

Coastal Community, Poverty and Climate Change Adaptation: An Anthropological Study of *Bayer Char* Community

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(This thesis is submitted to fulfill the requirement for the degree of Doctor of Philosophy (PhD) in Anthropology, University of Dhaka)

June, 2023

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Dedication

This thesis is dedicated to my beloved parents *Mohammad Mostafa and Rajia Sultana* with heart-felt gratitude, profound homage and immense respect for their unconditional love, innate blessings and care bestowed upon me throughout their lives.

Declaration

I undersigned hereby declare that this dissertation is my original work. The findings accumulated here are the result of inquiry that conducted in the areas under *Bayer Char*, Ramgati, Lakshmipur, Bangladesh. The dissertation titled ‘Coastal Community, Poverty and Climate Change Adaptation: An Anthropological Study of *Bayer Char* Community’ is submitted as the requirements for the Doctor of Philosophy (PhD) at the Department of Anthropology, University of Dhaka. I also proclaim that this dissertation or any part of this has not been submitted elsewhere for any academic degree.

Abu Saleh Mohammad Noman

Certificate of the Supervisor

This is to certify that the dissertation titled “Coastal Community, Poverty and Climate Change Adaptation: An Anthropological Study of *Bayer Char* Community”, conducted by Abu Saleh Mohammad Noman, Reg. No. 04/2019-2020 has been completed under my direct supervision. It is an original work and it has not been submitted to any other university for a degree. I recommend this dissertation for final submission to the concern authority.

Professor Dr. Zahidul Islam

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Particulars

Acknowledgements	i
Abstract	ii
List of Tables	vi
List of Figures	ix
List of Graphs	ix
List of Maps	xiv
Abbreviations and Acronyms	xv

Table of Contents

CHAPTER ONE: INTRODUCTION	1–25
1.1 Statement of the Problem	2
1.2 Rationale of the Study	6
1.3 Importance of the Study	8
1.4 Objectives of the Study	9
1.5 Research Questions	9
1.6 Pains and Pleasure of the Study	9
1.7 Conceptual Framework	10
CHAPTER TWO: REVIEW OF LITERATURE	26–47
2.1 Coastal Community and Climate Change Adaptation: Global Context	27
2.2 Coastal Community and Climate Change Adaptation: Asia Context	32
2.3 Coastal Community and Climate Change Adaptation: Bangladesh Context	33
CHAPTER THREE: THEORETICAL FRAMEWORK	48–60
3.1 Anthropogeography Theory	49
3.2 Theory of Historical Possibilism	49
3.3 Cultural Ecology Theory	53
3.4 Community Based Adaptation	54
3.5 Theories of Poverty	54
3.6 Feminist Theories	58
3.7 Theories of Migration	59

CHAPTER FOUR: METHODOLOGY OF THE STUDY	60-71
4.1 Phase -1: The Preparatory Stage	62
4.1.1 Selection of the Study Area	62
4.1.2 Geophysical Structure of the Study Area	63
4.1.3 Methods and Techniques of Data Collection	65
4.1.4 Why Qualitative Methods:	66
4.1.5 Why Survey Method?	66
4.1.6 The Study population, Interlocutors and Unit of Analysis	66
4.1.7 Pre-testing	67
4.2 Phase-2: Field Data Collection	67
4.2.1 Sampling Procedure	67
4.2.2 Data Collection Procedure	69
4.2.2.1 Rapport Building	69
4.2.2.2 Data collection	69
4.3 Phase-3:	69
4.3.1 Data Processing and Analysis	69
4.4 Phase-4: Preparing Report	70
4.5 Ethical Consideration	70
4.6 Reliability and Validity	71
CHAPTER FIVE: RESULTS OF THE QUALITATIVE STUDY	72–115
5.1 CLIMATE CHANGE IMPACTS, LIVELIHOOD ASSETS AND ADAPTATION	73
5.1.1 Climate Change Perception and Coping Mechanism	73
5.1.1.1 Climate Change Perception and Impacts at National Level	73
5.1.1.2 Sources of Knowing the Possible Impacts of Climate Change	73
5.1.1.3 Local Experience of Climate Change and Its Causes	74
5.1.1.4 Most Affecting Climatic Hazards, Affecting Time and Coping Mechanisms	74
5.1.2 Climate Change, Natural Assets and Adaptation	76
5.1.2.1 Climatic Hazards, Severity and Natural Assets	78
5.1.2.2 Natural Assets and People’s Vulnerability to Climatic Hazards	79
5.1.2.3 General Adaptation to Climatic Impacts on Natural Assets	79
5.1.2.4 Adaptation to Specific Climatic Hazards Impact on Natural Assets	80
5.1.3 Climate Change, Material Assets and Adaptation	83
5.1.3.1 Migration and Duration of Settlement	83
5.1.3.2 Profession and Production	83
5.1.3.3 Household Size, Income-Expenditure Gap and Livelihoods Vulnerability	83
5.1.3.4 Climatic Impacts on Material Assets	84
5.1.3.5 Severity of Climatic Hazards Impact Material Assets Most	84

5.1.3.6	Vulnerability of Material Assets to Climatic Hazards	86
5.1.3.7	Adaptation to Climatic Impacts on Material Assets	86
5.1.3.8	Adaptation to Specific Climatic Hazards Impact on Material Assets	87
5.1.4	Climate Change, Human Assets and Adaptation	89
5.1.4.1	Climatic Impacts, Diseases and Medicine	89
5.1.4.2	Climatic Impacts on Human Assets of Livelihoods	89
5.1.4.3	Severity of Climatic Hazards That Impact Human Assets of Livelihoods	90
5.1.4.4	Vulnerability of Human Assets to Flood and Thunderstorm	90
5.1.4.5	Adaptation to Climatic Impacts on Human Assets	91
5.1.4.6	Adaptation to Climatic hazards That Impact Human Assets	91
5.1.5	Climate Change, Social Assets and Adaptation	93
5.1.5.1	Relationship with Religious Institutions, Politics etc	93
5.1.5.2	Relation with Family and Community and Secured Places	93
5.1.5.3	Climatic Impacts on Social Assets	93
5.1.5.4	Severity of Climatic Hazards Impact on Social Assets	94
5.1.5.5	Adaptation to Climatic Impacts on Social Assets	94
5.1.6	Climate Change, Physical Assets and Adaptation	96
5.1.6.1	House, Household Size and Sanitation	96
5.1.6.2	Climatic Impacts on Physical Assets of <i>Bayer Char</i> People	96
5.1.6.3	Climatic Hazards That Impact on physical Assets	97
5.1.6.4	The Severity and Frequency of and Vulnerability to Cyclone	97
5.1.6.5	Empowering House as Adaptation to Cyclone	97
5.2	POVERTY AND ADAPTATION TO CLIMATE CHANGE	100
5.2.1	Natural Assets and Poverty	100
5.2.2	Material Assets and Poverty	100
5.2.3	Human Assets and Poverty	101
5.2.4	Poverty and NGOs Membership as Social Assets: A Net of Exploitation	103
5.2.5	Poverty and Physical Assets of Livelihoods	104
5.2.6	Poverty and Its Relation to Climate Change	104
5.2.7	Poverty and Its Impacts on Adaptation	104
5.3	GENDER, PATRIARCHY AND ADAPTATION TO CLIMATE CHANGE	106
5.3.1	Gender Role in Water and Fuel Management	106
5.3.2	Gender Role and Preference in Education	106
5.3.3	Gender Role in Production	106
5.3.4	Decision Maker, Income Earner and Patriarchy	107
5.3.5	Gender Impact of Climate Change	107
5.3.6	Gender and Adaptation to Climate Change	108
5.3.7	Climatic Hazards and Patriarchy in Adaptation	109
5.4	LOCAL KNOWLEDGE, NETWORKS AND ADAPTATION	110
5.4.1	Climate Change and Role of Local Knowledge in Adaptation	110
5.4.2	Climate Change and Role of Local Networks in Adaptation	111

5.5 Fishermen and Adaptation to Climate Change	113
5.5.1 Types of Fishing Profession, Facing Problems and Coping Mechanism	113
5.5.2 Special Climatic Impacts Experienced by Fishermen	114
5.5.3 Climatic Impacts and Fishermen Adaptation Strategies	115
CHAPTER SIX: FINDINGS OF THE QUANTITATIVE STUDY	116–271
SECTION ONE: DEMOGRAPHIC CHARACTERISTICS OF THE INTERLOCUTORS	117–119
6.1.1 Sex and Religion	117
6.1.2 Marital Status and Age of Interlocutors	117
6.1.3 Occupation Based on Sex	118
6.1.4 Household Size Based on Education	119
SECTION TWO: CLIMATE CHANGE PERCEPTION AND COPING MECHANISMS	120–129
6.2.1 Climate Change Perception and Impacts at National Level	120
6.2.2 Sources of Knowing the Possible Impacts of Climate Change	123
6.2.3 Local Experience of Climate Change Impacts	125
6.2.4 Most Affecting Climatic Hazards, Causes and Coping Mechanisms	126
SECTION THREE: CLIMATE CHANGE, LIVELIHOOD ASSETS AND ADAPTATION	130–216
6.3.1 Climate Change, Natural Assets and Adaptation	130
6.3.1.1 Land and Land Ownership Process	130
6.3.1.2 Exchange of Land and Nature of Exchange	131
6.3.1.3 Water, Its Sources and Distance	132
6.3.1.4 Fuel, Its Sources and Sufficiency	133
6.3.1.5 Climatic Impacts on Natural Assets	134
6.3.1.6 Climatic Hazards, Severity, Vulnerability and Natural Assets	137
6.3.1.7 Adaptation to Climatic Impacts on Natural Assets	143
6.3.1.8 Climatic Hazards, Natural Assets and Adaptation	145
6.3.2 Climate Change, Material Assets and Adaptation	152
6.3.2.1 Migration and Duration of Settlement	152
6.3.2.2 Profession and Production	153
6.3.2.3 Household Size, Income and Expenditure	155
6.3.2.4 Climatic Impacts on Material Assets	158
6.3.2.5 Climatic Hazards, Severity and Material Assets	160
6.3.2.6 Climatic Hazards, Vulnerability and Material Assets	164
6.3.2.7 Adaptation to Climatic Impacts on Material Assets	166
6.3.2.8 Climatic Hazards, Material Assets and Adaptation	168
6.3.3 Climate Change, Human Assets and Adaptation	175
6.3.3.1 Climatic Impacts, Diseases and Medicine	175
6.3.3.2 Climatic Impacts on Human Assets	178

6.3.3.3	Climatic Hazards, Severity and Human Assets	180
6.3.3.4	Climatic Hazards, Vulnerability and Human Assets	183
6.3.3.5	Adaptation to Climatic Impacts on Human Assets	184
6.3.3.6	Climatic hazards, Human Assets and Adaptation	186
6.3.4 Climate Change, Social Assets and Adaptation		191
6.3.4.1	Relationship with Religious Institutions, Family, Politics etc	191
6.3.4.2	Relation with Family and Community	194
6.3.4.3	Most Secured Places and Climatic Impacts on Social Assets	195
6.3.4.4	Climatic Hazards, Severity and Social Assets	198
6.3.4.5	Adaptation to Climatic Impacts on Social Assets	198
6.3.5 Climate Change, Physical Assets and Adaptation		202
6.3.5.1	House and Sanitation	202
6.3.5.2	Climatic Impacts on Physical Assets	205
6.3.5.3	Climatic Hazards, Severity and Physical Assets	208
6.3.5.4	Climatic Hazards, Vulnerability and Physical Assets	209
6.3.5.5	Adaptation to Climatic Impacts on Physical Assets	210
6.3.5.6	Climatic Hazards, Physical Assets and Adaptation	213
SECTION FOUR: POVERTY AND ADAPTATION TO CLIMATE CHANGE		217–239
6.4.1	Natural Assets and Poverty	217
6.4.2	Material Assets and Poverty	218
6.4.3	Human Assets and Poverty	224
6.4.3.1	Char Life, Gender in Education and Poverty	228
6.4.3.2	Access to Information	230
6.4.4	Social Assets and Poverty	231
6.4.5	Poverty and Its Relation to Climate Change	233
6.4.6	Poverty and Its Impacts on Adaptation	235
SECTION FIVE: GENDER, PATRIARCHY AND ADAPTATION TO CLIMATE CHANGE		240–257
6.5.1.	Women Gender Role in Water and Fuel Management	240
6.5.2	Education and Gender	242
6.5.3	Gender Role in Production	243
6.5.4	Income Earner, Decision Maker and Patriarchy	245
6.5.5	Gender Impact of Climate Change	247
6.5.6	Gender and Adaptation to Climate Change	249
6.5.7	Climatic Hazards and Patriarchy in Adaptation	253
SECTION SIX: LOCAL KNOWLEDGE, NETWORKS AND ADAPTATION		258–268
6.6.1	Climate Change and Role of Local Knowledge in Adaptation	258
6.6.2	Negative Role of Local Knowledge in Adaptation to Climate Change	259
6.6.3	Positive Role of Local Knowledge in Adaptation to Climate Change	260
6.6.4	Climate Change and Role of Local Networks in Adaptation	263
6.6.5	Negative Role of Local Networks in Adaptation to Climate Change	264

6.6.6	Positive Role of Local Networks in Adaptation to Climate Change	265
SECTION SEVEN: FISHERMEN AND ADAPTATION TO CLIMATE CHANGE		269–279
6.7.1	Types of Fishing Profession, Facing Problems and Coping Mechanism	269
6.7.2	Climatic Impacts and Fishermen Coping Strategies	271
6.7.3	Climatic Impacts and Fishermen Adaptation Strategies	276
CHAPTER SEVEN: CONCLUSION AND WAY OUT		280–288
7.1 International Level		281
7.2 National Level		283
7.2.1	Improvements of Policy and Administration	283
7.2.2	Special Program Interventions	284
7.2.3	Basic Services	286
7.3 Local Level		287
7.3.1	Local Government and Communities	287
7.3.2	Local Level NGOs	288
REFERENCES		289–297
APPENDICES		
Annexure One	: Ramgati Upazila Census Results at a Glance	
Annexure Two	: Map and Photographs	

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ABSTRACT

Bangladesh, a topography of flat and low-lying densely populated country, is one of the most climate vulnerable countries in the world and will become even more so from the perspective of its disadvantageous geographic location, high levels of poverty, climate change impacts and adaptation to it, reliance of significant numbers of livelihoods on climate sensitive sectors specially agriculture and fishing. The people of coastal-char area of Bangladesh mostly encounter increased frequency of climate change induced various natural and man-made disasters as cyclones, floods, land and coastal erosion, soil and water salinity, tidal surge, droughts, the thunder storm, cold waves, insect attacks and hailstorm. In response to these climatic impacts on their livelihood assets the people adopt various adaptation strategies where poverty, gender, patriarchy, local knowledge and networks play role which was explored and examined by the present study using the integrative method of analysis i.e., integration of qualitative and quantitative methods.

The thesis consists of seven chapters. Chapter one contains the introduction to the study as statement of the problem, rationale, importance, objectives, research questions, conceptual frameworks and pain and pleasure of the study. Chapter two involves review of the literature where more than 50 books, journals/articles, documents and reports related to present study were reviewed and found out the methodological and theoretical flaws, shortcomings and gaps which were intended to make up and bridge in the present study. Chapter three discusses some theories related to this study and this study was controlled and guided by the theory of cultural ecology developed by Julian Steward. Methodology of the study was discussed in chapter four where integrative method was followed i.e., qualitative methods (observation, case studies, FGDs, KIIs, In-depth interview and oral history) were supplemented by quantitative method (Sample survey). Chapter five contains the findings of qualitative study. The findings of the quantitative study were presented and analyzed with discussions in chapter six which was divided into seven sections. In first, second and third sections, the findings of demographic characteristics of interlocutors, climate change perceptions and coping mechanisms, and impacts of climate change on five livelihood assets of *Bayer Char* coastal community and their adaptation strategies to it were presented respectively. Sections four to six consist of impacts of poverty on adaptation strategies, the role of gender and patriarchy in adaptation and the role of local knowledge and networks in adaptation strategies of *Bayer Char* coastal community to ongoing climate change respectively. The special impacts of climate change on fishermen's life and livelihoods and their special adaptation

strategies to it were presented in section seven. Chapter seven includes the concluding remarks showing the relations of data to the theories and suggesting the way out.

It was explored in the present study that there is an adaptive relationship between ecology and culture i.e., between the environment and the subsistence system of *Bayer Char* community. Most of the time, the people of *Bayer Char* community use natural resources of their environment to adapt to the climatic impacts on their livelihood assets which creates the social system of *Bayer Char* community. Cyclone, tidal surge, water salinity and soil salinity are the most devastating climate change induced hazards that affect the livelihood assets of *Bayer Char* coastal community most in autumn (Bhadra-Ashwin), late autumn (Kartik-Augrahan) and summer (Baishakh-Jaishthya) seasons.

It was found out in the present study that the major climate change impacts on natural assets of livelihoods of coastal community are increased salinity in drinking water source and cultivable lands causing acute hunger, poverty and destitution for them; on material assets are declining production and facing hunger and malnutrition, decreasing the test of food and smaller the size of fruits, grains and trees; on human assets are food insecurity, lack of nutrition and loss of life or death due to increased drought, salinity in land and water and thunderstorm; on social assets are social and internal conflicts based on scarcity of land, food insecurity and unrest in family, poverty and failure to sustain relationship with relatives or neighbours and on physical assets are damage of house and homestead land, scarcity of house building materials, lack of shelter and damage of essential foods.

It was examined in this study that the people of this coastal char adopt particular adaptation strategies to the climatic impacts on particular livelihood assets as using *fitkari* (Potassium Aluminum Sulphate) to clean water, using solar heat to separate sodium chloride (salinity) and clean water, reducing expenses by changing consumption as reducing the number of daily meals and adapting cropping densities are the adaptive strategies to climatic impacts on natural assets; using animals (eater bird) to feed the pests on the farm to control the insects biologically, reducing pest-inducing crop losses using different mechanisms, removal of insects by hands, cutlass or trap and strengthening the resilience of agricultural systems are the adaptive strategies to climatic impacts on material assets; taking religious education, saving life by taking shelter in relatives' *paka* (Brick-made) house and cyclone shelter, depending on traditional medicine, building educational institutions on very high places are the adaptive strategies to climatic impacts on human assets; giving more importance on mosques/temples security than their own houses, building the mentality of helping each other

in climatic crises, sending women and girls to relatives' house and building religious and social institutions and clubs on very high places are the adaptive strategies to climatic impacts on social assets and planting trees around the house, making the foundation of dwelling house high and using iron or brick pillar in house are the adaptive strategies to climatic impacts on physical assets of livelihoods. Even they use particular adaptation strategies to the particular impacts of climatic hazards like cyclone, tidal surge, soil and water salinity, flood etc. A very surprising and peculiar strategy the people of *Bayer Char* coastal community frequently use as adaptation to climate change induced hazards particularly to cyclone is empowering houses or homes. They stay home during disaster to keep house strong i.e., they think if they leave home and stay outside the home (cyclone shelter or any safe places) their houses become too weak to face cyclone and the houses become destroyed. So, they stay home to strengthen their houses to fight against cyclone or any other climatic impacts on houses-their beloved physical assets.

It was assessed in the present study that in their adaptation strategies poverty, gender and patriarchy play negative role. Poverty plays negative role in adaptation as poverty causes their failure to respond to water and soil salinity, difficulty or failure to livelihood diversification, failure to ensure structural societal change as deagrarianisation or industrialization and failure to buy modern technologies provide weather forecast as smart phone.

It was argued in the study that generally females are more vulnerable to and affected by climate change than males but females play vital and more important role in adaptation to climate change especially in taking NGO membership for loan, preserving the fuel wood, using different water purification techniques, making and saving dry food for and during crisis time and maintaining house. In adaptation strategies boys are got preference to girls by both males and females. Patriarchy plays a vital role in adaptation strategies as wives' NGO membership depends on the decisions of husbands and wives' disaster training and capacity building activities are interrupted by husbands' decisions. Husbands are the decision makers in adaptation to climate change in their family.

Though local knowledge and networks have some negative roles in adaptation most of the time they play important positive role as local knowledge helps to develop a detailed picture of on-farm events before, during and after the natural disasters, form a culturally appropriate and sustainable adaptation policy, identify the increasing threats and impacts of climate change, ensure understanding situation quickly, take the immediate adaptive responses,

enhance farmers' adaptation potentiality to climate variability and reduce the adverse impacts of climate change. Local networks play role in arranging communal water harvesting/tanks, ensuring the access to material and non-material critical resources managed by networks, constructing traditional bridges and trail, preserving rangeland and grazing restrictions and making easy way to get loan.

It was explored that climate change has special impacts on life and livelihoods of fishermen who are engaged in fishing, the second highest profession in *Bayer Char* coastal community. The major special impacts caused by cyclone, tidal surge, excessive fog and thunderstorm on fishermen's livelihoods are changing and endangering natural food cycle of fish, destroying the flock of fish, inundating inland aquaculture and fisheries, reducing primary productivity of fish, reducing mixing of water in lakes due to changing temperatures and reducing the stocks of fish. Besides different special coping mechanisms, the fishermen adopt different special adaptation strategies to climatic impacts. Some major adaptation strategies are accessing to and interpreting of warning signals, changing profession and reducing expenses by changing consumption (reducing the number of meals), frequently changing the timing and location of fishing trips, changing target species to fish with higher demand and better prices, selling and delivering seafood directly to customers instead of fishes and making the boat and launch strongly with thunder resilient roof.

However, the livelihood system of coastal char community is tuned to the ecology they live in and their livelihood assets are developed as a result of interaction between culture and environment. As adaptation to climate change, they developed a unique livelihood pattern which has high vulnerability to ongoing climatic variability and this vulnerability will be much more in absence of effective institutional supports (the supports of GOs and NGOs). So, institutional supports in their basic needs and services are required to extend to reduce livelihood vulnerability and strengthen the coastal-char people's adaptation strategies to ongoing climate change.

So, the findings of this study are expected to help government, national and international NGOs form appropriate climate change adaptation policies and programs incorporating the coastal-char community in the mainstream development so that these poor coastal-char people can successfully adapt to the upcoming more critical and vulnerable situation of climate change and save them from being 'environmental refugees'. The study is also expected to contribute to the field of knowledge generally and to the discipline of anthropology particularly.

List of Tables

		Page No.
Table-4.1:	Four Year Research Execution Plan	62
Table-4.2:	Detailed Feature of Sampling Procedure	68
Table-5.1:	Climate Change Impacts on Natural Assets of <i>Bayer Char</i> people and Their Adaptation Strategies	82
Table-5.2:	Climate Change Impacts on Material Assets of <i>Bayer Char</i> people and Their Adaptation Strategies	88
Table-5.3:	Climate Change Impacts on Human Assets of <i>Bayer Char</i> people and Their Adaptation Strategies	92
Table-5.4:	Climate Change Impacts on Social Assets of <i>Bayer Char</i> people and Their Adaptation Strategies	95
Table-5.5:	Climate Change Impacts on Physical Assets of <i>Bayer Char</i> people and Their Adaptation Strategies	99
Table-6.1:	Interlocutors Based on Sex and Religion	117
Table-6.2:	Marital Status of Interlocutors Based on Age group	117
Table-6.3:	Occupation of Interlocutors Based on Sex	118
Table-6.4:	Household Size and Educational Qualification of Interlocutors	119
Table-6.5:	Educational Qualifications of Interlocutors and Their Hearing about Climate Change	121
Table-6.6:	Most Affecting Hazards and When the Interlocutors Are Affected Most	127
Table-6.7:	Causes of Climate Change Based on Educational Qualifications of Interlocutors	128
Table-6.8:	Most Used Coping Mechanism of Interlocutors with Climate Change Impacts Based on Sex	129
Table-6.9:	Types of Households and the Ways of Getting Homestead Land	130
Table-6.10:	Sources of Most Used Water and Sources of Drinking Water	132
Table-6.11:	Household Types and Is There Any Impacts on Natural Assets?	135
Table-6.12:	Household Types and Main Impacts of Climate Change on Natural Assets of Livelihoods	136
Table-6.13:	The Sources and Causes of Migration of Interlocutors	152
Table-6.14:	Primary Occupation of the Interlocutors and the Duration of Settlement Here	153
Table-6.15:	Length of Present Profession and Causes of Choosing the Profession	154
Table-6.16:	Crops the Interlocutors Produce Most and The Causes of Producing These Crops	155

Table-6.17:	Household Size and Daily Income of Households	156
Table-6.18:	Daily Per Capita Expenditure of the Family and the Sectors They Expend Most	157
Table-6.19:	Household Types and Main Loss/Damage of Material Assets by Climatic Impacts	160
Table- 6.20:	Sex and Whether the Interlocutors Affected by Diseases in Last 1 Year	175
Table- 6.21:	Educational Qualification of the Interlocutors and Types of Medicine They Took	177
Table- 6.22:	Primary Occupation of Respondents and Climate Change (CC) Induced Natural Hazards That Affect Their Human Assets Most	180
Table- 6.23:	Household Types of Interlocutors and Whether They Use Any Adaptation Strategies to Climatic Impacts on Human Assets	185
Table- 6.24:	The Relationship of Interlocutors with Politics, Club and <i>Somities</i> (Associations) Based on Household Types	192
Table- 6.25:	Types of Relations of Interlocutors with Family and Community	194
Tables- 6.26:	The Place Where the Interlocutors Feel Most Secured and whether Their Social Assets Are Impacted by Climate Change	195
Table- 6.27:	Household Size of Interlocutors and Whether They Adopt Any Adaptation Strategies to Climatic Impacts on Social Assets	199
Table- 6.28:	Educational Qualifications of Interlocutors and Major Strategies they Use as Adaptation to Climatic Impacts on Social Assets	200
Table- 6.29:	House Wall and House Floor of Interlocutors	202
Table- 6.30:	Types of House Floor of the Interlocutors Based on Sex	202
Table- 6.31:	Numbers of Rooms in Houses Based on Household Size of Interlocutors	203
Table- 6.32:	House Rooms Sufficiency for Family Based on Household Size	204
Table- 6.33:	Sanitation Scenario of Interlocutors Based on Educational Qualification	205
Table- 6.34:	Daily Income of Households and Whether Climate Change Has Any Impacts on Physical Assets	206
Table- 6.35:	Educational Qualification and Whether the Interlocutors Adopt Any Adaptation Strategies	210
Table- 6.36:	Household Types and Getting Sufficient Safe Drinking Water	217
Table- 6.37:	Crops that the Interlocutors Produce Most and Return from Production	218
Table- 6.38:	Sex of Interlocutors and Whether They Face Difficulty of Less Income in the Last 1 Year	218
Table- 6.39:	Household Size and Interlocutors' Facing Food Shortage in Last 6 Months	220
Table- 6.40:	Household Size of Interlocutors and Whether They Feel Their Family Members Are Not Getting Sufficient Food	221

Table- 6.41:	Sex of Interlocutors and Whether They Save or Not	222
Table- 6.42:	Amount of Yearly Savings of Interlocutors and the Places of Savings	223
Table- 6.43:	Number of Years the Interlocutors Engaged in Profession and Hours They Spend Daily in Occupation	224
Table- 6.44:	Educational Qualifications of Interlocutors and Whether They Managed Vaccine for Offspring	226
Table- 6.45:	Daily Income of Households and Whether the Members of Households Get Proper Health Services	227
Table- 6.46:	Educational Qualifications of Interlocutors and Whether Their Children Went/Go to Educational Institutions	229
Table- 6.47:	Educational Qualifications of Interlocutors and Media of Getting Agriculture Related Weather Forecast/Information	231
Table- 6.48:	Sex of Interlocutors and Their Membership of NGOs	231
Table- 6.49:	Household Types of Interlocutors and Whether They are Poor or Rich	233
Table- 6.50:	Household Types and Whether Poverty Has Any Impacts on Adaptation to Climate Change	236
Table- 6.51:	Sources of Drinking Water and Gender in Collection of Water	240
Table- 6.52:	Sources of Fuel and Women Gender Role in Fuel Collection	241
Table- 6.53:	Educational Qualifications of Interlocutors and Their Gender Preference	242
Table- 6.54:	Sex of Interlocutors and Decision Maker in Family	245
Table- 6.55:	Sex and Whose Income Considered as Income in the Households of Interlocutors	246
Table- 6.56:	Gender Impacts of Soil and Water Salinity	247
Table- 6.57:	Gender Impacts of Cyclone and Tidal Surge	248
Table- 6.58:	Gender Impacts of Drought and Insect Attack	249
Table- 6.59:	Sex of Interlocutors and Their Gender Preference in Adaptation	253
Table- 6.60:	Educational Qualifications of Interlocutors and Whether There Is Any Patriarchal Role in Adaptation	253
Table- 6.61:	Decision Maker in Adaptation to Climate Change Based on Religious Status	256
Table- 6.62:	Age of Interlocutors and Whether Local Knowledge Plays Role in Their Adaptation to Climate Change	258
Table- 6.63:	Age of the Interlocutors and Whether Their Local Networks Play Any Role in Adaptation to Climate Change	263
Table- 6.64:	Types of Local Networks Role and Whether Interlocutors Have Any Relation with Politics/Club/Somity	264
Table- 6.65:	The Places of Fish Selling and the Problems the Interlocutors Face in Fish Selling	270

Table- 6.66:	Types of Profession of Fishermen and whether Climate Change Has Any Special Impacts on Their Life and Livelihood	272
Table- 6.67:	Educational Qualifications of Interlocutors and Whether They Have Special Adaptive Strategies to Climatic Impacts	276

List of Figures

Figure-1.1:	Schematic view of the components of the climate system and of their potential changes	12
Figure- 1.2:	Relationships among Risks, Resilience, Hazard, Mitigation and Climate Change Adaptation	16
Figure- 1.3:	An Integrated Analytical Framework for Analyzing Livelihood Vulnerability to Climate Change	17
Figure- 1.4:	Approaches for Addressing Climate Adaptation Policy	19
Figure- 1.5:	Factors Affecting Adaptive Responses to Climate Change	20
Figure- 1.6:	Classification of Char	21
Figure- 1.7:	The Sustainable Livelihood Framework	22
Figure- 1.8:	The Importance of Household	24
Figure- 3.1:	Competing Functions of the Environment	51
Figure-3.2:	The Pulling and Pushing Factors of Migration	59
Figure- 4.1	Geophysical Structure of the Study Area (<i>Char Gazi</i>)	64
Figure- 4.2:	Study Method, Sample Size and Techniques of Data Collection	65
Figure- 4.3	Study Design	70
Figure- 6.1:	A Framework of Climate Change Impacts on Livelihood Assets and Adaptation in <i>Bayer Char</i> Coastal Area	216
Figure- 6.2:	A Framework of Relationship among Climate Change, Poverty and Adaptation	239
Figure- 6.3:	A Diagram on Gender and Patriarchy Role in Adaptation to Climate Change	257
Figure- 6.4:	A Framework of Local Knowledge and Networks Role in Adaptation	268
Figure- 6.5:	A Diagram on Climatic Impacts on Fishermen Livelihoods and Their Adaptation Strategies	279

List of Graphs

Graph-6.1:	Prime Impact of Climate Change Respondents Heard at National level	122
Graph-6.2:	Different Climatic Impacts the Interlocutors Heard At National Level	123

Graph-6.3:	Sources of Knowing the Possible Impacts of Climate Change	124
Graph-6.4:	Liking Sources of Interlocutors to Receive the Information about Impacts and Adaptation to Climate Change	125
Graph-6.5:	Climate Change Impacts Interlocutors Are Experiencing in <i>Bayer Char</i>	126
Graph-6.6:	Things the Interlocutors Pay in Exchange of Homestead Land	131
Graph-6.7:	Distance of Sources of Drinking Water	133
Graph-6.8:	Sources of Fuel and Fuel Sufficiency	133
Graph-6.9:	The Ways of Enlightening Houses at Night	134
Graph-6.10:	General Impacts of Climate Change Induced Hazards on Natural Assets of Livelihoods	137
Graph-6.11:	Climatic Hazards That Affect the Natural Assets Most	138
Graph-6.12:	Degree of Severity of Tidal Surge	138
Graph-6.13:	Degree of Severity of Soil Salinity	139
Graph- 6.14:	The Degree of Severity of Water Salinity	140
Graph-6.15:	Rank of Vulnerability to Tidal Surge	141
Graph- 6.16:	Rank of Vulnerability of Soil Salinity and Its Comparison with Degree of Severity of Soil Salinity	142
Graph-6.17:	Rank of Vulnerability to Water Salinity	143
Graph-6.18:	Prime Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Natural Assets of Their Livelihoods	144
Graph-6.19:	General Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Natural Assets of Their Livelihoods	145
Graph-6.20:	General Strategies the Interlocutors Adopt as Adaptation to Tidal Surge	146
Graph-6.21:	Prime Strategy the Interlocutors Adopt as Adaptation to Tidal Surge	147
Graph-6.22:	The Strategies the Interlocutors Generally Use as Adaptation to Soil Salinity	148
Graph-6.23:	Main Strategies the Interlocutors Use as Adaptation to Soil Salinity	149
Graph-6.24:	Different Strategies the Interlocutors Use as Adaptation to Water Salinity	150
Graph-6.25:	Main Strategies the Interlocutors Use as Adaptation to Soil Salinity	151
Graph-6.26:	Secondary Income Sources of Interlocutors	158
Graph-6.27:	General Impacts of Climate Change Induced Hazards on Material Assets of Livelihoods	159
Graph- 6.28:	Climatic Hazards That Affect the Material Assets Most	160
Graph- 6.29:	Severity of the Impacts of Insect Attack on Material Assets of Livelihoods of Interlocutors	161
Graph- 6.30:	Severity of the impact of Drought on Material Assets of Livelihoods of Interlocutors	162
Graph- 6.31:	Severity of the Impact of Hailstorm on Material Assets of Livelihoods	163

Graph- 6.32:	Comparison between Impact Severities of Drought and Hailstorm	163
Graph-6.33:	Vulnerability of Livelihoods to Drought and Insect Attack	164
Graph- 6.34:	Vulnerability of Livelihoods to Hailstorm	165
Graph- 6.35:	General Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Material Assets of livelihoods	167
Graph- 6.36:	Major Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Material Assets of Livelihoods	168
Graph- 6.37:	Different Strategies the Interlocutors Use as Adaptation to Insect Attack on Material Assets of Livelihoods	169
Graph- 6.38:	Prime Strategy the Interlocutors Use as Adaptation to Insect Attack on Material Assets of Livelihoods	170
Graph- 6.39:	Different Strategies the Interlocutors Use as Adaptation to Impacts of Drought on Their Livelihood Assets	170
Graph- 6.40:	Prime Strategy the Interlocutors Use as Adaptation to Impacts of Drought on Their Livelihood Assets	171
Graph- 6.41:	Different Strategies the Interlocutors Use as Adaptation to Impacts of Hailstorm on Their Livelihood Assets	172
Graph- 6.42:	Prime Strategy the Interlocutors Use as Adaptation to Impacts of hailstorm on Their Livelihood Assets	173
Graph- 6.43:	Diseases by Which the Interlocutors Affected in Last One Year and Whether They Took Medicine	176
Graph- 6.44:	The Causes of Taking Traditional Medicine	177
Graph- 6.45:	General Climatic Impacts on Human Assets of Livelihoods of Interlocutors	178
Graph- 6.46:	Major Climatic Impacts on Human Assets of Livelihoods of Interlocutors	179
Graph- 6.47:	Severity of the Impacts of Flood on Human Assets of Livelihoods and Its Recent Intensity/Frequency	181
Graph- 6.48:	Degree of Severity of the Impacts of Thunderstorm on Human Assets of Livelihoods and Its Recent Intensity/Frequency	182
Graph- 6.49:	The Degree of Vulnerability of Households to Flood	183
Graph- 6.50:	The Degree of Vulnerability of Households to Thunderstorm	184
Graph- 6.51:	Different Strategies the Interlocutors Use as Adaptation to Climatic Impacts on Human Assets	185
Graph- 6.52:	Major Strategies the Interlocutors Use as Adaptation to Climatic Impacts on Human Assets	186
Graph- 6.53:	Different Strategies the Interlocutors Adopt as Adaptation to Flood	187
Graph- 6.54:	Major Strategies the Interlocutors Adopt as Adaptation to Flood	188

Graph- 6.55:	Different Strategies the Interlocutors Adopt as Adaptation to Impacts of Thunderstorm on livelihood Assets	189
Graph- 6.56:	Major Strategies the Interlocutors Adopt as Adaptation to Impacts of Thunderstorm on livelihood Assets	190
Graph- 6.57:	Religious Status of Interlocutors and Whether They Go to Respective Religious Institutions	191
Graph- 6.58:	Causes of Going to or Keeping Relation with Religious Institutions	192
Graph- 6.59:	Causes of Keeping Relation with Politics, Club and <i>Somities</i> (Associations)	193
Graph- 6.60:	Different Climatic Impacts on Social Assets of Livelihoods of Interlocutors	196
Graph- 6.61:	Major Climatic Impacts on Social Assets of Livelihoods of Interlocutors	197
Graph- 6.62:	Climatic Hazards That Impact the Social Assets of Livelihoods Most	198
Graph- 6.63:	Different Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Social Assets	200
Graph- 6.64:	Different Climatic Impacts on Physical Assets of Livelihoods	207
Graph- 6.65:	Major Climatic Impacts on Physical Assets of Livelihoods	207
Graph- 6.66:	Natural Hazard that Affects the Physical Assets Most	208
Graph- 6.67:	Rank of Impact Severity/Intensity of Cyclone and Whether Its Frequency Increased	209
Graph- 6.68:	The State (Rank) of Vulnerability of Livelihoods to Cyclone	210
Graph- 6.69:	Different Strategies the Interlocutors Adopt as Adaptation to the Climatic Impacts on Physical Assets of Livelihoods	211
Graph- 6.70:	Major Strategy the Interlocutors Use as Adaptation to Climatic Impacts on Physical Assets of Livelihoods	212
Graph- 6.71:	Different Strategies the Interlocutors Adopt as Adaptation to Cyclone	213
Graph- 6.72:	Major Strategies the Interlocutors Adopt as Adaptation to Cyclone	214
Graph- 6.73:	The Season When the Interlocutors (Who Face Difficulty of Less Income) Faced the Difficulty of Less Income	219
Graph- 6.74:	Whether the Interlocutors Remain Anxious about the Next Meal	221
Graph- 6.75:	Sex of Interlocutors and Whether They Go to Union/Upazila Health Centre	224
Graph- 6.76:	The Causes of Not Going to Union/Upazila Health Centre	225
Graph- 6.77:	The Causes of Not Managing Vaccines for Offspring	227
Graph- 6.78:	Causes of Children's Not Going Educational Institutions	230
Graph- 6.79:	The Causes of Taking NGOs Membership	232
Graph- 6.80:	Educational Qualifications of Interlocutors and Relation between Climate Change and Their Poverty	234
Graph- 6.81:	How Climate Change Causes Their Poverty	235

Graph- 6.82:	Different Negative Impacts of Poverty on Adaptation to Climatic Impacts on Livelihood Assets of Interlocutors	237
Graph- 6.83:	Major Negative Impacts of Poverty on Adaptation to Climatic Impacts on Livelihood Assets of Interlocutors	238
Graph- 6.84:	Who Impacted More by Fuel Insufficiency?	241
Graph- 6.85:	Sex of Interlocutors and Their Gender Preference in Education	243
Graph- 6.86:	Gender Role in Different Sectors of Agriculture	244
Graph- 6.87:	Gender Role in Agricultural Production	245
Graph- 6.88:	Different Roles Gender Plays in Adaptation to Climate Change	250
Graph- 6.89:	Major Role Gender Plays in Adaptation to Climate Change	251
Graph- 6.90:	Sex of Interlocutors and Vital Role Players in Adaptation	252
Graph- 6.91:	Different Patriarchal Role in Adaptation Strategies to Climate Change	254
Graph- 6.92:	Major Patriarchal Role in Adaptation Strategies to Climate Change	255
Graph- 6.93:	Different Negative Role Local Knowledge Plays in Adaptation to Climate Change	259
Graph- 6.94:	Major Negative Role Local Knowledge Plays in Adaptation to Climate Change	260
Graph- 6.95:	Different Positive Role Local Knowledge Plays in Adaptation to Climate Change	261
Graph- 6.96:	Major Positive Role Local Knowledge Plays in Adaptation to Climate Change	262
Graph- 6.97:	Different Negative Roles of Local Networks in Adaptation to Climate Change	264
Graph- 6.98:	Major Negative Role of Local Networks in Adaptation to Climate Change	265
Graph- 6.99:	Different Positive Roles of Local Networks in Adaptation to Climate Change	266
Graph- 6.100:	Major Positive Roles of Local Networks in Adaptation to Climate Change	267
Graph- 6.101:	Types of Profession of Interlocutors Whose Major Profession is Fishing	269
Graph- 6.102:	Problems the Fish Seller Face in Selling Fish	270
Graph- 6.103:	Coping Mechanisms of Fishermen to Face the Robber Group in the River/Sea	271
Graph- 6.104:	Climatic Hazards That have Special Impacts on the Life and Livelihoods of Fishermen	272
Graph- 6.105:	Different Special Impacts of Climate Change on Livelihoods of Fishermen	273
Graph- 6.106:	Major Special Impacts of Climate Change on Livelihoods of Fishermen	274
Graph- 6.107:	Different Coping Mechanisms the Fishermen (Boatmen) Adopt to Face the Climatic Hazards	275

Graph- 6.108: Major Coping Mechanisms the Fishermen (Boatmen) Adopt to Face the Climatic Hazards	276
Graph- 6.109: Different Special Adaptive Strategies to Climatic Impacts on Livelihoods of Fishermen	277
Graph- 6.110: Major Special Adaptive Strategies to Climatic Impacts on Livelihoods of Fishermen	278

List of Maps

Map- 1.1: Coastal Zone of Bangladesh	10
Map- 4.1: Ramgati Upazila That Covers Bayer Char	63
Map- 4.2: Bayer Char	64

ABBREVIATION AND ACRONYMS

ADP	:	Annual Development Plan
BBS	:	Bangladesh Bureau of Statistics
BCCRF	:	Bangladesh Climate Change resilience Fund
BCCSAP	:	Bangladesh Climate Change Strategy and Action Plan (BCCSAP)
BCCT	:	Bangladesh Climate Change Trust
BCCTF	:	Bangladesh Climate Change Trust Fund
BRAC	:	Bangladesh Rural Advancement Committee
BWDB	:	Bangladesh Water Development Board
CARE	:	Corporative for Assistance Relief Everywhere
CBA	:	Community Based Adaptation
CBO	:	Community Based Organization
CCA	:	Climate Change Adaptation
CCC	:	Climate Change Cell
CCU	:	Climate Change Unit
CDMO	:	Comprehensive Disaster Management Program
CDS	:	Coastal Development Strategy
CDSP	:	Char Development and Settlement Project.
COP	:	Conference of the Parties
CSO	:	Coastal States Organization
CSPM	:	Climate-Smart Pest Management
CZM	:	Coastal Zone management
CZPo	:	Coastal Zone Policy
DDMC	:	District Disaster Management Committee
DFID	:	Department for International Development
DMC	:	Disaster Management Committee
DUS	:	Dwip Unnayan Songstha
DWA	:	Distressed Women Allowance
EGIS	:	Environment and Geographic Information System Support Project for Water Sector Planning
EIA	:	Environmental Impact Assessment
ELDCs	:	Economically Least Developed Countries.
EMDCs	:	Economically Most Developed Countries.
FAP	:	Flood Action Plan
FE	:	Physical Environment
FGD	:	Focus Group Discussion.
FWC	:	Forecasting and Warning Centre
GDP	:	Gross Development Product
GIS	:	Geographical Information System

GoB	:	Government of Bangladesh
GOs	:	Governmental Organizations
GR	:	Gratuitous Relief
HASI	:	Homeland Association for Social Improvement
HDI	:	Human Development Index
ICZMP	:	Integrated Coastal Zone Management Program
IDMC	:	Internal Displacement and Monitoring Centre
IGVGD	:	Income Generation for Vulnerable Group Development.
IPCC	:	Intergovernmental Panel on Climate Change
ISPAN	:	Irrigation Support Project for Asia and the Near East
LA	:	Local Administration.
LDCs	:	Least Developed Countries
LEP	:	Livelihoods of the Extreme Poor
MDGs	:	Millennium Development Goals.
MoDMR	:	Ministry of Disaster Management and Relief
MoEF	:	Ministry of Environment and Forest
NAPA	:	National Adaptation Program of Action
NEC	:	National Environment Committee
NGOs	:	Non - Governmental Organizations
NHRG	:	Natural Hazard Research Group
NPDN	:	National Plan for Disaster Management
N-RAS	:	Noakhali Rural Action Society
PIO	:	Project Implementation Officer
PPs	:	Power Poles.
SEA	:	Strategic Environmental Assessment
SL	:	Sustainable Livelihood.
SD	:	Sustainable Development
SDGs	:	Sustainable Development Goals
SLA	:	Sustainable Livelihoods Approach.
SLR	:	Sea Level Rise
SPSS	:	Statistical Package for Social Sciences
SRL	:	Sustainable Rural Livelihoods Framework.
SSUS	:	Sagorika Samaj Unnayan Sangstha
TR	:	Test Relief
UDMC	:	Union/Upazila Disaster Management Committee
UNFCCC	:	United Nations Framework Convention on Climate Change
UPAMA	:	Unnayan Parikolpanay Manush
VGD	:	Vulnerable Group Feeding
WB	:	World Bank

CHAPTER ONE

INTRODUCTION

CHAPTER ONE: INTRODUCTIN

1.1 Statement of the Problem

Bangladesh is one of the most climate vulnerable countries in the world and will become even more so from the perspective of its disadvantageous geographic location, topography of flat and low-lying densely populated country, high levels of poverty, climate change impacts and adaptation to it, reliance of significant numbers of livelihoods on climate sensitive sectors specially agriculture and fishing (BCCSAP, 2009). The people of the world including Bangladesh encounter increased frequency of various natural and man-made disasters caused by climate change as cyclones, floods, land and coastal erosion, salinity intrusion, tidal surge, droughts, the thunder storm, water logging, arsenic contamination, tornadoes, cold waves, earthquakes, landslides, insect attacks, hailstorm etc (Islam and Shafie, 2017). At the same time, it is hypothesized that human beings are acting as the prime agent of climate change through their activities and this trend has reached a rather alarming stage by the course of time (Choudhury, 2009/2012). 2016, 2020 and 2021 were the first, second and fifth in the rank of the warmest years on the planet. The 2010s were the hottest decade on record on the planet. Since the 1960s, each decade has been warmer than the previous one by noticeable amounts (The New York Times, 2020).

Climate is changing slowly and normally and will continue to change in future (DDM, 2013). The global surface temperature is increasing and by the end of the 21st century it is *likely* to exceed 1.5 °C relative to the 1850 to 1900 period for most scenarios, and is likely to exceed 2.0 °C for many scenarios. The global water cycle has been changing with increases in disparity between wet and dry regions, as well as wet and dry seasons with some regional exceptions (IPCC, 2014, AR5). The oceans will continue to warm with heat extending to the deep ocean and affecting circulation patterns (IPCC, 2014, AR5).

The newest research estimates that climate change is a particularly acute threat for third world countries like Bangladesh where population density is high, most of the global poor are concentrated here and facing high exposure to climate change induced calamities.

Global poverty data show that there are roughly 7.8 billion people in the world (Worldometer, 2021), out of which 698 Million (9%) live below extreme poverty line income level which is less than 1.90 international dollars (int.-\$) per day. 80% of extreme poor and 75% of moderate poor live in coastal and rural areas affected by fragility, conflict, violence, salinity, flood and

different natural disasters (WB, 2020) and women represent a majority of them. About 70 percent of the world poor aged 15 and over have no schooling or only some fundamental education. Nine million people (11 in every minute) die from hunger every year (WFP, 2021).

Due to COVID-19, the newest and most immediate threat to poverty reduction, globally extreme poor people increased by 50 million between 2019 and 2020 for the first time in over 20 years (WB, 2020; Suckling, Christensen and Walton, 2021) and it is hypothesized by many scientists that novel coronavirus or Covid-19 disease is a manmade-natural disaster caused by climate change (Bendell, J. 2020).

The challenges of climate change may seem distant and marginal compared to poverty reduction and economic development in the coastal regions of developing countries like *Bayer Char* of Bangladesh but there is a rising acknowledgement that poverty and the impacts of climate change are inextricably interrelated. Impacts of climate change upon land availability due to sea-level rise, water availability for rain-fed agriculture and reducing production in fisheries due to the emergence of new diseases and other factors are the vivid examples of interrelation between climate change and poverty (Schipper and Lisa, 2007). Besides, it is well recognized and proved that the issues of poverty and climate change are indispensably related to land deterioration and sustainable land management (UNCCD, 1994).

Bangladesh, a densely populated country (1140 per km²) where poverty and extreme poverty rate is 20.5 and 10.5 % respectively (43% to 45% and 17% to 18% households) and 7.84% of total rural households are landless (BBS, 2021), is identified as being at specific risk from climate change due to its exposure and vulnerability to sea-level rise and extreme events like cyclones, floods and concentrated multidimensional poverty (Eastham et al., 2008; Wassmann et al., 2009); IPCC, 2014; AR5, Chapter 13).

Though climate impacts on the livelihoods of females are severer than those of males and the climate adaptation strategies are mostly adopted by both males and females, the adaptive capacity of males was found to be higher than those of females (Adzawla, et al., 2019). For their gender specific roles, females are more vulnerable to and affected by climate change impacts than males and gender and patriarchy play an important and vital role in adaptation to hazards caused by climate change.

In cases of male outmigration as climate change adaptation in Bangladesh due to unsustainable rural livelihoods, women face unsafe working conditions, exploitation and loss of respect (ICCCAD Briefing, IPCC, 2014), AR5 Chapter 13). Women and children rarely learn to swim and so are vulnerable when exposed to flooding. Restricted mobility keeps women and children waiting in risk-prone houses during floods (Khan et al., 2008; IPCC, 2014; AR5 Chapter 5). Local knowledge and networks in rural and coastal areas like *Bayer Char* play a vital role to read the climatic situations and construct adaptive strategies (Mekonnen, Z. et al., 2021).

Along the coasts of developing countries like Bangladesh, weather and climate extremes impact on a wide range of economic activities which support coastal communities (IPCC, 2014), AR5, WG2, Chapter 5). The overall livelihood and adaptation strategies of coastal community like *Bayer Char* people to ongoing climate change will be even more critical and vulnerable in the years to come because of the greater economic and non-economic losses and damages from natural disasters in these areas compared to the rest of the country (Baqee, 1998:5). Sea level rising in the Bay of Bengal, increased severity and frequency of floods along the three giant rivers-the Ganges, the Brahmaputra and the Meghna (GBM), increased severity and frequency of powerful cyclones fueled by warm waters, changing ecologies of the water bodies and droughts in prime agricultural zones are the glances of the future already provided by climate change in Bangladesh (Finan T.J and Rahman, M.A 2006; Crate S. A and Nuttall M, 2009:23). Moreover, due to climate change, moderate annual flooding restores the fabled fertility of the country's paddy land and replenishes the fresh water fish stocks so critical to the food security of the population, specially the poor char people (Finan T.J and Rahman, M.A 2006).

Though over the last three decades, the government has invested over \$10 billion (at constant 2007 prices) to make the country more climate resilient and less vulnerable to natural disasters (BCCSAP, 2009), Bangladesh lost an estimated 5.9% of GDP to storms from 1998-2009 (Murray et al., 2012; IPCC, 2014), AR5, Chapter 5) and without changes to current global behavior the country would experience a 2.0% GDP annual loss by 2050 due to climate change (ADB, 2014). Bangladesh and India account for 86.0% of mortality from tropical cyclones, mainly due to having the rarest and most severe storm categories and World Bank estimates the annual adaptation cost in developing countries like Bangladesh is USD 70 billion and adaptation deficit with respect to cyclones is USD 25 Billion (World Bank, 2011).

More than 50 million people of Bangladesh still live under poverty line and many of these people live in remote or ecologically fragile parts of the country, such as river islands and cyclone-prone coastal belts like *Bayer Char*, which are especially vulnerable to natural disasters (BCCSAP, 2009). The coastal region (Char/Shoal) covers 32.0% of Bangladesh where, in spite of harsh physical condition, 35 million people live and developed their own adaptive strategies related to the vagaries of nature (Rabbani et al. 2013; Haque, et al. 2017). In a low crop productivity scenario for ongoing climate change, Bangladesh would experience a net increase in poverty of 15% by 2030 (Hertel et al., 2010, IPCC (2014), AR5). The impacts of future climate change on many ecosystem services are not certain, but it is very clear that those who depend most on natural resources (coastal-char community of Bangladesh) are likely to be most severely affected (e.g., African Development Bank et al., 2003; Burton et al., 2002; Simms et al., 2004).

However, ongoing climate change will worsen the poverty of coastal-char people of Bangladesh and make their adaptation strategies insecure, vulnerable and unsustainable over the next 20 to 30 years (Khan and Seeley, 2005; Islam, Z and Shafie H, 2017). World Bank estimates that, with more than 3 meters of inundation depth, vulnerable area in coastal Bangladesh may increase 69.0% due to climate change while 8.06 million people in coastal Bangladesh are vulnerable to 3 meters inundation depth resulting from cyclonic storm surges now (Dasgupta, 2011). Thus, the adaptive capacity of coastal community like *Bayer Char* people is limited by historical, socio-cultural and ecological factors (Finan T.J and Rahman, M.A 2006/2016).

These changes threaten the significant achievements Bangladesh has made over the last 20 years in increasing incomes and reducing poverty, and will make it more difficult to achieve the SDGs (BCCSAP, 2008). So, the impacts and risks of ongoing climate change on poor coastal community of *Bayer Char* and their adaptation strategies to it were re-read examining the role of poverty, gender, patriarchy, local knowledge and networks in their adaptation from anthropological point of view.

So, delivering the information about present adaptation strategies of poor coastal people of *Bayer Char* to ongoing rapid climate change impacts, the findings of this study are expected to help government, national and international NGOs form appropriate climate change adaptation policies and programs incorporating the coastal community in the mainstream development so that these poor coastal people can successfully adapt to the upcoming more critical and vulnerable situation of climate change and save them from being ‘environmental

refugees'. It is also expected to contribute to the field of knowledge generally and to the discipline of anthropology particularly.

1.2 Rationale of the Study

The research is grounded on the following reasons. **Firstly**, most of the studies carried out in the coastal community of Bangladesh do not follow any specific theories, hypotheses or research questions. In the present study, these methodological, theoretical and empirical shortcomings or gaps were made up and this study will contribute as a baseline in the field of knowledge in general and anthropology as discipline in particular being guided by fundamental anthropological theory i. e., cultural ecology theory, specific hypothesis and research questions.

Secondly, The global surface temperature increase by the end of the 21st century is *likely* to exceed 1.5 °C relative to the 1850 to 1900 period for most scenarios, and is *likely* to exceed 2.0 °C for many scenarios. The global water cycle will change, with increases in disparity between wet and dry regions, as well as wet and dry seasons, with some regional exceptions. The oceans will continue to warm, with heat extending to the deep ocean, affecting circulation patterns (IPCC, 2014, AR5). So, the overall livelihood and adaptation strategies of coastal community like *Bayer Char* people to ongoing climate change will be even more critical and vulnerable in the years to come because of the greater economic and non-economic losses and damages from natural disasters in these areas compared to the rest of the country (Baqee, 1998:5). So, the findings of the this study are expected to help them to adapt to the upcoming more critical and vulnerable situation creating consciousness in governmental, national and international NGOs about severity of poverty and adaptation strategies to ongoing rapid climate change in this coastal area so that they can incorporate the coastal community in the mainstream development and save them from being 'environmental refugees'.

Thirdly, the studies carried out in coastal communities or char people of Bangladesh overlook to examine poverty and climate change adaptation from anthropological aspects incorporating the qualitative and quantitative methods which are very crucial to examine these concepts or variables except the study of Islam, Z. and Shafie, H. (2017) but their study follows no specific theories. On the other hand, the state of poverty, livelihoods and climate change adaptation of coastal chars are not quite similar in all regions of Bangladesh. The approach may differ from place to place (ibid, 8). As integrative methods were used in this

study, it was certainly able to examine the livelihoods based adaptation to climate change looking for the answers to the research questions and bridged those gaps.

Fourthly, the coastal community living in the *Bayer Char* remained secluded from the people living in main lands of Bangladesh. They have their own life style, own laws and own economic system. Chars are another Bangladesh within the political boundary of Bangladesh. Various national and international organizations have been formulating and implementing different development programs for the overall improvement of the livelihood and adaptation strategies of them, but till now very little changes are visible. They are the poorest of the poor. The reason is, without understanding environmental context, the relationship between climate change adaptation and cultural evolutions and without understanding the coastal people's livelihood assets based adaptation strategies to climatic impacts, most of these programs were formulated and implemented and as a result, in most cases, the implemented programs have been back lashing. So, finding out the answers to the research questions using anthropological perspective of research, the present research helps to formulate and implement different development policies and programs including five year plans of the countries properly and successfully.

Moreover, None of the studies carried out in coastal area of greater Noakhali explores the role of poverty, gender-patriarchy, local knowledge and networks in adaptation to climate change while poverty, gender-patriarchy, local knowledge and networks may have an influential role on livelihoods and adaptation strategies to continuous climate change and create social inequality. Extracting the role of poverty, gender-patriarchy, local knowledge and networks in adaptation strategies to climate change, this research is expected to play vital role in achieving seventeen Sustainable Development Goals (SDGs) targeted by UNGA to achieve by 2030 specially the SDGs number 4, 5 10 and 13 and act as a baseline for the next researches.

Finally, no specific study was conducted in this area and in this field from anthropological point of view while the field is anthropological in nature (Scoones, 1998 and Kabeer, 1996). So, the findings of this anthropological study are expected to be helpful to extend the epistemological domain and to formulate strategically short and long term new development policies for the people of Bangladesh as well as in the world.

1.3 Importance of the Study

The coastal zone of Bangladesh covers 4, 7201 km² which is 32.0% of the country. Around 29.0% of the total population lives in the coastal zone of the country (MoWR, 2015). Livelihood options and the natural environment of coastal communities of Bangladesh will severely be affected by the anticipated one meter sea level rise and different natural calamities caused by global warming and climate change, which will lead to the national food insecurity of Bangladesh (Sarwar, 2005). About 10 million people live in the coastal areas of the three major rivers of the country-the Padma, the Meghna and the Jamuna, and approximately 17,506 people live in *Bayer Char*, a poverty and natural disaster stricken agro-fishing ecosystem (CDSP, 2007).

While to achieve Sustainable Development Goals (SDGs), every citizen must have opportunity and access to information and resources to meet their basic needs without violating environmental and ecological quality, inhabitants of *Bayer Char* are marginal and destitute people, who can be categorized as the poorest of the poor living in the country. There are no general formal educational institutions, afforestation, embankment, sanitation facilities, safe drinking water, family planning devices, economic provisioning and access to information. They are deprived of basic needs and rights. Though CDSP (CDSP-1 to CDSP-111) and five local NGOs including Upama and N-RAS-under BRAC have been working for seventeen years for the social and infrastructural development of the inhabitants, almost all the development ventures could not create any permanent positive impact on the livelihood strategies of the population in *Bayer Char* community. Life is still very uncertain, and often they face the impacts and risks of recent climate change on their poverty, power conflicts between the '*Jotdars*', food shortage, ill health, weak network, severe economic and cultural crises, poor adaptive capacities to natural calamities and so on. Climate change compelled them to change their livelihood strategies and adaptation techniques to it. This has made the life and living of the population in this char constantly more challenging than any other coastal chars of the country.

Future global warming and climate change will certainly worsen their poverty and destitute life. It will have a devastating impact on their socio-cultural relations. So, to ensure the right, to secure livelihood and adaptation strategies to climate change of these deprived people, it was essential to explore the impact of climate change on poor *Bayer Char* coastal community and their livelihood based adaptation strategies based on anthropological theories, methods and techniques so that it could be widely representative and government, national

and international NGOs can take an appropriate plan and strategy to incorporate them actively in mainstream development and cultural activities and finally conservation of the purity of nature and ecosystem can be ensured without spoiling the opportunity of sustainable economic growth (Paul Romer, 2018). Otherwise, Sustainable Development Goals (SDGs) -- a crying need-- will remain a far cry.

1.4 Objectives of the Study

There were some general and specific objectives of the study. The general objective of the study was to examine the livelihood asset based adaptation strategies of poor *Bayer Char* coastal community to the impacts of ongoing climate change from anthropological point of view.

The specific objectives of the study were:

- ▶ To assess how livelihoods of *Bayer Char* Community are impacted by ongoing climate change,
- ▶ To look into how they adapt to the impacts of continuous climate variability based on livelihood assets,
- ▶ To explore the impacts of poverty on their adaptation strategies,
- ▶ To examine the role of gender and patriarchy on their adaptive responses and
- ▶ To find out the role of local knowledge and networks in adaptation strategies.

1.5 Research Questions

The study looked for the answers to five specific questions. Firstly, how are the livelihoods of poor *Bayer Char* coastal community impacted by ongoing climate change? Secondly, how do they adapt to continuous climate variability? Thirdly, what are the impacts of poverty on their adaptation strategies? Fourthly, what is the role of local knowledge and networks in selecting adaptation strategies? Finally, have gender and patriarchy any influential role on their adaptive responses?

1.6 Pains and Pleasure of the Study

There were some pains and pleasure of the study as:

Limitation of Money: As the study area is much more remote as stated earlier and it is related with much money consuming. It was not easy to go to the study area in every necessity. It had negative impacts on collecting enough informative materials for the study.

Lack of Secondary Data: As no prominent study was carried out in this area. It was almost impossible to get sufficient secondary data to compare and strengthen the primary data.

Limitation in Sampling: As the population are not classified enough according to demographic characteristics. It was something impossible to include every necessary class in quantitative sampling though the study was basically qualitative and many qualitative techniques and tools were used in data collection.

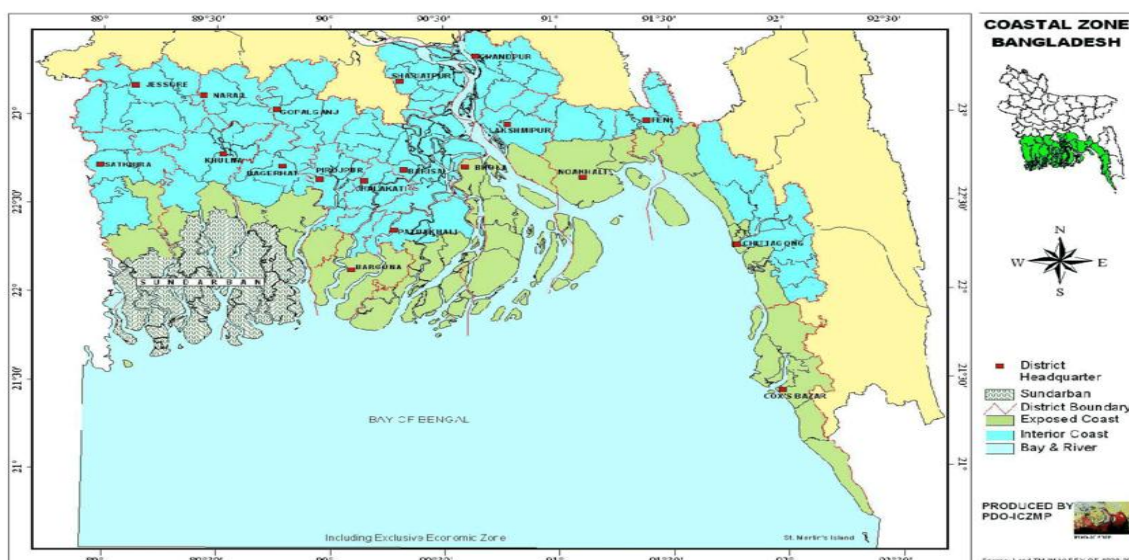
Limitation of the Illiteracy of the Interlocutors: Most of the interlocutors were illiterate and therefore, it was very difficult for them to provide available information in most cases on the one hand, and it took more time in administering the questionnaire on the other hand.

Limitation of Time: On the one hand, the research was to complete in a definite time framework, on the other hand, the study area is about 280 km land way from the residence of the researcher. That is way it was not possible to go to the study area frequently. The study area was visited 6 times during long vacation of Covid-19 but was not possible to stay more than 7 days in every time. So, the limitation to dedicate the time required to conduct an integrative study maintaining other professional commitments of researcher also impacted the study.

1.7 Conceptual Framework

Coastal Community: Coastal community is a group of people living on the thin strip of land

Map- 1.1: Coastal Zone of Bangladesh



(Source: Coastal Policy, 2005, MoWR, Bangladesh)

called coastal zone or on the water along the fluctuating line where the river or sea meets the land. They are people who have multiple sources of income but there are often serious threats to food security and are basically dependent on the sea or river for livelihood. The people of coastal zone are basically poor and marginalized in spite of their living at the coast of resourceful sea. These people have no monetary wealth and sometimes, they live on the resources which are degraded (Newkirk, Gary F. 1998).

Community

Maclver and Page in their pioneering book “Society” defines community as “*wherever the members of any group, small or large, live together in such a way that they share, not this or that particular interest but the basic conditions of a common life, we call that group a community*” (MacIver and Page, 1962). People of a certain administrative boundaries live in close proximity to one another and automatically constitute a “Community” which has definite common interests, goals and a communal sense of identity. To implement any activities in the field, the community is generally the most convenient administrative level.

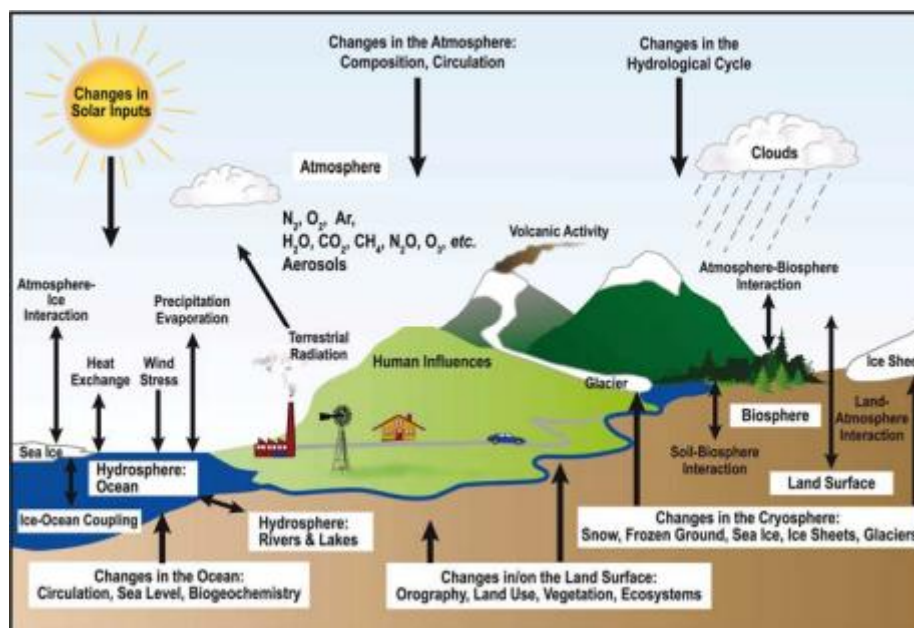
Poverty

Poverty is the condition or state of a person who lacks a general amount of money or livelihood assets to meet his or her basic needs (Britannica.com). According to World Bank, the extreme poor are those who live on less than \$1.90 (WB, 2020). Poverty in this study was measured in terms of income and human poverty. Inability to meet the minimum requirements of consumption by using income is called income poverty while deprivation in terms of knowledge, health services and economic provisioning is considered as human poverty. For measuring income poverty two methods are being used in Bangladesh: one is Direct Calorie Intake (DCI) method and the other is Cost of Basic Needs (CBN) method. Under the DCI method, a household with per capita calorie intake less than 1805 kilo calorie (kcal) per day per person is considered as hard core poor while a household with less than 2122 kcal per day per person is considered as absolute poor. In CBN method, poverty line is measured on the basis of the per capita expenditure at which the members of a household can be expected to meet their basic need. To measure income poverty CBN method was used in the present study. The approach of poverty given by economist Amartya Sen as the deprivation of a person's capabilities to live the life they have reason to value (Sen, A. 1983) was also taken into account.

Weather and Climate

Weather and climate are not synonymous (Philander 2008/2012:202; Islam and Uddin 2017). Weather is the average result of atmospheric elements of a few days, usually one to seven days (Rahman, 2009:44). In general, climate is the average weather of millions of years (IPCC, 2014) and its elements are temperature, air, cloud, rainfall, snowfall, air pressure and moisture (Rahman, 2009:43). WMO defines climate as the mean weather of thirty years. In broader context, climate is the statistically mean condition of climate system mutually and intensively consists of five elements as atmosphere, hydrosphere, cryosphere, land surface and biosphere which are deeply influenced by external elements especially by sun (IPCC, 2012).

Figure-1.1: Schematic view of the components of the climate system and of their potential changes



(Source: IPCC, 2007/2012).

Climate Change

Climate change is the change of the composition of the global atmosphere which is observed over comparable time periods and caused actively or passively by human activities (UNFCCC 1992). It is the statistical and continuous change of average climate of 30 years of a certain community or country. Average climate, difference and extremes are statistical indicators of climate change (IPCC, 2014). The sunray that comes to the earth, the earth absorbs it and this naturally absorbed sunray radiates or diffuses again to the aerospace. If there is any hindrance or obstacles created in this natural absorption- diffusion process, the

climate changes (Rahamn, 2019: 44). Climate change is an intensifying, cumulative and compounding set of socio-ecological feedbacks that will unfold establishing new average and norms and in all likelihood new extremes (Wrathall et al. 2015). It brings about a wide range of impacts on social, economic and environmental systems. The total costs of climate change account for: mitigation costs (+) adaptation costs (+) the residual costs of loss and damage. The last one which cannot be avoided through adaptation and mitigation is classified into: 1) Economic losses and 2) Non-economic losses. Economic losses are losses of income and physical assets. The concept of non-economic losses (NELs), recently originated in the context of negotiations on loss and damage under UNFCCC (Serdecny, et al, 2017), is the losses of values that are not generally traded in markets and are difficult to assess because of the absence of market price such as losses of life, biodiversity and cultural heritage (Islam, Z. Shafie, H. and Mahmood, R. 2017).

Hazard

Hazard is a natural process, phenomenon or human activity that may have sudden and acute impacts on a community and ecological nature as loss of life, damage of property, injury or other health impacts, social and economic disruption or environmental degradation” (UNGA, 2016, 2017; UNDRR, 2020, p. 22).). It has the potential to impact a community, measurable spatial and temporal components and its proactive and reactive measures are available ((UNDRR, 2020, p. 22). For example of environmental hazard, landslide susceptibility is intensified by deforestation and the intensity and frequency of floods, droughts and heat waves are affected by changes in climate and land cover (UNDRR, 2020, p. 29).

Vulnerability or Vulnerability Context

Vulnerability is the existing conditions which affect the ability of a community to adapt to climate change (to prevent, mitigate, prepare for or respond to a climate change induced hazard) and increase the susceptibility of the community to poverty and climate change impacts. Absence of adaptation strategies and living in a climate change induced hazard prone area like near to a river, sea or congruence of river and sea are the part of vulnerability. It may be multidimensional, dynamic scale-dependent and site-specific. It has physical (geographical proximity to the source and origin of disaster), economic, social, attitudinal and environmental factors or types. The adaptive strategies which people adopt and livelihoods outcomes they aspire to, are greatly influenced by the vulnerability context. The prime character of these factors is that the local people themselves are not capable to control them at least in the short term. So, it is essential to find out the indirect means by which the negative

effects of the vulnerability context can be reduced – including building greater resilience based on adaptation strategies and improving overall livelihoods security (*Khan and Seeley, 2005:23*); *DFID- Bangladesh, 2001*).

Three prime areas contribute to the vulnerability context are:

Shocks – political crisis, natural disasters (flood, cyclone, tidal surge, thunderstorm, hailstorm, heavy rain, illness, social conflicts etc. are the shocks of char people

Trends –increasing erosion of riverbanks, increasing population, increasing number of political conflicts, decreasing supply of foods are some of many trends that aggravate the vulnerability context.

Seasonality – peak or lean erosion, peak producing, peak trading season, lean producing, lean trading season, season of fish harvesting, seasonal shifts in employment opportunities are some of seasonality that influence char people’s adaptive strategies to climate change.

Risks: Risk is the likelihood of harmful aftermath originated from the contact between hazards and vulnerable conditions. For example, the probability of death or injuries of human beings, environmental damages and loss or disruption of property, livelihoods and economic activities of *Bayer Char* community by the impact of climate change.

Disaster

Disaster is the action and activities of risk process. It is an acute disruption of a community functioning causing a massive human, socio-economic and environmental damages or losses surpassing the capacity of the affected community to adapt to the based on its own resources. It is the outcome of the combination of three things- hazards, vulnerable state and community’s inability to adapt to the possible harmful consequences of risk. According to the definition of Natural Hazard Research Group-NHRG, an event meeting the criteria of 1 million losses of property, deaths of at least 100 lives and injury of minimum 100 people, is called disaster.

Risk Assessment

A procedure of identifying the character and magnitude of risk based on the explanation of probable hazards, analysis of prevailing vulnerable state and evaluation of adaptive capability of the community. In a word, it is the assessment of hazard, vulnerability and capacity.

Coping mechanism

Coping mechanism means the techniques or procedures that people use to adapt to the crisis moment. It indicates their adaptive capability, how they face the problem, what they use to face the crises, how they prevent or recover the losses. The coping mechanism is sustainable if it is elastic and effective. If it can maintain their normal life and save them from losses without harming environmental quality.

Mitigation

Formal and informal actions or measures taken to cut down the adverse effects of a disaster by lessening the impacts of untoward (adverse) events, For example construction of embankments or retaining walls, ensuring the building codes, and widening of water channels to reduce the adverse effects of climate induced natural disasters of a coastal community.

Adaptation

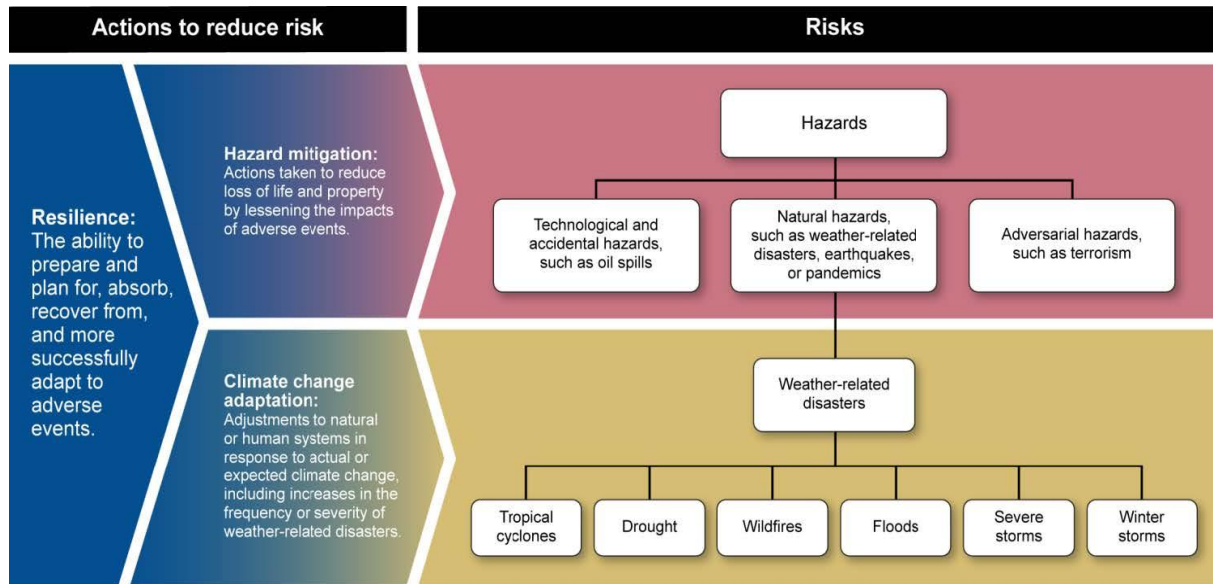
Adaptation implies the adjustments to natural and human systems and changes in behavior and/or belief in response to actual or expected climate change impacts to reduce the risks to the lives and livelihoods for ensuring the conditions of existence of a certain community including a culturally meaningful life. Adaptive ability of human beings depends on a greater number of attendant features as very complex human cognition, social organization, values and meaning (Islam, Z. Shafie, H. and Mahmood, R. 2017). In explaining human biological and cultural evolution, adaptation is the one of the central concepts of anthropology from its origin in 19th century to recent days (Harris, 1968/1980). Adaptation and mitigation are not alternative techniques or strategies but supplementary ones that require to be applied together.

Resilience

Resilience usually refers to the capacity of a community or a society to prepare and plan for, resist, absorb, recover from, and adapt to the adverse impacts of climate change-induced disasters timely, potentially and successfully. It is basically assessed by the degree to which a community is able for preparing itself to strengthen its capacity for better future protection based on the learning and experience of past disasters and improve risk reduction measures as awareness programs, early warning systems, ‘culture of prevention’, community recovery plans and risk management or adaptation strategies.

Relating Risk, resilience, Hazard and Mitigation: Resilience activities based on hazard mitigation and climate change adaptation reduce the risks of climate change-induced hazards or disasters.

Figure-1.2: Relationships among Risks, Resilience, Hazard, Mitigation and Climate Change Adaptation



Source: GAO analysis of Presidential Policy Directive 8, previous GAO work, and National Oceanic and Atmospheric Administration data. | GAO-16-454

Integrated Framework of Livelihood Vulnerability to Climate Change: Reid and Vogel drew an integrated analytical framework for analyzing livelihood vulnerability to climate change. This framework integrates a number of generally used analytical frameworks such as sustainable livelihood frameworks, ecosystem services, diffusion of innovations, social learning, tensions management and adaptive management to evaluate, reduce and combat the vulnerability of livelihood to climate change. According to them, livelihood consists of stocks and flows of capital assets as natural, human, social physical and financial assets which are dependent on two factors. The first one is future change as climate change, policy reforms and socioeconomic changes. The second one is current context as socioeconomic, political and environmental including tenure regime, agro-ecological zone and social norms. These two factors affect the whole stocks and flows of capital assets especially they affect the four services as supporting, provisioning, regulating and cultural services derived from natural capital asset. . This integrated analytical framework helps diagnose vulnerability to climate change, whilst identifying and comparing adaptation options that could reduce vulnerability, following four broad steps: i) determine likely level of exposure to climate change, and how climate change might interact with existing stresses and other future drivers of change; ii) determine the sensitivity of stocks of capital assets and flows of ecosystem services to climate

change; iii) identify factors influencing decisions to develop and/or adopt different adaptation strategies, based on innovation or the use/substitution of existing assets; and iv) identify and evaluate potential trade-offs between adaptation options.

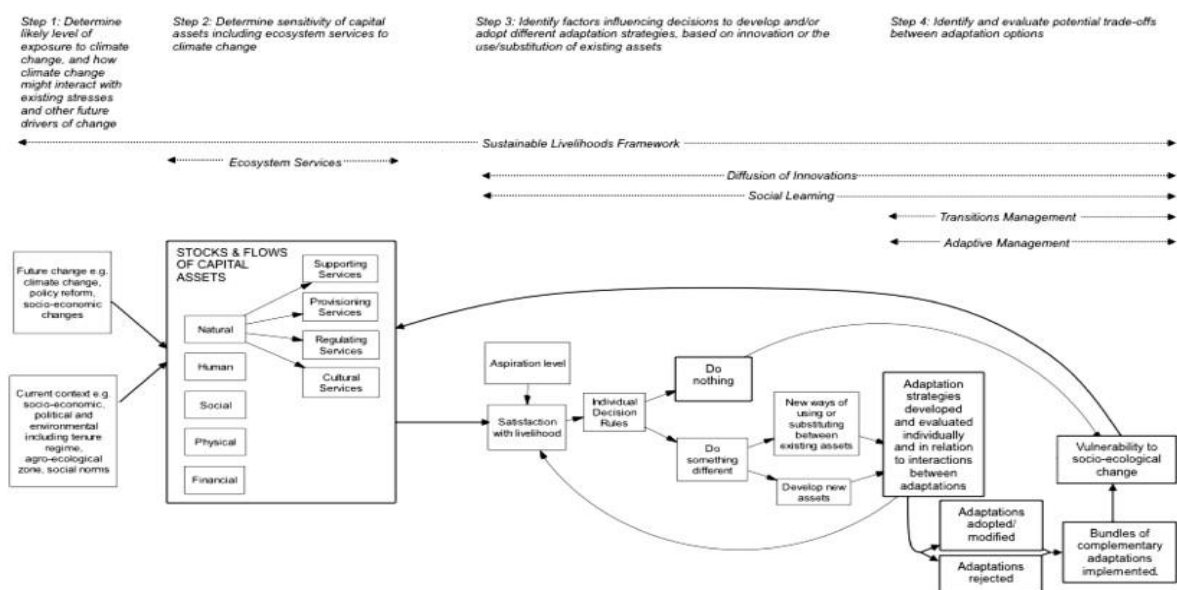
i) Determine Climate Change Exposure and Interactions with Existing/Future Stresses:

There are many current stresses as land degradation, demographic changes etc and climate variability are well recognized as one of them. It is not right to pay special and exclusive attention either on climate change or on other changes of coastal community but is crucial to have similar adaptation strategies to address both challenges fruitfully and effectively. Based on this theme, integrated framework commences combining the effects of climate variability and other future changes on adaptive strategies of rural and coastal livelihood (Ziervogel et al. 2006; Thomas and Twyman (2005).

ii) Determine Sensitivity of Capital Assets and Ecosystem Services to Climate Change:

This integrated framework acknowledges that climate change and livelihood affect each other directly. Beside natural capital, climate change has direct impacts on other capital assets by weakening social networks through heat and disease-vector linked illness and mortality, rendering physical infrastructure obsolete as existing flood defenses. It also admits that the effects of climate change is not similar across specific agro-fishing ecosystem or same communities but diverse on different communities' livelihoods (c.f., van Aalst et al., 2008)

Figure-1.3: An Integrated Analytical Framework for Analyzing Livelihood Vulnerability to Climate Change



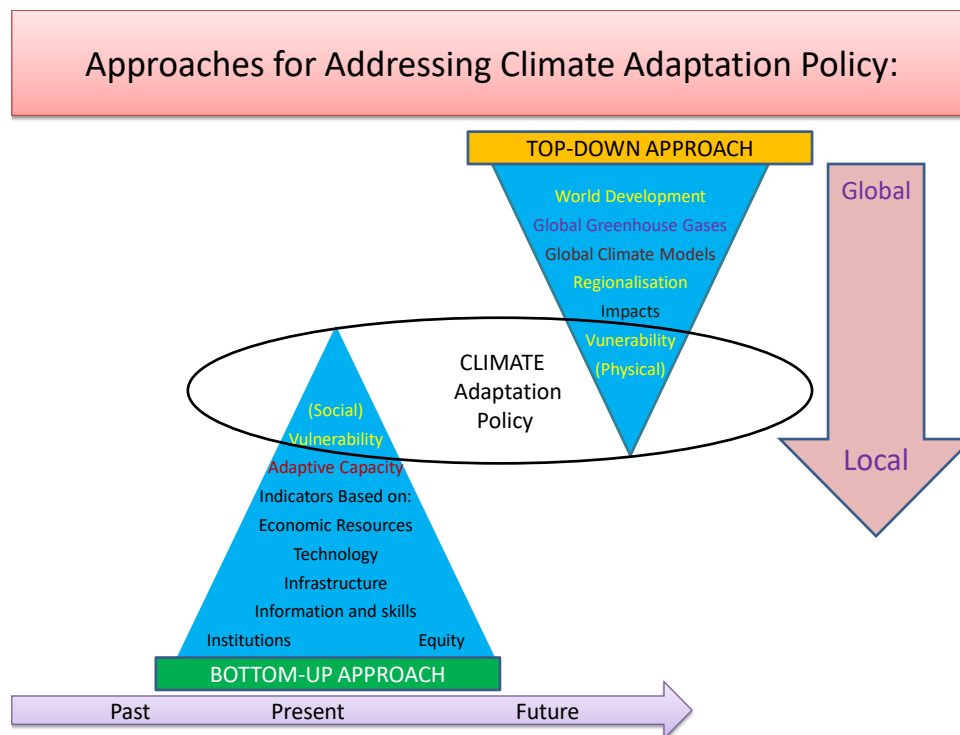
(Source: Reid and Vogel, 2006)

iii) **Identify Factors Influencing Decisions to Develop/Adopt Adaptations:** To understand the factors affecting future adaptation strategies the framework tries to assess the perceived need to adapt to ongoing and future climate, culture and ecological change based on: i) the sensitivity of the livelihood to climate change (the relation between capital assets and satisfaction with livelihood; and ii) the aspiration level of the person making the livelihood (Simon, 1955, 1956). If a livelihood is not sensitive to climate changes or the aspiration level of actor is low, the actor may perceive little need or no need to adapt to climate change induced critical situations of assets as presents by “do nothing” and in this context livelihood will not be vulnerable as shown by the arrow between “do nothing” and “vulnerability to socio-ecological change” (M.S. Reed et al. / Ecological Economics, 2013, 66–77). In the same criticality of livelihood, if the households’ aspiration level is high and they are not satisfied with livelihood outcomes, they will look for an adaptive choice between i) adopting adaptations based on new ways of using or substituting between existing assets; or ii) developing new assets; which are evaluated against the decision rules held by different individuals (Ziervogel et al., 2006).

iv) **Evaluate Potential Trade-offs between Adaptation Options:** To implement complementary bundles of adaptations together potential trade-offs between reactive adaptation and anticipatory or planned adaptation are evaluated to reduce vulnerability to climate change. While the former is related to learning from past and current adaptations, the latter is related to future adaptations (Schneider et al., 2000; Smith and Lenart, 1996; Tol et al., 1998)

Approaches for Addressing Climate adaptation Policy: There are two complementary approaches for addressing the problem of climate change vulnerability and adaptation (Figure- 1.4) as bottom-up and top down. While the bottom-up approach addresses contextual vulnerability- actual human secure framing, the top down addresses outcome vulnerability- scientific prediction. Bottom-up focuses on participatory ways of understanding current and future vulnerability of human community and ecosystem and top down approach focuses on technical ways of assessing vulnerability. Bottom-up approach addresses social and economic well-being by focusing on past and present condition to develop an understanding of vulnerability and future adaption while top down uses global climate models and downscaling or biophysical models to predict impacts and vulnerability to inform climate change adaptation.

Figure-1.4: Approaches for Addressing Climate Adaptation Policy

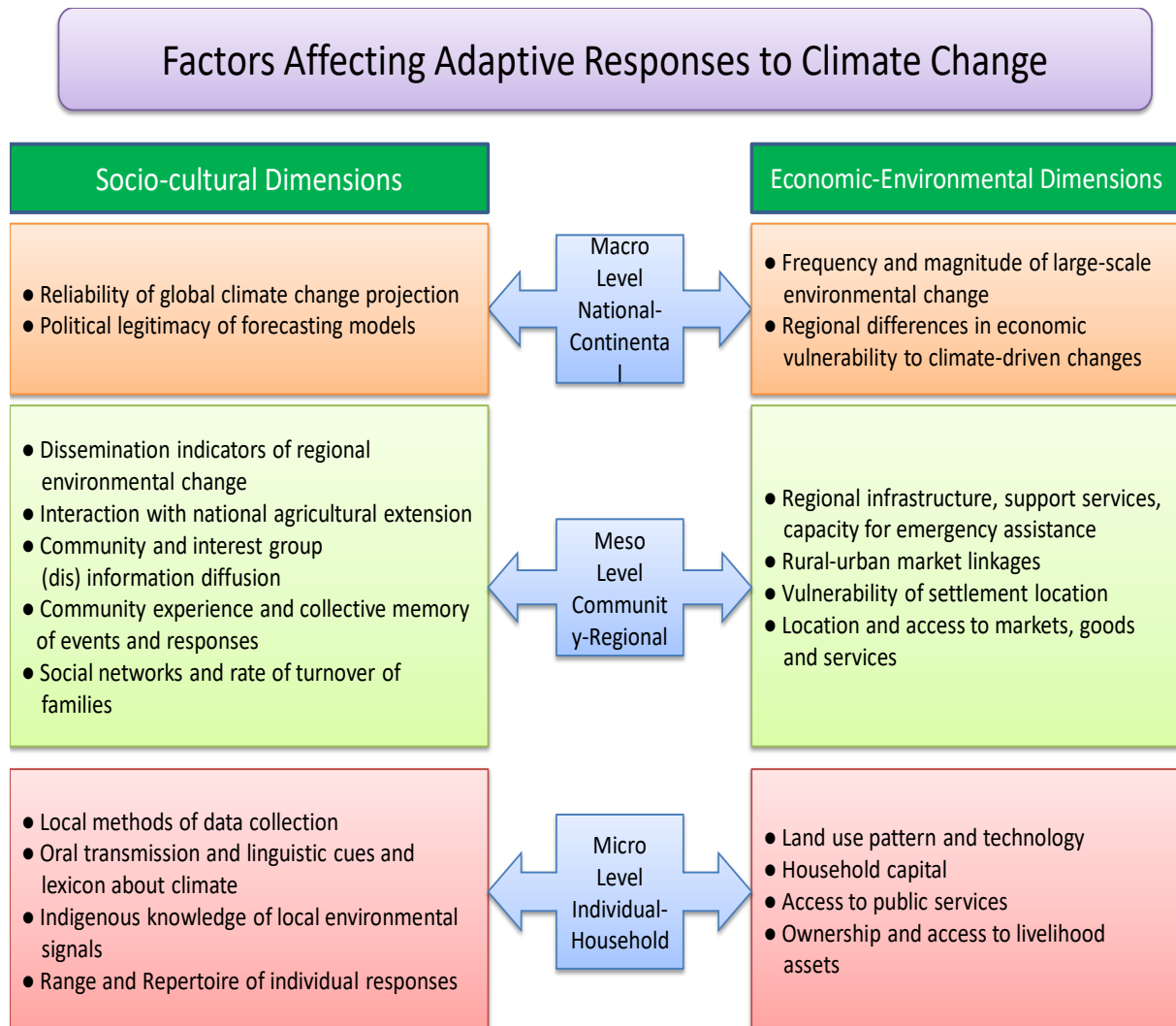


(Source: Adapted from Dessai and Hulme, 2004)

When bottom up uses scenario analysis or visioning processes with affected stakeholders and end users to understand social vulnerabilities which can then be used to identify the best opportunities for climate change adaptation, the top down uses predictive biophysical tools to inform climate change adaptation. The former addresses climate change vulnerability and adaptation from social vulnerability perspective and the latter from physical vulnerability perspective. In spite of differences of perspective and techniques in addressing the issue of climate change vulnerability and adaptation, these two approaches are complementary.

Factors Affecting Adaptation to Climate Change: Factors affecting adaptive responses to climate change are classified into two dimensions as socio-cultural and economic-environment (Figure- 1.5).

Figure-1.5: Factors Affecting Adaptive Responses to Climate Change



(Source: Modified and adopted from Brodizio and Moran, 2008).

Both dimensions are divided into three levels: i) Macro Level as national-continental, ii) Meso Level as community-regional and iii) Micro Level as individual-household.

Local Knowledge: Local knowledge is a certain local community or indigenous people’s wisdom, knowledge and practices gained over time through experience and orally transmitted from generation to generation.

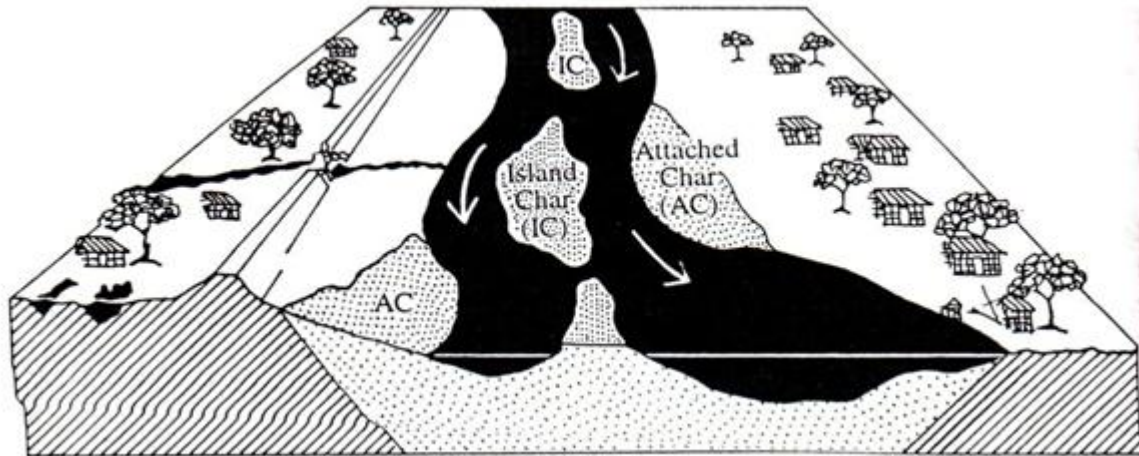
Char and Choura

On the one hand, the rivers erode land and cause displacement of the people; on the other hand they throw up virgin lands for newer settlements and agricultural activities. These virgin lands are called *char or doira*. The migrated and desperate poor people of rural Bangladesh inhabit these newly shaped lands are known as *chouras* in Bengali (Baqee, A. 1998:17).

Classification of Char

Generally there are two kinds of chars: island chars and attached chars (Figure- 1.6). The land that, even during the dry season, can be reached from the mainland only by crossing a main channel is called island char.

Figure-1.6: Classification of Char



(Source: EGIS, 2002:2)

On the other hand, the land which is inundated or surrounded by water during the peak of a 'normal' flood (normal monsoon) but accessible from the mainland without crossing a main channel during the dry season (crossing lesser channels may be required), is called attached char (ISPAN, 1995).

Livelihoods and sustainable livelihoods

A livelihood refers to the capabilities, assets and activities which are required for a means of living. When a livelihood can adapt to and recover from stresses and shocks and preserve and enrich its capabilities and assets both now and in the future, conserving the natural resource base, it is called sustainable livelihood (Khan and Seeley, 2005:23, quoted from DFID-Bangladesh, 2001).

