, I am growing old".

It is easily understandable, in these situation children do not get proper socialization and most of the cases they are living in a great insecurity.

2.5 Gender Vulnerability: Women are most vulnerable

Though gender must be a very crucial issue regarding vulnerability caused by climate change and environmental degradation as women are very much close to the nature and due to their socio-economic status and condition unequal to men, they are most likely to be worst victim. Social researchers somehow did not focus significantly on gender issues and vulnerability in the climate change and environmental degradation related studies. From the field study it appeared clearly that women are the most vulnerable due to climate change. Most of the informants said that after cyclone SIDR and AILA, the role of women in family and society has been changed significantly. Just after cyclone when they had no food and water, women were the most responsible to collect or manage food and water for their family. One the other hand, those women who has lost their husbands or prime earning members in cyclone, they are living in an extreme vulnerable situation. Hosne Ara Begum (30) a young lady from Tafalbari village, who had lost her husband during SIDR said, "After cyclone Sidr I am facing a lot of problem with my two young children. Our small hut was washed out. Now I am working as a day laborer but it is becoming hard for me to fulfill basic needs of my children. My parents are making pressure on me to get married for the second time but I am worried about my children's future".

2.6 Migration

Bangladesh is the world's 3rd most vulnerable country to sea-level rise in terms of the number of people and in the top ten in terms of percentage of population living in low-lying coastal zones. Currently, almost 40 million people live in the coastal areas of Bangladesh. Loss of coastal land to the sea in this vulnerable zone – currently predicted to reach up to 3% by the 2030s, 6% in the 2050s and 13% by 2080 – is likely to generate a steady flow of displaced people. (Pender, 2007)

Migration is one of the socio-economic consequences of climate change. In the study most of the farmer considered agriculture as an unprofitable occupation due to extreme salinity intrusion. For the fishermen losing their nets and boats in the cyclones and for the increasing trend of frequent cyclone most of the fishermen feel insecure to go to sea for catching fish. So a common tendency of migration is noticed in Soudkhali Union. The prime zones of migration are Dhaka, Chittagong and Khulna. Push factor is working here, they move to urban areas to get better life.

Mohammed Monir (38), a fisherman at Sonatola, said, "My younger brother who worked with me, after Cyclone Aila left this village and now he is living at a slum in Dhaka city with his wife and kids." Nojrul Islam (32), a petty shopkeeper in Gabtola bazer said, "I want to go Saudi Arabia and my interview is under processing." "There is an economic depression and business is affected due to lackof money in local's hand these days" he added. "I have noticed that the tendency of migration is increasing in the last couple of years" said Abdur Rahaman (75). "Mostly young people are more interested in migration" he added.

2.8 Occupational Shifting

Occupational shifting is one of the major consequences of climate change in Soudkhali Union. Due to frequent cyclone caused by climate change, most of the people who were engaged with agriculture and fishing lost their livestock, crops, nets, boats and houses. Then it is very difficult to back in production due to insufficient resource. For their survival, they are compelled to shift their occupation. "I was a fisherman; most of the days of my life have been spent in the river connected to the sea. During cyclone AILA I had lost all of my fishing equipments including net and boat. I could not buy those equipments yet and I don't know whether I will be able to buy these or not" said Abul Kashem (30) which shows the uncertainty of their occupation.

2.9 Unemployment

After different natural deserters like frequent cyclone, most of the farmer loss their crops, houses and livestock and that they become workless for several months. Then these workless farmers are considered unemployed people. In this study it appeared that erosion took several farmers' land, so that they lost their livelihood and became unemployed people. On the other hand many fisherman who had lost their fishing boat and net, since they have only fishing skill they become unemployed too.

2.10 Physical Vulnerability

Most of the informant said that because of these types natural calamity they fall in poverty, so that they cannot maintain their regular food habit and they cannot take care of their health properly. So that different health problems like Arsenicosis, anemia, malnutrition and so on are increasing day by day. On the other hand many people were injured during cyclone SIDR and Aila and they could not continue their regular activities properly. Some of the informants in the FGD mentioned that that their psychological problems caused by the trauma of losing dear ones and their livelihoods and assets also lead to physiological suffering such as heart attack, and strokes which caused physical vulnerability.

VII. CONCLUSION

From the above discussions, the bleak vulnerability scenario of coastal Bangladesh due to climate change is exposed. In this study, it is shown that most of the people in Soudkhali Union depend on agriculture and fishing as their livelihood which are very much connected with climate. Due to frequent cyclone and tidal surge farmers are facing huge agricultural damages and fishermen are losing their fishing materials like fishing equipments. Devastating cyclone like Aila and Sidr took a lot of human lives, livestock and so on. Agricultural production and shrimp cultivation are adversely affected by the salinity intrusion in these coastal villages. Similarly rising temperature, decreasing rainfall, irregular weather pattern set impediments in the livelihood of local people. Migration, occupational shifting and unemployment are experienced commonly due to climate change. Women and children are the mostly vulnerable due to climate change. It can be said that climate change induced vulnerabilities are universal for all strata of people though their intensity may vary and usually poor are most victims. So we can see poverty and risk are the major outcome of climate change as Blaikie (1994) stated that vulnerability and livelihood are tremendously interrelated which is emphasized by Ribot (2010) as well in his discussion. The study presented the extreme vulnerability of middle class people as well the issue of "*Unexpected Equality"* is raised.