According to **Ashley** and **Carney** (1999), a sustainable livelihood (SL) approach aims to improve the lives of the poor people and correlates three extant concepts of capability, equity and sustainability. SL approaches claim the people's own explanation of and priorities for their livelihood.

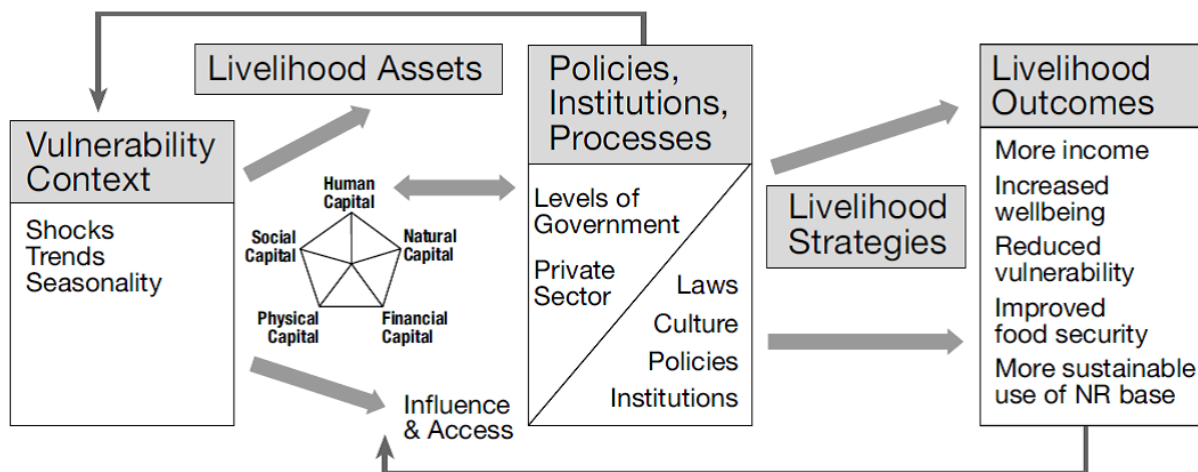
Scoones (1998) noted that five key indicators are important for assessing the achievement of sustainable livelihoods: 1) poverty reduction, 2) well-being and capabilities, 3) livelihood adaptation, 4) vulnerability and resilience and 5) natural resource base sustainability.

According to **Ashley and Carney** (1999), livelihood is sustainable when people:

- are resilient in the face of vulnerability contexts as external shocks and stress;
- are not reliant upon external assistances;
- preserve the long-term productivity of natural assets and
- do not undermine the livelihoods of, or compromise the livelihood options open to others.

Figure-:1.7 shows the livelihood framework and its various factors that constraint or enhance livelihood opportunities and show how they relate to each other. The framework basically presents the analysis of different public and private policies institutions and processes which influence vulnerability context of livelihood assets and influence sustainable livelihood outcomes.

Figure-1.7: The Sustainable Livelihood Framework



(Source: Khan and Seeley, (2005:23), Quoted from DFID- Bangladesh, 2001)

The framework helps to understand about the things a holistic way that poor people might be very vulnerable to, the capitals that assist them thrive and survive and the policies, institutions and processes that influence their livelihoods (DFID, 2000). The framework analyses the process of achieving sustainable livelihoods in different contexts through access to a group of livelihood assets which are ensured by the pursuit of different livelihood strategies.

Livelihood Assets: Livelihood assets comprised of five capitals as:

Human Capital: Human capital refers to the education, skills, knowledge, labour power and good health that collectively enable a community to pursue their livelihood strategies. Being of an intrinsic value, it is required to manage any of the four other types of assets and to ensure positive livelihood outcomes.

Natural Capital: Natural capital consists of land, water, fuel and wider environmental goods that are critical for the community to run productive activities and lead life. Climate change induced impacts and rapid population growth lead to decrease natural capitals that affect their life, livelihood and adaptation strategies to climate change.

Financial Capital: Financial capital refers to the financial resources that the people of a community apply to achieve their livelihood objectives.

Physical Capital: Road, transport, electricity, shelter, market, adequate drainage facilities, telecommunication, clean water etc. are the physical capital of char people that make people able to pursue their livelihood strategies.

Social Capital: Social capital is the relation or network, trust, access to information, groups etc.

Union

Union is the smallest unit of rural local government in Bangladesh (banglapedia, 2021).

Village

A small community or group of houses and associated building is located in a rural area which is bigger than a hamlet and smaller than a town (banglapedia, 2021).

Ward: A ward is a local authority area. It is used for electoral aspect. A union in Bangladesh is generally divided into 9 wards and in every ward a member is directly elected by people of that ward (Wikipedia, 2021).

***SamajPara* (Society)**

Somaj or *Para* refers to the concept of a society as an entity which includes and transcends the *ghar*, the *bari*, the *paribar* and the *gushti*. *Samaj* is at the apex of rural life. *Samaj* also connotes an association or community in a particular area with a definite stamp of its own and cultural uniqueness.

Gushti (Kinsmen)

A *gushti* is a collection of *paribar* mostly belonging to common origin (ancestral). A *gushti* is spread over quite a large area, across the neighborhood and village itself. All the members are closely bound by blood or by matrimonial connections.

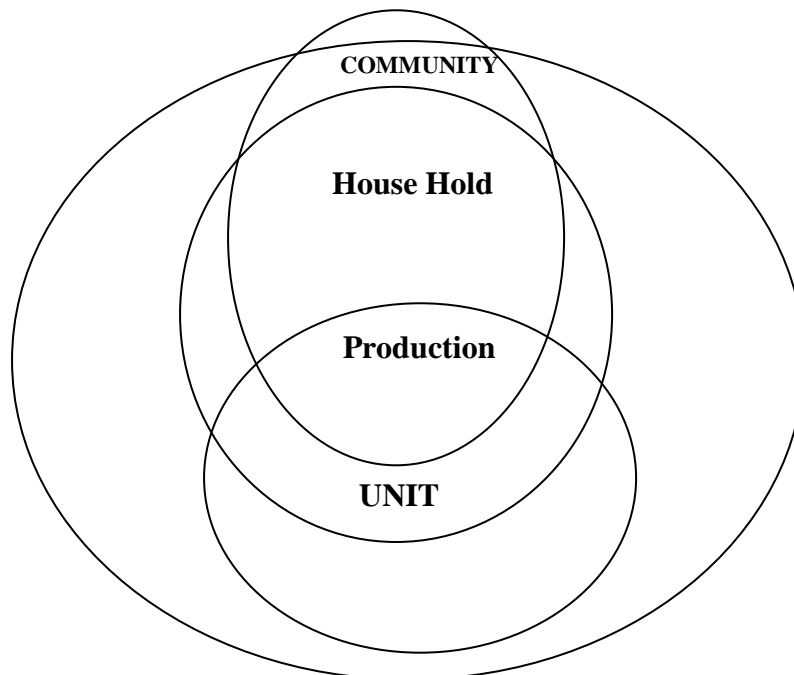
Bari (Household)

A *bari* in a coastal community or rural society is household consists of one or more than one hutment, shed or cottage. It is generally headed by an elderly male whom the residents abide by and pay loyalty to. He is the lord of the *bari* and directs and guides all the inmates in all aspects.

Household

Below the community level, the household is the important key unit in any social analysis (Townesley, 1998:24). In urban community the household generally corresponds to the nuclear family. In rural community the household generally consists of a wide range of contribution of kin or people connected by links of patronage and employment to the care of household members or the head of household. It refers to one or few persons reside in the same dwelling and share meals.

Figure-1.8: The Importance of Household



(Source:Townesley, 1998:17)

Paribar (Family)

The social group larger than the *bari* is the *paribar*. The members of a *paribar* are bound by blood and kinship and extend beyond the sphere of one *bari*. The *paribar* exercises wide influence and power in society.

Ghar (House)

In Bengal, *aghar* is the smallest unit of residence in a village Bangladesh. It is a house, a simple hutment or a thatched cottage with walls of mud and bamboo and a straw roof. It may also be a tin shed, or a *pucca* house, based on the economic status of its owner.

Gender

Gender is the socially and culturally constructed discrimination and disparity between men and women.

Patriarchy

To measure patriarchy in a community or a society, there is no single indicator. Patriarchy is the men's absolute authority and access to and control over material resources (like food, income, land and other forms of wealth) and social resources (including knowledge, prestige and power in decision making) within the family, the community and in the society as a whole (Dixon, 1978: 6-7).

CHAPTER TWO
LITERATURE REVIEW

CHAPTER TWO: LITERATURE REVIEW

To survive human beings must produce their production mechanism depends on what they find in nature and what they must produce to survive (Marx, K 1859/1977). The nature and environment of the world is different from place to place and region to region. So the nature of poverty and climate change adaptation of coastal community of different places of the world is different. Anthropological interest in poverty and climate change adaptation of coastal community is not absolutely new (Dove, 2014; Islam, Z. Shafie, H. and Mahmood, R. 2017) and anthropologists have always seen it as fundamental to explore human-environment relations. For having a clear view about the study area review of literature was done and based on it research methods, data collection strategies, interview schedule/ questionnaire were prepared, pre- tested and finalized. The literary works found on poverty and climate change adaptation extracted the different impacts of climate change on livelihood assets, people's adaptation strategies to climatic impacts and hazards, impact of poverty and role of gender, patriarchy, local knowledge and networks in adaptation process based on the variation of study areas, methodologies, theories and practices paved the path and made the ground of present study. Some is composed from global context, some from Asian context and some from Bangladesh context.

2.1 Coastal Community, Poverty and Climate Change Adaptation: Global Context

Adzawla, et al. (2019) carried out a study in South Tongu (a coastal district) and Zabzugu districts of the Volta and Northern regions of Ghana, respectively and explored that climate impacts on the livelihoods of females are severer than those of males and the climate adaptation strategies are mostly adopted by both males and females but the adaptive capacity of males was found to be higher than those of females. They used only quantitative method but no specific theory was used in the study.

Jem Bendell (2020) found climate mayhem lurking behind covid-19 outbreak. He explained that the lockdown and social distancing caused by the coronavirus pandemic all over the world are providing human beings with a taste of the disruptions to daily life that would be caused by climate change. It causes not only massive death tolls but also short, mid and long term socio-economic, political and cultural impacts all over the world, which have already reported by different research institutions. He addressed this pandemic as dress rehearsal of

upcoming more destructive collapse of civilization within decade. Here Bendell theorized that, in modern industrial societies, the fallout from Covid-19 feels like a dress rehearsal for the kind of collapse that climate change threatens. This crisis reveals how fragile our current way of life has become (Kishan, S 2020).

Crate, S. A (2011) carries out her study on Viliui Sakha communities in Siberia and finds out the environmental changes due to the local effects of climate change are making cow-keeping increasingly challenging as flooded hay-lands, disrupted seasonal timing and an unpredictable precipitation regime. Her study does not explain their livelihood and adaptation strategies to climate change and the challenges she found may vary in Bangladesh context. So, these theoretical gaps were solved in the present study.

Croome and King (1959) theorized that our economic civilization rests on a complicated and world-wide division of labor, specialization of workers, local groups, nations, climatic condition. They (1959:36-37) also examined the biggest and most obvious difference between the primitive & modern community and the difference between the kinds & amounts of equipment they work with. Of course the equipment is available and the more each specialized user of that equipment can produce as a result the more human energy will be available to work for tomorrow. Thus, the period of each worker's life devoted to actual production will be shortened so that instead of children having to start earning work as soon as physically possible, they can spend their growing years in learning, developing, acquiring skills and finding out where their abilities lie. However, they went to conclusion that the effect of specialization is like a snowball gathering impetus which is growing faster and faster. They saw climate change aspect completely from economic aspect and capitalistic perspective ignoring social, political, natural and physical aspects; they ignored the devastating impact of capitalist mode of production on human beings. They saw division of labor in society and specialization from Weberian perspective as good for society (Johnson, H. 1987).

Dapilah, Nielsen and Friis (2019), examined how local networks help livelihood diversification and resilience in adaptation to climate change in a small rural community in northern Ghana using qualitative and quantitative methods and found that the rural people in the study area have been experiencing a number of impacts of climate change on agriculture for the last three decades. As adaptive responses to this negative impacts of climate change people are compelled to diversify their livelihood strategies from agricultural to non-agricultural activities where households participation in different group activities or local

networks play important role in ensuring their access to material and non-material critical resources crucial for livelihood diversification.

Haque, M (2020) examined the resilience of coastal ethnic communities of four Asia-Pacific island countries in facing tsunami related hazards and found that based on observations of animal behavior, celestial bodies, traditional and faith-based beliefs and practices, the coastal community is able to develop a coping mechanism for themselves with climate change induced natural disasters and they maintain a co-existence with hydro-meteorological hazards by applying their indigenous knowledge and practices acquired from their forefathers over the years. The paper mainly used secondary sources of data available in print and electronic media.

Hastrup, K (2016) drew on extensive field study on north-west Greenland and explained that how anthropology contributes to a shared and multidisciplinary field of climate issues and concerns. She explored the knowledge construction process regarding climate change with reference to three key themes: assemblage, anticipation and action. She set the stage on how climate knowledge is assembled, contextualized historically and socially, and configured in multiple ways. She argued to incorporate past experiences and to respond to future concerns as climate scenarios are deeply social.

Urry, J (2016) examines various interdependent processes in environment, economy, climate, food, water, and energy. Especially he assesses how in the final years of the last century, neoliberalism ratcheted up the global scale of movement within the global North enabled by oil. He argues that this migration of people and goods became essential to most social practices that depend on and reinforce a high carbon society.

Mariz, C. L. investigated how religious groups support individualism and encourage the poor to organize. Groups with shared values are then able to develop strategies to adapt with poverty and, ultimately, to transform the social structure. Interviews with members and leaders of religious groups and close readings of religious literature contribute to a realistic account of Christian base communities and Assembly of God churches, folk Catholic tradition, and Afro Brazilian Spiritism. Climate change adaptation was ignored in this study and it was not conducted on coastal community.

Salick and Byg (2007) assessed the coping strategies of rural communities in the basin of the River *Offin* in Ghana with impacts of climate change and variability using semi-structured questionnaires, focus group discussions, interviews and field observations. They explored

that local knowledge of indigenous people of rural communities has been playing an important role in selecting coping strategies to climate change and variability over the years. The local people live very close to nature and natural resources frequently and intensively monitor the changing activities of nature, climate and natural resources as birds, animals and plants, weather changes; gather some special wisdom and knowledge which helps them to identify first the changes in nature and to select the appropriate coping strategies with it accordingly. The study is based on both methods but they focused only on coping mechanism not adaptation strategies.

Gyampoh, B.A. and et al. (2007) explored that indigenous people that live close to natural resources often observe the activities around them and are the first to identify and adapt to any changes. The appearance of certain birds, mating of certain animals and flowering of certain plants are all important signals of changes in time and seasons that are well understood in traditional knowledge systems. Indigenous people have used biodiversity as a buffer against variation, change and catastrophe; in the face of plague, if one crop fails, another will survive

Wadsworth et al. (2006) examined prospective associations among poverty-related family stress adaptation, involuntary stress reactivity and psychological symptoms in a sample of 79 rural, low income adolescents. They tried to find out how poor households cope with increased risk and vulnerability from conflict or state fragility, how households can be resilient in these environments through creative coping strategies and risk/reward assessment to explore the potential utility of social protection policy to help households overcome poverty.

Michael Lokshin and Ruslan G. Yemtsov (2007) looked into what strategies have Russian households used to cope with economic hardship in the wake of recent financial crisis, which coping strategies have been most effective in reducing poverty for different groups of households, and how have people been able to adapt to the dramatic drop in formal cash incomes. The authors look at these questions using subjective evaluations of coping strategies used by household survey respondents to mitigate the effects of the Russian financial crisis on their welfare. The data come from two rounds (1996 and 1998) of the Russian Longitudinal Monitoring Survey. The results of their analysis show that a household's choice of survival strategy strongly depends on its human capital: the higher its level of human capital, the more likely it is to choose an active strategy (such as finding a supplementary job, or increasing home production). Households with low levels of human capital, those headed

by pensioners, and those whose members have low levels of education, are more likely to suffer social exclusion. To prevent poverty from becoming entrenched, the trend toward marginalization, and impoverishment of these groups of households, needs to be monitored, and targeted policy interventions need to be undertaken to reverse the trend. In this study only quantitative method was used and human capital of livelihood was emphasized in coping with poverty. Climate change adaptation was rarely emphasized in this study.

Naess (2013) examined that the farmers of African countries are practicing different local weather indicators such as the solar system, plants, insects, animals, and wind in forecasting the weather and climate variation. He found that the accumulation of sufficient local knowledge of the community plays vital role in enhancing farmers' adaptation strategies to reduce the adverse impacts of climate change induced natural impact. He also explored that the better the communities of Hadiya and Ethiopia perceive the climate change driven impacts, the better they play role in coping and adaptation strategies.

Oliver-Smith A. (2005) interrogates in depth the concepts of adaptation, resilience and vulnerability regarding the significant potential for large-scale population displacement and resettlement associated with climate change. She pays particular attention to recent policy initiatives from the international community relating to the shortcomings of adaptation and programs for compensation of losses and damages resulting from climate change for which mitigation and adaptation will not be sufficient. He uses no specific theories or models in his study and no anthropological research method is used while the study area is anthropological in nature.

Serdecny, et al. (2017) explored that climate change brings about a wide range of impacts on social, economic and environmental systems. The total costs of climate change account for: mitigation costs (+) adaptation costs (+) the residual costs of loss and damage. The last one which cannot be avoided through adaptation and mitigation is classified into: 1) Economic losses, and Non-economic losses. Economic losses are losses of income and physical assets. The concept of non-economic losses (NELs) has recently originated in the context of negotiations on loss and damage under UNFCCC (Serdecny, et al, 2017; Islam, Z. Shafie, H. and Mahmood, R. 2017). NELs are defined as the losses of values that are not generally traded in markets and are difficult to assess because of the absence of a market price such as loss of life biodiversity and cultural heritage (Islam, Z. Shafie, H. and Mahmood, R. 2017).

Strauss, S (2008/2016)) studies the responses to climate change in Swiss Alpine village of Leukerbad and explored the ways that traditional narratives of engagement with environmental threats posed by glaciers or avalanches are connected with modern reactions to the risks of a changing climate. She examines the construction process and limitations of climate change models and explores that scholars do not possess what most local mountain communities need to face the dramatic climate change. Her study overlooks the adaptation and livelihood strategies. The study area is not coastal zone.

2.2 Coastal Community, Poverty and Climate Change Adaptation: Asia Context

Johnson (1987) explored that the lives of poor people consist of innumerable daily actions that attempt to alleviate hardship, from trying to secure ways of growing food or earning income to negotiating the distribution of resources within households. These daily struggles are accompanied by individuals and collective actions to subvert or defeat structures which reinforce poverty. In more collective responses, the rural poor may establish or join peasant organizations or community groups to try and bring about more fundamental change. He examined that in many third world economic problems in food production and distribution, combined with low productivity and low remuneration for most people. On the other hand a minority some group of producers and land owners has experienced potential and actual accumulation. He also found out that the rural poor are 'conscious actions' who are constantly adapting to circumstances. They have their own kinds of knowledge and skills which have been adapted to local conditions. Their social relations and cultural norms have own validity (1987). He carried out his study on some people of Sri Lanka using qualitative method. Integrated method was not used in this study.

Karki et al. (2015) carried out a study on Ambient Air Pollution and Respiratory Health Effects in Kathmandu Valley in in Nepal and found that as a response to the effects of climate change, the community was able to construct a significant climate resilience into community infrastructures providing drinking and irrigation water system, local bridges, and trails.

Mekonnen, Z. et al. (2021) assessed the value of community based indigenous knowledge and traditional weather forecasting system in Ethiopia. They found out that the local knowledge and networks play a vital role to read the climatic situations and construct adaptive strategies. The study is based on secondary level data.

Nilkanta Sastri (1974) conceptualized that the chief occupation of the people of Indian subcontinent has, from time immemorial, been agriculture. They ploughed the ground the plough had been drawn by two oxen festered to the yoke with hamper or leather traces and driven with goad. Goat and sheep were reared. Houses were mostly of wood. The bulk of the people is poor and borrows at usurious rates of interest and pays their debts in eight or sixteen installment. The first important rite in the life of the girls is marriage. But the shortcoming in his study is that he carried out his study from subcontinent context, discussed from historical and political context most, coastal and char people's life and livelihoods were not focused from climate change perspectives and overlooked the people's adaptation to climate change.

2.3 Coastal Community, Poverty and Climate Change Adaptation: Bangladesh Context

Ahmed and Halim (2004) tried to point out and assess the women's involvement in fish production reviewing five projects ongoing in coastal areas of Bangladesh. They tried to examine whether women's livelihood is sustainable or not. They found out gender discrimination in women's profession, lack of representation in the decision making process in their occupation and lack of access to physical and capital resources. They explored that women and children are discriminated in adaptation to natural disasters.

Ahmed, Z and Habib, A (2015) theorized that poverty is a state of being that can be re-read through analysis of local social relations and specific socio-political contexts. Economic, political and environmental risks in char areas have contributed to survival strategies for the majority of the small producers. They explored the ways in which the social relations of land ownership/ access directly affect farmers' access to water and their ability to innovate. There is a methodological flaw in their study because they used only qualitative approach in explaining poverty which is basically related to variables.

Akhtaruzzaman, M (2020) argued that the lifestyle of coastal communities or small ethnic communities of Bangladesh is very distinct having close connection with river or nature. The people of these areas are the most vulnerable to adapt to the adverse impact of climate change induced diverse calamities in their daily lives. Climate Change, a burning issue for the existence of human beings at present, is indeed a global phenomenon and has to be dealt with global steps collaboratively for the safe and sound existence of all human beings on the earth.

Alam, M.S. Rahman, M.O. and Ahmed, S. (2020) conducted an empirical study in five administrative districts adjacent to Sundarbans, the world largest mangrove forest and

identified that the coastal areas of Bangladesh, the most climate vulnerable country around the world, have turned into immediate and extreme climate vulnerable areas for enormous evidences including sea level rise, intrusion of salinity, frequent and abrupt tidal surge, cyclones, water logging, infrastructural damages, emergence of climate refugees, internal displacements and many more. The prime objective of their study was whether the actors and activities involved in coping with climate change launched by GOs, PNGOs and NGOs, are complementing and joining up or not and they found that there is a lack of joined up and holistic policy approach among the activities, efforts and interventions involved in coping with climate change launched by government, developing partners, NGOs local community and individuals. Most of the activities involved in climate change in the coastal areas remained individualistic, silo style, overlapping, conflicting instead of complementing, integrating and joining up with one another. Though this study conducted in coastal areas but they did not use integrative method and the study was not conducted on *Bayer Char* Community and their study objectives are different to present study.

Anik and Khan (2012) explored that due to its physiographic location, Bangladesh would be the worst victim by extreme climate events. Climate change has a devastating impact on the poverty and adaptive strategies of char people in Bangladesh (Anik, S.A& Khan, M.A.S, 2012).

Baqee (1998) developed his idea that cultivation of the char-lands is usually done by hired labor through share-cropping arrangement or against harvest / cash contacts, depending on the size of the land of cultivation. He (1998) explored that the *chouras* have keen the power of observing the nature of climate and take different planned attempt at reducing and minimizing the devastating impact of natural disaster especially flood cyclone in three major areas-structural, agricultural and human. He expands his ideas that in the char land except for a few *matbers*' households almost all other households are poor and run on a difficult budget. To cope with the consequent food shortage, they set community storage facilities. He (1998: 90) also explored that the initiation of a char settlement depends largely on the physical environment (PE), the action of power poles (PPs) and the local administration (LA). His study highlighted on coping mechanism with natural calamities of the people but followed only qualitative method. His study did not follow any specific hypotheses or theories did not explore no specific findings or conclusion, no term is operationally or conceptually defined. In the present study it was attempted to bridge this research gap.

Begum, F (2020) theorized that ethnic minorities and coastal communities have their own innovative ways derived from their experiential knowledge and traditional practices to cope with the impact of climate change but these initiatives are rarely highlighted and incorporated in mainstream discourses of climate change and national policy-making process. She (2018) also examined the underlying logic of the existence of a plural medical system in rural Bangladesh. She explored that in rural Bangladesh biomedicine operates alongside alternative medicines such as Homeopathy, *Ayurveda*, and folk systems. Besides, she (2015) explored the capital and health seeking of women's reproductive health. His studies were basically based on only qualitative methods and no specific theories were followed.

Biswas (2003) explored that the effects of natural hazards are devastating and damaging for all people, but they have a terrible impact on poor people's livelihood. People create their own mechanism for coping with their vulnerability to natural hazards. The coping strategies and adjustments differ from region to region and local solution is found to the recurrent problems. He also found out that the livelihood of the poor people in rural areas have always changed and assumed newer forms in response to the devastation of disasters. He extracted the coping mechanism of the general rural people not of the coastal community.

Care Bangladesh (2002) finds that seasonal migration was an important livelihood strategy for the very poor. It is one of the major strategies for almost a quarter of the poor households. (CARE BAN & DFID D-B 2002). The lacking of Care Bangladesh is that its study picked out only the migration aspects of rural people.

Chakma (2005/2003) explored that poor people do not own land and it has a profound impact on their livelihoods. The families having many girls are more vulnerable than those with boys because sons add to the working hands in a family when they grow up, girls, on the other hand, are said to be a constant source of anxiety for the parents. Prolonged illness, physical and psychological disability, death and sudden death etc. are the reasons of major income earner most frequently mentioned for the deepening of poverty in all rural extents. He also examined that natural disasters make the poorer destitute women more vulnerable as they have no adult male member in the family and get nothing in the way of relief if they do not have any special relation with the formal and the informal institutions (2005:144; 2003). His study highlighted only the human assets of livelihoods pattern. The shortcomings of this study are to overlook the adaptation process of poor coastal community to climate change.

Chambers (1995) argues that beside low income, poverty also involves – a sense of social inferiority, isolation, physical weakness, vulnerability, seasonal deprivation, powerlessness and humiliation. Here, he emphasized on the ground on poverty but the adaptation to climate change is not considered. This empirical gap was fulfilled in the present research.

Choudhury, A.M (2009/2012) argues that a unique confluence of natural and human-made circumstances has made social and environmental well-being in Bangladesh at risk year-in and year-out. Bangladesh locates in a broad delta plain that contributes to both potentiality and vulnerability for the nation. Half of the nation's landmass is less than 25 meters above sea level. Geographical location has created natural hazards and calamities for Bangladesh and poverty made it very complex for the nation to respond to it successfully. He theorizes that forces and factors related to climate have invariably shaped the course of human cultures and civilizations for good or bad. In recent times, negative human activities in industrial, agricultural and technological spheres have pushed the world to destruction. Depletion of the ozone layer of the atmosphere due to increased emissions of CFCs, deforestation and warming of the globe as a result of the green house effect causing tropical cyclones, tornadoes, earthquakes and droughts and the consequent probability of the melting of polar ice caps and snow at mountain peaks resulting sea level rise causing possible frequent flooding and emersion of low-lying and coastal areas pose drastic and grave threats to all human kind. This threat is even more critical and urgent for poorer and technologically backward people of too low-lying coastal char people of Bangladesh. As adaptation process of this vulnerable coastal community he focuses particular attention to disaster forecasting, preparedness, capacity building and management based on Rose Petal Theory and Atmospheric Teleconnection Theory. The author has put forth in this book his lifelong research work. All the articles included here are written based on secondary data, no specific theory is used, emphasis is given only weather forecasting.

Crate and Nuttall (2009/2016) conceptualized that, sea level rising in the Bay of Bengal, increased severity and frequency of floods along the three giant rivers-the Ganges, the Brahmaputra and the Meghna (GBM), increased severity and frequency of powerful cyclones fueled by warm waters, changing ecologies of the water bodies and droughts in prime agricultural zones are the glances of the future already provided by climate change in Bangladesh (Crate S. A. and Nuttall M, 2009/2016).

Equity and Justice Working Group Bangladesh (EquityBD) focused on key challenges to achieving Sustainable Development Goals (SDGs) for Bangladesh and theorized that coastal people, innocent victim of climate change, got less integration and priority in government's national plan. Here it is argued that Bangladesh coastal region covers about 20 percent of its geographical area where more than 50 million people are living and most of the populations are poor and living below the poverty line. It is stated that a multidimensional impact of climate change is being observed in coastal areas. Salinity intrusion along with severe water crisis is causing lower crop yields and scarcity of safe drinking water, thus endangering livelihoods. Every year thousands of affected people are migrating and taking shelter in urban slums in cities especially in Dhaka and Chittagong. The Internal Displacement and Monitoring Center (IDMC) predict that 30-50 million people will be displaced for climate change and rising sea level water. But country preparedness in term of strategic planning and financial support is not yet much visible. The severe cyclone SIDR-2007 caused an economic loss of US\$ 3 billion which has not recovered. Poverty was increased by about 5 percent. Government has committed to protect coastal people through building up the most essential and protection-oriented critical infrastructure like embankment and polders in the most vulnerable coastal areas and providing economic opportunities for their adaptation and ensuring sustainable livelihoods. But the 7th FYP and its implementation has taken a very traditional approach and focused on growth-oriented development infrastructure like transport facilities and export processing zones.

Equity BD also focused that government has conducted a study on "Coastal Zone Management" to make the coastal areas resilient and sustainable, following an expert recommendation to develop a "Coastal Development Board" with a separate development plan and budget, but this is yet to be implemented. The study also argued that it is also true that the development of critical infrastructure will require a huge amount of financial allocations and technical support. Effective CSO participation has yet to be facilitated by government, although it is widely acknowledged that current development strategies require the participation of all CSO stakeholders, including public representatives, Government, the private sector, the media, civil society, NGOs, the knowledge community and development partners. As the implementation and achievement of the SGDs(SDG target 17.17)depends on the inclusive participation of Government, the private sector and other development agents like civil society

Elahi & Rogge (1990) found char and embankment zones to have nearly three times as many females headed households as the (mainland) zones. They expand that most of the female headed households are headed by wives of men temporarily absent for labor. Their study examined the gender perspective of coastal community.

Finan, T and Rahman, A. (2006)) studied the local level coastal area of Bangladesh and focus on the role of anthropological research in examining the nature of vulnerability and adaptation to climate change pressures, the rural level experience with climate change, and the influence of unequal power relations and governance on the vulnerability of rural populations. Moreover, they assessed how an anthropological perspective of local livelihood systems and adaptive capacities of power and governance can contribute to a broader understanding of future climate change, and the viability of adaptation pathways. They also found that global warming results in frequently occurred natural disasters that lead to acute levels of damage including excessive mortality and livelihood disruption. Moreover, due to climate change, moderate annual flooding restores the fabled fertility of the country's paddy land and replenishes the fresh water fish stocks so critical to the food security of the population, specially the poor char people. Their study followed only qualitative method and technique of data collection was only case study. But, using integrative methods of analysis was very essential to extract such rural level experience of developing countries like Bangladesh. In present study these theoretical and methodological flaws were solved to ensure a reliable contribution in the field of knowledge.

Haque (2017) theorized that the people of coastal area are the innocent victims of this man-made ugly curse. In spite of harsh physical condition a significant proportion of the total population of Bangladesh live in the Char (Shoal) areas and developed their own adaptive strategies related to the vagaries of nature (Haque, M. 2017).

Hasan, Z (2020) argued that the impacts of climate change induced disasters as head waves, heavy rain, wildfire, droughts, and melting of snow and ice are widespread and affecting each continent, from the equator to the poles and from the mountains to the coasts encompassing all the ecosystems and human endeavor. He suggested that for facing these impacts already being visualized on coastal and small ethnic communities of Bangladesh adaptation is very important and anthropological study, a great potential in leading a multidisciplinary approach, is essential for understanding climate change impacts from the perspective of the frontline people.

Hussain (2005/2003) found out that a family that has struggled hard out of chronic poverty, often poverty which has been passed on from one generation to the next, can lose all they have gained because of disaster, sickness, political/social unrest or unemployment. How people cope with such vulnerability is dependent upon whom and where they are and what assets they have. Most of the time they migrate in search of homestead land, food, cloth and safety. He examined that mobility is an important factor in the lives of the poorest in Bangladesh. Though they face a lot of problems as lack of regular work, accommodation, sickness, disease, robbery and physical harassment, they do not leave migrated land. He (2005/20003) also explored that poor people spend most of their money on food. They find many different ways to manage required food but they often have compromise on both the quantity and quality of the food they take. This continuous process of struggle for food takes its toll on the health and psychological well-being of many, affecting not only adults but also children, thus compromising their performance in school, their performance in work, as well as their present & future health. The lacking in his study is that it covered only the material and human assets of livelihoods and no specific method was used. His study emphasized more on the causes of migration and ignored the matter of adaptation to climate change.

Islam, Z and Shafie, H (2017) conduct their research in ecologically different four upazilas of Bangladesh using SEA approach and assess that the means and capacities for adapting to climate change in developing countries like Bangladesh are scarce or low owing to low levels of human and economic development and high frequencies of poverty. These conditions create a state of acute vulnerability to climate change impacts multiplying each other. They hypothesized that people's livelihood strategies in many areas of coastal char are expected to change significantly over the next 20 to 30 years. So, this complex inter-relationship among climate change, poverty and adaptation of coastal char people can be re-read by the analysis of local social relations and specific socio-political perspectives from anthropological aspects. Their study aims at only Strategic Environmental Assessment of policies, plans and programs (PPPs). Although their study carries out in Bangladesh the field is not exclusively coastal areas and they uses an approach like SEA no theory is applied. The present study was guided by an anthropological theory i. e., cultural ecology theory.

Islam, Z and Uddin, M.B (2017) examines the impact of climate change and people's perception regarding climate change and their effective adaptation strategies to it in four different regions of Bangladesh. They theorize that Bangladesh is more risky and vulnerable to climate change and the people of Bangladesh adopt some short term coping strategies to

mitigate the acuteness of vulnerability. Due to lack of personal, social, economic and institutional capacity, capital, knowledge and skill, the local community cannot adopt the long-term adaptation strategies to climate change. A notable portion of local people are not aware about the impact of climate change.

ISPAN (2000) explored that the socio-economic activities of the char inhabitants are intimately related to the land use potential within the chars. Average household size for all chars considered together is larger than the national average of 5.44 (BBS, 1992). ISPAN (2000) also examined that many char people depend on sales of livestock as a source of income. Livestock is also used as draft power for cultivation. It also supplies food items such as meat and milk. Cow-dung is extensively used as organic manure and fuel. Cattle are the most important animals raised in the chars; goats are also widespread. ISPAN (2000) found out that although both river water and ground water are abundantly available in chars and coastal areas, irrigated crops are scarce in many of these areas. Land in the chars and coastal areas can be owned either by individuals or by the government, in the latter case it is known as *khas* land. The inhabitants of coastal chars face a number of natural hazards, of which the crucial ones are riverbank erosion and flooding. People take different management aspects with regard to floods. ISPAN emphasized basically only on natural and material aspects of livelihood of coastal char people, and used only qualitative method. No specific theory was used in this study.

Jansen and Baqee (1998) assessed that employment for the landless in the char or coastal area means working as daily wage laborers in the agricultural fields and boats or launches (Jansen, 1987:2; Baqee, 1998:5).

Kabir (1999) explored that adolescent girls in rural areas spend a considerable amount of time during their childhood to help their family in the house holds instead of going to school. In rural areas they cannot easily work outside home because of insecurity; and social and religious restrictions on women's movement.

Kamruzzaman (2005/2003) pointed out that in rural Bangladesh the cultivation of crops is the most important employment opportunity for the poor but the poor people do many other jobs, often depending on a diverse range of occupation in order to survive and adapt to various types of disasters. They often depend on their social networks to get work. He pointed out that earning a living is fraught with risks, uncertainties and insecurities that are associated with a range of economic and non-economic factors.

Kathari (2005/2002) theorized that during natural disasters in coastal areas the chronically ill poor people are left alone. Their adaptation process to natural calamities caused by climate change is vulnerable and insecure.

Khaliquzzaman, K (2020) argued that climate change is a global issue but its impact is local. It has already created a very bad situation. The people who are not liable for climate change are suffering more as innocent victims. The communities who live in harsh land, chars and coastal areas are suffering most. The needs of poor people of coastal communities are different from those of ethnic community or tea garden people. So, multi-dimensional, integrated human-centric model of climate change adaptation should be created and applied so that the people of different communities can get the equal opportunities to meet their basic needs, can live with same dignity and equal humanity. As climate change is a global issue, global measures, not local, can combat it successfully. On the other hand, coastal communities have their own indigenous knowledge to adapt to different types of calamities created by climate change. It is important to study how the knowledge of these communities can be integrated into sustainable development process which requires social acceptability, environmental soundness and economic growth.

Khan, M. I (2019) argued that climate crisis is actually a social crisis. How science is used by society that lays the foundational premise of this crisis. At pre-industrial age (before 1750 A.D.) the average global temperature was 15 degree celsius; it has now reached almost 17 degree. The world cannot tolerate this elevated temperature resulting in cyclone after cyclone because of the excessive heat of the sea surface. He explained that science is human invention, from there came technology and industries. Such industries have been used less for human well being more for consumerism and luxury. Exclusively profit oriented business promoted consumerism. Now it has become a part of structure in the sense many things (e.g., employment, life standard, social status and political power) now depend on such industries that produce luxury goods and release a large amount of green houses gases. Such industries are not essential for human well being but essential for luxury. Those who have got a large amount of surplus beyond the need for housing, health or education are the main consumers of luxurious industrial items. As adaptation to climate change, he advised to shut down luxurious goods producing industries that would help cut down carbon concentration of the atmosphere. Thus human beings need a new outlook for their life: exploring the inherent strength of life (e.g., cultural creativity) and orient towards it instead of adopting consumerism to lead this life. He summarized that climate crisis is essentially a social and

outlook (or philosophical) crisis, so solution should be sought there instead of creating new science to surpass the old science

Khan (2005) theorized that the indicators of dividing people into poor and non-poor are material assets, human assets, social assets and natural assets. He (2005) hypothesized that ethnic minorities of coastal area may suffer hunger and deprivation because they have lost their occupations or lands and do not have a reliable source of food or income. The aged, disabled and chronically ill people complain of neglect and when a household loses its main earners the poor family can suffer hardship but when that happens in a place when it is difficult for women to work or she is unable to work, the options become severely limited and the family becomes dependent on the wage of children to survive. But he saw the livelihoods only from social aspect and his study carried out following only qualitative method.

Khan and Seeley (2005 / 2003) explored that climate change worsens the poverty situation of coastal community and makes their adaptation strategies insecure, vulnerable and unsustainable. Many NGOs have specific projects for the poor of all categories. The problems seem to lie in the lack of monitoring and weak feasibility studies and as a result, well intentioned projects have failed to deliver the goods. Though Union Parishad (UP) is an agency at the grassroots level and responsible for carrying out social development, providing relief and assistance, enforcing law and order etc., the UP leaders are sometimes accused of demanding bribes and cheating poor laborers. The local elite and the UP leaders together control whole *salish* process & often the verdict of *salish* goes in favor of well-off families. Most of the time the poorer people cannot pay bribes and are deprived of their due rights. They also examined that a lack of coordination between formal and informal organizations and institutions and a bias against the poorer people, for a variety of reasons as politics, kinships, taking bribes etc., lead to a denial of their rights. Nevertheless, some of the organizations, they found, are trying to bridge the gap between formal and informal institutions and organizations (2005/2003).

Lipa and Begum (2020) found in their study that despite having contributed the least to global warming by traditionally leading 'low carbon' ways of life, the indigenous people and local communities like Marma community of Khagrachhari hilly area of south east region of Bangladesh, are disproportionately vulnerable to ongoing climate change. They also examined that these indigenous people are not simply victims of continual climate change, they have an important contribution to the formulation of substantively scientific knowledge

and adaptation strategies to continual climate change. Due to their close relationship with their environment these people are repositories of learning and knowledge on successfully adapting to local-level climate variability and effectively responding to prime environmental changes affecting their livelihood. The main methodological shortcoming of the study is it is conducted based on only qualitative method and no specific theory was followed.

Mahabubullah (1996) examined the survivability of coastal and char people and found that the survivability of coastal and char people depends on agriculture, livestock-rearing and fishing. He investigated that Bangladesh rural economy is characterized by preponderance of a large number and by landless households. Success of a household in its survival and exploitation strategies depends on the success in gaining access to and maintaining control over land. The competition to gain access to land intensifies since it is the most important livelihood asset ensuring resource in rural economy. This is known as 'competitive quest for survival'. Differential in income and living conditions is also observed due to differences in access to land and other sources of earnings. Changes in a rural society are essentially land centered. He examined that though agriculture is the main source of earnings, it fails to provide significant employment opportunities for the land poor households. Their earnings from the non land sources are also very low with some exceptions. Those who have been losing land or have reached the stage of pauperization would still follow the principle of walking on two legs. A sizeable section of the 'base' group households needs relief support from the government and private individuals when they were in distress (1996: 208). He emphasized only on material aspects of livelihoods and overlooked the other aspects. The adaptation strategies of poor coastal community to ongoing climate change are not focused in this study.

Monsoor (2000) explored that the system of dowry is closely linked to women's role in 'productive activities'.

Nasreen (1999) explored that although flood affected both men and women the physical burden of coping falls heavily on women because of the wider responsibility of having to protect their households. In flood affected area, poor women and children suffer from lack of food clothing drinking water, fuel and shelters as their gender assigned tasks.

She also examined that women non-productive assets as jewellery, livestock and other household items become more productive during floods because these are used to meet the

immediate needs of the households when men's assets were kept for the future. She highlighted the causes and consequences of gender discrimination in rural Bangladesh.

Nazneen and Yasmin (1999) pointed out that women, children and elderly who receive less or no aid are the vulnerable to flood and become victims of various diseases. Very little information is provided to them about potency and methods of using WPT. They also explored women are the worst victims of flood and they suffer most because of gender blind relief and rehabilitation strategies and plans.

New Age (2019), a renowned English news paper reported that about 40 million people live in the vulnerable thirteen districts, seven of which are highly vulnerable. On November 09, 2019, the paper headlined that 40 million people are on path as Bulbul, a highly severe cyclonic storm heads to the east coast of Bangladesh. The paper stated that the authorities prepare for massive evacuation and arranging shelter in 4071 cyclone shelters in coastal areas; maritime and river posts shut down as an adaptation strategies to this natural disaster caused by climate change.

Purvez (2005/2003) explored that though social networks such as trust, bonds and ties, horizontal and vertical relationship etc. have the positive role on accessing to organization creating survival options and providing support for the family sometimes create problems for the poor as they prompt negative action and exclusion from society. He also examined that because of prevailing social custom and taboos, some of the poorest are excluded from social networking that is important for adaptation to any disasters caused by climate change.

Rashid, S. (2005) carried out an ethnographic study on the Koibortta fishing community of Krishnapur village in the northeast flood plain region of Bangladesh and explored that many fishing communities of Bangladesh have been living from primitive age. They developed traditional local knowledge and networks of fishing practices in diverse environments and these indigenous local knowledge and networks are playing vital role in managing fisheries and adapting to the change of environmental and ecological states. But their capacity to adapt their indigenous knowledge and networks to continuous climate variability was insufficient for lacking strong government commitment to their long term security. The study is based on only qualitative approach.

Sarwar, MGM (2005) assessed the impacts of sea level rise on Bangladesh. He hypothesized that livelihood options and the natural environment of coastal communities of Bangladesh will be severely affected by the anticipated one meter sea level rise that will lead to the

national food security and total disappearance of Sundarbans, the most important ecosystem of the country. To minimize the impacts, the study suggested a combined effort of GOs, NGOs and international communities in mitigation and adaptation strategies to ensure the survivability of coastal communities and ecosystems. The study was conducted using only secondary sources.

Seeley and Khan (2006) explored that social protection, in whatever form it is provided, cannot be tailored to individual needs particularly when government and NGOs are trying to provide support for the highest numbers of extremely poor people in Bangladesh. The labels that are applied to 'the poorest' and categories assigned for the targeting specific programmes are not sensitive to the diversity of poor people, to the different ways in which the poorest make a living, to programmes in support of what many people do or want to do, and to the necessary skill so that they can do the work safely. People need for not only material wealth, education and health but also security, justice and a recognized status in their society. The shortcoming of their study is that they carried out their study basically emphasizing only on the flaws of government and NGOs' initiatives to improve the livelihoods of the people of Bangladesh.

Selim et. al (2019) explores the literature around climate change in the context of Bangladesh and theorizes that climate change is a global fact which is experienced by spheres of society irrespective of social and cultural phenomena and geographic locations. It has various effects on ecosystem and society which in turn directly impacts on food security, safe drinking water supply, sound health and livelihoods especially for the poor and more vulnerable sections of society as char and coastal community. Their book provides a comprehensive picture on the issues of climate change and tries to draw insights, lessons and perspectives on how Bangladesh, one of the most climate change affected countries of the world, is adapting to the impacts of climate change.

Solaiman (2004) examined the functioning of the credit system, gender roles and overall livelihood pattern of poor participants in the fish commodity chain living in coastal village in Bangladesh. Study followed qualitative style (interview technique) only. The study did not include any village from Meghna coastal area. The study did not focus on education sanitation and livelihood sustainability profoundly.

Sultana (2005/2002) examined that dowry is a commonly observed practice among both the Muslim and Hindu communities in rural Bangladesh. All classes of people including the

poorest are under pressure to give dowry during their daughters' marriage. The emergence and spread of the practice of dowry is an outcome of the social and cultural construction of women's subordinate position in both private and public spaces, where women's capabilities are not recognized.

She also examined that people employ a variety of strategies for meeting dowry obligations as: some sell land, others offer payment in kind and still others take loans to cover the expenses. Age is one of the most important factors that influence decisions on marriage because the older the girls the greater the dowry. She (2003) also examined that the loopholes in the existing laws, the lack of the proper execution and people's indifferent attitudes towards the law lead to the negative and devastating impact of dowry on not only women but also on the household and ultimately on the whole society. She picked out only the causes and consequences of dowry practices in rural Bangladesh.

Susmita et al., (2014) quantify the projected inter relationship between climate change and river water salinization in the southwest coastal zone of Bangladesh and identify that climate change induced saltwater intrusion seriously affects land and water of coastal zones and would cause a significant scarcity of drinking water, irrigation water for dry-season agriculture and biodiversity loss. The study focuses mainly on climatic impacts, gives a little attention to adaptation and no specific theories were used.

The 5th Assessment Report of Intergovernmental Panel on Climate Change (IPCC-AR5) has predicted that sea-level rise threatens coastal and deltaic rice production areas in Asia such as coastal zones in Bangladesh and the Mekong River Delta. According to the Bangladesh Planning Commission, by 2050, the country will face an incremental cost of flood protection of US\$ 2.6 billion in initial costs and US\$ 54 million in annual recurring costs. Therefore it is evident that, climate change will be a serious threat to Bangladesh in achieving the SDGs.

Volart, Botticini and Siow (2003) found out that a strong argument as a reason for the dowry system in Bangladesh society especially rural areas of Bangladesh is unequal inheritance between son and daughters.

Wood (2005/2001) found a strong understanding of the problematic link between the resources that poor people can deploy in their immediately experience lives and the social capital in terms of political culture, social integration and economic institutions by connecting the micro analysis of adaptation constraints, options and strategies. He depicted a

right based livelihoods framework and expends his idea that the sense of membership of local community is both essential but also a straggle for the poor. Inclusion brings its own rewards in term of security but it becomes at the price of conformity. He theorized that poor people are able to call upon the support of patrons, neighbors and kin by process; personalized networks become institutionalized into a framework of informal security (2005/2003). The shortcoming of his study is that he carried out his study basically from social aspect and something from economic aspect.

None of the studies stated above was carried out to examine the poverty and adaptation strategies of coastal community to continuous climate change. None of the analyses uses integrative approach i. e., the integration of qualitative with qualitative that is very essential to extract a real scenario of a backward small community except the study of Islam, Z and Shafie, H (2017) but their study follows no specific hypotheses or research questions. All studies overlook the objectives of proposed study and not carried out in present study area i.e., *Bayer Char* coastal community of Bangladesh. All studies have theoretical and methodological shortcomings as stated. So, in the present study, all the methodological, theoretical and empirical gaps of reviewed literatures were bridged applying pure anthropological perspectives in every stage of research so that it can contribute in the field of knowledge in general and anthropology as discipline in particular.

CHAPTER THREE
THEORETICAL FRAMEWORK

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The concepts climate change, poverty, adaptation are very much relevant to some of the theoretical aspects of anthropology. These concepts are explained by the following anthropological theories:

3.1 Anthropogeography Theory

One of the two contesting grand theoretical traditions that led to the origin of cultural ecology and ecological anthropology is the theory of anthropogeography, a variant of environmental determinism (Geertz 1963; Moran 1979). The theory developed by Friedrich Ratzel in the late 1800s theorizes the environment as a causal agent for the behavior of social systems and considers habitat as primary in causing cultural diversity and diffusion of traits by migrating groups. Human cultural evolution or similarities between cultural groups are the result of the territorial contest between migrating groups (Moran 1979; Islam and Shafie 2017). Human thinking, activities and culture are determined by natural environment and climate (Gan 1980). A certain culture developed within a certain environment and staying within the sphere of this geographical culture human beings interact with social environment. Development in human societies varies due to environmental opportunities and limitations. Environment determines the social and cultural development and degradation (Bennett 1976). So, the natural disasters and calamities and its devastating impacts on human society are created and determined by the change of climate, an important element of environment (Islam and Uddin 2017).

Climatic determinism, a variant of anthropogeography theory, is the recent phenomenon to study climate change. The main idea of climatic determinism is the life and mentality of a community is mostly influenced by its climate. As a result, human beings succeed or fail to adapt to changing climate based on holistic cultural knowledge originated from climate. From this context the concept of 'collapse' is generated in anthropology by which it is explained that how some culture has been collapsed being failed to adapt to climatic change from pre-historical age.

3.2 Theory of Historical Possibilism

The second one of the two contesting grand theoretical traditions that led to the origin of cultural ecology and ecological anthropology is the theory of historical possibilism developed by Franz Boas, the American anthropologist. Kroeber (1939), a PhD student of Franz Boas, also contributed to the development of historical possibilism. In explaining the relationship

and interaction among human, culture and environment, the theory considers humans as the founder of culture and culture as the foundation of human adaptation (Moran 1979; Islam and Shafie 2017). Human beings control environment for their necessity and in this controlling sphere, their some activities are useful for them and their environment; and some activities are, in the long run, harmful for them and their environment. According to historical possibilism, natural environment creates some possibilities from which culture derived. This culture is the culture of adaptation to changing environment (Moran 1979). Based on the opportunities and limitations of environment human beings culturally make the decision which part of the nature will be utilized or exploited for their survival and these cultural decisions determine the trajectory of their societies, communities and cultural change. The theory assumes culture as the 'causal agent' rather than environment as well as 'superorganic' entity which enslave individual human beings to lead their lives within the pattern of culture (Davidson-Hunt and Berkes 2000; Islam and Shafie 2017). In this context, Environment sets the screen where the historical and cultural forces are performed and cause change. Using their instinctive cultural knowledge humans successfully face environmental challenges, utilize environment to meet their basic needs and ensure their survivability as they construct roads to ascend inaccessible mountains and build suitable boats or launches to collect fishes from reckless rivers and seas.

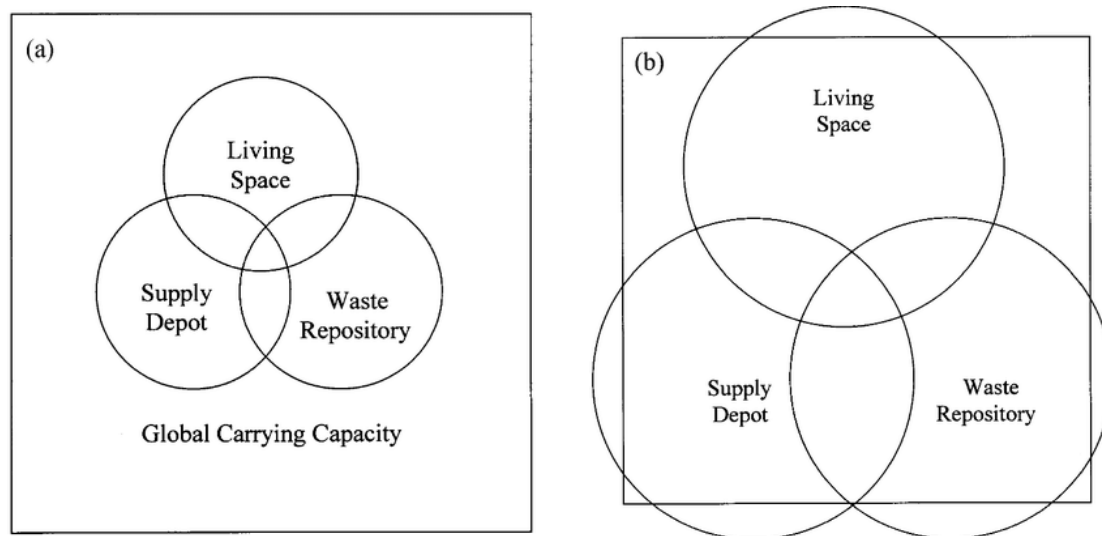
Challenging the idea of historical determinism, historical ecology developed. Its investigation is long-term and explores how culture and environment influence each other by the course of time (Barfield 1997:232). The investigation process of historical ecology is holistic and it claims that life and environment are not independent from culture. To examine the relationship between humans and environment, it emphasizes on the historical processes rather than environmental determinism.

Cultural materialism, originated from the idea of historical possibilism, is one of the three anthropological schools in studying environmental problems, originated by the publication of *The Rise of Anthropological Theories: A History of Theories of Culture* by Marvin Harris in 1968. To explore the cultural similarities and dissimilarities and to discuss the cultural change within societal structure, cultural materialism uses three concepts based on the idea of Marxist materialism: Infrastructure, structure and superstructure. According to cultural materialism, the infrastructure consists of technology, population and economy basically influences the other elements of culture. The structure of culture consists of organizational aspects of culture like the theory of political economy and kinship while superstructure

consists of idealistic and symbolic matters of society. The theory hypothesizes that human society is made of technological and economic aspects. To examine the characteristics of human society based on production, cultural materialism studies the interaction among environment, technology and population (Harris 1996:277).

Ecological explanation theory, another variant of historical possibilism, is an influential theory on human ecology school from 1920s to 1960s. Catton and Dunlop (1978) are two of the prime contributors in building ecological explanation theory. The model of Catton and Dunlop in explaining environmental disasters plays a vital role in assessing causality of climate change.

Figure- 3.1: Competing Functions of the Environment [(a) Situation circa 1900. (b) Current situation]



(Source: Dunlop 1993)

Supply Depot: Environment is the source of renewable and non-renewable environmental resources which are very important to survive in the earth as air, water, forest, minerals etc. Due to massive and excessive use, the scarcity of these resources emerged, climate change induced problems are created and the survivability of living organism including human beings is threatened.

Living Space or Habitat: Living space creates the residence, communication and other facilities for humans and other animals. But due to massive use of this element by humans, the habitats of humans and other living organism are being destroyed.

Waste Repository Function: The environment has its own level of power to remove waste. But due to excessive emission of waste by human beings, environment fails to remove the waste naturally which results in environmental calamities.

The activities of these three elements influence the environment. For example, if wastes are kept in living space, the place will be unsuitable for living and that certain place will be failed to play role as a supplying depot of foods as well (Dunlop 1993). The conflicting and competing relationship among these three activities of local environment may have negative impacts on global environment, at the same way, competing relationship among these three activities of global environment may have negative impacts on local environment. While ethnobotany in 1960s determines deforestation as the main cause of climate change and suggests afforestation to solve the climate change-induced problems, ecological explanation theory identifies that due to the decrease of natural power of environment to absorb different types of hydrological and meteorological wastes as methane, carbon-di-oxide, CFC etc. the global environmental problems as climate change emerged which results in highly frequent and sever many natural disasters as floods, tornados, heavy rain, drought, salinity etc.

The idea of historical possibilism is reflected in Marx's theory of historical materialism. Marx states three basic propositions as the baseline of his historical materialism theory. i) In order to live in the earth human beings' first and foremost needs are food, shelter and clothing three primary material needs. ii) to satisfy their these primary material needs human beings produce the means which actually distinguish themselves from animals. iii) Their production system depends on what they find in natural environment and what types of primary materials they must produce to ensure their survivability (Marx, 1859/1977; quoted in Morrison, 1995). Marx theorizes that there is an adaptive relationship between human economic or cultural activities and environment.

Marx used four fundamental concepts as central to the materialist theory of history: (i) means of production; (ii) relations of production (iii) mode of production and (iv) forces of production. According to Marx, the means of production refer to anything (productive forces) in the external world as land, animals, tools, machinery, etc. which are used to produce their material needs or means of survival as food shelter and clothing. His observation is one class is owner of the means of production while the other is subject to those who rule over them. Relations of production which economically bind one class to another, are transformed into relation of domination, become physical and economic fetters for one class and an economic

advantage for the other and protected by coercive sanctions of political and legal structure of society. Social relations are deeply bound up with productive forces i.e., instruments equipments as land tools etc. Forces of production and relations of production since together these define the mode of production. In adapting to new productive forces human beings change their mode of production which causes change in their way of earning, their living and all their social relations and in this way total society changes.

3.3 Cultural Ecology Theory

Culture is one of the central concepts of anthropology. It is the most important medium or agency of interaction between humans and environment. So, without cultural knowledge regarding environment, it is impossible to ensure human social development based on interaction with and adaptation to environment. Though there is a reflection of cultural ecology theory in the critical discussion of environmental problems by Semple (1911), McKenzie (1924), Forde (1934) and Kroeber (1939), the theory is basically developed by Julian Steward and evolving out of the debate between above mentioned two opposing theoretical traditions-‘anthropogeography’ of Friedrich Ratzel and ‘historical possibilism’ of Franz Boas. As a result, cultural ecology theory is the base of the theoretical structure of anthropology in studying the interaction among culture, community, poverty, environment and adaptation to climate change. Steward used the theory in his book titled ‘Theory of Cultural Change. The Methodology of Multilinear Evolution’ (1955/1990). Cultural ecology theory intensively studies the human adaptation strategies to socio-cultural environment. Steward states the culture as a dynamic element of any ecosystem of which human being is a part (Frake, 1962).The theory mainly focuses on the adaptive relationships or causal connections between society and culture i.e., among natural environmental conditions, subsistence technology and social structures of a community or society from an evolutionary perspective- ‘multilinear evolution’ (Steward, 1955/1990). To examine the questions whether adaptation to certain environmental conditions occurs through abilities’ specialization (specific behavioural responses) or generalization (broad behavioural repertoire), the theory gives importance on the investigation of relationship between the environment and the subsistence system, explain the behavioural patterns related with e definite subsistence technology and studies the effects of the respective behavioural aspects on other aspects of culture in the community or society. Steward (1955/1990) theorizes that the use of natural resources of a certain environment creates the social system. He claims that a small community lives in familial group and in a small area due to limited natural assets. Using the

term ‘Multilinear Evolution’ he shows that the development processes of different communities, societies or countries vary due to different environmental conditions that provide limited and different amount of natural resources for development. Human adaptation strategies to a certain environment of a society determine how the natural assets of that society will be utilized and regarding the utilization of natural resources Steward (1955/1990) emphasizes on environment-centric adaptation power. This adaptation power determines how much development people will ensure utilizing the certain environmental conditions. Methodologically, the theory focuses on culture comparative and common grounds (generalization) in human behaviour, social structure and belief systems. To explain this aspect Steward develops the idea of ‘culture core’ and hypothesizes that by adaptive process, some concrete patterns of culture- social, economic, political and religious- will emerge among all human groups in steady order in spite of cultural variation of different groups in different environmental conditions. Ontologically, the theory differs from classical functionalism basically functionalism of Malinowski (1960) for its more emphasis on the exploration of change and its causes and less so on the mechanisms of equilibrium states. In contrast to the classic Stewardian view, Leslien White, another proponent of cultural ecology, focuses on the use of energy as the determinant of cultural evolution (White, 1943) and develops a linear and mono-causal explanation for cultural evolution (Islam, Z. and Shafie, H. 2017).

3.4 Community Based Adaptation

Community Based Adaptation (CBA) is an effective approach to reduce vulnerability of the poor and marginalized people from climate change impacts. There are seven principles of CBA as community focus, community members’ participation, inter- sectoral collaboration, substantial resource requirements, long-term program view, multifaceted interventions and population outcome (Nilson, 2006). CBA has emerged as a term from community based program in climate change sub-sector, disability sectors and poverty reduction sectors (Rashid and Khan, 2013).

3.5 Theories of Poverty

Theories on the causes of poverty are the foundation upon which poverty reduction strategies are based. While in developed nations poverty is often seen as either a personal or a structural defect, in developing nations the issue of poverty is more profound due to the lack of governmental funds. Some theories on poverty in the developing world focus on cultural

characteristics as a retardant of further development. Other theories focus on social and political aspects that perpetuate poverty. Perceptions of the poor have a significant impact on the design and execution of programs to alleviate poverty.

Theories of poverty: Developed countries perspective

Poverty as a personal failing: Based on the idea of meritocracy and its entrenchment within developed countries like the USA, Katherine S. Newman theorized that a person is poor because of his/her traits that in turn have caused the person fail to climb out of poverty and that range from personality characteristics, such as laziness, to educational levels. As poverty is individual's personal failing and it creates resistance to social and economic welfare programs, it should not be compensated (justified) by the state.

Poverty as a structural failing: Contrary to the idea that personal failing causes poverty, Rank, Yoon, and Herschl (2003) consider poverty in the developed countries like the USA as a structural failing. As example of economic structural failings they mentioned low paying or part-time work which lacks benefits or a failure of the job market to provide a proper amount of jobs which pay enough to keep families out of poverty and as example of key social structural failings they point to the minimal amount of social safety nets in developed countries.

Theories of poverty: developing countries perspective

Poverty as restriction of opportunities: Unstable conditions and a lack of natural, material, social, human and physical capitals are called poverty environment that holistically makes the features of poverty vulnerable. The environment, within which a person lives, determines daily decisions and actions of the person. Arjun Appadurai (2004) and Chakravarti argue that a person's restrictions of opportunities or lack of capacities to aspire to change the environment of poverty through required practices reinforces and perpetuates the cycle of poverty and poverty environment of that person. They also claim that expanding the poor's aspiration horizon through changing the terms of recognition and/or creating collaborative programs government agency and the poor which provide the poor with an environment in which to practice capacities, helps the poor to find both voice and exit the environment of poverty.

Culture of Poverty or Poverty as cultural characteristics: The culture of poverty is a concept in cultural anthropology that asserts that the values of people experiencing poverty

play a significant role in perpetuating their impoverished conditions, sustaining a cycle of poverty across generations (Crate, 2011). Early proponents of the theory argue that the poor are not only lacking resources but also acquire a poverty-perpetuating value system i.e., poverty is the result of people's values or cultural norms passed down through generations. The concept was introduced by American anthropologist, Oscar Lewis, as a result of studying the urban poor in Mexico and Puerto Rico. The culture of poverty constitutes a "design for living" that is passed on from generation to the next. Individuals feel marginalized, helpless and inferior, and adopt an attitude of living for the present. They are fatalistic. Families are characterized by high divorce rates with mothers and children abandoned; they become matrilineal families headed by women. People adopting this culture of poverty do not participate in community life or join political parties; they make little use of banks, hospitals and the like. According to Lewis the culture of poverty perpetuates poverty. It tends to perpetuate itself from generation to generation because of its effect on children. By the time slum children are aged six or seven, they have usually absorbed the basic values and attitudes of their subculture and are not psychologically geared to take full advantage of changing conditions or increased opportunities which may occur in their life time. In the culture of poverty the people firmly feel themselves as dependent, unworthy, marginal, helpless not belonging, inferior, and aliens in their own community realizing that the existing systems or institutions never serve their part and basic requirement (Lewis 1971:87).

Lewis theorizes that, if the structure of things like economy or access to schooling changes, people are likely to resume poor. Lewis argues for one mode that anthropologists should pursue the development of critical collaborative and multisided ethnography, which he terms "climate ethnography" (Lewis 1971). Another proponent of culture of poverty is anthropologist Daniel Patrick Moynihan. Moynihan studied the Black families of the USA and developed the idea in "Moynihan Report" published in 1965. To Moynihan, poor people have different cultural values than main stream society. These different values, passed down through generations, shape their life choices and opportunities and they want to remain poor in spite of economic and other structural changes. However, Lewis regards the culture of poverty as applicable to Third World countries, or countries in the early stages of industrialization, and claims that it is not prevalent in advanced capitalist societies.

But sociologists such as Michael Harrington (*The Other America*) argue that the culture of poverty can apply to advanced industrial societies. Hylan Lewis, an American sociologist,

arguing this situationalist explanation claims that the poor in fact share the same values as the rest of society, but their behaviour are a response to their perception of hopelessness in realizing these ideals (black academy.net). Elliot Liebow's Tally's Corner is a major contribution to this approach. He studied the life and culture of black "street corner men". He argues that the habits of members of this group, such as blowing money on a weekend of drinking, are reactions to their knowledge of their situation. Since he has a dead-end job and insufficient income, the street corner man is "obliged to expend all his resources on maintaining himself from moment to moment." These men want to have a conventional family life, but their incomes are too low to support it. In reaction to this hopelessness, the men develop a "theory of manly flaws". Rather than blame the breakdown of their marriage on their lack of income and situation, they prefer to attribute it to their "success" as men - their need for sexual variety and adventure, for example.

Grondona and Harrison, Lindsay present some cultural factors or values as indicators to whether the cultural environment is favorable or resistant to development that plays a central role to poverty reduction in third world countries. They said, in development aspect or poverty reduction, culture matters. Based on cultural factors or values they identified two value systems stand in opposition: development value system-development assistant and non-development value system-development resistant. To them, in developing or under-developed countries, poverty is fueled by cultural characteristics as focus on macroeconomics, oppression of the individual through control of information, often unachievable goals, unruly distribution of law and justice, an obtuse mindset within the larger world and access to leaders permitting easier and greater corruption. They think, to ensure development or poverty reduction in an effective way, developing countries should take measures to change at least some aspects of development-resistant cultures.

Amartya Sen's Entitlement Approach: Amartya Sen (1981) presented the entitlement approach for explaining the causes of poverty and famines in a lovely way. He discussed market economy in which a person can exchange what he owns for another collection of commodities. Sen's approach centers on each person's entitlements to bundles of commodity including food and regards famine as resulting from a failure to be entitled to a bundle of required food. In spite of having land, labor power and a few other resources, which together make up endowment and provide commodity bundles or the exchange entitlement set in a given economic situation, a person will be exposed to starvation if his endowment does not contain any feasible bundle including enough food through a rise in food prices.

3.6 Feminist Theories

Liberal Feminism: Classical liberalism believes if discriminatory rules are excluded, female can acquire equality to male. They challenged the biological weakness and told it is society imposed problem not biological. Wollstonecraft argues that, before industrial revolution, all economic activities were domestic. After industrial revolutions it was shifted to industry and men involved in it, but women were excluded. Female become unemployed, stagnated to home and lost their decision making power. Female become the instrument of pleasurement of male and it is their main duty to please the male. Mary views that, captive ladies especially the ladies of middle, highly bourgeoisie class families are like color feather hold birds in the case. They have nothing to do in the case but the movement of feather. Mill and Taylor argue that actually female will be equal to male when she contributes financial help to family. So, she has to go out to play her role in economic activities. They believe that, if equal economic, political & citizen rights and opportunities are given to females, they can facilitate the society and husbands will get intelligent partners. Freidan views that the problem of women's dual activities will be solved if equality between man and women is established, if society considers masculine quality and feminine quality in equal view and male and female learn to achieve each other's good qualities. Welfare Liberals, on the other hand, believe the state should focus on economic justice rather than simply on civil liberties. Women should be given the same education as male to develop their capabilities. They should have the freedom of choice to accept marriage.

Ecofeminism: Ecofeminism views that there is interconnection and interdependence between women and nature and historically both are exploited and oppressed by patriarchal society and capitalists as they are in power. Vandana Shiva argues that in subsistence economies women have a special relation to the environment through their daily interactions as production and reproduction of wealth in partnership with nature that has been ignored. And, in this way, women's expertise in their own right of holistic and ecological knowledge of environmental system has been developed which has been ignored by patriarchal capitalistic society. Shiva perceives the interconnectedness between nature and the women's lives, work and knowledge with the creation of wealth. Ecofeminism thinks to repair social and ecological injustices women must work towards creating and preserving a healthy environment and ending the destruction of the lands, trees and nature on which women rely to manage the livelihoods for their families as their gender specific roles.

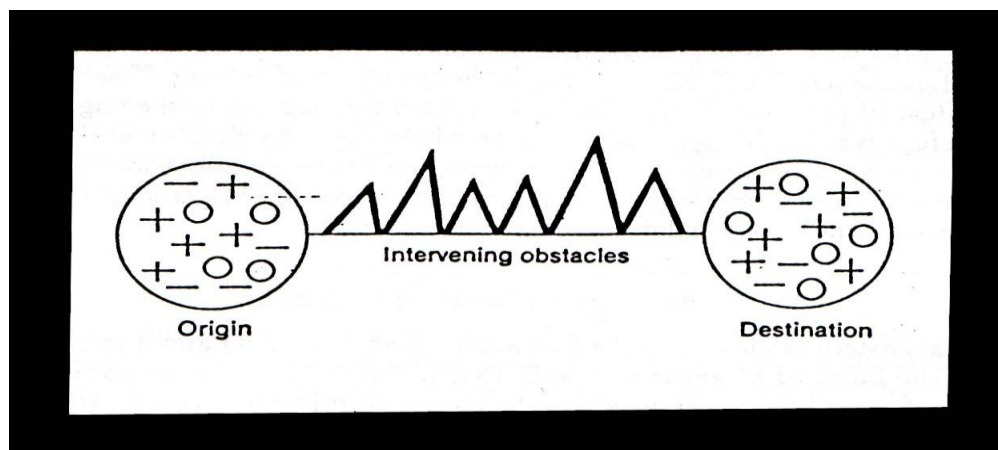
3.7 Theories of Migration

Ravenstein's Laws of Migration: Ravenstein views that economic motives provide the primary motive for migration. The factor, plays most influential role in causing migration, is the aspiration of people to make a better material life. During the peak years of migration, young adults migrate and if the distance of migration is short, women migrate more than men. Ravenstein argues that migration occurs from rural areas toward urban areas and often there is also a counter flow of migrants moving in the opposite direction.

Ecological Theories: Ecological theories explain migration at a societal level. The proponents of these theories view that in response to the structural and substantial changes in social organization, technological innovations and environmental quality, population will either grow or decline to preserve equilibrium between population size, social organization, technology and the environment (Hawley, 1950).

Decision Making Theories: Decision-making theory of migration, advanced by Everett Lee (1966) and built on Ravenstein's propositions, is based on four very general factors from which migration hypotheses derived as:

Figure-3.2: The Pulling and Pushing Factors of Migration



(Lee, 1966:47)

for every decision to migrate there will be: (1) pull (positive) and push (negative) factors associated with the place of origin, (2) pull (positive) and push (negative) factors associated with the place of destination. Evaluations of employment opportunities, living conditions, climate, the availability of cultural and leisure facilities, the presence or absence of discriminatory treatment, as well as cost factors are included in earlier two factors, (3) intervening obstacles that make the actual migration from one place to another difficult. They include physical barriers as mountain ranges, oceans, and deserts and political barriers as

immigration laws that keep people out of a country or national laws that prohibit migration within or out of a country, and (4) personal factors as characteristics of person or a family, such as family size or stage of the family life cycle, personal sensitivities, intelligence and awareness of conditions elsewhere (Lee, 1996, p.50).

Out of the theories and approaches mentioned above, the present study was controlled and guided by the theory of cultural ecology developed by Julian Steward. On the basis of this theory the impacts of climate change on the livelihoods of *Bayer Char* community and their adaptation strategies to climate variability were explored and examined from anthropological perspectives. The validity, reliability and replication of this theory were assessed giving special focus on cultural dimensions of adaptation as culture is a dynamic element of any ecosystem of which human being is a part. The likely impact of poverty on, and role of cultural knowledge, social network, gender and patriarchy on these adaptation processes or responses were also examined. Besides, other anthropological theories of poverty, gender, patriarchy, migration and local knowledge, networks and adaptation to climate change were under close examination in this study.

CHAPTER FOUR
METHODOLOGY OF THE STUDY

CHAPTER FOUR: METHODOLOGY OF THE STUDY

It is recognized that different research problems imply different research goals, which in turn call for varied methods. Choices are guided not merely by researcher's own thinking but also by the nature of the problem and research goals. This study is basically exploratory-cum-descriptive in nature. As the study is basically anthropological in nature and the research work was part-time, it was based on empirical research conducted over a period of four years following the research execution plan.

Table-4.1: Four Year Research Execution Plan

Items \ Years	1st year	2nd year	3rd year	4 th year
Checklists and questionnaire drafting, and pilot testing and finalizing	√	√		
Qualitative data collection (Participants Observation, Case Studies, FGDs, KIIs, In-depth Interviews, Oral History)		√	√	
Quantitative data collection			√	
Data analysis of both types		√	√	√
Report Writing			√	√

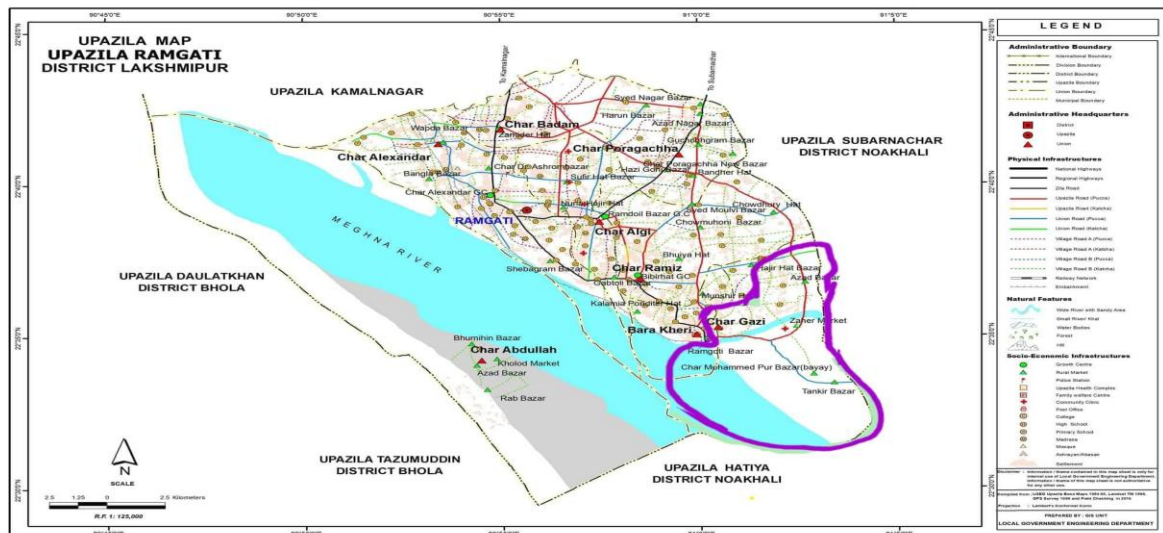
Based on the research problem, study area, objectives of the study and feasibility the study subject, unit of analysis, sampling, data collection methods, techniques and procedure, data processing and analysis, and reporting were selected. The whole study was conducted following the some successive phases as follows:

4.1 Phase-1: The Preparatory Stage

This was the initial stage. It includes:

4.1.1 Selection of the Study Area: There are many chars in Lakshmipur District as *Bayer Char, Toomchar, Char Falcon, Char Jhangalia, Kalir Char, Shac Char, Char Ruhita, Char Alekjhandar, Char Gojaria* etc. However, the present study site is *Bayer Char* located in *Char Gazi* Union of Ramgati Upazila.

Map-4.1: Ramgati Upazila That Covers *Bayer Char*



(Source: Bangladesh Population Census 2001, Bangladesh Bureau of Statistics)

This area was selected for the study because it is the most disaster prone area as nearest to river, near the congruence of Meghna river and Bay of Bengal and land is not demarcated.

4.1.2 Geophysical Structure of the Study Area

Bayer Char is a border area of two districts and covers some parts of *Char Gazi* union under Ramgati Upazila of Lakshmipur district and some parts of *Horni Union* under Hatiya upazila of Noakhali district in Bangladesh. The inhabitants of this char were migrated from these two districts basically for poverty and river bank erosion and live dividing the char into two divisions- Lakshmipur and Noakhali part. The present study was carried out in Lakshmipur part of the char. There are five villages in *Char Gazi* Union of Lakshmipur District as *Char Gazi* (Disappeared in riverbed, it has no existence at present), *Toomchar*, *Char Afjal*, *Char Lakshmi* and *Char Darbesh*. Out of these five villages, the Lakshmipur part of *Bayer Char* consists of 3 wards of three villages as ward no. 5 (South *Toomchar*) of *Toomchar*, ward no. 9 of *Char Lakshmi* and ward no. 6 of *Char Darbesh*. Every ward is divided into many *Somajes* (societies) as *Mainuddin Somaj*, *haukkar Gora* (Culvert Centre) *Somaj*, *Mir Somaj*, *Mohammadpur* (*Tegasia*) *Somaj*, *Tanki Somaj* etc. in ward no. 5 of South *Toomchar*; *Rulu Somaj*, *Gabtoli Somaj* and *Kamal Netar Somaj* in ward no. 9 of *Char Lakshmi* and *shahabuddin Somaj*, *Nasir Batainya* (Cowboy) *Somaj* and *Jaker Somaj* in ward no. 6 of *Char Darbesh*. Ramgati Upazila area is 291.82 sq km (69160 acres), total number of households are 55,144. It is located in between 22°52' and 22°90' north latitudes and in between 90°47' and 91°01' east longitudes. The area of *Char Gazi* is 12,150 acres, total population is 42, 890

and total number of households are 9350. The total population of *Bayer Char* in Lakshmipur part is 33,500 and total households are 6709.

Map-4.2: Bayer Char



(Source: CDSP, 2021)

Though the residents demarcated the chars based on their place of migration (regional origin) it was not settled formally and two cases on demarcation are going on in chief judicial magistrate court, Lakshmipur and High Court Division of Supreme Court. It is one of the major problems of the inhabitants of this char. Most of the time they engaged in conflict on demarcation. Their livelihood is dependent on nature i.e. land and river. But the total land is *khas*. Though the land is distributed among the inhabitants in 2009 by government, the record is not done. At the commencement stage of the char different leaders had occupied a large amount of land and distributed among the migrated poor people in exchange of money, labour, participating in fight against the opposite land leaders. In a word there were developed a semi feudalistic and semi capitalistic modes of production based on land.

Figure-4.2: Geophysical Structure of the Study Area (*Char Gazi*)

Area (acres)	No. of HH	Population			Literacy Rate (%)			Married Female	Latitude	Longitude	Elevation
		B	M	F	B	M	F				
12150	9350	42890	21660	21230	27.9	29.7	26.2	9520	22°34'58" north	91°0'32" east	5 meters (16 feet)

(Source: Upazila Information Office, Ramgati, 2021)

Most of the inhabitants live producing rice, wheat, peanuts, vegetables and catching fish in the river. Beside manmade disasters, most of the time they have to survive adapting to the devastating impacts of climate change induced natural disasters as cyclones, floods, tidal surge, and river bank erosion, thunder storm, hailstorm and insects attack on crops that cause

the destruction of lives, wealth and harvests, chronic diseases, livelihood vulnerability and unsustainability. The frequency and intensity of these impacts are increasing due to increasing global warming and climate change which makes their adaptive strategies and livelihood pattern more vulnerable and insecure. There are no general formal educational institutions. There are no afforestation, embankment, sanitation facilities, safe drinking water facilities, family planning devices facilities and economic provisioning. People have no access to information. They are deprived of basic needs and rights. Netherlands based Char Development and Settlement Project (CDSP) has been working here for seven years in cooperation with PNGO- Bangladesh Rural Advancement Committee (BRAC). Under BRAC 5 local NGOs-Noakhali Rural Action Society (N-RAS), *Unnayan Parikolpanay Mnush* (UPAMA), *Dwip Unnayan Songstha* (DUS), *Sagorika Samaj Unnayan Sangstha* (SSUS) and Homeland Association for Social Improvement (HASI) are working but very little changes they brought. Still now they are the poorest of the poor.

4.1.3 Methods and Techniques of Data Collection: The study was conducted on integrative frame of analysis (integration of qualitative with quantitative) with primary data and information to compare with secondary data and information as climate change induced impacts, adaptation strategies to it, poverty, gender, patriarchy, local knowledge and networks are mostly related to feelings, speeches and irony as well as variables. But the qualitative approach was given more importance as focal method because the study area is more explorative in nature and it was intended to explore social meanings. The qualitative was supplemented by quantitative with a view to examining some numerical meanings.

Figure-4.2: Study Method, Sample Size and Techniques of Data Collection

Study Area	Study Methods and Sample Sizes						Sample Selection Method	Method of Data Collection
	Case Study	FGD	KII	In-depth Interview	Oral History	Sample Survey		
<i>Bayer Char</i>	20	20	9	13	6	100 k=67	Purposive (Qualitative) Systematic(Quantitative)	Triangular

(Sources: Population and Housing Census, 2011, UPAMA, 2020 and Field Work, 2021-2022)

In qualitative data collection, the methods of participant Observation, case studies, focus group discussions (FGDs), Key Informants Interviews (KIIs), in-depth interview and oral history were used. In this regard, 20 case studies, 20 FGDs, 9 KIIs, 13 in-depth interviews and 6 oral histories were conducted. In conducting sample survey method of quantitative

research, a semi structured interview schedule was used as a tool instead of mail questionnaire and self administrated questionnaire. Draft questionnaire was designed and pre-testing was completed. All the tools of data collection were certainly expected to help collect specific and required data to answer to the research questions and hypotheses of the study and to ensure original contribution in the field of anthropology theoretically and empirically.

4.1.4 Why Qualitative Methods: As the most important and effective approach, qualitative methods involve embedding oneself deeply in a study area in order to systemically document the everyday lives, behaviors and interactions of a community of people. In this study it was intended inherently to develop a rich and valuable understanding of the cultural meaning of practices and interactions as how and why people of poor *Bayer Char* Community think, behave and interact regarding climate change induced impacts and adaptation to it and most importantly, to understand these things from the standpoint of them (known as an "emic perspective" or "insider standpoint) avoiding all forms of biases or stereotypes. Besides, it was intended to situate the findings in historical and local context, and to identify the connections between the findings and the larger social forces and structures of society. On the other hand, every day people are coming to live here permanently and going to live in other places losing their homestead lands by riverbank erosion. So, keeping this dimension in mind and to materialize the intensions stated above, the qualitative methods were selected in this research because only qualitative methods and techniques can ensure the purpose while quantitative research methods are unable to capture and serve the purpose.

4.1.5 Why Survey Method: As quantitative data collection technique, sample survey method was supplemented or integrated with qualitative methods and techniques because it is the best method in quantitative data collection methods. Using this method a scientific study can be conducted. As it was intended to reach a generalizable result this method or technique was chosen.

4.1.6 The Study population, Interlocutors and Unit of Analysis: People of *Bayer Char* under Lakshmipur district were the population of present study. Heads of the households were the interlocutors of sample survey in the study. The households of the study area were the unit of analysis of present study. Case studies were conducted with males and females of different professions of the study area. Focus group discussions (FGDs) were conducted with women–female heads of households, female members of NGOs, NGO officials, females whose ages are greater than 70, males and females whose ages are greater than 50, fishermen whose occupation is exclusively fishing and community leaders as members of committees of mosques, clubs, associations and organizations of the study area. To gather specialized

knowledge and to crosscheck the findings of other methods, Key informants interviews (KIIs) were conducted with male and female members, chairman of Upazila Parisad, Ramgati Upazila Nirbahi Officer (UNO), Project Implementation Officer (PIO) of Ramgati Upazila, Chairman of Char Gazi Union Parisad and Area Manager (AM) of CDSP working in *Bayer Char* area. In-depth interviews were conducted with males and females selected from three wards located in *Bayer Char*. Oral histories were conducted with males and females whose ages are greater than 75 and living in the study area from the rise of the char.

4.1.7 Pre-testing: Based on the research objectives/research questions, geophysical structure of study area, target groups or population of the present study draft checklists and questionnaire were designed, prepared and showed to respected supervisor. The valuable comments, suggestions and instructions of supervisor were inserted very carefully and draft checklists and questionnaire were finalized after approval of supervisor.

Then, to examine the appropriateness, risk behavior issues, language sweetability and feasibility of checklists and questionnaire, the draft checklists and questionnaire were pre-tested in the field. During pre-testing of the checklists and survey instruments, the issues of probing techniques, the language necessary to address specific occupational and risk behavior, the sequencing of questions, the technique/methods/options for documenting responses, providing appropriate skips in the checklists and questionnaire were sincerely considered.

Based on pre-test findings, the translation, consistency and integrity of the checklists and questionnaire were checked, corrected, finalized and presented it to respected supervisor for final approval. After approval of the Bengali checklists and questionnaire, it was printed and translated it later into English.

4.2 Phase-2

The second phase of the study was completely devoted to field data collection. Steps followed in this phase were:

4.2.1 Sampling Procedure: Sampling is the process of choosing a representative portion of population. If the survey's respondent sample is not properly drawn, the findings cannot legitimately be generalized to the population under study. So, sampling procedure is an important step in conducting any research. Well-selected samples may reflect fairly and accurately the characteristics of the population. Sampling reduces the time and cost of the research work. It also saves labour. So, to ensure the quality of research as well as to stand a scientific judgment of neutrality of the study, sampling plays a vital role.

Out of 5 villages named *Char Gazi* (Disappeared in riverbed, it has no existence at present), *Toomchar*, *Char Afjal*, *Char Lakshmi* and *Char Darbesh*, 3 villages named *Toomchar*, *Char Lakshmi* and *Char Darbesh* were selected purposively as *Bayer Char* of Lakshmipur part is included in these 3 villages. From these 3 villages, 3 wards were selected purposively to collect data because Lakshmipur part of *Bayer Char* consists of 3 wards of three villages as

ward no. 5 (South *Toomchar*) of *Toomchar*, ward no. 9 of *Char Lakshmi* and ward no. 6 of *Char Darbesh*.

In qualitative research of present study, purposive sampling was used. In sample survey of quantitative research, 100 households out of 6709 households i.e., every sixty seventh households (Sampling interval (k) =N/n=67) were selected as sample using the technique of systematic sampling. After determining sampling interval (67th) starting point was selected using simple random sampling (lottery) from 1 to 20 households of sampling frame and household number 3 was selected as starting point of systematic sampling. The detailed feature of sampling procedure is shown in the following table:

Table-4.2: Detailed Feature of Sampling Procedure

Names of Villages	Ward n.	N. of H.H	Selected Ward (BC)	N. of Survey	N. of Case Studies	N. of FGD	Number of KII	In-depth Interview	Oral History
<i>Char Gazi</i> (Disappeared in riverbed)	-	-	-	-	-	-	-	-	-
<i>Toomchar</i>	1	445							
	2	466							
	4	281							
	5	3204	5 (South Toom char: BC)	48	9 (Different Professions)	9	1 (Member)	6 (3 Males and 3 Females)	3 (2 Males, 1 Female, Age >75)
<i>Char Afjal</i>	3	589	-						
<i>Char Lakshmi</i>	7	412							
	8	448							
	9	1502	9 (Bayer Char)	22	4 (Different Professions)	5	2 (Male and Res. Female Member)	3 (1 Male and 2 Female)	1 (Male Comm. Leader, Age >75)
<i>Char Darbesh</i>	6	2003	6 (Bayer Char)	30	7 (Different Professions)	5	1 (Member)	4 (2 Males and 2 F.)	2 (1 M. and 1 F. Age >75)
Other						1 (NGO Officials)	5 (Up. Chair, UNO and PIO, UC, AM, CDSP)		
Total	9 Wards	6709 (5+9+7)	3 Wards	100	20	20	9	13	6

Source: Upazila Information Office, Ramgati, 2021; UPAMA, 2020, SUS, 2021; Field Work, 2021-2022

Systematic sampling was used because sampling frame was found to *Unnayan Parikolponay Manush* (UPAMA) a local NGO working in *Bayer Char* (UPAMA, 2021).

4.2.2 Data Collection Procedure

4.2.2.1 Rapport Building: It is very tough for a researcher to collect data particularly qualitative data from any sensitive areas like this disaster prone (both man-made and natural disasters) char without building rapport with the people of the study area. In data collection of this study, it was tried to make a good rapport with linkmen and the population to gain access to and establish trust within the community. Same language was helpful for the researcher to do this best.

4.2.2.2 Data collection: In qualitative and quantitative data collection I was helped by two research assistants who are the students of Anthropology Department of Dhaka University and Jahangirnagar University. They were very expert and experienced in research field as the students of anthropology. The interlocutors were reached every morning and evening when they were available at their house. Some interlocutors were reached two or three times. The study area was visited by me and my assistants 6 times during long vacation and in every time we had to stay there six to seven days. The techniques of notes, audio and visual recordings were used during data collection of the study with prior consent from the interviewees to ensure accuracy, reliability and validity of findings.

4.3 Phase-3

This phase covered the following steps:

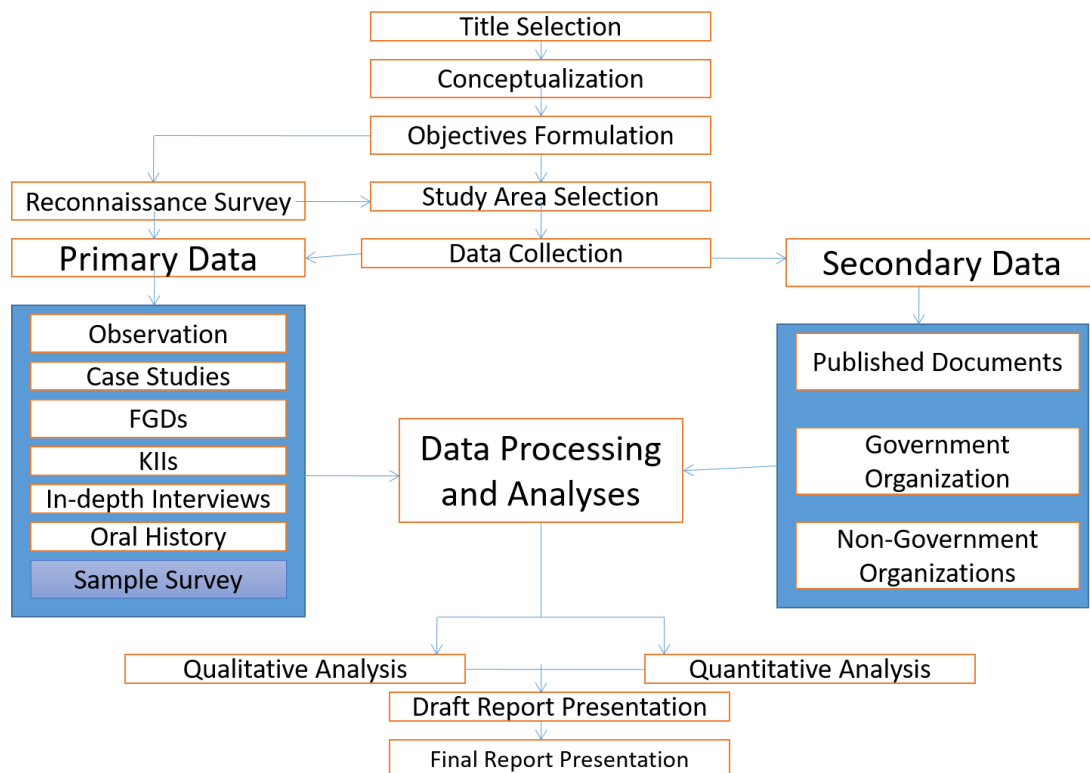
4.3.1 Data Processing and Analysis: After the completion of the field work, qualitative data were processed and analyzed following the theory and outline laid down for the purpose at the time of formulating the research proposal. On the other hand, quantitative data processing involved the following steps:

- Questionnaire registration and editing
- Edit verification
- Listing of open-ended responses and classification
- Coding and code transfer
- Verification of coding and code transfer
- Development of data entry structure

- Data entry and entry verification
- Entering data as per questionnaire structure in SPSS 24.0 version
- Verifying the logic and accuracy of the data as per filled up questionnaire
- Keeping and maintaining data backups
- Tabulating as per objective and requirement in Quantum (an upgraded version of SPSS), also tabulating data in SPSS 24.0 version
- Development of analysis plan
- Program development as per the analysis plan
- Program running and report generation.

However, the collected quantitative data were presented and interpreted through frequencies and percentage in table, figures and graphs based on cultural ecology theory.

Figure-4.3 Study Design



4.4 Phase-4

In phase-4, based on the analysis of data, the report was prepared.

4.5 Ethical Considerations

Anthropological researchers must consider the right of the respondents involved in any study (Baker, 1999). Thus in order to carry out a research project, the researchers must consider the ethical aspects of their studies. In this study ethical standards had been maintained in every stage of the research project by following "emic perspective" and avoiding the biases and stereotypes in collection and interpretation of data. All the names of interlocutors mentioned in the present study are fictive, no real names of interlocutors were used anywhere in this study.

4.6 Reliability and Validity

The study was conducted on integrative frame of analysis (integration of qualitative with quantitative) with primary data and information to compare with secondary data and information. In qualitative approach, the most important and scientific methods named participant observation, case studies, focus group discussions (FGDs), key informants interviews (KIIs), in-depth interviews and oral histories were used to develop a rich and reliable understanding of the cultural meaning of practices and interactions, to illuminate which is taken for granted and which goes unspoken within the community disapproving negative biases or stereotypes about the population in question. In data collection procedures, the scientific techniques/tools were used to ensure the reliability and validity of this study.

In quantitative research, sample survey method was chosen in data collection and systematic sampling procedure was followed. The total procedures were scientific, deep attention was given, sufficient information was collected. That is why it can be verified using various statistical methods.

So, it can be said that, in spite of some limitations stated above, the result of this study is reliable and valid.

CHAPTER FIVE
RESULTS OF THE QUALITATIVE STUDY

CHAPTER FIVE:

RESULTS OF THE QUALITATIVE STUDY

5.1 CLIMATE CHANGE IMPACTS, LIVELIHOOD ASSETS AND ADAPTATION

5.1.1 Climate Change Perception and Coping Mechanism

5.1.1.1 Climate Change Perception and Impacts at National Level: About all the people of *Bayer Char* coastal community heard about climate change. Cyclone and damage of infrastructure is the prime one of the impacts of climate change the people of *Bayer Char* heard at national level and other prime climatic impacts they heard at national level are water salinity, flood, sea level rise, thunderstorm and drought, soil salinity, insect attack and declined plants and trees, increased land erosion, increased precipitation, decreased rainfall, increased diseases and rain not in time.

5.1.1.2 Sources of Knowing the Possible Impacts of Climate Change: In *Bayer Char* community, the people's prime source of knowing the possible impacts of climate change is private TV channels. Besides, the households are generally informed of the climatic impacts through FM radios, NGO meetings, Bangladesh Television-BTV, school/college/university, religious institutes like mosques, temples etc., Radio (Bangladesh Betar), and known people as friends and relatives. National news paper, local newspaper, posters, internet and foreign radio stations as BBC, VOA etc play a negligible role as sources of knowing the climatic impacts at national level.

On the other hand, the people of *Bayer Char* like to receive the information about impacts of and adaptation to climate change at national and local levels from the sources of private TV channels, FM radios, religious institutes as mosques, temples and church, Indian TV channels. Though no interlocutors mentioned Indian TV channels as a source of hearing, some interlocutors like Indian TV channels as source of information about climatic hazards and impacts. The cause behind it is described in the speech of Rahima Khatun, a 67-year old female, as she said, "*Beker age ora khobor ditare, hogol time a ogo kota mili ja*"- Before all, they (Indian TV channels) can deliver news (about climatic impacts and hazards), most of the time, their information matches the reality. Most of the people mentioned NGO meetings as source of climatic information, but very few of them like it as source of climatic information because the people of *Bayer Char* do not rely on information provided by NGOs. The speech of

Ershad Mia, a 57-year old man, explains the context in this way: ***“Hego kotar biswas nai, ja koile hetago lab o, ta ko”***- There is no belief in their speech, they say what benefits them.

5.1.1.3 Local Experience of Climate Change and Its Causes: People of *Bayer Char* coastal community are experiencing climatic impacts in their locality. The climatic impacts they experience in *Bayer Char* are cyclone and damages of government and private infrastructure, soil salinity, water salinity, tidal surge, increased land erosion, drought, insect attack and declined plants and trees, increased thunderstorm, sea level rise and increased hailstorm. The climatic impacts on natural assets are described by Tojol Hoq, a 67-year-old man, as he said, ***“Eanne aisi aij honcis bosor oise, hans soi bosor dori nuna hani je dol maertese aida age ar deino, ki at mas, ki borsha, hotto mase hoir, gor, bai baggin tolai ja, sairdige nuna madi, nuna hani, gai-girusti oina bollei sole.”***- I have been here for 25 years, how tide of saline water has been surged for 5 to 6 years which did not notice before. Pond, homestead everything is inundated every month irrespective of summer and rainy seasons. Salty soil and salty water are everywhere. There is little production.

According to them, the main causes of climate change are the excessive use of fossil fuel (coal, oil, gas etc) and deforestation. Though they are poor and illiterate they were able to address the causes of climate change rightly because they get climatic information over many media as private TV channels, FM radios, religious institutes as mosques, temples and church, Indian TV channels etc. as stated earlier. Some of the interlocutors stated the causes of climate change as will of God and natural phenomenon that have been attacked them for their sins as stated by Abdur Rab Mia, a 75-year old male, ***“Aije joarer dol, ban-boinnya, nuner hani, beggin angu haper hol”***-**This tidal surge, floods, salt attack, everything is the consequence of our sins.** He added, ***“Ango hap ato bai gase hailai urper ola angu urpe bejar, heilai on aink gojob thada, jegin jibone o deino”***- Our sins are so more that the entity staying up (the God) is dissatisfied with us. That’s why now such hazards are sent that we did not notice in our life before.

5.1.1.4 Most Affecting Climatic Hazards, Affecting Time and Coping Mechanisms: Cyclone, tidal surge, water salinity and soil salinity are the most devastating climate change induced hazards that affect the life and livelihoods of *Bayer Char* coastal people most in autumn (Bhadra- Ashwin), late autumn (Kartik-Augrahan), and summer (Baishakh-Jaishthya) seasons. Most of the people of *Bayer Char* community mentioned that as a climatic hazard, cyclone affects their life and livelihoods most and its severity and frequency are acutest in autumn (Bhadra- Ashwin). From the context of impacts (losses and damages) it

is the highest one among all climate change induced hazards that affect them most severely. In summer (Baishakh-Jaishthya) its severity and frequency are also acute. Tide or tidal surge is the second severe climate change induced hazard that affects them and its severity and frequency are acutest in autumn (Bhadra- Ashwin). In late autumn (Kartik-Augrahasan) and summer (Baishakh-Jaishthya) its severity and frequency are also acute. From the context of severity of impacts on life and livelihoods of *Bayer Char* households, the position of water salinity is third and its severity and frequency are acutest in autumn (Bhadra- Ashwin). In late autumn (Kartik-Augrahasan) its severity and frequency are also acute. The fourth one that affects them most is soil salinity severity and frequency of which are acutest in late autumn (Kartik-Augrahasan). Other climatic hazards that affect their life and livelihoods are flood, drought, insect attack on crops, thunderstorm and hailstorm.

They took coping mechanisms with the impacts of these climate change induced hazards and in this context their most used coping mechanisms include taking shelter in cyclone centre, formation of temporary cluster house on embankment, consuming seeds saved for next season, eating one meal a day, taking food on credit from a local shop or use credit to purchase food. Besides, some less used coping mechanisms mentioned by few people are eating two meals a day, taking loan and take no meals a day.

5.1.2 Climate Change, Natural Assets and Adaptation

Land and Land Ownership Process, a Symbol of Semi Feudalistic and Semi Capitalistic Modes of Production: Land is the first and foremost asset that is the base of *Bayer Char* coastal community. Land is a significant wealth that determines the socio-political and cultural structure of this society. From land ownership context, here most of the people belong to marginal and landless households who have 0.01- 1.0 acre and may have or have not homestead land but no cultivable land respectively. A negligible households are categorized as small who have 1.01-3.0 acre land, medium who have 3.01- 7.0 acre land and large who have 7.0 acre land or above. Most of the households of *Bayer Char* got their homestead land by local leaders, some got by hereditary and very few of them got homestead land by other sources as by buying, willing etc. Most of the households paid or have been paying money in exchange of homestead land. Some households said in exchange of homestead land, they have (had) to fight for the leader, have to give labour in the agricultural land or fishing boat of leader who managed the land for them. Besides, some interlocutors said they have to pay the leader food grain in exchange of their homestead land. Here it is very significant that the interlocutors who got their homestead land by hereditary had (have) to pay too in exchange of land and by the change of ownership the payment does not change and the new owners have to pay again. So, resent study noticed that there is a land ownership based social system or mode of production where the leaders are playing role, sometimes, as feudal lord of feudalistic society and sometimes as petty bourgeoisie of capitalistic society as stated by the studies of Chowdhury, A. (1978) Jahangir, B.K. (1982) and Mahbubullah (1996) . As a whole, Marxian theory is part and parcel applicable in the study of Bangladesh society.

Water, Its Sources and Distance: The data show that tubewell is the prime source of most used water. Other sources of most used water are deep tubewell, pond, river, canal and rain water. Likewise, tubewell is the prime source of drinking water in *Bayer Char* coastal area. Most of the interlocutors use tubewell or shallow tubewell as the source of drinking water. Very few interlocutors use deep tubewell as the source of drinking water because the water of deep tubewell is saltier than shallow tubewell. In explaining the reason the interlocutors said, deep tubewells get connected with the river or sea water as *Bayer Char* is a coastal area and very near the Bay of Bengal. In this context, Jolekha Begum, a 47-year old head of the households said, '*Sagor dare ouai deep kole sagorer nuna hani soli aiya, nuna hani khaitarina*'-As sea is very near, the salt water of sea comes in deep tubewell, we cannot drink

the salty water. For the lack of tubewell, a significant number of interlocutors drink river, pond and canal water. Some interlocutors mentioned that they drink rain water in rainy season as they are not able to drink tubewell water. Most of the people's source place of drinking water is within their house. The data show that a significant number of interlocutors collect drinking water from outside their house. Some interlocutors said, the distance between source of drinking water and their house is less than 1 kilometers. Sometimes, they have to collect drinking water from a very remote place which is one to two kilometers away from their residential area.

Fuel, Its Sources and Sufficiency: In *Bayer Char*, the households have no sufficient fuel. The major source of fuel is straw as mentioned by the interlocutors. There are other sources of fuel in *Bayer Char* as cow dung, tree-leaves used by the poor households. Some interlocutors who are rich and economically solvent use LPG stove as source of fuel. The houses of *Bayer Char* community are enlightened by electrical light or electricity, home-made lamps (Kupi), candles and solar energy.

Climatic Impacts on Natural Assets: Collected data show that, climate change has impacts on natural assets of livelihoods of *Bayer Char* community. The major climate change induced impact on natural asset is the loss of land by riverbank erosion or land erosion. It indicates that climate change induced riverbank erosion has devastating impacts on landlessness of *Bayer Char* people. The interlocutors have the relationship of sweetness and sournesses with river. Due to global warming, glacier is melting and sea level rises that causes the severe riverbank erosion in one side of the river and accumulation of silt on the other side and char arises where the landless poor people gather to live. So, river has a profound impact on life and livelihoods of *Bayer Char* coastal community. As Meraj Molla, a 57-year-old man, said, "***Gang angu sotru, gangi angu bondu, gang angore hanp oi kamba, ar ojha oi jare, gang angu baigor khaise abar gang angore mata gojarlai kotdur jaga dise***"- River is our enemy, and friend, the river runs with the hare and hunts with the hound. River has eaten our house and homestead and river again gives us some land to save our heads.

Increased salinity in drinking water source and cultivable lands is another major impact of climate change on their natural assets. This increasing salinity in land and water has a devastating impacts on other assets of livelihoods especially on material, human and social assets. Other important climatic impacts on natural assets of livelihoods of *Bayer Char* people are declining and losing of plants and trees due to drought and cyclones, water stagnation and pollution by floods and heavy precipitation and arsenic problems etc.

5.1.2.1 Climatic Hazards, Severity and Natural Assets

Tidal Surge: Climatic hazards affected people said, tidal surge affects the natural assets of livelihoods most than any other hazards in *Bayer Char*. As *Bayer Char* is a coastal area where almost no permanent embankment is constructed, the natural assets of this area are frequently affected by tidal surge. After tidal surge, soil salinity and water salinity affect the natural assets most but out of these two, the impact of soil salinity is the more. Bablu Mal, a 67-year old farmer said, “*Joare marar karone mati ar hani nuna oi gese. Joar bondo koirtaille sob thik*”- Tidal surge causes soil and water salinity. If tidal surge is stopped, everything will be right (the problems of soil salinity and water salinity will be solved). So, soil salinity and water salinity are related with tidal surge in *Bayer Char* coastal community as mentioned by interlocutors.

The interlocutors whose natural assets were impacted by climate change induced hazards said that the degree of severity of tidal surge is high or very high and in last 10 years, its frequency and intensity have been increasing gradually. Study data show that, on the one hand, out of all climate change induced natural hazards tidal surge affects natural assets most and, on the other hand, its degree of severity is high or very high and frequency and intensity have been increasing day by day. It indicates that following the increasing trend of the degree of climate change in the world, the degree of frequency of climatic hazards like tidal surge or storm surge and its impacts on life and livelihoods are increasing in coastal area of Bangladesh. So, it can be said that, tidal surge has the most devastating impacts on livelihood assets of *Bayer Char* coastal people in particular and on their holistic life in general.

Soil Salinity: Likewise, the people of *Bayer Char* informed that the degree of severity of soil salinity is high. Interlocutors ranked soil salinity as second among the climatic hazards affect the natural assets of livelihoods of *Bayer Char* coastal people but, according to them, its severity is higher than tidal surge’s. The reason behind it as explained by them is soil salinity affects material life or basic needs of coastal and char people more than tidal surge.

Water Salinity: The degree of severity of water salinity is also high as stated by most of the interlocutors. Sometimes, according to them, its degree of severity is very high. According to the interlocutors, water salinity affects the natural assets of livelihoods of *Bayer Char* coastal people least than any other climatic hazards as tidal surge or soil salinity but its degree of severity is the highest. In this context, the interlocutors’ interpretation is without safe and pure water human beings cannot imagine a healthy life and water salinity affects seriously not

only the material life but also the non-material life i. e., the total life and livelihoods of coastal char people.

5.1.2.2 Natural Assets and People's Vulnerability to Climatic Hazards

Vulnerability to Tidal Surge: Interlocutors ranked their vulnerability to climate change natural hazards that impact their natural assets of livelihoods most. These climatic impacted interlocutors said their vulnerability to tidal surge is very high, some of them said their vulnerability to tidal surge is high. The field data show that the *Bayer Char* coastal people not only impacted most by tidal surge but also they are very high vulnerable to it.

Vulnerability to Soil Salinity: On the other hand, the interlocutors whose natural assets were impacted by climate change said their vulnerability to soil salinity is high or very high. The collected data show that though the position of soil salinity among most affecting climatic hazards is second, its degree of severity and rank of vulnerability were stated as high by most of the interlocutors.

Vulnerability to Water Salinity: Climate change induced natural hazards impacted interlocutors ranked the vulnerability of them to water salinity is high or very high. The data collected by qualitative methods and techniques explore that water salinity is the lowest in position among the climatic hazards affect the natural assets of livelihoods of *Bayer Char* people most but it stands a significant position from the degree of severity and people's vulnerability to it.

5.1.2.3 General Adaptation to Climatic Impacts on Natural Assets

The interlocutors whose natural assets of livelihoods were impacted by climatic hazards informed that they adopt many adaptation strategies to climate change. According to them, their first major adaptation strategy to climatic impacts on natural assets of livelihoods is using *fitkari* (Potassium Aluminium Sulphate) to clean water or to remove salinity from water and their second major adaptation strategy to climatic impacts on natural assets is using solar heat to separate sodium chloride (salinity) and clean water. In this context Roisa Khatun, 59-year-old woman and head of household, said, "*Age dan roide ditam on hanio roide di, girustite loss, khana pinar kosto, ango koster sash nai, allar duinnai aidar lai kissu nai?*"- Before, I used to dry the paddy in the heat of the sun, now we also dry (keep) water in the heat of the sun. Loss in cultivation, suffering of eating and drinking. There is no end to our sufferings. Is there no way out of it in the world of God?

Other important adaptation strategies adopted by the interlocutors are storing safe water under the ground, restoring and preserving homestead forest to prevent erosion, using homemade filter to remove arsenic and purify water, using water harvesting techniques through canal, raising the bank of pond and home foundation to stop intrusion of saline water, covering the land with *serfi* (piece of grassy land) to prevent land erosion, buying land in upward areas to build houses to take shelter during natural disasters like tidal surge and using chlorine tablet or bleaching to purify water.

5.1.2.4 Adaptation to Specific Climatic Hazards Impact on Natural Assets

Adaptation to Tidal Surge: Qualitative data show that the interlocutors adopt many specific strategies to the impacts of specific climatic hazards on their natural assets of livelihoods. First major strategy the interlocutors most frequently adopt as their adaptation to tidal surge is reducing expenses by changing consumption including number of meals. The second major adaptation strategy to tidal surge is access to and interpretation of warning signals as stated by the interlocutors of the study. Besides, as adaptation to tidal surge they adopt other important strategies that include preservation of fuel wood, diversification of crop selection, improving the construction or rehabilitation of terrace, handicrafts activities, adapting sowing time agriculture to tidal surge intensity and frequency, changing the pastoral system, applying different feed techniques for domestic animals as livestock, hens, constructing seed storage facilities, strengthening tidal surge resilience of agricultural systems, migrating temporarily to rural upward areas, home-garden agriculture, restoring and preserving homestead forest to reduce soil erosion, rangeland preservation and grazing restrictions for domestic animals, communal water harvesting/tanks for ensuring saline free water, buying cultivable land in upward areas to take shelter during tidal surge, storing dry food, safe water, life-saving medications to use during tidal surge, raising platform for livestock/cooking, raising houses built with fences, taking shelter in cyclone centre and taking loan.

Adaptation to Soil Salinity: The first major strategy the interlocutors frequently adopt as adaptation to soil salinity is adapting cropping densities i.e., they sow crops maintaining less density which ensures less impacts of soil salinity and production increases. Other two major adaptation strategies the interlocutors use to soil salinity are diversification of crop selection and adapting sowing time i.e. selecting sowing time considering the time of the least impact of soil salinity. Besides, the qualitative data show that to reduce risk and to adapt the impacts of soil salinity on their natural assets of livelihoods, the people of *Bayer Char* use many strategies as improving soil quality by incorporating cover crops like peas, rye, radish,

cowpeas, mustard, and grasses, adapting tillage/ploughing techniques to soil salinity, reducing expenses by changing consumption (number of meals), planting salt-tolerant crops, restoring the balance using chemical amendment-gypsum/sulfuric acid doing poultry business, livestock rearing, business/trading, home-garden agriculture, increasing drainage for better flushing to remove salts from the ground surface, adopting handicrafts, buying cultivable land in upward areas to cultivate during acute soil salinity in *Bayer Char*, using cross-sectoral approach.

Adaptation to Water Salinity: On the other hand, the first major strategy frequently used as adaptation to water salinity mentioned by interlocutors is adapting sowing time i.e., selecting sowing time considering the time of the least impact of soil salinity. It is most frequently used adaptation technique in *Bayer Char* as it is very easy for coastal char people to adapt sowing time to water salinity based on their local knowledge and experience. Diversification of crop selection based on seasonal variability and home-garden agriculture are the other two major strategies adopted interlocutors as adaptation techniques to water salinity.

Other Major techniques or strategies the interlocutors use as adaptation to water salinity are reducing expenses by changing consumption as reducing the number of daily meals, adapting cropping densities i.e., sowing crops maintaining less density which ensures less impacts of soil salinity and production increases, adapting fertilizer/pesticides application (e.g. gypsum. potash to reduce salinity), developing communal irrigation, adopting fisheries, poultry and livestock, saline resilient food production system, cross sectoral approach and doing business and trade for a certain time period. Communal irrigation also indicates the role of local networks in adaptation to climate change. Reducing the number of meals as reduction of expenses is adopted as they are poor and it is a general technique of rural poor people in reducing consumption.

Collected data point out that the least frequently used adaptation strategies used by the people of *Bayer Char* to water salinity are buying cultivable land in upward areas to cultivate during acute soil salinity, leaching and crop removal, handicrafts activities, water harvesting techniques through canal and communal water harvesting.

Table-5.1: Climate Change Impacts on Natural Assets of Bayer Char people and Their Adaptation Strategies

Major Impacts (Loss and Damage) on Livelihoods		Adaptation Strategies	Most Affecting Climatic Hazards and Time
Livelihood Assets	Description of Impacts		
Natural Asset	<ul style="list-style-type: none"> • Increased salinity and arsenic in drinking water 	<ul style="list-style-type: none"> • Use sun heat to separate salinity, • Use homemade filter, • Safe water storage under the ground, • Preserve rain water 	<ul style="list-style-type: none"> • Tidal surge, • Soil salinity and water salinity, • Cyclone • Baishakh-Jaishthya and Bhadra-Ashyin (summer and autumn)
	<ul style="list-style-type: none"> • River water rise • Losing land by riverbank/land erosion increase, • Land erosion by heavy precipitation 	<ul style="list-style-type: none"> • Plant trees • Cover the land with <i>serfi</i>(piece of grassy land) 	
	<ul style="list-style-type: none"> • Increasing salinity in cultivable lands 	<ul style="list-style-type: none"> • Buy cultivable land in upward areas • Adapt cropping densities • Use gypsum or sulfuric acid to restore the balance of soil, • Diversified crop selection 	
	<ul style="list-style-type: none"> • Declining and losing of plants and trees due to drought and cyclones 	<ul style="list-style-type: none"> Restore and preserve homestead forest 	

(Source: Field Data, 2021-2022)

5.1.3 Climate Change, Material Assets and Adaptation

5.1.3.1 Migration and Duration of Settlement: Collected data show that most of the interlocutors migrated from same district i.e., from different parts of Lakshmipur. Some of them migrated from other districts as Noakhali, Bhola, Chandpur and Chattagram. Their main causes of migration are riverbank erosion, lack of land, poverty, in search of better life, natural disasters and political problems. The char arose at the beginning of the last decade of the twentieth century and settlement started from the year 1995 (Information Office, Ramgati, Lakshmipur, 2020). Data point out that most of the interlocutors have been living in *Bayer Char* for 15 to 20 years but there are interlocutors who have been living in this coastal area for more than 20 years. So, from the study data it is noticed that most of the inhabitants of *Bayer Char* have been living here since the very beginning of the char's rising. Besides, some interlocutors said they have been living in this char for 10 to 15 years.

5.1.3.2 Profession and Production: The inhabitants of *Bayer Char* have been engaged in present profession for five to forty years and most of the time they chose their present profession by inheritance. Sometimes, they chose their present profession due to lack of land and riverbank erosion due to near the sea, unavailability of other jobs, less money consuming, more income in short time and by hobby. From the information provided by the interlocutors it is clear that there are some interlocutors who have been engaged in present profession before coming in *Bayer Char*. Because, settlement started in this coastal char from the year 1995 (Information Office, Ramgati, Lakshmipur, 2020). Now it is about 25 years since the settlement started but some interlocutors have been engaged in their present profession for 30 to 40 years.

Data show that rice and fish productions are the prime food gains produced in *Bayer Char* and rice is the staple food of *Bayer Char* coastal people like other people of Bangladesh. The interlocutors of *Bayer Char* frequently produce rice, fish, vegetables and peanut. Sometimes, they produce fruits and wheat. Most of the time they produce for their own consumption and sometimes they produce for selling in the markets.

5.1.3.3 Household Size, Income-Expenditure Gap and Livelihoods Vulnerability: These field data explore a grim picture of poverty of coastal people of *Bayer Char*. The household members in *Bayer Char* coastal area is generally 6 or more than 6 and every household generally earns from their primary profession about tk. 200 to tk. 400 daily. On the one hand, their daily per capita income is about tk. 50 and, on the other hand, their daily per capita expenditure is 60 to 80 taka as said by the interlocutors. To make up the deficit between

income and expenditure they rear birds or animals as cow, goat, hen, buffalo, duck etc as secondary income sources. For these poor people of *Bayer Char*, rearing animals or birds is easier than any other things to do as the area is char, the char is very much grassy, these secondary income sources are least money consuming.

Sometimes, to bridge this income-expenditure gap they take loan at a high interest rate generally 25% to 35% from *Mohajons* (Local usurers) and fall in a vicious cycle of loan. The *Mohajons* capitalize their poverty or livelihoods vulnerability, exploit them in exchange of loan and these poor people cannot get rid of this vicious cycle of loan. So, the people of *Bayer Char* are not only hard-core poor but the poorest of the poor in Bangladesh and their life and livelihoods are most vulnerable.

5.1.3.4 Climatic Impacts on Material Assets: The prime impact of climate change on material assets of their livelihoods is declining production and facing hunger and malnutrition. The climatic impacts on declining production are described by Nurul Huda, a 60-year-old peasant, as he said, “*Age boinner hor hor-e je hoshol koittam heidar holon onek bala oito, kintu on ona, ganger hani nosto ar bis oi gese, hei bisakto hani madireo nosto kori di ja.*” -Before, cultivation what we would do immediate after of flood, the yield of that would have been much better but not now. The river water has become wasted and toxic, that poisonous water backed to the river destroying the soil.

Other most frequently occurred climate change induced impacts on material assets of *Bayer Char* community are decreasing the taste of food, smaller the size of fruits, grains and trees, economic loss and failure to meet dress need of households and seasonal variability mentioned by interlocutors. There are some least frequently occurred climatic impacts on material assets of *Bayer Char* people livelihoods as disruption of cattle rearing, disruption of subsistence activities and destruction of fish breeding areas due to siltation. Jamal Munshi, a 58-year old farmer said, “*Horibes ki ar ager jagai ase? Mela horibortan oi gese, heilai hosoler hoid komi gese, godon sodo oi gese, holono kom, bal-baichcherlai dui mud bat hoijjonto joaitam arina*”-Is environment at the before place (condition)? a lot of changes occurred, as a result, the taste of crop has decreased, size and shape of crop is reduced, yield is low, can't arrange even two handfuls of rice for children.

5.1.3.5 Severity of Climatic Hazards Impact Material Assets Most: The important climate change induced natural hazards that impact the material assets of livelihoods of *Bayer Char* coastal people are water salinity, cyclone (especially nor'wester), soil salinity, insects attack on crops, tide or tidal surge, drought and hailstorm. Among these climatic hazards,

water salinity, cyclone, soil salinity and insects attack on crops impact the material assets of char people livelihoods most. In explaining the severity of climatic impacts on material assets Akkaser Nesa, a 73-year-old woman, said, “*Gerame joine onek dan oito, kristi oito, eanne nuna madi ar nuna hanirlai kissu ona*”- In village (where she migrated from) a lot of paddy would produce, other agricultural crops would produce but here nothing is produced due to salty land and salty water.

According to the interlocutors, *Bayer Char* is a coastal area where almost no permanent embankment is there and it is very near to the congruence of the Meghna river and the Bay of Bengal. So, it is one of the most disaster prone areas of Bangladesh and the material assets of livelihoods of the people of this area are frequently affected by natural disasters like cyclone, tidal surge, floods etc. which cause generally the water salinity, soil salinity and insect attack on crops that affect the material assets of their livelihoods most. All these hazards are interrelated.

Severity and Frequency of Insect Attacks on Crops: Though most of the time the severity of insect attack on crops is medium, sometimes, its severity is high. Following the degree of increase of climate change in the world, the degree of frequency and intensity of climatic hazards like insect attack and its impacts on material life and livelihoods are increasing in coastal area of Bangladesh.

Severity and Frequency of Drought: The interlocutors ranked the impact severity of drought on their life and livelihoods as medium. They said, sometimes, its severity on material assets of livelihoods is high. Likewise, the intensity or frequency of drought has been increased for last 10 years and it is increasing day by day. Khotiza Khatun, a 50-year old household worker described the matter in this way, “*Hoittek bosori Nargis, Aila, khora lagi tha. Goru, sagol ans, murga loi kiamot*”-Nargis, Aila (cyclones) and drought frequently occurred every year. Great misfortunate for cows, goats, ducks and hens.

Following the degree of increase of global warming and climate change in the world, the degree of frequency and intensity of climatic hazards like drought and its impacts on life and livelihoods are increasing in coastal area like *Bayer Char* of Bangladesh.

Severity and Frequency of Hailstorm: The interlocutors ranked the impact severity of hailstorm on their material assets of livelihoods as medium. Sometimes, they said, its severity on material assets of livelihoods is high. At the same time, the intensity or frequency of hailstorm has been increasing gradually for last 10 years. Following the exponential growth of global warming and climate change in the world, the degree of frequency and intensity of

hailstorm and its impacts on material assets of livelihoods are increasing in coastal area like *Bayer Char* of Bangladesh.

5.1.3.6 Vulnerability of Material Assets to Climatic Hazards

Most of the time, the vulnerability of material assets of interlocutors' livelihoods to insect attack is medium. But sometimes, their material assets' vulnerability to insects attack is very high or high. At the same time, the interlocutors ranked the vulnerability of material assets of their livelihoods to drought as medium. Sometimes, the vulnerability of their material assets to drought is very high and sometimes, the vulnerability of their material assets to drought is very low. Likewise, most of the time, the vulnerability of material assets of livelihoods of interlocutors to hailstorm is medium. Sometimes, the material assets vulnerability to hailstorm is very high or high.

From the qualitative data, it is explored that, though the people of *Bayer Char* ranked the vulnerability of livelihood assets to insect attack, drought and hailstorm as medium, sometimes, their material assets' vulnerability to insect attack, drought and hailstorm is very high or high and sometimes, the vulnerability to drought is very low.

5.1.3.7 Adaptation to Climatic Impacts on Material Assets

The people of *Bayer Char* coastal area adopt different adaptive strategies to climate change induced impacts on material assets of their livelihoods. Their major adaptation strategies to climatic impacts on material assets are cultivating saline resilient crops as carrots, potatoes, cabbage, beets etc., raising seed bed to save from tidal surge, floods and salinity and diversification of crop selection. Other important strategies the interlocutors frequently use as adaptation to climate change induced impacts on their material assets are, emphasizing on surpluses and savings, changing the herd composition, increasing drainage for better flushing to reduce salinity, selling assets, using gypsum or sulfuric acid to restore the balance of soil, adapting sowing time to seasonal variability, making river embankment and migrating temporarily to other areas or generally upward areas, raising platform for livestock, doing home-garden agriculture, improving seed storage facilities, storing food specially dry food, building dwarf embankment around field and applying different feed techniques for birds and livestock.

There are some adaptation strategies the interlocutors sometimes use as taking insurance policies regarding life, health, house, grain etc., using irrigation and adapting tillage or ploughing techniques as using minimal tillage, direct drilling or conservation tillage is followed leaving the crop residue on the field surface after harvest to minimize soil

disturbance, reduce soil erosion, runoff, sequester carbon and increase organic matter or instead traditional tillage that leads to CO₂, methane and nitrous oxide emissions and soil exposure to wind and water.

5.1.3.8 Adaptation to Specific Climatic Hazards Impact on Material Assets

Adaptation Strategies to Insect Attack: As adaptation strategy to insect attack on their material assets of livelihoods, the interlocutors mainly use animals (eater bird) to feed the pests on the farm to control the insects biologically, remove insects by hands, cutlass or trap and use pesticides or chemical control. They adopt some more strategies as adaptation to insect attack on their material assets of livelihoods as reducing pest-inducing crop losses using different mechanisms, enhancing ecosystem services, using cross sectoral approach like Climate-Smart Pest Management (CSPM) where they work in different sectors to control insect attack on crops and strengthening the resilience of agricultural systems, reducing green house gas emissions intensity per unit of food production.

Adaptation Strategies to Drought: The qualitative data show that the most used strategies the interlocutors adopt as adaptation to climatic impacts of drought on material assets of their livelihoods are diversification of crop selection to make crop tolerable to drought, reducing their expenditure usually by changing consumption as reducing the number of meals (one or two meal a day), temporal migration to upward rural areas, making seedbeds next to ponds or reservoirs and adapting sowing time, improving watering sites in pastoral areas, different feed techniques application as zero grazing and using surplus or savings while the least used adaptation strategies to the impacts of drought on life and livelihoods of *Bayer Char* coastal people are the arrangement of communal irrigation, using irrigation, taking loan, access to and interpretation of warning signals and strengthening the resilience of agricultural system, handicrafts activities, charcoal or timber sales and selling assets.

Adaptation Strategies to Hailstorm: Access to and interpretation of warning signal regarding natural hazards, cultivation in advance (before season) so that they can harvest before the time of hailstorm and reduction of expenses by changing consumption specially reducing the number of meals are the strategies the interlocutors most frequently used as adaptation to hailstorm in *Bayer Char* community. About changing consumption as a adaptation strategy, Nabiul Hok, a 49-year old day labourer said, “*Ak bela khaile dui bela uash thai, akkuri angu din ja rait honan*”-If have one meal, fast two meals. In this way our days and nights pass.

Besides, some important adaptation strategies of *Bayer Char* people to the impacts of hailstorm on their life and livelihoods specially their material assets of livelihoods are adapting cropping densities as less density of crops ensures less impacts, adapting sowing time, less density during high frequency and high intensity of hailstorm and more density of crops during low frequency and low intensity of hailstorm, taking loan from *Mohajon* (local usurers), keeping the animals in safe places and adopting the techniques of agri-insurance.

There are some strategies the interlocutors sometimes practiced as adaptation to the impacts of hailstorm as replacing spoiled tin of roof by new tin, sowing new seed in case of complete destruction, starting fisheries/poultry/livestock instead of crop cultivation and using medicine in hailstorm impacted crops to save it from rotation. Sometimes, the interlocutors have no strategy to protect their paddy from hailstorm.

Table-5.2: Climate Change Impacts on Material Assets of *Bayer Char* People and Their Adaptation Strategies

Major Impacts (Loss and Damage) on Livelihoods		Adaptation Strategies	Most Affecting Climatic Hazards and Time
Livelihood Assets	Description of Impacts		
Material Asset	<ul style="list-style-type: none"> Declining production and facing shortage of food (Aman and Aush) 	<ul style="list-style-type: none"> Cultivating saline resilient crops Seed bed raising Temporal migration to other areas Reducing expenses by changing consumption (reducing the number of meals) Using animals to feed on the pests on the farm-biological control/eater bird Removal of insects by hands, Accessing and interpreting of warning signals Using gypsum or sulfuric acid to restore the balance of soil 	<ul style="list-style-type: none"> Land, water salinity and tidal surge (Bhadra-Jaisthya: autumn-summer) Cyclone (Baishakh-Jaishthya and Bhadra-Ashyin i.e.:summer and autumn), Insect Attack (Falgun-Chaitra-spring), Drought/Aridity (Baishakh-Jaishthya - summer)
	<ul style="list-style-type: none"> Decreasing the taste of crop 	<ul style="list-style-type: none"> Diversifying crop selection but hardly works (Almost no strategy) 	
	<ul style="list-style-type: none"> Smaller the size of fruits, crops and trees 	<ul style="list-style-type: none"> Diversifying crop selection but hardly works (Almost no strategy) 	
	<ul style="list-style-type: none"> Seasonal Variability 	<ul style="list-style-type: none"> Adapting sowing time Accessing and interpreting of warning signals 	

(Source: Field Data, 2021-2022)

5.1.4 Climate Change, Human Assets and Adaptation

5.1.4.1 Climatic Impacts, Diseases and Medicine

In the last one year, irrespective of their sex the interlocutors were affected by different diseases. Most of the time, they were affected by fever, diarrhoea, cholera and dysentery. Sometimes, the interlocutors affected by asthma, gastric/ulcer and vomiting. They generally take traditional medicines for diseases instead of modern due to lack of money and religious prohibition. In this context, the speech of Rotan Kumar, a 53-year-old differently able person is not worthy as he said, *“Are bhai, ango roger sesh ace ni, akdige nuna madi-nuna hanillai girostiona, abar ja aktu o jo-tuanerlai gore udaitarina, soril dorkari khana ha na, rog-baram angore janpi dore, badi calan dio ougga dakto rhaitenno eanne, toi ango roger o sash nai osudero sash nai. Jan fukerten suru kori ash pashe ja den baggin ango oshud”*- Oh! Brother, there is no end to our diseases. On the one hand, no production due to salty land and salty water, on the other hand how little produced cannot bring to house due to storm, cyclone. The body cannot get necessary food, diseases jumped on us, you do not find out any doctor here even searching by bowl (a magical process locally used to find out anything lost). So, our diseases have no end and its medicine has also no end. From scrubbing to everything you see around us is our medicine.

Other important causes of taking traditional medicine are lack of knowledge and lack of awareness. The inhabitants take traditional medicine for diseases irrespective of their educational qualifications i.e., education does not work in taking medicine (traditional) in *Bayer Char* coastal community where survivability is the main concern.

5.1.4.2 Climatic Impacts on Human Assets of Livelihoods

Climate change induced hazards have devastating impacts on human assets of *Bayer Char* people's livelihoods. The most frequently occurred climatic impacts on human assets are food insecurity and lack of nutrition due to increased drought, land erosion and salinity in land and water and the loss of life or death by cyclone, thunderstorm (especially during a strong nor'wester that coupled with thunderstorms, hailstorms and monsoon rains) heat wave and flood. Bedora Khatun, a 58-year-old woman described the impact of water salinity on human assets of their livelihoods in this way, *“Ban ba deeper khanar hanite nun ato baese ai nuna hani khaile ka oinna mataider han soi maniya sutkia onek somoy kansa ja”*- The salt in the drinking water of flood, tidal surge or deep tubewell is so much that if a pregnant women drink it, their fetuses of 5 to 6 months are sometimes aborted.

Besides, lack of modern health facilities due to rough environment, damage of roads and public utilities, diseases due to increased precipitation/water stagnation, floods and arsenic contamination and lack of education due to damage of educational institutions and public utilities by cyclones and river bank erosion are major climatic impacts on human assets of livelihoods. There are some other climatic impacts on human assets of livelihoods of *Bayer Char* people as lack of awareness and lack of human resource development (HRD) due to deprivation from public/private modern education and training.

5.1.4.3 Severity of Climatic Hazards That Impact Human Assets of Livelihoods

Flood is the first major climate change induced hazard that affects the human assets of livelihoods of *Bayer Char* coastal people most as informed by the interlocutors. The second and third major climatic hazards that affect the human assets of livelihoods of interlocutors most are cyclone and thunderstorm. Other climatic hazards that impact the human assets of livelihoods severely are tide or tidal surge, water salinity and insect attack on crop. Thunderstorm affects the human assets directly and flood, cyclone, tidal surge, water salinity and insect attack impact the human assets of livelihoods directly and indirectly but their indirect impacts on human assets are more than direct impacts as said by the interlocutors of the study.

Impact Severity of Flood on Human Assets: The degree of impact severity of flood on life and livelihoods especially human assets of livelihoods is high and sometimes it is very high as said by the interlocutors of qualitative study. The intensity or frequency of flood has been increasing in *Bayer Char* coastal area for the last 10 years.

Impact Severity of Thunderstorm on Human Assets: Qualitative data show that thunderstorm has significant impacts on life and livelihood assets of *Bayer Char* coastal. The degree of impact severity of thunderstorm on human assets of livelihoods of *Bayer Char* people is very high and sometimes, the impact severity of thunderstorm on life and human assets of livelihoods is high. At the same time, the intensity or frequency of flood has been increasing in *Bayer Char* coastal area for the last 10 years as described by the interlocutors of the study.

5.1.4.4 Vulnerability of Human Assets to Flood and Thunderstorm

The vulnerability of human assets of livelihoods of *Bayer Char* community to flood is high and even, sometimes, their human assets vulnerability to flood is very high as said by the interlocutors. Likewise, the vulnerability of human assets of livelihoods of *Bayer Char* community to thunderstorm is high and sometimes, the inhabitants' human assets vulnerability to flood is very medium as said by the interlocutors.

5.1.4.5 Adaptation to Climatic Impacts on Human Assets

Climatic hazards impacted people of *Bayer Char* adopt various strategies as adaptation to climatic impacts on their human assets of livelihoods as stated by interlocutors. The data point out that the prime strategies the interlocutors frequently used as adaptation to climatic impacts on human assets of their livelihoods are saving their life taking shelter in relatives' paka house and cyclone shelter, taking religious education and depending on traditional medicine. The climatic impacts on human assets of *Bayer Char* community and people's adaptation strategies to it are actually emerged in the speech of Rustom Ali, a 77-year old man as he said in KII, "*Hunen bai, ki ar komu, din din asman, gang, abaoa aink oise angore soijjo koirtarena. Asman, ganger loge to ar judo koron ja na, apos kori solto o, koto rokomer kaeda koirtto o*"- Listen brother, what we will say, day by day the sky, the river, the weather have become such they cannot tolerate us. It is not possible to fight against the sky and the river, we have to compromise, have to follow different techniques.

They said, religious education helps them to be patient and tolerant to climatic impacts considering that every pain and gain come from Allah or God. Other important strategies the interlocutors use as adaptation to climate change induced impacts on human assets are taking health facilities and training from *upazila* and district government offices, taking health training from NGOs, building educational institutions on very high places and taking loan from banks, relatives or *Mohajons*.

5.1.4.6 Adaptation to Climatic hazards That Impact Human Assets

The interlocutors adopt specific strategies to specific hazards that impact their life and livelihoods especially the human assets of their livelihoods.

Adaptation Strategies to Flood: The most used techniques or strategies the interlocutors use as adaptation to the impacts of flood on their livelihood assets especially human assets of livelihoods are raising their houses which are built with fences, storing food and medicine as the storage of dry food, safe water, life-saving medications and access to and interpretation of warning signals regarding weather and climatic variability. Other very important adaptation strategies to flood are reducing expenses by changing consumption specially by reducing the number of meals, temporal migration to other rural areas or upward areas and restoring and preserving homestead forest to reduce erosion, emphasizing on seed storage facilities, using surpluses/savings, raising platform for livestock/cooking, temporal migration to urban areas, handicrafts, preserving fuel wood, strengthening the resilience of agricultural systems, applying different feed techniques as zero grazing, adopting handicrafts, using cross-sectoral

approach. The least frequently used strategies the interlocutors use as adaptation to the impacts of flood are rangeland preservation and grazing restrictions, communal water harvesting/tank and construction of storage areas ceiling like raised platform, temporal migration to urban areas, diversifying crop selection, changing the herd composition, changing pastoral to sedentary agri-system and soil erosion prevention programs.

Adaptation Strategies to Thunderstorm: The most used techniques or strategies the interlocutors use as adaptation to the impacts of thunderstorm on their livelihood assets especially human assets of livelihoods are planting very high trees like palm trees, accessing to and interpreting of warning signals, keeping insurance policy. Other very important adaptation strategies to thunderstorm are building shelter-house near farm-land, trying to keep the animals safe, planting more and more trees and adapting sowing time. The least frequently used strategies the interlocutors use as adaptation to the impacts of thunderstorm are not taking cattle out of the cow house and immediately getting away from ponds, canals and rivers. Some interlocutors mentioned that they have nothing to do or they have no adaptive strategy to the impact of thunderstorm. It indicates very high vulnerability of *Bayer Char* coastal people to the impacts of thunderstorm.

Table-5.3: Climate Change Impacts on Human Assets of *Bayer Char* People and Their Adaptation Strategies

Major Impacts (Losses and Damages) on Livelihoods		Adaptation Strategies	Most Affecting Climatic Hazards and Time
Human Asset	<ul style="list-style-type: none"> • Loss of life or death 	<ul style="list-style-type: none"> • Saving life taking shelter in relatives' paka house and cyclone shelter • Temporal migration to main areas • Reduce expenses by changing consumption (reducing the number of meals) • Access and interpretation of warning signals 	<ul style="list-style-type: none"> • Cyclone (Baishakh-Jaishthya and Bhadra-Ashyin i.e.:summer and autumn), Thunderstorm (Baishakh-Jaishthya -summer)
	<ul style="list-style-type: none"> • Malnutrition and chronic diseases due to food insecurity 	<ul style="list-style-type: none"> • Diversified crop selection but hardly works (almost no strategy) • Flood resilient crop production 	<ul style="list-style-type: none"> • Land and water salinity (Bhadra-Jaishthya: autumn-summer) • Floods (Asar-Srabon-rainy season)
	<ul style="list-style-type: none"> • Lack of modern education and health services due to damage of Institutions 	<ul style="list-style-type: none"> • Depending on traditional medicine • Building educational institutions on very high places • Taking religious education 	<ul style="list-style-type: none"> • Cyclone (Baishakh-Jaishthya and Bhadra-Ashyin i.e.:summer and Autumn), • River bank erosion((Asar-Srabon-rainy Season)

(Source: Field Work, 2021-2022)

5.1.5 Climate Change, Social Assets and Adaptation

5.1.5.1 Relationship with Religious Institutions, Politics etc

The interlocutors of *Bayer Char* community go to or keep relationship with the religious institutions. The causes of going to or keeping relationship with religious institutions are mainly religious and social. There are other causes of keeping relation with religious institutions as this relationship works as source of power, source of help during disaster and as source of mental satisfaction. About all the interlocutors of *Bayer Char* keep relation with different social organizations as politics, club, *somities* (association) irrespective of their amount of ownership of homestead or cultivable land or households types and they described that they keep these relationships with politics, club, *somities* (associations) mainly for financial help or micro credit and for ensuring the sources of power. Besides, the important causes of keeping relationship with different social organizations as politics, club, *somities* (associations) are to get training on adaptation to climate change, to ensure entertainment and to influence the community people i.e., keeping relationships with social organizations ensures their training facilities on impacts of and adaptation to climate change, entertainment for their mental satisfaction and to influence the community people so that they follow the leadership of interlocutors and adapt to climatic impacts on social assets of livelihoods. Other causes of keeping relations are to ensure technical assistance, agricultural inputs, to expand social networks, to do social welfare, to help community and for protection. Some of the interlocutors said keeping relations with politics is a matter of social relations and sometimes, they are obliged to keep relations.

5.1.5.2 Relation with Family and Community and Secured Places

The interlocutors informed that their relationship with family is not very good but good or medium. At the same time, they said their relationship with community is medium or good, not very good. On the contrary, the interlocutors said their first secured place is individual level i.e., they feel secured first when they are individual and their second secured place is family. The interlocutors also informed that they feel insecure most in community level. This may be the result of different impacts of climate change on their life and livelihoods.

5.1.5.3 Climatic Impacts on Social Assets

The interlocutors whose livelihoods were impacted by climate change induced hazards said climate change has various types of devastating impacts on social assets of their livelihoods. The most affecting three climatic impacts on social assets are social and internal conflict based on scarcity of land, food insecurity and unrest in family and poverty and failure to

sustain relationships with relatives, neighbours and religious and social institutions. Explaining climatic impacts on social assets of livelihoods Jubraj Mia, a 39-year-old man, said, “*Bujento, dar koroj kori, matar gam hae halai girusti kori Jodi tuanne, dole, khorai nosto oi ja, manser mata thik thani? Gore baire osanti, mojjider sanda naditaille somajerten nam kadi da, ant bajare jaitarina, holai holai ko din than ja? Gor-songsar, somaj sa sola ja, bolen?*” You understand well, if the cultivation based on loan and sweat on the feet is damaged by cyclone, tidal surge and drought, does the head work right? Unrest is in and outside the house. If fail to give the subscription of mosque, the name is cut, cannot go to market? How many days can be fled? Is it possible to live without house, family and society? The other important impacts of climate change on the social assets of livelihoods of *Bayer Char* community are male children are preferred to face disasters, damage of mosques/temples and failure to maintain social relation, increased violence against women and political abuse due to poverty caused by frequent natural disasters. The climatic impacts that least frequently affect the social assets are women and girls are neglected in family and community considering them unproductive and biologically weak, losing friends and relatives of interlocutors in disasters and become lonely.

5.1.5.4 Severity of Climatic Hazards Impact on Social Assets

Cyclone is the first major climate change induced hazard that affects the social assets of livelihoods of *Bayer Char* coastal people most as informed by the interlocutors. Sometimes, a strong nor’wester (coupled with thunderstorms, hailstorms and monsoon rains) affects their social assets of livelihoods most in Baishakh and Jaishthya (April-May). The second and third major climatic hazards that affect the social assets of livelihoods of interlocutors most are flood and tidal surge. Other climatic hazards that impact the social assets of livelihoods severely are water salinity, drought and soil salinity.

5.1.5.5 Adaptation to Climatic Impacts on Social Assets

Climatic hazards impacted people of *Bayer Char* adopt various strategies as adaptation to climatic impacts on their social assets of livelihoods as stated by interlocutors. The data point out that the prime strategies the interlocutors frequently used as adaptation to climatic impacts on social assets of their livelihoods are building mentality of helping each other in climatic crises, giving more importance on mosques or temples security than their own houses, sending women and girls to relatives’ *paka* or brick made house and building religious and social institutions and clubs on very high places. Other important adaptation strategies to the impacts of climate change induced natural hazards on social assets of

livelihoods of the interlocutors are practicing active participation in politics, spreading the net of relationship by marriage, taking loan from *mohajon* (local usurers), taking financial help from relatives especially from the sides of father-in-law, and receiving religious charity (*Fitrah and Zakat*) from muslims living in the main land or upper land. Abdul Hai, a 57-year old day labourer said, ‘*Onik mosibot, ogga na jaite arugga aeyye. Tar horeo banci asi da koroj kori, horera hase ase ar uporer manser (where they migrated) hitra jokate*’- Many types of hazards, come one after another. In spite of that we survive based on loans, charity of upper land people and the help of the family of father-in-law.

Table-5.4: Climate Change Impacts on Social Assets of *Bayer Char* people and Their Adaptation Strategies

Major Impacts (Losses and Damages) on Livelihoods		Adaptation Strategies	Most Affecting Climatic Hazards and Time
Livelihood Assets	Description of Impacts		
Social Asset	<ul style="list-style-type: none"> • Unrest in family, failure to sustain relationship with relatives and neighbours due to poverty, scarcity of land and food insecurity. 	<ul style="list-style-type: none"> • This may be the result of different impacts of climate change on their life and livelihoods. • Send women and girls to relatives’ house, • Hazards resilient crop production, • High yield crop selection, • Reduce expenses by changing consumption (reducing the number of meals), • Diversified crop selection, • Women save <i>Muri Cail</i> (Fist Rice), • Hand over their ornament to husband 	<ul style="list-style-type: none"> • Cyclone (Baishakh-Jaishthya and Bhadra-Ashyini.e.:s ummer and autumn), • Land and water salinity (Bhadra-Jaisthya: autumn-summer) • Floods (Asar-Srabon-rainy season)
	<ul style="list-style-type: none"> • Failure to maintain social relation due to damage of house, mosques, temple, Community organization, Become lonely losing our relatives and friends in disasters 	<ul style="list-style-type: none"> • Building the mentality of helping each other in this crisis • Spread the net of relationship by marriage, • Give more importance on mosques /temple security than own houses 	

(Source: Field Work, 2021-2022)

5.1.6 Climate Change, Physical Assets and Adaptation

5.1.6.1 House, Household Size and Sanitation

House Walls, Roofs and Floors: Most of the house walls of interlocutors are built by tin and straw. Even, there are some house walls built by leaves and polythine. The house wall built by brick is very rare in *Bayer Char* coastal community. Likewise, most of the house roofs of *Bayer Char* people built by straw and tin. Even, there are some house roofs built by leaves and polythine in the char also. The house roof built by brick is very rare in this coastal community. The floors of houses of interlocutors are *cancha* (built by mud). The house floor built by brick is very rare in this coastal community. For weak house structure, the houses of *Bayer Char* coastal people are very much vulnerable to climate change induced natural hazards.

Household Size and House Rooms: Most of the households have six members or more than six. Even, there are some houses which have more than ten members. The households consist of four members or less than four are almost unavailable in *Bayer Char*. About all houses have two rooms or only one room in the char. There are some houses which have three rooms. Considering the household size, most of the households need four rooms or more than four rooms but the houses consist of four rooms or more than four are very rare in the char. Their houserooms are not sufficient for them. So, the households in *Bayer Char* coastal area are facing acute shortage and crisis of houserooms which are very fundamental material need of human beings.

Sanitation System: It is a common phenomenon in *Bayer Char* community that the inhabitants use pit latrine and unpaved latrine as said by the interlocutors of qualitative study. Very few households use paved or sanitary latrines. The interlocutors who use sanitary or paved latrines are graduation or post-graduation completed.

5.1.6.2 Climatic Impacts on Physical Assets of *Bayer Char* People

The interlocutors whose livelihoods were impacted by climate change induced hazards said that climate change has various types of devastating impacts on physical assets of their livelihoods. The most affecting two climatic impacts on their physical assets are damage of house and homestead land by floods, heavy rainfall and cyclones, and heat wave, drought, salinity in water and land cause scarcity of house building materials. Other climatic impacts that frequently affect the physical assets of livelihoods of *Bayer Char* community are lack of

shelter, damage of essential foods for destroying floors, roofs and walls by climate change induced floods, cyclones, tidal surge etc., insecurity of life and becoming climate refugees.

5.1.6.3 Climatic Hazards That Impact on physical Assets

Cyclone is the first major climate change induced hazard that affects the physical assets of livelihoods of *Bayer Char* coastal people most as informed by the interlocutors. The second and third major climatic hazards that affect the physical assets of livelihoods of interlocutors most are flood and hailstorm.

5.1.6.4 The Severity and Frequency of and Vulnerability to Cyclone

Data show that most of the time the impact severity or impact intensity of cyclone on physical assets of their livelihoods is very high as said by the interlocutors. The interlocutors said, sometimes, the impacts severity of cyclone on their physical assets is high.

At the same time, the frequency of cyclone in *Bayer Char* coastal area has been increasing for last ten years. At the same time, the severity of cyclone has also been increasing day by day.

The vulnerability of households to cyclone is very high as said by the interlocutors. From study data, it is observed that cyclone impacts the physical assets of livelihoods of *Bayer Char* coastal community most, its impacts severity is very high, frequency is increasing day by day by the increase of global warming and climate change in the world and households vulnerability to cyclone is very high.

5.1.6.5 Empowering House as Adaptation to Cyclone:

Climatic hazards impacted people of *Bayer Char* adopt various strategies as adaptation to climatic impacts on their physical assets of livelihoods as stated by interlocutors. The data point out that the prime strategies the interlocutors frequently use as adaptation to climatic impacts on physical assets of their livelihoods are tree plantation around the house, using iron or brick pillar in house and planting trees in origin areas (upward areas). Other important adaptation strategies to the impacts of climate change induced natural hazards on physical assets of livelihoods of the interlocutors are high foundation of dwelling house, taking loan from various sources as public and private banks, NGOs, relatives etc.

A very surprising and peculiar strategy the people of *Bayer Char* coastal community frequently use as adaptation to climate change induced hazards particularly to cyclone is empowering houses or homes. They stay home during disaster to keep house strong i.e., they think if they leave home and stay outside the home (cyclone shelter or any safe places) their

houses become too weak to face cyclone and the houses become destroyed. So, they stay home to strengthen their houses to fight against cyclone or any other climatic impacts on houses-their beloved physical assets. In a Focus Group Discussion (GGDs) when the interlocutors who stay at home as adaptation to cyclone were asked to explain the reason behind it, Ozifa Khatun, a 75-year-old woman, said, "*Tuaner somoy jon amra gore thai, gor angotten sokti ha, gorer sokti ba, tuan gorere halaite hare na. Amra judi gorere sai soli jai, gor durbol oi ja, sokti komi ja, tuaner loge hare na, gor hoi ja*"- During cyclone when we stay home, house gets power from us, power of house increases, cyclone cannot damage the house. If we leave house, house becomes weak, its power decreases, cannot fight against cyclone, the house becomes damaged. Sokina Khatun (55) and Ramjan Ali (58) supported the statement of Ozifa Khatun.

Khairunnesa, a 83-year-old woman, said in an oral history, "*Khali gorer bitte thaikle oitono, jore jore azan dito o, toile jiner dapa dapi bondo o, gor-bai, gas-gasali, joiner hosol rehai ha*"- Only staying home is not sufficient, have to give Azan (Call in the people to mosque to say prayer), then the reckless races and running of *Gynes* are stopped, houses, trees and the harvest of land are saved.

Besides, the people of *Bayer Char* coastal people adopt some other adaptation strategies to the impacts of cyclone on physical assets of their livelihoods. These adaptive strategies to cyclone are planting and preserving homestead forest to protect house from cyclone, building and repairing houses strongly to prepare for seasonal change and cyclone, temporal migration to main land (upward areas) or urban areas. Likewise, there are some techniques the interlocutors most frequently use as an adaptation to cyclone as food and medicine storage as dry food, safe water, life-saving medications, raising platform for livestock/cooking, accessing to and interpreting of warning signals, reducing expenses by changing consumption as reducing the number of meals, buying land and building houses in upward areas and trying to ensure surpluses or savings. Moreover, there are techniques the interlocutors, sometimes, use as adaptation to cyclone as doing handicraft activities, taking loan, preserving fuel wood and trying to keep the animals safe, improving, constructing or rehabilitating terrace and subscribing insurance policy like life insurance, house insurance, grain insurance or livestock insurance.

Table-5.5: Climate Change Impacts on Physical Assets of *Bayer Char* people and Their Adaptation Strategies

Major Impacts (Losses and Damages) on Livelihoods		Adaptation Strategies	Most Affecting Climatic Hazards and Time
Livelihood Asset	Description of Impacts		
Physical Asset	<ul style="list-style-type: none"> • Damage of house and homestead land • Lack of shelter and • Become climate refugee 	<ul style="list-style-type: none"> • Stay home during disasters to keep house strong • High foundation of dwelling house • Taking shelter on river embankment and cyclone shelter • Temporal migration to origin areas • Access to and interpretation of warning signals 	<ul style="list-style-type: none"> • Cyclone: Bhadra-Ashyin , autumn) Kartik-Augrahan , late autumn) Baishakh-Jaishthya , summer), • Floods: (Asar-Srabon, rainy season)
	Scarcity of house building materials	<ul style="list-style-type: none"> • Tree plantation in origin area (where they migrated from) 	
	<ul style="list-style-type: none"> • Damage of preserved essential seeds and foods 	<ul style="list-style-type: none"> • Preserving essential foods and seeds under the ground of house. 	

(Field Work, 2021-2022)

5.2 POVERTY AND ADAPTATION TO CLIMATE CHANGE

5.2.1 Natural Assets and Poverty

The inhabitants of *Bayer Char* are landless or marginal land owners. The inhabitants who settled first here got 1.50 acre (150 decimals) land jointly (husband and wife) from government by document settlement and by rules they are not able to sell the land in their need. Most of interlocutors said their parents got 150 decimals land by document settlement but after the death of their parents this land has been divided among the heirs and now most of them have only homestead land they have no cultivable land. They also informed that in getting this land they or their parents had to give the *Neta* (local leader) money, grains and sometimes, they had to give the labour in the land of *Neta*, sometimes, they had to fight for *Neta* against other *Neta*. Even these exchange processes are going on from generation to generation. Most of the interlocutors are leading a slave life in *Bayer Char* coastal area based on land ownership. The interlocutors informed that they do not get sufficient safe drinking water in *Bayer Char* coastal community. Even, most of the time of the year, they do not get sufficient safe water. They use the water of pond, canal, river and the water of low land which are severely unhealthy for them and cause different types of water borne diseases. They are facing insufficiency of energy to cook food and enlighten their house at night. They generally use cow-dung, dried leaves, straw etc as source of cooking fuel. So, considering the natural assets, the people of *Bayer Char* are poorest of the poor. They are facing income and human poverty.

5.2.2 Material Assets and Poverty

Climate Change, Less Income and Failure to Meet Basic Needs: Data show that most of the interlocutors' profession is agriculture, most of them have been engaged in this profession for more than 15 to 20 years and they produce different agricultural crops but they do not get expected production and face loss in cultivation due to different impacts of climate change.

They face less income in the whole year but in autumn and rainy seasons they face the difficulty of less income most as said by the interlocutors. They have been facing the difficulty of less income for last ten years and they cannot afford to meet basic needs as food, cloth, shelter for their households. Sahjahan, a 50-year old day labourer, said, "*Huda gorib one inane aisi ar thai. Hat bori saerga bat khaitarina, bat khaito boile holaine bat loi kore kamba kambi. Inanne angu bakher ak obosta, angu Mabud sa keu nai*"- Only being poor, we come here and live. We cannot eat a little rice filling our bellies. When sit for having rice, children quarrel with rice. Here we all have same condition, we have none but Allah.

Climate Change and Acute Food Shortage: The members of households of *Bayer Char* community are not getting sufficient food. Before ten years, the amount of production was more because then the amount of soil salinity, the frequency of tidal surge, cyclone and flood were less. Then, they would face the shortage of foods in a definite time of the year especially in autumn but for the last few years their households face acute food shortage in the whole year due to impacts of climate change on their material assets of livelihoods. Even, now the interlocutors often remain anxious about the next meal for their households. They are facing income poverty.

Spending Time in Occupation and Savings: It is almost impossible for the interlocutors of *Bayer Char* community irrespective of their profession and sex and it is absolutely impossible for the interlocutors engaged in agriculture, day labour, home making, driving (rickshaw puller, van driver, motor cycle driver), fishing, household working to save some money, food or grain after meeting the basic needs of their households where they are struggling to meet fundamental needs of their households. Savings is very crucial for interlocutors of *Bayer Char* coastal people to face the critical time of climate change induced natural hazards and disasters as said by the interlocutors. The interlocutors generally spend about 10 to 12 hours a day in their profession but to ensure savings they spend 12 to 14 hours a day in their profession. In spite spending 12 to 14 years a day in profession very few of them (most of them engaged in service, business) are able to save some money and food and the amount of yearly savings is very negligible as almost 5000 to 10,000 taka. But it is more disappointing that there is no any bank in *Bayer Char* coastal area to save the money. As a result, these interlocutors though they are very few, save the money in their own house or in their relatives' house. So, their savings system is very vulnerable.

5.2.3 Human Assets and Poverty

Poverty, Superstition and Lack of Qualified Physicians: Qualitative data point out that the interlocutors of *Bayer Char* community generally do not go to union or upazila health centre for the lack of money. Jainob Begum, a 70-year old woman, said, “*Tane ru bair oi ja, hoisar lai ougga koiraj deitam harina*”- The breathing is near to be stopped but cannot visit a doctor for the lack of money.

Besides, income poverty they believe it is religiously forbidden to go to health centre. Some of them think there are no qualified physicians in union or upazila health centre. If they take medicine following the suggestions of these physicians they will be sicker instead of relief from diseases. Some of them do not go to health centre for the lack of awareness and

knowledge. In *Bayer Char* community, there are some interlocutors who do not believe in modern health system or medicines, they take traditional medicines when get attacked by any diseases. All of these indicate income and human poverty of the people of *Bayer Char* community.

Poverty, Failure to Manage Vaccine for children and Lack of Proper Health Service:

Most of the interlocutors of the study could not manage to vaccinate their children for the lack of money irrespective of their educational qualifications. Sometimes, they cannot vaccinate their children for the unavailability of vaccine in their area. Besides, they cannot vaccinate their children for the lack of awareness, religious superstition and lack of knowledge about vaccination of children. In *Bayer Char* community, there are some interlocutors who do not believe in vaccination of children but they follow traditional medicines like religious rites, exorcism, amulet or water of exorcism etc to expel an evil spirit or cure a disease of their children.

The main point is the households of interlocutors of *Bayer Char* coastal community do not get the minimum level of proper health service which indicates their acute human poverty. The interlocutors do not practiced family planning for many causes. The first and foremost cause is income poverty or their economic inability to buy the family planning or contraceptive devices. Another main cause is religious superstition. The inhabitants of *Bayer Char* believe that family planning religiously forbidden. Allah sends human beings in the world and All arranges the food of human beings. As Kulsuma Khatun, a 60-year old female member of NGO said in an indepth interview, “*Nahormainna kota koienna, bori khan haram, je khasi oibo tar lai besto nai, pat je da khaon o hete da*”- Do not utter the speech of disobedience. To eat contraceptive tablets is *Haram* (religiously forbidden), Heven is forbidden for those who will be vasectomized. The food gives who gives belly. Peara Begum (65) and Samsunnahar (58), other two female members of NGO, supported the speech of Kulsuma Khatun. Other causes of not using contraceptive devices or not practicing family planning are lack of awareness, lack of knowledge and unavailability of family planning devices in the char. Some interlocutors (including male and female) informed that they do not use contraceptive devices because they cannot buy it from the shop for shame as Ratan Mia, a 32-year old fisherman said in an FGD, “*Doanner ten agin kinte loijja lage, tai mon saileo lagaitarina*”- Feel ashamed to buy it (contraceptive devices as condom), so I cannot use it (condom) though mind wants to use. Saddam Hussein, a 37-year old fisherman, supplemented the speech of Ratan Mia saying, “*Aginer dam bistor beshi, abar amra thai*

gange gange, agin hai koi?”- The price of these (contraceptive devices) is very high; besides, we live in rivers, where do we get these?

Poverty and Lack of Education: The children of most interlocutors did not or do not go to educational institutions as schools, colleges or madrasahs irrespective of parents' educational qualifications. There are many causes of not going to educational institutions but the first and foremost cause of not going educational institutions is poverty as mentioned by the interlocutors of the study. Other major causes of children's not going to educational institutions are lack of educational institutions and social system of *Bayer Char* coastal people. There are some interlocutors who said their children did not or do not go to educational institutions because they think education is unnecessary for children. They think education does not help the children to earn their livelihoods. As Arobindo Das, a 57-year old man, said, *“hoa la kori lab nai, ga khadi hat chalaio o”*- There is no benefit in reading and writing, to earn livelihoods body is to use. Here, it is seen that, the negative conception about education lies in the mind of all people of *Bayer Char* community irrespective of their religiosity. The reasons behind it are impact of acute poverty, lack of consciousness and aggravation of poverty state by the impact of climate change.

5.2.4 Poverty and NGOs Membership as Social Assets: A Net of Exploitation

Netherlands based Char Development and Settlement Project (CDSP) has been working here for twenty years in cooperation with PNGO- Bangladesh Rural Advancement Committee (BRAC). Under BRAC 5 local NGOs-Noakhali Rural Action Society (N-RAS), *Unnayan Parikolpanay Manush* (UPAMA), *Dwip Unnayan Songstha* (DUS), *Sagorika Samaj Unnayan Sangstha* (SSUS) and Homeland Association for Social Improvement (HASI) are working in *Bayer Char* coastal community. Most of the interlocutors of *Bayer Char* community are members of these Non Government Organizations (NGOs). They take the membership of these NGOs jointly (in group/*Dal*) and individually for financial help and protection during climate change induced impacts on their livelihood assets. Sometimes, NGO membership is considered as source of power in the char. NGO members are the more powerful than the general inhabitants. Some interlocutors said they took NGO membership because it was obligatory for them to be registered as members of NGOs after the death of their parents who were the NGO members and the loan they took from NGOs was unpaid due to compound high interest. Though NGO membership should have been the social assets for them, it is now a liability for them for very high and compound interest. NGOs are exploiting

the inhabitants of *Bayer Char* in the name of help. The interlocutors have been caught in a net of exploitation. It is impossible for them to get rid of NGOs' exploitation. Though to get rid of poverty and to adapt to climatic impacts successfully the interlocutors became registered in NGOs, NGOs membership exaggerates their state of poverty now. As NGOs may be considered as emerging petty bourgeoisie of Marxian theory, the poverty situation of *Bayer Char* coastal community will be deteriorated in future and their adaptation strategies to climate change will be more insecure and vulnerable.

5.2.5 Poverty and Physical Assets of Livelihoods

The houses of interlocutors are very vulnerable to climatic hazards especially cyclone, flood and hailstorm as house walls in *Bayer Char* are built by tin, straw, leaves and polythine; house roofs are built by straw, tin and leaves; the house floors are *cancha* (built by mud). About all houses have two rooms or only one room in the char. So, the house rooms are not sufficient for the families consist of more than six members. The inhabitants use pit latrine and unpaved latrine. Their sanitation system is not healthy. For weak house structure, the houses of *Bayer Char* coastal people are very much vulnerable to climate change induced natural hazards. Due to lack of money, the interlocutors cannot strengthen the structure of houses so that the house would be tolerable to climate change induced natural disasters especially to cyclone, flood and hailstorm.

5.2.6 Poverty and Its Relation to Climate Change

Irrespective of educational qualifications about all the interlocutors mentioned them as poor and, according to them, there is a relationship between climate change and their poverty.

Explaining the relationship between climate change and poverty the interlocutors stated some causal explanations. Firstly, climate change causes low production that is the main cause behind their poverty. Secondly, climate change induced flood and tidal surge cause Stalinization in land and water that is one of the main causes of production reduction or poverty. Thirdly, due to climate change, the season changes and soil has become infertile which causes poverty. Fourthly, due to climate change, their livelihood options have been reduced and they have been failed to substitute the reduced livelihood options due to climate change. So, their livelihoods become vulnerable and they become poor.

5.2.7 Poverty and Its Impacts on Adaptation

Qualitative data show that poverty has negative impacts on interlocutors' adaptation strategies to climatic impacts on their life and livelihoods irrespective of their types of

households. Poverty has no any positive impacts on adaptive strategies to climate change. Describing the major negative impacts of poverty on adaptation strategies to climate change the interlocutors mentioned that less income, less access to resources and livelihood vulnerability cause failure to secure basic needs and threaten adaptive strategies to climate change induced impacts. Deen Mohammad, a 59-year old differently able man, said, ***“Hoettek toane gor gan bangi ho, hoisar obabe sokto kori doirtam harina”***- In every cyclone, the house is damaged, for the lack of money cannot build it strongly.

The interlocutors said, due to poverty they failed to respond to water and soil salinity, difficult or failed to livelihood diversification, failed to ensure structural societal change as deagrarianisation or industrialization and failed to buy modern technologies provide weather forecast as smart phone. The impact of poverty is actually presented by the speech of Sodu Mia, a 68-year-old boatman, as he said in a Focus Group Discussion (FGD), ***“Ate hoisanian thaikle, ai roj gar bala thaikle, soje tiki thaun ja, amra sorbo hara obagara inane koto kisimer kaida kori kono rokom bansi asi, ki korum! Janer to kono jaga nai!”***- If paisa and money is in hand, income-earning is good, easy to survive. We destitute-luckless people are somehow alive here adopting many types of strategies. What we will do! No place to go!

Other notable negative impacts of poverty on adaptation strategies are weak social networks crucial for adaptation, very high vulnerability to climate change impacts, weak adaptive strategies due to lack of alternative sources of income, poor social capital as weak familial and social relationships and very hard to help each other during economic and social crises

The researcher was informed that due to being poor the interlocutors are deprived of institutional support as food assistance, loan, training, information from GOs and NGOs. The institutions think their support to poor people will not return any economic profit but loss.

5.3 GENDER, PATRIARCHY AND ADAPTATION TO CLIMATE CHANGE

5.3.1 Gender Role in Water and Fuel Management

Females and female children are the collectors of water from the sources of canal, pond, river and rain used in drinking and household activities and they are the collectors of fuel as straw, cow dung, dried leaves of tree and wood used in every day cooking activities in *Bayer Char* coastal community as informed by the interlocutors.

5.3.2 Gender Role and Preference in Education

Data point out that irrespective of educational qualifications the interlocutors prefer the boys or boy children than girls or girl children because they think boys are the heirs of them. Besides, boys are preferred most to girls because, *Bayer Char* is an acute poverty stricken and climate induced disaster prone area where boys are perceived by the interlocutors to be more helpful to face the crises than girls. Likewise, the interlocutors do not prefer girls for dowry system, a commonly used practice in the char. Fatema Begum, a 42-year old woman said, “*Oh Allah! Jotuk bade bea o kemni*” - Oh Allah! How marriage is done without dowry. Though women play vital role inside and outside the house, women are considered here as an unproductive burden. The parents of *Bayer Char* (irrespective of sex) believe the girls are for others not for the them, as Sohifa Khatun, a 61-year old woman added to the narratives of Fatema Begum, “*Maia holara horer lai, joto tatai horera dan ja to to bala, noile baper mela bipod o*”- Girl children are for others, the more they can be handed over to others, the more well, otherwise fathers have to face different types of risks. Some interlocutors prefer girls to boys because, to them, girls also play vital role in facing crises and adapting to climate change with boys.

At the same way, the interlocutors of *Bayer Char* coastal community prefer boys in education to girls. Even the female interlocutors prefer their boys in education to girls. As Bibi Fatema, a 63-year old woman said, “*Bear hor maiara horer bidai soli jaibo, bedar gore kaj koirbo, holain sain biainbo, hoa la di ki koirbo?*”- After marriage the girls will go to the house of others, will work in the house of husband, will give birth to children, what will do by education?

5.3.3 Gender Role in Production

The interlocutors said there is a gender role in agricultural production especially in different aspects of agricultural production. Besides females’ reproductive role within the house, females play more roles in the most sectors of agricultural production as stated by the interlocutors irrespective of sexes. Females play more role in the sectors of husking, harvesting, and threshing poultry activities, drying, cleaning, boiling, pest controlling, germination, transplant/sowing, livestock rearing. Only in the sectors of trilling, marketing, preparing seed bed, fertilizer using, pond fisheries males play more role than females.

5.3.4 Decision Maker, Income Earner and Patriarchy

Data show that husbands make decisions in family said by the interlocutors irrespective of their sex. There are some interlocutors who said both i.e., husbands and wife jointly make decision in family. Likewise, the income of husbands is generally considered as income in the *Bayer Char* coastal community. Women domestic work is far away; their outdoor income is not considered as income. Most of the time women are considered as unproductive. In some households, the income of wives is considered as income. These households are basically female headed. Some interlocutors informed that in their family, the income of both (husband and wife) is considered as income but the existence of this type of households is very rare in *Bayer Char* community.

5.3.5 Gender Impact of Climate Change

Gender Impacts of Soil and Water Salinity: Males are more vulnerable to soil salinity than females as mentioned by the interlocutors irrespective of their sexes. Likewise, males are affected more by soil salinity than females. In explaining the matter the interlocutors said, as males play major roles in managing the material needs of households as food, cloth etc. and by soil salinity the material assets are impacted most so males are affected more by soil salinity than females. On the other hand, females are more vulnerable to water salinity than males as mentioned by the interlocutors irrespective of their sexes. Likewise, females are affected more by water salinity than males. In explaining the matter the interlocutors said, as females play exclusive roles in collecting the water and managing the cooking activities in the household and by water salinity, the households activities of females are impacted most, so females are affected more by water salinity than males.

Gender Impacts of Cyclone and Tidal Surge: Females are more vulnerable to the climatic impact of cyclone than males as mentioned by the interlocutors irrespective of their sexes. Likewise, females are affected more by the climatic impact of water salinity. Because women gender specific activities as collecting fuel and water, cooking food for the household members, bearing and rearing children and care taking the olds are seriously impacted by cyclone and tidal surge. On the other hand, a substantial number of interlocutors said males and females both are equally vulnerable to and impacted by cyclone and tidal surge.

Gender Impacts of Drought and Insect Attack: Males are more vulnerable to the climatic impact of drought than males as mentioned by the interlocutors irrespective of their sexes. Likewise, males are affected more by the climatic impact of insect attack. The interlocutors explained the matter saying that males play major roles in managing the material needs of households as food. The sufficiency of food depends on sufficiency of food production. By drought and insect attack, the food production is impacted most. So, males are affected more by soil salinity than females.

5.3.6 Gender and Adaptation to Climate Change

Data show that gender plays a significant role in adaptation to climate change as mentioned by the interlocutors. As an exclusive gender role in adaptation to climate change induced hazards like cyclone, tidal surge, soil and water salinity, women preserve fuel wood, use different water purification techniques and are compelled to take NGO membership for loan. Likewise, there are some important gender roles in adaptation to climate change as only women make and save dry food for and during crisis time, maintain households, have to go to relatives' house at mainland, develop home-garden agriculture, have to engage in handicrafts activities, reduce expenses by taking less food or observing fasting in food crises, sell their jewellery during economic crises, sometimes they are obliged to sell, play vital role in poultry business as supporting economic activities for households during climatic crises, keep medicine under mud and spend their surpluses/savings during crises. As Parul, a 57-year-old woman, said, "***Omma! Bansto oile uas thaikto o, hutdola gore to ar uash ran ja na, ora thakto hare ona, amra jara mainyan hola asi angore thakto o, soerle na kulaileo ango kaj korar hor huruser loge bare kaj koerto o, kono समय बाइदो ओ ओरि अबर कओ समय नेजर्टेन सैज्जो ओरि, बान्सेर लै ओरि***"- Oh! To survive fasting is mast and it is not right to keep men in fasting, they are not able to fast. We who are women have to fast. Though the body is not capable, we have to work with men outside the house after finishing our work. Sometimes we are compelled to work sometimes we willingly help, help to survive. Khairnessa, a 60-year old women added, "***Hunen, huddolara na bansle ango mainyan holago kono dam nai***"- Listen to me, if men are not alive, we women have no value.

Beside men, women actively participate in irrigation and agricultural activities, contribute in building embankment and contribute in building seed storage facilities, removing insects from crop leaves by hands. Doing these activities, women play significant role in adaptation to climate change in *Bayer Char* coastal area.

Irrespective of sexes, the interlocutors informed that in adaptation to climate change induced natural hazards, females generally play vital role and the role of females in adaptation to climate change is more than males. As Ramjan Ali, a 58-year-old fisherman, said, "***Mainyan holara nijego gorer kajar hasahasi ango kajgin o koirto o, hego urpe onek sap ho, abar amra sogore thaner समय बन-बोय्ना, दोल, तुआन ओले, मैन्यान होलारा अंगोर लै तेंसेन ओरलेओ बग डुरजोग बाला ओरि समल दे.***"- Females have to do all those work in addition to their housework. Again when we were in the sea and in this time if there occurred any floods, tidal surges and cyclones, though females do tension for us they effectively handle all types of disasters.

On the other hand, the interlocutors have gender preference in adaptation. In formulation and execution of adaptation strategies and techniques, boys are given preference to girls as said by the interlocutors, irrespective of their sexes. The interlocutors always consider the merits and demerits of boys. The life and livelihoods of boys are given priority in adaptation to climate change while the life and livelihoods of girls or daughters are not given priority or not considered especially as the interlocutors think, boys or sons are the heirs of their lineage, without boys or sons their lineage will be cut, there will be no body in the world to mention them, to enlighten a lamp in their homestead.

5.3.7 Climatic Hazards and Patriarchy in Adaptation

Irrespective of sexes and educational qualifications, the interlocutors said that patriarchy plays important role in adaptation to climate change. The interlocutors mentioned some important patriarchal roles in adaptation to climate change induced natural hazards as husbands send women and girls to relatives' house during crises, take the decision in building house, embankment etc. and women just execute the decisions and compelled women to sell their jewellery. Besides, the interlocutors mentioned some other roles of patriarchy in adaptation to climate change as women's parents are compelled to help in crises, husbands decide about staying home or go to cyclone shelter, taking NGO membership depends on husband's decision and women's disaster training and capacity building are interrupted by husbands' decision.

Likewise, husbands decide when, how and which types of strategies will be adopted as adaptation to climate change as informed by both male and female interlocutors. Here, wives are given no scope to express their opinions. As Jobeda Khatun, a 42-year-old woman, said, ***“Ban boinna, tuan so hogol dujogerten nijera bansonerlai bal-baichchha, don sompod bansanerlai ki koirto oibo beggin hurdolara thik kore, angore kota koito dena”***- The males decide everything about what will have to do to save own life, to save the children and wealth from all disasters including floods, cyclones. We are not permitted to talk.

Most of the time wives have no participation in decision making process related to the formulation of adaptation strategies to climate change induced hazards. In *Bayer Char*, women are considered as incapable of participating in decision making process. As Shamsullah, a 65-year-old man, placed argument against Jobeda saying, ***“Are! Ajaira kota bad do, tongore ki kota koito dibo, tongore kota koito dile, tongo kota moto soille, koto age bek tin saker tole thaik tam, tongo buddi handur tole”***-Hey! Exclude unnecessary talk, what will you be allowed to speak of? If you were allowed to make decision and your decisions are followed, long ago we all would go to the grave.

5.4 LOCAL KNOWLEDGE, NETWORKS AND ADAPTATION

5.4.1 Climate Change and Role of Local Knowledge in Adaptation

Local knowledge plays a significant role in adaptation to climatic impacts on life and livelihoods of *Bayer Char* coastal community. Local knowledge plays some major positive roles in adaptation to climate change as it helps to develop a detailed picture of on-farm events before, during and after the natural disasters, to form a culturally appropriate and sustainable adaptation policy, to ensure understanding the situation quickly, to identify the increasing threats and impacts of climate change and to take the immediate adaptive responses. Explaining the positive roles of local knowledge Abdul Matin a 76-year-old man said, *“Hunen bai, sorkar je siknal de hedar khobor naner ango time ase? Khobor hamuoba korai? Rad kisen jon sunga huna, hedar mela ageito baro ana sara. Amra ango nijer gan di soli ai mosiboter jagai bansi asi. Toi bish bosor age ango onuman baro ana mili jaito, on at ana o mile na.”*- Listen brother, do we have time to know what the government warns? Where do we get the news? 75% losses and damages had happened before the Red Crescent warned by miking. We get survived in this dangerous place based on our own knowledge and experience. Before 20 years our assumption would match with the fact 75%, now it does not match with the 50% of reality. The interlocutors said, before some years, the people of *Bayer Char* would adopt different adaptation strategies to natural disasters and their local knowledge would match the reality completely but now a day 50.0 of their assumptions about natural hazards and disasters do not match the reality. The reasons behind it are the increased impacts of climate change.

Local knowledge enhances farmers' adaptation potentiality to climate variability and changes and helps to reduce the adverse impacts of climate change. Here it is very notable that, local knowledge produces weather and seasonal climate forecasts that are locally relevant and better trusted. The interlocutors said they get agriculture related weather forecast or information from their local knowledge. Other positive roles played by local knowledge in adaptation to climate change are building climate resilience into community and making projects cost-effective financially and socially. Besides, local knowledge empowers communities to form adaptation policy, ensures informed decisions to make. In this context, the narratives of Hazrat Ali, a 78 year-old man are worthy to mention as he added with the narratives of Abdul Matin, *“Gore mela himba uitle ban-boinnaya oi, hensa daikle bo kono tuan ba bipod o. Kutta, ban, goru, sagol, haki beshi daikleo ban boinnyar lokkon, bataser ulta halta sola mani sagore gurni suru oise, bo jor-tuan aitase, mot kota oilo hoshu-haki*

mas, gaser hata beginner basa amra buji jai ar hai hisabe hostuti ni.”- If a lot of ants appear in house, floods occur. The sound of an owl indicates tremendous cyclone or danger. A lot of sounds (loud sounds) of dog, sheep, cow goat and birds are the symbol of floods. If the wind blows randomly, it means the depression has been created in the sea and strong storm or cyclone is coming. The sum up is we understand the language of animals, birds, fishes, the leaves of trees and everything and according to it we get prepared. This result partially fits the study result of Gyampoh, B.A et al. (2007) as the study explored that the appearance of certain birds, mating of certain animals and flowering of certain plants are all important signals of changes in time and seasons that are well understood in traditional knowledge systems. Indigenous people have used biodiversity as a buffer against variation, change and catastrophe. On the other hand, sometimes local knowledge plays some negative roles in adaptation to climatic impacts on livelihoods of *Bayer Char* coastal community as it does not help them to form appropriate adaptation policy, not trusted, misguides them in adaptation to climate change and not helpful in identifying the impacts severity of climate change due to continuous climatic variability. Sometimes, following the local knowledge the interlocutors fall in a big danger. As Sagir Hossein, a 76-year-old Imam of mosque, described in his oral history, *“On obiggota heink kaj dana, aro bipode hoito o.”*-Now experience (local knowledge) does not work so (like the past), moreover (following the local knowledge) we have to fall in a danger.

5.4.2 Climate Change and Role of Local Networks in Adaptation

The interlocutors keep relation with religious institutions, politics, *somities* (Associations), clubs etc as local networks play an important role in adaptation to climate change induced natural impacts on life and livelihoods of *Bayer Char* community. The interlocutors who are 60 years old or more than 60 said, most of the time it play positive roles in adaptation to climate change. The major positive roles played by local networks in adaptation to climate change are managing communal water harvesting/tanks, constructing or reforming traditional bridges, trail, terrace, creating social awareness to restore and preserve homestead forest to reduce erosion, preserving rangeland and restricting grazing, ensuring the access to material and non-material critical resources managed by networks. Besides, networks play some important roles in adaptation strategies to impacts on livelihood assets as making climate resilience into community by developing long-term self-organized adaptation strategies, ensuring access to climate information and providing loan, food assistance before, during and

after the natural disasters and diversifying livelihoods from crop production to off-farm or nonfarm activities.

On the other hand, local networks sometimes have some negative roles in adaptation strategies to climate change as it create dependency, cause socio-economic and political harassment. Besides, the interlocutors mentioned some other negative roles played by local networks in adaptation to climate change as it do not ensure the access to resources need for adaptation and people are exploited by social networks instead of being helped. Describing the positive and negative roles of local networks in their adaptation strategies to climate change Ayesa Begum, a 56-year-old NGO member, said, ***“Songsthar loge thakar bala dig o ase kharap dig o ase, CDSPir under a jegin agin kharab na, ango onek ukar kore, tobe durjoger somoy ora kono ukare aiyana, ar agin ogo kajo no, Mosjider group durjoger somoy ango onek ukare aiya. Ani je ngote asi, nam koitam no, akkare bogus, anre sotkai atkalse, on ar suttam harina. Angor eakbar gola di jokore abar nala di jokore, daikbar keu nai.”***- There are merits and demerits of being connected with Association. Those who are under CDSP are good, but during disaster they do not come in any help and these are not their work. The group, works under mosque’s authority, comes to a big help of us. The NGO which I belong to, will not mention the name, is completely bogus. It has caught me in a trap, now cannot get rid of it. It slaughters us once with the throat and again with the leg. There is none to watch. The study of Mariz, C. supports these findings as the study of Mariz explored that religious groups support individuals and encourage the poor to organize. Groups with shared values are able to develop strategies to adapt to poverty and, ultimately, to transform the social structure. On the other hand, in this study, NGOs can be considered as petty bourgeoisie of Marxian theory by assessing their material origin, political views and role in mode of productions or subsistence life of poor *Bayer Char* community.

5.5 Fishermen and Adaptation to Climate Change

5.5.1 Types of Fishing Profession, Facing Problems and Coping Mechanism

Types of Fishing Profession: Qualitative data show that a notable number of interlocutors are engaged in fishing profession as their primary occupation. Besides, many households engaged in fishing as secondary income sources during lean season of agriculture or crisis time caused by climate change induced hazards. The interlocutors, engaged in fishing, generally catch fish from the river or sea. Some of them sell fish and some produce or cultivate fish. The fishermen who produce fish, general produce shrimp, silver carp and other fishes as tilapia, catfish, grass carp etc.

The Problems the Fishermen Face: The fishermen who sell fish face some problems as deprivation from expected price, harassment by police, high transport cost, price difference through middle man and paying subscription to local leaders or politicians. They basically sell fish from door to door. Besides, they sell fish at local *hut* (market), at the bank of river and to local money lender. In exchange of money, these local money lenders exploit them, compel them to sell fish to them at a lower price and the fishermen are exploited by them being deprived from the appropriate price of fish. The interlocutors who catch fish from the river or sea, most of the time they face robber group in the river or sea and they adopt some highly practiced coping mechanisms as clashing with the robber group and most of the time becoming injured, reaching the safe area quickly. Sometimes, they have nothing to do and loss everything as said by the interlocutors.

Climatic Hazards and Coping Mechanism: The climatic hazards that specially affect life and livelihoods of the fishermen of *Bayer Char* community are cyclone, thunderstorm, tidal or storm surge, excessive fog and hailstorm. Among these natural hazards, cyclone impacts the life and livelihoods of fishermen of *Bayer Char* most as said by the interlocutors.

To cope with the climatic impacts the fishermen adopt different strategies. Their prime coping strategy with climate change induced natural hazards is returning to *ghat* (wharf) from the deep river or sea. Other frequently used coping strategies of fishermen with climatic impacts are bringing the boat into a canal and taking shelter under big trees to save them from hailstorm and thunderstorm after anchoring the boat at the bank of river. It is very important that sometimes, the fishermen are not able to adopt any coping strategies to climatic hazards impact their life and livelihoods. It indicates the lack of knowledge or vulnerable coping

strategies with climatic hazards and livelihood vulnerability of fishermen in *Bayer Char* coastal community.

5.5.2 Special Climatic Impacts Experienced by Fishermen

The fishermen of *Bayer Char* community informed that climate change has special impacts on their life and livelihoods. The most important and special climate change impacts experienced by the interlocutors (fishermen) are endangered natural food cycle of fish, destruction of the flock of fish, inundation of inland aquaculture and fisheries due to storm surges and wave, reduction of fish stocks and reduction of the primary productivity of fish for climate change. Shopon, a 55-year-old fisherman, said, ***“Gange, sagore kui bosor dori jianne jal halai mas haitam on hianne haina, gange hani bai gese, hanite nun bai gese, maser jag nosto oi gese, on masera sonnosa, ager moto jale mas lagena, age jianne dine akbar gange jaile oito on duibar tinbar jaito o, tarpor o ona, songsar salaite kosto o, hiar hor abar dui din hor hor obijan, morar upor khodar ga.”*** -For twenty years where we have been fishing in the river and sea, now we don't find fishes there. The water in the river has increased and the salinity in the water has increased. The flock and breeding place and environment of fish are getting ruined. Now the fishes are scattered. The fishes are not caught in net like before. Before, it was sufficient to go river once a day, now we have to go to river two-three times, in spite of that, it is not sufficient. It is very difficult to run the family. After that, two consecutive days of raids, to slay the slain.

The interlocutors (Fishermen) informed that the size of fish is getting smaller. The weight of the fish is decreasing. So, the way we sell fish by portion, there is a loss. The taste of fish is also decreasing and the taste is not what it used to be. Describing this aspect Korban Ali, a 31-year-old fish businessman, said, ***“Kota kisuna, kiamot kasai gese, maser hoid jeink komi gese, dekteo sodo oi gese. Kismoter ten udi jaitase.”*** - Nothing to speak of, resurrection is near, as the taste of the fish decreased, it has become smaller to look, it is becoming out of luck.

It is also informed by the fishermen who catch fish in the deep sea that the amount of the fish in the sea is decreasing. So, they have to spend extra time in the sea to catch their expected amount of fish. As Shariat Ali, a 58-year-old fisherman, said, ***“Honro bish bosor age tolar loi sogore mas doirto jaitam, goire jan laig tona, sat at dine tolar hurai mas loi aitam. Bait dor kari onno kaj koirte haittam. On sagor onek sense oi gese, sogorer onek goire jaiti o, mas doirte honsish tirish din समय lage.”*** - Before 15 to 20 years, we would go to sea with trawler to catch fishes. We did not have to go deep into the sea. We would come back with the

trawler full of fishes within seven to eight days, we could do other useful things at home. Now the sea has changed a lot, we have to go deeper into the sea; it takes twenty five to thirty days to catch fishes.

Other special impacts of climate change on life and livelihoods of fishermen of *Bayer Char* are less income and food insecurity of families, reducing mixing of water in lakes due to changing temperatures, health injuries-death and familial and social insecurity.

5.5.3 Climatic Impacts and Fishermen Adaptation Strategies

Data show that the interlocutors whose primary profession is fishing adopt special adaptive strategies to climate change induced natural hazards. The major and special adaptation strategies used by fishermen to climatic impacts on their life and livelihoods are access to and interpretation of warning signals, changing profession and reducing expenses by changing consumption (reducing the number of meals) and frequently changing the timing and location of fishing trips as said by the interlocutors (fishermen). As Abdur Rob Mia, a 60-year old fisherman, said, "*Hara din radite ki ko hei dige kan lagai thakto o.*"-We have to listen to the radio all day long to hear what is being said on the radio (about weather). Other special strategies the fishermen adopt as adaptation to climatic impacts are changing target species to fish with higher demand and better prices, selling and delivering seafood directly to customers instead of selling fishes, taking loan from usurers (*mohajon*), making the boat and launch strong (specially strong roof) so that they would be thunder resilient roof, refraining from work and using surpluses/savings during climate change induced crises time, food storage for crises time and selling permanent assets.

CHAPTER SIX

FINDINGS OF THE QUANTITATIVE STUDY

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FINDINGS OF THE QUANTITATIVE STUDY

SECTION ONE: DEMOGRAPHIC CHARACTERISTICS OF THE INTERLOCUTORS

6.1.1 Sex and Religion

Table-6.1 shows that, out of the total interlocutors, a significant number of interlocutors (78.0%) are males while 21.0% are female and only 1.0% is third sex (*Hijra*).

Table-6.1: Interlocutors Based on Sex and Religion (in number and per cent)

Sex						Religion			
Male		Female		Third Sex		Islam		Hinduism	
N	%	N	%	N	%	N	%	N	%
78	78.0	21	21.0	1	1.0	93	93.0	7	7.0

Table-6.1 also points out that from religious aspect a substantial number (93.0%) of interlocutors are Muslim (Islam) while 7.0% of interlocutors are Hindu (Hinduism).

6.1.2 Marital Status and Age of Interlocutors

Table- 6.2 indicates that from age perspective, a substantial number (41.0%) of interlocutors fall between 30 and 45 age group, of them 75.6% interlocutors are married interlocutors who are the 47.0% of married interlocutors and 31.0% of total interlocutors. The second highest number of interlocutors (20.0%) fall between 18-30 age group, of them, 80.0% interlocutors are married and 10.0% are divorced. A narrow figure of interlocutors (4.0%) fall at 75 age or above, of them 100.0% are married. 14.0% interlocutors' age is between 45 and 60. The number of interlocutors fall between 60-75 age group is 10.0%. 11.0% interlocutors' age is less than 18 years; of them, 45.0% are married, which indicates that there is a practice of early marriage in *Bayer Char*. A significant number (66.0%) of interlocutors are married

Table-6.2: Marital Status of Interlocutors Based on Age Group

		Marital Status (in number)						Raw Total
		Married	Unmarried	Widow	Widower	Separated	Divorced	
Age (in years)	<18	5	5	-		1	-	11
	18-30	16	1	1		-	2	20
	30-45	31	1	4	1	-	4	41
	45-60	5	2	3	1	-	3	14
	60-75	5	2	1	1	-	1	10
	>75	4	-	-	-	-	-	4
Column Total		66	11	9	3	1	10	100

Mdn (Married Interlocutors: 66) = 3 5.80, Mdn (Total Interlocutors: 100) = 45.46.

where a narrow figure (1%) is separated. The second highest numbers (11.0%) of interlocutors are unmarried; of them, 45.0% interlocutors fall at age group below 18. The percentages of divorced, widow and widower interlocutors are 10.0%, 9.0% and 3.0% respectively. Explaining the age of interlocutors it is observed that the median age of married interlocutors (66) is 35.8 and the median age of total interlocutors (100) 45.46 while the median age of population of Bangladesh is 26.3 and the median age of global population is 30.3. So, in the present study, the age of 50.0% married interlocutors is below 35.8 years and the age of 50.0% total interlocutors is below 45.46 years at national and global perspective 50.0% people live below the age of 26.3 and 30.3 years respectively. In the study the median age is greater than national and global values because all the interlocutors in the study are heads of the households.