REFERENCES

[1]. Akram, Shahzada. M, Mahmud, Tanvir and Iftekharuzzaman 2007, Integrity in Humanitarian Assistance: Issues and Benchmarks. www.ti-bangladesh.org

[2]. Ahmed, A.U. and Haque, N., 2002. Climate Change and Sustainable Development. Paper presented at the Dhaka Meet on Sustainable Development, March 14-18, 2002. Incorporated in Q.K. Ahmad and A.U. Ahmed (eds.), Citizens' Perspectives on Sustainable Development, Bangladesh Unnayan Parishad (BUP).

[3]. Blaikie, P., Cannon, T., Davis, I.& Wisner, B. (1994). A Risk: Natural Hazards, People's Vulnerability, and Disasters. London: Routledge.

[4]. Emanuel, K., 2005. Increasing destructiveness of tropical cyclones over the past 30 years. Nature: 436, 686-688.

[5]. Hasan, Faruque 2012. 'Climate Change and Bangladesh' the Daily Star November 28, 2012

[6]. IPCC, 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Eds.). Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

[7]. Islam, N. (2013, March). Vulnerability to Climate Change: Perspectives from Bangladesh. Paper presented at the Conference Hall, India-Arab Cultural CentreJMI, New Delhi.

[8]. Islam, S.M.R., Huq, S. and Ali, A., 1998, 'Beach Erosion in the Eastern Coastline in Bangladesh', in S. Huq, Z. Karim, M. Asaduzzaman, and F. Mahtab (Eds.), *Vulnerability and Adaptation to Climate Change for Bangladesh*, Kluwer Academic Publishers, Dordrecht, pp. 71-92.

[9]. Khan, Arastoo 2013. '*Bangladesh – The Most Climate Vulnerable Country'* End Poverty in South Asia. http://blogs.worldbank.org

[10]. **Khatun, Mahmuda** (2013), Bangladesh e-Journal of Sociology. Volume 10, Number 2. July 2013.

[11]. Kumar, U., Baten, A., et.al (2010) Cyclone Aila: One Year on Natural Disaster to Human Sufferings. Unnayan Onneshan-The Innovators.

[12]. Mahmood, Shakeel Ahmed Ibne 2012, *Impact of Climate Change in Bangladesh: The Role of Public Administration and Government's Integrity*, Journal of Ecology and the Natural Environment Vol. 4(8), pp. 223-240
[13]. Ministry of Food and Disaster Management, 2007. National Plan for Disaster Management 2007-2015. Draft National Plan, Volume 6. Dhaka: Government of the People's Republic of Bangladesh.
[14]. Pender, James (2007, February), *2nd International Workshop on Community Based Adaptation to Climate Change, held in Dhaka, Bangladesh,:* www.iisd.ca/ymb/sdban
[15]. Rahman, Rashadur and Somashree Chattapadhya(2013). Climate Change Induced Vulnerability: Migration towards Cities, IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT) e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 4, Issue 5 (May. - Jun. 2013), PP 77-82 www.Iosrjournals.Org
[16]. Rashed, H.E., 1991 "Geography of Bangladesh" (Second Revised Edition), The University Press Ltd. Dhaka, Bangladesh.
[17]. Rashid, A.K.M Mamunur (2009) " *Climate Change Vulnerability in Bangladesh: Strategic Position of DSK/DCA in the field of climate change adaptation initiatives in Bangladesh"* Published by the Dustha Shastha Kendra (DSK)
[18]. Ribot, Jesse. 2011. Vulnerability before Adaptation: Toward Transformative Climate Action*Global Environmental Change*, Vol. 21, No. 4. (October 2011)
[19]. Ribot, J., 2009. "Vulnerability does not Fall from the Sky: Toward Multi-scale Pro-Poor Climate Policy," Pp. 47-74 in Robin Mearns and Andrew Norton (eds.), *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World.* Washington, DC: The World Bank.
[20]. Sarwar, Golam, Mahbub and Khan, Mamunul, H. 2007. Sea level Rise: A Threat to the Coast of Bangladesh.International Quarterly for Asian Studies 38(3/4): 375-397.
[21]. Sen, Amartya and Dreze. Jean. 1989. Hunger and Public Action. Oxford : Clarendon Press, 1989, WIDER Studies in Development Economies.
[22]. Sharma and Hugo, 2009:4, Alam, 2003:432, Bangladesh Water Development Board, 2010:6, International Organization for Migration, 2010:28
[23]. Stern, Nicholas. 2007. The Economics of Climate Change: The Stern Review.Cambridge University Press: Cambridge.
[24]. *The Daily Star*, 2 February 2007 "Donors propose $ 4 billion plan to fight natural calamities"
[25]. WB, 2000, "Bangladesh: Climate Change and Sustainable Development. Report No. 21104-BD", Rural Development Unit, South Asia Region, The World Bank (WB), Dhaka, pp. 95.
[26]. World Bank, 2010.Vulnerability of Bangladesh to Cyclone in a Changing Climate: Potential Damages of Adaptation Cost.Policy Research Working Paper 5280.World Bank: Washington, DC.
[27]. Webster, P. J., G .J. Holland, J.A. Curry, and H-R. Chang. 2005. Changes in tropical cyclone number, duration and intensity in a warming environment. Science 309: 1844-46.
[28]. UNDP (2004), A Global Report: Reducing Disaster Risk: A Challenge for Development. http://www.undp.org/bcpr

Md. Ohidujjaman." Pattern of Climate Change and Climate Change Induced Socio-Economic Vulnerability in Bangladesh: An Empirical Study." International Journal of Humanities and Social Science Invention (IJHSSI) 7.03 (2018): 01-10.