6.1.3 Occupation Based on Sex

Table-6.3 shows that the primary occupation of a substantial number (42.0%) of the interlocutors is agriculture while fishing is 17.0%, day labour is 9.0%. Out of the interlocutors whose primary occupation is agriculture, 92.9% interlocutors are males and only 2.0% are females. The interlocutors whose primary occupation is fishing; of them, 94.1% interlocutors are males and only 5.9% are females. So, agriculture and fishing are male dominated occupations. Out of the total interlocutors, 13.0% are homemakers (Housewife) and all of them are females. So, it can be said that in *Bayer Char*, homemaking is a gender specific activities and females have to play role here. 5.0% interlocutors are engaged in business where males are 80% and females are 20.0%. The interlocutors whose

Table-6.3: Occupation of Interlocutors Based on Sex

	Primary Occupation of Interlocutors (in number)										Total
		Agriculture	Fishing	Day Labourer	Home maker	Business	Driver	Service	Jobless	Household worker	
Sex of Interlocutors (in number)	Male	39	16	8	-	4	5	-	2	4	78
	Female	2	1	1	13	1		1		2	21
	Third Sex	1	-	-	-	-	-	-	-	-	1
Total		42	17	9	13	5	5	1	2	6	100

primary occupation is driving, all are males and no females are related to driving. So, the data indicate that driving (rickshaw pulling, van, auto rickshaw and motor cycle driving) is a gender specific profession in *Bayer Char* and males play role in this profession like other parts of Bangladesh. Out of the total interlocutors, a negligible number (1.0%) of

interlocutors are service holder to which the female is related. No males are related to service. 2.0% interlocutors are jobless; of them 100.0% are males. Among the total interlocutors, 6.0% interlocutors' primary occupation is house working; where a significant number (66.7%) are males who are called *kamla* (Worker) and 33.3% are females who are called *Jhi* (Aunt). The major two primary occupations of *Bayer Char* coastal community are agriculture and fishing. It is supported by the study of Mahbubullah (1996) as he found that the survivability of coastal and char people depends on agriculture and fishing.

6.1.4 Household Size Based on Education

Table-6.4 points out that most of the families (39.0%, 39) have more than 6 members; of them, the highest number (51.2%) of interlocutors are illiterate. Out of the total interlocutors, six-member-family is 32.0% which is the second highest member family; of them, 62.5% interlocutors are illiterate and only 3.0% interlocutors' educational qualification is masters or post-graduation. 20.0% interlocutors have five-member-family, 7.0% have four-member-family and only 2.0% interlocutors' family members are less than four. Out of total interlocutors, a significant number of interlocutors (50.0%) are illiterate; of them, 40.0% interlocutors' family members are more than six, another 40.0% have six-member-family and only 2.0% interlocutors' family members are less than four. 14.0% can sign only, 7.0% can read only, 9.0% are below class eight. Among total interlocutors, 4.0% interlocutors'

Table-6.4: Household Size and Educational Qualification of Interlocutors

		Household Size of Interlocutors (in number)					Total
		<4	4	5	6	>6	
Educational Qualifications of Interlocutors (in number)	Illiterate	1	1	8	20	20	50
	Can Sign Only	1	2	2	5	4	14
	Can Read Only	-	-	2	3	2	7
	Below Class 8	-	-	4	-	5	9
	Below SS	-	4	2	2	2	10
	SSC	-	-	-	1	3	4
	HSC	-	-	1	-	1	2
	Graduation	-	-	1	-	2	3
	Masters	-	-	-	1	-	1
Total	2	7	20	32	39	100	

$$\chi^2=41.86,$$

$$r=-.027$$

$$\bar{x} \text{ of Household Size}= 3.99$$

educational qualification is SSC passed, 2.0% interlocutors are HSC passed and 3.0% are graduates. The interlocutors whose educational qualifications are SSC, HSC and Graduation, of them, 75.0%, 50.0% and 75.0% families have more than six-member family. The interlocutors who passed masters are (1.0%), 100.0% of them have six-member family. Based on the study data it is observed that, the average household size is 3.99 in *Bayer Char* coastal

community which is less than the national average of 4.06 (BBS, 2016). This finding is not supported by the study of ISPAN (2000) as ISPAN found the average household size in char areas larger than the national average. The cause behind smaller size of households in *Bayer Char* is the char is a coastal char, comparatively young families live here as the char is frequently impacted by climate change induced natural hazards and less necessity of larger households as most of the households are landless or have little land to cultivate.

Here, it is observed that the calculated value of χ^2 is 41.86. At 0.05 level of significance and $df= 32$, the table value (critical value) is 43.773 which is greater than calculated value ($\chi^2=41.86$). So, education has no any relation with the family size of *Bayer Char* people. On the other hand, the value of r is -0.02. So, there is a negligible relationship between education and household size in *Bayer Char* community.

SECTION TWO:

CLIMATE CHANGE PERCEPTION AND COPING MECHANISMS

6.2.1 Climate Change Perception and Impacts at National Level

Table-6.5 shows that when all the interlocutors (100) were asked whether they heard about climate change, a significant number of them (96, 96.0%) answered positively, a negligible number (3.0%) of them answered negatively and only 1.0% of interlocutors responded that they did not know about climate change. Out of the interlocutors who answered positively, 47.9% interlocutors are illiterate, 14.6% can sign only and only 3.1% and 1.0% interlocutors' educational qualifications are graduation and masters passed respectively. All the interlocutors who answered negatively or responded as they did not know about climate

Table-6.5: Educational Qualifications of Interlocutors and Their Hearing about Climate Change

		Whether Interlocutors Heard about Climate Change			Total
		Yes	No	Don't know	
Educational Qualifications of Interlocutors	Illiterate	46	3	1	50
	Can Sign Only	14	-	-	14
	Can Read Only	7	-	-	7
	Below Class 8	9	-	-	9
	Below SSC	10	-	-	10
	SSC	4	-	-	4
	HSC	2	-	-	2
	Graduation	3	-	-	3
	Masters	1	-	-	1
Total		96	3	1	100

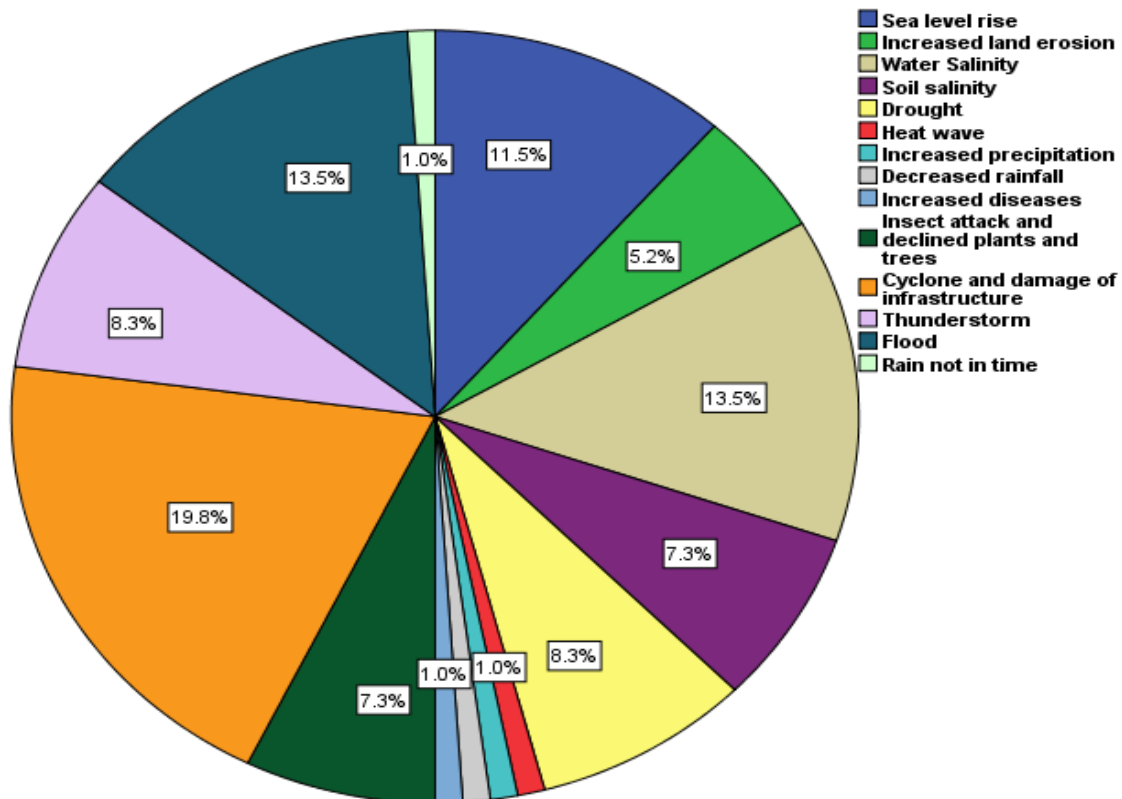
$$(\chi^2=4.167, df= 16, \alpha= .05, t\text{-value}= 26.296)$$

change are illiterate. Here, statistical data show that at $df=16$ and $.05$ level of significance ($\alpha=.05$), the t-value (critical value) is 26.296 i.e., calculated value ($\chi^2=36.646^a$) is less than t-value (critical value). So, alternative hypothesis (H_1) is rejected and null hypothesis (h_0) is accepted i.e., there is no significant relationship between educational qualifications of interlocutors and their hearing about the concept of climate change. It indicates that irrespective of educational qualifications, the people of *Bayer Char* heard about climate change.

Graph-6.1 (Pie Chart) presents that when the interlocutors, who heard about climate change (96), were asked what climatic impacts they heard mainly at national level, the highest number (19.8%) of interlocutors mentioned cyclone and damage of infrastructure and second

highest number of interlocutors mentioned water salinity and flood (13.5% each) as climatic impacts they heard mainly at national level. 11.5% (11) interlocutors mentioned sea level rise as the prime climate change induced impact they heard at national level.

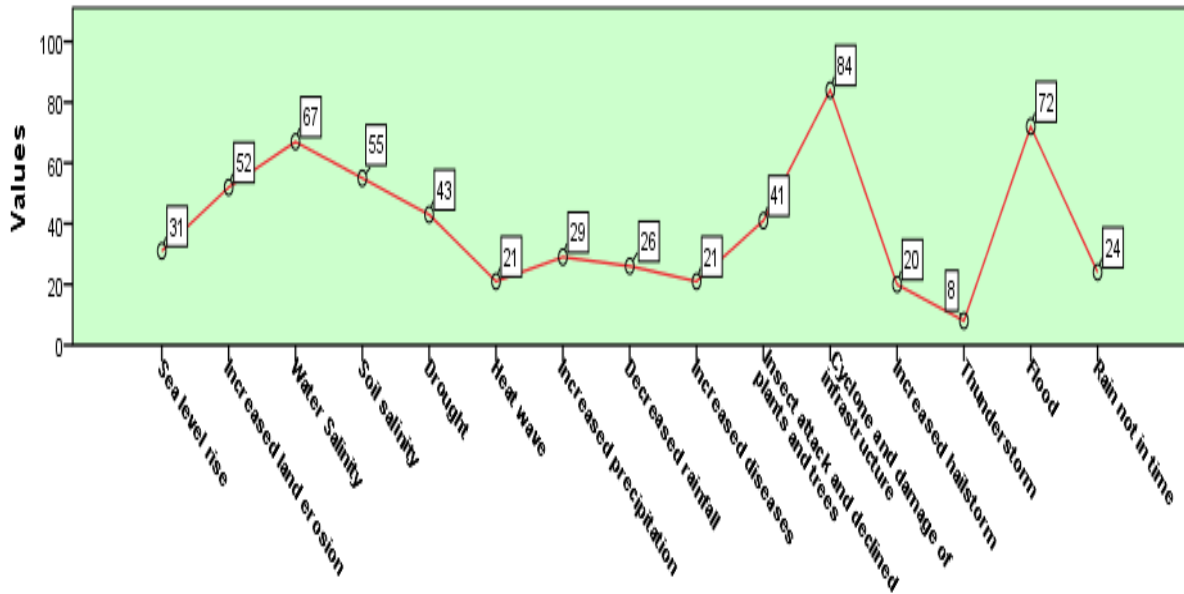
Graph-6.1: Prime Impact of Climate Change interlocutors Heard at National level (in per cent)



Thunderstorm and drought were mentioned by 8.3% interlocutors each. 7.3% interlocutors each mentioned soil salinity and insect attack and declined plants and trees as the prime climatic impacts they heard at national level while 5.2% (5) mentioned increased land erosion. A narrow number of interlocutors mentioned heat wave, increased precipitation, decreased rainfall, increased diseases and rain not in time as the impacts of climate change they heard mainly at national level and the percentage is 1.0 each.

On the other hand, when the interlocutors, who heard about climate change (96), were asked what climatic impacts they heard at national level and they have given the options of multiple responses, the highest number of interlocutors mentioned cyclone and damage of infrastructure which is the 84 (14.1%) out of 594 total multiple responses and second highest number (72, 12.1%) of interlocutors mentioned flood (Graph-6.2). While in single response question 11.5% (11) interlocutors mentioned sea level rise

Graph-6.2: Different Climatic Impacts the Interlocutors Heard At National Level (in frequency of multiple responses)



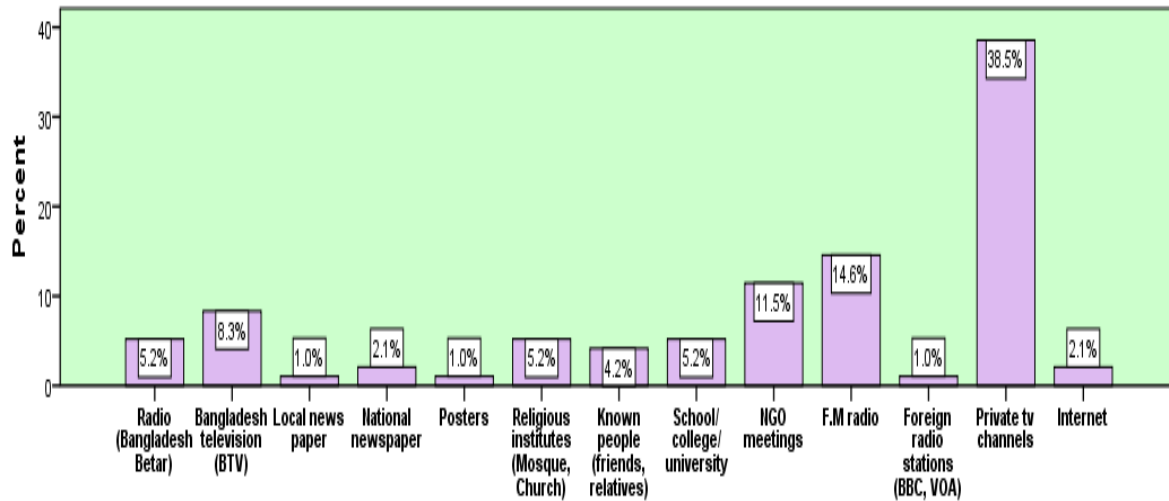
as the prime climatic impacts they heard at national level (Graph-6.3), in multiple responses question only 5.2% (31) interlocutors mentioned it (Graph-6.2). Where in single response heat wave, increased precipitation, decreased rainfall, increased diseases and rain not in time were mentioned by only 1.0% interlocutors each (Graph-6.3) in multiple responses these were mentioned by 3.5%, 4.9%, 4.4%, 3.5% and 4.0% respectively (Graph-6.4). In single response, no interlocutors mentioned hailstorm or increased hailstorm as the prime climatic impact they heard at national level (Graph-6.3) but in multiple response, increased hailstorm was mentioned by 3.4% interlocutors (20 out of 594) as the climatic impacts they heard at national level (Graph-6.4). Out of 594 interlocutors, 52 (8.8%), 67 (11.3%), 55 (9.3%), 41 (6.9%) and 43 (7.2%) interlocutors described increased land erosion, water salinity, soil salinity, insect attack and declined plants and trees and drought respectively as the climate change induced hazards they heard at national level. While in single response, 8.3% (8 out of 96) mentioned thunderstorm as the prime hazard of climate change (Graph-6.3), in multiple response only 1.3% (8 out of 594) interlocutors mentioned it as the climatic hazard they heard at national level (Graph-6.2).

6.2.2 Sources of Knowing the Possible Impacts of Climate Change

Graph-6.3 shows that when the interlocutors, who heard about climate change and were informed of the climatic impacts and hazards (96), were asked about the sources or media of

knowing, a significant number of interlocutors (38.5%, 37 out of 96) shared that they were informed of the climatic impacts through private TV channels. A substantial number of interlocutors (14.6%, 14) shared that they were informed through FM radios, which is the second highest number of interlocutors. The percentages of interlocutors who answered that they were known it from NGO meetings, school/college/university and known people

Graph-6.3: Sources of Knowing the Possible Impacts of Climate Change (in per cent)

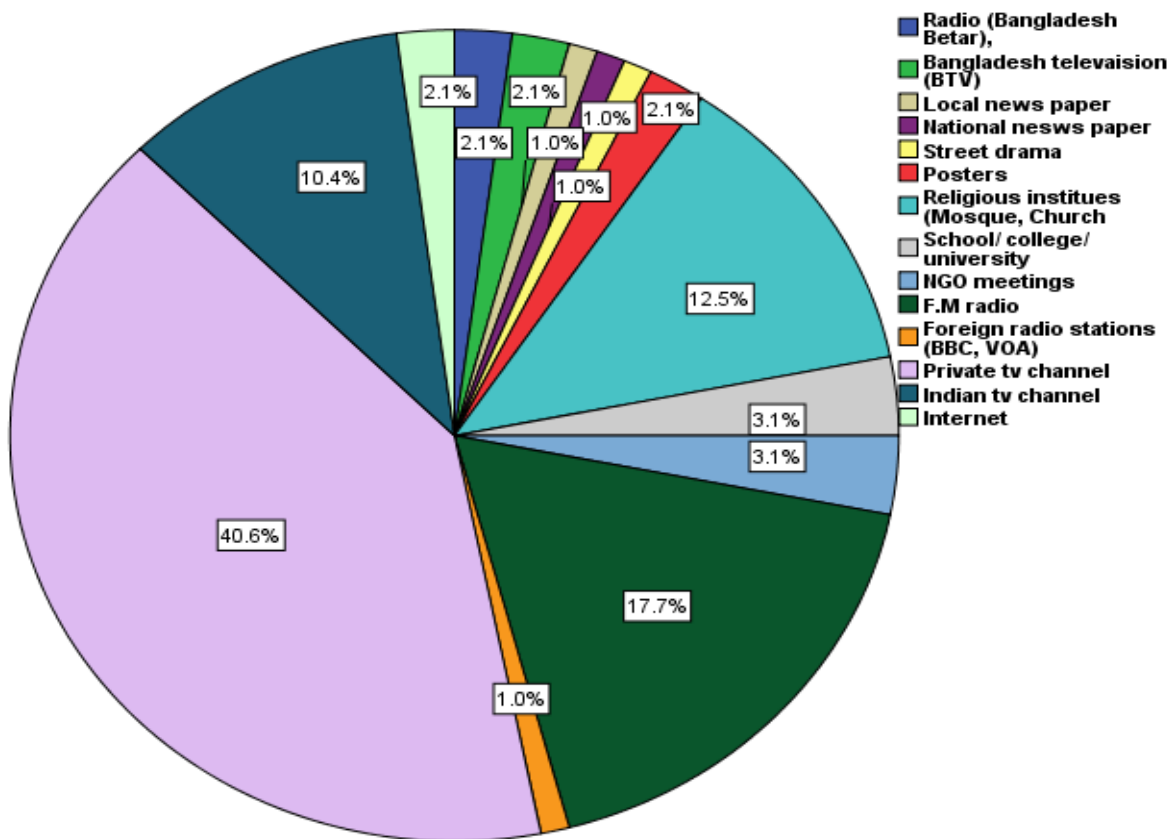


as friends and relatives are 11.5 (11), 5.2 (5) and 4.8 (4) respectively. 8.3% interlocutors said they are informed through Bangladesh Television (BTV), 5.2% said through religious institutes like mosques, temples etc. and 5.2% said through Radio (Bangladesh *Betar*). A narrow figure of interlocutors shared that the sources of knowing the climatic impacts at national level through local newspaper (1.0%), national news paper (2.08%), posters (1.0%), foreign radio stations as BBC, VOA etc (1.0%) and internet (2.1%)

Around the same number of interlocutors stated that they get climate information through private TV channels (38.5%, Graph- 6.3) and they also like it as source (40.6%, Graph- 6.4). Likewise, 14.6% interlocutors' source of climatic information is FM radios (Graph- 6.3) and 17.7% interlocutors like it as source of information about climate change induced impacts. While no interlocutors mentioned Indian TV channels as a source of hearing about climate change and knowing the impacts of climate change (Graph-6.3), 10.4% (10 out of 96) interlocutors shared that they like or want Indian TV channels as a source of information about climate change and its impacts at national level (Graph-6.4). On the other hand, 12.5% interlocutors like religious institutes (mosques, temples and church) as sources of getting

information about climatic impacts at national level where only 5.2% interlocutors mentioned religious institutes as sources of climatic information. It indicates that the people of *Bayer Char* have an easy access to or reliability on Indian TV channels

Graph-6.4: Liking Sources of Interlocutors to Receive the Information about Impacts and Adaptation to Climate Change (in per cent)



and religious institutes. Though 11.5% interlocutors mentioned NGO meetings as source of climatic information, only a narrow figure of interlocutors (3.1%) like it as source of climatic information (Graph-6.4). It indicates that the people of *Bayer Char* may have no easy access to or do not rely on information provided by NGOs.

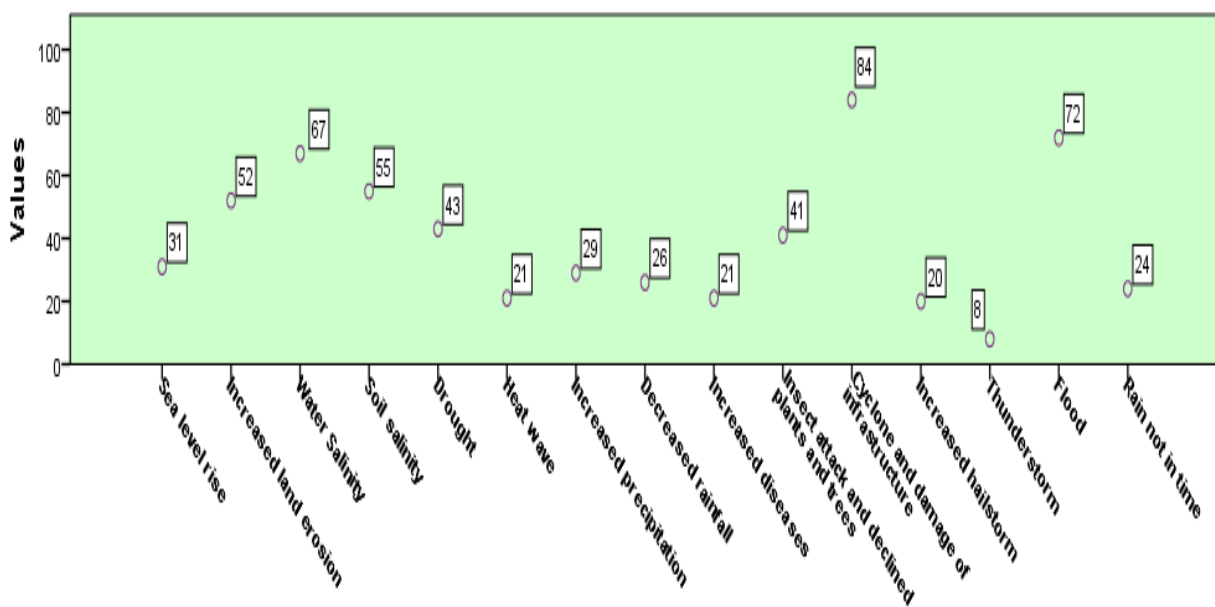
6.2.3 Local Experience of Climate Change Impacts

When all the interlocutors were asked whether they were impacted or experienced by climate change impacts in their locality, 96.0% of them answered positively and only a negligible number of interlocutors (4.0%) answered negatively.

Graph-6.5 points out that when the interlocutors, who were impacted by climate change, were asked what climatic impacts they experienced in *Bayer Char* and they had options of multiple responses, a significant number of interlocutors (19.7%, 69 out of 350 responses) said that

they experienced cyclone and damage of government and private infrastructure as climate change impacts. 15.7% (55 out of 350) interlocutors mentioned flood which is the second highest in multiple responses. 13.4% (47 responses) and 11.7% (41) interlocutors shared that they are experiencing soil salinity and water salinity respectively as climatic impacts. Tidal surge was mentioned by 7.7% (27 out of 350 responses) of interlocutors. Increased land erosion, drought, insect attack and declined plants and trees and increased thunderstorm were stated by 6.0% interlocutors each as the climatic impacts they are experiencing in their

Graph-6.5: Climate Change Impacts Interlocutors Are Experiencing in *Bayer Char* (in frequency of multiple responses)



locality. Only a narrow figure of interlocutors mentioned sea level rise (4.3%, 15 out of 350) and increased hailstorm (3.4%, 12 out of 350) as the climate change impacts they are experiencing in *Bayer Char*. The findings regarding the climatic impacts on natural assets partially support the findings of Crate, S.A. (2011) as her study found flood and precipitation, Hazan, Z. as he found heat waves, heavy rain, wildfire, droughts, and melting of snow and ice and Alam and Rahman as their study explored sea level rise, intrusion of salinity, frequent and abrupt tidal surge, cyclone, water logging, infrastructural damages and internal displacements.

6.2.4 Most Affecting Climatic Hazards, Causes and Coping Mechanisms

Table-6.6 shows that when the interlocutors (96), who experienced climatic impacts in their locality, were asked about the climatic impacts that affect them most and the seasons when

they are affected by climatic impacts most, a significant number of interlocutors (29 out of 96, 30.2%) mentioned cyclone; of them, 51.7 % and 31.3% interlocutors said they are affected by cyclone most in autumn (Bhadra- Ashwin) and summer (Baishakh-Jaishthya) respectively. The second highest number of interlocutors (16.7%) informed that they are affected most by tide or tidal surge; of them, a substantial number of interlocutors said they are affected most in autumn (37.5%) and late autumn (Kartik-Agrahayan, 31.3%). 15.6% interlocutors said they are affected most by water salinity which affects them most in autumn (46.7%, 7 out of 15) and late autumn (40.0%, 6 out of 15). 13.5% interlocutors mentioned soil salinity as the most impacting hazard; of them, 76.9% informed that they are impacted

Table-6.6: Most Affecting Hazards and When the Interlocutors Are Affected Most

		The Seasons When Affected Most				Total
		Summer (Baishakh- Jaishthya)	Rainy season (Ashar- Srabon)	Autumn (Bhadra- Ashwin)	Late autumn (Kartik- Augrahasan)	
Which CC Induced Natural Hazards Affect Them Most	Flood	2		2	3	7
	Cyclone	9	3	15	2	29
	Water Salinity	2	-	7	6	15
	Tide	4	1	6	5	16
	Drought	1	-	1	3	5
	Insect Attack on Crops	3	-	1	1	5
	Thunderstorm	-	-	1	2	3
	Hailstorm	-	-	3	-	3
	Soil Salinity	1	-	2	10	13
Total	22	4	38	32	96	

$$(\chi^2=36.646^a, df= 24, \alpha= .05, t\text{-value}= 36.415)$$

most by it in late autumn. A negligible number of interlocutors expressed that they are affected most by thunderstorm and hailstorm, the percentage of both is 3.2% each. Only 7.3% interlocutors stated that they are affected most by flood which affects them most in late autumn (42.9%, 3 out of 7), autumn (28.6%) and summer (28.6%). Statistical data show that at df=24 and .05 level of significance ($\alpha= .05$), the t-value (critical value) is 36.415 i.e., calculated value ($\chi^2=36.646^a$) is greater than t-value. So, alternative hypothesis (H_1) is accepted and null hypothesis (h_0) is rejected i.e., there is a significant relationship between most affecting climatic hazards and the season the interlocutors are affected by it.

Table-6.7 points out that being asked about the prime causes of climate change, a significant number of total interlocutors (65.6%, 63 out of 96), who were impacted by climate impacts, described the excessive use of fossil fuel (coal, oil, gas etc.) as the prime cause of climate change; of them, 47.6% (30) are illiterate, 15.9% can sign only. 22.9% (22) interlocutors said

deforestation is the prime cause of climate change; of them, 54.6% (12 out of 22) are illiterate. Only 8.3% interlocutors (8 out of 96) said that the cause of climate change is natural; of them, 37.5% are illiterate and a negligible number of interlocutors (3.1%, 3 out of 96) mentioned 'Will of God' as the cause of climate change; of them, illiterate, can sign only and HSC pass interlocutors are 33.3% each. The interlocutors who are masters passed, 100.0% of them mentioned deforestation as the cause of climate change. 66.7% of graduation completed interlocutors stated the cause of climate change is excessive use of fossil fuel and the rest 33.3% stated the cause is natural. The interlocutors who are SSC passed (4), 75.0% (3) of them said the excessive use of fossil fuel and the rest 25% (1) said the cause is natural.

Table-6.7: Causes of Climate Change Based on Educational Qualifications of Interlocutors

		Causes of Climate Change (in number)				Total
		Excessive use of fossil fuel	Deforestation	Will of God	Natural	
Educational Qualifications of Interlocutors	Illiterate	30	12	1	3	46
	Can sign Only	10	2	1	1	14
	Can Read Only	4	2	-	1	7
	Below Class 8	6	3	-	-	9
	Below SSC	8	2	-	-	10
	SSC	3	-	-	1	4
	HSC	-	-	1	1	2
	Graduation	2	-	-	1	3
Masters	-	1	-	-	1	
Total		63	22	3	8	96

$$(\chi^2=34.263^a, df= 24, \alpha= .05, t\text{-value}= 36.415)$$

The interlocutors whose educational qualification is HSC passed, they stated the causes of climate change are will of God and natural, the percentages are 50.0% each. The interlocutors who are illiterate (46), 65.2% (30) of them mentioned excessive use of fossil fuel, 26.1% (12) mentioned deforestation, only 2.17% (1) mentioned will of God and 6.5% mentioned natural phenomena as the causes of climate change. Here, the data indicate that around all the interlocutors rightly addressed the causes of climate change irrespective of their educational qualification. Observing the statistical data, it is seen that, at $df=24$ and $.05$ level of significance ($\alpha= .05$), the t-value (critical value) is 36.415 i.e., calculated value ($\chi^2=34.263^a$) is less than t-value (critical value). So, alternative hypothesis (H_1) is rejected and null hypothesis (h_0) is accepted i.e., there is no significant relationship between educational qualifications of interlocutors and their conception about the causes of climate change.

When climate change impacted interlocutors (96) were asked to state whether they took any coping mechanism with the impacts of climate change, all of them (96, 100.0%) answered positively. At the same time, when these interlocutors were asked to describe the most used types of their coping mechanisms with climate change hazards, the highest number of interlocutors (25.0%, 24 out of 96) mentioned that they take shelter in cyclone centre (Table-6.8); of them, 91.7% are male and only 8.3% are female. The second highest number of interlocutors (22.9%, 22 out of 96) stated their coping mechanism is formation of temporary cluster house on embankment; out of them 68.2% are males and 27.3% are females. 14.6% interlocutors mentioned that they consumed seeds saved for next season; of them, 85.7% are males and 14.3% are females. Eating one meal a day and taking food on credit from a local shop, or use credit to purchase food are mentioned by 12.5% (12 out of 96) each. A narrow figure of interlocutors mentioned they eat two meals a day and take loan as most used coping mechanism to climate change, the percentages of which are 5.2 each. A negligible number of interlocutors said they take no meals a day as the most used coping mechanism to climate

Table-6.8: Most Used Coping Mechanism of Interlocutors with Climate Change Impacts Based on Sex

		Most Used Coping Mechanisms with Climate Change (in number)								Total
		Eat two meals a day	Eat one meal a day	Eat no meals in a day	Take food on credit from a local shop or use credit to purchase food	Consume seeds saved for next season	Take loan	Formation of temporary cluster house on embankment	Take shelter in cyclone centre	
Sex of Interlocutors	Male	5	6	2	8	12	4	15	22	74
	Female	-	6	-	4	2	1	6	2	21
	Third Sex	-	-	-	-	-	-	1	-	1
Total		5	12	2	12	14	5	22	24	96

$$(\chi^2 = 15.453^a, df = 14, \alpha = .05, t\text{-value} = 23.685)$$

change; of them, 100.0% are males (2 out of 2). These findings are almost similar to the findings of Biswas study as he theorized that rural people create their own mechanism for coping with their vulnerability to climate change induced natural hazards. Here, some different coping mechanisms are seen because coping mechanisms and adjustments differ from region to region and local solution is found to the recurrent problems of climatic variability. Here, the data indicate that around all the interlocutors rightly addressed the causes of climate change irrespective of their educational qualification. Observing the statistical data, it is seen that, at $df=14$ and $.05$ level of significance ($\alpha = .05$), the t -value (critical value) is 23.685 i.e., calculated value ($\chi^2=34.263^a$) is less than t -value (critical value). So, alternative hypothesis (H_1) is rejected and null hypothesis (h_0) is accepted i.e., there is no significant relationship between sex of interlocutors and their most adopting coping mechanisms.

SECTION THREE:

CLIMATE CHANGE, LIVELIHOOD ASSETS AND ADAPTATION

6.3.1 Climate Change, Natural Assets and Adaptation

6.3.1.1 Land and Land Ownership Process

Table-6.9 shows that while the highest number of interlocutors (53.0%) are marginal household who have 0.01- 1.0 acre land, the lowest number (3.0%) of interlocutors are medium household who have 3.01- 7.0 acre land. Where the second highest number of interlocutors (33.0%) are landless who may have or have not homestead land but no cultivable land, a negligible number of interlocutors are small households (7.0%) who have 1.01-3.0 acre land and large households (4.0%) who have 7.0 acre land or above.

When the total interlocutors were asked about the ways of getting their homestead land (Table-6.8), a significant number (63 out of 100) of them said that they got their homestead land by local leaders; of them, a substantial number of interlocutors (50.8%, 32 out of 63) are marginal households who are 60.4% of total marginal households (32 out of 53), 33.3% (21 out of 63) are landless and only 7.9% (5 out of 63) are small households who are 71.4% of total small households (5 out of 7), 3.2% (2 out of 63) are medium who are 66.7% of total medium households (2 out of 3) and 4.8% (3 out of 63) are large households who are 75.0%

Table-6.9: Types of Households and the Ways of Getting Homestead Land

		How Got Homestead Land (Nos. of Interlocutors)			Total
		By local leader	By hereditary	By other source	
Household Types (Amount of Land in Acres)	Landless	21	9	3	33
	Marginal	32	17	4	53
	Small	5	2	-	7
	Medium	2	1	-	3
	Large	3	-	1	4
Total		63	29	8	100

$$(\chi^2= 3.931^a, df= 8, \alpha= .05, t\text{-value}= 15.507)$$

of total large households interlocutors (3 out of 4). 29.0% of total interlocutors stated that they got their homestead land by hereditary; of them, 58.6% are marginal household, 31.0% are landless, 6.9 % are small household and only 3.5% are medium household; no large households are in this category. Out of total, 8.0% interlocutors shared that they got their homestead land by other sources as buying, will etc; of them 50.0% are marginal household, 37.5% are landless and only 12.5% are large household. No small or medium households are in this category. Based on the ownership of land, the interlocutors can be considered as poor as said by Ahmed, Z. and Habib, A (2015).

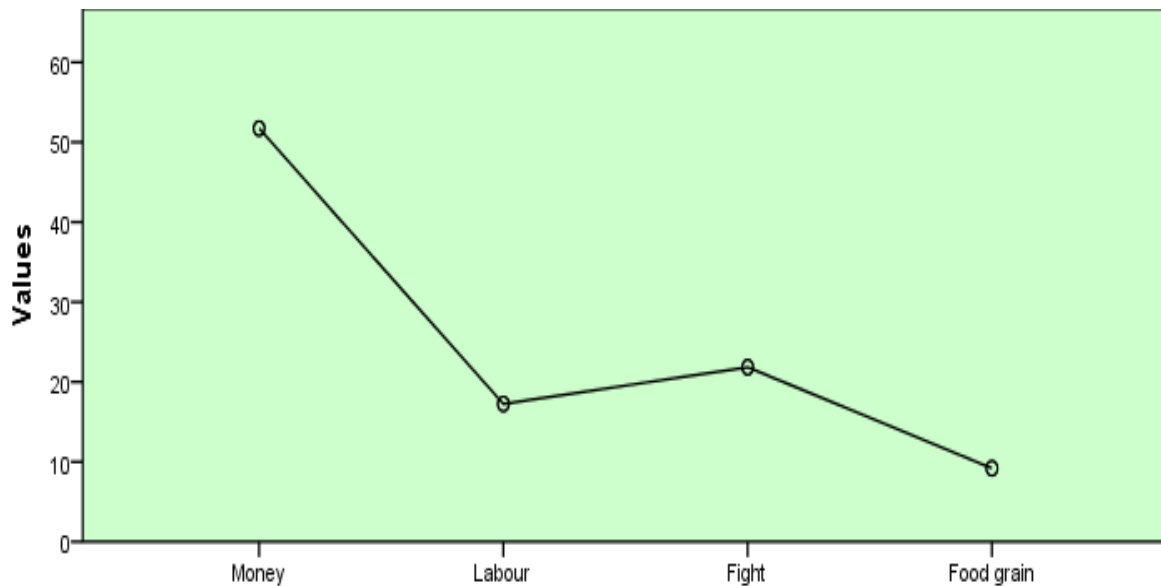
Observing the statistical data, it is seen that, at $df= 8$ and $.05$ level of significance ($\alpha= .05$), the t-value (critical value) is 15.507 i.e., calculated value ($\chi^2=34.263^a$) is less than t-value (critical value). So, alternative hypothesis (H_1) is rejected and null hypothesis (h_0) is accepted i.e., there is no significant relationship between household types of interlocutors and the process of getting homestead land.

6.3.1.2 Exchange of Land and Nature of Exchange

When the interlocutors were asked whether they paid anything in exchange of homestead land, a significant number of interlocutors (87.0%) answered positively and only a negligible number of interlocutors answered negatively. That means, the interlocutors who got their homestead land by hereditary had (have) to pay too in exchange of land and by the change of ownership the payment does not change or the new owners have to pay again.

Graph-6.6 states that when the interlocutors, who said they had to pay in exchange of homestead land (87), were asked what things they had to pay, a substantial number of interlocutors (51.7%, 45 out of 87) mentioned money. 21.8 % (19 out of 87) said they have to

Graph-6.6: Things the Interlocutors Pay in Exchange of Homestead Land (in number)



fight in exchange of homestead land for the leader who manages the land and 17.2% (15 out of 87) said they have to give labour in the agricultural land or fishing boat of the leader. A negligible number of interlocutors (9.2%, 8 out of 87) informed that they have to pay food grain in exchange of homestead land.

Explaining the exchange of land and nature of exchange, present study observed that a land based mode of production or social system exists in *Bayer Char* community where the

leaders who managed the land for landless people are playing role sometimes as feudal lords of feudalistic society and sometimes as petty bourgeoisie of capitalistic society. These leaders may be considered as emerging petty bourgeoisie. As a whole, Marxian theory part and parcel exists in the study of Bangladesh society.

6.3.1.3 Water, Its Sources and Distance

Table-6.10 shows that, in response to the question about the sources of most used water and sources of drinking water; the researcher was informed that highest number (56.0%) of interlocutors' source of most used water is tubewell; of them, all interlocutors' source of drinking water is tubewell. Though 13.0% of total interlocutors informed that their source of most used water is deep tubewell; of them, all said that their source of drinking water is tubewell or shallow tubewell. According to their explanation, the cause behind it is water of

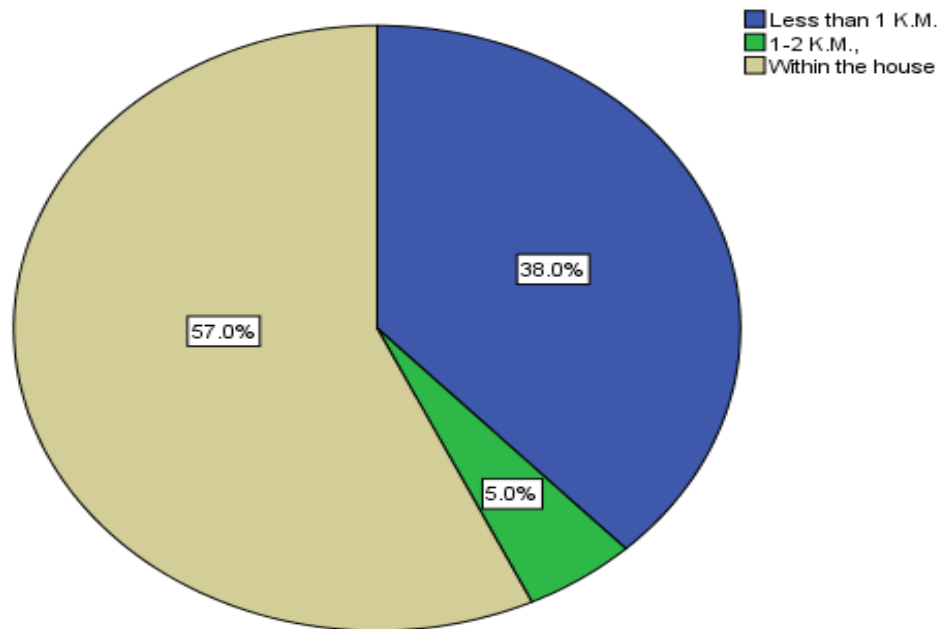
Table-6.10: Sources of Most Used Water and Sources of Drinking Water (Nos. of Interlocutors)

		Sources of Drinking Water						Total
		Deep tubewell	Tubewell	River	Pond	Canal	Rain water	
Sources of Most Used Water	Deep tubewell	-	13	-	-	-	-	13
	Tubewell	-	56	-	-	-	-	56
	River	5	4	-	-	-	-	9
	Pond	6	-	1	3	1	-	11
	Canal	-	-	-	-	-	6	6
	Rain water	-	-	-	-	-	5	5
Total		11	73	1	3	1	11	100

deep tubewell is saltier than shallow tubewell as the deep tubewells get connected with the river or sea water. In spite of that, 11.0% interlocutors informed that their source of drinking water is deep tubewell; of them, 45.5% interlocutors' source of most used water is river and 54.5% interlocutors' most used water is pond. Another 11.0% interlocutors mentioned rain water as the source of their drinking water. Only a narrow number of interlocutors mentioned canal (1.0%), pond (3.0%) and river (1.0%) as the sources of their drinking water. The total interlocutors use tubewell as the source of drinking water are 73.0%. River, pond, canal or rain were mentioned as sources of most used water by 9.0%, 11.0%, 6.0% and 5.0% interlocutors respectively.

Graph-6.7 points out that in response to questions about the distance of the source of their drinking water, the highest number (57.0%) of interlocutors informed that their source of drinking water is within their house where a significant number of interlocutors said that the

Graph-6.7: Distance of Sources of Drinking Water (in per cent)

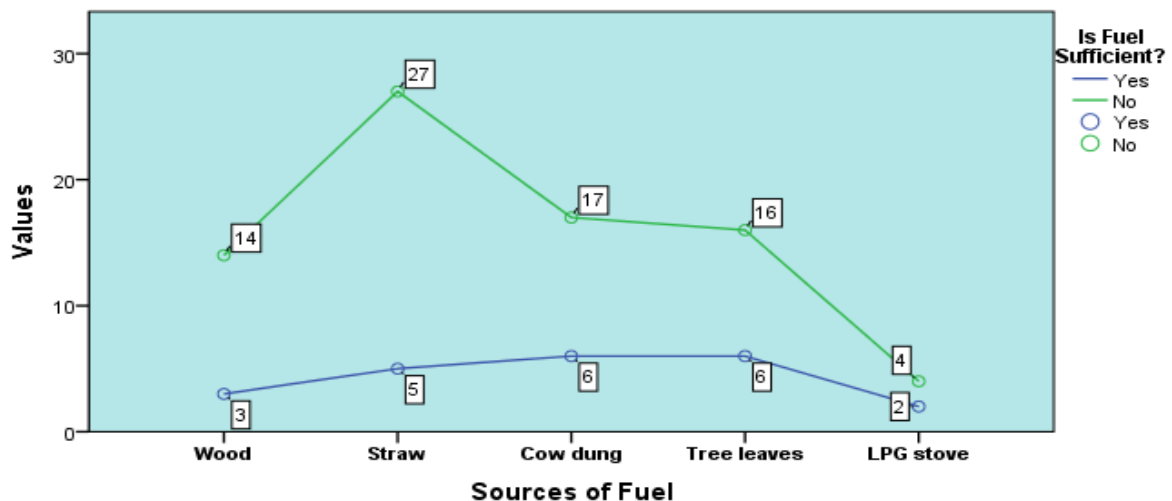


distance of the source of their drinking water is less than one kilometer and only 5.0% interlocutors' distance of the source of drinking water is one to two kilometers.

6.3.1.4 Fuel, Its Sources and Sufficiency

Graph-6.8 shows that, in response to question whether fuel is sufficient or not for their households, a significant number of interlocutors (78.0%) answered negatively while a negligible number answered positively. When the interlocutors were asked about the sources of fuel, the researcher was informed that the highest number (32.0%) of interlocutors' source of fuel is straw; of them, a significant number of interlocutors (84.4%, 27 out of 32) informed that fuel is not sufficient

Graph-6.8: Sources of Fuel and Fuel Sufficiency (Nos. of Interlocutors)

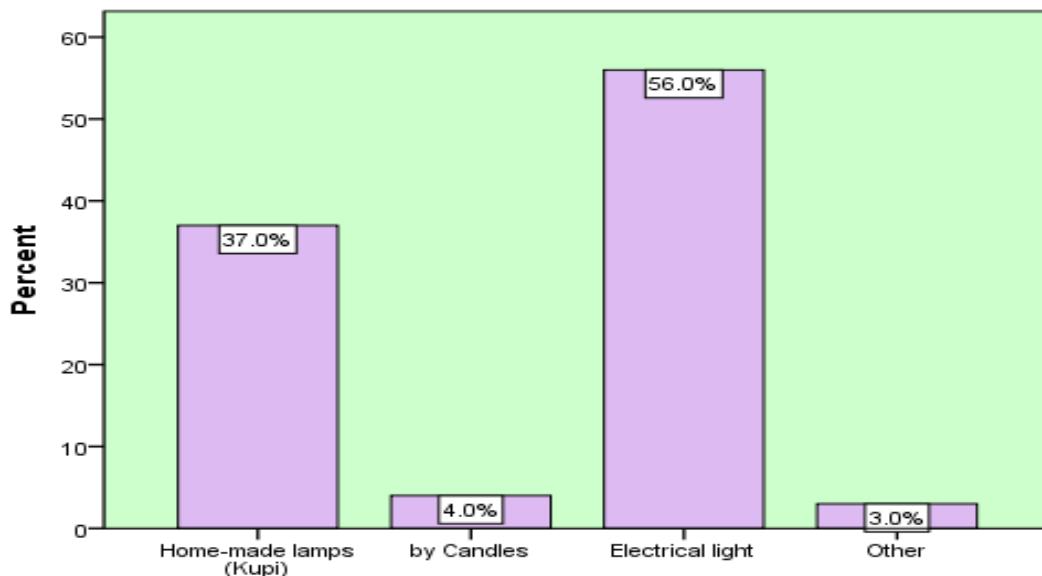


and only 15.6% said fuel is sufficient. The second highest source of fuel is cow dung (23.0%); of them, 73.9% said fuel is not sufficient. In char areas cow-dung is extensively

used as organic manure and fuel as explored in the study of ISPAN (2000). The third highest number of interlocutors said that the source of fuel is tree leaves (22.0%); of them, only 27.3% said fuel is sufficient and 72.7% said fuel is not sufficient. Only 17.0% and 6.0% interlocutors informed that the sources of fuel are wood and LPG/LPG stove respectively. Out of the total interlocutors who mentioned wood as the source of their fuel, 82.4% (14 out of 17) said fuel is not sufficient and only 17.7% said fuel is sufficient for their households. The interlocutors who mentioned LPG/LPG stove as the source of fuel, 66.7% (4 out of 6) of them said about fuel insufficiency and only 33.3% (2 out of 6) said about fuel sufficiency.

Graph-6.9 states that in response to the question how the interlocutors enlighten their houses at night, the highest number of interlocutors (56.0%) mentioned that they enlighten their houses by electrical

Graph-6.9: The Ways of Enlightening Houses at Night (in per cent)



light or electricity. The second highest number of interlocutors (37.0%) informed that they enlighten their houses by home-made lamps (*kopi*). A negligible number of interlocutors said they enlighten their houses by candles and other as solar electricity which is 4.0% and 3.0% respectively.

6.3.1.5 Climatic Impacts on Natural Assets

When the interlocutors (96), who experienced climatic impacts in their locality, were asked whether climate change has any impacts on their natural assets, 99.0% (95 out of 96) answered positively and only a negligible number of interlocutors answered negatively. The interlocutors who answered positively, 52.6% (50 out of 95) are marginal households. All the

landless (32.6%, 31 out of 95), small (7.4%, 7 out of 95), medium (3.2%) and large (4.2%) households interlocutors answered that climate change has impacts on natural assets of their livelihoods. There is only one interlocutor (1.0%) who said climate change has no any

Table-6.11: Household Types and Whether Climate Change Has Any Impacts on Natural Assets of Livelihoods of Interlocutors (Nos. of Interlocutors)

		Is There Any Impacts on Natural Assets? (in numbers of interlocutors)		Total
		Yes	No	
Household Types of Interlocutors (Amount of Land in Acres)	Landless	31	-	31
	Marginal	50	1	51
	Small	7	-	7
	Medium	3	-	3
	Large	4	-	4
Total		95	1	96

$$(\chi^2=.892, df= 4, \alpha= .05)$$

impacts on natural assets and this one belongs to marginal type of households who own 0.01-1.0 acre of land (Table- 6.11). Based on the statistical data it can be said that there is no significant relationship between household types of interlocutors and climate change impacts on their natural assets of livelihoods because here, at .05 level of significance and df=4, the table value is 9.488 which is greater than chi-square (χ^2) value (.892). So, null hypothesis (H_0) is accepted and alternative hypothesis (H_1) is rejected. It indicates that. Irrespective of household types or amount of land of the households, the natural assets of the livelihoods of *Bayer Char* community are impacted by climate change.

Table-6.12 shows that in response to question about the main impacts of climate change on natural assets of livelihood, 25 (26.3%, the highest number) out of total interlocutors (95) who were impacted by climate change induced hazards, mentioned the loss of land by riverbank erosion; of them, 68.0% households are landless. On the other hand, 14.7% (14) interlocutors shared that the main impact of climate change on natural assets is increased land erosion; of them, 28.6% are land less and 35.7% are marginal households. It indicates that climate change induced riverbank erosion has devastating impacts on landlessness of *Bayer Char* people. The second highest number of interlocutors (17 out of 95) informed that increased salinity in drinking water source is the main impact of climate change where a significant number of them are marginal households and only 5.9% (1 out of 17) is large household. The third highest number of interlocutors (16 out of 95) stated increased salinity in cultivable lands as the main impact of climate change where a substantial number

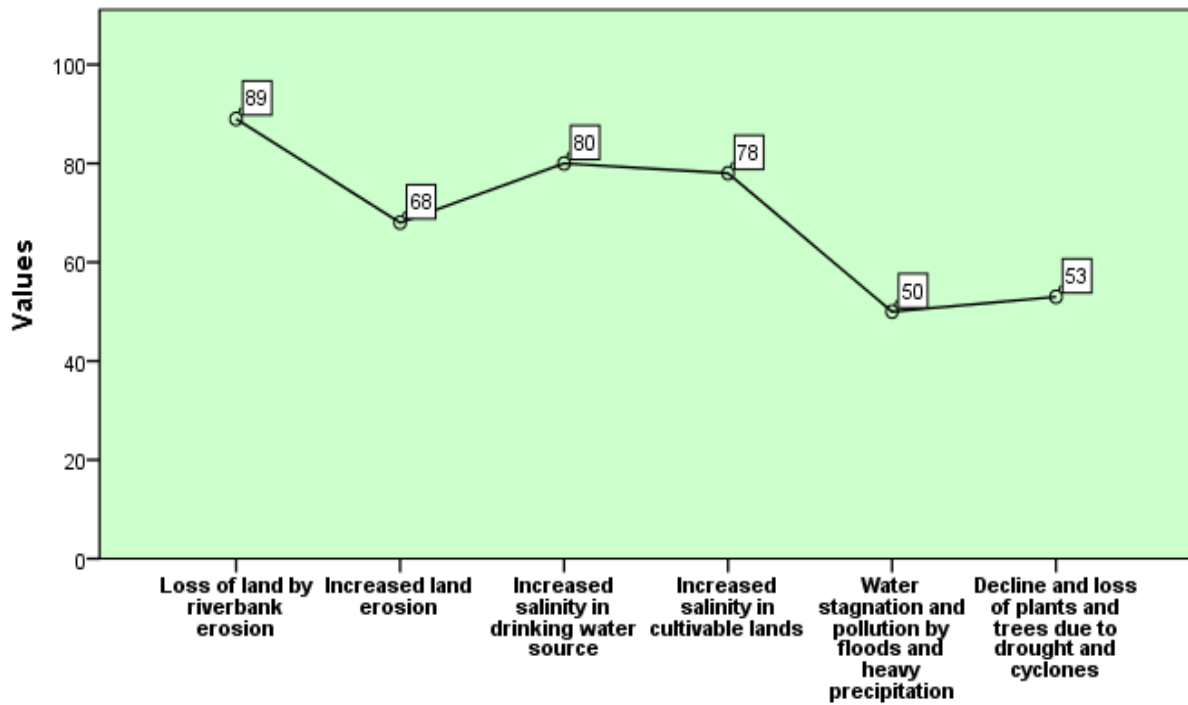
Table-6.12 : Household Types and Main Impacts of Climate Change on Natural Assets of Livelihoods

		Main Loss of Natural Assets (in number)						Total
		Loss of land by riverbank erosion	Increased land erosion	Increased salinity in drinking water source	Increased salinity in cultivable lands	Water stagnation and pollution by floods and heavy precipitation	Decline and loss of plants and trees due to drought and cyclones	
Household Types of Interlocutors (Amount of land in acres)	Landless	17	4	2	4	-	4	31
	Marginal	8	5	11	9	10	7	50
	Small	-	2	1	2	1	1	7
	Medium	-	1	2	-	-	-	3
	Large	-	2	1	1	-	-	4
Total		25	14	17	16	11	12	95

of them 56.3% (9 out of 16) are marginal, 25.0% (4 out of 16) are landless and only 6.3% (1 out of 16) are large households. Here it is observed that 41.1% interlocutors (39 out of 95) mentioned that loss of land due to river erosion and land erosion is the main impact of climate change on their natural assets of climate change; and 34.7% interlocutors (33 out of 95) mentioned salinity in drinking water and cultivable lands as the another main impact of climate change on natural assets of livelihoods in *Bayer Char* community. Besides, 11.6% (11) and 12.6% (12) interlocutors mentioned water stagnation and pollution by floods and heavy precipitation and decline and loss of plants and trees due to drought and cyclones respectively as the main impacts of climate change.

On the other hand, when the interlocutors were asked to describe the general impacts of climate change on natural assets of livelihoods of them and they were given the options of multiple responses, the highest number of responses (89 out of 418, 21.3%) were loss of land by riverbank erosion, 19.1% (80) responses were increased salinity in drinking water sources, 18.7% (78) responses were increased salinity in cultivable lands, 16.3% (68) responses were increased land erosion (Graph-6.10). While in single response, 11.6% (11) and 12.6% (12) interlocutors stated water stagnation and pollution by floods and heavy precipitation and decline and loss of plants and trees due to drought and cyclones respectively as the main impacts of climate change (Table-6.10), in multiple responses, it was 12.0% and 12.68% respectively (50 and 53 out of 418) (Graph-6.10). As a whole it can be said that there is no significant difference between single and multiple responses about the main and general impacts of climate change on natural assets of livelihoods of *Bayer Char* people. Besides, data indicate that climate change induced riverbank erosion has devastating impacts on

Graph-6.10: General Impacts of Climate Change Induced Hazards on Natural Assets of Livelihoods (in frequency of multiple responses)

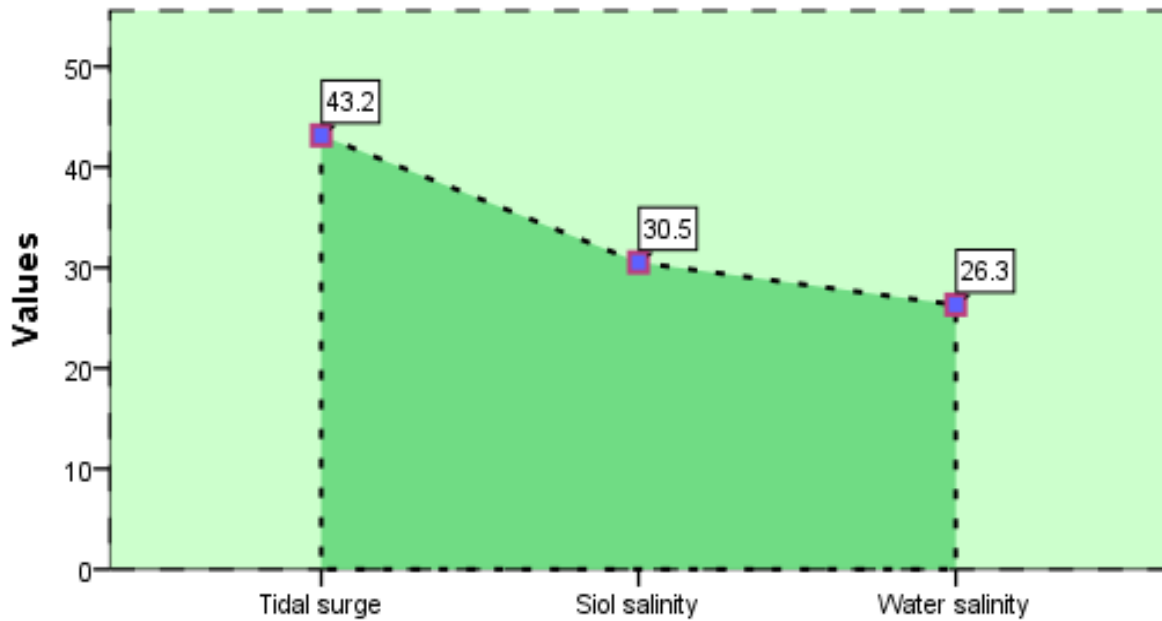


landlessness of *Bayer Char* people and increased salinity in drinking water source and cultivable lands is the most significant climatic impacts on their natural assets of livelihoods. These cause acute hunger and poverty in this area. The findings regarding the climatic impacts on natural assets partially support the findings of Crate, S.A. (2011)

6.3.1.6 Climatic Hazards, Severity, Vulnerability and Natural Assets

Graph-6.11 (Area chart) informs that tidal surge affects the natural assets of livelihoods most in *Bayer Char*, as the highest number of interlocutors (43.2%, 41 out of 95) stated it. As the *Bayer Char* is a coastal area where no permanent embankment is constructed, so the natural assets of this area are frequently affected by tidal surge. 30.5% (29) and 26.3% (25) climatic hazards affected people said the hazards that affect their natural assets most are soil salinity and water salinity respectively. Here we see that the hazards that affect the natural assets of *Bayer Char* coastal people are tidal surge, soil salinity and water salinity. As tidal surge

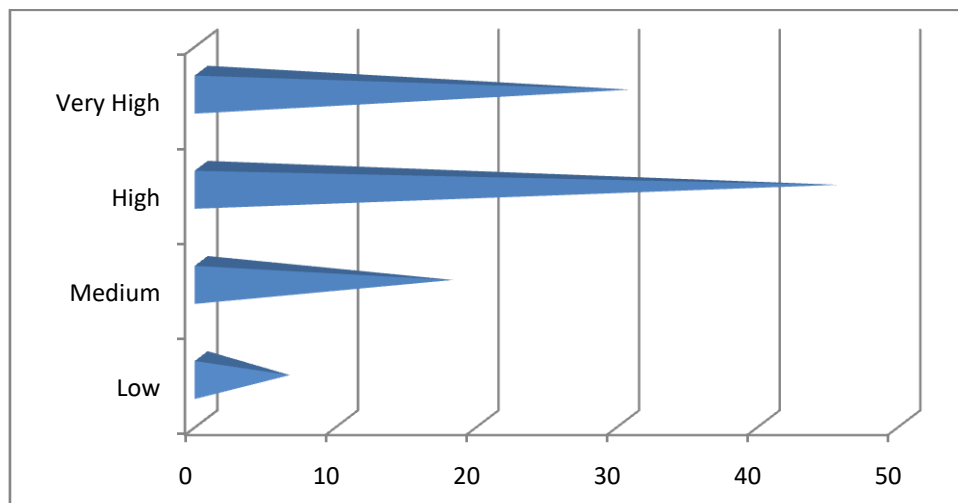
Graph-6.11: Climatic Hazards That Affect the Natural Assets Most (in per cent)



causes soil salinity and water salinity, all of the three are interrelated.

Graph-6.12 states that being asked about the degree of severity of tidal surge, the highest number (45.3%, 43 out of 95) of interlocutors whose natural assets were impacted by climate

Graph-6.12: Degree of Severity of Tidal Surge (in per cent)



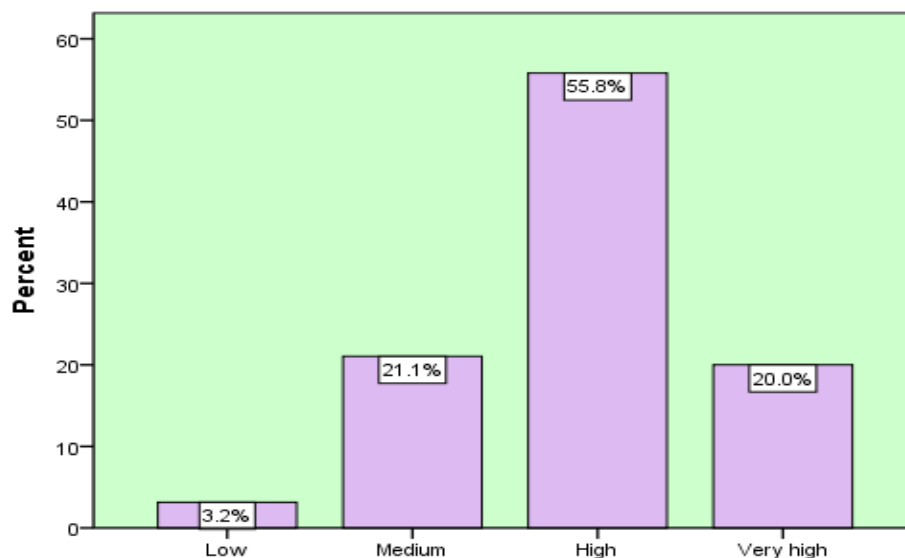
change hazards said that the degree of severity of tidal surge is high while only a negligible number of interlocutors said low (6.3%, 6 out of 95). Likewise while 30.5% (29) said the severity of tidal surge is very high, 17.9% (17) said medium. From the study data, it is observed that, on the one hand, out of all climate change induced natural hazards, tidal surge affects natural assets most (Graph-6.17) and, on the other hand, its degree of severity is high

or very high (Graph-6.18). So, it can be said that tidal surge has the most devastating impacts on livelihood assets of *Bayer Char* coastal people in particular and on their holistic life in general.

At the same time, when the interlocutors who were impacted by climate change induced natural hazards (96) were asked whether the intensity or frequency of tidal surge increased in last 10 years, a significant number of them (80.2%, 77 out of 96) informed positively while a narrow figure (19) informed negatively; the percentage of both categories is 80.2 and 19.8 respectively. It indicates that following the degree of increase of climate change in the world, the degree of frequency of climatic hazards like tidal surge or storm surge and its impacts on life and livelihoods are increasing in coastal area of Bangladesh.

Graph-6.13 shows that in response to the question regarding the degree of severity of soil salinity, the researcher was informed as ‘High’ by the most of the interlocutors (53), ‘Very

Graph-6.13: Degree of Severity of Soil Salinity (in per cent)

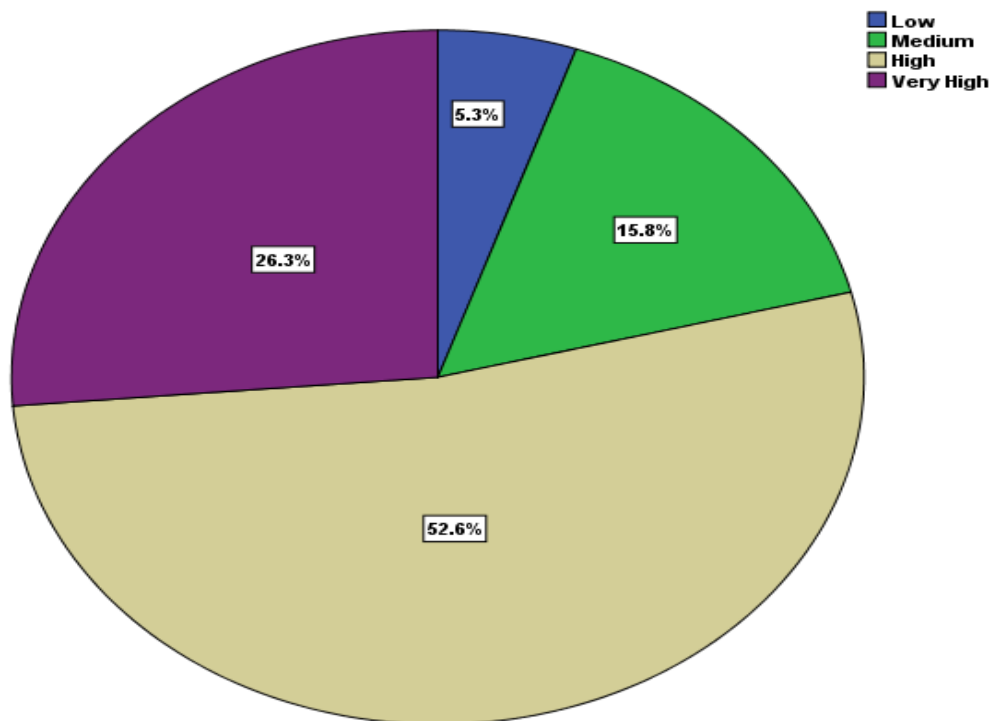


high’ by a substantial number of interlocutors (19), ‘Medium’ by a good number of people (20) and low by a negligible number of people (3). The percentage is 55.8, 20.0, 21.05 and 3.2 respectively. Though soil salinity is the second among the climatic hazards affect the natural assets of livelihoods of *Bayer Char* coastal people, its severity is higher than tidal surge’s. The reason behind it is soil salinity affects material life or basic needs of coastal and char people more than tidal surge.

Graph- 6.14 (Pie chart) shows that when the interlocutors were asked about the degree of severity of water salinity, more than half interlocutors (50) informed that the degree of

severity of water salinity is 'High' and a substantial number of interlocutors (25) informed as 'Very high'; the percentage of interlocutors who said the degree of severity of water salinity as 'High' and 'Very High' is 52.6 and 26.3 respectively. The total percentage of these two categories is

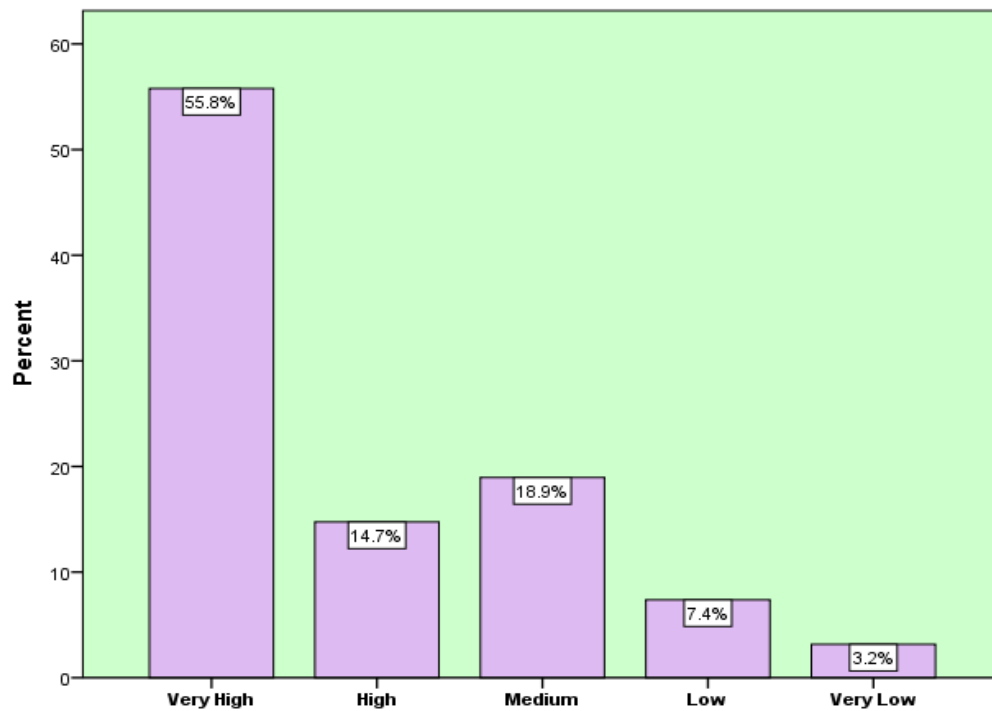
Graph- 6.14: The Degree of Severity of Water Salinity (in per cent)



79.0%. On the other hand, only 15.8% (15) interlocutors mentioned the degree of severity of water salinity as 'Medium' and 5.3% (5, a negligible number) as 'Low'. From the study data it is noticed that the position of water salinity is the third among the climatic hazards that affect the natural assets of livelihoods of *Bayer Char* coastal people most, but its degree of severity is the highest of them. The reason behind it is without safe and pure water human beings cannot imagine a healthy life and water salinity affects seriously not only the material life but also the non-material life i. e., the total life and livelihoods of coastal char people.

Graph-6.15 (Hisrofram) points out that when the interlocutors, who were impacted by climatic hazards, were said to rank their vulnerability to tidal surge, a significant number of interlocutors ranked them 'Very high' vulnerable (53) and 'High' vulnerable to tidal surge; the percentage of them is 55.8 and 14.7 respectively and the total percentage of these two categories is 70.5. On the hand, a narrow figure of interlocutors ranked them as 'Medium', 'Low' and 'Very low' vulnerable to tidal surge, the percentages of them are 19.0,

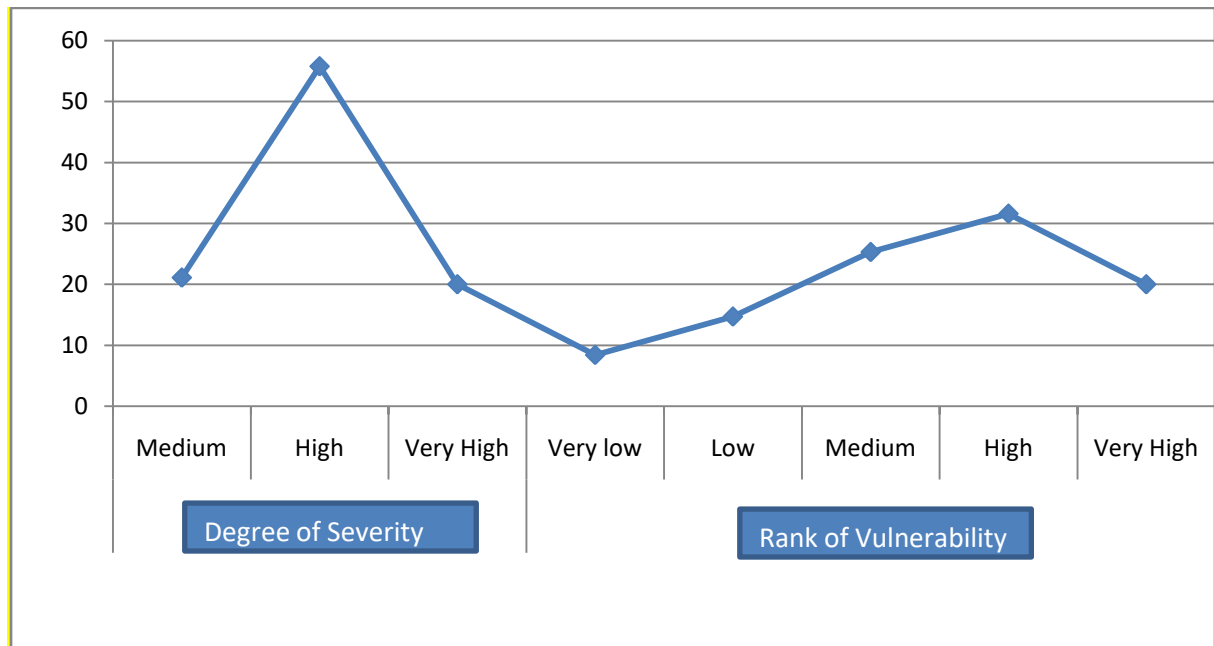
Graph-6.15: Rank of Vulnerability to Tidal Surge (in per cent)



7.4 and 3.2 respectively. The field data show that the *Bayer Char* coastal people are not only impacted most by tidal surge but also they are very high vulnerable to it.

Graph- 6.16 (Line Chart) informs that in response to request to rank their vulnerability to soil salinity, the highest number of interlocutors whose natural assets were impacted by climatic hazards, ranked their vulnerability to soil salinity as ‘High’ while a substantial number ranked them as ‘Very high’ vulnerable; which is 31.6% and 20.0% respectively (Graph-6.13).The second highest number of interlocutors (24) ranked them as medium vulnerable to soil salinity which is 25.3% of interlocutors. On the other hand a negligible number of interlocutors ranked their vulnerability to soil salinity as ‘Low’ and ‘Very low’, the percentages are 14.7 and 8.4 respectively. The collected data show that though the position of soil salinity among most affecting climatic hazards is second

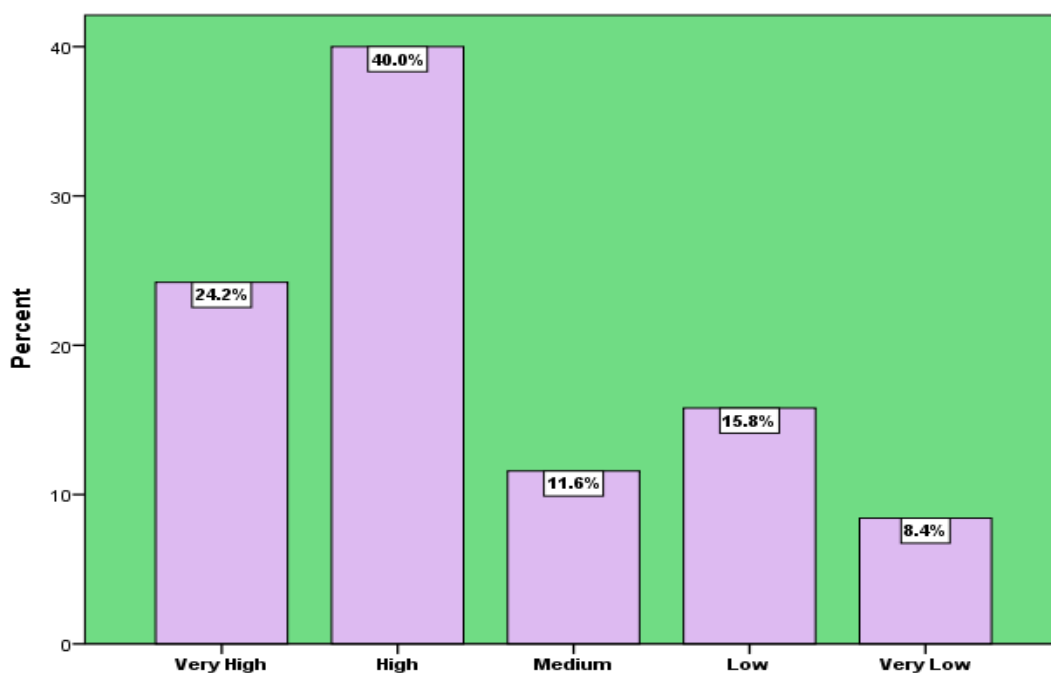
Graph- 6.16: Rank of Vulnerability of Soil Salinity and Its Comparison with Degree of Severity of Soil Salinity (in per cent)



(30.5%, Graph-6.11), its degree of severity and rank of vulnerability were stated as ‘High’ by highest number of interlocutors, the percentages are 55.8 and 31.6 respectively (Graphs-6.13 and Graph-6.16).

Graph- 6.17 (Histogram) states that when the interlocutors whose natural assets of livelihoods are impacted by climate change induced natural hazards were said to rank their vulnerability to water salinity, a significant number of interlocutors ranked their vulnerability to water salinity as ‘High’ (38) and ‘Very high’(23) which is the highest (40.0%) and second highest (24.2%) of the total responses. 11.6% interlocutors ranked their vulnerability as ‘Medium’ 15.8% ranked them as ‘Low’ and only a negligible figure of interlocutors ranked them as ‘Very low’ vulnerable to water salinity (Graph-6.24). Based on the field data it is observed that water salinity is the lowest in position among the climatic hazards affect the natural

Graph-6.17: Rank of Vulnerability to Water Salinity (in percent)



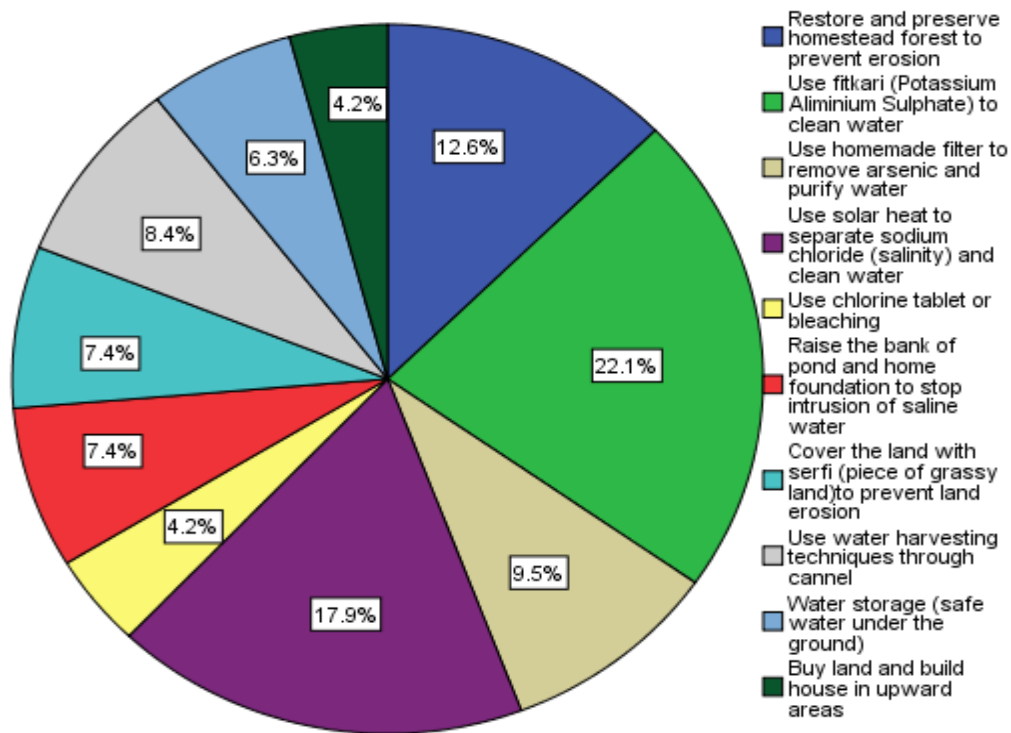
assets of livelihoods most (Graph-6.11) but it stands a significant position from the degree of severity (High 52.6% and ‘Very High’ 26.3%) and people’s vulnerability to it (High 40.0%, Graph-6.14 and Very High 24.2%, Graph-6.17).

6.3.1.7 Adaptation to Climatic Impacts on Natural Assets

Quantitative data show that when the interlocutors whose natural assets of livelihoods were impacted by climatic hazards (95 out of 100), were asked whether they adopt any adaptation strategies to it, all the interlocutors answered positively irrespective of sex, education, ages and religions.

When they were asked to describe the prime strategies they adopt as adaptation to climatic impacts on natural assets of livelihoods, the highest number of interlocutors (22.1%, 21 out of 95) mentioned that they use fitkari (Potassium Aluminium Sulphate) to clean water while the lowest number of interlocutors said they buy land in upward areas and build houses and use chlorine tablet or bleaching to purify water which is 4.2% each (4 out of 95). On the other hand, when the second highest number of interlocutors (17.9%, 17) informed that they use solar heat to separate sodium chloride (salinity) and clean water, a negligible number of interlocutors (6.3%) said they store safe water under the ground. The average number of interlocutors shared they restore and preserve homestead forest to prevent erosion (12.6%), use homemade filter to remove arsenic and purify water (9.5%), use water harvesting techniques through channel (8.4%), raise the bank of pond and home foundation to stop

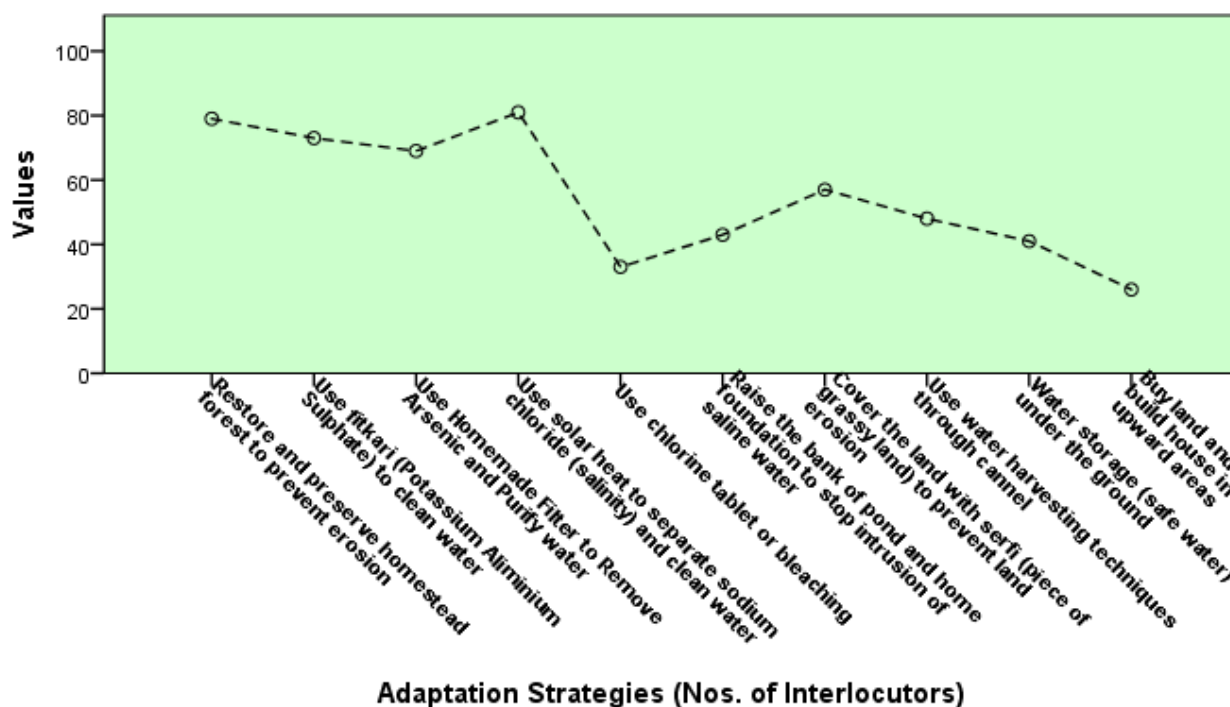
Graph-6.18: Prime Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Natural Assets of Their Livelihoods (in per cent)



intrusion of saline water (7.4%) and cover the land with *serfi* (piece of grassy land) to prevent land erosion (7.4%) as the prime strategies to adapt to climate change impacts on natural assets of their livelihoods (Graph-6.18).

At the same way, when the interlocutors were asked to describe the general strategies they adopt as adaptation to climatic impacts on natural assets of livelihoods of them and they were given the options of multiple responses, the highest number of interlocutors (14.7%, 81 out of 550 responses) informed that they use solar heat to separate sodium chloride (salinity) and clean water while the lowest number of interlocutors (4.7%, 26 out of 550) said they buy land in upward areas to build houses (Graph-6.19, Line Chart). The second and third highest number of interlocutors shared they restore and preserve homestead forest to prevent erosion (14.4%) and use *fitkari* (Potassium Aliminium Sulphate) to clean water (13.3%) respectively. A substantial number of interlocutors informed that they use homemade filter to remove arsenic and purify water (12.5%) and cover the land with *serfi* (piece of grassy land) to

Graph-6.19: General Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Natural Assets of Their Livelihoods

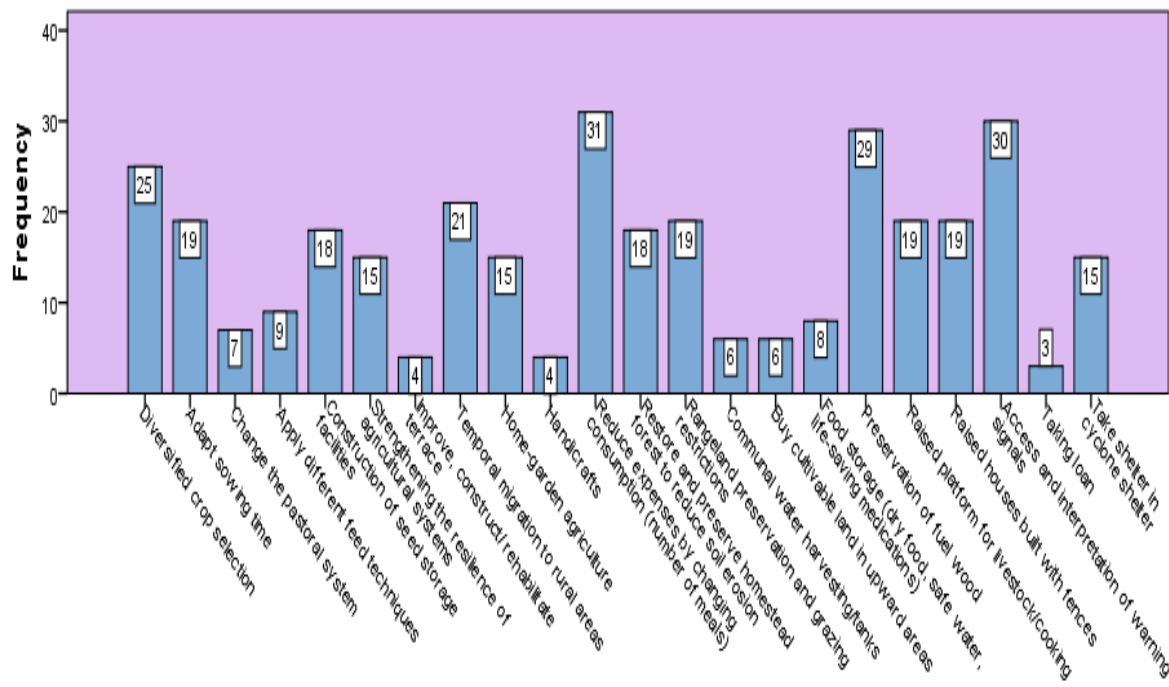


prevent land erosion as the general adaptation strategies to climate change induced impacts on the natural assets of their livelihoods.

6.3.1.8 Climatic Hazards, Natural Assets and Adaptation

Graph-6.20 (Histogram) states that reducing expenses by changing consumption including number of meals is the most frequently used strategy most of the interlocutors (31 out of 340 responses, 9.1%) adopt as adaptation to tidal surge while taking loan is the least frequently practiced strategy which was mentioned by only 0.9% (3 out of 340 responses) interlocutors. Where access to and interpretation of warning signals is practiced by second highest number of interlocutors, only a negligible number of interlocutors practiced improving the construction or rehabilitation of terrace (4) and handicrafts activities (4) as adaptive techniques to the impacts of tidal surge; the percentage is 1.2% each. Preservation of fuel wood and diversified crop selection are the two important strategies a substantial number of *Bayer Char* coastal people practiced as adaptation to tidal surge as tidal surge impacts on two basic needs of char people-energy and food. Besides, the coastal people of *Bayer Char* use different techniques such as adapting sowing time of agriculture to tidal surge intensity and frequency, changing

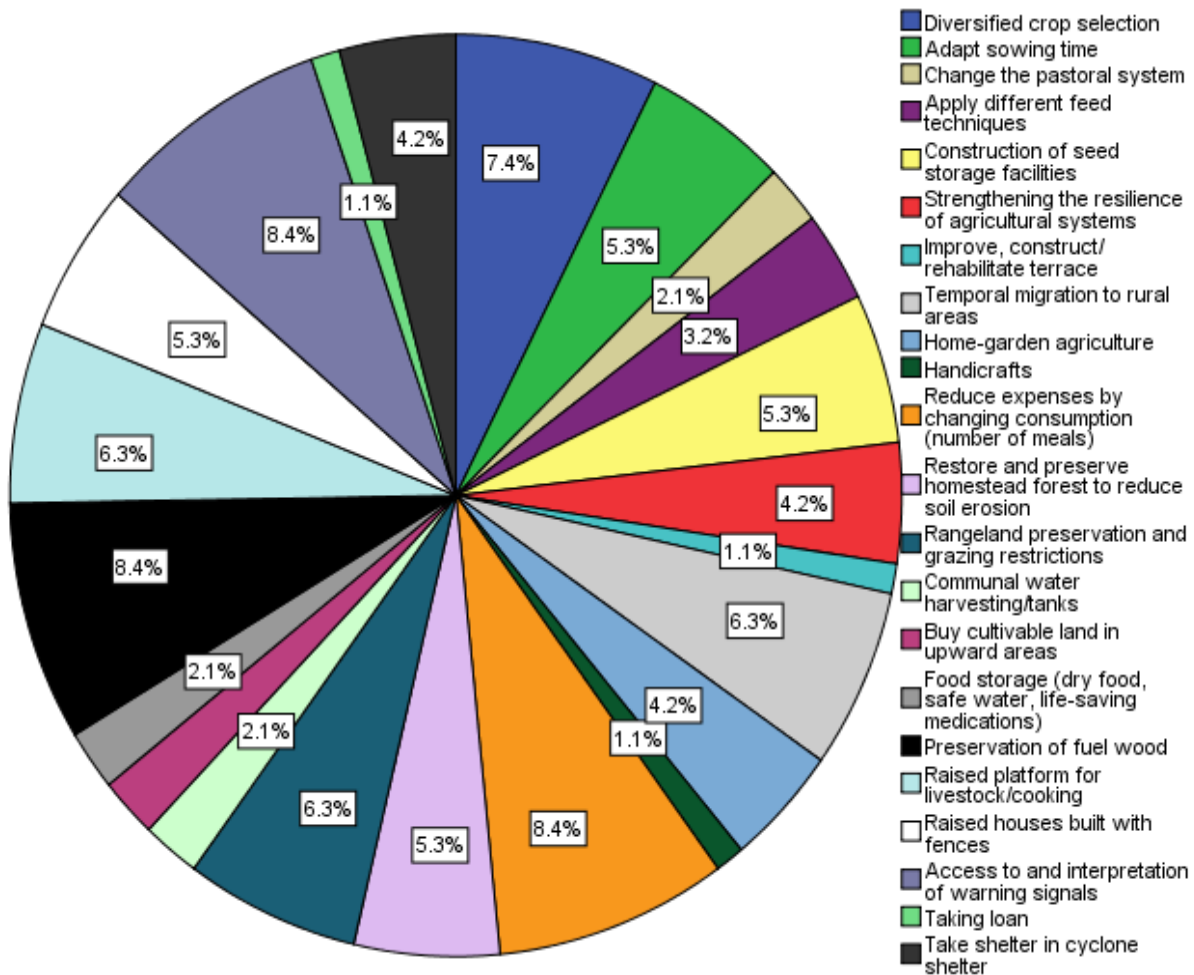
Graph-6.20: General Strategies the Interlocutors Adopt as Adaptation to Tidal Surge (in frequency of multiple responses)



the pastoral system, applying different feed techniques for domestic animals as livestock, hens, constructing seed storage facilities, strengthening tidal surge resilience of agricultural systems, migrating temporarily to rural areas, home-garden agriculture, restoring and preserving homestead forest to reduce soil erosion, rangeland preservation and grazing restrictions for domestic animals, communal water harvesting/tanks for ensuring saline free water, buying cultivable land in upward areas, storing dry food, safe water, life-saving medications, raising platform for livestock/cooking, raising houses built with fences and taking shelter in cyclone centre as adaptation to impacts of tidal surge caused by climate change.

On the other hand, graph-6.21 (Pie Chart) states that in single response, reducing expenses by changing consumption as reducing the number of meals, preservation of fuel wood and access to and interpretation of warning signals related to tidal surge are the three prime strategies the interlocutors use as adaptation to the impacts of tidal surge on natural assets of their livelihoods; the percentage is 8.4% each while in multiple responses it was 9.1% for reducing the number of meals, 8.5% for preservation of fuel wood and 8.8% for access to and interpretation of warning signals. While in multiple responses taking loan (0.9%) is the least

Graph-6.21: Prime Strategy the Interlocutors Adopt as Adaptation to Tidal Surge (in per cent)



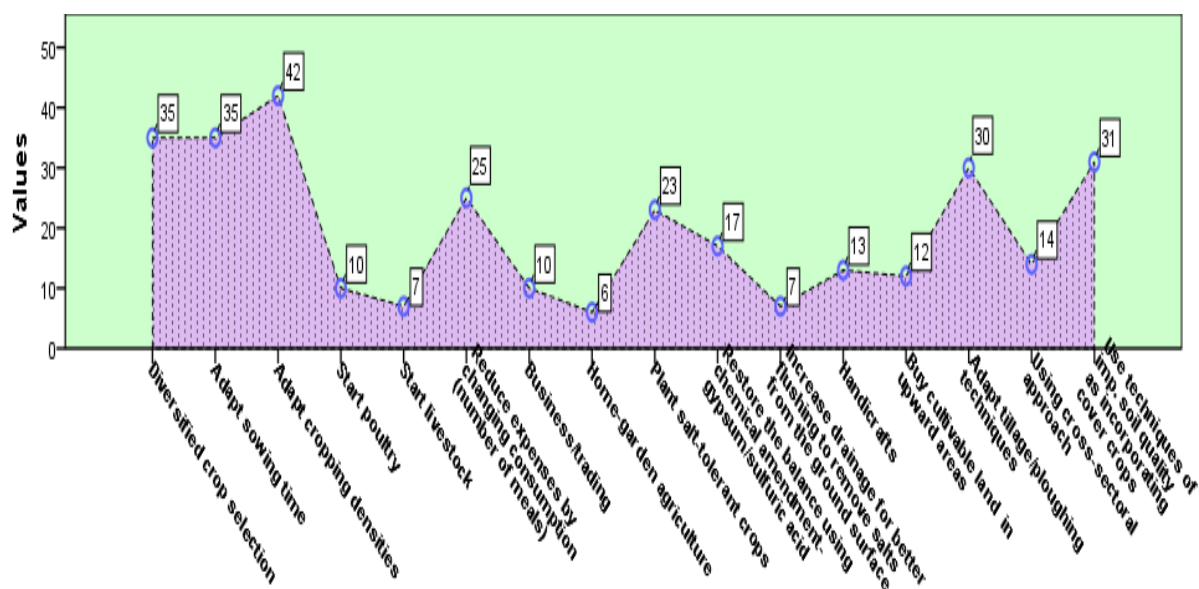
used adaptation strategy, in single response (prime adaptation strategy) handicrafts and taking loan are the two least used prime strategies the interlocutors adopt as adaptation to climatic impacts of tidal surge on natural assets of livelihoods of *Bayer Char* coastal people.

Explaining the single and multiple responses data it is noticed that as the first and foremost adaptation strategy to tidal surge the interlocutors adopt reducing the number of meals as reduction of expenses. The reason behind adopting it as prime and first adaptation strategy to tidal surge is their poverty and it is a general technique of rural poor people in reducing consumption.

Graph-6.22 (Area Chart) shows that when the interlocutors were asked what strategies they generally adopt as adaptation to soil salinity and they were given options of multiple responses, the highest number of interlocutors (13.2%, 42 out of 317) mentioned that they adapt cropping densities i.e., they sow crops maintaining less density which ensures less

impacts of soil salinity and production increases. A significant number of interlocutors said their adaptation strategies to soil salinity are diversification of crop selection and adapting sowing time; which is 11.0% (35 out of 317) each. While 9.8% interlocutors (31) stated they use technique of improving soil quality as incorporating cover crops like peas, rye, radish, cowpeas, mustard, and grasses, 9.5% stated that they adapt tillage/ploughing techniques to soil salinity. Besides, 7.9% interlocutors (25 out of 317) use the strategy of reducing expenses by changing consumption (number of meals), 7.3% said they plant salt-tolerant crops and

Graph-6.22: The Strategies the Interlocutors Generally Use as Adaptation to Soil Salinity (in frequency of multiple responses)



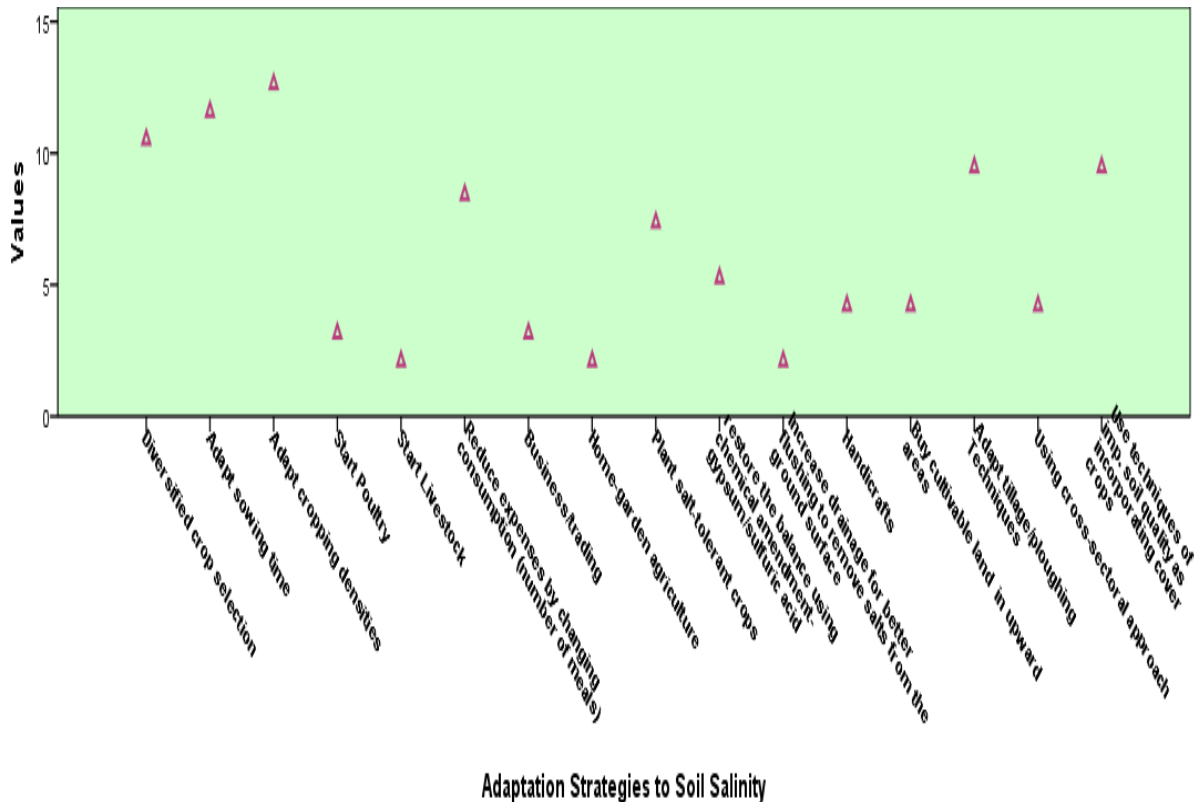
Adaptation Strategies to Soil Salinity (Multiple Responses, Nos. of Interlocutors)

5.4% said they try to restore the balance using chemical amendment-gypsum/sulfuric acid as adaptation to soil salinity. A negligible number of interlocutors mentioned that they adopt the strategies of poultry business (10), livestock rearing (7), business/trading (10), home-garden agriculture (6), increasing drainage for better flushing to remove salts from the ground surface (7), handicrafts (13), buying cultivable land in upward areas (12), using cross-sectoral approach (14) which is 3.2%, 2.2%, 3.2%, 1.9%, 2.2%, 4.1%, 3.8%, 4.4% respectively.

On the other hand, when the interlocutors were asked about their main adaptation strategy to soil salinity, 12.63% interlocutors said they try to adapt cropping density to soil salinity (Graph-6.23, Dot Chart). While in multiple responses, the second highest number of interlocutors stated diversification of crop selection and adapt sowing time jointly (11.0%

each, Graph-6.23), in single response, the second highest number of interlocutors (11.6%) stated that they adapt sowing time to soil salinity (Graph-6.23). Here diversification of

Graph-6.23: Main Strategies the Interlocutors Use as Adaptation to Soil Salinity

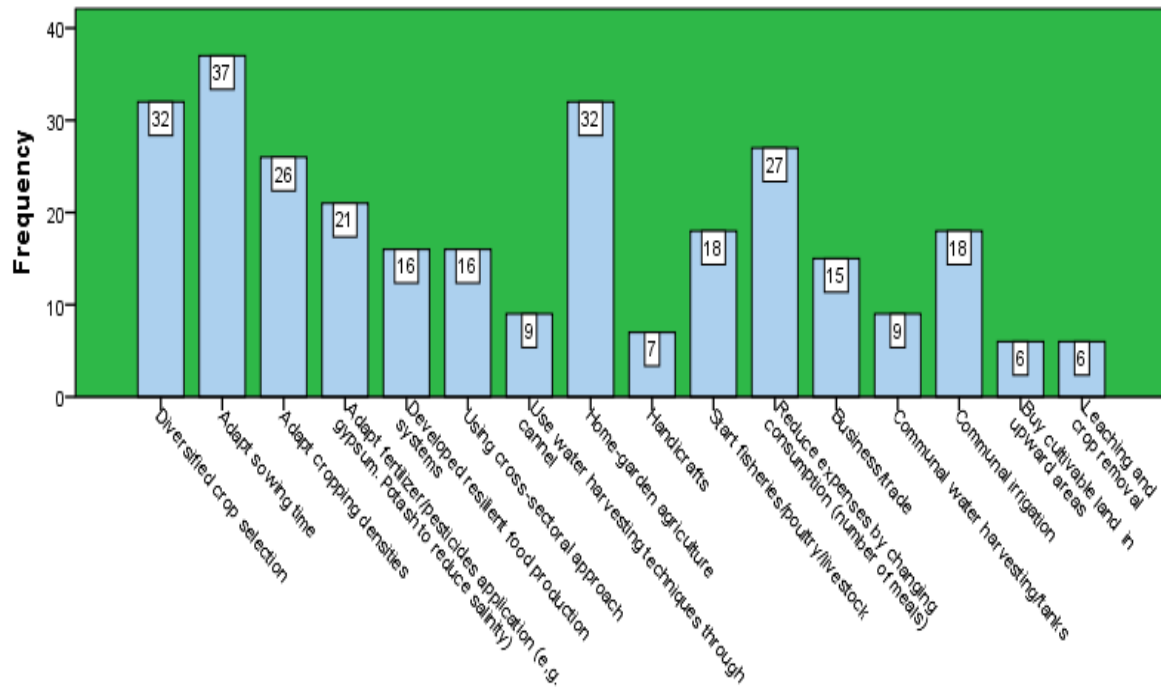


crop selection is the third highest adaptation strategy to soil salinity (Graph-6.23). Where in single response the lowest number of interlocutors stated livestock rearing, home-garden agriculture and increase drainage for better flushing to remove salts from ground surface as adaptation strategies to soil salinity which is 2.1% (Graph-6.23). In multiple responses the lowest number of interlocutors (only 1.9%) adopts home-garden agriculture as adaptation to soil salinity caused by climate change (Graph-6.22).

Graph-6.24 informed that the highest number of interlocutors (37 out of 295, 12.5%) adapt sowing time as a general adaptation to water salinity induced by climate change while the least frequently used adaptation strategies to water salinity are buying cultivable land in upward area (6) and leaching and crop removal (6), the percentage is 2.0% each. It is most frequently used adaptation technique as it is very easy for coastal char people to adapt sowing time to water salinity based on their local knowledge and experience. Diversified crop selection and home-garden agriculture are two major adaptation strategies adopted by a significant number of people (10.8% each) while a negligible number of interlocutors use handicrafts activities, water harvesting techniques through cannel and communal water

harvesting as adaptation to water salinity; the percentage of first one is 2.4% and second and third one is 3.1 each. A substantial number of interlocutors generally use the techniques of reducing expenses by changing consumption as reducing the number of daily meals (9.2% ,

Graph-6.24: Different Strategies the Interlocutors Use as Adaptation to Water Salinity (in frequency of multiple responses)

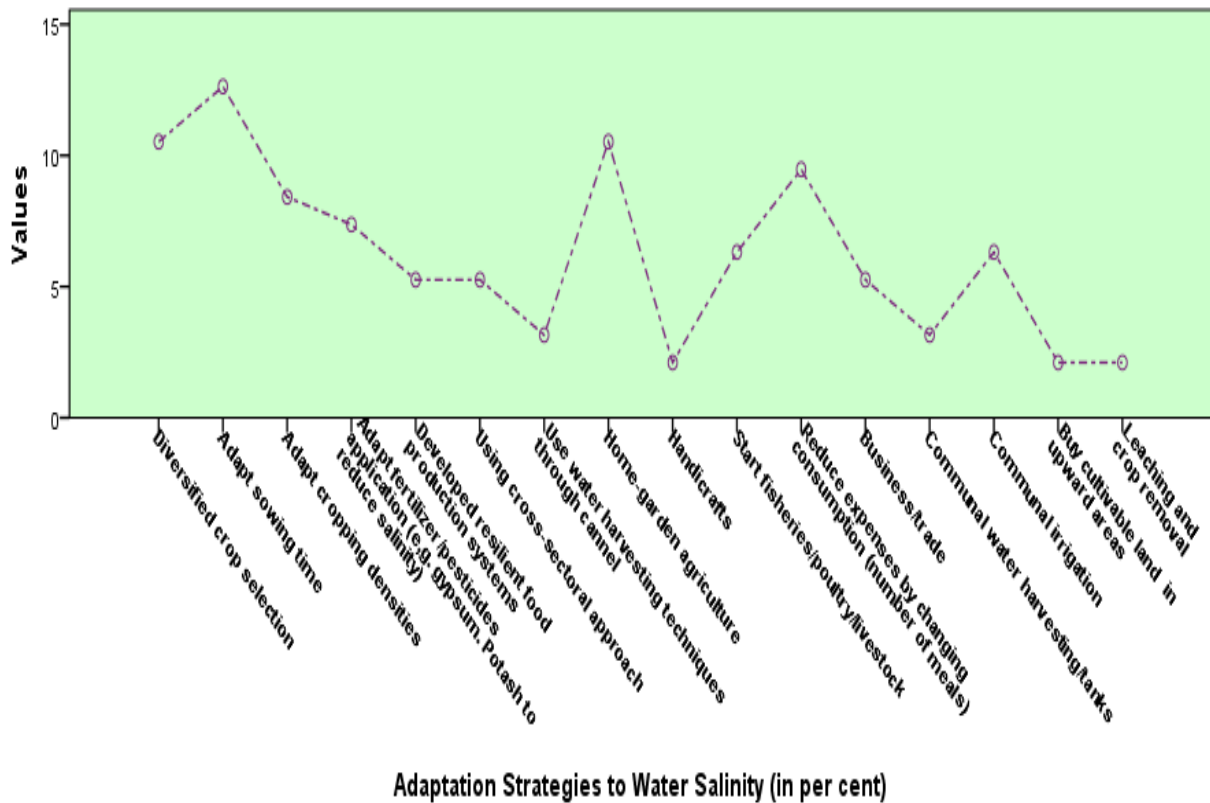


27 out of 295), adapting cropping densities (8.8%) and adapting fertilizer/pesticides application (e.g. gypsum, potash to reduce salinity) while some people develop communal irrigation (6.1%), adopting fisheries, poultry and livestock (6.1%), saline resilient food production system (5.4%), cross sectoral approach (5.4%) and business or trade for a certain time period (5.1%). Communal irrigation indicated the role of local networks in adaptation to climate change. Reducing the number of meals as reduction of expenses is adopted as they are poor and it is a general technique of rural poor people in reducing consumption.

On the other hand, in single response, while the prime strategy used by the highest number of interlocutors (12.6%, 12 out of 95) as adaptation to water salinity is adapting sowing time of agricultural crops, the prime strategy adopted by the lowest number of interlocutors is handicrafts, buying cultivable land in upward areas and leaching and crop removal, the percentage is only 2.1% each (Graph-6.25). The percentages of interlocutors adopt diversification of crop selection, home-garden agriculture and reducing expenses by changing

consumption or reducing the number of meals as prime adaptation strategies to water salinity are 10.5, 1.5 and 9.5 respectively while the percentages of interlocutors mainly use water harvesting techniques

Graph-6.25: Main Strategies the Interlocutors Use as Adaptation to Water Salinity



through canal and communal water harvesting or water tanks are only 3.2% each. A substantial number of interlocutors use the techniques of adapting cropping densities (8.4%), applying fertilizer/pesticides i.e., gypsum, potash to reduce salinity (7.4%), taking fisheries, poultry and livestock rearing as secondary income source (6.3%) and communal irrigation (6.3%) as prime adaptation strategies to the impacts of water salinity on natural assets of livelihoods while a negligible number of interlocutors develop water salinity resilient food production systems, cross sectoral approach and business or trade, the percentages are 5.3 each.

Here, it is observed that in response to the impacts climate change the people of *Bayer Char* coastal community used many adaptation strategies based on the resources found from their environment. So, the focus of cultural ecology theory is proved.

6.3.2 Climate Change, Material Assets and Adaptation

6.3.2.1 Migration and Duration of Settlement

Table-6.13 shows the sources and causes of migration. Here, a significant number of interlocutors (77.0%) informed that they migrated from the same district i.e., Lakshmipur while only 23.0% informed they migrated from other districts as Noakhali, Bhola, Chandpur and Chattagram. Among the total interlocutors, the highest number of interlocutors (28) mentioned riverbank erosion as the cause of migration. So, it can be said that in coastal area the main cause of human migration is riverbank erosion.

Table-6.13: The Sources and Causes of Migration of Interlocutors

		Causes of Migration (Nos. of Interlocutors)						Total
		Lack of land	Poverty	For better life	Politics	Riverbank erosion	Natural disaster	
Migrate from?	Same district	13	14	15	2	21	12	77
	Other districts	6	6	-	3	7	1	23
Total		19	20	15	5	28	13	100

Besides, a substantial number of interlocutors mentioned poverty, lack of land, in quest of better life, natural disaster and politics as the causes of migration, which is 20.0%, 19.0%, 15.0%, 13.0% and 5.0% respectively. Out of the interlocutors who said their source of migration is same district, a significant number of them (27.27%) mentioned river bank erosion as the cause of migration which is 75.0% of total interlocutors (21 out of 28) whose cause of migration is riverbank erosion. Likewise, the interlocutors who migrated from other districts, the highest number of them mentioned riverbank erosion as their cause of migration. So, it may be said that riverbank erosion is a common climatic phenomenon in the coastal districts of Bangladesh. Collected data regarding the causes of migration partly fits with the study of Hussain (2005) as he explored that, most of the time the coastal char people migrate in search of homestead, food, cloth and safety i.e., in search of better life. Lack of homestead, food, cloth and safety are the pushing factors and the expectation of getting these basic needs are the pulling factors as well. These factors lie behind the migration of poor people from different places to *Bayer Char*.

Table-6.14 points out that the highest numbers of interlocutors (45.0%) have been living in *Bayer Char* for 15 to 20 years; of them, a significant number (21) of interlocutors' occupation is agriculture, which is 46.67% of this category and 50.0% of total interlocutors whose primary occupation is agriculture. Besides, a substantial number of interlocutors have been

Table-6.14: Primary Occupation of the Interlocutors and the Duration of Settlement Here (in number)

		Years the Interlocutors Living Here			Total
		10-15	15-20	>20	
Primary Occupations	Agriculture	9	21	12	42
	Fishing	4	7	6	17
	Day Labourer	1	4	3	8
	Household Worker	7	2	4	13
	Business	-	3	1	4
	Driver	2	2	2	6
	Service	-	-	2	2
	Jobless	-	2	-	2
	Housewife	-	4	-	4
Boatman	1	-	1	2	
Total		24	45	31	100

living in this coastal area for more than 20 years. This information supports the findings of Hussain (2005) as Hussain found out that, though the coastal char people like *Bayer Char* coastal community face a lot of problems as lack of regular work, accommodation, sickness, diseases, robbery and physical harassment, they do not leave migrated land. Among the interlocutors who have been living in *Bayer Char* for more than 20 years, the highest number (12%) of interlocutors' occupation is agriculture which is 38.7% of this category and 28.57% of the total interlocutors whose occupation is agriculture. The lowest number (24%) of interlocutors have been living in this char for 10 to 15 years and a significant number of them (9) primarily engaged in agriculture which is the 37.5% of total interlocutors living for 10 to 15 years and 21.13% of total interlocutors whose primary occupation is agriculture. The char arose at the beginning of the last decade of the twentieth century and settlement started from the year 1995 (Information Office, Ramgati, Lakshmipur, 2020). So, from the study data it is noticed that most of the inhabitants of *Bayer Char* have been living here since the very beginning of the char's rising.

6.3.2.2 Profession and Production

Table-6.15 shows that the researcher was informed that more than half of the total interlocutors (52.0%) have been engaged in present profession for one to ten years; of them, a significant number (32.7%, 17) chose this profession due to lack of land and 28.9% (the second highest) have been in this profession inheritably. 36.0% interlocutors have been in present profession for ten to twenty years; of them, 30.6% chose this profession because the

sea is near. On the other hand, regarding choosing the present profession, the highest number of interlocutors (29.0%) said they chose this profession because they got it

Table-6.15: Length of Present Profession and Causes of Choosing the Profession

		Causes of Choosing the Present Profession (in number)							Total
		Hobby	More income in short time	Inherited	No other jobs are available	Lack of land	Near to sea	Less money consuming	
Years They Engaged in Present Profession	1-10 years	-	5	15	5	17	5	5	52
	10-20 years	2	1	9	8	3	11	2	36
	20-30 years	-	1	5	-	2		2	10
	30-40 years	-	-	-	1	-	1	-	2
Total		2	7	29	14	22	17	9	100

inheritably; of them, 51.7% interlocutors have been in present profession for one to ten years. The second highest number of interlocutors (22.0%) said they chose present profession for lack of land; of them, 77.3% interlocutors have been in this profession for one to ten years. There are only 10.0% and 2.0% interlocutors who have been engaged in ongoing profession for 20-30 years and 30-40 years respectively. From table data it is clear that there are some interlocutors who have been engaged in present profession before coming in *Bayer Char*. Because, settlement started in this coastal char from the year 1995 (Information Office, Ramgati, Lakshmipur, 2020). Here it is observed that, most of the people of *Bayer Char* community have been engaged in present profession for 1 to 10 years. It indicates that a significant number of them changed and assumed newer forms of livelihood strategies. The same result was explored in the study of Biswas (2003) as his study found out that, livelihood of poor people in rural areas have always changed and assumed newer forms in response to the devastation of climate change disasters.

When the interlocutors were asked whether they produce anything, a significant number of interlocutors (93.0%) answered positively while a negligible number of interlocutors (7.0%) answered negatively. The interlocutors, who said they do not produce anything, are service holder, businessmen or household workers.

Table-16 shows that when the interlocutors, who said they produce something, were asked about what they produce most in *Bayer Char* and the causes of production, The highest number (44) of interlocutors informed they produce rice most; which is the 47.3% of interlocutors who produce and 44.0% of total interlocutors. On the other hand, a negligible number (1 out of 93) of interlocutors said they produce wheat most. The percentages of

interlocutors who produce fish, vegetables and peanut most are 22.6, 14.0% and 10.7% respectively. Likewise, the interlocutors who produce rice most, about all of them (98.0%)

Table- 6.16: Crops the Interlocutors Produce Most and The Causes of Producing These Crops (in number of interlocutors)

		Why Produce?		Total
		For own consumption	For sale in market	
What They Produce Most?	Rice	43	1	44
	Fish	19	2	21
	Wheat	1	-	1
	Peanut	10	-	10
	Vegetables	12	1	13
	Fruits	2	2	4
Total		87	6	93

produce rice for own consumption and only 2.0% produce for selling in the market. At the same time, the interlocutors who produce fish most 90.0% of them said they produce for own consumption while only 10.0% said they produce for selling in the market. Out of the 93 interlocutors who produce, 93.6% (87 out of 93) said they produce for own consumption and only a narrow figure (6.4%) said they produce for selling in the market. So, based on the field data, it can be said that, rice and fish productions are the prime food gains produced in *Bayer Char* and rice is the staple food of *Bayer Char* coastal people like other people of Bangladesh.

6.3.2.3 Household Size. Income and Expenditure

From the table-17 it is seen that a significant number of interlocutors (41.0%) earn 200 to 300 taka and, of them, 43.4% (26 out of 41) interlocutors' family member is 6 or more than 6; which is 26.0% of total interlocutors. On an average, the daily per capita income of this category people is around 41 taka or less. Even out of total interlocutors, 3.0% and 17.0% interlocutors' daily income is less than 100 taka and 100 to 200 taka respectively; of them, 66.7% and 88.2% households respectively have 6 or more than 6 members whose daily per capita income is around 25 taka. 22.0% households earn 300 o 400 taka daily, 13.0% earn 400 to 500 taka daily. Only 4.0% households' daily income is more than 500 taka, of them, 25.0% are 5 members family and 75.0% are more than 6-member-family. The daily per capita income of this category household is around less than 100 taka. These field data explore a grim picture of poverty of coastal people *Bayer Char*. So, it can certainly be said

that the people of *Bayer Char* are not only hard core poor but the poorest of the poor in Bangladesh. Explaining the table data it is observed that at 5.0% level of significance and

Table- 6.17: Household Size and Daily Income of Households

		Daily Income of Households (in taka)						Total
		<100	100-200	200-300	300-400	400- 500	>500	
Household size (in number)	<4	-	-	1	-	1	-	2
	4	1	1	4	1	-	-	7
	5	-	1	10	2	6	1	20
	6	1	6	13	10	2	-	32
	>6	1	9	13	9	4	3	39
Total		3	17	41	22	13	4	100

$$(\chi^2 = 23.100^a, df = 20, \alpha = .05, t\text{-value} = 31.410)$$

df=20, the table value (critical value) is 31.410 which is greater than calculated value of chi square ($\chi^2 = 23.100$). So, null hypothesis (H_0) is accepted and alternative hypothesis (H_1) is rejected. So, there is no relationship between household types of interlocutors and daily income of their households.

In table- 6.18, it is observed that, the highest number of interlocutors' (43%) daily per capita expenditure is only 30 to 60 taka while only 5.0% interlocutors' daily per capita expenditure is 120 to 150 taka and another 5.0% interlocutors' daily per capita expenditure is more than 150 taka. Out of the total interlocutors, a substantial number (62%) expend most for food while only a negligible figure of interlocutors spend for education and treatment which is 3.0% and 1.0% respectively. Where 20.0% interlocutors said their most expending sector is shelter, 14.0% informed their most expending sector is dressing. The data show that the people of *Bayer Char* expend more to ensure their shelter than to meet their dressing need. On the other hand, out of the total interlocutors whose daily per capita expenditure is 30 to 60 taka, a significant number of them (32, 74.4%) spend most to meet the need of food which is the 51.6% of interlocutors whose most expend sector is food. Likewise, the interlocutors (32) whose daily per capita expenditure is 60 to 90 taka, a substantial number of them (62.5%) spend most to meet the need of food, which is the 32.3% of those who expend most in food sector. On the contrary to this, the interlocutors whose per capita expenditure is 90 to 120, 120 to 150 and more than 150 taka, the most expending sector of them is shelter; the percentages of which are 46.2, 60.0 and 40.0 respectively. Research data shows that most of the people of *Bayer Char* coastal community generally expend most in food sector but whose per capita expenditure is 90 to more than 150 taka, they spend most in shelter or building

Table- 6.18: Daily Per Capita Expenditure of the Family and the Sectors They Expend Most

		Sectors They Expend Most (in number)					Total
		Food	Dressing	Shelter	Education	Treatment	
Daily Per Capita Expenditure of the Family (in taka)	< 30	1	-	-	1	-	2
	30-60	32	5	6	-	-	43
	60-90	20	7	3	2	-	32
	90-120	5	2	6	-	-	13
	120-150	2	-	3	-	-	5
	>150	2	-	2	-	1	5
Total		62	14	20	3	1	100

$$(\chi^2 = 55.62^a, df = 20, \alpha = .05, t\text{-value} = 31.410)$$

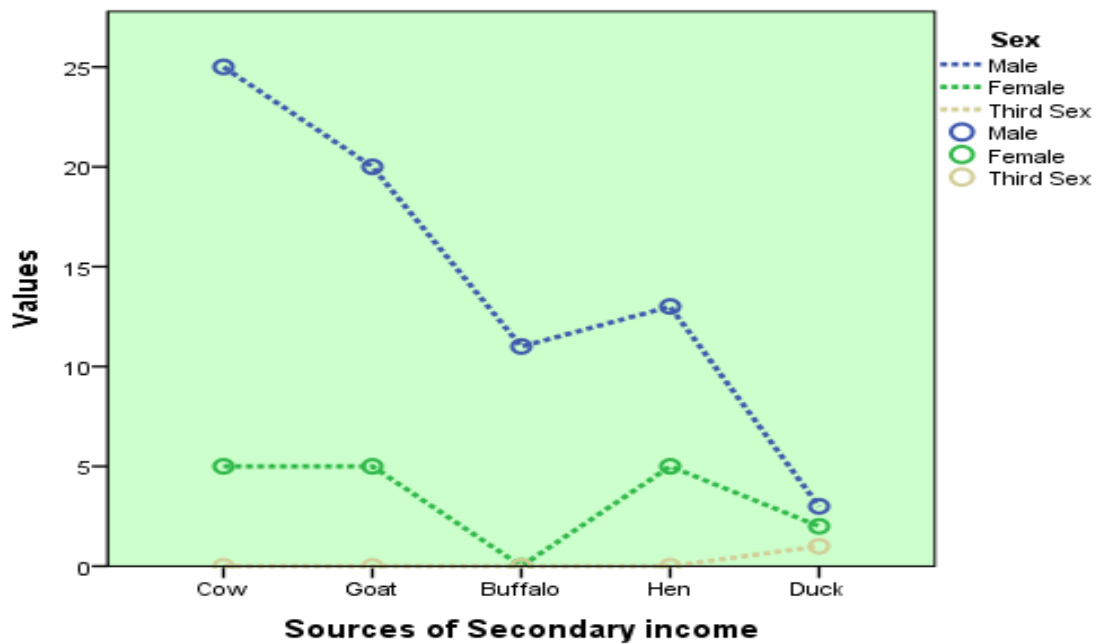
houses to ensure their life and wealth security from climate change induced natural hazards. Explaining the table data it is noticed that at 5.0% level of significance and $df=20$, the table value (critical value) is 31.410 which is less than calculated value of chi square ($\chi^2=55.62$). So, null hypothesis (H_0) is rejected and alternative hypothesis (H_1) is accepted. So, there is a significant relationship between per capita expenditure of the families and the sectors the families expend most.

In response to question whether they have any secondary income sources, a significant number of interlocutors (90.0%) answered positively while a negligible number of interlocutors (10.0%) answered negatively. Here, it is observed that the primary income of *Bayer Char* people is not sufficient to lead their life and livelihoods. That is why a significant number of them have secondary income sources to supplement their primary income in quest of a better life.

Accordingly, graph-6.26 (Line Chart) states that, when the interlocutors, who said they have secondary income sources, were asked about the sources of secondary income, the highest number of interlocutors (33.3%, 30 out of 90) informed that they rear cows as their secondary income source, of them, 25 interlocutors are males and 5 interlocutors are female while the second highest number of interlocutors (27.8%, 25) said they rear goats as their secondary income sources (Graph-6.26), of them, 20 interlocutors are male and 5 interlocutors are female. Rearing hens was stated by 20.0% (Third highest, 18) of interlocutors while a negligible number of interlocutors mentioned rearing buffalo and duck as their secondary income sources; the percentages of which are 12.2 (11) and 6.7 (6) respectively. From the study data it is significantly noticed that all the interlocutors (11) who rear buffalo are male because it is tougher for females to rear buffalo than males; in rearing hens and duck females

participation is more (38.5% and 33.3% respectively) than rearing cow (20.0%, goat (25.0%) or buffalo (0.0%) as it is very easy for females to rear hens and duck maintaining

Graph-6.26: Secondary Income Sources of Interlocutors (in number)



their household activities. On the other hand, all the interlocutors, who have secondary income sources, rear animals or birds as source of secondary income. The reason behind is rearing animals or birds is easier for them than any other things as the area is char, the char is very much grassy, the people are the poorest of the poor and these secondary income sources are least money consuming.

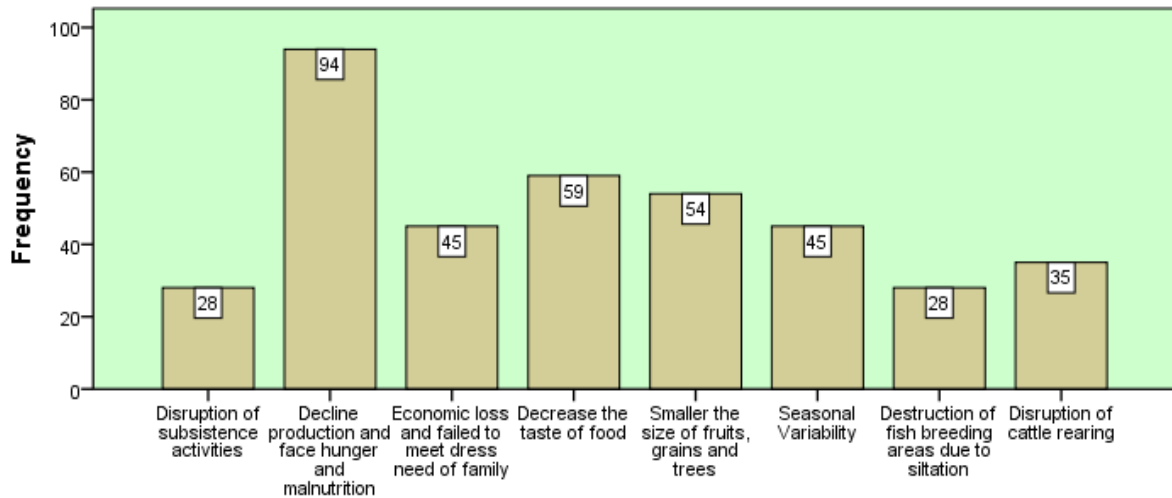
6.3.2.4 Climatic Impacts on Material Assets

When the interlocutors (96), who experienced climatic impacts in their locality, were asked whether climate change has any impacts on their material assets, 99.0% (95 out of 96) of them answered positively and only a negligible number of interlocutors answered negatively (1.0%, 1 out of 95).

On the other hand, graph- 6.27 (Histogram or Column chart) states that when the interlocutors who said climate change has an impact on their material assets of livelihoods, were asked to describe the general impacts of climate change on material assets of livelihoods of them and they was given the options of multiple responses (graph- 6.38), the highest number of interlocutors (94 out of 388, 24.2%) mentioned declining production and facing hunger and malnutrition as the general impact of climate change while the lowest number mentioned disruption of subsistence activities (28 out of 388) and destruction of fish

breeding areas due to siltation (28) as the general impacts of climate change on material assets of livelihoods, the percentages are 7.2 each. Likewise, a significant number of

Graph-6.27: General Impacts of Climate Change Induced Hazards on Maternal Assets of Livelihoods



interlocutors (59) mentioned decrease the taste of food as the general climatic impact while a narrow figure (35) said that disruption of cattle rearing is one of the different climatic impacts on material assets; here the percentages are 15.2 and 9.0 respectively. Another substantial number of interlocutors (54, 13.9%) stated smaller the size of fruits, grains and trees as a general impact of climate change on material assets while economic loss and failure to meet dress need (45) and seasonal variability (45) are mentioned as two important impacts of climate change on material assets by 11.6% interlocutors each.

On the other hand, table- 6.19 shows that in response to question about the main loss and damage of material assets of livelihoods by climatic hazards, out of the total interlocutors (95) who said climate change has impacts on material assets, the highest number of them (35, 36.8%) mentioned declining production and facing hunger and malnutrition while the lowest number (5 out of 95, 5.3%) mentioned destruction of fish breeding areas due to siltation. Likewise, 12.6% and 11.6% of interlocutors (12) mentioned decrease the test of food and smaller the size of fruits, grains and trees respectively as the main climatic impacts on material assets of livelihoods while 6.3% and 7.4% mentioned disruption of subsistence activities and disruption of cattle rearing respectively as the main climatic impacts on material assets. Besides, 10.5% (10 out of 95) and 9.5% (9 out of 95) interlocutors said seasonal variability and economic loss and failure to meet the dress need of family

respectively are the two major impacts of climate change on material of livelihoods of coastal people. Comparing the single response and multiple responses data, it is observed that while

Table-6.19: Household Types and Main Loss/Damage of Material Assets by Climatic Impacts

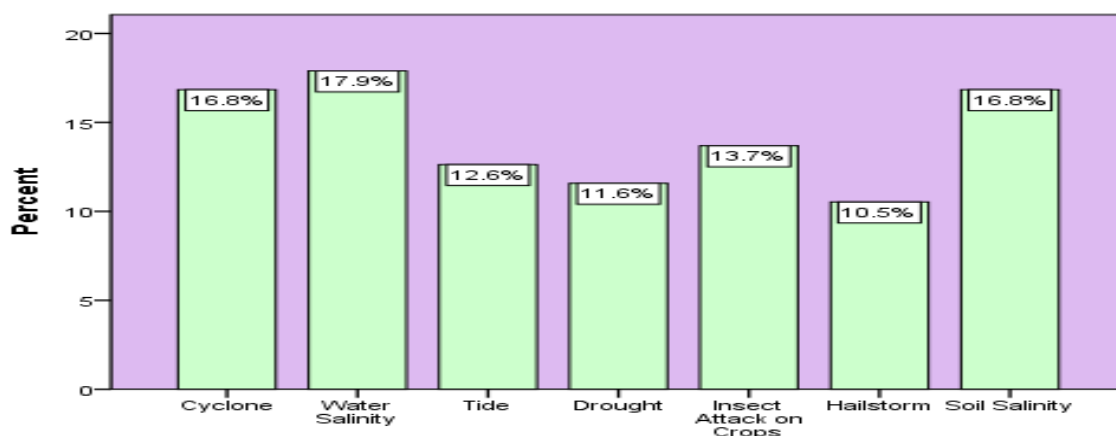
		Main Losses/Damages of Material Assets by Climatic Hazards (in number)								Total
		Disruption of subsistence activities	Decline production and face hunger and malnutrition	Economic loss and failed to meet dress need	Decrease the taste of food	Smaller the size of fruits, grains and trees	Seasonal Variability	Destruction of fish breeding areas due to siltation	Disruption of cattle rearing	
Household Types (amount of land in acres)	Landless	4	6	3	6	4	3	1	4	31
	Marginal	2	23	5	4	6	4	4	2	50
	Small	-	1	-	2	1	2	-	1	7
	Medium	-	2	-	-	-	1	-	-	3
	Large	-	3	1	-	-	-	-	-	4
Total		6	35	9	12	11	10	5	7	95

and facing hunger and malnutrition as the highest general impact of climate change (Graph- 6.38), in single response declining production and face hunger and malnutrition was mentioned by 36.8% interlocutors (Table- 6.19). On the other hand, in multiple responses disruption of subsistence activities and destruction of fish breeding areas due to siltation were mentioned as the lowest general climatic impacts on material assets by 7.2% interlocutors each (Graph- 6.27) while in single response, only destruction of fish breeding areas due to siltation was mentioned by only 5.3% interlocutors (Table- 6.19).

6.3.2.5 Climatic Hazards, Severity and Material Assets

Graph- 6.28 (Histogram) informs that water salinity affects the material assets of livelihoods most in *Bayer Char*, which was shared by the highest number of interlocutors (17.9%, 17 out of 95). The second highest number of interlocutors stated that cyclone (16, especially nor'wester) and soil salinity (16) affect the material assets most, the percentages of which are 16.8% each. Moreover, 13.7% (13) and 12.6% (12) interlocutors respectively informed that, insect attack

Graph- 6.28: Climatic Hazards That Affect the Material Assets Most (in per cent)

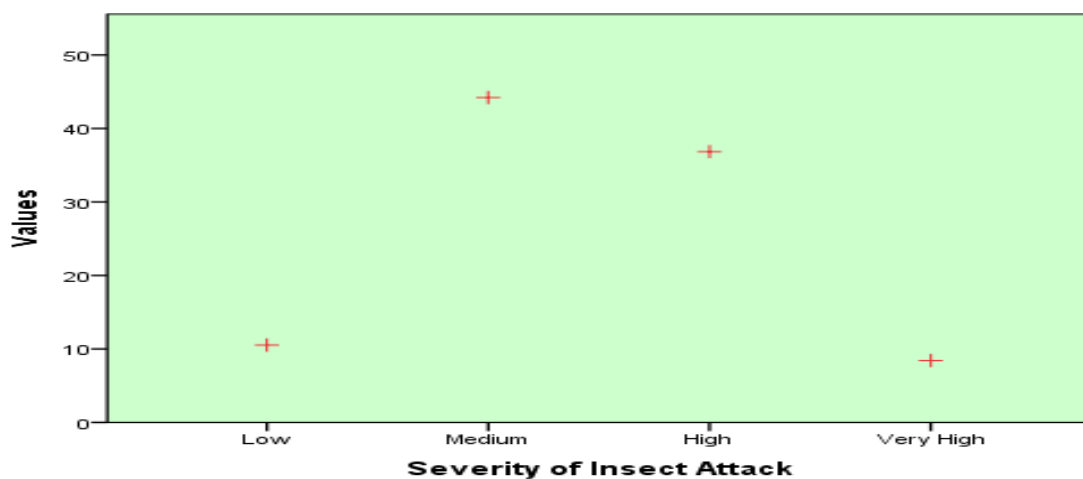


on crops and tidal surge or tide are the two climatic hazards that affect the material assets most. Likewise, drought and hailstorm were stated by 11.6% (11) and 10.5% (10) interlocutors respectively as the climatic hazards that affect their material assets most.

As *Bayer Char* is a coastal area where almost no permanent embankment is there and it is very near to the congruence of the *Meghna* river and the Bay of Bengal. So, it is one of the most disaster prone areas of Bangladesh and the material assets of livelihoods of the people of this area are frequently affected by natural disasters like cyclone, tidal surge etc which cause generally the water salinity, soil salinity and insect attack on crops that affect the natural assets of livelihoods most. Here we see that the hazards that affect the material assets of *Bayer Char* coastal people are soil salinity, water salinity, tidal surge, insect attack on crops, drought and hailstorm and most of them are interrelated.

Graph- 6.29 (Dot chart) points out that, in response to the question regarding the severity of insect attack on crops as a climate change induced hazard, a significant number of interlocutors (the highest, 45 out of 95) mentioned the severity of insect attack on crop as “Medium” while the second highest

Graph- 6.29: Severity of the Impacts of Insect Attack on Material Assets of Livelihoods of Interlocutors (in number of interlocutors)



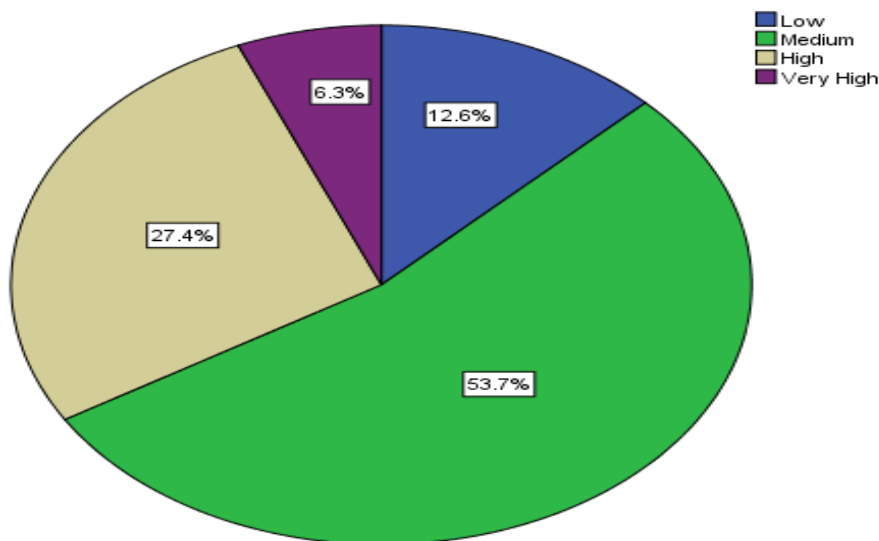
number (27, 27.4%) mentioned it as “High” and a narrow figure (8, 8.4%) stated as “Very High”. On the other hand, a substantial number (16, the third highest) of interlocutors stated that the severity of insect attack is “Low”; the percentage of which is 16.8%.

At the same time when the interlocutors, who are impacted by climate change induced natural hazards (96), were asked whether the intensity or frequency of insect attack increased in last 10 years, a significant number of them (69.8%, 67 out of 96) informed positively while a

narrow figure (29) informed negatively; the percentages of both categories are 69.8 and 30.2 respectively. It indicates that following the degree of increase of climate change in the world, the degree of frequency of climatic hazards like insect attack and its impacts on life and livelihoods are increasing in coastal area of Bangladesh.

When the interlocutors whose material assets impacted by climatic hazard of drought (95), were asked to rank the impact severity of drought on their life and livelihoods, most of them (51) ranked it as “Medium” while a negligible figure (6) ranked the impact severity of drought as “Very High”; the percentages of both categories are 53.7 and 6.3 respectively (Graph- 6.30). They are the 53.1% and 6.1% respectively of climatic hazard impacted

Graph- 6.30: Severity of the impact of Drought on Material Assets of Livelihoods of Interlocutors (in per cent)



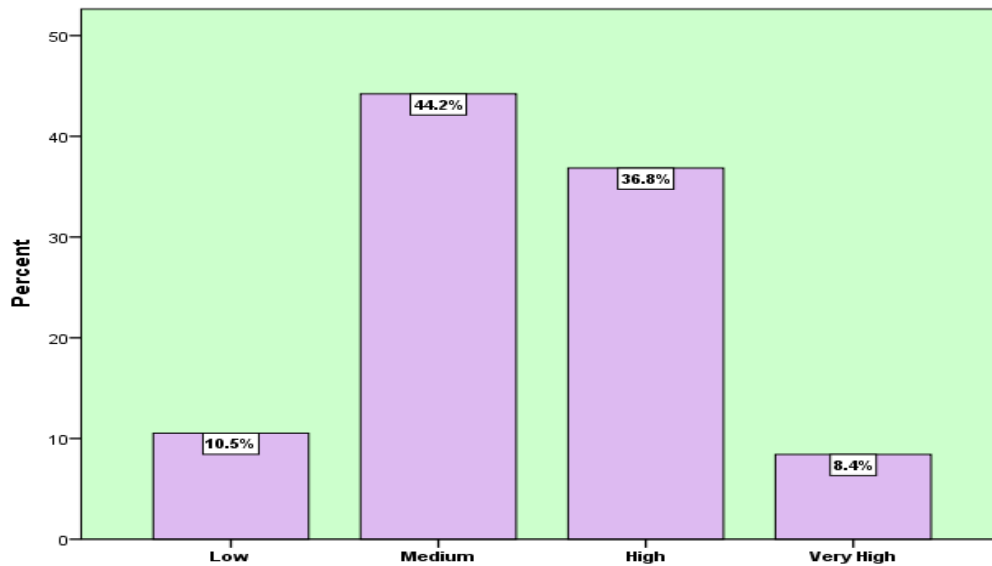
interlocutors (96), 51.0% and 6.0% respectively of the total interlocutors (100). Moreover, out of the interlocutors whose material assets were impacted by climatic hazards, 27.4% (26 out of 95) of them ranked the impact severity of drought as “High” while only 12.6% (12 out of 95) ranked as “Low”, which is the 27.1% and 12.5% respectively of climatic hazard impacted interlocutors (96), 26.0% and 12.0% respectively of the total interlocutors (100).

Likewise, when the interlocutors, who are impacted by climate change induced natural hazards (96), were asked whether the intensity or frequency of drought increased in last 10 years, a significant number of them (60 out of 96) informed positively while a narrow figure (36) informed negatively; the percentages of both categories are 62.5 and 27.5 respectively. It indicates that, following the degree of increase of global warming and climate change in the

world, the degree of frequency of climatic hazards like drought and its impacts on life and livelihoods are increasing in coastal area like *Bayer Char* of Bangladesh (Graph- 6.43).

From graph- 6.31 (Histogram), it is showed that the severity of the impact of hailstorm on material assets of livelihoods is “Medium” which was said by the highest number of

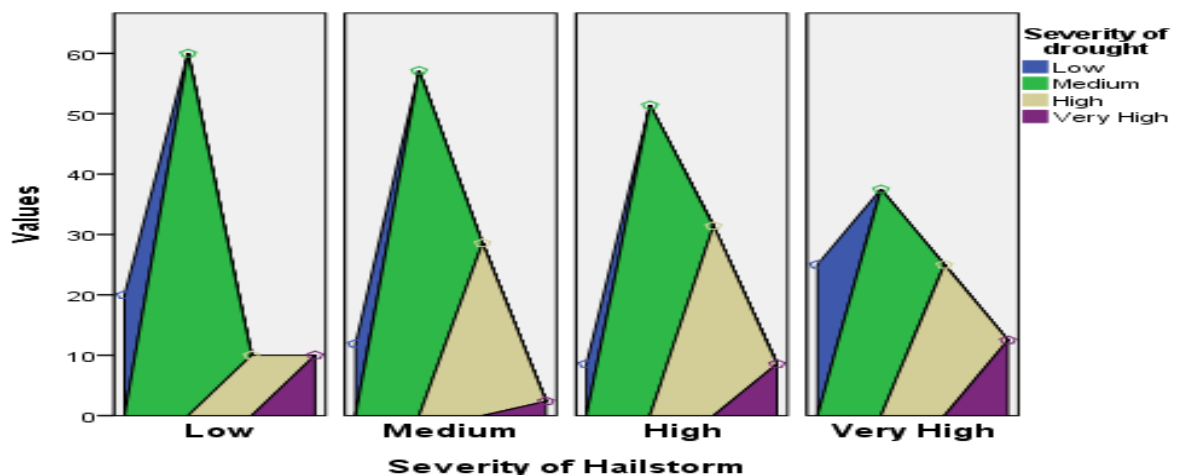
Graph- 6.31: Severity of the Impact of Hailstorm on Material Assets of Livelihoods (in per cent)



interlocutors (42 out of 95, 44.2%). Moreover, 36.8% (35) and 8.4% (8) of interlocutors stated the severity of the impact of hailstorm on material assets as “High” and “Very High” respectively while only 10.5%, a negligible number (10) stated the severity of hailstorm as “Low”.

From graph- 6.32 (Area chart) it is observed that the interlocutors who said hailstorm as ‘Low’ (10), most of them (60.0%) mentioned drought severity as medium. The interlocutors (42) who said hailstorm severity is ‘Medium’, highest of them (57.1%) mentioned drought

Graph- 6.32: Comparison between Impact Severities of Drought and Hailstorm

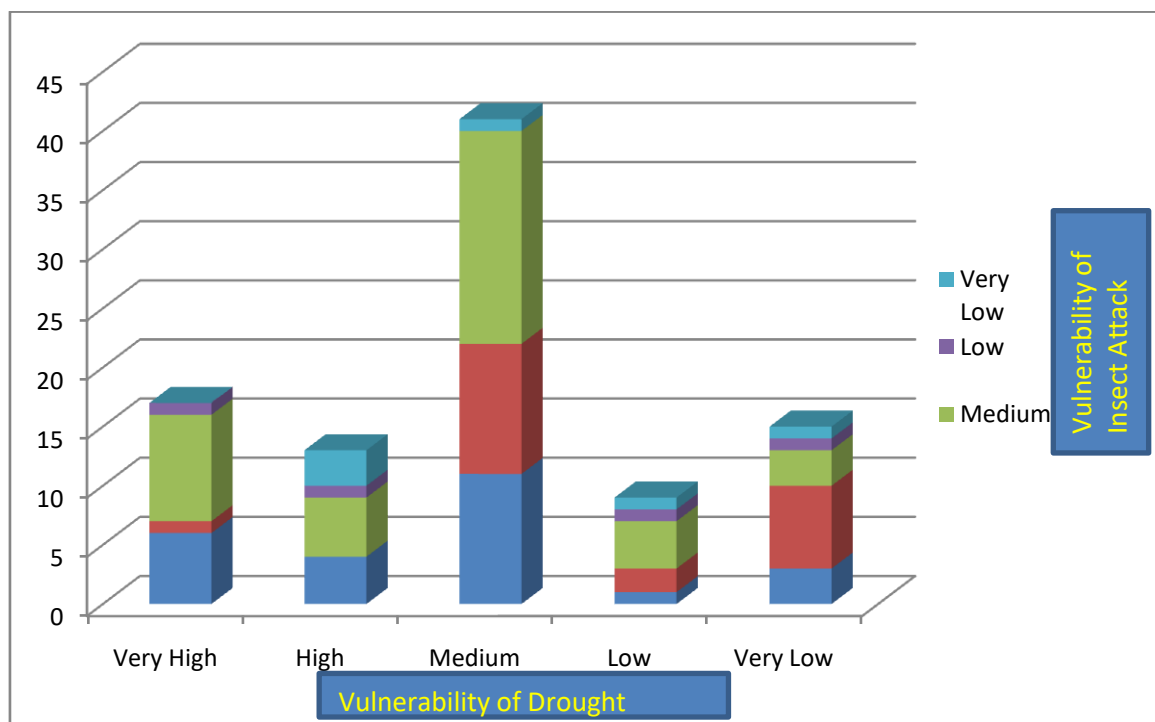


severity as ‘Medium’. Likewise, the interlocutors (35) who stated hailstorm severity as ‘High’; highest of them (51.4%) mentioned drought severity as ‘Medium’ and the interlocutors (8) who mentioned hailstorm severity as ‘Very High’, the highest of them stated the drought severity as ‘Medium’.

6.3.2.6 Climatic Hazards, Vulnerability and Material Assets

It is shown in the graph- 6.33 (3-D Column Chart) that, when interlocutors, whose material assets were affected by climatic hazards, were said to rank the vulnerability of livelihoods to drought, a significant number of interlocutors (41 out of 95) ranked the vulnerability of material assets to drought as “Medium”; of them, the highest number of interlocutors (18, 43.9%) ranked their livelihood vulnerability to insect attack as ‘Medium’ while a negligible number of them (9) ranked the vulnerability of material assets to drought as “Low”; of them, the highest number of interlocutors (4, 44.4%) ranked their livelihood vulnerability to insect attack as ‘Medium’ the . Likewise, a substantial number of interlocutors ranked it as “Very High” (17) and “High” (13) which is the second highest (17.9%) and the third highest percentage (13.7%) of interlocutors whose material assets of livelihoods were impacted by climate change induced natural hazards. On the other hand, only a narrow figure of

Graph- 6.33: Vulnerability of Livelihoods to Drought and Insect Attack (in number)

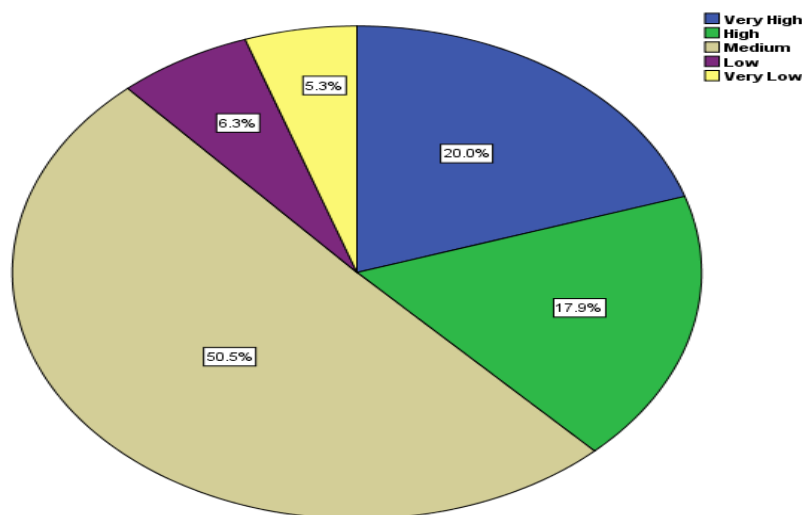


interlocutors ranked the vulnerability of material assets to drought as “Low” (9 out of 95) and “Very Low” (15); the percentages are 9.5 and 15.8 respectively. The highest number (41.1%,

39 out of 95) of them shared that the vulnerability of of their livelihoods to insects attack is “Medium” while only 4.2% and 6.3% of them mentioned the vulnerability of their material assets to insects attack on crop is “Low” and “Very Low respectively.” Moreover, the second highest number (26.3%, 25 out of 95) of them stated the vulnerability of material assets to insects attack is “Very High” and third highest number of them (22.1%, 21 out of 95) mentioned the vulnerability of material assets to insect attack is “High”. The interlocutors who ranked their livelihood vulnerability to drought as ‘Very High’ (17) and ‘Very Low’ (15) the highest number of both categories (52.9% and 46.7% respectively) ranked their livelihood vulnerability to insect attack is ‘Medium’ and ‘High’ respectively.

Graph- 6.34 shows that more than 50.0% (50.5%, 48 out of 95) of interlocutors, whose material assets were impacted by climatic impacts (95), mentioned the vulnerability of livelihoods to as “Medium” while only 6.3% (6 out of 95) and 5.3% hailstorm (5 out of 95)

Graph- 6.34: Vulnerability of Livelihoods to Hailstorm (in per cent)



mentioned as “Low” and “Very Low”. Likewise, a significant number of them ranked the vulnerability of their life and livelihoods to hailstorm as “Very High” (19) and “High’ (17); the percentages of both categories are 20.0 and 17.9 respectively.

From the study data, it is obvious that the highest number of interlocutors, whose material assets of livelihoods were impacted by climate change induced hazards, ranked the vulnerability of livelihood assets to insect attack, drought and hailstorm as “Medium”, the percentages are 41.1, 43.2 and 50.5 (Graphs- 6.33 and 6.34 respectively) respectively while a negligible number of interlocutors (the lowest number) ranked the vulnerability of livelihood assets to insect attack and drought as “low” the percentages of both categories are 4.2 and 9.5

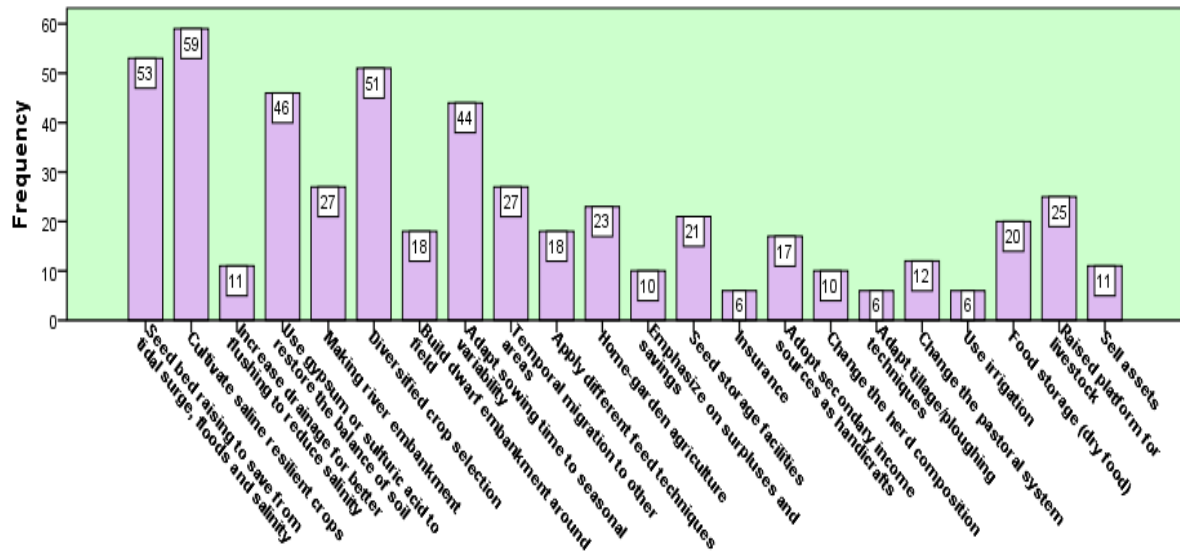
respectively (Graph- 6.33). On the other hand, the second highest number of interlocutors ranked the vulnerability of livelihood assets to insect attack and hailstorm as “Very High”, the percentages are 26.3 and 20.0 respectively while only 17.9% of interlocutors mentioned the vulnerability of livelihoods to drought as “Very High”. Besides, a substantial number (the third highest) of interlocutors ranked the vulnerability of livelihood assets to insect attack and hailstorm as “High” (22.1% and 17.9%) and 13.7% of interlocutors mentioned the vulnerability of livelihood assets to drought as “High”.

6.3.2.7 Adaptation to Climatic Impacts on Material Assets

Present study was informed that around all interlocutors (94 out of 95) of *Bayer Char* coastal area adopted adaptive strategies to climate change induced impacts on material assets of livelihoods. They are 98.9% of total interlocutors whose material assets impacted by climatic hazards and 94.0% of total interlocutors. The researcher was also informed that only a negligible number of interlocutors did not adopt any adaptation strategies to climate change impacts on their material assets of livelihoods and their percentage is simply 1.1 (1 out of 65) which is the 1.0% of total sample size (100).

Graph-6.35 points out that when the interlocutors, who used adaptation strategies to climatic impacts on their material assets of livelihoods, were asked about their different strategies and they were said to respond in a multiple way (multiple responses), the highest number of responses (11.3%, 59 out of 521) informed that they cultivate saline resilient crops as carrots, potatoes, cabbage, beets etc. while the lowest number of responses informed that they take insurance (6), adapt tillage or ploughing techniques (6) and use irrigation (6) as adaptive strategies to climatic impacts on material assets of their livelihoods. The techniques of seed bed raising to save from tidal surge, floods and salinity and diversification of crop selection are mentioned by 10.2% (53) and 9.8% (21) responses respectively as adaptation strategies to climate change impacts on material assets, which are the second and third highest responses respectively out of the total responses. Contrary to it, the second lowest responses mentioned emphasizing on surpluses and savings and changing the herd composition (10, 1.9% each) and the third lowest responses mentioned increasing drainage for better flushing to reduce salinity and selling assets as the adaptation strategies to climatic impacts on material assets of their livelihoods. Likewise, a significant number of responses shared that they use gypsum or sulfuric acid to restore the balance of soil (46), adapt sowing time to seasonal variability (44), making river embankment (27) and migrate temporarily to other areas or generally

Graph- 6.35: General Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Their Material Assets of Livelihoods (in frequency of multiple responses)

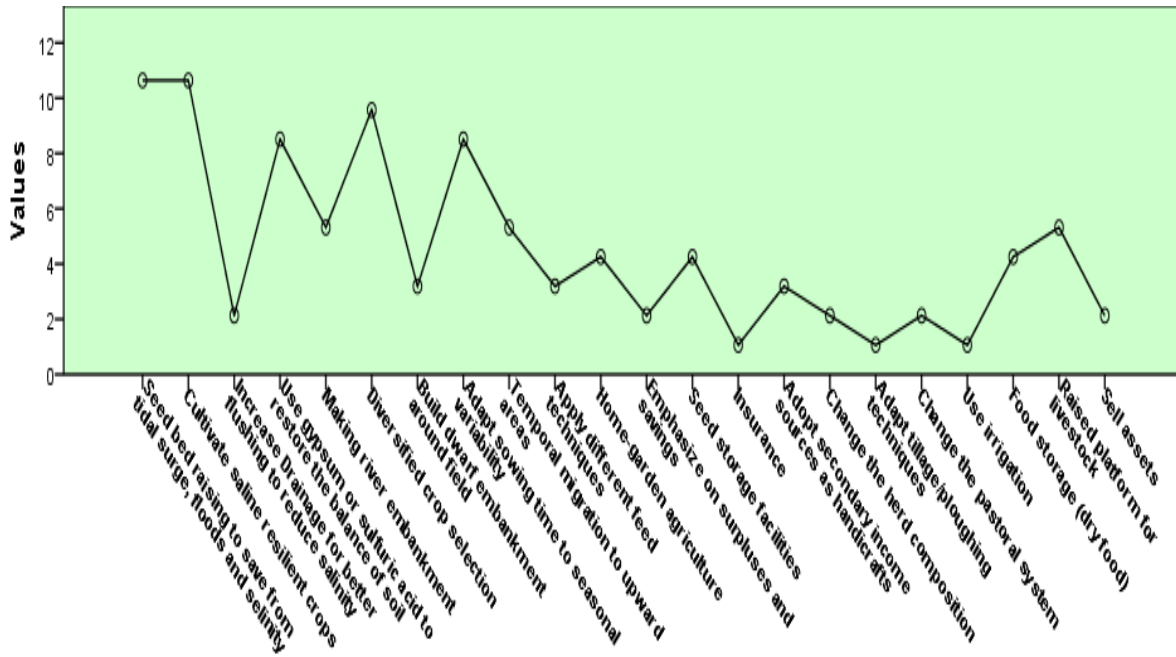


upward areas (27) as adaptation strategies to climatic impacts on material assets; the percentages of former two techniques are 8.8 and 8.4 and the percentages of later two techniques are 5.2 each. Besides, some responses shared they raise platform for livestock (25), do home-garden agriculture (23), improve seed storage facilities (21), store food specially dry food (20), build dwarf embankment around field (18) and apply different feed techniques for birds and livestock (18) as adaptation strategies to climatic impact on material assets of their livelihoods; the percentages of these responses are 4.8, 4.4, 4.0, 3.5 and 3.5 respectively.

At the same time, the Graph- 6.36 shows that, in response to the question about the major strategy they adopt as adaptation to climatic impacts on material assets of livelihoods, the highest number of interlocutors mentioned that they raise seed bed to save material assets from tidal surge, floods and salinity (10 out of 94) and cultivate saline resilient crops carrots, potatoes, cabbage, beets etc. (10); which is 10.6% each. On the other hand, the lowest number of them said they do different insurance policies regarding life, health, house, grain etc (1 out of 94), adapt tillage/ploughing techniques (1) and use irrigation in agriculture as major adaptive strategies to climatic impacts on material assets of their livelihoods; the percentages of these three categories are 1.1 each. Likewise, a significant number of interlocutors (9, 6.6%) shared that they adopt diversification of crop selection as a major adaptation strategy to climatic impacts on material assets while a negligible number of interlocutors mentioned increasing drainage for better flushing to reduce salinity,

emphasizing on surpluses and savings, changing the herd composition, changing the pastoral system and selling the assets as the major strategies they use as adaptation to climatic impacts on their material assets, the percentage of each category is 2.1. Besides, using

Graph- 6.36: Major Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Material Assets of Livelihoods (in per cent)



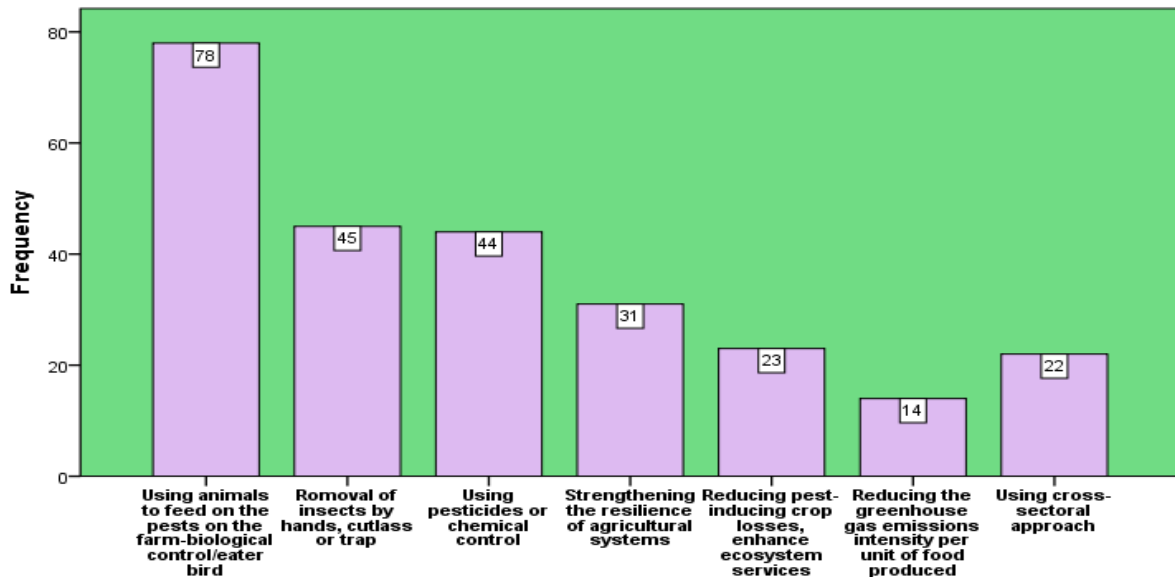
gypsum or sulfuric acid to restore the balance of soil and adapting sowing time to seasonal variability are mentioned as prime adaptation strategies by 8.5% interlocutors each. From the comparison between multiple responses and single response to different and major adaptation strategies respectively, it is observed that while in multiple responses, the strategies of seed bed raising to save material assets from tidal surge, floods and salinity and cultivating saline resilient crops are mentioned respectively as the first highest and second highest used adaptive strategies to climatic impacts on material assets of livelihoods and the percentages of interlocutors are 10.2 and 11.3 respectively, in single response these two are mentioned as the highest used prime adaptation strategies jointly and the percentage of interlocutors is 10.6 each.

6.3.2.8 Climatic Hazards, Material Assets and Adaptation

Graph- 6.37 states that being asked to describe the different strategies (multiple responses) the interlocutors use as adaptation to insect attack on material assets, a significant number of interlocutors (30.6%, 78 out of 257) said they use animals or eater birds as hens, ducks, tailorbird (*tuntuni*), sparrow, Asian green bee-eater etc. to feed the pests on the farm to

control the insects biologically while a negligible number of them (5.4%, 14 out of 257) said they reduce the greenhouse gas emissions intensity per unit of food production as adaptation strategies to insect attack. Likewise, 17.5 and 17.1% interlocutors said they remove insects by

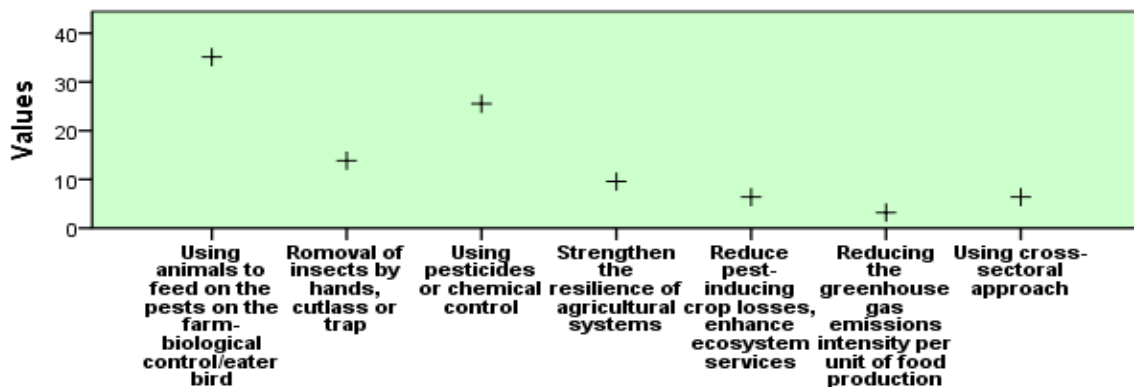
Graph- 6.37: Different Strategies the Interlocutors Use as Adaptation to Insect Attack on Material Assets of Livelihoods (in frequency of multiple responses)



hands, cutlass or trap (45) and use pesticides chemical control (44) respectively as general adaptation strategies to insect attack when 8.9% and 8.6% interlocutors said they reduce pest-inducing crop losses using different mechanisms or enhance ecosystem services (23) and use cross sectoral approach (22) like Climate-Smart Pest Management (CSPM) where they work in different sectors to control insect attack on crops. Besides, a substantial number of interlocutors (31) said they strengthen the resilience of agricultural systems; the percentage of this category is 12.1.

On the other hand, when the interlocutors were asked what prime strategy they adopt as adaptation to insect attack (Graph- 6.38), the highest number of them (33, 35.1%) shared they use animals eater birds as hens, ducks, tailorbird (*tuntuni*), sparrow, Asian green bee-eater etc. to feed the pests on the farm to control the insects biologically while a negligible number of them (3 out of 94, 3.2%) shared they reduce the greenhouse gas emissions intensity per unit of food production as adaptation strategies to insect attack. A significant number of interlocutors (25.5%, 24 out of 94) informed that they use pesticides or chemical control while a narrow figure of interlocutors mentioned the techniques of reducing pest-inducing crop losses or enhancing ecosystem services (6) and using cross-sectoral approach (6) as major adaptive strategies to insect attack on material assets like crops and grains; which is

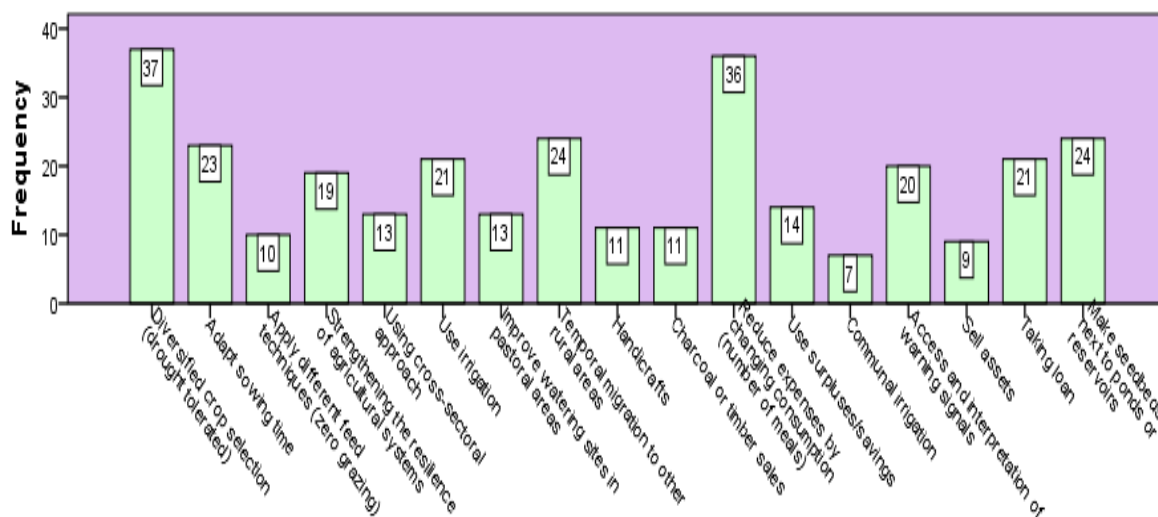
Graph- 6.38: Prime Strategy the Interlocutors Use as Adaptation to Insect Attack on Material Assets of Livelihoods (in per cent)



only 6.4% each. Besides, a substantial number of interlocutors (13) mentioned removal of insects by hands, cutlass or trap and strengthening the resilience of agricultural systems (9) as the two major strategies they adapt to insect attack; which are mentioned respectively by 13.8%, and 9.6% of total interlocutors who adopt adaptation strategies to climatic hazards.

Graph- 6.39 shows multiple responses where the researcher was informed that a substantial number of the people of *Bayer Char* (37 out of 313 responses) follow the diversification of crop selection to make crop tolerant to drought, it is the most used one among different adaptation strategies to the impact of drought on people's livelihoods of coastal people while the least used general adaptation strategy is the arrangement of communal irrigation (2.2%, 7 out of 313). The second highest number of people (11.5% of interlocutors) generally reduces their expenditure usually by changing consumption as reducing the number of meals (one or

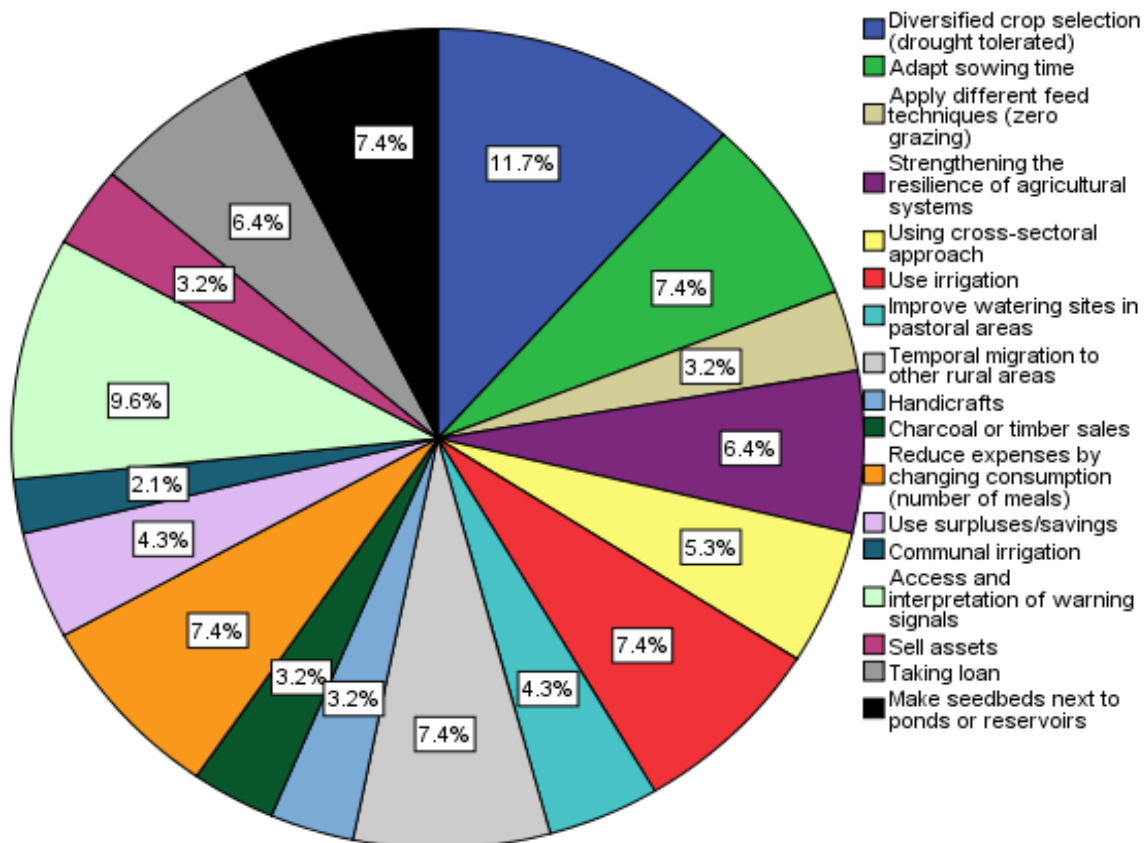
Graph- 6.39: Different Strategies the Interlocutors Use as Adaptation to the Impacts of Drought on Their Livelihood Assets (in frequency of multiple responses)



two meals a day) as adaptation to drought. Among other important strategies, temporal migration to upward rural areas (24), make seedbeds next to ponds or reservoirs (24) and adapting sowing time (23) are the three general strategies the interlocutors use as adaptation to drought impacts on their livelihoods. The percentages of first two categories are 7.7% each and the percentage of the last one is 7.3%. Besides, they use irrigation (21), take loan (21), access and interpretation of warning signals (20) and strengthen the resilience of agricultural system (19) are different important strategies the interlocutors use as adaptation to climatic impacts on their livelihoods.

When the interlocutors, who said they adopt adaptation strategies to climatic impacts on material assets of livelihoods, were asked regarding their prime adaptation strategy to drought, the highest number of interlocutors (11, 11.7%) said they diversify crops selection so that the crops would be drought tolerant. A significant number of interlocutors (9, 9.6%) informed that they give importance on access to and interpretation of warning signals as a prime strategy to climatic impacts on material assets of livelihoods. This is the second highest prime strategy. Besides, a substantial number of interlocutors said they use the techniques of sowing time adaptation (7), irrigation (7), temporal migration to other rural areas specially

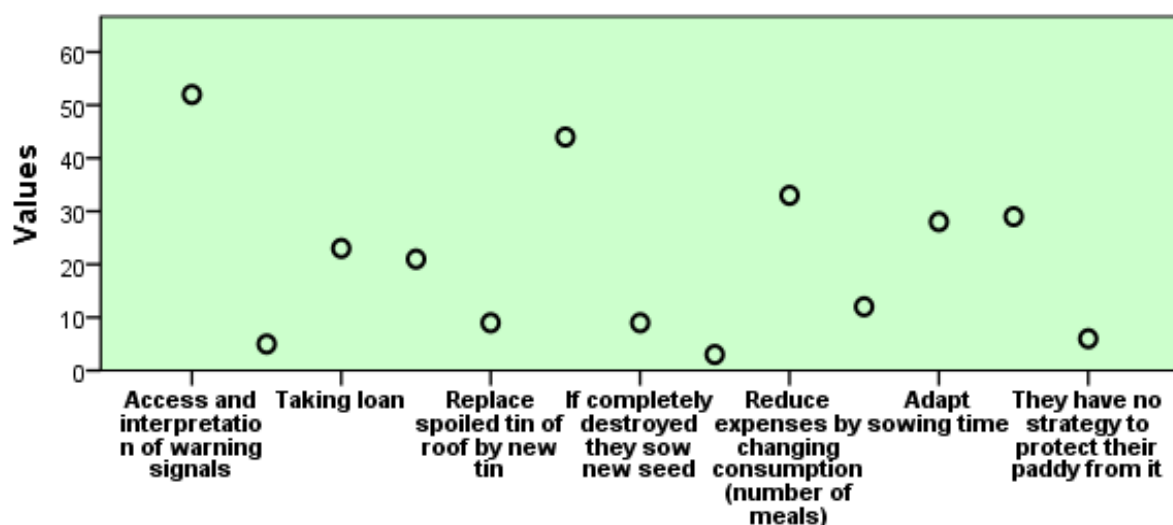
Graph- 6.40: Prime Strategy the Interlocutors Use as Adaptation to Impacts of Drought on Their Material Assets of Livelihood (in per cent)



upward areas (7), expenditure reduction of households by changing consumption specially by reducing the number of meals (7), making seedbeds just next to ponds or reservoirs (7) as the prime adaptation strategies to the impacts of drought or aridity on livelihoods; the percentage of interlocutors adopt these strategies is 7.4% each. Strengthening the resilience of agricultural systems and taking loan are two strategies mentioned as prime adaptation strategies by 6.4% interlocutors each. Likewise, improve watering sites in pastoral areas and using surplus or savings were mentioned by 4.3% interlocutors each and using cross-sectoral approach was mentioned by 5.3% interlocutors as the major adaptation strategies to the impacts of drought. On the other hand, a negligible number of interlocutors informed that different feed techniques application as zero grazing (3.2%), handicrafts, charcoal or timber sales (3.2%), communal irrigation (2.1%) and selling assets are their prime adaptation strategies to the impacts of aridity or drought on their material assets of livelihood assets (Graph- 6.40, Pie Chart).

Graph- 6.41 (Dot Chart) shows the multiple responses where the highest number of interlocutors (19.0%, 52 out of 274) shared that, access to and interpretation of warning signal regarding natural hazards is the strategy they used as adaptation to hailstorm while a negligible number of interlocutors (only 1.1%, 3 out of 274) said they use medicine in hailstorm impacted crops to save it from rotation.

Graph- 6.41: Different Strategies the Interlocutors Use as Adaptation to Impacts of Hailstorm on Their Material Assets of Livelihood (in frequency of multiple responses)

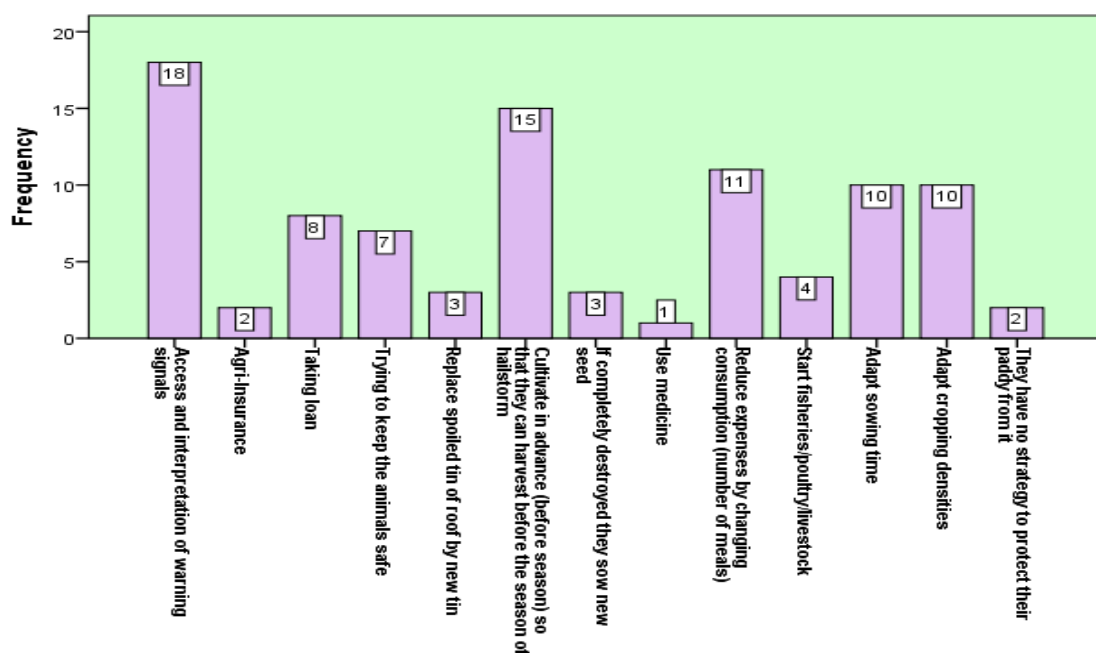


Likewise, the second highest number of interlocutors (44) mentioned that they cultivate in advance (before season) so that they can harvest before the season of hailstorm and the third highest number of interlocutors (33 out of 274) said they reduce expenses by changing consumption specially reducing the number of meals; the percentages of them are 16.1 and

12.0 respectively. Besides, a substantial number of them said they adapt cropping densities (29), adapt sowing time (28) and take loan (23) as general adaptation strategy to hailstorm. They are 10.6%, 10.2% and 8.4% of interlocutors who adopt adaptation strategies to hailstorm.

Graph- 6.42 points out that, in response to question about the prime strategy they use as adaptation to the impacts of hailstorm on their material assets, a significant number of interlocutors (18 out of 94) informed that, access to and interpretation of warning signals regarding natural hazards is their prime adaptation strategy to hailstorm; which is 19.1% of total interlocutors who adopt adaptation strategy to hailstorm while only a narrow figure (1, 1.1%) said they use medicine in hailstorm impacted crops to save it from rotation. Likewise, a substantial number of interlocutors (15, 16.0%) cultivate in advance so that they can harvest before the season when the frequency of hailstorm generally increases while 11.7% (11) said they reduce everyday expenditure by changing consumption including the reduction of number of meals and 8.5% and 7.4% interlocutors said taking loan and keeping the animals in safe places are the prime strategies they

Graph- 6.42: Prime Strategy the Interlocutors Use as Adaptation to Impacts of hailstorm on Their Livelihood Assets (in number of interlocutors)



adopt as adaptation to the impacts of hailstorm on their livelihood assets. Besides, the techniques of adapting sowing time to hailstorm and adapting cropping densities i.e., less density during high frequency and intensity of hailstorm and more density of crops during low frequency and intensity of hailstorm were mentioned by 10.6% (10) interlocutors each as

adaptation to the impact of hailstorm on livelihood assets specially material assets of livelihoods while the techniques of agri-insurance (2), replacing spoiled tin of roof by new tin (3), sowing new seed in case of complete destruction and starting fisheries/poultry/livestock instead of crop cultivation were mentioned by only 2.1%, 3.2%, 3.2%, and 4.3% interlocutors respectively. On the other hand, 2.1% (2) interlocutors said they have no strategy to protect their paddy or material assets from hailstorm. Explaining the adaptive strategies of *Bayer Char* coastal community to the climatic impacts specially the impacts of insect attack, drought and hailstorm on their material assets of livelihoods it is noticed that, the main idea of cultural ecology theory is reflected in these findings i.e., there is an adaptive relationships between ecology and culture of particular community.

6.3.3 Climate Change, Human Assets and Adaptation

6.3.3.1 Climatic Impacts, Diseases and Medicine

Table- 6.20 shows that when all the interlocutors were asked whether they were affected by any diseases in last one year, while a significant number of interlocutors (92.0%) answered positively, a negligible number of them (8.0%) answered negatively. Out of the interlocutors who answered positively, 79.3% of them are males who are 93.6% of male interlocutors and 73.0% of total interlocutors. Out of the total female interlocutors, 85.7% said they were affected by diseases and only a narrow figure (14.3%) said they were not affected by

Table- 6.20: Sex and Whether the Interlocutors Affected by Diseases in Last 1 Year (in number)

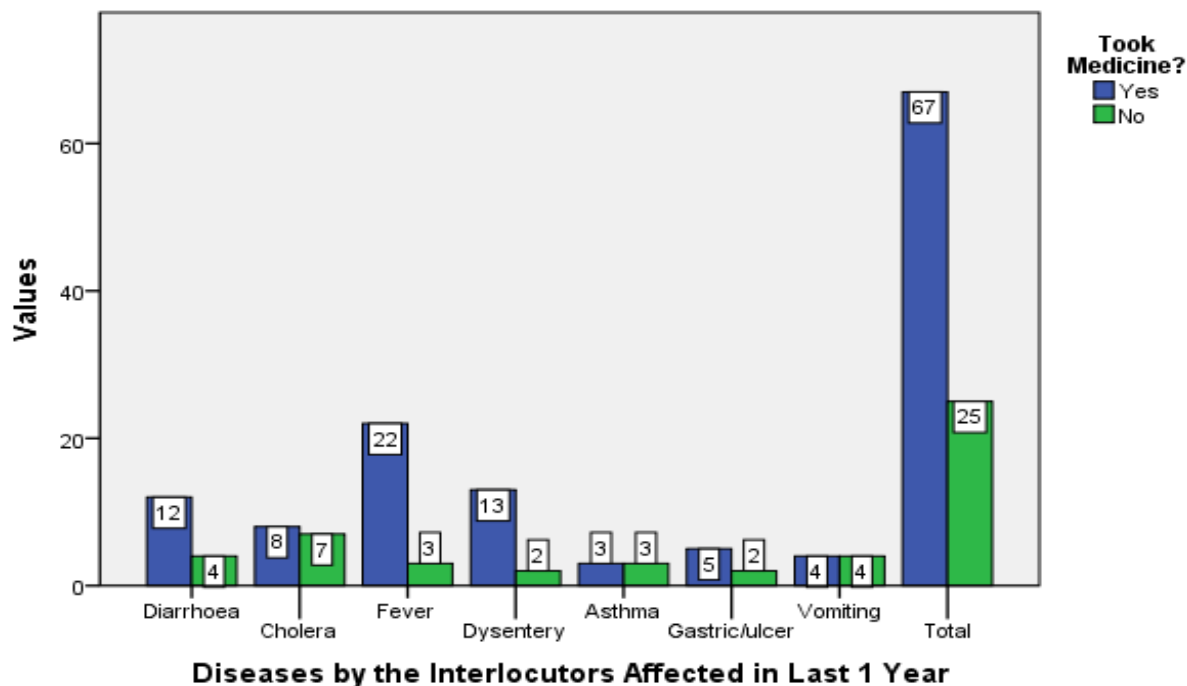
		Affected by Diseases?		Total
		Yes	No	
Sex	Male	73	5	78
	Female	18	3	21
	Third Sex	1	-	1
Total		92	8	100

$$(\chi^2 = 1.482, df = 2, \alpha = .05, t\text{-value} = 5.991)$$

diseases. Explaining the statistical data, it is observed that at $df = 2$ and $\alpha = .05$, the critical t -value is 5.991 which is greater than chi-square value i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the sex of interlocutors and their affecting by diseases in *Bayer Char* coastal community. It indicates that irrespective of sexes the people of *Bayer Char* are affected by climate change induced diseases.

From the graph- 6.43 it is observed that, when the total interlocutors who affected by diseases in last one year (92), were asked to mentioned the diseases, the highest number of them (27.2%, 25 out of 92) mentioned fever, the second highest number mentioned diarrhoea (17.4%, 16) and third highest number mentioned cholera (15) and dysentery (15) which is 16.3% each. Besides 6.5%, 7.6% and 8.7% interlocutors who affected by diseases in last one year, mentioned the names of diseases as asthma, gastric/ulcer and vomiting respectively. When disease affected interlocutors were asked whether they took medicine, most of them (67, 72.8%) answered positively and a substantial number of interlocutors (27.2%) answered negatively. Out of the interlocutors who were affected by diarrhea, gastric, fever and dysentery, 75.0%, 71.4%, 88.0% and 86.7% of them respectively answered positively i.e.,

Graph- 6.43: Diseases by Which the Interlocutors Affected in Last One Year and Whether They Took Medicine (in number of interlocutors)



they took medicine for diseases. On the other hand, out of the interlocutors who were affected by asthma, cholera and vomiting, 50.0%, 53.3%, and 50.0% respectively answered that they took medicine.

Table- 6.21 shows that in response to the question about the types of medicine they took when affected by diseases, a significant number (60) of interlocutors informed that they took traditional medicine while only a negligible number (7 out of 67) informed that they took modern medicine; the percentages of both types are 89.6 and 10.4. On the one hand, the interlocutors who said they took traditional medicine, 58.3% of them are illiterate, 13.3% can sign only, 8.3% are below class eight, 10.0% are below SSC, 3.3% are SSC pass and 1.7% completed graduation. On the other hand, the interlocutors who took modern medicine, the highest number of them (42.9%) can sign only, 14.2% (1) are illiterate, 14.2% are SSC passed, 14.2% completed graduation and 14.2% are master passed. Out of the total interlocutors who took medicine (67), the educational qualifications of 53.7% (the highest) are illiterate, 16.4% (second highest) can sign only, 9.0% are below SSC (the third highest) and 7.5% are below class eight. Though most of the disease affected people took medicine (67, 72.8%), a significant number (60, 89.6%) of people took traditional medicine irrespective of educational qualifications while only a negligible number (7 out of 67) took modern medicine (10.4). From statistical data it is seen that at $df = 7$ and $\alpha = .05$, t-value is

Table- 6.21: Educational Qualification of the Interlocutors and Types of Medicine They Took (in number)

		Types of Medicine		Total
		Traditional	Modern	
Educational Qualifications of Interlocutors	Illiterate	35	1	36
	Can sign only	8	3	11
	Can read only	3	-	3
	Below 8	5	-	5
	Below SSC	6	-	6
	SSC	2	1	3
	Graduation	1	1	2
	Masters	-	1	1
Total		60	7	67

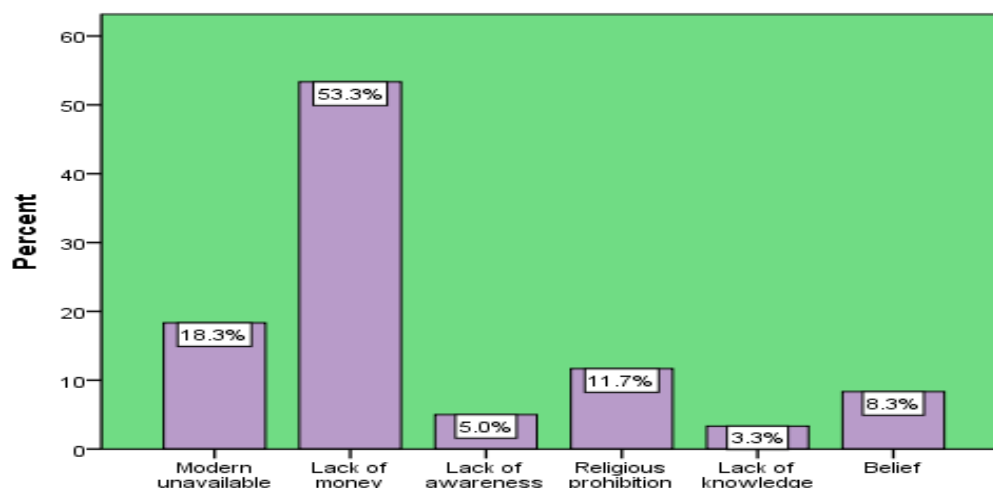
$$(\chi^2 = 20.820, df = 7, \alpha = .05, t\text{-value} = 14.067; R = .322)$$

14.067 that is less than calculated value of chi-square ($\chi^2 = 20.820$) i.e., null hypothesis (H_0) is rejected and alternative hypothesis (H_1) is accepted. So, there is a relationship between educational qualifications of interlocutors and types of medicine that take. But the level of relation between them is positive and very negligible as found from the value of R ($R = .322$). So, it can be said that education hardly works in taking modern medicine in *Bayer Char* coastal community because survivability is the main concern here.

It is also observed that the people of Bayer Char used the resource of their environment in adaptation to the impacts of climate change (different types of diseases). So, the theory of cultural ecology is proved here.

When the interlocutors, who took traditional medicine, were asked to state the causes of taking traditional medicine, most of them (32, 53.3) mentioned the cause as lack of money while the lowest number (2, 3.3%) of them mentioned the lack of knowledge as the cause of

Graph- 6.44: The Causes of Taking Traditional Medicine (in per cent)



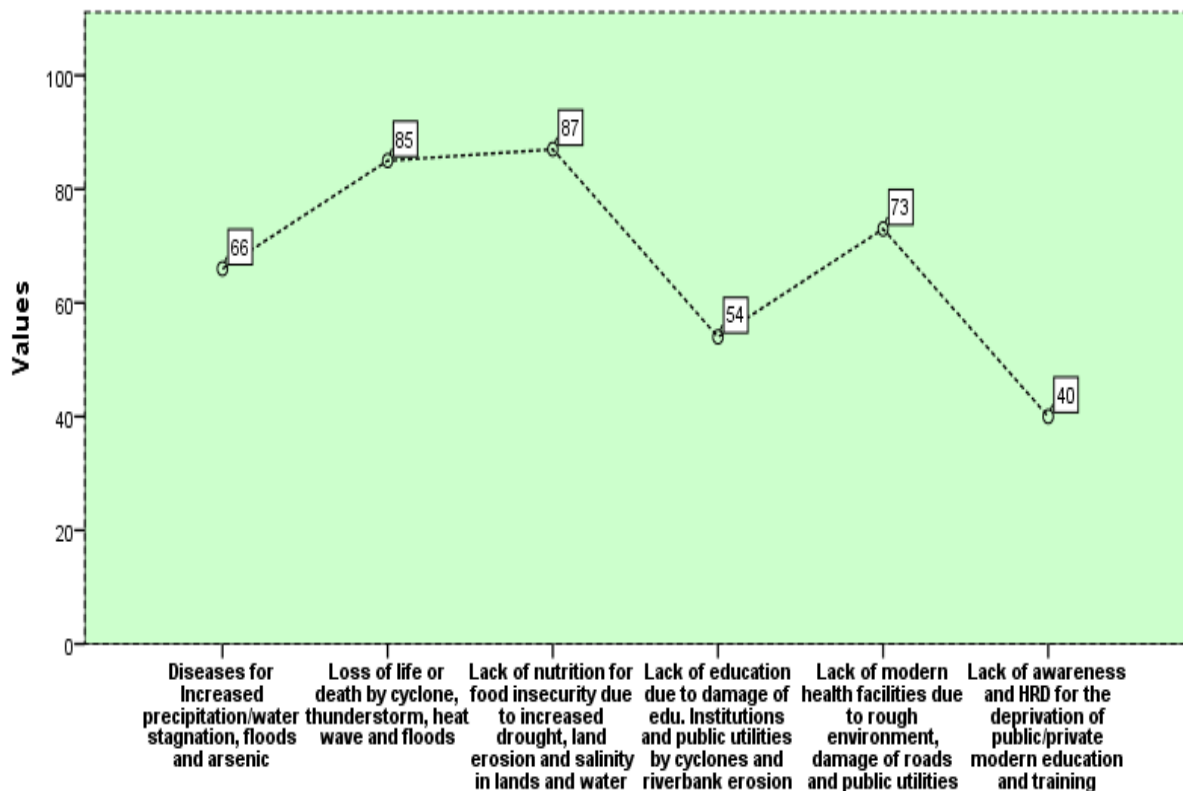
taking traditional medicine for diseases(Graph- 6.44). The unavailability of modern medicine in *Bayer Char* coastal area and religious prohibition are mentioned by 18.3% (11) and 11.7% (7) interlocutors that are the second and third highest percentages respectively. Besides, 5.0% (3) interlocutors mentioned that the reason behind taking traditional medicine is the lack of awareness.

6.3.3.2 Climatic Impacts on Human Assets

When the interlocutors, who were impacted by climate change induced natural hazards (96), were asked whether climatic hazards have any impacts on human assets of livelihood, a highly significant number of them (94) answered positively while only a negligible number of interlocutors (2) answered negatively. The percentage of interlocutors who answered positively is 97.9 which is the 94% of total interlocutors. On the other hand, the percentage of the interlocutors who answered negatively is 2.1%, which is the 2.0% of total interlocutors.

In response to the question (Multiple Responses) about general climatic impacts on human assets of livelihoods, the highest number of responses (87 out of 405) mentioned food insecurity and lack of nutrition due to increased drought, land erosion and salinity in land and water while the lowest number of responses (40 out of 405) mentioned lack of awareness and lack of human resource development (HRD) due to deprivation from public/private modern education and training; the percentage is 21.5 and 9.9 respectively(Graph- 6.45). Likewise, a

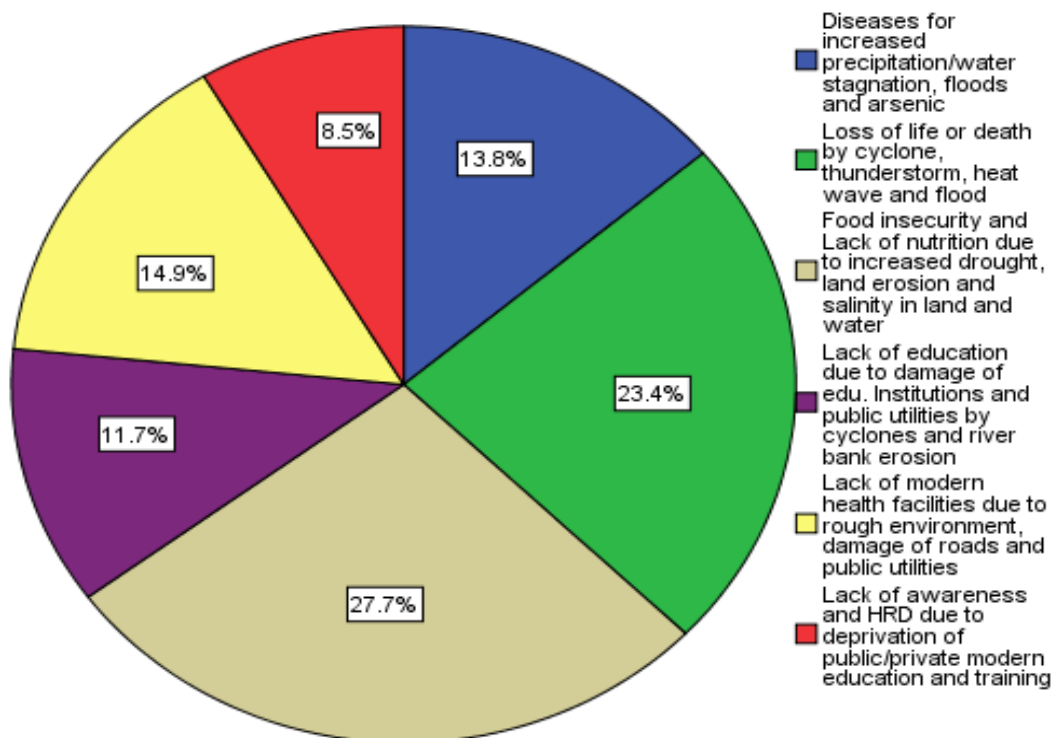
Graph- 6.45: General Climatic Impacts on Human Assets of Livelihoods of Interlocutors (in frequency of multiple responses)



significant number of responses (85, 21.0%) stated the loss of life or death by cyclone, thunderstorm, heat wave and flood as one of the general impacts of climatic hazards on human assets of livelihoods. Besides, 18.0% (73), 16.3% (66) and 13.3% (54) responses mentioned lack of modern health facilities due to rough environment, damage of roads and public utilities, diseases due to increased precipitation/water stagnation, floods and arsenic contamination and lack of education due to damage of educational institutions and public utilities by cyclones and riverbank erosion respectively (Graph- 6.45).

On the other hand, graph- 6.46 points out that when the interlocutors (94) whose human assets were impacted by climatic hazards, were asked about the major impacts of climate change on human assets of livelihoods, the highest number of them (26, 27.7%) mentioned food insecurity and lack of nutrition due to increased drought, salinity in land and water as the major climatic impacts on human assets of livelihoods while the lowest number of them (8, 8.5%) mentioned the lack of awareness and human resource development due to the deprivation of public/private modern education and training as the major climatic impact on human assets. Loss of life or death by

Graph- 6.46: Major Climatic Impacts on Human Assets of Livelihoods of Interlocutors (in per cent)



cyclone, thunderstorm, heat wave and flood was mentioned by 23.4% interlocutors (22 out of 94, the second highest) as the major impact of climatic hazards on human assets while the

second lowest number of interlocutors (11, 11.7%) stated that lack of education due to damage of educational institutions and public utilities by cyclones and river bank erosion is the major climatic impacts on human assets of livelihoods. Likewise, 14 and 13 interlocutors mentioned lack of modern health facilities due to rough environment, damage of roads and public utilities and diseases due to increased precipitation/water stagnation, floods and arsenic respectively are the two major climatic impacts on human assets; the percentages are 14.9 and 13.8.

6.3.3.3 Climatic Hazards, Severity and Human Assets

Table- 6.22 points out that when the interlocutors whose human assets were impacted by climatic impacts, were asked which climate change induced hazards affect their human assets most, the highest number of them (32 out of 94, 34.0%) mentioned flood, of them, 37.5% interlocutors' (the highest) primary profession is agriculture. While the second highest number of interlocutors (18, 19.1%) mentioned that cyclone affects their human assets of livelihood most and, of them, 50.0% (9) are farmers, 16.7% (3) are fishermen, 11.1% (2) are day labourer, 16.7% (3) are housewives and 5.6% (1) are businessmen. The third highest number of interlocutors (14, 14.9%) mentioned thunderstorm as the climatic hazard that

Table- 6.22: Primary Occupation of Interlocutors and Climate Change (CC) Induced Natural Hazards That Affect Their Human Assets Most (in frequency of interlocutors)

		Which CC Induced Natural Hazards Affect Human Assets Most						Total
		Flood	Cyclone	Tide	Insect Attack on Crops	Thunderstorm	Water Salinity	
Primary Occupation	Agriculture	12	9	6	5	5	3	40
	Fishing	7	3	1	-	5	-	16
	Day labourer	1	2	-	-	-	4	7
	Housewife	4	3	1	1	2	1	12
	Business	2	1	1	-	-	-	4
	Driver	3	-	2	-	-	1	6
	Service	1	-	-	1	-	-	2
	Jobless	1	-	-	1	-	-	2
	Household worker	1	-	-	1	2	1	5
Total		32	18	11	9	14	10	94

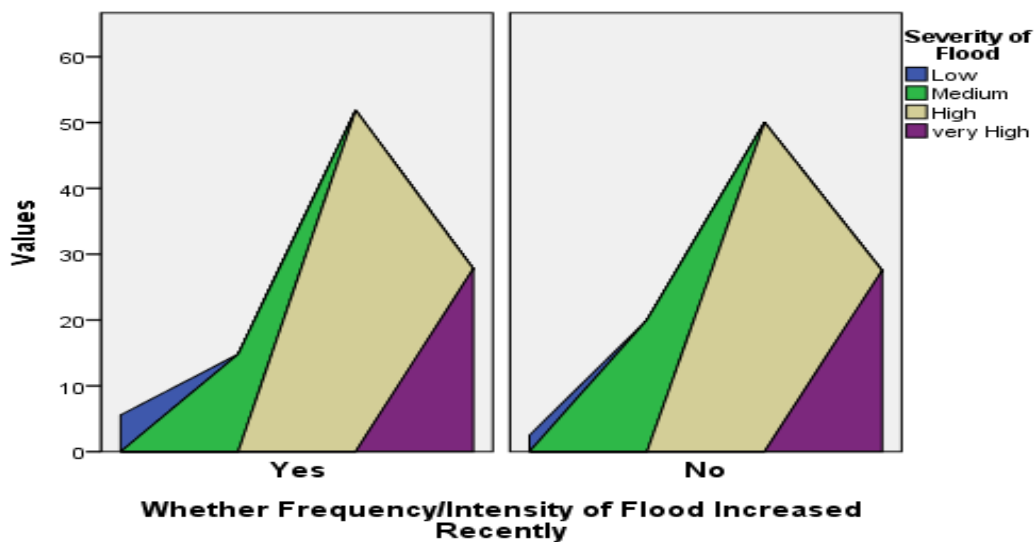
$$(\chi^2 = 50.879, df = 40, \alpha = .05, t\text{-value} = 55.758)$$

impacts the human assets most, of them, farmers and fishermen are 35.7% each, housewives and household workers are 14.3% each. Besides, 11.7%, 9.6% and 11.7% interlocutors mentioned tide, insect attack and water salinity respectively as the climatic hazards that affect their human assets of livelihoods most. From statistical data it is seen that at $df = 40$ and $\alpha = .05$, $t\text{-value}$ is 55.758 that is greater than calculated value of chi-square ($\chi^2 = 50.879$) i.e., null

hypothesis (H_0) is accepted and alternative hypothesis (H_1) is rejected. So, there is no relationship between primary occupation of interlocutors and the climatic hazards that affect their human assets most

Graph- 6.47 (area chart) states that being asked about the degree of severity of the impacts of floods on their livelihood assets, the highest number (51.1%, 48 out of 94) of interlocutors whose natural assets were impacted by climate change hazards said that the degree of impacts severity of floods on livelihoods is “High” while only a negligible number of interlocutors said ‘Low’ (4.3%, 4 out of 94). Likewise while 27.7% (26) said the impact severity of flood on livelihood assets is “Very High”, 17.0% (16) said “Medium”. When the interlocutors whose human assets were impacted most by flood (94), were asked whether the intensity or frequency of flood has recently increased or not, a significant number (54 out of 94) of them answered positively while 40 interlocutors answered negatively. The percentages of these two

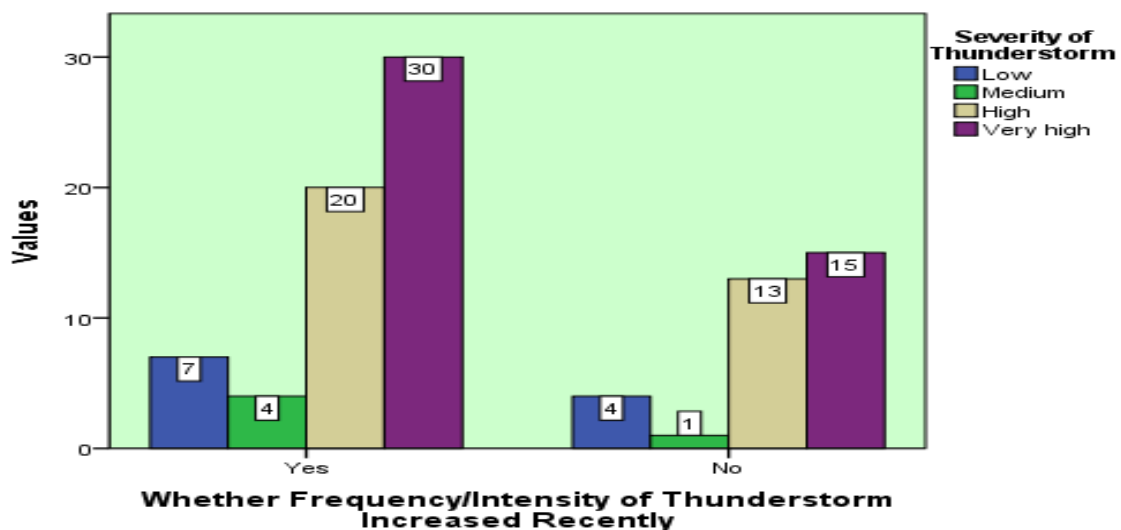
Graph- 6.47: Severity of the Impacts of Flood on Human Assets of Livelihoods and Its Recent Intensity/Frequency (in per cent)



categories are 57.4 and 42.6 respectively (Graph-6.47). The interlocutors who said the intensity of flood has increased recently (54), most of them (51.9%) said the impact severity of flood on human assets of their livelihoods is ‘High’ on the other hand, the interlocutors who said the intensity of flood did not increase recently, 50.0% of them ranked the impact severity of flood on human assets of livelihoods as ‘High’ (Graph-6.47). From the study data, it is observed that, on the one hand, out of all climate change induced natural hazards flood affects human assets most (Table- 6.20) and, on the other hand, its degree of impact severity is ‘High’ (51.1%) or ‘Very High’ (Graph- 6.61). So, it can be said that flood has the most devastating impacts on livelihood assets of *Bayer Char* coastal people in particular and on their holistic life in general.

Graph- 6.48 (Histogram) states that being asked about the degree of severity of the impacts of the thunderstorm on their livelihood assets, the highest number (47.9%, 45 out of 94) of interlocutors whose natural assets were impacted by climate change hazards said that the degree of impacts severity of thunderstorm on livelihoods is “Very High” while the lowest number (5 out of 94, 5.3%) of interlocutors said “Medium”. Likewise, while 35.1% (33) said the impact severity of thunderstorm on livelihood assets is “High”, 11.7% (11) said “Low”. From the study data, it is observed that, on the one hand, out of all climate change induced natural hazards that affect human assets most, the position of thunderstorm is third (Table-20), on the other hand, its degree of impact severity is stated as very high (47.9%) or high

Graph- 6.48: Degree of Severity of the Impacts of Thunderstorm on Human Assets of Livelihoods and Its Recent Intensity/Frequency

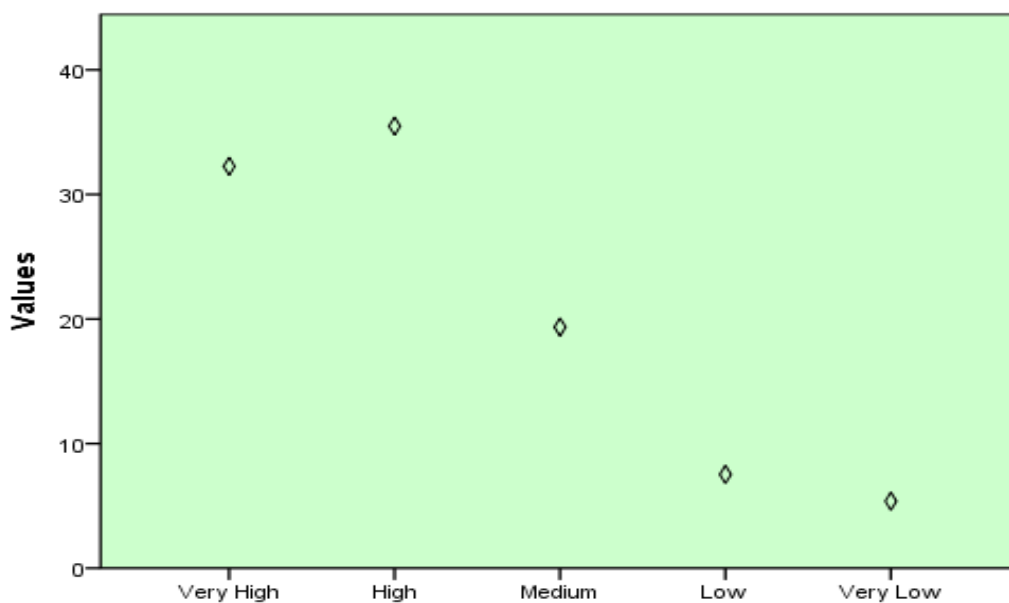


Graph- 6.65 also shows that when the interlocutors whose human assets were impacted most by thunderstorm (94), were asked whether the frequency or degree of intensity of thunderstorm has recently increased or not, a significant number (61 out of 94) of them answered positively; of them, the highest number of interlocutors (30 out of 61, 49.2%) ranked the impact severity of thunderstorm on human assets as ‘Very High’ and second highest number of interlocutors (20 out of 61, 32.8%) ranked the impact severity of thunderstorm as ‘High’. 33 interlocutors (35.1%) answered negatively; of them, the highest number of interlocutors (15 out of 33, 45.5%) ranked the impact severity of thunderstorm on human assets as ‘Very High’ and second highest number of interlocutors ranked impact severity of thunderstorm as ‘High’. The percentages of positively and negatively answering interlocutors are 64.9 and 35.1 respectively. So, it can be said that thunderstorm has a significant impacts on life and livelihood assets of *Bayer Char* coastal.

6.3.3.4 Climatic Hazards, Vulnerability and Human Assets

From graph-6.49 it is observed that the researcher was informed of the degree of vulnerability of households to the climatic impacts of flood where a significant number (36.2%) of interlocutors described their vulnerability to flood as “High” which is the highest number (32) of total interlocutors (94) who said their life and human assets of their livelihoods were impacted by flood. Here it is also noticeable that a negligible number of interlocutors described the vulnerability of their households to flood as ‘Very Low’ and “Low”; out of the interlocutors who were impacted by flood, they are 5.3% (5) and 7.4% (7) respectively and

Graph- 6.49: The Degree of Vulnerability of Households to Flood

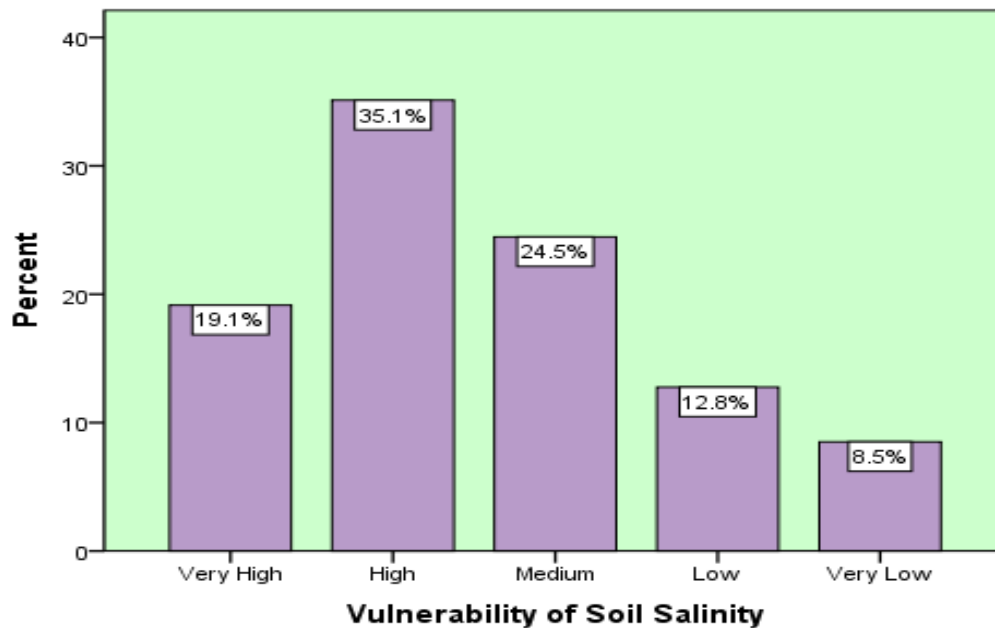


out of the total interlocutors they are 5.0% and 7.0% respectively. Likewise, a substantial number of interlocutors mentioned their vulnerability to flood as “Very High”; they are 31.9% (30) of interlocutors who were asked about their household vulnerability to flood. Besides, notable number (18) of interlocutors mentioned that their vulnerability to flood is “Medium”; their percentage is third highest (19.1%) among the interlocutors who were asked about their vulnerability to flood.

The graph-6.50 points out that when the interlocutors, who informed that their human assets of livelihoods were impacted by climatic hazards including thunderstorm, were asked about the vulnerability of their households to thunderstorm, the highest number of interlocutors (33 out of 94) described their household vulnerability to thunderstorm as “High” while the lowest number of interlocutors described as “Very Low”. The percentage of highest number and

lowest number of interlocutors is 35.1 and 8.5. Likewise, a significant number of interlocutors (23) said that their household vulnerability to thunderstorm is “Medium”,

Graph- 6.50: The Degree of Vulnerability of Households to Thunderstorm



their percentage is 24.5 and this is the second highest number of interlocutors. Moreover, a substantial number of interlocutors (18) mentioned their household vulnerability to thunderstorm as “Very High”, this category is 19.1% of total interlocutors whose human assets were impacted by climatic hazards (94). On the other hand, 12.8% interlocutors informed that the degree of vulnerability of their household to thunderstorm is “Low”, the number of interlocutors of this category is 12.

6.3.3.5 Adaptation to Climatic Impacts on Human Assets

When the interlocutors whose human assets of livelihoods were impacted by climate change induced hazards (94) were asked whether they adopt any adaptation strategies (Table- 6.23), a significant number of them (93) answered positively while a negligible number of interlocutors (1) answered negatively. The percentages of these two categories are 98.9 and 1.1 respectively. The interlocutors who answered positively, 51.6% (48), 33.3% (31) interlocutors respectively are marginal and landless households. On the other hand, the only interlocutor who answered negatively belongs to marginal households. Statistical data show that at $df = 4$ and $\alpha = .05$, t-value is 9.488 which is greater than chi-square value (calculated value = .928). So, null hypothesis (H_0) is accepted and alternative hypothesis (H_1) is rejected i.e., there is no significant relationship between the household types of interlocutors and their adopting

Table- 6.23: Household Types of Interlocutors and Whether They Use Any Adaptation Strategies to Climatic Impacts on Human Assets (in number)

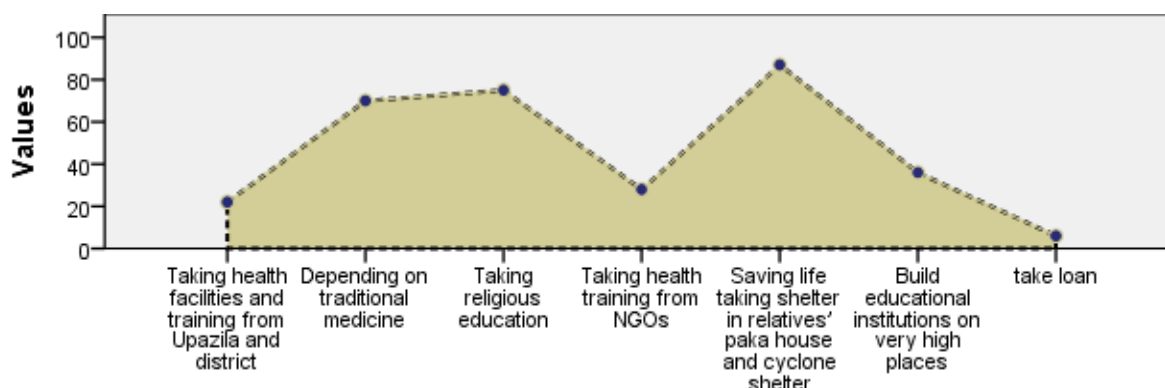
		Any Adaptation to Climatic Impacts on Human Assets		Total
		Yes	No	
Household Types of Interlocutors (amount of land in acres)	Landless	31	-	31
	Marginal	48	1	49
	Small	7	-	7
	Medium	3	-	3
	Large	4	-	4
Total		93	1	94

$(\chi^2 = .928, df = 4, \alpha = .05, t\text{-value} = 9.488)$

adaptation strategies to the climatic impacts on human assets of their livelihoods in *Bayer Char* community. So, irrespective of household types the people of *Bayer Char* coastal community adopt adaptation strategies to climatic impacts on their human assets of livelihoods which was said in the theory of cultural ecology of Steward.

In response to multiple responses questions about different strategies the interlocutors (93) generally use as adaptation to climatic impacts on human assets (Graph- 6.51), a substantial number (87 out of 324, 26.9%) mentioned that they save their life taking shelter in relatives' *paka* house and cyclone shelter while a negligible number (6, 1.9%) mentioned taking loan as general adaptation to climate change impacts on human assets. Likewise, 23.1% (75) and 21.6% (70) interlocutors mentioned

Graph- 6.51: Different Strategies the Interlocutors Use as Adaptation to Climatic Impacts on Human Assets (in frequency of multiple responses)

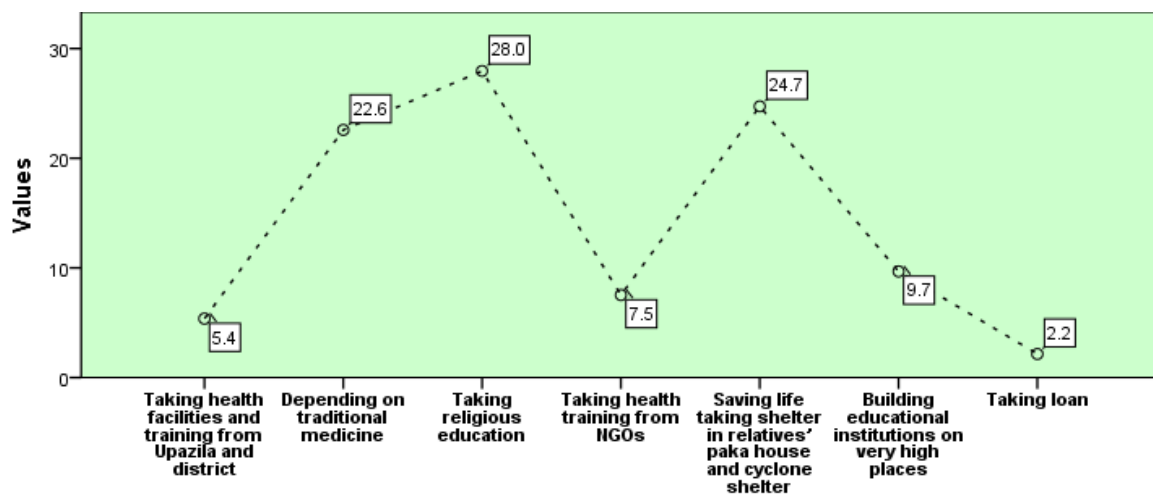


taking religious education and depending on traditional medicine respectively are the two important general adaptation strategies to the impacts of climate change on human assets. These two strategies are mentioned by second and third highest number of interlocutors. Besides, taking health facilities and training from Sadar Upazila and district, taking health

training from NGOs and building educational institutions on very high places are three general adaptation strategies to climatic impacts on human assets and which were mentioned by 22 (6.8%), 28 (8.6%) and 36 (11.1%) interlocutors respectively.

In response to single response question about major strategies the interlocutors (93) use as adaptation to climatic impacts on human assets (Graph- 6.52), a substantial number of interlocutors (26 out of 93, 28.0%) mentioned that they take religious education while a negligible number of interlocutors (2, 2.2%) said they take loan. Likewise, the strategies of saving life by taking shelter in relatives' *paka* house and cyclone shelter, depending on

Graph-6.52: Major Strategies the Interlocutors Use as Adaptation to Climatic Impacts on Human Assets (in per cent)



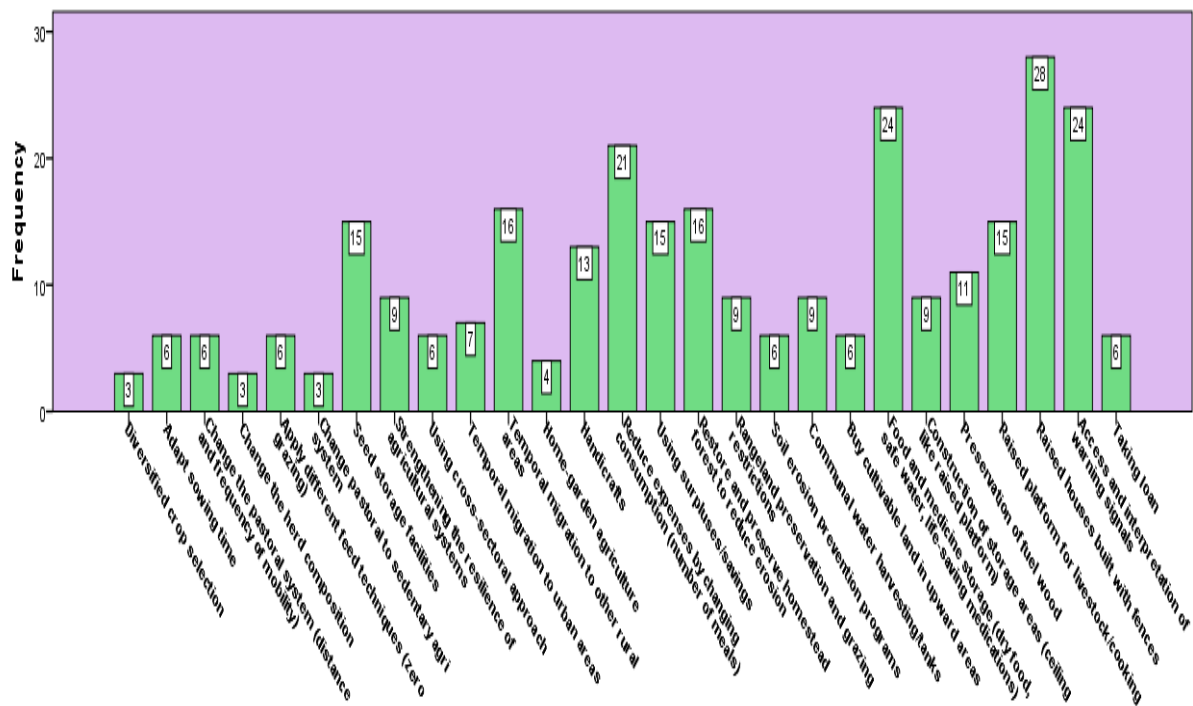
traditional medicine, building educational institutions on very high places are mentioned by 24.7% (23), 22.6% (21) and 9.7% (9) interlocutors respectively. Besides, taking health training from NGOs and taking health facilities and training from Upazila and district are adopted by 7.5% (7) and 5.4% (5) interlocutors as major adaptation strategies to climatic impacts on their human assets of livelihoods. Here, adaptive relationships between ecology and culture as stated in the theory of culture ecology are observed

6.3.3.6 Climatic Hazards, Human Assets and Adaptation

From the graph-6.53 it is observed that when the interlocutors were asked to state the general strategies (multiple responses) they adopt as adaptation to the impacts of flood on their livelihood assets, the highest number of them (28 out of 296 responses, 9.5%) mentioned that they raise their houses which are built with fences while the lowest number of interlocutors (3 out of 296 responses) mentioned that they diversify crop selection (3), change the herd composition and change pastoral to sedentary agri-system (3), the percentages of these three

categories are 1.0% each. Food and medicine storage as the storage of dry food, safe water, life-saving medications (24) and access to and interpretation of warning signals (24) are mentioned by second highest number of interlocutors as the general adaptive strategies to the impacts of flood on livelihoods, the percentage is 8.1 each. The third highest number of

Graph- 6.53: Different Strategies the Interlocutors Adopt as Adaptation to Flood (in frequency of multiple responses)

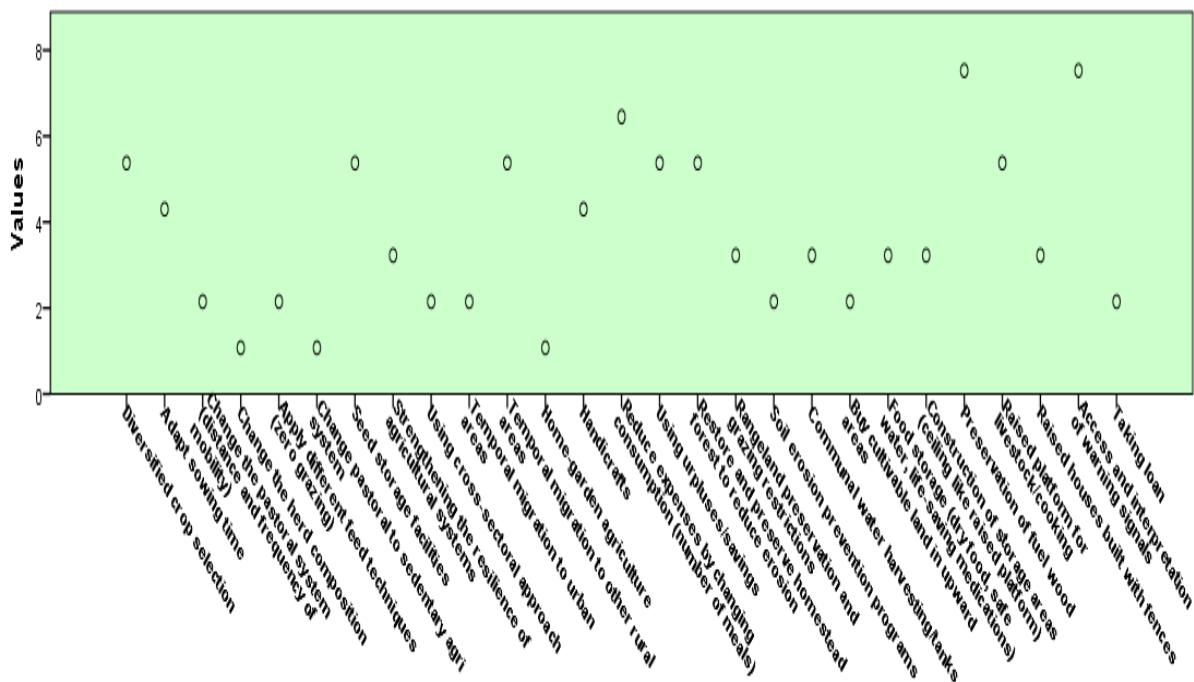


interlocutors stated that they reduce expenses by changing consumption specially by reducing the number of meals as adaptation strategy to flood. Besides, temporal migration to other rural areas and restore and preserve homestead forest to reduce erosion are used as general adaptation strategies to flood; the percentage is 5.4% each (16 each). Likewise, Emphasizing on seed storage facilities, using surpluses/savings, raising platform for livestock/cooking are mentioned as three important adaptive strategies to flood by 5.1% interlocutors each. Other important adaptive strategies to flood are handicrafts (13), preservation of fuel wood (11), strengthening the resilience of agricultural systems (9), rangeland preservation and grazing restrictions (9), communal water harvesting/tanks (9) and construction of storage areas (ceiling like raised platform, 9).

Graph- 6.54 points out that raising houses built with fences and access to and interpretation of warning signals were mentioned by the highest number of interlocutors (8 out of 93 each) as

the two major adaptation strategies to flood, the percentages of two categories are 8.6 each while diversification of crop selection, changing the herd composition, changing pastoral to sedentary agro-system and home-garden agriculture are mentioned by the lowest number of interlocutors as the prime adaptation strategy to flood, the percentage is 1.1 each. Likewise, a substantial number of people said they store food and essential things (dry food, safe water, life-saving medications) and reduce expenses by changing consumption specially reducing the number of meals as adaptation strategies to flood; the percentages of these two categories are 7.5 (7) and 6.5 (6) respectively. Seed storage facilities, temporal migration to other rural areas (upward rural areas),

Graph- 6.54: Major Strategies the Interlocutors Adopt as Adaptation to Flood (in per cent)

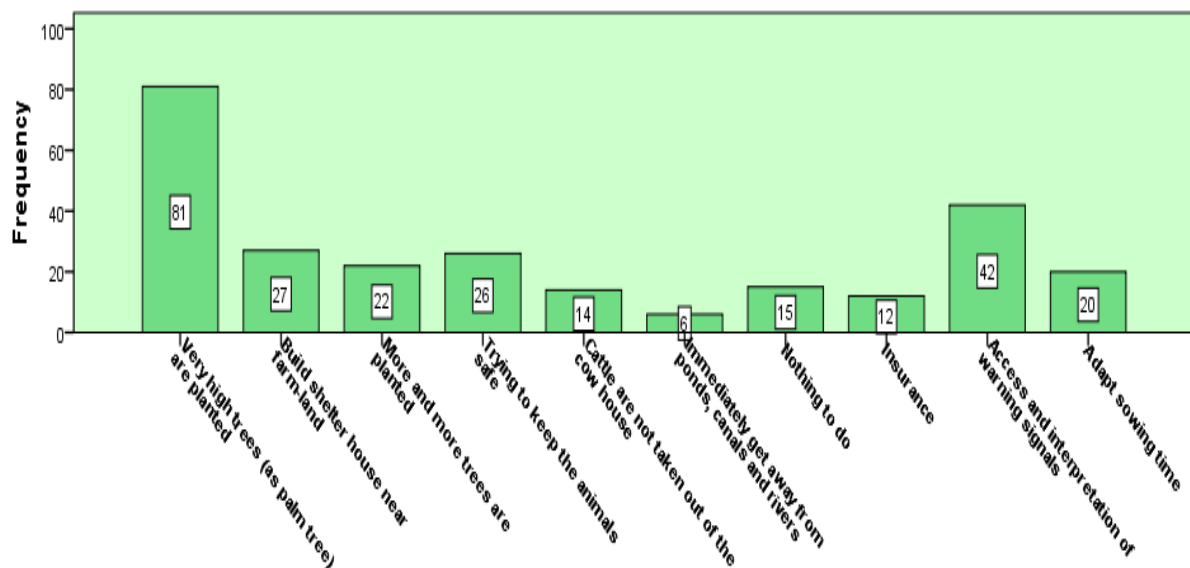


using surpluses/savings, restoring and preserving homestead forest to reduce erosion and raising platform for livestock/cooking were mentioned by 5.4% interlocutors each (5 out of 93 each) as the major adaptation strategies to flood, a major climatic impact on human assets of livelihoods. Besides, interlocutors mentioned engaging handicrafts (4.3%), adapting sowing time (2.2%), changing the pastoral system as distance and frequency of mobility (2.2%), applying different feed techniques as zero grazing (2.2%), strengthening the resilience of agricultural systems (3.2%), using cross-sectoral approach (2.2%), temporal migration to urban areas (2.2%), rangeland preservation and grazing restrictions (3.2%), soil erosion prevention programs (2.2%), communal water harvesting/tanks (3.2%), buying

cultivable land in upward areas (2.2%), construction of storage areas as ceiling like raised platform (3.2%), preservation of fuel wood (3.2%) and taking loan (2.2%) as the major adaptation strategies to the impacts of flood on livelihood assets specially human assets of livelihoods.

When the interlocutors, who adopt adaptation strategies to climatic impacts on human assets, were asked to describe their general adaptation strategies (multiple responses) to the impacts of thunderstorm on livelihood assets (Graph- 6.55), a significant number (the highest number) of them (81 out of 265 responses, 30.6%) said they plant very high trees like palm trees while a negligible number (the lowest number) of them (6 out of 265) informed that they immediately get away from ponds, canals and rivers. While access to and interpretation of warning signals was mentioned by the second highest number (42 out of 265), the second

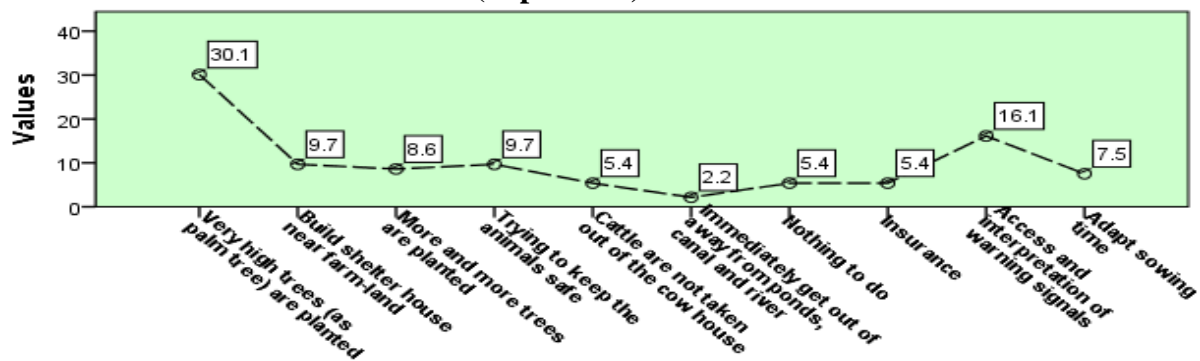
Graph- 6.55: Different Strategies the Interlocutors Adopt as Adaptation to Impacts of Thunderstorm on livelihood Assets (in frequency of multiple responses)



lowest number of interlocutors (12) mentioned taking insurance policy as the different adaptation strategies to the impacts of thunderstorm. Likewise, a substantial number of interlocutors mentioned building shelter house near farm-land (27), trying to keep the animal safe (26), more and more trees are planted (22) and adapt sowing time (20) as different strategies they adopt as adaptation to the impacts of thunderstorm on their livelihood assets especially human assets of livelihoods. At the same time, a narrow figure of interlocutors informed adopting insurance policy (12) and not taking cattle out of the cow house (14) are two of the general adaptation strategies to thunderstorm. Cultural ecology theory fits with these findings.

Graph- 6.56 shows that in response to the question what major strategies the interlocutors (93) adopt as adaptation to the impacts of thunderstorm, a substantial number of interlocutors (28 out of 93, 30.1%) informed that very high trees (as palm tree) are planted while a negligible number (2 out of 93, 2.2%) of interlocutors informed they immediately get away from ponds, canals and rivers when the thunderstorm starts. The second highest number of interlocutors (16.1%, 15 out of 93) mentioned access to and interpretation of warning signals as a major adaptation strategy to thunderstorm. While the second lowest number of interlocutors mentioned cattle are not taken out of the cow house (5) and adopting insurance policy (5) as the two major adaptation strategies to thunderstorm; the percentages of these two categories are 5.4 each. Building shelter house near farm-land and trying to keep the

Graph- 6.56: Major Strategies the Interlocutors Adopt as Adaptation to the Impacts of Thunderstorm on livelihood Assets (in per cent)



animals safe are mentioned by 9.7% interlocutors each (9 out of 93) as major adaptive strategies to thunderstorm. Besides, 8.6% (8) and 7.5% (7) interlocutors said they adopt the strategies of planting more and more trees and adapting sowing time as the major adaptation strategies to the impacts of thunderstorm on livelihood assets specially on human assets of livelihoods. It is notable that 5.7% (15 out of 265 responses) and 5.4% interlocutors mentioned that they have nothing to do or they have no adaptive strategy to the impacts of thunderstorm. The reason behind it is as they are hard core poor they are compelled to stay outside the house during thunderstorm without adopting any coping or adaptation strategies to ensure their livelihoods. It indicates very high vulnerability of life and livelihoods of *Bayer Char* coastal community to the impacts of thunderstorm.

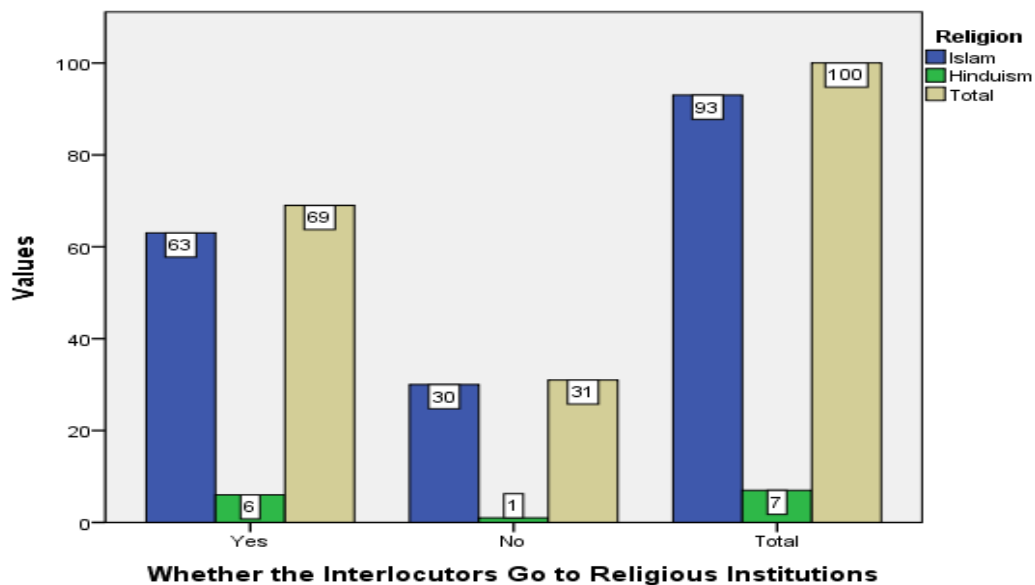
Collected data related to human assets of livelihoods show that as adaptation to the impacts of climate change induced impacts specially the impacts of drought and thunderstorm on human assets of their livelihoods, the people of *Bayer Char* coastal community adopt various adaptation strategies. So, the idea of cultural ecology theory fits with these findings.

6.3.4 Climate Change, Social Assets and Adaptation

6.3.4.1 Relationship with Religious Institutions, Family, Politics etc.

Graph-6.57 points out the religious status of interlocutors and their state of going to respective religious institutions. When all the interlocutors were asked whether they go to religious institutions or whether they keep relationship with their respective religious institutions, a significant number of them (69.0%) answered positively; of them, 91.3% (63)

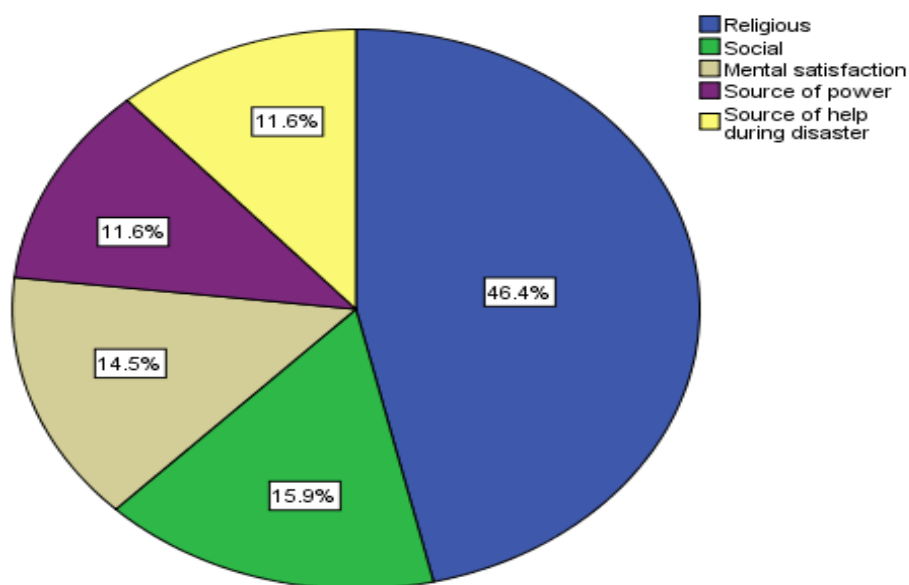
Graph- 6.57: Religious Status of Interlocutors and Whether They Go to Respective Religious Institutions (in number)



interlocutors' religious status is Islam and 8.7% (6) interlocutors' religious status is Hinduism. On the other hand, a substantial number of interlocutors (31.0%) answered negatively; of them, 96.8% (30) interlocutors' religious status is Islam and 3.2% (1) interlocutors' religious status is Hinduism.

When the interlocutors who go to or keep relation with religious institutions were asked to describe the causes of going to or keeping relation with, a significant number of them (32, 46.4%) mentioned the cause as religious while source of power (8) and source of help during disaster (8) were mentioned by 11.6% each. Likewise, 15.9% interlocutors (11) mentioned the cause as social and 14.5% interlocutors (10) stated the cause of going to or keeping relation with religious institutions is mental satisfaction; the percentages of these two

Graph-6.58: Causes of Going to or Keeping Relation with Religious Institutions (in per cent)



categories are the second and third highest respectively (Graph-6.58).

Table- 6.24 describes that a significant number of interlocutors (86%) keep relation with different social organizations as politics, club, *somities* (associations). Of them, the highest number (48 out of 86, 55.8%) of interlocutors' household type is marginal, a substantial number of interlocutors' household type (30, 34.9%) is landless, only 5.8% (5) and 3.5% (3) interlocutors' household types are small and large respectively. On the other hand, a negligible number of interlocutors (14%) do not keep relation with politics, clubs, *somities* (associations) and any other social organizations. Out of them, the highest number (5 out of

Table- 6.24: Relationship of Interlocutors with Politics, Club and *Somities* (Associations) Based on Household Types (in frequency of interlocutors)

		Household Types (based on amount of land in acres)					Total
		Landless	Marginal	Small	Medium	Large	
Any Relation with Politics/Club/Somities?	Yes	30	48	5	-	3	86
	No	3	5	2	3	1	14
Total		33	53	7	3	4	100

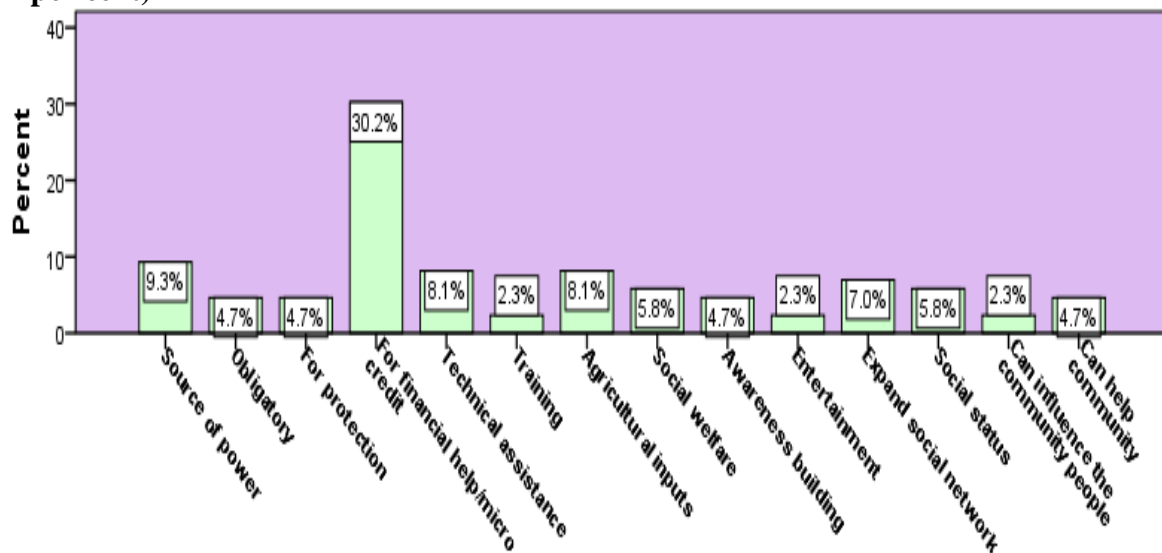
$$(\chi^2 = 21.643, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

14, 35.7%) of interlocutors' household type is marginal land owners, landless household type is 21.4%, 14.3% (2) interlocutors are small household type and 7.1% (1) interlocutors are large household type. It is notable that, out of total (100.0%), medium household interlocutors are 3.0% and all of them do not keep relation with politics, clubs and *somities*

(associations), which is 21.4% of the interlocutors who do not keep relation with politics, clubs and *somities* (associations). Statistical data show that at $df = 4$ and $\alpha = .05$, t -value is 9.488 which is less than chi-square value (calculated value = 21.643). So, alternative hypothesis (H_1) is accepted and null hypothesis (H_0) is rejected and i.e., there is a significant relationship between the household types of interlocutors and their keeping relation with politics, club, *somities* or social networks in *Bayer Char* community.

At the same time, when the interlocutors who keep relations with politics, clubs and *somities* (associations), were asked to describe the causes of keeping relation, the highest number of interlocutors (26 out of 86, 30.2%) said they keep relation for financial help or micro credit, the second highest number of interlocutors (9.3%) said they keep relation because it is the source of power while a negligible number of interlocutors (2.3% each) mentioned training (2), entertainment (2) and influencing the community people (2) as the main causes of

Graph- 6.59: Causes of Keeping Relation with Politics, Club and *Somities* (Associations) (in per cent)



keeping relations with politics, clubs and *somities* (associations). To ensure technical assistance (7) and agricultural inputs (7) are mentioned as the causes of keeping relation by 8.1% interlocutors each. A substantial number of people informed that they keep relations with politics, clubs and *somities* (associations), to expand social networks (7.0%), to do social welfare (5.8%), to help community (4.7%) and for protection (4.7%). Another 5.8% interlocutors said keeping relations with politics, clubs and *somities* (associations) is a matter of social status and 4.7% interlocutors said they are obliged to keep relations (Graph- 6.59).

6.3.4.2 Relation with Family and Community

Table- 6.25 states that when all the interlocutors were asked to describe rank their relations with their respective family and community, regarding relations with family, the highest number of interlocutors (38.0%) described their relations as “Good”, regarding relation with community the highest number of interlocutors (42.0%) described their relation as “Medium”. Out of the interlocutors who said their relations with family are “Good” (38.0%), 31.6% of them described their relations with community as “Medium” and none of them (38) described their relation with community as “Bad” or “Very Bad”. The interlocutors who described their relations with family as “Very Bad”, all of them described their relations with community as “Medium”. The interlocutors (35) who said their relations with community are “Good”, 31.4% (11) of them described their relations with their respective family as “Medium”, 57.1% (20) described as “Good” and 11.4% (4) described as “Very Good”.

Table- 6.25: Types of Relations of Interlocutors with Family and Community (in number)

		Relation with Community					Total
		Very Good	Good	Medium	Bad	Very Bad	
Relation with Family	Good	6	20	12	-	-	38
	Very Good	7	4	1	3	2	17
	Medium	1	11	25	-	-	37
	Bad	2	-	1	-	2	5
	Very bad	-	-	3	-	-	3
Total		16	35	42	3	4	100

$$(\chi^2 = 13.073, df = 16, \alpha = .05, t\text{-value} = 26.296)$$

Out of the interlocutors (37) who described their relations with their respective families as “Medium”, 67.6% (25) described their relations with community as “Medium”, 29.7% (11) described as “Good” and only 2.7% (1) described as “Very Good”. The interlocutors (16) who said their relations with community is “Very Good”, of them, 43.7% (7 out of 16) described their relations with family as “Very Good”, 37.5% (6 out of 16) described as “Good”, 12.5% described as “Bad”. Out of the interlocutors (17) who said their relations with their families are “Very Good”, 17.6% described their relations with community as “Bad” and 11.8% described as “Very Bad”. The interlocutors who said their relations with their respective families are “Bad”, of them, 40.0% described their relations with community as “Very Good” and 40.0% described as “Very bad”. Statistical data show that at $df = 16$ and $\alpha = .05$, t-value is 26.296 which is greater than chi-square value (calculated value = 13.073). So, alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted i.e., there is no

significant relationship between interlocutors' keeping relation with family and keeping relation with community in *Bayer Char* community.

6.3.4.3 Climatic Impacts on Social Assets

Table- 6.26 points out that when the interlocutors were asked to mention the places where they feel most secured, a significant number of them 46 stated that their self arena or individual arena is the place where they feel most secured. The percentage of interlocutors saying this is 48.0% which is the highest. This may be the result of different impacts of climate change on their life and livelihoods. The second highest number of interlocutors (38 out of 96, 40.0%) informed that family is the most secured place for them. Only a negligible number of interlocutors (12, 12.5%) mentioned community as the place where they feel most secured.

In response to the question whether climate change has any impacts on social assets of their livelihoods, about all interlocutors (97.9%, 94 out of 96) whose livelihoods were impacted by climate change induced hazards answered positively while only a very negligible number of interlocutors (2.1%, 2 out of 96) answered negatively (Graph- 6.79). The interlocutors who answered positively (94), the highest number of them informed that they feel most secured at

Table- 6.26: The Place Where the Interlocutors Feel Most Secured and whether Their Social Assets Are Impacted by Climate Change (in number of interlocutors)

		Most Secured Places			Total
		Individual	Family	Community	
Any Impacts on Social Assets	Yes	45	38	11	94
	No	1	-	1	2
Total		46	38	12	96

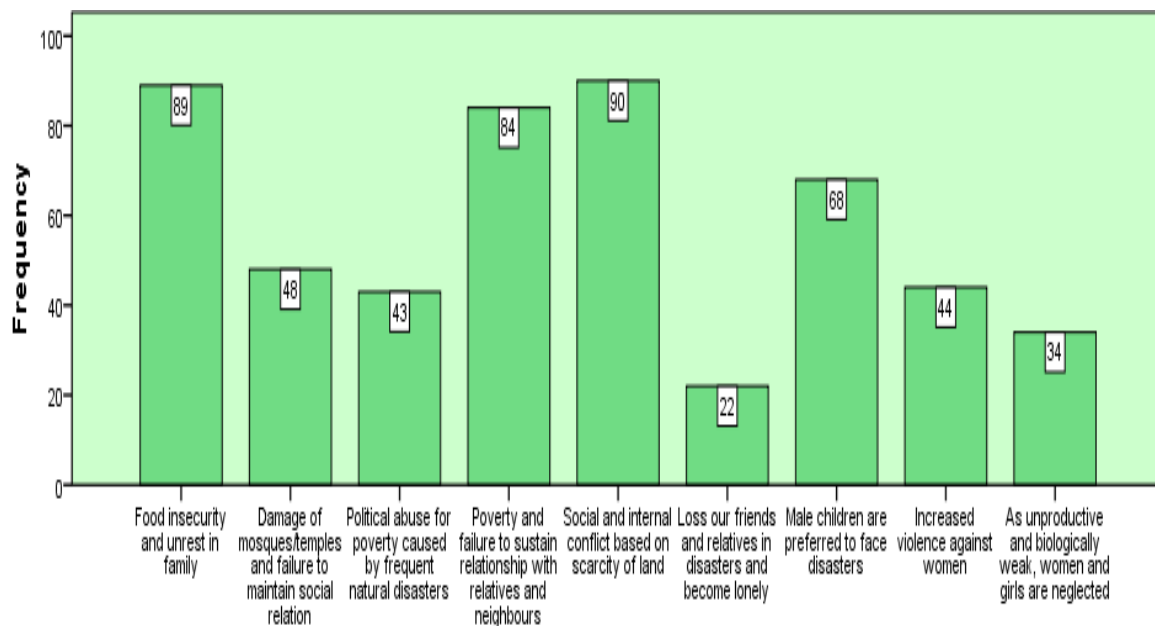
$$(\chi^2 = 3.108, df = 2, \alpha = .05, t\text{-value} = 5.991)$$

individual level while 38 and 11 interlocutors said they feel most secured at family and community levels respectively. The interlocutors who said climate change has no any impacts on their social assets of livelihoods, 50.0% (1) informed that their most secured place is individual arena and 50.0% (1) said their most secured place is community level. Explaining the statistical data it is observed that, at $df = 2$ and $\alpha = .05$, $t\text{-value}$ is 5.991 which is greater than chi-square value (calculated value = 3.108). So, alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted i.e., there is no significant relationship between interlocutors' feeling of most secured place and impact of climate change on their social assets of livelihoods in *Bayer Char* coastal area. Most secured place of *Bayer Char* coastal community

is individual arena that indicates their state of poverty as Chambers (1995) argued that besides low income, poverty also involves a sense of social inferiority, isolation, physical conditions, vulnerability seasonal deprivation, powerlessness and humiliation.

When the interlocutors were requested to state the different climatic impacts on social assets and they were given the options of multiple responses (Graph-6.60), the highest number of interlocutors (17.2%, 90 out of 522 responses) stated social and internal conflict based on scarcity of land as one of the impacts of climate change on social assets while the lowest number of interlocutors (4.2%, 22) mentioned that they loss their friends and relatives in disasters and become lonely by the impacts of climate change. At the same time 17.0% responses (89 responses) mentioned food insecurity and unrest in family as one of the

Graph- 6.60: Different Climatic Impacts on Social Assets of Livelihoods of Interlocutors (in frequency of multiple responses)

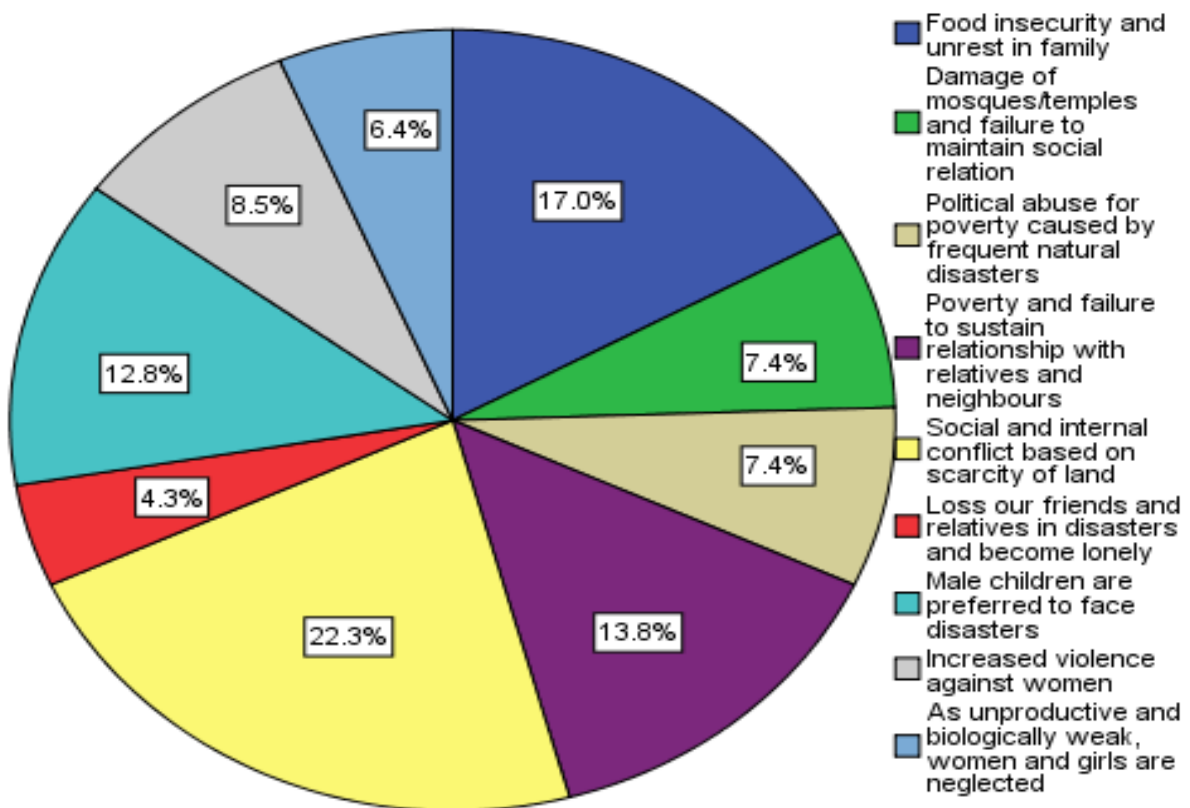


different climatic impacts on their social assets of livelihoods when 6.5% (34 responses) interlocutors stated that being unproductive and biologically weak, women and girls are neglected in family and community, which is caused by climatic impacts on social assets. Besides, poverty and failure to sustain relationship with relatives and neighbours, male children are preferred to face disasters and damage of mosques/temples and failure to maintain social relation are mentioned as different climatic impacts on social assets of livelihoods by 84 (16.1%), 68 (13.0%) and 48 (9.2%) responses respectively. Other climatic impacts on social assets of livelihoods of *Bayer Char* community are increased violence

against women and political abuse due to poverty caused by frequent natural disasters mentioned by 8.4% (44) and 8.2% (43) responses.

On the other hand, Graph- 6.61 points out that when the interlocutors whose social assets of livelihoods were impacted by climatic hazards, were asked to describe the major impacts of climate change on social assets of their livelihoods, the highest number of them (22.3%, 21 out of 94) mentioned social and internal conflict based on scarcity of land while the lowest number of them (4.3%) mentioned losing their friends and relatives in disasters and become lonely. The second highest number of interlocutors (17.0%, 16) mentioned food insecurity

Graph- 6.61: Major Climatic Impacts on Social Assets of Livelihoods of Interlocutors (in per cent)



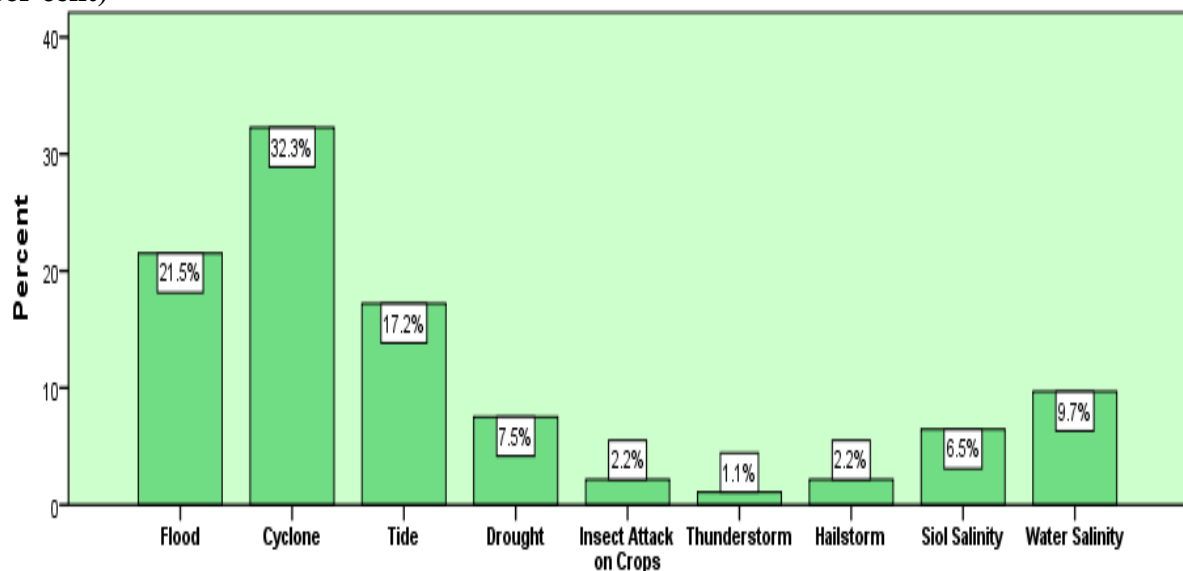
and unrest in family as the major climatic impact on their social assets of livelihoods while the second lowest number of interlocutors (6.4%, 6) mentioned that being unproductive and biologically weak, women and girls are neglected in family and community which is caused by climatic impacts on social assets. 13.8% and 12.8% interlocutors stated poverty and failure to sustain relationship with relatives and neighbours and preference of male children to face disasters respectively as major climatic impacts on social assets. Increased violence against women was mentioned by 8.5% interlocutors while damage of mosques and failure to

maintain social relation and political abuse for poverty caused by frequent natural disasters were mentioned by 7.4% interlocutors each.

6.3.4.4 Climatic Hazards, Severity and Social Assets

Graph-6.62 states that in response to the question what climatic hazards impact their social assets most, a significant number of interlocutors (32.3%) whose social assets of livelihoods were impacted by climatic hazards (94) mentioned cyclone while the lowest number of interlocutors (1.1%) mentioned thunderstorm. Likewise, the second highest number of interlocutors (21.5%) stated that flood impacts the social assets most while a verynegligible

Graph- 6.62: Climatic Hazards That Impact the Social Assets of Livelihoods Most (in per cent)



number of interlocutors (2.2%) said insect attack on crops and hailstorm are the climatic hazards that impact the social assets most. Moreover, tide or tidal surge, water salinity, drought and soil salinity are mentioned by 17.2%, 9.7%, 7.5% and 6.5% interlocutors respectively as climate change induced hazards that impact the social assets of livelihoods most.

6.3.4.5 Adaptation to Climatic Impacts on Social Assets

Table- 6.27 shows the household size of interlocutors and whether they adopt any adaptation strategies to climatic impacts on social assets. When the interlocutors (94) whose social assets of livelihoods were impacted by climatic hazards, were asked whether they adopt any adaptation strategies to climatic impacts, about all interlocutors answered positively which is 98.9% of asked interlocutors (93 out of 94) and 93.0% of total interlocutors of survey. On the

other hand, only a very negligible number of interlocutors (only 1 interlocutor) answered negatively which is 1.1% of asked interlocutors and 1.0% of total interlocutors of

Table- 6.27: Household Size of Interlocutors and Whether They Adopt Any Adaptation Strategies to Climatic Impacts on Social Assets (in number of interlocutors)

		Any Adaptation to Climatic Impacts on Social Assets?		Total
		Yes	No	
Household size (Member of Household)	<4	2	-	2
	4	7	-	7
	5	20	-	20
	6	28	1	29
	>6	36	-	36
Total		93	1	94

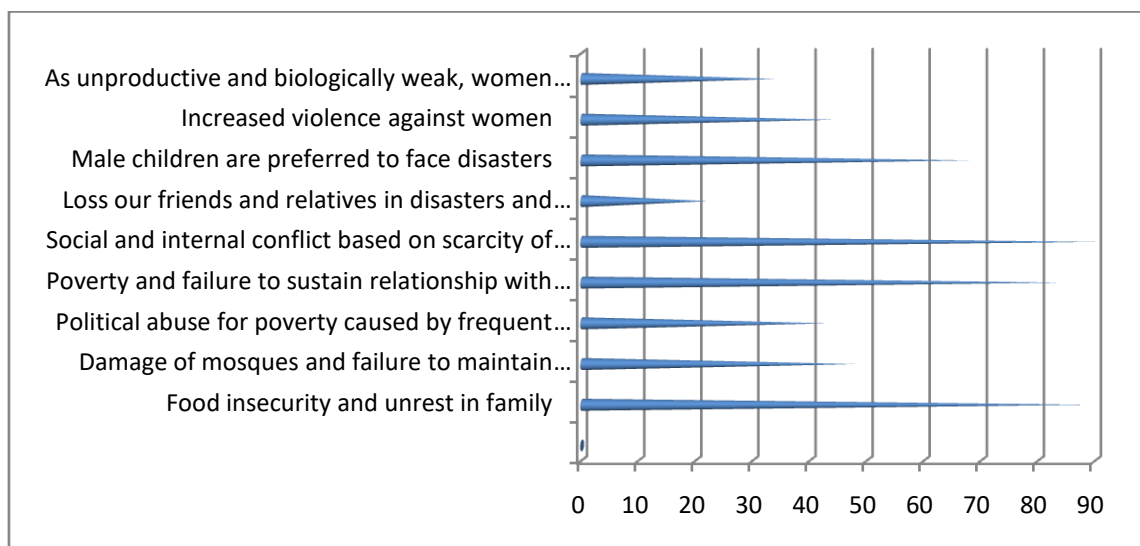
$$(\chi^2 = 2.265, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

survey sample size. The interlocutors whose household size is more than six (36), all of them informed that they adopt adaptation strategies to climatic impacts on social assets of livelihoods. The interlocutor having no adaptation strategies to climatic impacts on social assets belongs to six-member household.

Explaining the statistical data it is observed that, at $df = 4$ and $\alpha = .05$, t-value is 9.488 which is greater than chi-square value (calculated value = 2.265). So, alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted i.e., there is no significant relationship between household size of *Bayer Char* community and their adopting adaptation strategies to climatic impacts on social assets of livelihoods impact of climate change on their social assets of livelihoods.

Graph- 6.63 (cone bar) points out that when the interlocutors who used adaptation strategies to climatic impacts on social assets were asked to state different adaptation strategies and they were given multiple options to choose (multiple responses) a significant number of interlocutors (88 out of 380 responses, 23.2%) mentioned building their mentality of helping each other in climatic crises as one of the adaptation strategies where only a negligible number of interlocutors (39) mentioned they spread the net of relationship by marriage. A substantial number of interlocutors (80 out of 380 responses, 21.1%) informed that they give more importance on mosques or temples security than their own houses as adaptation strategy to climatic impacts on social assets. Besides, 17.6% (67), 14.2% (54), and 13.7% (52) interlocutors stated sending women and girls to relatives' house, active participation in politics and building religious and social

Graph- 6.63: Different Strategies the Interlocutors Adopt as Adaptation to Climatic Impacts on Social Assets (in frequency of multiple responses)



institutions and clubs on very high places respectively as adaptation strategies to climatic impacts on their social assets of livelihoods in *Bayer Char* coastal area.

At the same time, table- 6.28 states that when the same interlocutors were asked to describe their major adaptation strategies to climatic impacts on their social assets of livelihoods, the highest number of interlocutors (24, 25.8%) mentioned giving more importance on mosques/temples security than their own houses as the major adaptation strategy to climatic impacts on social assets; of them, the highest number (45.8%) of interlocutors' educational status is illiterate, 25.0% can sign only and only 4.2% are HSC passed. On the other hand, the lowest number of them mentioned that, they practiced spreading the net of relationship by

Table- 6.28: Educational Qualifications of Interlocutors and Major Strategies they Use as Adaptation to Climatic Impacts on Social Assets (in frequency of interlocutors)

		Major Adaptation Strategies to Climatic Impacts on Social Assets						Total
		Building the mentality of helping each other in climatic crises	Spread the net of relationship by marriage	Give more importance on mosques/temples security than our own houses	Build religious and social institutions and clubs on very high places	Actively participate in politics	Send women and girls to relatives' house	
Educational Qualifications	Illiterate	12	2	11	4	5	11	45
	Can sign Only	3	1	6	1	-	3	14
	Can Read Only	2	1	3	-	-	-	6
	Below class eight	-	-	2	2	2	3	9
	Below SSC	1	2	1	2	3	1	10
	SSC	1	1	-	2	-	-	4
	HSC	-	-	1	-	-	-	1
	Graduation	2	-	-	-	-	1	3
Masters	-	1	-	-	-	-	1	
Total		21	8	24	11	10	19	93

$$(\chi^2 = 49.787, df = 40, \alpha = .05, t\text{-value} = 55.758)$$

marriage as major adaptation to climate change impacts on social assets of their livelihoods. The second highest number of interlocutors (21, 22.6%) mentioned building the mentality of helping each other in climatic crises and third highest number of interlocutors (20.4%, 19) mentioned sending women and girls to relatives' house as adaptation strategies to climatic impacts on social assets. 11.8% interlocutors said as major adaptation strategy they build religious and social institutions and clubs on very high places; of them, 36.3% are illiterate. 10.8% interlocutors said they practiced active participation in politics as major adaptation strategy to climatic impacts on social assets of their livelihoods, out of them, 50.0% interlocutors are illiterate, 30.0% are below SSC passed and 20.0% interlocutors' educational status is below class eight.

From above data, it is observed that in multiple responses, while the highest number of interlocutors (88 out of 380 responses, 23.2%) build their mentality of helping each other in climatic crises, in single response, the highest number of interlocutors (24 out of 93, 25.8%) give more importance on mosques/temples security than their own houses as the major adaptation strategy to climatic impacts on social assets.

Besides, statistical data show that, at $df = 40$ and $\alpha = .05$, t-value is 55.758 which is greater than chi-square value (calculated value = 49.787). So, alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted i.e., there is no significant relationship between educational qualifications of interlocutors and their adopting major adaptation strategies to climatic impacts on social assets of livelihoods.

However, collected data related to social assets of livelihoods of *Bayer Char* coastal community show that, as adaptation to the impacts of climate change induced impacts on social assets of their livelihoods, the people of the community adopt various adaptation strategies based on the resources they find in their local environment. So, the idea of cultural ecology theory fits with these findings.

6.3.5 Climate Change, Physical Assets and Adaptation

6.3.5.1 House and Sanitation

Table-6.29 shows the types house wall and house roof of interlocutors. The highest number of interlocutors' house wall is built by tin (55.0%); of them, 65.5% interlocutors' house roof is built by straw (dried stalks of grain), 27.3% interlocutors' house roof is built by tin. On the other hand, the lowest number of interlocutors' house wall is built by polythene (1, 1.0%) and the house roof of this interlocutor is made by straw. Out of the total, only 2.0% (2) interlocutors' house wall is built by brick where the roof of one house is built by brick and the roof of another is built by tin. 31.0% interlocutors' house wall is built by straw; of them, 48.4% house roof is built by tin and 45.2% house roof is built by straw. Likewise, the highest

Table- 6.29: House Wall and House Floor of Interlocutors (in frequency)

		House Roof of Interlocutors				Total
		Brick	Tin	Straw	Leaves	
House Wall of Interlocutors	Brick	1	1	-	-	2
	Tin	-	15	36	4	55
	Straw	-	15	14	2	31
	Leaves	-	3	8	-	11
	Polythene	-	-	1	-	1
Total		1	34	59	6	100

number of interlocutors' house roof is built by straw (59.0%); of which, 61.1% house wall is built by tin and 23.7% house wall is built by straw. Only one interlocutor's house roof is built by brick, the wall of this interlocutor's house is also built by brick. From the table data it is observed that, house wall of the most people of *Bayer Char* is built by tin (55.0%) while the house roof of the most people of *Bayer Char* is built by straw (59.0%). Only 1.0% people of this coastal area have brick-built house wall and house roof.

Table-6.30 points out that the floors of houses of almost all interlocutors (97.0%) are *cancha* (built by mud) while only a negligible number (3.0%) of interlocutors' house floors are *paka* (made of bricks). Out of the interlocutors whose house floors are *cancha*, 77.3% are male and

Table- 6.30: Types of House Floor of the Interlocutors Based on Sex (in number)

		Types of House Floor		Total
		Paka	Cancha	
Sex	Male	3	75	78
	Female	-	21	21
	Third Sex (Hijra)	-	1	1
Total		3	97	100

21.6% are female interlocutors. On the other hand, out of the interlocutors (3) whose house floors are *paka*, all (100.0%, 3) are male interlocutors. The house floors of all female interlocutors (100.0%, 21 out of 21) are *cancha*. So, in *Bayer Char*, females headed households' economic condition is worse than that of male headed households.

From table- 6.31, it is observed that most of the interlocutors (53.0%) have two room-houses; of them, 43.4% (23) interlocutors' household size is more than six members, 41.5% (22) interlocutors are six-member households and only one interlocutor (1.9%) has a household of less than four members. 32.0% interlocutors live in a one-room houses; of them, the highest

Table- 6.31: Numbers of Rooms in Houses Based on Household Size of Interlocutors (in number pf interlocutors)

		Numbers of Rooms in Houses				Total
		1	2	3	≥4	
Household Size	<4	1	1	-	-	2
	4	3	2	1	1	7
	5	15	5	-	-	20
	6	6	22	4	-	32
	>6	7	23	9	-	39
Total		32	53	14	1	100

$$(\chi^2 = 40.402, df = 12, \alpha = .05, t\text{-value} = 21.026)$$

number (15, 46.9%) of interlocutors' household size is five members, 18.8% interlocutors have six members family, 21.9% interlocutors' household members are more than six and only one household has less than four members and one household has four members. 14.0% households' house rooms are three and only 1.0% households' (1 out of 100) house rooms are four or more than four and its family size is four members. So, it is notable that a significant number of households with five members live in one-room houses in *Bayer Char* coastal community.

Explaining the table data it is seen that, at $df = 12$ and $\alpha = .05$, t-value (critical value) is 21.026 which is less than chi-square value (calculated value = 40.402). So, null hypothesis (H_0) is rejected and alternative hypothesis (H_1) is accepted i.e., there is a significant relationship between household size of interlocutors and number of rooms in their houses in *Bayer Char* coastal community.

When all the interlocutors were asked whether their house rooms are sufficient or not, 90.0% of them answered negatively (Table- 6.32); of them, the highest number of interlocutors (40.0%, 36) have families with more than six members, 33.3% (30) have families with six members and only 1.1% (1) have families with less than four members. On the other hand.

Table- 6.32: House Rooms Sufficiency for Family Based on Household Size (in frequency of interlocutors)

		Whether House Rooms Are Sufficient for Family?		Total
		Yes	No	
Household Size (members of households)	<4	1	1	2
	4	2	5	7
	5	2	18	20
	6	2	30	32
	>6	3	36	39
Total		10	90	100

$$(\chi^2 = 6.969, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

only 10.0% interlocutors said they have sufficient house rooms; of them, 30.0% (3) interlocutors' household members are more than six, 20.0% interlocutors' household members are six and only 10.0% households' family members are less than four. As 90.0% people of *Bayer Char* community have no sufficient house rooms, they may be considered as the most poverty stricken community. So, they very much vulnerable to climate change induced natural disasters.

Statistical data show that, at $df = 4$ and $\alpha = .05$, t-value (critical value) is 9.488 which is greater than chi-square value (calculated value = 6.969). So, alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted i.e., in *Bayer Char* coastal community there is no significant relationship between household size of interlocutors and sufficiency of rooms for their family. So, in *Bayer Char* community, the numbers of rooms of households do not depend on number of members of their households or household size.

Table-6.33 points out that half of the interlocutors (50.0%) use pit latrine and other 16.0% use unpaved latrine while only 15.0% interlocutors use sanitary latrine and 19.0% interlocutors use paved latrine. The interlocutors who use pit latrine (50.0%), 68.0% of them are illiterate and they are the 68.0% of total illiterate interlocutors. No interlocutors whose educational qualification is class to masters use pit latrine. The interlocutors who use unpaved latrine (16), 75.0% of them are illiterate, only 12.5% interlocutors' educational qualification is above class eight and below SSC and none of them are SSC passed or above. The interlocutors who use paved latrine (19), the highest number of them (36.8%) are between class eight and below SSC, below class eight and SSC passes are 15.8% each, HSC and graduation passed are 5.3% each and only 5.3% interlocutors are illiterate. Likewise, the interlocutors who use sanitary slab, 13.3% are graduation completed, only 20.0% interlocutors are illiterate, below class

Table- 6.33: Sanitation Scenario of Interlocutors Based on Educational Qualification (in number of interlocutors)

		Latrine Types				Total
		Sanitary slab	Paved	Unpaved	Pit latrine	
Educational Qualifications	Illiterate	3	1	12	34	50
	Can Sign Only	2	2	1	9	14
	Can Read Only	3	1	1	2	7
	Below Class 8	1	3	-	5	9
	Below SSC	1	7	2	-	10
	SSC	1	3	-	-	4
	HSC	1	1	-	-	2
	Graduation	2	1	-	-	3
	Masters	1	-	-	-	1
Total		15	19	16	50	100

$$(\chi^2=71.308, df = 24, \alpha = .05, t\text{-value} = 36.415)$$

eight, below SSC, SSC, HSC, and Masters degree completed interlocutors are 6.7% each. Master degree holder interlocutor is only one who use sanitary slab. So, based on the observed data presented in the table, it is observed that at $df = 24$ and .05 level of significance ($\alpha = .05$), the table value (critical value) is 36.415 which is less than calculated value (chi-square value = 71.308) i.e., null hypothesis (H_0) is rejected and alternative hypothesis (H_1) is accepted. So, there is a significant relationship between educational qualifications of interlocutors and their sanitation practice (types of latrine). It indicates that sanitation consciousness developed among educated people and education works in sanitation practices among coastal community of *Bayer Char*.

6.3.5.2 Climatic Impacts on Physical Assets

Table- 6.34 shows that when the interlocutors (96) who said they were impacted by climatic hazards, were asked whether their physical assets were impacted by climate change induced natural hazards or not, about all interlocutors (94) answered positively while the most negligible number of interlocutors (2) answered negatively. The percentages of interlocutors who answered positively and negatively are 97.9 and 2.1 respectively. The interlocutors who answered positively; of them, 38 (40.4%, the highest) households' daily income is between 200 and 300 taka and 21 (22.3%, the second highest) households' daily income is between 300 and 400 taka. On the other hand the interlocutors who answered negatively i.e., who said climate change has no any impacts on their physical assets of livelihoods,

Table- 6.34: Daily Income of Households and Whether Climate Change Has Any Impacts on Physical Assets

		Whether Climate Change Has Any Impacts on Physical Assets (in number of interlocutors)		Total
		Yes	No	
Daily Income of Households (in taka)	<100	3	-	3
	100-200	16	-	16
	200-300	38	1	39
	300-400	21	-	21
	400- 500	12	1	13
	>500	4	-	4
Total		94	2	96

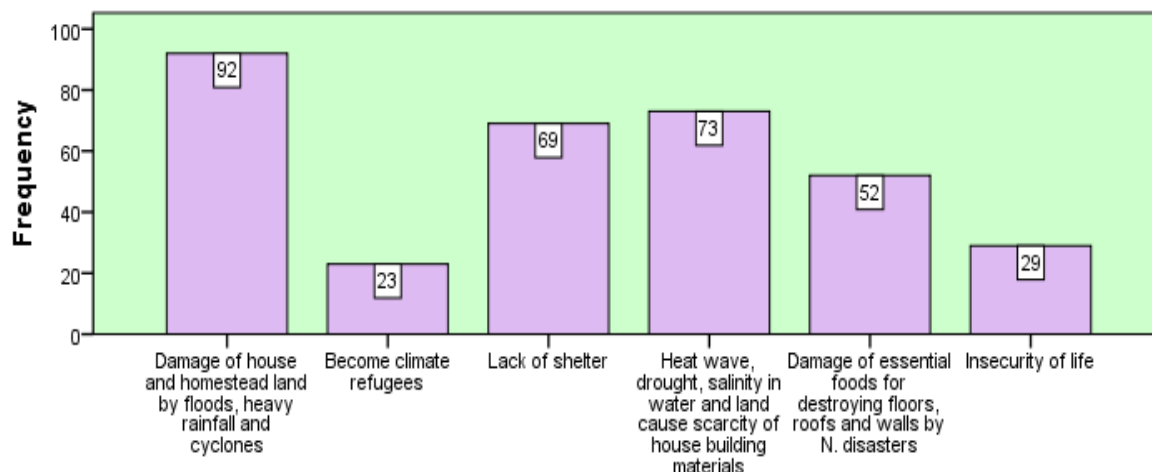
$$(\chi^2 = 2.985, df = 24, \alpha = .05, t\text{-value} = 11.070)$$

of them, 50.0% households' daily income is between 200 and 300 taka and 50.0% households' daily income is between 400 and 500 taka.

Based on the data presented in the table-, it is observed that at $df = 24$ and $.05$ level of significance ($\alpha = .05$), the table value (critical value) is 11.070 which is greater than calculated value (chi-square value = 2.985) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between daily income of households and the impacts of climate change on their physical assets of livelihoods. It indicates that climate change impacts the physical assets of *Bayer Char* people irrespective of their daily income or economic conditions.

When the interlocutors who said their physical assets were impacted by climatic impacts, were asked to describe the different impacts and they were given the options of multiple responses, the highest number of interlocutors (92 out of 338, 27.2%) mentioned damage of house and homestead land by floods, heavy rainfall and cyclones as one of the different climatic impacts on physical assets while the lowest number of interlocutors (23, 6.8%) mentioned that they become climate refugees by climatic impacts on their physical assets. The second highest number of interlocutors (73, 21.6%) described heat wave, drought, salinity in water and land cause scarcity of house building materials as one of different climate change induced impacts while insecurity of life was mentioned by second lowest number of interlocutors (29, 8.6%). Besides, 20.4% (69) and 15.4% (52) interlocutors

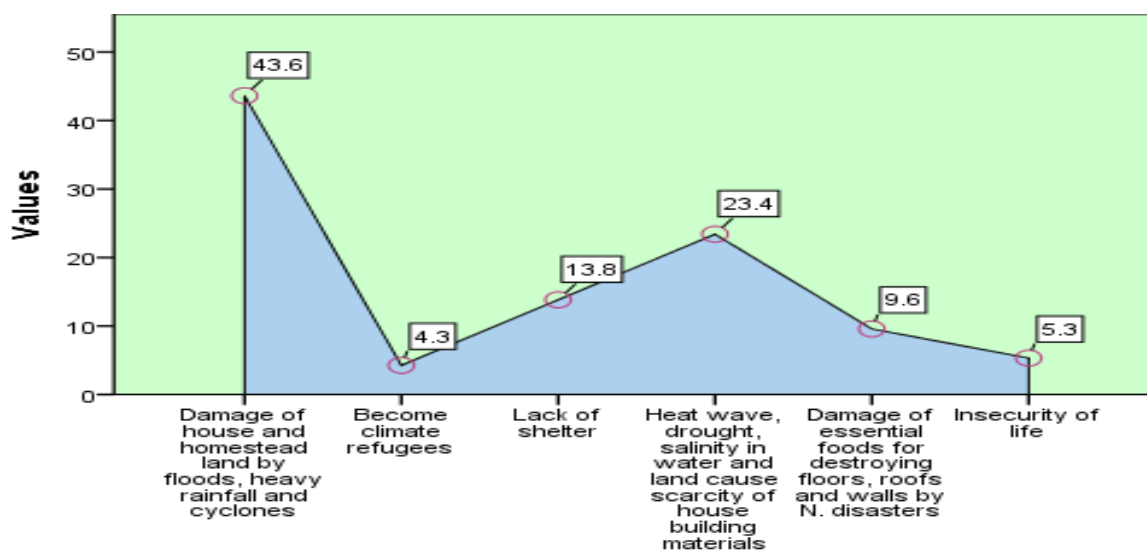
Graph- 6.64: Different Climatic Impacts on Physical Assets of Livelihoods (in frequency of multiple responses)



mentioned lack of shelter and damage of essential foods due to destroying floors, roofs and walls respectively as the climatic impacts on physical assets of livelihoods (Graph-6.64).

Graph- 6.65 (Area Chart) states that when the interlocutors (96) whose livelihoods were impacted by climatic impacts, were asked to state the major climatic impacts on their physical assets of livelihoods, the highest number of interlocutors (43.6%, 46 out of 94) mentioned damage of house and homestead land by floods, heavy rainfall and cyclones while the lowest number of them (4.3, 4) mentioned becoming climate refugees as the major climatic impacts on physical assets.

Graph- 6.65: Major Climatic Impacts on Physical Assets of Livelihoods (in per cent)



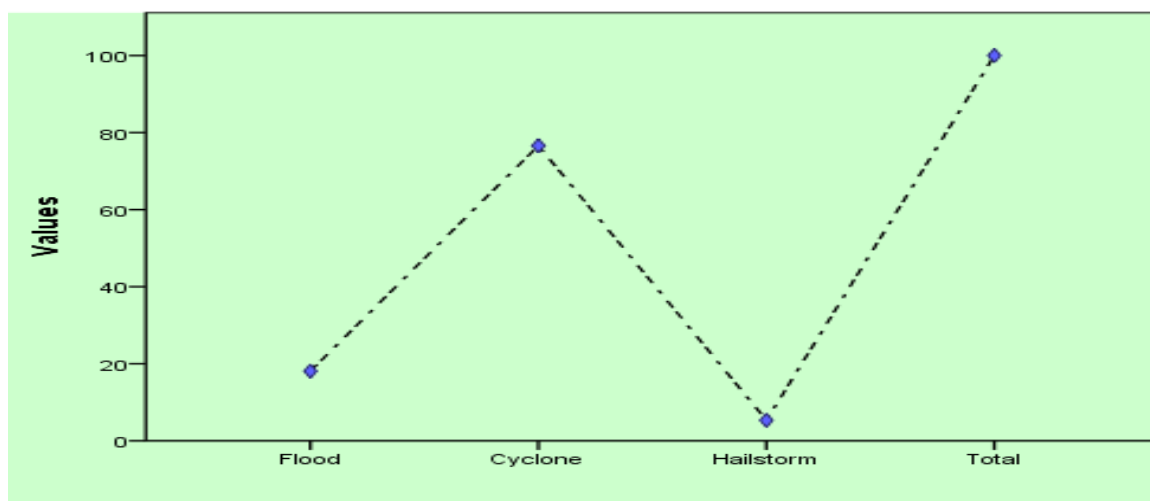
Likewise, scarcity of house building materials due to heat wave, drought, salinity in water and land was mentioned as second major climatic impact on physical assets by 23.4%

interlocutors while the second lowest number of interlocutors (5.3%, 5) mentioned insecurity of life as the major climatic impact on physical assets of their livelihoods. 13.8% (13 out of 94) and 9.6% (9 out of 94) interlocutors stated lack of shelter and damage of essential foods due to destroying floors and roofs respectively as the two major climate change induced impacts on physical assets of livelihoods.

6.3.5.3 Climatic Hazards, Severity and Physical Assets

Graph- 6.66 points out that when the interlocutors (94) whose physical assets of livelihoods were impacted by climatic hazards, were asked to state the hazard that affects their physical assets most, a significant number of them (76.6%, 72 out of 94) mentioned cyclone

Graph- 6.66: Natural Hazard that Affects the Physical Assets Most (in per cent)



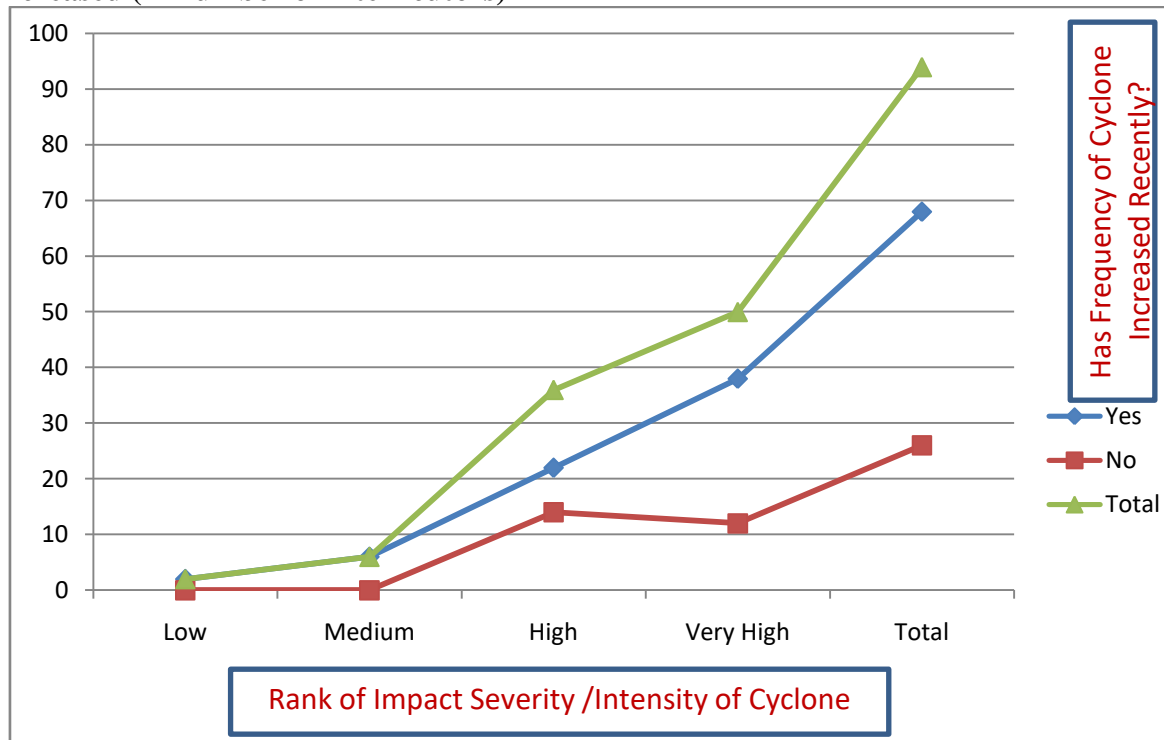
(especially nor'wester) while a negligible number of them (5.3%, 5) mentioned hailstorm that affects their physical assets most. Likewise, 18.1% (17) interlocutors stated that flood affects the physical assets of their livelihoods most.

From the Graph- 6.67 (line chart) it is observed that, when climatic hazards impacted interlocutors (94) were said to rank the impact severity or intensity of cyclone, most of the interlocutors (53.2%, 50 out of 94) ranked the impact severity of cyclone as “Very High” while a very negligible number of interlocutors (2.1%, 2) ranked it as “Low”. Likewise, the second highest number of interlocutors (38.3%, 36) ranked the severity/intensity of the impact of cyclone as “High” and only 6.4% interlocutors (6 out of 94) ranked the cyclone severity/ intensity as “Medium”.

The graph- 6.67 also shows that when the interlocutors (94) whose physical assets were impacted by climatic hazards, were asked whether the frequency of cyclone has been

increased recently or not, a significant number of them (68 out of 94) answered positively and the percentage is 72.3. The interlocutors who answered positively most of them (38 out of 68,

Graph- 6.67: Rank of Impact Severity/Intensity of Cyclone and Whether Its Frequency Increased (in number of interlocutors)

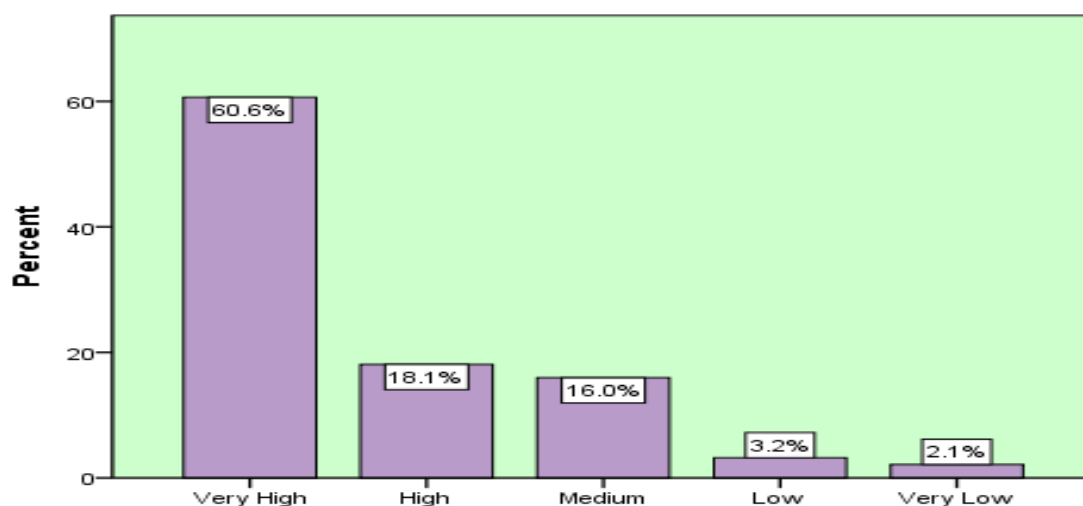


55.9%) ranked the impact severity of cyclone as ‘Very High’ and the second highest number of them ranked as ‘High’. On the other hand, a narrow number of interlocutors (26 out of 94) answered that the frequency of cyclone has not been increased recently and their percentage is 27.7. The interlocutors answered negatively, most of them ranked the impact severity of cyclone as ‘High’ and the second highest number of them ranked the impact severity of cyclone as ‘Very High’. Here the findings of *Bayer Char* coastal area recognize the findings of Schreck and others (Schreck et al., 2014) regarding the frequency and intensity of cyclone caused by global warming all over the world.

6.3.5.4 Climatic Hazards, Vulnerability and Physical Assets

From the graph- 6.68 it is observed that when the interlocutors (94) whose physical assets were impacted by climatic hazards, were asked to rank the state of vulnerability of their livelihoods to the climatic hazards of cyclone, more than half of the asked interlocutors (60.6%) ranked as “Very High” which is the 57.0% of total interlocutors participated in the survey while only a negligible number of asked interlocutors (2.1%, 2 out of 94) ranked their livelihood vulnerability to cyclone as “Very Low”. Likewise, 18.1% (17) and 16.0% (15)

Graph- 6.68: The State (Rank) of Vulnerability of Livelihoods to Cyclone (in per cent)



interlocutors stated the vulnerability of their livelihoods to cyclone as “High” and “Medium” respectively when only 3.2% (3) interlocutors ranked their livelihood vulnerability to cyclone as “Low”.

6.3.5.5 Adaptation to Climatic Impacts on Physical Assets

Table- 6.35 states that in response to the question whether the interlocutors whose physical assets were affected by climatic hazards, adopted any adaptation strategy, about all interlocutors (98.9%, 93 out of 94) answered positively; of them, 48.4% (45, the highest) are illiterate, 15.1% can sign only. All the interlocutors whose educational qualifications are above illiteracy (from ‘can sign only’ to ‘masters’) informed that they adopted adaptation

Table- 6.35: Educational Qualification and Whether the Interlocutors Adopt Any Adaptation Strategies (in number)

		Whether the Interlocutors Adopt Any Adaptation Strategies		Total
		Yes	No	
Educational Qualifications of Interlocutors	Illiterate	45	1	46
	Can sign only	14	-	14
	Can read only	5	-	5
	Below class 8	9	-	9
	Below SSC	10	-	10
	SSC	4	-	4
	HSC	2	-	2
	Graduation	3	-	3
	Masters	1	-	1
Total		93	1	94

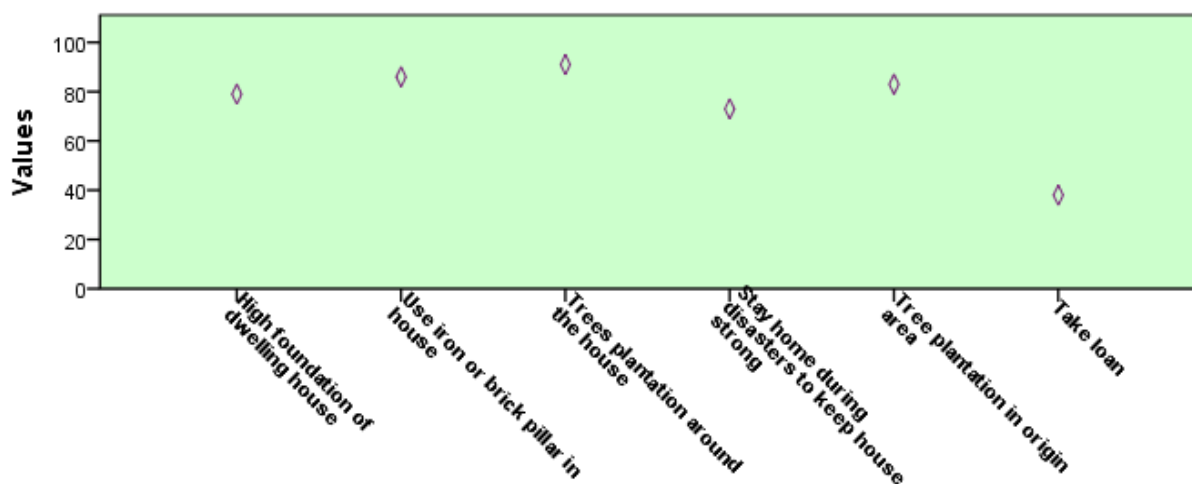
$$(\chi^2 = 1.055, df = 8, \alpha = .05, t\text{-value} = 15.507)$$

strategies to climatic impacts on physical assets of livelihoods. On the other hand, only one interlocutor (1.1%) answered negatively and the educational qualification of this interlocutor is illiterate which is the 2.2% (1 out of 46) of total illiterate interlocutors. So, 97.8% of total illiterate interlocutors (45 out of 46) also said they used adaptation strategies to climatic impacts on physical assets of livelihoods.

Explaining the statistical data of table- 6.35, it is seen that at $df = 8$ and .05 level of significance ($\alpha = .05$), the table value (critical value) is 15.507 which is greater than calculated value (chi-square value = 1.055) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between educational qualifications of interlocutors and their adopting adaptation strategies to the impacts of climate change on their physical assets of livelihoods. It indicates that irrespective of educational qualifications about all people of *Bayer Char* coastal community adopt adaptation strategies to the climate change impacts on their the physical assets of livelihoods.

Graph- 6.69 points out that, when the interlocutors (93) who adopted adaptation strategies to climatic impacts on physical assets of their livelihoods, were requested to mention different adaptation strategies and they were given the options of multiple responses, tree plantation around the house was mentioned by the highest number of interlocutors (91 out of 450, 20.2%) and taking loan was mentioned by the lowest number of them (38, 8.4%). 19.1% (86) and 18.4% (83) stated that they use iron or brick pillar in house and plant trees in origin areas (upward areas) respectively as adaptation strategies to climatic impacts on physical assets.

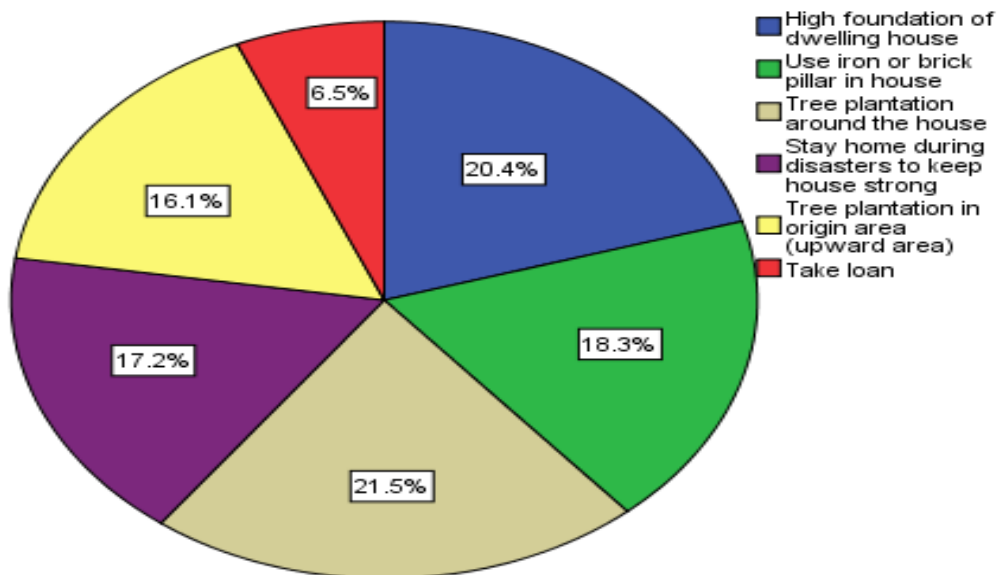
Graph- 6.69: Different Strategies the Interlocutors Adopt as Adaptation to the Climatic Impacts on Physical Assets of Livelihoods (in frequency of multiple responses)



17.6% (79) interlocutors mentioned high foundation of dwelling house as one of their different adaptation strategies. Besides, a substantial number of interlocutors (16.2%, 73) stated that as adaptation to climatic impacts on physical assets of their livelihoods, they stay home during disaster to keep house strong.

In Graph- 6.70 the researcher was informed that out of the interlocutors (93) who adopted adaptation strategies to climatic impacts on physical assets of livelihoods, the highest number of interlocutors (21.5%, 20 out of 93) plant trees around the house as a major adaptation strategy to climatic impacts (specially cyclone) on physical assets while the lowest number of interlocutors (6.5%, 6) take loan as a major adaptation strategy. Besides, the second highest and third highest number of interlocutors (19) make the foundation of dwelling house high

Graph- 6.70: Major Strategy the Interlocutors Use as Adaptation to Climatic Impacts on Physical Assets of Livelihoods (in per cent)



and use iron or brick pillar in house respectively as two major adaptation strategies to climate change induced hazards, the percentages of both categories are 20.4 and 18.3 respectively. Likewise 17.2% (16) and 16.1% (15 interlocutors) said stay home during climatic disasters (specially cyclone) to keep house strong and plant trees in origin area as major adaptation strategies to climate change induced impacts on physical assets of livelihoods.

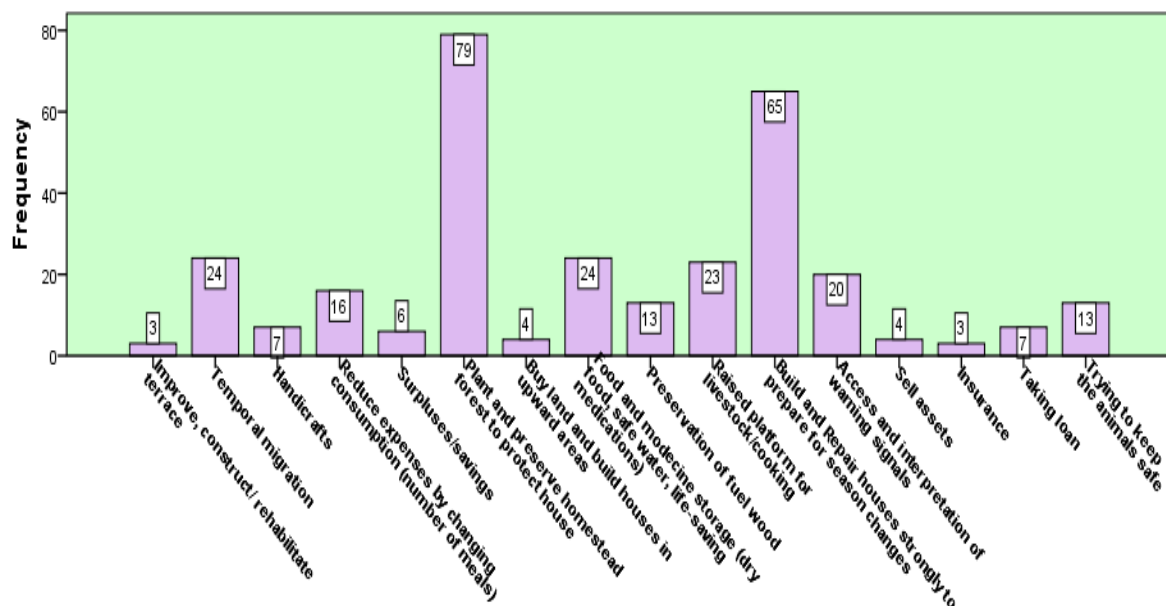
Staying Home to Help and Strengthen Home: Explaining the single and multiple responses data presented in graph- and graph- it is observed that an interesting and important finding was explored in this study that 16.1% (single response) and 16.2% (multiple responses) interlocutors stated as adaptation to climatic impacts on their physical assets of livelihoods

specially as adaptation to the impacts of cyclone on their houses they stay their own home during disasters to keep house strong i.e., they think if they leave home and stay outside the home (cyclone shelter or any safe places) their houses become too weak to face cyclone and the houses become destroyed. They believe, if the owners of the houses stay within the houses the houses get strength from its owners or residents to fight against natural hazards or disasters specially cyclone successfully. So, they stay home to help and strengthen their houses to fight against cyclone or any other climatic impacts on houses-their beloved physical assets.

6.3.5.6 Climatic Hazards, Physical Assets and Adaptation

Graph- 6.71 presents that the researcher was informed by the interlocutors who said they adopt adaptation strategies to climatic impacts on physical assets of their livelihoods. Here, getting options of multiple responses, the highest number of interlocutors (79 out of 311 responses, 25.4%) informed that they plant and preserve homestead forest to protect house from cyclone while improving, constructing or rehabilitating terrace and subscribing insurance policy are mentioned by the lowest number of interlocutors (1.0% each, 3 interlocutors each) as the least practiced two adaptation strategies to cyclone, a climatic

Graph- 6.71: Different Strategies the Interlocutors Adopt as Adaptation to Cyclone (in frequency of multiple responses)

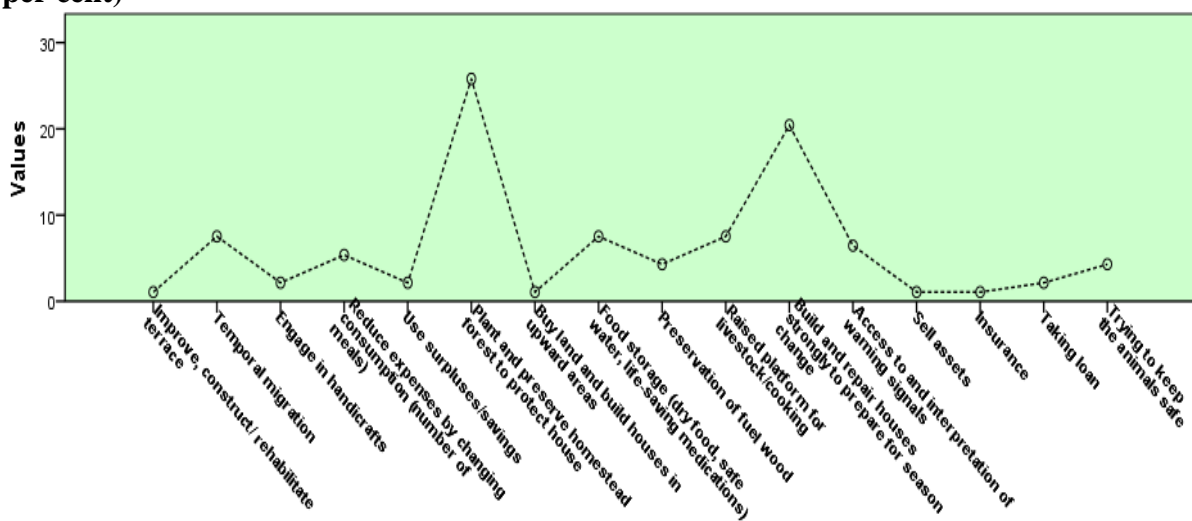


impact on physical assets. Likewise, 20.9% (65) interlocutors said they build and repair houses strongly to prepare for season change and cyclone. A substantial number of

interlocutors mentioned temporal migration (24) and food and medicine storage as dry food, safe water, life-saving medications (24) as two general adaptation strategies to cyclone, the percentages are 7.7 each. Besides, the strategies of raising platform for livestock/cooking (23), accessing to and interpreting of warning signals (20) and reducing expenses by changing consumption as reducing the number of meals (16) are mentioned by 7.4%, 6.4% and 5.1% interlocutors respectively as adaptation to cyclone. Other less practiced general adaptation strategies to cyclone are buying land and building house in upward areas (4, 1.3%), trying to ensure surpluses or savings (6, 1.9%), engaging in handicraft activities and taking loan (2.3% each), preservation of fuel wood and trying to keep the animals safe (4.2% each).

Graph- 6.72 (line chart) states that, when the interlocutors (93) who adopted adaptation strategies to climatic impacts on physical assets of livelihoods, were asked to describe the major strategy they adopt as adaptation to the impacts of cyclone on their livelihood assets specially on physical assets of livelihoods, a significant number of them (25.8%, 24 out of 93) said that they plant and preserve homestead forest to protect house as major adaptation strategy to cyclone while Improving, constructing or rehabilitating terrace, buying land and building house in upward areas, selling assets and subscribing insurance policy are stated by a negligible number of them (1.1% each). Likewise, a substantial number of interlocutors

Graph-6.72: Major Strategies the Interlocutors Adopt as Adaptation to Cyclone (in per cent)

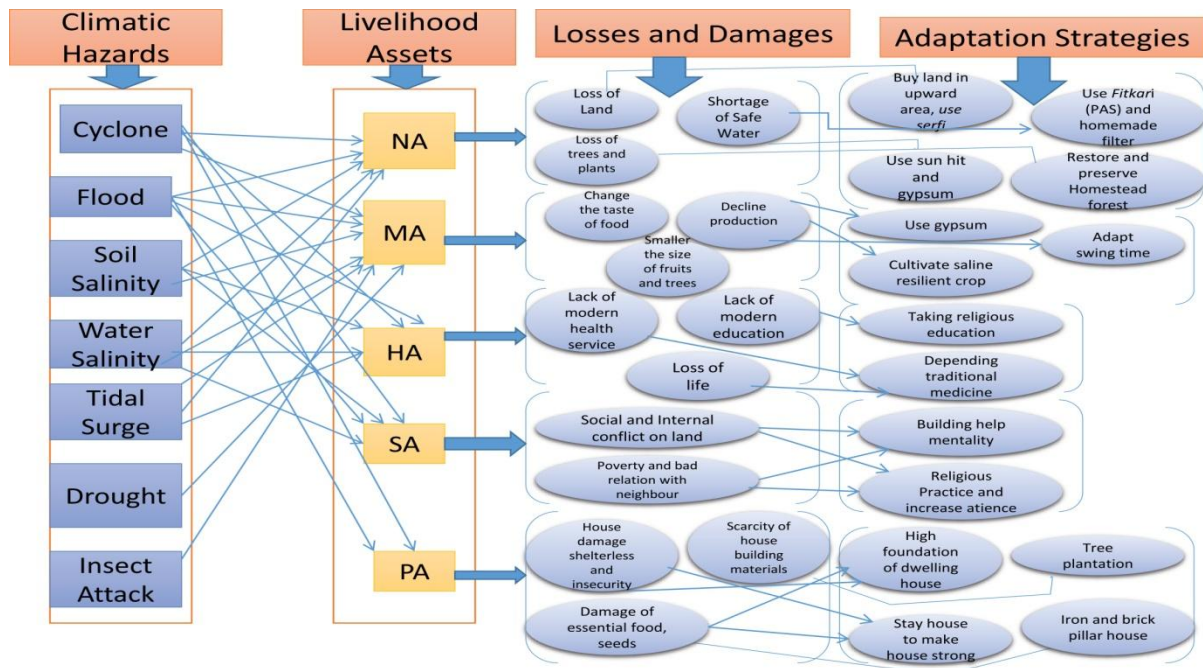


(20.4%, 19) informed that they build and Repair houses strongly to prepare for season change as a major adaptation strategy to climatic impact of cyclone on their livelihood assets especially physical assets of livelihoods. Besides, temporal migration, food and medicine

storage as dry food, safe water, life-saving medications and Raising platform for livestock and cooking are mentioned by 7.5% interlocutors each as major adaptation strategies to cyclone. As major adaptation strategies to cyclone, 6.5% (6) and 5.4% (5) interlocutors mentioned accessing to and interpreting of warning signals and reducing the expenses by changing consumption as reducing the number of meals respectively. Moreover, handicrafts (2), ensuring surpluses or savings (2), preservation of fuel wood (4), taking loan (2), keeping the animals safe (4) are mentioned by 2.2%, 2.2%, 4.3%, 2.2% and 4.3% interlocutors respectively as major adaptation strategies to cyclone. Here, it is seen that there is no fundamental differences between the result of multiple responses and that of single response.

Figure- 6.1 is constructed based on the field data, the framework describes the climate change induced hazards and their impacts on livelihood assets of *Bayer Char* coastal people and the strategies the inhabitants adopt as adaptation to climate change. The major climatic hazards that impact the livelihoods of *Bayer Char* community are cyclone, flood, soil salinity, water salinity, tidal surge, drought and insect attack. Here, it is observed that cyclone has impacts on all five assets of livelihoods as natural assets (NA), material assets (MA), human assets (HA), social assets (SA) and physical assets (PA). Flood also impacts the all five assets of livelihoods of *Bayer Char* people. Soil salinity and water salinity have impacts on four assets of livelihoods as natural, material, human and social assets. They have no direct impacts on physical assets. Tidal surge has direct impacts on natural, material and human assets. It has no direct and notable impacts on social and physical assets of livelihoods. Drought and insect attack have direct and significant impacts only on material assets of livelihoods. Other assets are not directly impacted by drought and insect attack. The major losses and damages (impacts) of natural assets caused by climatic hazards are loss of land, shortage of safe water and loss of trees and plants. As adaptation to loss of land, people adopt the strategies of buying land in upward areas and use *serfi*, as adaptation to shortage of safe water people adopt the strategies of using *fitkari* (PAS), using sun hit and gypsum and as adaptation to loss of trees and plants, the inhabitants adopt the strategy of restoring and preserving homestead forest. The major climatic impacts (losses and damages) on material assets are change the taste of food, decline production and smaller the size of fruits and crop plants. As adaptation to declining production, the people of *Bayer Char* adopt three major strategies as they use gypsum, cultivate saline resilient crop and adapt swing time. The inhabitants of *Bayer Char* community have no specific adaptation strategies to change of the taste of food and smaller the size of fruits and crop plants. Three major climatic impacts on human assets of

Figure- 6.1: A Framework of Climate Change Impacts on Livelihood Assets and Adaptation in *Bayer Char* Coastal Area



(Source: Field Data, 2021-2022)

livelihoods of *Bayer Char* community are lack of modern health service, lack of modern education and physical injury and loss of life. As adaptation to lack of modern health service and physical injury, the inhabitants of *Bayer Char* use the techniques of depending on traditional medicines and as adaptation to lack of modern education, the inhabitants use the strategy of taking religious education. Two major climatic impacts on social assets, of livelihoods in *Bayer Char* community are social and internal conflicts on land and bad relationship with neighbours due to poverty. As adaptation to these climatic impacts on social assets the people adopt the strategies of building help mentality and doing religious practices and increasing patience. There are three major climatic impacts on physical assets of livelihoods of *Bayer Char* community as house damage, shelterless and insecurity, scarcity of house-building materials and damage of essential food and seeds. As adaptation to house damage, shelterless and insecurity, the people of *Bayer Char* use the strategies of staying house to make house strong, doing high foundation of dwelling house and using iron and brick-pillar in house. As adaptation to scarcity of house-building materials the people plant trees in upward areas and homestead land, and as adaptation to damage of essential food and seeds, the inhabitants use the strategies of ensuring high foundation of dwelling house, staying house to make house strong and using iron and brick-pillar in house. The framework proves the theory of cultural ecology conceptualized by Julian Steward.

SECTION FOUR:

POVERTY AND ADAPTATION TO CLIMATE CHANGE

6.4.1 Natural Assets and Poverty

When all the interlocutors were asked whether they and their family members get sufficient drinking water (Table- 6.36), a substantial number of interlocutors (65.0%) answered negatively; of them, a significant number of interlocutors (55.4%, 36 out of 65) are marginal households, 29.2%(19) interlocutors are landless and only 7.7% (5), 4.62% (3) and 3.1% (2) interlocutors are small, medium and large households respectively. 31.0% interlocutors answered positively where a substantial number of interlocutors are marginal (23.1%, 15 out of 31) and landless (18.46%, 12 out of 31) households. Here small and large households are only 6.5% each. All the

Table- 6.36: Household Types and Getting Sufficient Safe Drinking Water

		Whether Interlocutors and their Family Members Get Sufficient Safe Drinking Water (in number)			Total
		Yes	No	Don't Know	
Household Types (amount of land in acres)	Landless	12	19	2	33
	Marginal	15	36	2	53
	Small	2	5	-	7
	Medium	-	3	-	3
	Large	2	2	-	4
Total		31	65	4	100

$$(\chi^2 = 3.855, df = 8, \alpha = .05, t\text{-value} = 15.507)$$

medium households answered negatively. A negligible number of interlocutors (4 out of 100) said that they do not know the matter, of them, 50.0% (2) are landless and 50.0% are marginal households. Explaining the statistical data of table- 6.36, it is seen that at $df = 8$ and .05 level of significance ($\alpha = .05$), the table value (critical value) is 15.507 which is greater than calculated value (chi-square value = 3.855) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between household types of interlocutors and their getting sufficient safe drinking water. It indicates that irrespective of household types (landless or large land owners) the household heads and members of households of *Bayer Char* coastal community do not get sufficient safe drinking water. It indicates their acute human poverty. The reason behind it may be their close proximity to river or sea and, tidal surge, flood, land and water salinity due to climate change.

6.4.2 Material Assets and Poverty

Table-6.37 points out that when the interlocutors (93) who produce agricultural crops, were asked to describe the types of crops and their return from crop production, a significant number of them (47.3%, the highest) said their most produced crop is rice; of them, 84.1% interlocutors (the highest) said they are losing, 6.8% said they are getting no profit –no loss and only 9.1% said they are getting profit from rice production. The second highest number of interlocutors (22.6%, 21 out of 93) said their most produced crop is fish; of them, 61.9%

Table- 6.37: Crops that the Interlocutors Produce Most and Return from Production (in number)

		Return from Production			Total
		Profit	Loss	No Profit/No loss	
Crops the Interlocutors Produce Most	Rice	4	37	3	44
	Fish	3	13	5	21
	Wheat	-	1	-	1
	Peanut	2	7	1	10
	Vegetables	2	9	2	13
	Fruits	1	2	1	4
Total		12	69	12	93

interlocutors said in fish production they are losing, 23.8% said they are getting no profit–no loss and only 14.3% said they are getting profit from fish production. On the other hand, a substantial number of interlocutors (74.2%) said they are losing in the production of agricultural crops; of them, 53.6% interlocutors' most produced crop is rice, 18.8% interlocutors produce fish most and 13.0% produce vegetables most. 12.9% interlocutors said they are getting profit and another 12.9% said they are getting no profit or loss in agricultural production.

Present study was informed that 94.0% interlocutors faced difficulty of less income in the last one year where 77.7% are male interlocutors who are 93.1% of total male interlocutors (78). Out of the interlocutors who faced the difficulty of less income in the last one year,

Table- 6.38: Sex of Interlocutors and Whether They Face Difficulty of Less Income in the Last 1 Year

		Whether They Face Difficulty of Less Income		Total
		Yes	No	
Sex	Male	73	5	78
	Female	20	1	21
	Third Sex (<i>Hijra</i>).	1	-	1
Total		94	6	100

$$(\chi^2 = .144, df = 2, \alpha = .05, t\text{-value} = 5.991)$$

21.3% are female interlocutors who are 95.2% of total female interlocutors (21). The only interlocutor who is third sex (*Hijra*) faced the difficulty of less income (Table- 6.38). It is observed from the table data that at $df = 2$, $\alpha = .05$ the table value (critical value) is 5.991 which is greater than calculated value i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between sex of interlocutors and their facing difficulty of less income. It indicates that irrespective of the sexes, the households of *Bayer Char* coastal community face difficulty of less income.

At the same time, when the interlocutors who faced difficulty of less income (94) were asked to mention the season when they faced the difficulty of less income (Graph-6.73), the highest number of them (33.0%) said they face the difficulty of less income in autumn season and the second highest number of them (25, 26.6%) mentioned rainy season when they faced the

Graph- 6.73: The Season When the Interlocutors (Who Face Difficulty of Less Income) Faced the Difficulty of Less Income (in per cent)



difficulty of less income in last one year. On the other hand, the lowest number of them mentioned spring (6, 6.4%). 10.6% (10) and 8.5% (8) mentioned that they faced the difficulty of less income in summer and winter season respectively in last one year.

Table- 6.39 presents that being asked whether they faced food shortage in last 6 months, out of total interlocutors, 47.0% answered by “Often/Always”; of them, 31.9% (the highest) are 5 member-households, 29.8% are 6 member-household and 25.5% households’ have more than 6 members. 28.0% interlocutors answered by “Yes”, of them, 64.3% interlocutors have more than 6-member households and 28.6% have 6 member-households. 18.0% interlocutors

answered by “Sometimes”; of them, 38.9% (the highest) interlocutors have more than 6 member-households and 33.3% have 6 member-households. On the other hand, only a

Table- 6.39: Household Size and Interlocutors’ Facing Food Shortage in Last 6 Months (in number of interlocutors)

		Whether the Interlocutors Faced Food Shortage in Last 6 Months				Total
		Yes	No	Sometimes	Often/Always	
Household Size (member of households)	<4	-	-	-	2	2
	4	-	-	3	4	7
	5	2	1	2	15	20
	6	8	4	6	14	32
	>6	18	2	7	12	39
Total		28	7	18	47	100

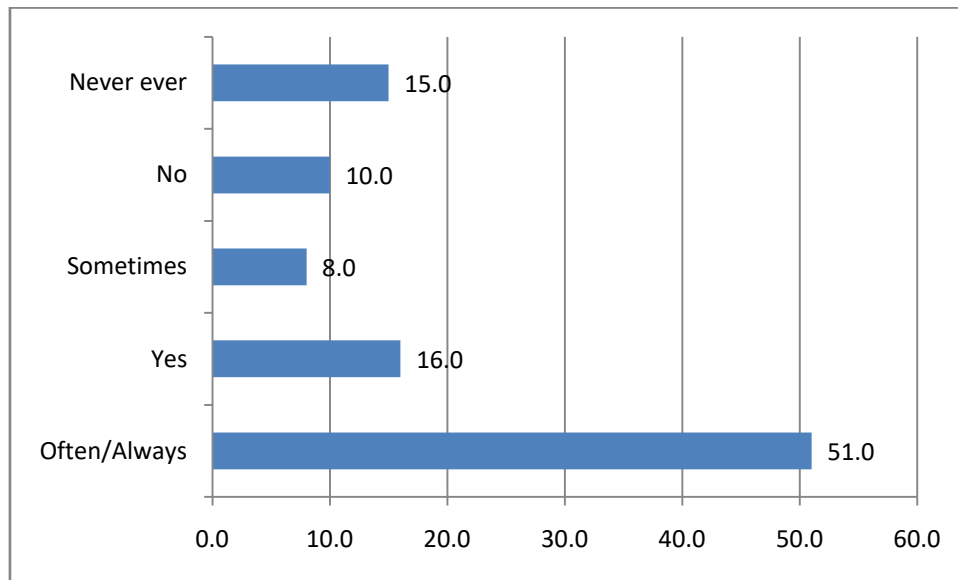
$$(\chi^2 = 22.276, df = 8, \alpha = .05, t\text{-value} = 15.507)$$

negligible number of interlocutors (7.0%) answered negatively i.e., they or their family did not face any food shortage in last 6 months. So, about 75.0% interlocutors said they faced food shortage in last 6 months and another 18.0% said they or their family faced food shortage in last 6 months but not always (sometimes).

Statistical data of table- 6.39 show that at $df = 8$ and .05 level of significance, the table value (critical value) is 15.507 which is less than calculated value ($\chi^2 = 22.276$) i.e., null hypothesis (H_0) is rejected and alternative hypothesis (H_1) is accepted. So, there is a significant relationship between household size (members of households) of interlocutors and their facing food shortage. It indicates that, in *Bayer Char* coastal community, the larger the household size, the greater the food shortage.

Likewise, graph-6.74 (bar chart) when all the interlocutors were asked whether they remain anxious about the next meal for them and their family, more than half of the interlocutors (51.0%) answered saying “Often/Always”, 16.0% answered saying “Yes” and 8.0% answered saying “Sometimes”. On the other hand, 10.0% interlocutors answered saying “No” and 15.0% answered saying “Never ever”. From the data of the Graph- 6.74:, it is observed that 67.0% interlocutors said that they remain anxious about the next meal for them and their family and other 8.0% said they remain anxious about the next meal for them and their family

Graph- 6.74: Whether the Interlocutors Remain Anxious about the Next Meal (in per cent)



but not always (sometimes). On the other hand, 25.0% interlocutors said they do not remain anxious about the next meal for them and their family.

Table-6.40 presents that when all the interlocutors were asked whether they feel their family members are not getting sufficient food, a significant number of interlocutors (40.0%) answered saying “Yes”; of them, 50.0% interlocutors’ have more than 6-member households and only 5.0% have less than 4-member households. Likewise, 31.0% interlocutors said they always feel that their family members are not getting sufficient food; of them, five and six-member households are 32.3% each. Besides, 13.0% households said they sometimes feel

Table- 6.40: Household Size of Interlocutors and Whether They Feel Their Family Members Are Not Getting Sufficient Food

		Whether The Interlocutors Feel Their Family Members Are Not Getting Sufficient Food (in number)					Total
		Often/Always	Yes	Sometimes	No	Never	
Household Size (members of households)	<4	-	2	-	-	-	2
	4	4	2	-	1	-	7
	5	10	5	1	2	2	20
	6	10	11	6	2	3	32
	>6	7	20	6	5	1	39
Total		31	40	13	10	6	100

$$(\chi^2 = 17.960, df = 16, \alpha = .05, t\text{-value} = 26.296)$$

their family members are not getting sufficient food. On the other hand, 6.0% interlocutors informed that they never feel their family members are not getting sufficient food; of them, the highest number of interlocutors’ household size is 6 members. Besides, 10.0%

interlocutors do not feel so; of them, 50.0% (the highest) interlocutors have more than 6-members households. Here it is observed that most of the heads of the households of *Bayer Char* coastal area (84.0%) feel (of them, 31.0% always and 13.0% sometimes) their family members are not getting sufficient food. From statistical data ($\chi^2 = 17.960$, $df = 16$, $\alpha = .05$, t -value = 26.296) it can be decided that there is no significant relationship between the household size of interlocutors and their feeling about their families' not getting sufficient food i.e., most heads of the household feel that their family members are not getting sufficient food and household size does not matter here.

Table- 6.41 shows that when all the interlocutors were asked whether they save or not, a negligible number of interlocutors (14.0%) answered positively and a significant number of them (86.0%) answered negatively. Out of the total male interlocutors (78), only 12.8% said they save and 87.2% said they do not save. On the other hand, out of the total female interlocutors (21), only 19.0% said they save and 81.0% said they do not save. From these data, it is observed that, though very few peoples (14.0%) of *Bayer Char* save, the percentage

Table- 6.41: Sex of Interlocutors and Whether They Save or Not (in number)

		Whether the Interlocutors Save or Not		Total
		Yes	No	
Sex of Interlocutors	Male	10	68	78
	Female	4	17	21
	Third Sex (<i>Hijra</i>).	-	1	1
Total		14	86	100

$$(\chi^2 = .697^a, df = 2, \alpha = .05, t\text{-value} = 5.991)$$

of females is more than that of males (Females 19.0% and males 12.8%) in savings. It indicates that by climatic impacts females are affected more than males in *Bayer Char* coastal community for their gender specific role in the households. From statistical data, it is observed that at $df = 2$ and 5.0% level of significance, the t -value (critical value) is 5.991 which is greater than chi-square value ($\chi^2 = .697^a$). That means alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the sex of interlocutors and their savings.

When the interlocutors who save (14), were asked to mention the places of savings (Table-6.42), 50.0% (7 out of 14) said they save in their house whether only a negligible number of interlocutors (14.3%, 2) said they save in bank. Out of the interlocutors who save in their house (7), 42.9% interlocutors' amount yearly savings are between 1,000 and 5,000 taka,

another 42.9% interlocutors' amount of yearly savings are between 5,000 and 10,000 taka and yearly savings of only 14.3% interlocutors is between 10,000 and 20,000 taka, Besides, 35.7% interlocutors (5 out of 14) said they save in their relatives' house. Out of the interlocutors who save in their relatives' house (5) , , 40.0% (2 out of 5, the highest)

Table- 6.42: Amount of Yearly Savings of Interlocutors and the Places of Savings

		Where the Interlocutors Save (in number)			Total
		In house	In relative's house	In bank	
Amount of Yearly Savings (in taka)	1,000-5,000	3	2	-	5
	5,000-10,000	3	1	-	4
	10,000-20,000	1	1	1	3
	20,000-40,000	-	1	1	2
Total		7	5	2	14

$$(\chi^2 = 5.873^a, df = 6, \alpha = .05, t\text{-value} = 12.592)$$

interlocutors' amount of yearly savings is between 1,000 and 5,000 taka and only 20.0% (1 out of 5) interlocutors' amount of yearly savings is between 1,000 and 5,000 taka. Out of the interlocutors who save in banks (2, 14.9%), 50.0% interlocutors' amount of yearly savings is 10,000 to 20,000 taka and another 50.0% interlocutors' amount of yearly savings is between 20, 000 and 40,000 taka. From statistical data, it is observed that at $df = 6$ and 5.0% level of significance, the t-value (critical value) is 12.592 which is greater than chi-square value ($\chi^2 = 5.873^a$). That means alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the amount of yearly savings of interlocutors and the places the interlocutors save. So, their savings conditions and system are very much vulnerable.

The present study was informed that a significant number of interlocutors (67.0%) spend daily 8 to 12 hours in their occupation; of them, 58.2% interlocutors have been engaged in their present profession for 1 to 10 years, 32.8% engaged for 10 to 20 years, 7.5% engaged for 20 to 30 years and only 1.5 %engaged in their profession for 30 to 40 years (Table- 6.43). On the other hand, out of the total interlocutors, the highest number of interlocutors (52.0%) have been engaged in their present profession for 1 to 10 years; of them, 75.0% (39 out of 52) interlocutors spend daily 8 to 12 hours in their occupation, 11.5% (6) spend daily 4 to 8 hours, 9.6% (5) spend daily more than 12 hours and only 3.8% interlocutors spend daily less than 4 hours in their occupation. A negligible number of interlocutors (3.0%) have

Table- 6.43: Number of Years the Interlocutors Engaged in Profession and Hours They Spend Daily in Occupation (in number of interlocutors)

		Hours Interlocutors Spend Daily in Occupation				Total
		Less than 4	4-8	8-12	Above 12	
Years Interlocutors Engaged in Profession	1-10 years	2	6	39	5	52
	10-20 years	1	8	22	4	35
	20-30 years	1	-	5	4	10
	30-40 years	-	1	1	1	3
Total		4	15	67	14	100

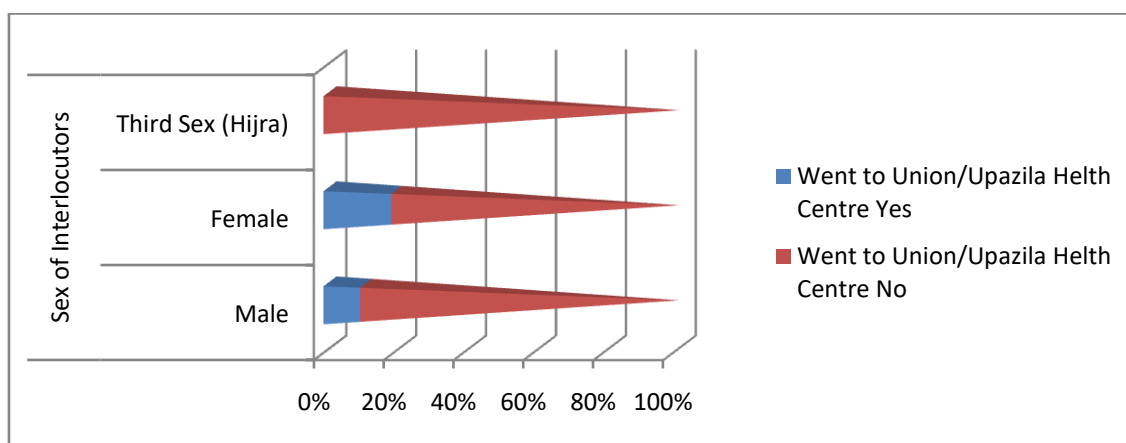
been engaged in their present profession for 30 to 40 years. The interlocutors who spend daily less than 4 hours and more than 12 hours are 4.0% and 14.0% respectively.

Acute Income Poverty: Explaining the data it is observed that, very few people of Bayer Char coastal community save and most of them save in their house, a very insecure place. The amount of yearly savings is very negligible though they spend daily 8 to 12 hours in their occupations to earn their livelihoods. This finding shows the acute income poverty of Bayer Char coastal community.

6.4.3 Human Assets and Poverty

Graph- 6.75 points out that when all the interlocutors were asked whether they go to union/upazila health centre or not, a substantial number of them (88.0%) answered positively; of them 87.5% interlocutors are males and 19.3% are females. Only 12.0% interlocutors (12) answered negatively; of them, 66.7% are male and 33.3% are female interlocutors. From statistical data of this pyramid graph (Graph-), it is seen that at $df= 2$ and .05 level of significance, the table value is 5.991 which is greater than chi-square value ($\chi^2 = 1.349^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no

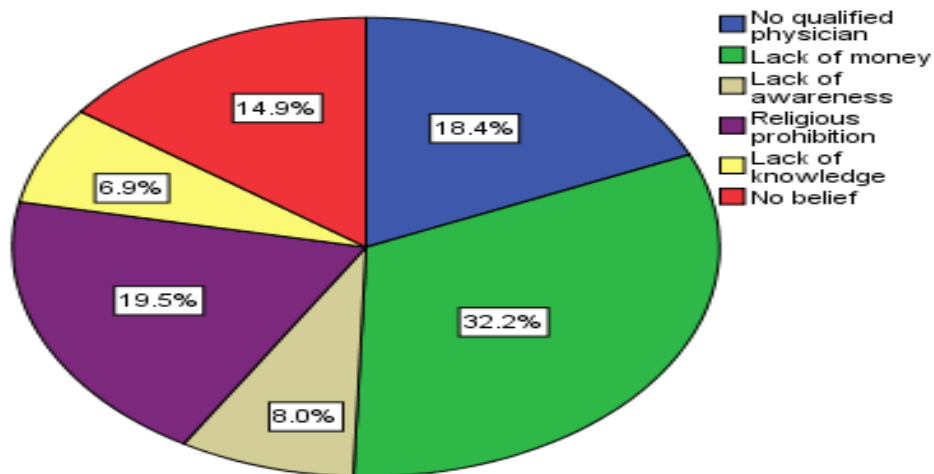
Table- 6.75: Sex of Interlocutors and Whether They Go to Union/Upazila Health Centre (in per cent)



significant relationship between the sex of interlocutors and their going to union/upazila health care centre to take health services. So, irrespective of sexes, a significant number of the people of *Bayer Char* coastal community do not go to union/upazila health services to take health services though they are affected by many diseases caused by climate change. The most important reason behind it is income and human poverty of the households in the coastal area.

At the same time, when the interlocutors (88) who said they do not go to union/upazia health centre were asked to mention the causes behind it, a significant number of them (28, 32.2%) mentioned the cause as lack of money (Income Poverty) while a negligible number of interlocutors (6, 6.9% mentioned the cause as lack of knowledge (Human Poverty). Likewise, a substantial number of interlocutors i.e., 19.5% (17 out of 88) and 18.4% (16 out of 88)

Graph- 6.76: The Causes of Not Going to Union/Upazia Heath Centre (in per cent)



interlocutors said they do not go to union or upazila health centre due to religious prohibition and lack of qualified physician (Human Poverty) respectively. Besides, 14.9% and 8.0% interlocutors informed that the reasons behind their not going to union/upazila health centre are lack of awareness and lack of belief in union or upazila health service (Graph- 6.76).

From table- 6.44 it is observed that when all the interlocutors were asked whether they managed vaccine for their offspring, a substantial number of them (92.0%) answered negatively while a negligible number of them (8.0%) answered positively. Out of the interlocutors who answered negatively, though 52.1% are illiterate, 1.1% are masters passed who are the 100.0% of total masters passed interlocutors, 2.2% are graduates who are 66.7% of total graduate interlocutors, 2.2% are HSC passed who are 100.0% of total HSC passed interlocutors, 4.3% are SSC passed who are 100.0% of total SSC passed interlocutors, 8.7%

are below SSC passed who are 80.0% of total below SSC passed interlocutors, 9.8% are below class eight who are 100.0% of total below class eight interlocutors. Out of the interlocutors who can read only, 100.0% answered negatively and out of the interlocutors who can sign only, 78.6% answered negatively. On the other hand, out of the interlocutors who answered positively, 25.0% are illiterates who are 4.0% of total illiterate interlocutors, 37.5% interlocutors' educational qualification is "Can Sign Only" who are 21.4% of total

Table- 6.44: Educational Qualifications of Interlocutors and Whether They Managed Vaccine for Offspring (in number of interlocutors)

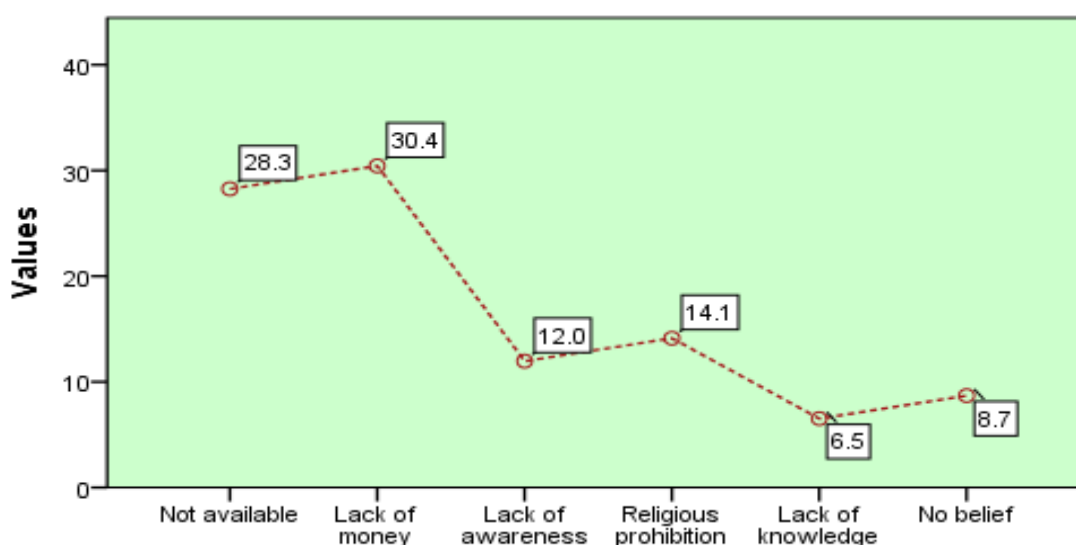
		Whether the Interlocutors Managed Vaccines for Offspring		Total
		Yes	No	
Educational Qualifications of Interlocutors	Illiterate	2	48	50
	Can Sign Only	3	11	14
	Can Read Only	-	7	7
	Below Class 8	-	9	9
	Below SSC	2	8	10
	SSC	-	4	4
	HSC	-	2	2
	Graduation	1	2	3
	Masters	-	1	1
Total		8	92	100

$$(\chi^2 = 11.090^a, df = 8, \alpha = .05, t\text{-value} = 15.507)$$

"Can Sign Only" interlocutors, 25.0% are below SSC who are 20.0% of total below SSC interlocutors and 12.5% are graduates who are 33.3% of total graduate interlocutors. From statistical data of table- 6.44, it is observed that at $df = 8$ and 5.0% level of significance, the t -value (critical value) is 15.507 which is greater than chi-square value ($\chi^2 = 11.090^a$). That means alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between educational qualifications of interlocutors and their managing vaccine for offspring. So, irrespective of their educational qualifications, the people of *Bayer Char* coastal community cannot manage vaccine for their offspring. Educational qualifications do not work in *Bayer Char* coastal community in managing vaccines for offspring. It proves their income and human poverty.

At the same time, when the interlocutors who answered negatively, were asked to mention the causes behind it, the highest number of them (30.4%) mentioned lack of money (Income Poverty) while the lowest number of them (6.5%) mentioned the cause as lack of knowledge. Likewise, 28.3% and 14.1% interlocutors mentioned unavailability of vaccines and religious

Graph- 6.77: The Causes of Not Managing Vaccines for Offspring (in per cent)



prohibition (Human Poverty) as the causes of not managing vaccines for offspring. Besides, lack of awareness and lack of belief in vaccines (Human Poverty) are mentioned as causes of not managing vaccines for offspring by 12.0% and 8.7% interlocutors respectively (Graph- 6.77).

Table- 6.45 presents the daily income of households and households' getting proper health services. Being asked whether the members of households get proper health services, 97.0% of total interlocutors answered negatively; of them, 42.3% (the highest) interlocutors' daily household income is between 200 and 300 taka and they are the 100.0% of total interlocutors whose daily household income is 200 to 300 taka. The interlocutors whose daily household income is less than 100 taka (3), between 100 and 200 taka, between 200 and 300 taka and between 300 and 400 taka, 100.0% of each category said their household members do not get

Table- 6.45: Daily Income of Households and Whether the Members of Households Get Proper Health Services

		Whether the Households Get Proper Health Services (in number)		Total
		Yes	No	
Daily Income of Households (in taka)	<100	-	3	3
	100-200	-	17	17
	200-300	-	41	41
	300-400	-	22	22
	400- 500	1	12	13
	>500	2	2	4
Total		3	97	100

$$(\chi^2 = 33.915^a, df = 5, \alpha = .05, t\text{-value} = 11.070)$$

proper health services. Likewise, the interlocutors whose daily household income is 400 to 500 taka and more than 500 taka, 92.3% and 50.0% of them respectively informed that they and members of their households do not get proper health services. Only 3.0% interlocutors said they and their household members get proper health services; of them, 33.3% interlocutors' daily household income is 400 to 500 taka and 66.7% interlocutors' daily household income is more than 500 taka. From table data it is observed that the households, whose daily income is more, get better health services. On the one hand, the people of *Bayer Char* coastal community are the poorest of the poor based on the daily income of the households, on the other hand, their deprivation of proper health services leads to prolonged illness, physical and psychological disability, death, and sudden death that deepen their poverty as explored in the study of Chakma (2005).

From the explanation of table data (Table- 6.45) it is seen that at $df = 5$ and 5.0% level of significance, the t-value (critical value) is 11.070 which is less than chi-square value ($\chi^2 = 33.915^a$). That means null hypothesis (H_0) is rejected and alternative hypothesis (H_1) is accepted. So, there is a significant relationship between daily income of households of *Bayer Char* community and their households' getting proper health services. So, though good health service is not available in *Bayer Char* coastal area the households whose daily income is more, may get proper health services from upazila, district, capital city or from any other places while the households whose daily income is less, do not get proper health services. Getting proper health services depends on daily income of households. On the other hand, as daily income of *Bayer Char* coastal community is very poor or negligible (income poverty), they do not get proper health services.

6.4.3.1 Char Life, Gender in Education and Poverty

Table- 6.46 shows that being asked whether their children went or go to educational institutions, a significant number of interlocutors (75.0%) answered negatively and a negligible number of them (25.0%) answered positively. Comparing educational qualifications of interlocutors it is observed that, the interlocutors whose educational qualifications are illiterate, 84.0% of them answered negatively while 100.0% of masters passed interlocutor (s) answered negatively and 66.7% of graduation completed interlocutors answered negatively i.e., their children did/do not go to educational institutions as schools, colleges or madrasahs. Likewise, the interlocutors whose educational qualifications are SSC and HSC passed, 100.0% of them informed that their children did/do not go to educational

institutions. Besides, the interlocutors whose educational qualifications are “can sign only”, “can read only” and “below class 8”, of them, 50.0%, 57.1% and 66.7% respectively said that

Table- 6.46: Educational Qualifications of Interlocutors and Whether Their Children Went/Go to Educational Institutions (in number of interlocutors)

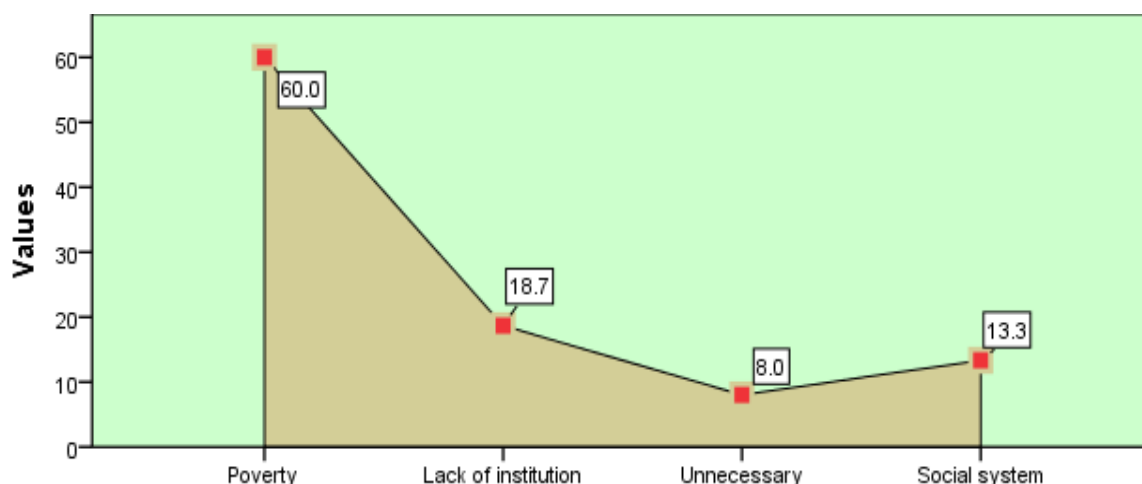
		Whether Children Went/Go to Educational Institutions		Total
		Yes	No	
Educational Qualifications of Interlocutors	Illiterate	8	42	50
	Can Sign only	7	7	14
	Can Read only	3	4	7
	Below Class 8	3	6	9
	Below SSC	3	7	10
	SSC	-	4	4
	HSC	-	2	2
	Graduation	1	2	3
	Masters	-	1	1
Total		25	75	100

$$(\chi^2 = 10.928^a, df = 8, \alpha = .05, t\text{-value} = 15.507)$$

their children did/do not go to educational institutions. Statistical data of table- show that, at $df = 8$ and 5.0% level of significance, the t-value (critical value) is 15.507 which is greater than chi-square value ($\chi^2 = 10.928^a$). That means alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between educational qualifications of the people of *Bayer Char* community and their and their children’s going to educational institutions. Educational qualifications of interlocutors do not matter here in sending children to educational institutions unlike main land of the country. This coastal char has a unique characteristics originated from their adaptive livelihoods to its climatic characteristics.

At the same time, graph- 6.78 (area chart) states that when the interlocutors who answered negatively i.e., who said their children did/do not go to educational institutions, were asked to mention the causes behind it, most of the interlocutors of them (60.0%, 45 out of 75) mentioned the cause as poverty while a negligible number of them (8.0%, 6) mentioned the cause as unnecessary i.e., it is not necessary for children to go to educational institutions. The second highest number of interlocutors (18.7%, 14) mentioned that due to lack of educational institutions their children did/do not go to educational institutions while the third highest number of interlocutors (13.3%, 10) mentioned the cause as social system i.e., in this

Graph- 6.78: Causes of Children’s Not Going to Educational Institutions (in percent)



community children generally do not go to educational institutions and it has become a part of social system in *Bayer Char* coastal community.

6.4.3.2 Access to Information

Table- 6.47 describes that when total interlocutors were asked how they get agriculture related weather forecast/information, the highest number of them (31.0%) said by local knowledge while the lowest number of them (2.0%) said their medium of getting agriculture related weather forecast/information is miking. The second highest number of interlocutors mentioned radio and NGOs are their media of getting agriculture related weather forecast or information, the percentage are 13.0 each. Besides, mosques and training are mentioned by 9.0% interlocutors each and 8.0% interlocutors mentioned television (TV) as the media or sources of agriculture related weather forecast or agricultural information. 6.0%, 5.0% and 4.0% interlocutors mentioned DAE staff, discussing neighbours and newspapers respectively as the media or sources of agriculture related weather forecast or agricultural information. On the one hand, the interlocutors who mentioned local knowledge as the source of agriculture related weather forecast or weather information, 47.0% of them are illiterate, 3.2% are HSC passed and none belongs to SSC, graduation or masters passed. Likewise, the interlocutors who get agriculture related weather forecast from NGOs, DAE staffs, radio or TV, none of them belongs to SSC, HSC, graduation or master degree holders. On the other hand, the interlocutors who get agriculture related weather forecast from newspaper, 50.0% of them are SSC passed, the rest are graduation and master degree holders (25.0% each) and none of them belongs to illiterate or below SSC passed interlocutors. The interlocutors who are graduates (3), they get agricultural information from newspaper, training and mosques

Table- 6.47: Educational Qualifications of Interlocutors and Media of Getting Agriculture Related Weather Forecast/Information (in number of interlocutors)

		How They Get Agriculture Related Weather Forecast/Information										Total
		TV	Radio	News paper	Training	Miking	Discussing neighbors	NGOs	DAE staff	Local Knowledge	Mosques	
Educational Qualifications of Interlocutors	Illiterate	3	7	-	5	1	4	7	2	16	5	50
	Can Sign Only	1	3	-	-	-	-	3	1	5	1	14
	Can Read Only	-	1	-	-	-	-	1	1	3	1	7
	Below Class 8	1	1	-	2	-	-	2	-	3	-	9
	Below SSC	3	1	-	1	-	-	-	2	3	-	10
	SSC	-	-	2	-	1	1	-	-	-	-	4
	HSC	-	-	-	-	-	-	-	-	1	1	2
	Graduation	-	-	1	1	-	-	-	-	-	1	3
Masters	-	-	1	-	-	-	-	-	-	-	1	
Total		8	13	4	9	2	5	13	6	31	9	100

$$(\chi^2 = 109.464^a, df = 72, \alpha = .05, t\text{-value} = 90.531)$$

(33.3% each). 100.0% of master degree completed interlocutor (s) get agriculture related weather forecast or agricultural information through newspaper. Statistical data show that at $df = 72$ and .05 level of significance, the table value (critical value) is 90.531 which is less than chi-square value ($\chi^2 = 109.464^a$). That means alternative hypothesis (H_1) is accepted and null hypothesis (H_0) is rejected. So, there is a significant relationship between educational qualifications of interlocutors and their media of getting agriculture related forecasting/information.

6.4.4 Social Assets and Poverty

Table- 6.48 informs that when all the interlocutors were asked whether they are NGOs member or not, a significant number of them (73.0%) answered positively while a negligible number of them (27.0%) answered negatively. Out of the all male interlocutors (78), 67.9% said they are NGOs members, which is the 72.6% of interlocutors who said they have membership of NGOs. On the other hand, out of the total female interlocutors, 90.5% said they have the membership of NGOs, which is the 26.0% of total interlocutors who are the members of NGOs. Out of the interlocutors who have no membership of NGOs (27.0%),

Table- 6.48: Sex of Interlocutors and Their Membership of NGOs (in number)

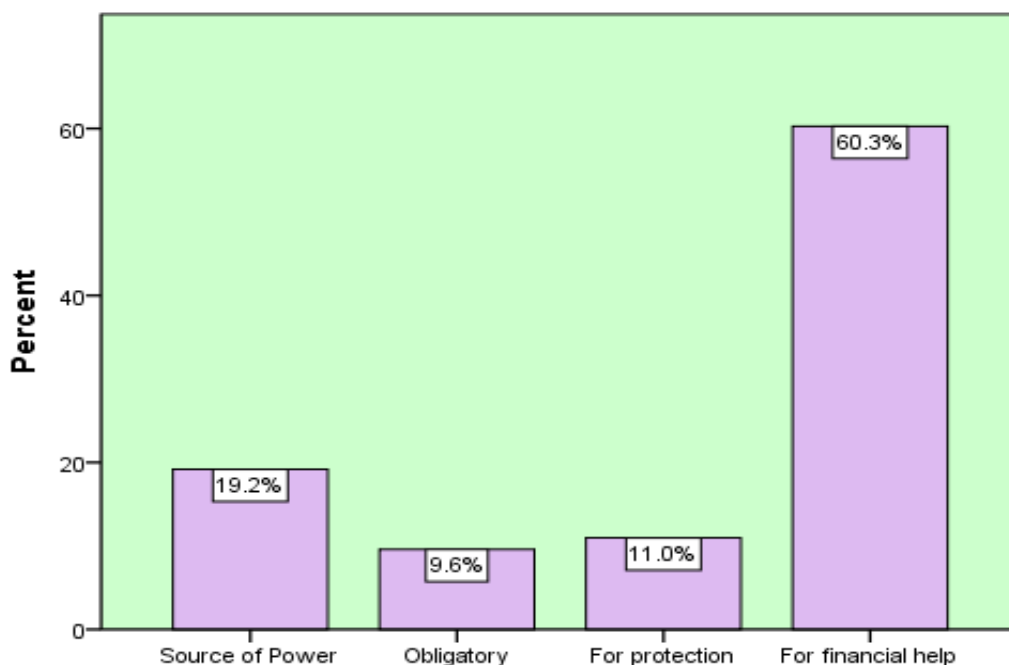
		Whether the Interlocutors Are NGOs Members or Not		Total
		Yes	No	
Sex of Interlocutors	Male	53	25	78
	Female	19	2	21
	Third Sex (Hijra)	1	-	1
Total		73	27	100

$$(\chi^2 = 4.634^a, df = 2, \alpha = .05, t\text{-value} = 5.991)$$

92.6% of them are males and only 7.4% are female interlocutors. So, from NGOs membership perspective, the percentage of females (90.5%) is more than that of males (67.9%), the cause behind it is females are more impacted by climatic hazards for their gender specific activities than males and their livelihood is more vulnerable than the livelihood of males. Explaining the data of this table it is observed that at $df = 2$ and .05 level of significance, the table value (critical value) is 5.991 which is greater than chi-square value ($\chi^2 = 4.634^a$). That means alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no relationship between sex of interlocutors and their being NGOs members. It indicates that the people of *Bayer Char* community take NGOs membership irrespective of their sexes.

At the same time graph- 6.79 states that when the interlocutors who have the membership of NGOs, were asked to state the causes behind taking NGOs membership, most of them (60.3%) said they took NGOs membership for financial help as finance is very crucial for adaptation to climate change induced hazards. 19.2% interlocutors said they took NGOs

Graph- 6.79: The Causes of Taking NGOs Membership (in per cent)



membership as it works as source of power while 11.0% mentioned that they took NGOs membership for protection and 9.6% said that they took NGOs membership as it is obligatory in *Bayer Char*.

6.4.5 Poverty and Its Relation to Climate Change

From the table- 6.49, it is found that when all the interlocutors were asked whether they are poor or rich, a significant number of them (93.0%) answered as poor while only a negligible number of interlocutors (7.0%) answered as rich. Out of the landless interlocutor (33), 100.0% mentioned them as poor, out of the marginal household interlocutors (53), 98.1% mentioned them as poor and out of the small household interlocutors (7), 85.7% mentioned them as poor. On the other hand, the interlocutors who mentioned them as rich (7), 42.9% of them are large households, 28.6% are medium households and small and marginal households are 14.3% each. Explaining the data of table- statistically, it is observed that at $df=4$ and .05 level of significance, the table value (critical value) is 9.488 which is less than chi-square value ($\chi^2 = 50.001^a$). That means alternative hypothesis (H_1) is accepted and null

Table- 6.49: Household Types of Interlocutors and Whether They are Poor or Rich (in number)

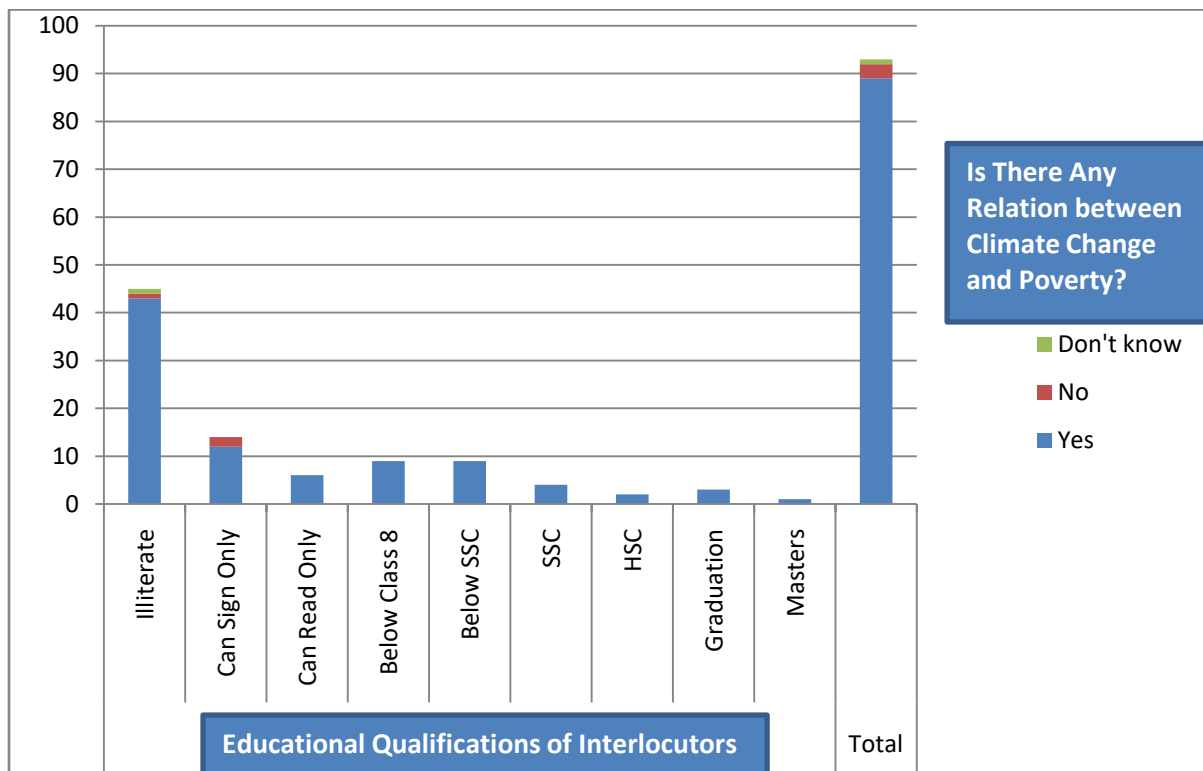
		Whether The Interlocutors are Poor or Rich		Total
		Poor	Rich	
Household Types (amount of land in acres)	Landless	33	-	33
	Marginal	52	1	53
	Small	6	1	7
	Medium	1	2	3
	Large	1	3	4
Total		93	7	100

$$(\chi^2 = 50.001^a, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

hypothesis (H_0) is rejected. So, there is a significant relationship between the household types of interlocutors and their conception or evaluation about themselves as poor or rich. It indicates that household types of *Bayer Char* community based on the amount of land ownership plays a significant role in evaluating themselves as poor or rich and social relations of land ownership directly affect their access to other assets and their ability to innovate adaptation strategies to climate change impacts as theorized by Ahmed, Z. and Habib, A (2015) in their qualitative study. The study of Mahbubullah (1996) also found the same result as he said that social structure in rural char areas is land centered. Those who have been losing land, follow the principle of walking on two legs.

When the interlocutors who mentioned themselves as poor, were asked whether there is any relation between climate change and their poverty (Graph-6.80), a substantial number of them (89, 95.7%) answered positively while a very negligible number of them (3, 3.2%) answered negatively and an interlocutor (1.1%) answered saying “Do’t know”. Out of

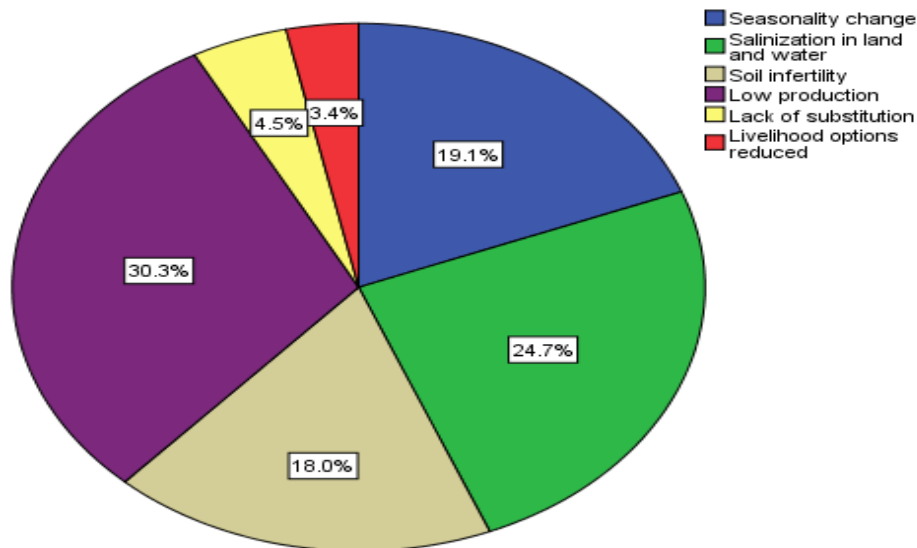
Graph- 6.80: Educational Qualifications of Interlocutors and Relation between Climate Change and Their Poverty



the illiterate (45) and “can sign only” (14) interlocutors, 95.6% and 85.7% interlocutors respectively said that there is a relationship between climate change and their poverty. Out of the interlocutors except illiterate and “can sign only” interlocutors, 100.0% said there is a relationship between climate change and their poverty. Khan and Seeley (2005) found the same findings as they explored that climate change causes poverty and worsens the poverty situation of coastal community.

At the same time, graph- 6.81 points out that, when the interlocutors (89) who said there is a relationship between climate change and their poverty, were asked to explain how climate change causes their poverty, a substantial number of them (30.3%, 27) said climate change causes low production that is the main cause behind their poverty while a negligible number of them said due to climate change their livelihood options have been reduced. The second highest number of interlocutors (24.7%, 22) said climate change induced flood or tidal surge causes salinization in land and water that is one of the main causes of production reduction or poverty. Besides, 19.1% and 18.0% interlocutors said due to climate change season changes and soil has become infertile, which causes poverty. Likewise, 4.5% interlocutors said there is a lack of substitution of reduced livelihood options due to climate change and their livelihood becomes vulnerable and they become poor. The findings provided by the

Graph- 6.81: How Climate Change Causes Their Poverty



interlocutors in present study are supported by the secondary study of Sarwar, M.G.M. (2005) as he hypothesized that, livelihood options and the natural environment of coastal communities of Bangladesh will be severely affected by the anticipated one meter sea level rise that will lead to the national food security.

6.4.6 Poverty and Its Impacts on Adaptation

Table- 6.50 presents that when the interlocutors who said they adopted adaptation strategies to climate change impacts (95, the highest number found in material assets) were asked whether poverty has any impacts on their adaptation to climate change, a significant number of interlocutors (95.8%, 91 out of 95) informed that poverty has impacts on their adaptation strategies to climate change while only 4.2%(4 out of 95) informed that poverty has no any impacts on their adaptation strategies. Out of the total landless households (31), 100.0% and out of the total marginal households (50), 94.0% said there are impacts of poverty on adaptation strategies to climate change. Likewise, out of the small (7), medium (3) and large (4) households, 100.0%, 66.7% and 100.0% respectively informed that poverty has impacts on their adaptive strategies to climatic impacts on livelihoods. Explaining the data of table-6.50 statistically, it is observed that at $df=4$ and .05 level of significance, the table value (critical value) is 9.488 which is greater than chi-square value ($\chi^2 = 8.552^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the household types of interlocutors and impacts of poverty on their adaptation strategies to climate change. It indicates that irrespective of their household types

Table- 6.50: Household Types and Whether Poverty Has Any Impacts on Adaptation to Climate Change (in frequency of interlocutors)

		Whether Poverty Has Any Impacts on Adaptation to Climate Change		Total
		Yes	No	
Household Types (amount of land in acres)	Landless	31	-	31
	Marginal	47	3	50
	Small	7	-	7
	Medium	2	1	3
	Large	4	-	4
Total		91	4	95

$$(\chi^2 = 8.552^a, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

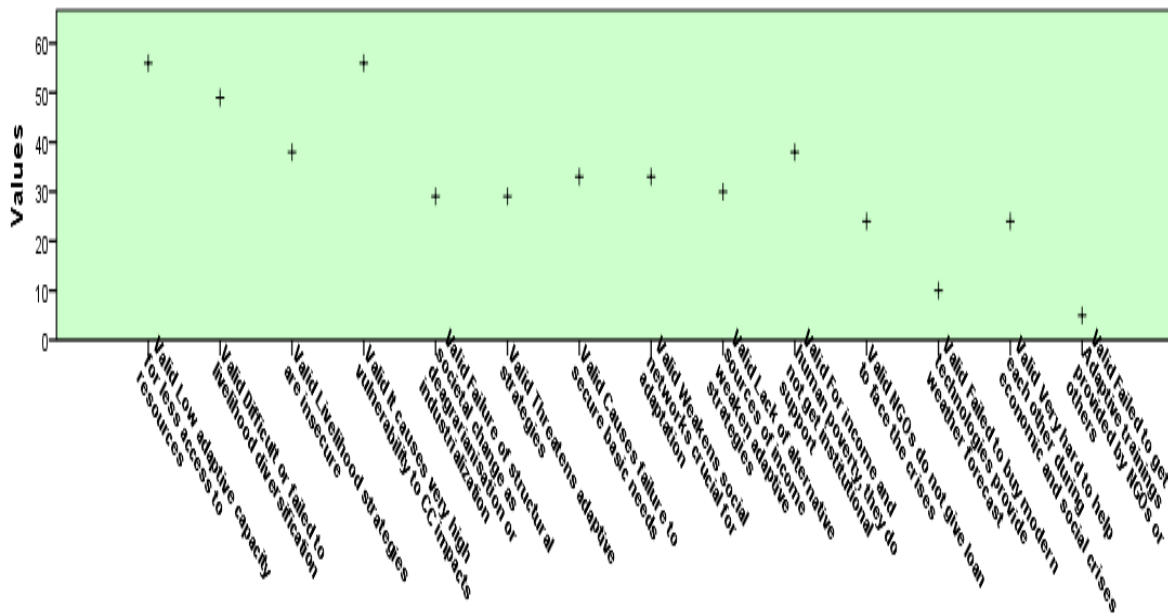
based on the amount of land ownership poverty impacts the adaptation strategies of *Bayer Char* coastal people to climatic impacts on their livelihoods.

The findings of this section are supported by the findings of Khan and Seeley (2005) as they examined in their study that, climate change and poverty make adaptation strategies of coastal community insecure, vulnerable and unsustainable. They also explored that Union Parishad (UP) leaders' practice of bribes and cheating is open-secret in chars. The poorer people cannot pay bribes and are deprived of their due rights. As a result, their state of poverty and exploitation accelerates in coastal chars like *Bayer Char*.

At the same time, when the interlocutors (91) who said poverty has impacts on their adaptation strategies to climatic impacts on livelihood assets, were asked to describe the types of impacts i.e., whether the impacts are positive or negative, 100.0% of them described the impacts of poverty on adaptation to climate change are negative.

When the interlocutors (91) who said poverty has impacts on their adaptation to climate change were asked to mention the different negative impacts of poverty and they were given the options of multiple responses (Graph- 6.82), the highest number of interlocutors mentioned that poverty causes low adaptive capacity for less access to resources (56 out of 454) and very high vulnerability to climate change impacts (56 out of 454), the percentage is 12.3% each. On the other hand, the lowest number of responses (5 out of 454, 1.1%) said, failure to get adaptive trainings provided by NGOs or others is one of the general negative impacts of poverty on their adaptation. Likewise, a substantial number of responses (49, 10.8%) stated that due to poverty it is difficult for them or they failed to diversify livelihoods. At the same time, Insecurity of livelihood strategies (38) and not getting institutional support (38) were mentioned by 8.4% responses each as the negative impacts of income and human

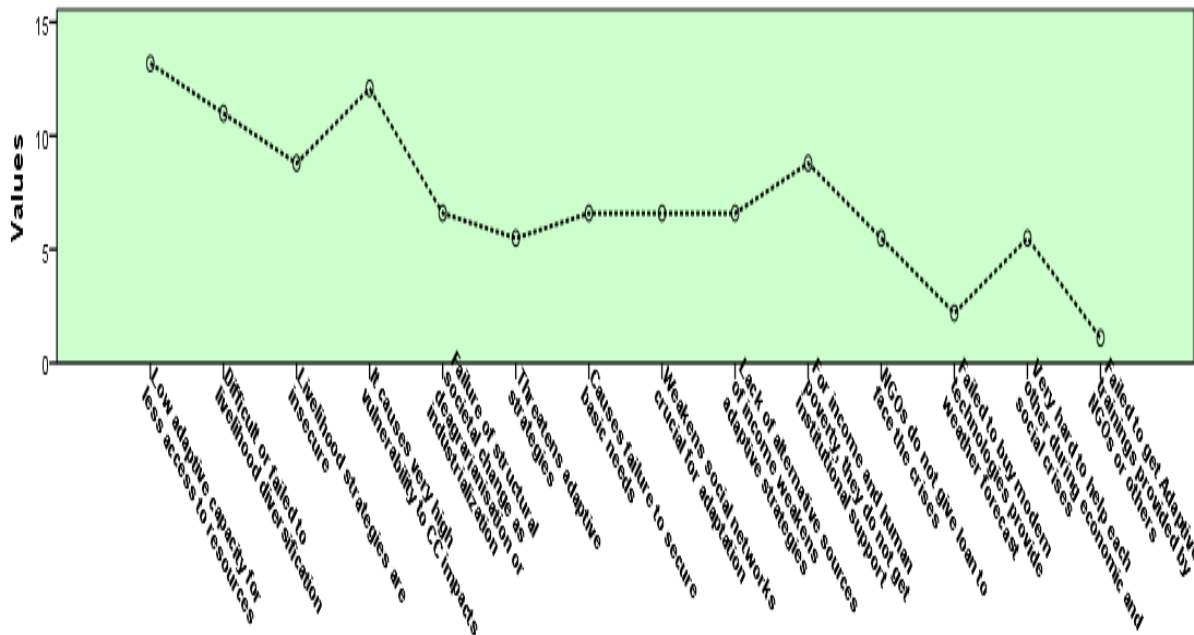
Graph- 6.82: Different Negative Impacts of Poverty on Adaptation to Climatic Impacts on Livelihood Assets of Interlocutors (Multiple Responses)



poverty. Besides, 7.3% responses each said poverty causes failure to secure basic needs (33) and weakens social networks crucial for adaptation (33) while 6.4% responses each (29 each) mentioned failure of societal change as deagrarianisation or industrialization and threat to adaptive strategies as the general negative impacts of poverty on adaptation strategies to climate change. Other negative impacts of poverty on adaptation to climatic impacts on livelihood assets mentioned by 5.3% responses each (24 each) are difficulty or inability to get NGOs loan to face the crises and very difficulty to help each other during economic and social crises.

On the other hand, graph- 6.83 points out that when these interlocutors (91) who said poverty has negative impacts on adaptation to climate change, were asked to mention the major negative impact of poverty on adaptation, the highest number of interlocutors (12, 13.2%) mentioned low adaptive capacity for less access to resources while the lowest number of interlocutors (1) mentioned failure to get adaptive trainings provided by NGOs or others. Likewise, 12.1% and 11.0% interlocutors mentioned very high vulnerability to climate change impacts (11) and difficulty or failure to diversify livelihoods (10) respectively as the major negative impacts of poverty on adaptation. Insecurity of livelihood strategies (8) and not getting institutional supports due to income and human poverty were mentioned by 8.8% interlocutors each. Besides, 6.6% interlocutors each said poverty causes failure of societal

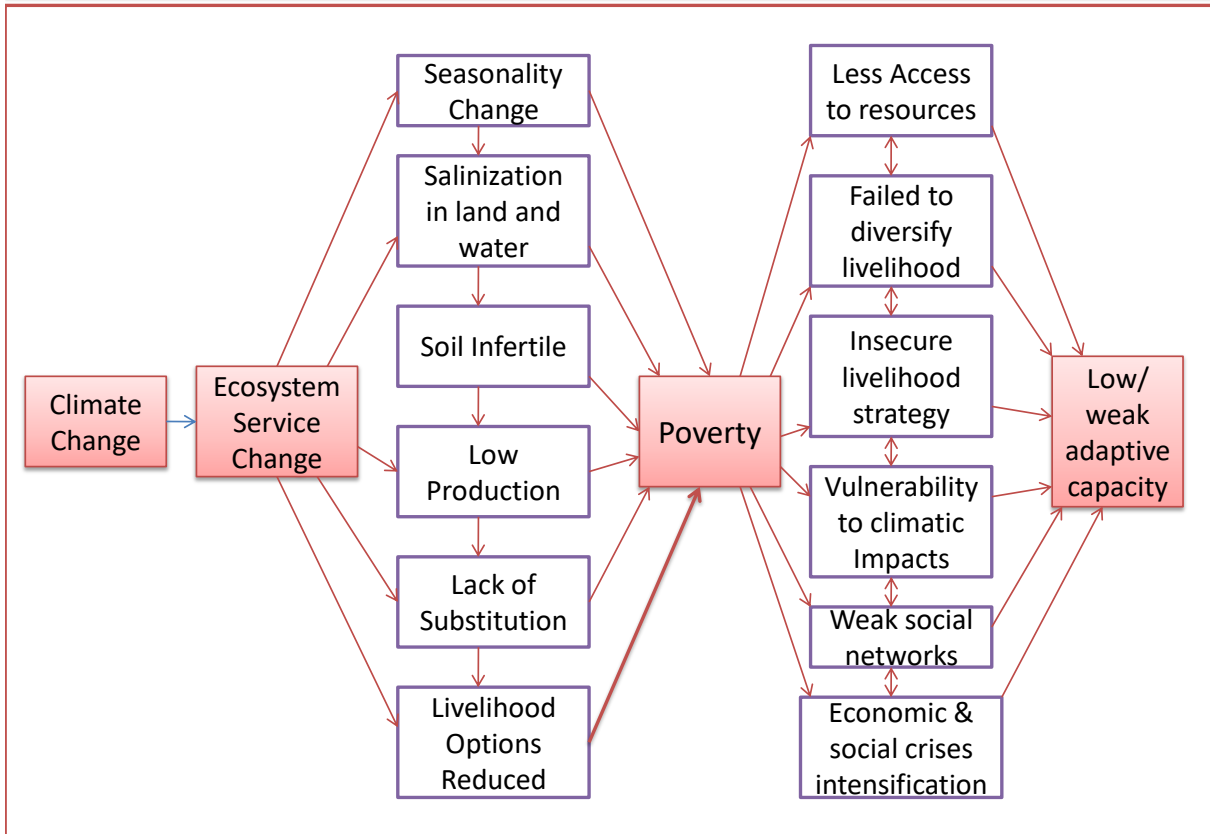
Graph- 6.83: Major Negative Impacts of Poverty on Adaptation to Climatic Impacts on Livelihood Assets of Interlocutors



change as deagrarianisation or industrialization, failure to secure basic needs, threatens adaptive strategies, weakens social networks crucial for adaptation and causes lack of alternative sources of income, weakens adaptive strategies. Other major negative impacts of poverty on their adaptation strategies are threat to adaptive strategies and not getting loan from NGOs to face the crises as mentioned by 5.5% interlocutors each. The findings regarding negative roles of poverty in adaptation partially fit the findings of Islam, Z. and Shafie, H. (2017), as they examined that, the means and capacities for adapting to climate change in developing countries like Bangladesh are scarce or low owing to low levels of human and economic development and high frequencies of poverty.

Figure- 6.2, formulated based on field data, describes a framework of relationship among climate change, poverty and *Bayer Char* people's adaptation strategies to climate change. On the one hand, climate change causes the change of ecosystem service. For the change of ecosystem service, seasonality changes. Seasonality changes cause salinization in land and water, salinization in land and water causes soil infertility, soil infertility causes low production, low production causes lack of livelihood substitution. So, livelihood options have been reduced which results in poverty. On the other hand, poverty causes less access to resources, failure to diversify livelihoods, insecure livelihood strategies, vulnerability to resources, failure to diversify livelihoods, insecure livelihood strategies, vulnerability to

Figure- 6.2: A Framework of Relationship among Climate Change, Poverty and Adaptation



(Source: Compiled Based on Field Data, 2021-2022)

climatic impacts, weak social networks and economic and social crises intensification. So, poverty caused by ecosystem service change (Climate Change) ultimately weakens the adaptive capacity of *Bayer Char* coastal people. Here, the conception of cultural ecology theory is reflected in the framework as the interaction and interconnection among natural environmental conditions, subsistence technology or culture and poverty is clearly observed.

SECTION FIVE:

GENDER, PATRIARCHY AND ADAPTATION TO CLIMATE CHANGE

6.5.1. Women Gender Role in Water and Fuel Management

Table- 6.51 shows that when all the interlocutors were asked to mention the collectors of water, most of the interlocutors (54.0%) said females while a negligible number of interlocutors (6.0%) said males. The second highest number of interlocutors (23.0%) said females and children are the collectors of water while the lowest number of interlocutors said male children are the collectors of water. Besides, 13.0% interlocutors said female children are the collectors of drinking water. The interlocutors (54) who said females are the collectors of water, 100.0% (54) of them said their source of drinking water is tubewell and they are the 74.0% of total interlocutors who mentioned tubewell as their source of drinking water. The interlocutors who said females and children are the collectors of drinking water (23), 82.6% of them mentioned tubewell as the source of drinking water. Here, it is observed that,

Table- 6.51: Sources of Drinking Water and Gender in Collection of Water (number of interlocutors)

		Collectors of Drinking Water					Total
		Males	Females	Male Children	Female Children	Females and Children	
Sources of Drinking Water	Deep Tubewell	6	-	1	-	4	11
	Tubewell	-	54	-	-	19	73
	River	-	-	1	-	-	1
	Pond	-	-	2	1	-	3
	Canal	-	-	-	1	-	1
	Rain water	-	-	-	11	-	11
Total		6	54	4	13	23	100

$$(\chi^2 = 211.821^a, df = 20, \alpha = .05, t\text{-value} = 31.410)$$

only 10.0% work of drinking water collection is done by male or male children while 90.0% is done by females, female children or female and children. It is observed in statistical data that at $df=20$ and .05 level of significance, the table value (critical value) is 31.410 which is less than chi-square value ($\chi^2 = 211.821^a$) i.e., alternative hypothesis (H_1) is accepted and null hypothesis (H_0) is rejected. So, there is a significant relationship between the sources of drinking water and the collectors of drinking water. So, collection of drinking water is a gender role of females in *Bayer Char* like other parts of Bangladesh and when water and its collection process are impacted by climatic hazards, females are impacted more than males.

Table- 6.52 points out that when all the interlocutors were asked to mention the collectors of fuel, a significant number of interlocutors (46.0%) said females while a negligible number of interlocutors (12.0%) said males. The second highest number of interlocutors (26.0%) said females and children are the collectors of fuel while only 7.0% interlocutors said male children are the collectors of water. Besides, 9.0%interlocutors said female children are the collectors of fuel. The interlocutors (46) who said females are the collectors of fuel, 50.0% (23) of them said their source of fuel is straw and they are the 71.9.0% of total interlocutors who mentioned straw as their source of fuel. The interlocutors who said females and children are the collectors of fuel (26). 57.7% of them mentioned cow dung as the source of fuel and they are the 65.2% of total interlocutors who said cow-dung is the source of their fuel. Here,

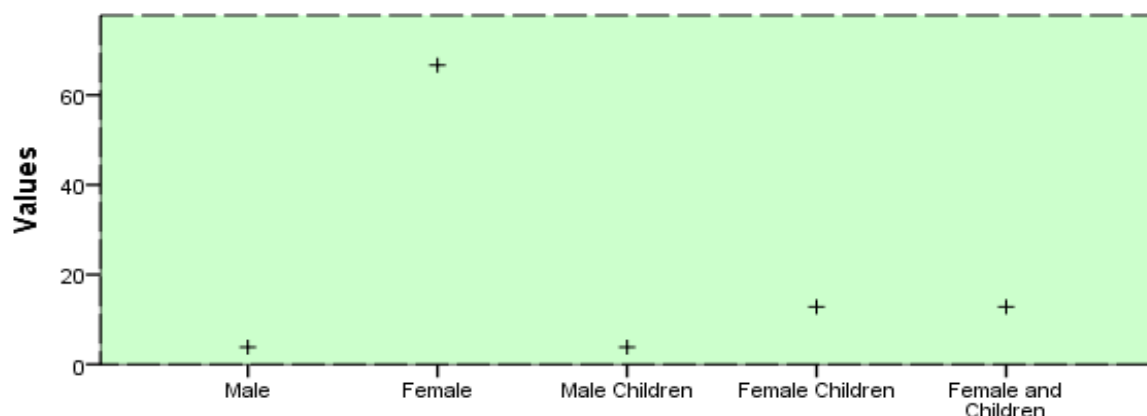
Table-6.52: Sources of Fuel and Women Gender Role in Fuel Collection (in number)

		Collectors of Fuel					Total
		Males	Females	Male Children	Female Children	Female and Children	
Sources of Fuel	Wood	4	13	-	-	-	17
	Straw	-	23	-	4	5	32
	Cow dung	-	5	3	-	15	23
	Tree Leaves	3	4	4	5	6	22
	LPG Stove	5	1	-	-	-	6
Total		12	46	7	9	26	100

$$(\chi^2 = 88.915^a, df = 16, \alpha = .05, t\text{-value} = 26.296)$$

it is observed that only 19.0% work of fuel collection is done by male or male children while 81.0% is done by females, female children or female and children. It is observed in statistical data that at df=16 and .05 level of significance, the table value (critical value) is 26.296 which is less than chi-square value ($\chi^2 = 88.915^a$) i.e., alternative hypothesis (H_1) is accepted and null hypothesis (H_0) is rejected. So, there is a significant relationship between the sources of fuel and the collectors of fuel. 78.0% of interlocutors informed that their fuel is not

Graph- 6.84: Who Impacted More by Fuel Insufficiency? (in per cent)



sufficient (Graph-6.84). As collection of fuel is a gender role of females in *Bayer Char* like any other parts of Bangladesh and when fuel and its collection process are impacted by climatic hazards, females are impacted more (66.7%, the highest) than males (3.8%, the lowest) as observed in the figure- 6.84 (dot chart). The result is compatible with the studies of Adzawla et al. (2019) and Chakma (2005/2003).

6.5.2 Education and Gender

Table- 6.53 shows that when all the interlocutors were asked from their boys and girls whom they prefer, a substantial number of them (44.0%) informed that they prefer the boys while only a negligible number of them (16.0%) said that they prefer the girls most. Boys are preferred to girls because *Bayer Char* is an acute poverty stricken and climate induced disaster prone area where boys are perceived to be more helpful to face the crises than girls. On the other hand, a noticeable number of interlocutors (40.0%) said that they prefer both of them (boys and girls). The reason behind it is girls also play vital role in facing crises and adapting to climate change with boys. Out of the interlocutors who prefer the boys (44), 47.7% are illiterates in educational qualification. Out of the interlocutors who prefer the girls (16), 43.8% are illiterates and 12.5% are graduates in educational qualification. While 66.7% of graduate interlocutors (2 out of 3) said they prefer the girls

Table- 6.53: Educational Qualifications of Interlocutors and Their Gender Preference (in number of interlocutors)

		Whom the Interlocutors Prefer			Total
		Boys	Girls	Both	
Educational Qualifications of Interlocutors	Illiterate	21	7	22	50
	Can Sign Only	5	3	6	14
	Can Read Only	4	1	2	7
	Below Class 8	5	1	3	9
	Below SSC	5	2	3	10
	SSC	2	-	2	4
	HSC	1	-	1	2
	Graduation	-	2	1	3
	Masters	1	-	-	1
Total		44	16	40	100

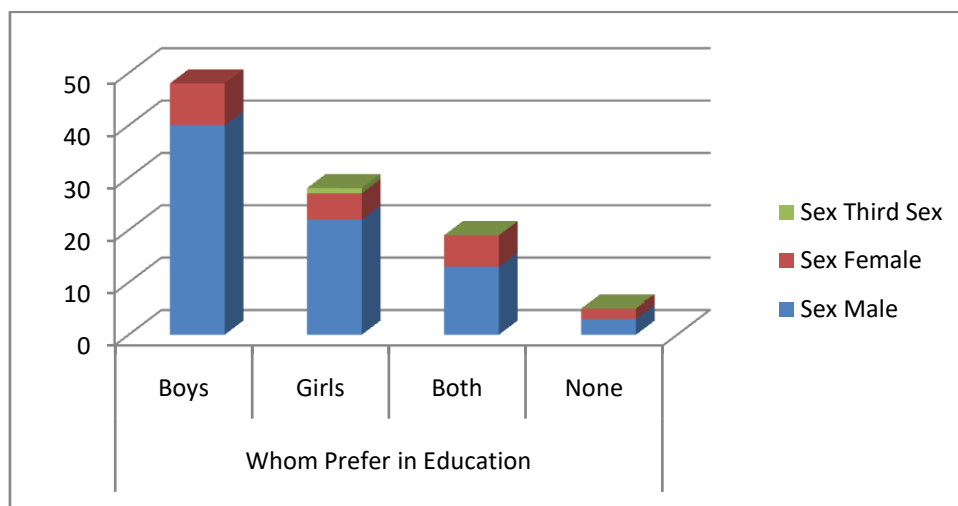
$$(\chi^2 = 11.847^a, df = 16, \alpha = .05, t\text{-value} = 26.296)$$

100.0% of masters passed interlocutor (s) expressed boys' preference. Statistical data show that at df=16 and .05 level of significance, the table value (critical value) is 26.296 which is greater than chi-square value ($\chi^2 = 11.847^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between educational

qualifications of interlocutors and their gender preference. So, educational qualifications of interlocutors do not matter in gender preference in *Bayer Char* community.

Graph- 6.85 presents the sex of interlocutors and their gender preference in education. The researcher was informed that about half of the interlocutors (48.0%) prefer their boys in education while only 28.0% interlocutors prefer their girls in education. The reason behind it is their poverty and lack of awareness. On the other hand, 19.0% interlocutors prefer both of their boys and girls in education. It indicates that the people of *Bayer Char* are going to be aware about universal education by the some awareness programs run by NGOs and GOs. It

Graph- 6.85: Sex of Interlocutors and Their Gender Preference in Education (in per cent)



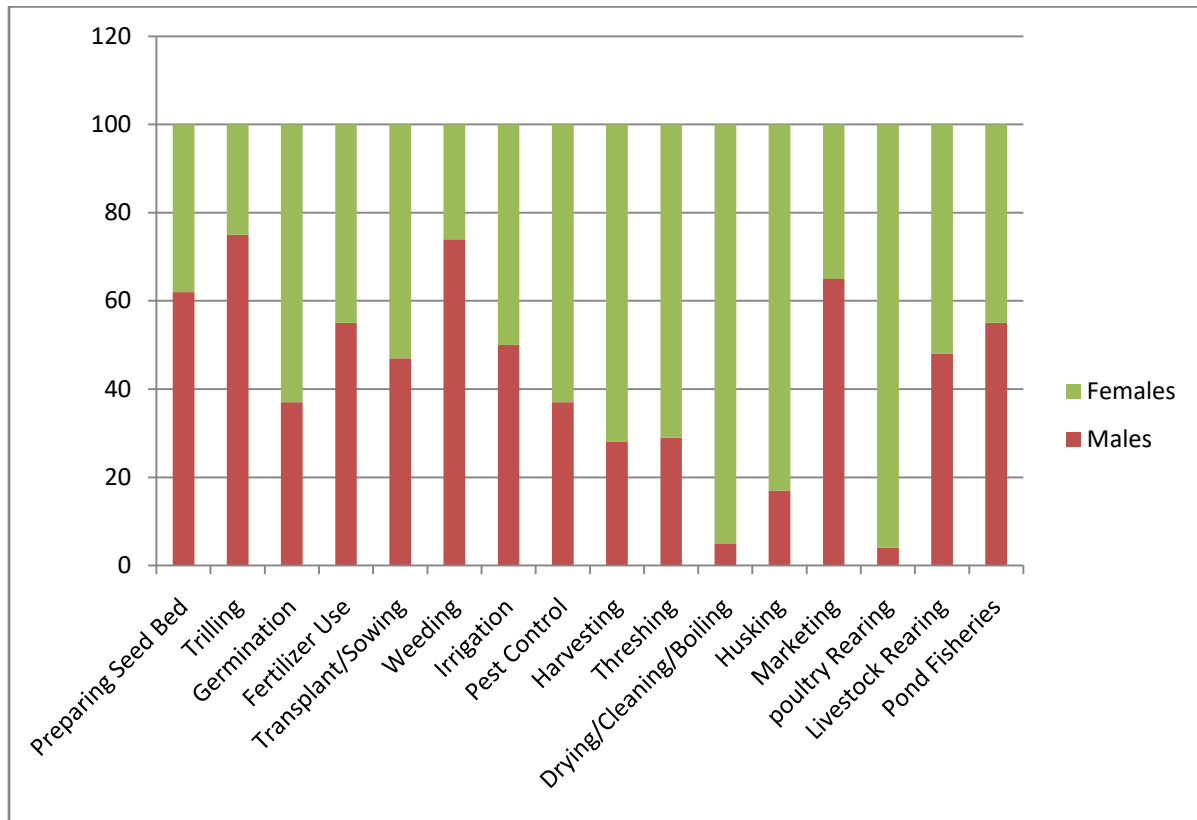
is very alarming that 5.0% interlocutors said they prefer neither boys nor girls in education. These people are illiterate, highly superstitious and poorest of the poor. The interlocutors who prefer boys in education (48), 83.3% of them are males, 16.7% are females. The interlocutors who prefer girls in education (28), 78.6% of them are males and 17.9% are females. Out of the interlocutors who prefer both of boys and girls in education (19), 68.4% are males and 31.6% are females. In spite of being females, a significant number of interlocutors prefer their boys in education to girls. The causes behind it are patriarchy, poverty and high frequency and intensity of climatic impacts in *Bayer Char* coastal community.

6.5.3 Gender Role in Production

Graph-6.86 shows the gender role in production especially in different aspects of agricultural production. When the interlocutors were asked to mention the percentages of roles of males and females in different aspects of agricultural production, the researcher was informed that, males play the highest role in trilling (75.0%) while in poultry rearing females play the

highest role (96.0%). The second highest role males play in wedding while females play the second highest role in drying, cleaning and boiling. In marketing, preparing seed

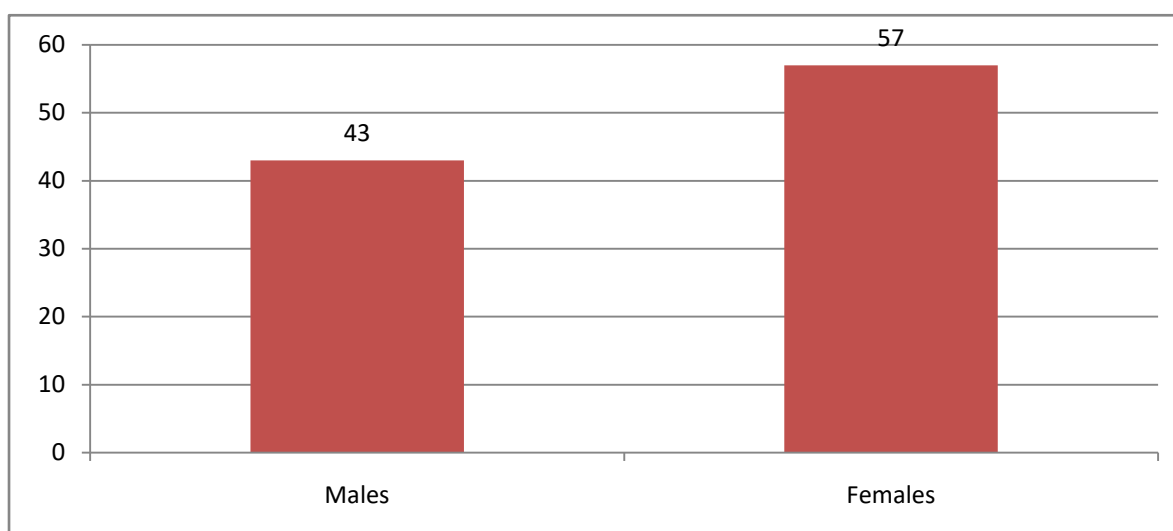
Graph- 6.86: Gender Role in Different Sectors of Agricultural (in per cent)



bed, fertilizer use and pond fisheries males play more role than females and the percentages are 65.0, 62.0, 55.0 and 55.0 respectively. On the other hand, in the sectors of husking, harvesting, and threshing females play significantly more role than males. Females’ roles in these sectors are 83.0%, 73.0% and 71.0% respectively. Besides, females play more role in pest control (63.0%), germination (63.0%), transplant/sowing (53.0%), livestock rearing (52.0%) than males. Males and females play the equal role (50.0%) in irrigation.

Graph- 6.87 presents that females play more role than males in agricultural production. Summarizing the data of Graph- 6.107 it is found that males play 43.0% role in agricultural production while females play 57.0% role in agricultural production. It is very notable that people of *Bayer Char* coastal community recognize that females play more role than males in agriculture sector. But the study of Biswas, R. et al. does not support wholly as their study explored that women make up 18.3% of the workforce in agriculture and related occupations, while men make up 22.3% (Biswas, R. et al. 2022). On the other hand, women’s contribution in agriculture is wide spread but under recognized at national economy and

Graph- 6.87: Gender Role in Agricultural Production (in per cent)



particularly women in rural areas are the unsung heroes of economy. In this context, the result of the present study is compatible with another part of the study of Biswas, R. et al. (2022) as they said, women’s labour force participation increased by 192.84% from 1999-2000 to 2016-2017 (Ibid).

6.5.4 Income Earner, Decision Maker and Patriarchy

Table- 6.54 indicates that when all the interlocutors were asked to inform who make (s) decisions in their households, a significant number of them (60.0%) said husband makes decisions while a narrow figure (24.0%) said wife makes decisions. Out of total interlocutors, 14.0% said both (husband and wife) play role in making decisions and 2.0% said neither husband nor wife but the decisions are made in family by others as sons, sisters or persons outside of the family. On the other hand, the interlocutors who said husband makes decisions in households (60), of them, 81.7% are males who are the 62.8% of total male interlocutors interlocutors. Besides, out of the interlocutors who said husband and wife jointly make decisions (14), 64.3% are males and 35.7% are females. Data from table- 6.50 shows that, out of the total male headed households (78.0%) 25.6% said decisions are made by wives while

Table- 6.54: Sex of Interlocutors and Decision Maker in Family (in number of interlocutors)

		Decision Maker in Family				Total
		Husband	Wife	Both	Other	
Sex of Interlocutors	Males	49	20	9	-	78
	Females	11	4	5	1	21
	Third Sex	-	-	-	1	1
Total		60	24	14	2	100

$$(\chi^2 = 50.739^a, df = 6, \alpha = .05, t\text{-value} = 12.592)$$

and 18.3% are females who are the 52.3% of total female interlocutors. Likewise, Out of the interlocutors who said wives make decisions (24), 83.3% are males who are the 25.6% of total male interlocutors and 16.7% are females who are the 19.0% of total female out of the total female headed households (21.0%) 52.4% said decisions in their family are made by their husbands. Statistical data show that at $df = 6$ and .05 level of significance, the table value (critical value) is 12.592 which is less than chi-square value ($\chi^2 = 50.739^a$) i.e., alternative hypothesis (H_1) is accepted and null hypothesis (H_0) is rejected. So, there is a significant relationship between sex of interlocutors and decision maker in their family. It indicates that, in *Bayer Char* coastal community, sex of interlocutors works in making decisions in their families. So, patriarchy plays a vital role in the households of *Bayer Char* coastal community like other parts of Bangladesh.

Table- 6.55 points out that, the researcher was informed by the interlocutors that in the highest number of households (58.0%) of *Bayer Char* coastal community the income of husband is considered as income while in 28.0% households, the income of wife is considered as income and only in 12.0% households, the income of both (husband and wife) is considered as income. Besides, 2.0% interlocutors informed that in their family neither husband's income nor wife's income is considered as income but the income of others as sons, daughters or persons outside of the families is considered as income. On the other hand, the interlocutors (58) who said husbands' income is considered as in the family, 44

Table- 6.55: Sex and Whose Income Considered as Income in the Households of Interlocutors (in number)

		Whose Income Considered as Income				Total
		Husband	Wife	Both	Other	
Sex of Interlocutors	Male	44	26	7	1	78
	Female	13	2	5	1	21
	Third Sex	1	-	-	-	1
Total		58	28	12	2	100

$$(\chi^2 = 8.204^a, df = 6, \alpha = .05, t\text{-value} = 12.592)$$

interlocutors (75.9%) are males who are 56.4% of total male interlocutors (78) and 13 interlocutors (22.4%) are females who are 61.9% of total female interlocutors (21). The interlocutors (28) who said wives' income is considered as income in their families, 92.9% (26) are males who are 33.3% of total male interlocutors (78) and 7.1% (2) are females who are only 9.5% of total female interlocutors (21). Statistical data show that, at $df=6$ and .05 level of significance, the table value (critical value) is 12.592 which is greater than chi-square

value ($\chi^2 = 8.204^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the sex of interlocutors and considering as income earners in their family. Males are the direct or indirect heads of households in *Bayer Char* community like other rural areas of Bangladesh.

6.5.5 Gender Impact of Climate Change

Table- 6.56 points out that when climate change impacted interlocutors (96) were asked to mention the sexes who are more vulnerable to and affected by soil and water salinity, while regarding soil salinity, the highest number of interlocutors (43 out of 96, 44.8%) said males, regarding water salinity, the highest number of interlocutors (44 out of 96, 45.8%) said females. On the other hand, while 40.6% (39 out of 96) interlocutors said males are more vulnerable to and affected by water salinity than females, 33.3% (32 out of 96) interlocutors said females are more vulnerable to affected by soil salinity than males. 21.9% (21) and 13.5% (13) interlocutors informed that both (males and females) are equally vulnerable to and affected by soil salinity and water salinity respectively. Out of the total interlocutors (43) who said males are more vulnerable to and affected by soil salinity, 44.2%, 39.5% and 16.3% interlocutors said males, females and both respectively are more vulnerable to and affected by water salinity, On the other hand, out of the total interlocutors (44) who said females are

Table- 6.56: Gender Impacts of Soil and Water Salinity (in number of interlocutors)

		Who Are More Vulnerable to and Affected by Water Salinity?			Total
		Males	Females	Both	
Who Are More Vulnerable to and Affected by Soil Salinity?	Males	17	19	7	43
	Females	11	18	3	32
	Both	11	7	3	21
Total		39	44	13	96

$$(\chi^2 = 3.190^a, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

more vulnerable to and affected by water salinity, 43.2%, 40.9% and 15.9% interlocutors said males females and both respectively are more vulnerable to and affected by soil salinity. As their gender role, males are highly related to land cultivation and females are intensively related to cooking activities. So, when land and water are affected, males and females are affected respectively. Likewise, on the hand, as the people of *Bayer Char* coastal community are the poorest of the poor and climate change induced natural disasters make the poorer destitute women more vulnerable as they have no adult male member in the family as hypothesized by Chakma (2005).

Statistical data show that, at $df=4$ and .05 level of significance, the table value (critical value) is 9.488 which is greater than chi-square value ($\chi^2 = 3.190^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between interlocutors' vulnerability to and affected by soil salinity, and their vulnerability to and affected by water salinity.

From Table- 6.57 it is observed that the researcher was informed by a substantial number (39, 40.6%) of climate impacted interlocutors (96) that females are more vulnerable to and affected by cyclone while 36.4% (35) informed that females are more vulnerable to and affected by tidal surge. Another 36.5% (35) interlocutors said both (males and females) are more vulnerable to and affected by tidal surge while 26.0% (25) interlocutors said both are more vulnerable to and affected by cyclone. 33.3% (32) and 27.1% (26) interlocutors informed males are more vulnerable to and affected by cyclone and tidal surge respectively.

Table- 6.57: Gender Impacts of Cyclone and Tidal Surge (in number of interlocutors)

		Who Are More Vulnerable to and Affected by Tidal Surge?			Total
		Males	Females	Both	
Who Are More Vulnerable to and Affected by Cyclone?	Males	8	9	15	32
	Females	9	15	15	39
	Both	9	11	5	25
Total		26	35	35	96

($\chi^2 = 4.912^a$, $df = 4$, $\alpha = .05$, t-value = 9.488)

Based on the table data it can be said that females are more vulnerable to and affected by climatic impacts of cyclone (40.6%) and tidal surge (36.5%) than males (33.3% and 27.1% respectively).

Statistical data show that, at $df = 4$ and .05 level of significance, the table value (critical value) is 9.488 which is greater than chi-square value ($\chi^2 = 4.912^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between interlocutors' vulnerability to and affected by cyclone, and their vulnerability to and affected by tidal surge.

Table- 6.58 shows that a significant number (41.4%, the highest) of climate change impacted interlocutors (96) informed that males are more vulnerable to and affected by climatic hazard of drought while the highest number (41.7%, 40) of impacted interlocutors informed males are more vulnerable to and affected by insect attack, a climate change induced hazard. On the other hand, 31.3% (30) and 40.6% (39) interlocutors said that females are more

Table- 6.58: Gender Impacts of Drought and Insect Attack (in number of interlocutors)

		Who Are More Vulnerable to and Affected by Insect Attack?			Total
		Males	Females	Both	
Who Are More Vulnerable to and Affected by Drought?	Males	22	26	11	59
	Females	17	10	3	30
	Both	1	3	3	7
Total		40	39	17	96

$$(\chi^2 = 7.260^a, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

vulnerable to and affected by drought and insect attack respectively. Besides, 7.3% (7) and 17.7% (17) interlocutors said both males and females are equally vulnerable to and affected by drought and insect attack respectively. Table data indicate that males are more vulnerable to and affected by drought (61.5%) and insect attack (41.7%) than females for their gender specific roles they play in agricultural activities.

Statistical data show that, at $df=4$ and .05 level of significance, the table value (critical value) is 9.488 which is greater than chi-square value ($\chi^2 = 7.260^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between interlocutors' vulnerability to and affected by drought, and their vulnerability to and affected by insect attack.

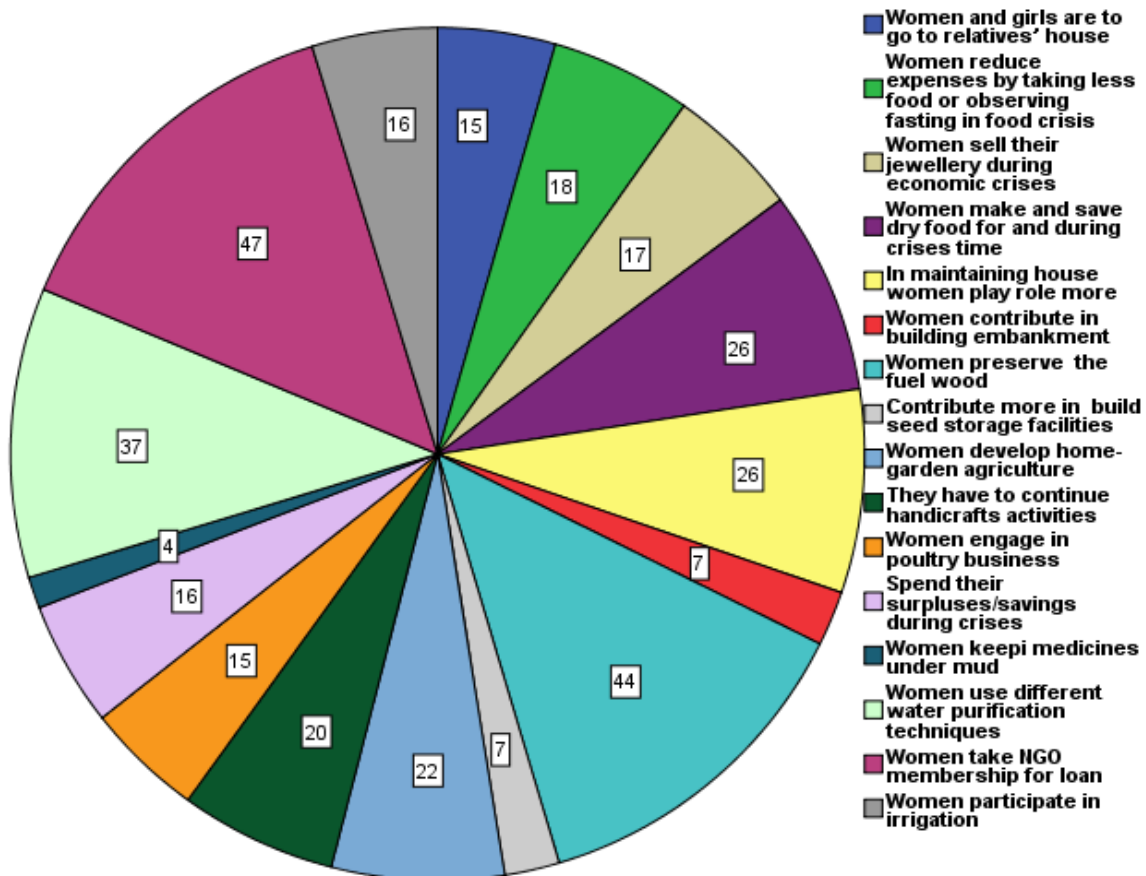
The findings of gender aspects of vulnerability and impact of soil salinity, drought and insect attack are not compatible with the study of Adzawla, et al. (2019) as in the study of them it was explored that the adaptive capacity of males to climate change is higher than those of females in Volta and northern regions of Ghana. But regarding the gender aspects of vulnerability and impact of water salinity, cyclone and tidal surge the findings of present study are similar to those of Adzawla, et al. (2019) as they explored in their study that climate impacts on the livelihoods of females are severer than those of males.

6.5.6 Gender and Adaptation to Climate Change

When the interlocutors who used adaptation strategies to climatic impacts on livelihood assets (95) were asked whether there is any gender role in adaptation, a significant number of them (93.7%, 89) answered positively while a negligible number of interlocutors (5.3%, 5) answered negatively. Besides, a very negligible number of them (1.1%, 1) answered by saying "Don't Know".

At the same time, when the interlocutors who answered positively (89) i.e., who said there is a gender role in adaptation to climate change, were asked to state the different roles of gender and they had options of multiple responses (Graph- 6.88), the highest number of interlocutors (47 out of 337 responses, 13.9%) said women take NGO membership for loan as adaptation to climate change while the lowest number of them (4, 1.2%) said women keep medicine under mud to face the climatic crises. The second and third highest number of responses said women preserve the fuel wood (44, 13.1%) and use different water purification techniques (37, 11.0%) as adaptation to climatic impacts on their livelihoods. Likewise, women make

Graph- 6.88: Different Roles Gender Plays in Adaptation to Climate Change (in frequency of multiple responses)

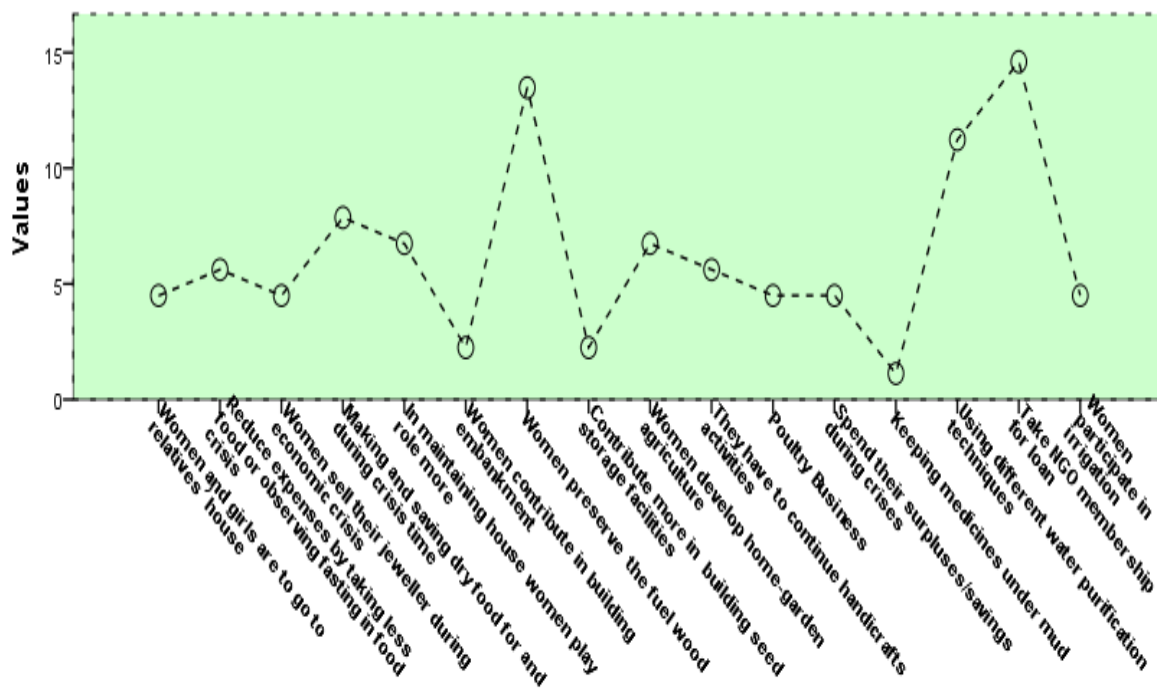


and save dry food for and during crisis time (26) and in maintaining house women play role more (26), the percentages of which are 7.7 each. Besides, 6.5%, 5.9%, 5.3%, 5.0%, 4.7% and 4.7% interlocutors said women develop home-garden agriculture (22), have to continue handicrafts activities (20), reduce expenses by taking less food or observing fasting in food crisis (18), sell their jewellery during economic crisis (17), spend their surpluses/savings during crisis (16) and actively participate in irrigation with men (16) respectively. Other gender roles in adaptation are women and girls are to go to relatives' house (15, 4.5%),

women play vital role in poultry business (15, 4.5%), contribute in building embankment with men (7, 2.1%) and contribute more in build seed storage facilities than men (7, 2.1%).

On the other hand, when these interlocutors who said there is a gender role in adaptation to climate change (89) were asked to mention the major gender role in adaptation (Graph- 6.89), the highest number of them (14.6%, 13 out of 89) said that women take NGO membership for loan as adaptation to climate change while only 1.1% (1 the lowest number) of them said women keep medicines under mud. The second, third and fourth highest number of interlocutors (13.5%, 11.2% and 7.9% respectively) mentioned that women preserve the fuel wood (12), use different water purification techniques (10) and make and save dry food for and during crisis time (7) respectively as gender role in adaptation. Maintaining house and

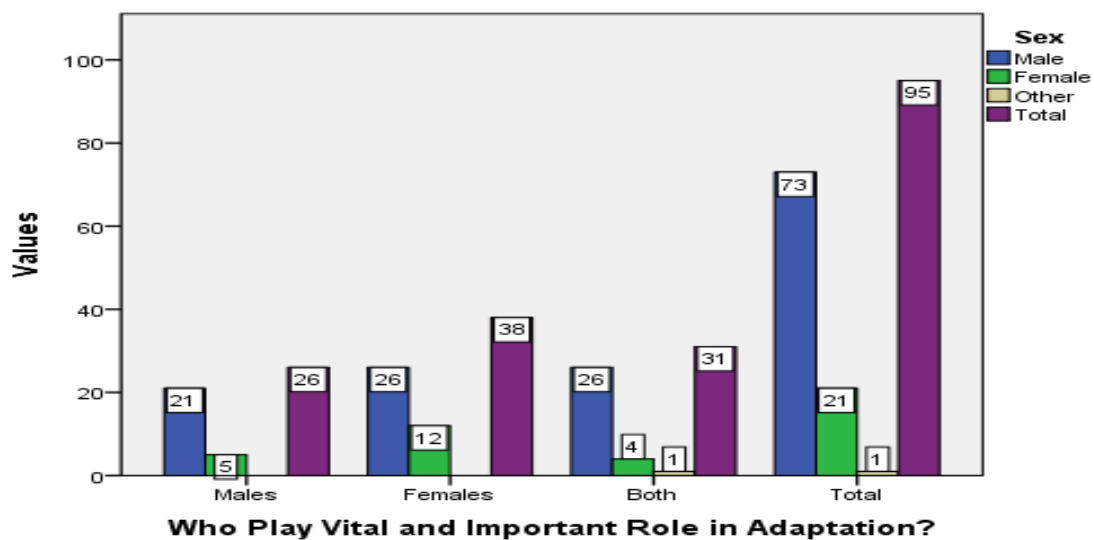
Graph- 6.89: Major Role Gender Plays in Adaptation to Climate Change (in per cent)



developing home-garden agriculture are mentioned as gender role in adaptation by 6.7% interlocutors each (6 interlocutors each). 5.6% interlocutors each said that women reduce expenses by taking less food or observing fasting in food crisis (5) and have to do handicrafts activities (5). Other gender roles in adaptation to climate change are women and girls are to go to relatives' house, women sell their jewellery during economic crisis, actively participate in poultry business, spend their surpluses/savings during crisis and women actively participate in irrigation with men mentioned by 4.5% interlocutors each (4 interlocutors each).

Graph- 6.90 points out that the researcher was informed by the interlocutors who used adaptation strategies to climate change that, females (40.0%, 38) play vital and important role in adaptation. 27.4% interlocutors (26) informed the researcher that, males play vital and important role in adaptation and 32.6% interlocutors (31) informed that both (males and females) play vital and important role in adaptation to climate change. The findings of adopting adaptation strategies to climate change induced natural impacts are compatible with the study of Adzwla et al. (2019). On the other hand, the interlocutors (38) who said females play vital role in adaptation, 68.4% of them are males and 31.6% are females. Out of the total interlocutors (26) who said males play vital role, 80.8% are males and 19.2% are females.

Graph- 6.90: Sex of Interlocutors and Vital Role Players in Adaptation (in number)



The interlocutors (31) who informed both (males and females) play vital role in adaptation, 83.9% of them are males, 12.9% are females and 3.2% are third sex (*Hijra*). Out of the total female interlocutors (21) of the study, 23.8% said males, 57.1% said females and 19.0% said both play vital role in adaptation. On the hand, out of the 73 male interlocutors (who used adaptation techniques to climate change), 35.6% said females, 35.6% said both and only 28.8% said males play vital and important role in adaptation to climatic impacts on their livelihood assets.

Table- 6.59 points out that the present study was informed that in adaptation to climate change, a substantial number of interlocutors (45.3%, 43) prefer boys while a negligible number of interlocutors (14.7%, 14) prefer girls and 40.0% of interlocutors (38) said they prefer both (boys and girls) in adaptation to climate change. The interlocutors who prefer boys in adaptation (43), 76.7% of them are males and 23.2% are females. Out of the interlocutors who prefer girls in adaptation (14), a significant number (92.9%) are males and only 7.1% are females. Likewise, the interlocutors who prefer both (38) in adaptation

activities, 71.1% are males and 26.3% are females. Out of the total female interlocutors (21), 47.6% (10) prefer

Table- 6.59: Sex of Interlocutors and Their Gender Preference in Adaptation (in number)

		Whom The Interlocutors Prefer in Adaptation			Total
		Boys	Girls	Both	
Sex of Interlocutors	Male	33	13	27	73
	Female	10	1	10	21
	Other	-	-	1	1
Total		43	14	38	95

$$(\chi^2 = 3.881^a, df = 4, \alpha = .05, t\text{-value} = 9.488)$$

boys, 47.6% (10) prefer both and only 4.8% interlocutors prefer girls in adaptation process. Out of the total male interlocutors (73), 45.2% prefer boys, 37.0% prefer both and only 17.8% interlocutors prefer girls in adaptation process. Statistical data show that, at $df = 4$ and .05 level of significance, the table value (critical value) is 9.488 which is greater than chi-square value ($\chi^2 = 3.881^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the sex of interlocutors and their gender preference in adaptation. So it is observed that, in adaptation boys are more preferred than girls by both male and female interlocutors as *Bayer Char* is a highly poverty stricken, gender based discriminated and climate change impacted society.

6.5.7 Climatic Hazards and Patriarchy in Adaptation

When the interlocutors who used adaptation strategies (95) to climate change, were asked whether there is any patriarchal role in their adaptation strategies (Table- 6.60), a significant number of them (86, 90.5%) answered positively; of them, 48.8% interlocutors are illiterate, 16.3% can sign only. The interlocutors whose educational qualifications are SSC to masters,

Table- 6.60: Educational Qualifications of Interlocutors and Whether There Is Any Patriarchal Role in Adaptation (in number)

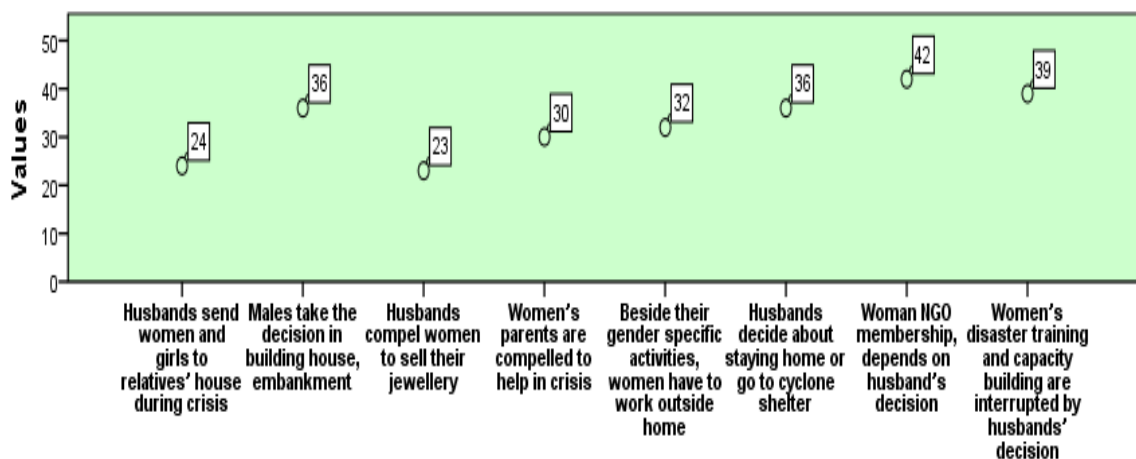
		Any Patriarchal Role in Adaptation?			Total
		Yes	No	Don't Know	
Educational Qualifications of Interlocutors	Illiterate	42	4	-	46
	Can Sign Only	14	-	-	14
	Can Read Only	5	2	-	7
	Below Class 8	8	1	-	9
	Below SSC	9	1	-	10
	SSC	3	-	-	3
	HSC	2	-	-	2
	Graduation	2	-	1	3
	Masters	1	-	-	1
Total		86	8	1	95

$$(\chi^2 = 36.765^a, df = 16, \alpha = .05, t\text{-value} = 26.295)$$

all of them said there is a patriarchal role in their adaptation strategies to climate change except only one interlocutor (Graduate) answered saying “Don’t Know”. On the other hand, a negligible number of interlocutors (8.4%) said that there is no patriarchal role in adaptation to climate change; of them, 50.0% interlocutors (4 out of 8) are illiterate and 25.0% can read only. The reason behind the graduation completed interlocutor’s answer as “Don’t Know” may be his or her new arrival in this area. From statistical data it is observed that, at $df = 16$ and .05 level of significance, the table value (critical value) is 26.295 which is less than chi-square value ($\chi^2 = 36.765^a$) i.e., alternative hypothesis (H_1) is accepted and null hypothesis (H_0) is rejected. So, there is a significant relationship between the educational qualifications of interlocutors and their response about patriarchal role in adaptation.

At the same time, when the interlocutors (86) who said there is a patriarchal role in adaptation, were said to state the different patriarchal roles and they were given the options of multiple responses (Graph- 6.91), the highest number of them (42 out of 262 responses, 16.0%) said wives’ NGO membership depends on the decisions of husbands while the lowest number of them (23 out of 262) said wives are compelled by their husbands to sell their jewellery. The second highest number of interlocutors (39) stated that wives’ disaster training and capacity building activities are interrupted by husbands’

Graph- 6.91: Different Patriarchal Role in Adaptation Strategies to Climate Change (in frequency of multiple responses)

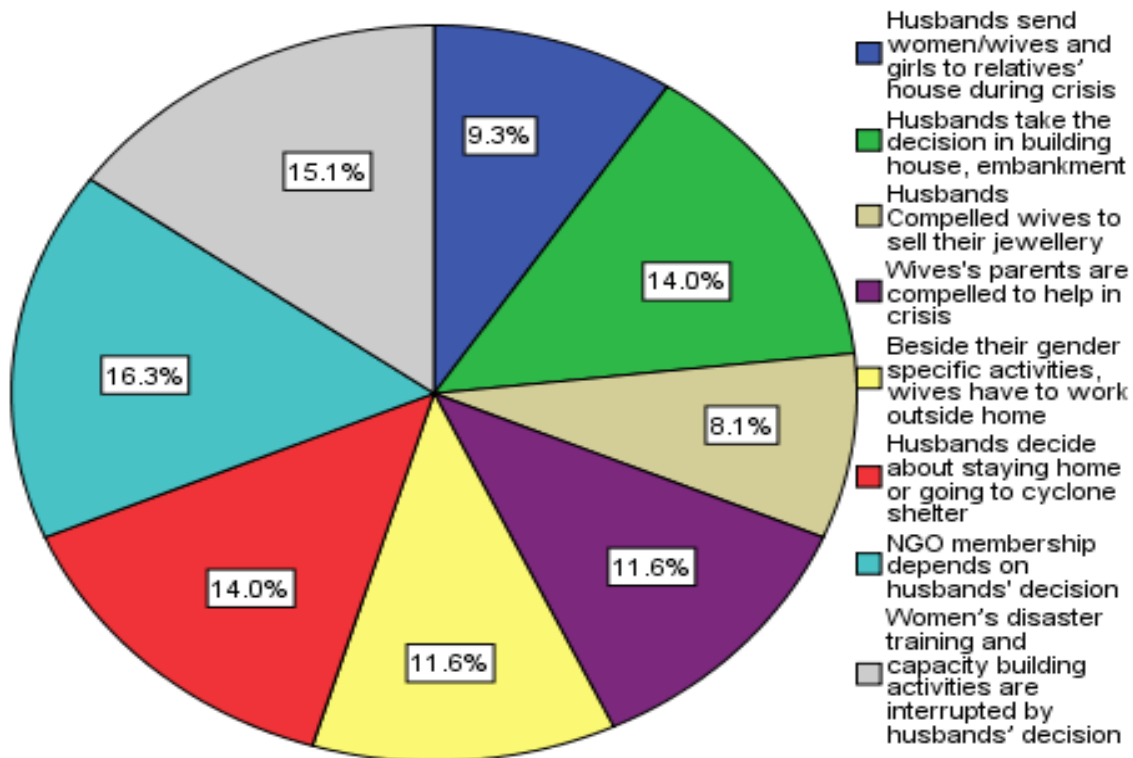


decisions while 13.7% interlocutors each said that males take the decision in building house and embankment (36) and husbands decide about staying home or going to cyclone shelter (36). Other patriarchal roles in adaptation to climate change are beside their gender specific activities, wives are compelled by husbands to work outside home (32), wives’ parents are

compelled to help in crisis (30) and husbands send women/wives and girls to relatives' house during crisis (24).

On the other hand, when the interlocutors (86) who said there is a patriarchal role in adaptation, were said to state the major patriarchal role (Graph- 6.92), the highest number of them (14 out of 86, 16.3%) said wives' NGO membership depends on the decisions of husbands while the lowest number of them (7 out of 86, 8.1%) said wives are compelled by their husbands to sell their jewellery. The second highest number of interlocutors (13, 15.1%)

Graph- 6.92: Major Patriarchal Role in Adaptation Strategies to Climate Change (in per cent)



stated that wives' disaster training and capacity building activities are interrupted by husbands' decisions while 14.0% interlocutors each said that males take the decision in building house and embankment (12) and husbands decides about staying home or going to cyclone shelter (12). Other major patriarchal roles in adaptation to climate change are beside their gender specific activities, wives are compelled by husbands to work outside home (10, 11.6%), wives' parents are compelled to help in crisis (10, 11.6%) and husbands send women/wives and girls to relatives' house during crisis (8, 9.3%).

Table- 6.61 points out that when the interlocutors (95) who used adaptation strategies to climate change, were asked to mention the decision maker in adaptation to climate change in

their family, most of the interlocutors (57, 60.0%) said husbands are the decision makers in adaptation to climate change in their family while 23.2% of interlocutors (22) said wife and only 14.7% interlocutors (14) said both (husband and wife) are decision makers in adaptation to climate change induced impacts. Out of the total Muslim interlocutors (88), 60.2% (53) said husband, 21.6% said wife and 15.9% said both are decision makers in adaptation to climate change. On the other hand, out of the total Hindus interlocutors (7), 57.1% said,

Table- 6.61: Decision Maker in Adaptation to Climate Change Based on Religious Status

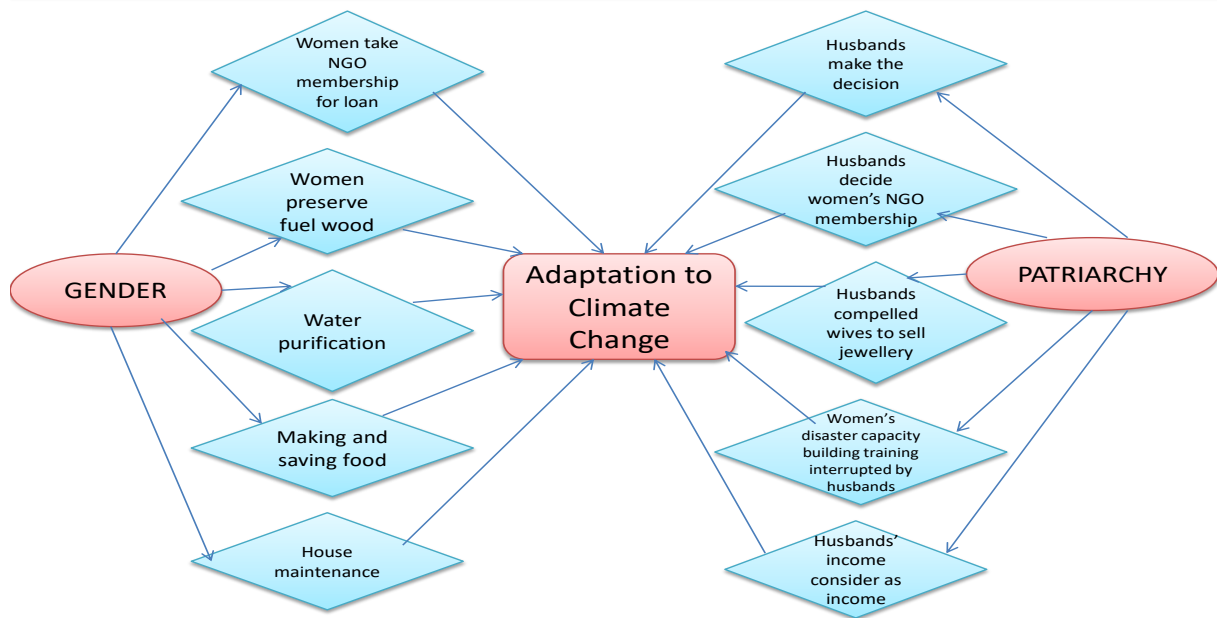
		Decision Maker in Adaptation to Climate Change				Total
		Husband	Wife	Both	Other	
Religious Status of Interlocutors	Islam	53	19	14	2	88
	Hinduism	4	3	-	-	7
Total		57	22	14	2	95

$$(\chi^2 = 2.549^a, df = 3, \alpha = .05, t\text{-value} = 7.815)$$

husbands and 42.9% interlocutors said wives are the decision makers in their family in adaptation to climate change. Ahmed and Halim (2004) explored the women's lack of representation in decision making process in their occupation and lack of access to physical and capital resources but they did not examine it based on religious status of interlocutors. From statistical data it is observed that, at $df = 3$ and .05 level of significance, the table value (critical value) is 7.815 which is greater than chi-square value ($\chi^2 = 2.549^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the religious status of interlocutors and decision makers in their family in adaptation to climate change.

Figure- 6.3 describes the major role of gender and patriarchy in adaptation to climate change in *Bayer Char* community. The major roles of gender in adaptation to climatic impacts on life and livelihoods of *Bayer Char* community are women's taking NGO membership for loan, preservation of fuel wood is done only by women; water purification is performed only by women, food making and saving are done only by women and house maintenance is done only by women. On the other hand, patriarchy plays some major roles in adaptation to climate change as husbands make the decision in the family about adaptation strategies, husbands decide whether wives take NGO membership or not, husbands compelled wives to sell their (wives') jewellery, women's disaster capacity building training is interrupted by

Figure- 6.3: A Diagram of Gender and Patriarchy Role in Adaptation to Climate Change



(Source: Compiled Based on Field Data, 2021-2022)

husbands and only husbands income is considered as income in the households in *Bayer Char* coastal community. The ideas of liberal and eco-feminism are reflected in the framework based on the data of social survey.

SECTION SIX:

LOCAL KNOWLEDGE, NETWORKS AND ADAPTATION

6.6.1 Climate Change and Role of Local Knowledge in Adaptation

Table- 6.62 shows that when the interlocutors who used adaptation strategies to climate change (95) were asked whether local knowledge plays any role in adaptation, a significant number of them (87, 91.6%) answered positively while a negligible number of them (8.4%) answered negatively. The interlocutors who answered positively (87), the highest number of them (35) belongs to 30 to 45 age group and they are the 89.7% of total interlocutors belonging to 30 to 45 age group. The interlocutors whose age is below 18 (11), between 60 and 75 (9) and above 75 years (4), all of them (100.0%) said local knowledge plays role in adaptation to climate change. The interlocutors whose age is between 18 and 30 and between 45 and 60, 88.9% and 85.7% of them respectively said that local knowledge plays role in

Table- 6.62: Age of Interlocutors and Whether Local Knowledge Plays Role in Their Adaptation to Climate Change

		Whether Local Knowledge Plays Any Role in Adaptation (in number)		Row Total
		Yes	No	
Age of Interlocutors (years)	<18	11	-	11
	18-30	16	2	18
	30-45	35	4	39
	45-60	12	2	14
	60-75	9	-	9
	>75	4	-	4
Column Total		87	8	95

$$(\chi^2 = 3.171^a, df = 5, \alpha = .05, t\text{-value} = 11.070)$$

their adaptation strategies to climatic impacts on livelihoods. From statistical data it is observed that, at $df = 5$ and $.05$ level of significance, the table value (critical value) is 11.070 which is greater than chi-square value ($\chi^2 = 3.171^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the age of interlocutors and their opinion about whether local knowledge has any role in adaptation to climate change. It indicates that irrespective of ages, the people of *Bayer Char* think local knowledge plays a vital role in adaptation to climate change.

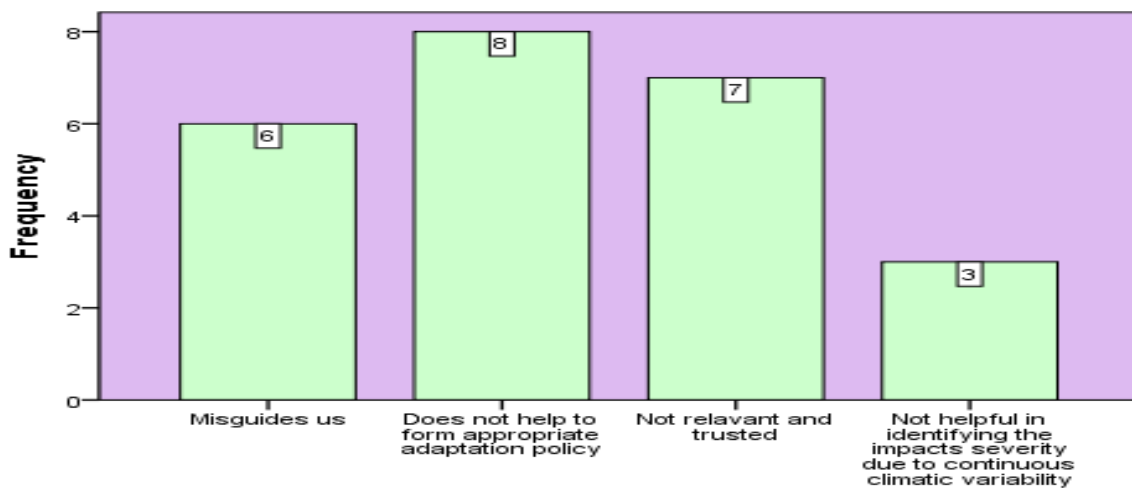
At the same time, when the interlocutors who said local knowledge plays role in adaptation to climate change (87) were asked to state the types of role, a substantial number of them (79,

90.8%) stated that local knowledge plays a positive role in adaptation while a narrow number of them (6, 6.9%) stated that local knowledge plays a negative role. Besides, 2.3% of them said local knowledge plays both (positive and negative roles) roles in adaptation to climatic impacts on their livelihoods.

6.6.2 Negative Role of Local Knowledge in Adaptation to Climate Change

Graph- 6.93 points out that when the interlocutors who said local knowledge plays negative or both (negative and positive, 8) roles in adaptation to climate change (6) were asked to mention the different negative roles of local knowledge in adaptation to climate change and they have given the options of multiple responses, the highest number of interlocutors (8 out of 24 responses, 33.3%) mentioned that local knowledge does not help them to form

Graph- 6.93: Different Negative Role Local Knowledge Plays in Adaptation to Climate Change (in frequency of multiple responses)

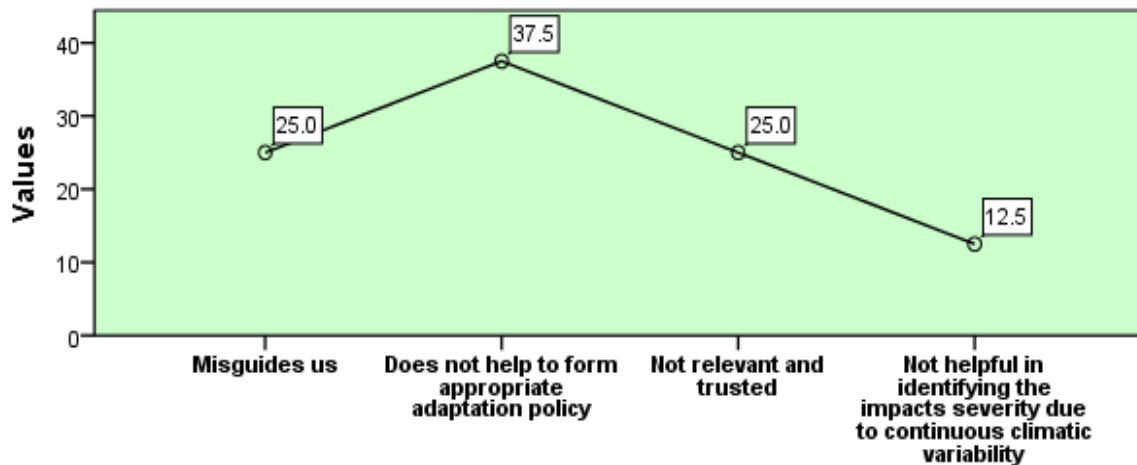


appropriate adaptation policy while the lowest number of interlocutors (3, 12.5%) said local knowledge is not helpful in identifying the impacts severity of climate change due to continuous climatic variability. Likewise, 29.2% (7) interlocutors said that local knowledge is not trusted and 25.0% (6) interlocutors mentioned that local knowledge misguides them in adaptation to climate change.

At the same time, graph- 6.94 points out that when the interlocutors who said local knowledge plays negative or both (negative and positive, 8) roles in adaptation to climate change, were asked to mention the major negative role of local knowledge in adaptation to climate change, the highest number of interlocutors (37.5%, 3 out of 8) mentioned that local

knowledge does not help them to form appropriate adaptation policy while the lowest number of interlocutors (1 out of 8, 12.5%) said local knowledge is not helpful in identifying

Graph- 6.94: Major Negative Role Local Knowledge Plays in Adaptation to Climate Change (in per cent)



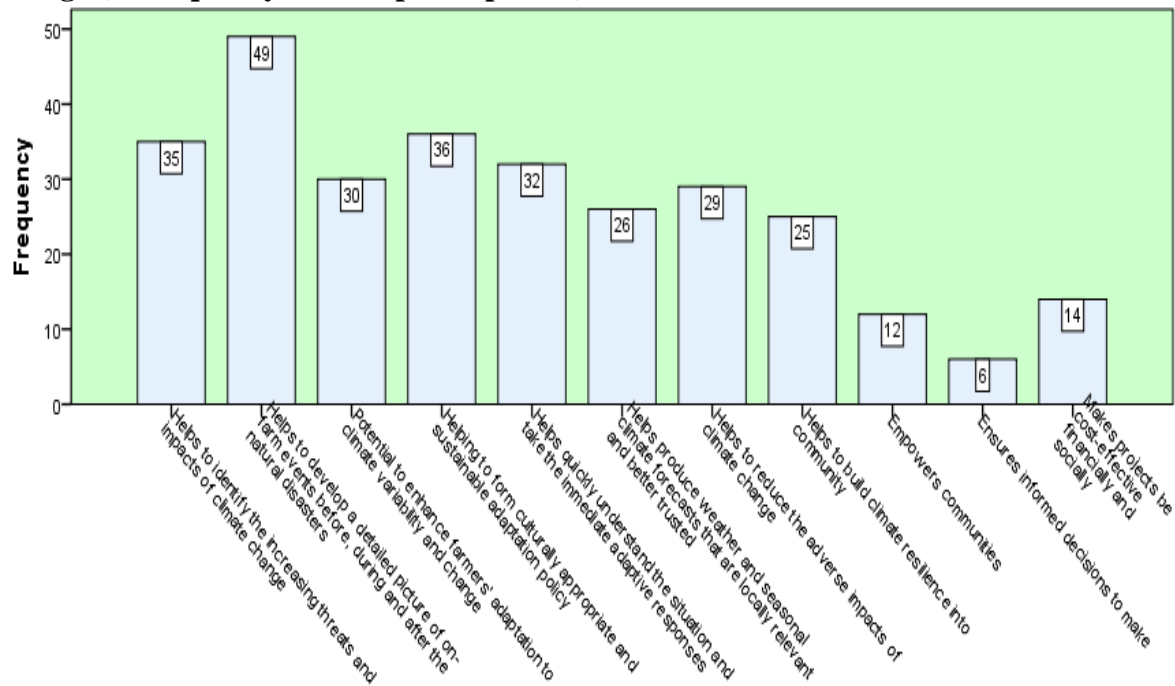
the impacts severity of climate change due to continuous climatic variability. Likewise, 25.0% (2 out of 8) interlocutors said that local knowledge is not trusted and another 25.0% interlocutors mentioned that local knowledge misguides them in adaptation to climate change.

6.6.3 Positive Role of Local Knowledge in Adaptation to Climate Change

From graph- 6.95 it is observed that when the interlocutors (81) who said local knowledge plays positive or both (positive and negative) roles in adaptation to climate change were asked to mention the different positive roles of local knowledge in adaptation and they had options of multiple responses, the highest number of responses (16.7% 49 out of 294 responses) mentioned that in developing a detailed picture of on-farm events before, during and after the natural disasters local knowledge plays an important role while the lowest number of responses (2.0%, 6 out of 294) said local knowledge ensures informed decisions to make. Likewise, a substantial number of responses (12.2%, 36) said it helps to form culturally appropriate and sustainable adaptation policy while a very narrow number of responses (4.1%, 12) said it empowers communities to form adaptation policy. Besides, 11.9%, 10.9%, 10.2%, 9.9% interlocutors respectively said that local knowledge helps to identify the increasing threats and impacts of climate change (35 responses), ensures understanding situation quickly and taking the immediate adaptive responses (32), enhances farmers' adaptation potentiality to climate variability and changes (30) and helps to reduce the

adverse impacts of climate change (29). Other positive roles played by local knowledge in adaptation to climate change are production of weather and

Graph- 6.95: Different Positive Role Local Knowledge Plays in Adaptation to Climate Change (in frequency of multiple responses)

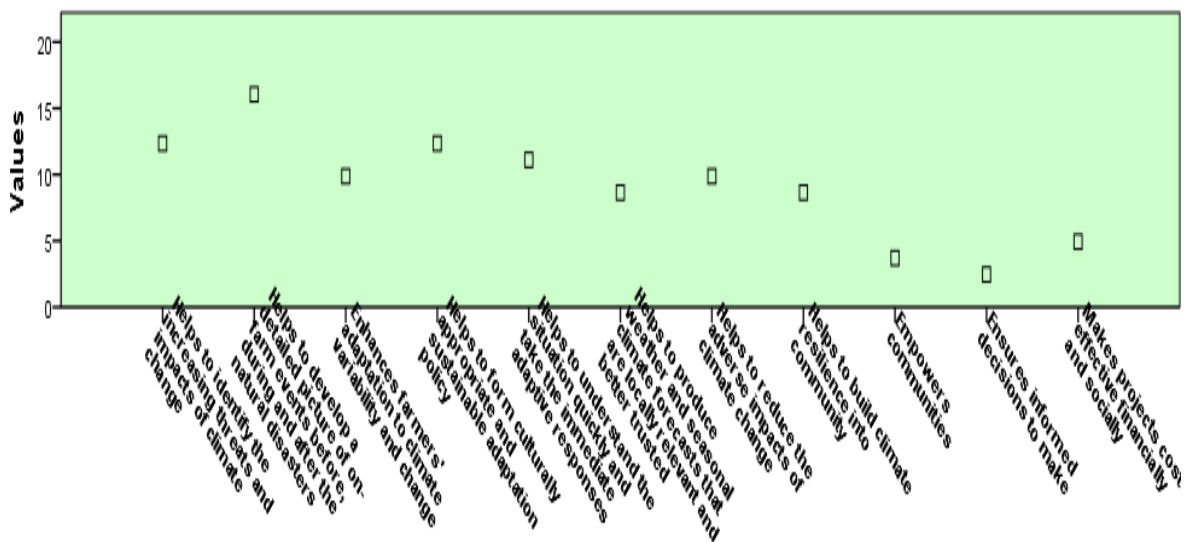


seasonal climate forecasts that are locally relevant and better trusted (26, 8.8%), building climate resilience into community (25, 8.5%) and making projects cost-effective financially and socially (14, 4.8%). The same positive roles of local knowledge were found out in the studies of Lipa and Begum (2020 and Dapilah, Nielsen and Friis (2019).

At the same time, when the interlocutors (81) who said local knowledge plays positive or both (positive and negative) roles in adaptation to climate change were asked to mention the prime positive roles of local knowledge in adaptation (Graph- 6.96), the highest number of interlocutors (16.0% 13 out of 81) mentioned that in developing a detailed picture of on-farm events before, during and after the natural disasters, local knowledge plays an important role while the lowest number of interlocutors (2.5%, 2 out of 81) said local knowledge ensures informed decisions to make. Likewise, a substantial number of interlocutors (12.3% each) said local knowledge helps to identify the increasing threats and impacts of climate change (10) and to form culturally appropriate and sustainable adaptation policy (10) while a very narrow number of responses (3.7%, 3) said it empowers communities to form adaptation policy. Besides, 11.1%, 9.9% and 9.9% interlocutors respectively said that local knowledge

ensures understanding the situation quickly and taking the immediate adaptive responses (9), enhances farmers' adaptation potentiality to climate variability and changes (8) and helps to reduce the adverse impacts of climate change (8). The similar result was found in the study of Naess (2013) as the study, carried out in different African countries, explored that, the

Graph- 6.96: Major Positive Role Local Knowledge Plays in Adaptation to Climate Change



accumulation of local knowledge of the community plays vital role in enhancing farmers' adaptation strategies to reduce the adverse impacts of climate change induced natural disasters. Other three major positive roles played by local knowledge in adaptation to climate change are producing weather and seasonal climate forecasts that are locally relevant and better trusted, building climate resilience into community (which is mentioned by 8.6% interlocutors each) and making projects financially and socially cost-effective (4, 4.9%). By birds and animals' loud chirping, random flow of wind and abnormal weather, they can understand the upcoming climatic hazards and impacts and adopt prior adaptation strategies accordingly.

Explaining the findings of the present study regarding the role of local knowledge in adaptation to climate change, it is observed that the findings of present study regarding the role of local knowledge in adaptation to climate change are supported by the previous studies of Haque, M. (2020), Salick and Byg (2007), Gympoh, B.A. et al. (2007), Naess (2013), Johnson (1987), Mekonnen, Z. et al. (2021), Khaliquzzaman, K. (2020), Lipa and Begum (2020), Rashid, S. (2005) and Wood (2005) to the some extents. In this study, some negative roles of local knowledge in adaptation to climate change are explored; very few of them were explored in the previous studies. For example, misguiding the interlocutors, not helping to

form appropriate adaptation policy, irrelevancy and distrust of local knowledge and not helping to identify the impacts severity of climate change are explored in present study; which were not found out in the previous studies mentioned.

6.6.4 Climate Change and Role of Local Networks in Adaptation

Table- 6.63 shows that the researcher was informed by a significant number of interlocutors (90.5%, 86 out of 95) that local networks play role in adaptation to climate change; of them, the highest number (41.9%, 36 out of 86) of interlocutors' age group is between 30 to 45 years and the lowest number (4.7%) of interlocutors' age group is above 75 years. On the other hand, a negligible number of interlocutors (9.5%, 9) informed the researcher that their local networks do not play any role in their adaptation to climatic impacts on their livelihoods; of them, the highest number of interlocutors' age group is between 18 and 30 and between 30 and 45 years (33.3% each, 9 interlocutors each) while the lowest number of interlocutors' age group is less than 18, between 45 and 60 and between 60 and 75 years

Table- 6.63: Age of the Interlocutors and Whether Their Local Networks Play Any Role in Adaptation to Climate Change

		Whether Local Networks Play Role in Adaptation (in frequency)		Row Total
		Yes	No	
Age of Interlocutors (in years)	<18	10	1	11
	18-30	15	3	18
	30-45	36	3	39
	45-60	13	1	14
	60-75	8	1	9
	>75	4	-	4
Column Total		86	9	95

$$(\chi^2 = 1.768^a, df = 5, \alpha = .05, t\text{-value} = 11.070)$$

(11.1% each). From statistical data it is observed that, at $df = 5$ and $.05$ level of significance, the table value (critical value) is 11.070 which is greater than chi-square value ($\chi^2 = 1.768^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the age of interlocutors and their opinion about whether local knowledge has any role in adaptation to climate change. It indicates that irrespective of ages, the people of *Bayer Char* think local networks play vital role in adaptation to climate change.

On the other hand, when the interlocutors (86) who said local networks play role in their adaptation to climate change, were asked to mention the types of role local networks play

(Table- 6.64), a substantial number of them (84.9%, 73) said positive role; of them, 86.3% (63) interlocutors have relation with politics/club/somity and 13.7% (10) have no relation with politics/club/somity. On the other hand, a negligible number of interlocutors (9.3%, 8) said

Table- 6.64: Types of Local Networks Role and Whether Interlocutors Have Any Relation with Politics/Club/Somity (in frequency of interlocutors)

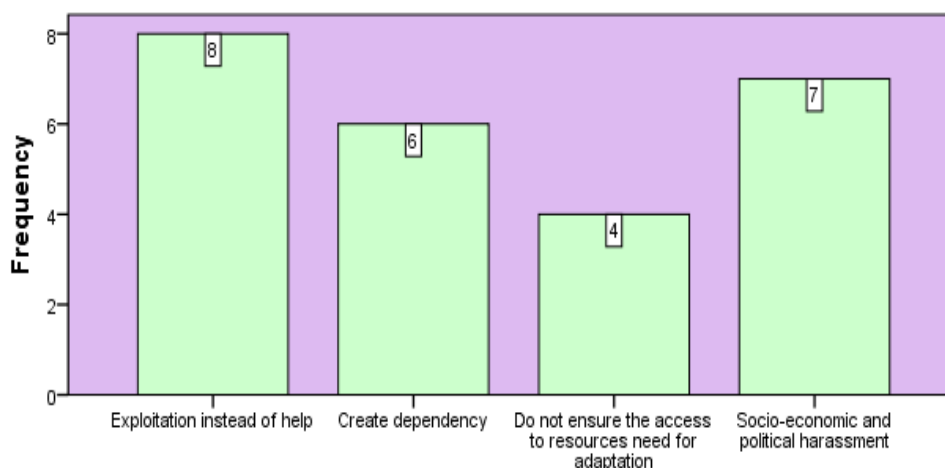
		Any Relation with Politics/Club/Somity		Total
		Yes	No	
Types of Role	Positive	63	10	73
	Negative	7	1	8
	Both	5	-	5
Total		75	11	86

That, local networks play negative role and a very negligible number of people said it play both (negative and positive) roles in adaptation to climate change. Out of the interlocutors who said local networks play negative role, 87.5% have relation with politics/club/somity and out of the interlocutors who said local networks play both (negative and positive) roles in their adaptation, 100.0% interlocutors have relation with politics/club/somity.

6.6.5 Negative Role of Local Networks in Adaptation to Climate Change

Graph- 6.97 states that when the interlocutors (13) who said local networks play negative (8) and both (negative and positive-5) roles in adaptation to climate change were asked to mention the different negative roles and they were given the options of multiple responses, the highest number of responses (8 out of 25, 32.0%) mentioned local networks exploit them

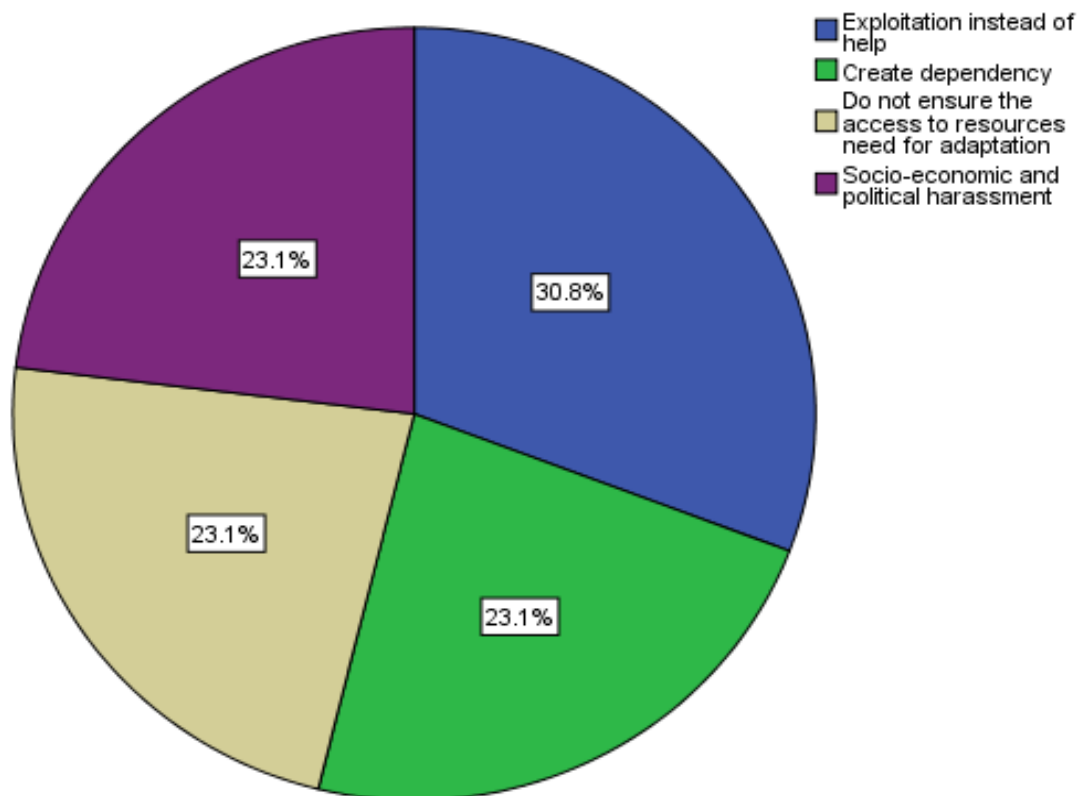
Graph-6.97: Different Negative Roles of Local Networks in Adaptation to Climate Change (in frequency of multiple responses)



instead of help while the lowest number of responses (4, 16.0%) said local networks do not ensure the access to resources need for adaptation. Besides, 28.0% (7) and 24.0% (6) responses respectively mentioned that local networks cause socio-economic and political harassment and create dependency-dependency of households on political leaders, clubs or somity.

On the other hand, graph- 6.98 states that when these interlocutors (13) were asked to mention the major negative role local networks play, the highest number of responses (4 out of 13, 30.8%) mentioned local networks exploit them instead of help while 23.1% responses

Graph-6.98: Major Negative Role of Local Networks in Adaptation to Climate Change (in per cent)



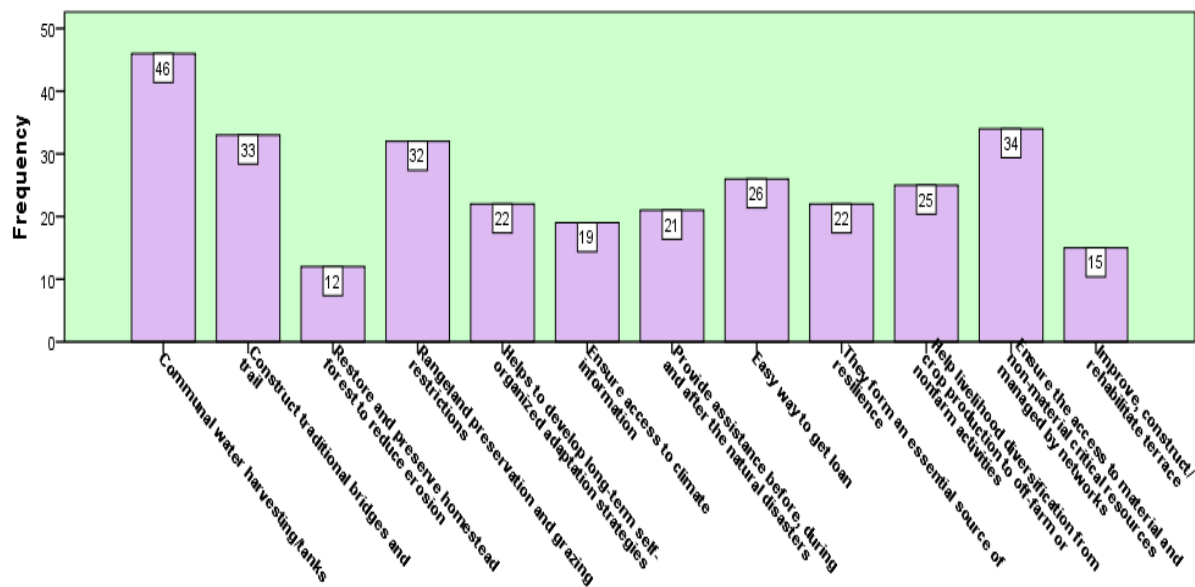
each said that said local networks cause socio-economic and political harassment (3), create dependency-dependency of households on political leaders, clubs or somity (3) and do not ensure the access to resources need for adaptation (3).

6.6.6 Positive Role of Local Networks in Adaptation to Climate Change

Graph- 6.99 points out that when the interlocutors (78) who said local networks play positive (73) and both (negative and positive-5) roles in adaptation to climate change were asked to mention the different positive roles and they were given the options of multiple responses, the

highest number of responses (46 out of 307, 15.0%) mentioned that local networks play role in arranging communal water harvesting/tanks while the lowest number of responses said (12, 3.9%) it help restore and preserve homestead forest to reduce erosion. The second (34) and third (33) highest number of responses (11.1% and 10.7% respectively) mentioned that it ensure the access to material and non-material critical resources managed by networks and help to construct traditional bridges and trail while the second (15) and third (19) lowest number of responses (4.9% and 6.2% respectively) said that it help them to improve, construct/ rehabilitate terrace. The most similar result was found in the study of Johnson (1987) as he explored that, in more collective adaptation strategies to climate change the rural poor establish or join different organizations and community groups to try and bring

Graph-6.99: Different Positive Roles of Local Networks in Adaptation to Climate Change (in frequency of multiple responses)

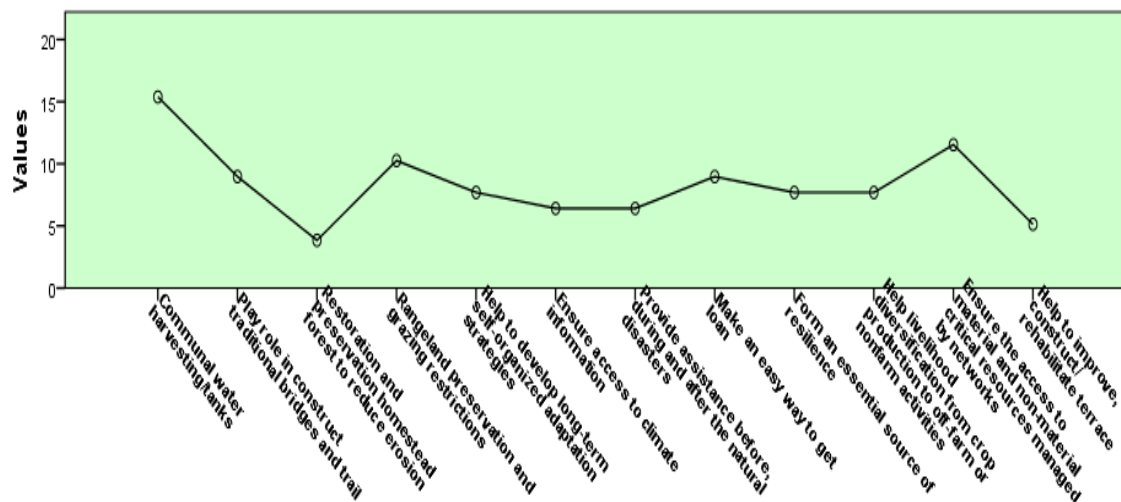


about more fundamental changes in their livelihood systems. Karki et al. (2015) found the almost same result in his study carried out in Nepal society as the study explored that, as adaptation strategies to the effects of climate change, the community was able to construct a significant climate resilience into community infrastructures providing drinking and irrigation water system, local bridges and trails. Likewise, 10.4% (32), 8.5% (26) and 8.1% (25) responses respectively said that it ensure rangeland preservation and grazing restrictions, make easy way to get loan and help livelihood diversification from crop production to off-farm or nonfarm activities. Other different positive roles, local networks play, are development of long-term self-organized adaptation strategies (22), formation of essential

source of resilience (22) and supplying assistance before, during and after the natural disasters (21) mentioned by 7.2%, 7.2% and 6.8% responses respectively.

At the same time, when these interlocutors (78) were asked to mention the major positive roles of local networks in adaptation to climate change (Graph- 6.100), the highest number of interlocutors (12 out of 78, 15.4%) mentioned that local networks play role in arranging communal water harvesting/tanks while the lowest number of interlocutors said (3, 3.8%) it help restore and preserve homestead forest to reduce erosion. The second (9) and third (8) highest number of responses (11.5% and 10.3% respectively) mentioned that it ensure the access to material and non-material critical resources managed by networks and rangeland preservation and grazing restrictions while the second lowest number of interlocutors (4,

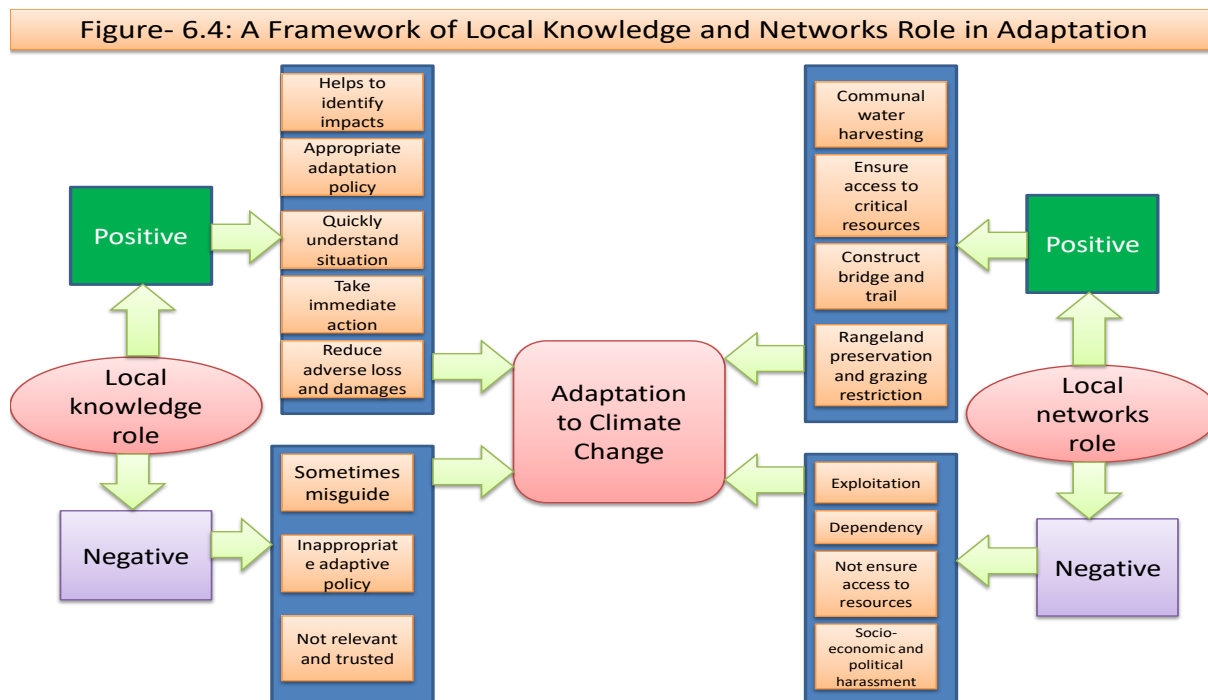
Graph-6.100: Major Positive Roles of Local Networks in Adaptation to Climate Change (in per cent)



5.1%) said that it help them to improve, construct/ rehabilitate terrace. Likewise, local networks help to construct traditional bridges and trail (7) and make easy way to get loan as mentioned by 9.0% interlocutors each. 7.7% interlocutors each said local networks help to develop long-term self-organized adaptation strategies (6), to form an essential source of resilience (6) and to diversify livelihood from crop production to off-farm or nonfarm activities. Other positive roles of local networks in adaptation to climate change are insurance of access to climate information (5) and providing assistance before, during and after the natural disasters (5) as mentioned by 6.4% interlocutors each.

The findings of this study regarding the role of networks in adaptation to climate change are compatible with the findings of the studies of Dapilah, Nielsen and Friis (2019), Johnson (1987), Karki et al. (2015), Mekonnen, Z. et al. (2021), Purvez (2005/2003), Rashid, S. (2005) and Wood (2005) to some extents.

Figure- 6.4 is formulated based on the field data regarding the role of local knowledge and networks in adaptation to climate change. The left part of the figure describes the two types of role of local knowledge in adaptation-positive and negative. The positive roles of local knowledge in adaptation process to climate change are helping to identify climatic impacts on life and livelihoods of *Bayer Char* coastal people, to formulate appropriate adaptation policies, to understand the situation quickly, to take immediate action, to understand the situation quickly, to take immediate action



(Source: Field Data, 2021-2022)

and to reduce adverse loss and damages. On the other hand, the negative roles played by local knowledge in adaptation to climate change are misguiding the people, formulating inappropriate adaptive policies and making the policies which are not relevant and trusted. The right side of the figure shows the positive and negative roles of local networks in adaptation to climatic impacts on the livelihood assets of *Bayer Char* community. Local networks play some important positive role in adaptation to climate change as it help to arrange communal water harvesting, to ensure access to critical resources, to construct bridge and trail, to preserve rangeland and to restrict grazing. On the other hand, local networks play some negative roles in adaptation to climate change as it sometimes cause exploitation, create dependency, ensure access to resources and lead to socio-economic and political harassment. Based on the framework it can be stated that there is an adaptive relationships between the impacts of climate change and human adaptation strategies to it where their local knowledge and networks play an important role.

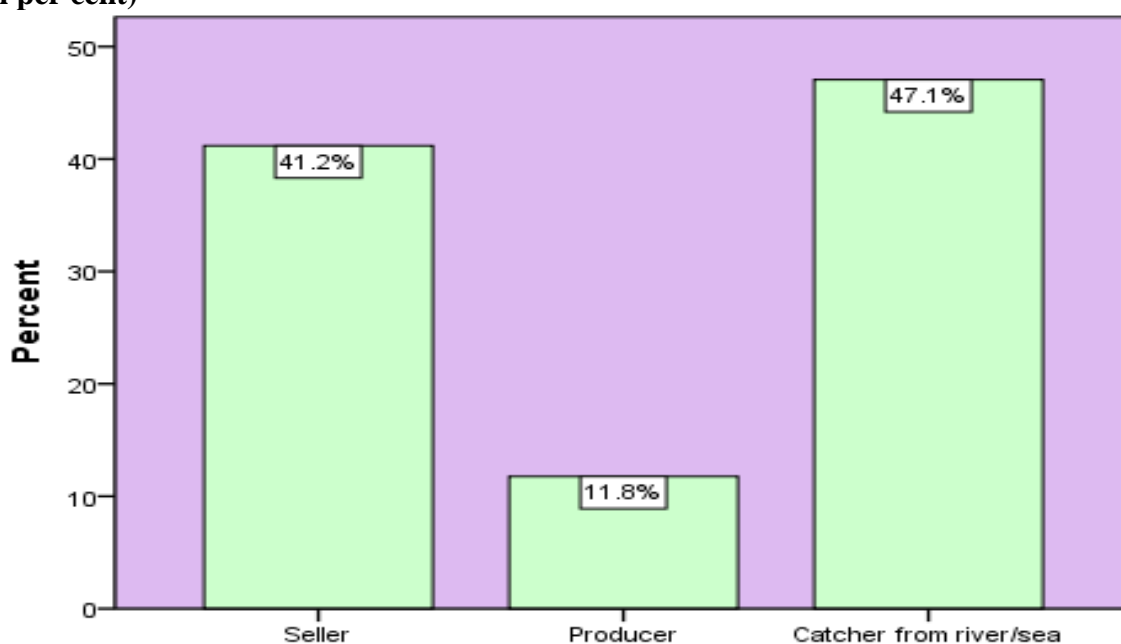
SECTION SEVEN:

FISHERMEN AND ADAPTATION TO CLIMATE CHANGE

6.7.1 Types of Fishing Profession, Facing Problems and Coping Mechanism

Graph- 6.101 shows that when the interlocutors (17) whose major profession is fishing were said to mention the types of fishing profession, a significant number of them (47.1%, 8 out of 17) said they catch fishes from river or sea while a negligible number of them (11.8%, 2) said they produce fishes. Likewise, a substantial number of them (41.2%, 7 out of 17) mentioned

Graph- 6.101: Types of Profession of Interlocutors Whose Major Profession is Fishing (in per cent)



that they sell fishes. Here, it is observed that, a significant number of fishermen (88.3%, 15 out of 17) are related to fish catching (47.1%) and selling (41.2%) because they live in a coastal poor community named *Bayer Char*.

When the interlocutors whose types of fishing profession are fish selling were asked to mention the places of selling (Table- 6.65), a significant number of them (42.9%, 3 out of 7) said they sell fishes door to door and 14.3% interlocutors each said their places of fish selling are local money lender (1) and the bank of river (1). Likewise, 28.6% (2) interlocutors said the place of fish selling is local *hat* (market). On the other hand, when they (7) were asked whether they face any problems in selling, most of them (85.7%, 6 out of 7) answered positively and only a negligible number of them (14.3%, 1 out of 7) answered negatively.

Out of the interlocutors (5) who said their places of fish selling are door to door (3), local money lender (1) and the bank of river (1), 100.0% said they face problems in selling

Table- 6.65: The Places of Fish Selling and the Problems the Interlocutors Face in Fish Selling (in number of interlocutors)

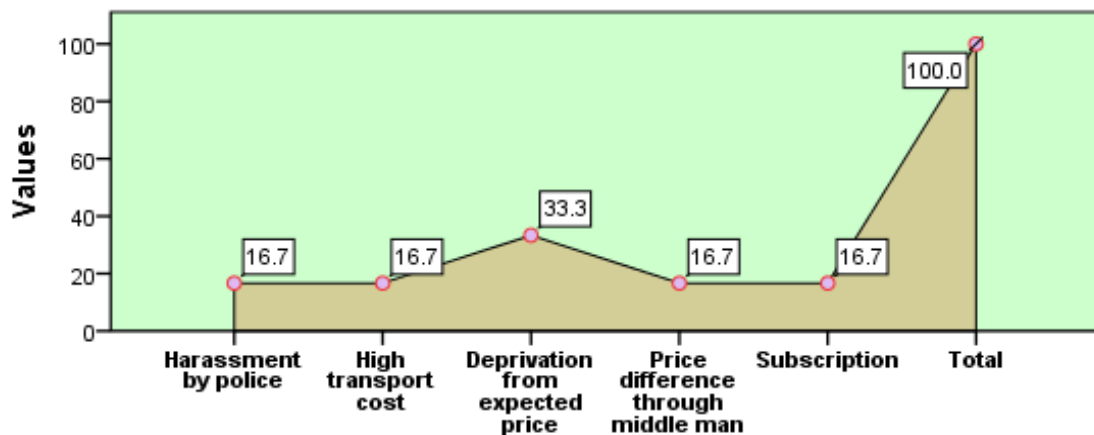
		Whether They Face Any Problems in Selling		Total
		Yes	No	
If Seller, the Places of Sell	Local money lender	1	-	1
	Local <i>hat</i> (market)	1	1	2
	Door to door	3	-	3
	In the bank of river	1	-	1
Total		6	1	7

$$(\chi^2 = 2.917^a, df = 3, \alpha = .05, t\text{-value} = 7.815)$$

while out of the interlocutors (2) who said their place of fish selling is local *hat* (Market), 50.0% said they face problems in selling. The collected data indicate that their fishing profession is vulnerable. From statistical data it is observed that, at $df = 3$ and .05 level of significance, the table value (critical value) is 7.815 which is greater than chi-square value ($\chi^2 = 2.917^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between the selling place of fish and fishermen's facing problems.

At the same time, graph- 6.102 shows that when the interlocutors (6) who said they face problems in selling fish were asked to state the problems, a substantial number of them (33.3%, 2 out of 6) said they are deprived from expected price while the problems

Graph- 6.102: Problems the Fish Sellers Face in Selling Fish (in per cent)



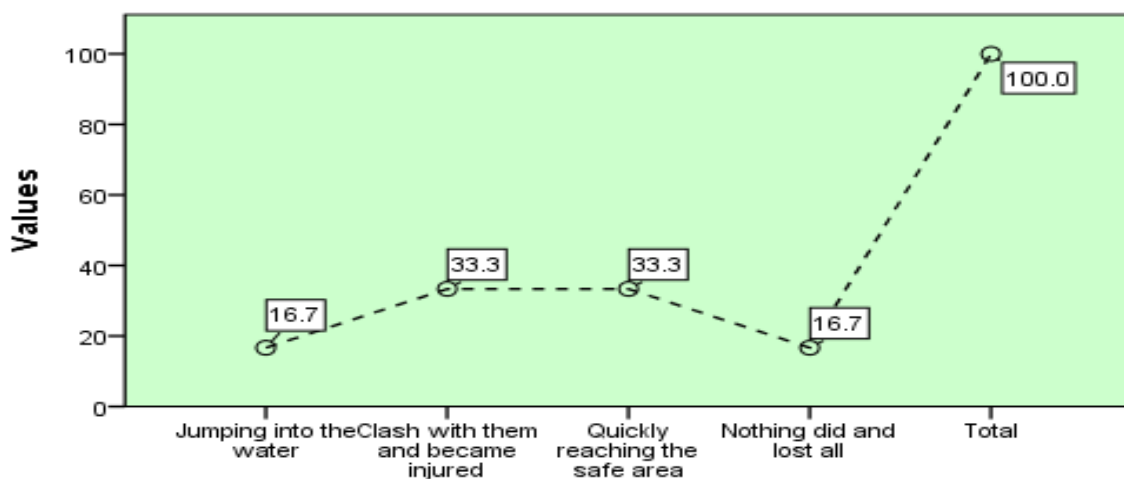
of harassment by police (1), high transport cost (1), price difference through middle man (1) and paying subscription (1) are mentioned by 16.7% interlocutors each.

Quantitative data point out that when fish producer interlocutors (2) were asked to state the types of fishes they produce, 50.0% (1 out of 2) of them said they produce shrimp while other 50.0% of them said they produce silver carp and other fishes as tilapia, catfish, grass carp etc.

When the interlocutors (fishermen) who catch fishes in the river or sea(8) were asked whether they face any robber group in the river or sea, a significant number of them (75.0%, 6 out of 8) answered positively while a negligible number of them (25.0%, 2) answered negatively.

At the same time, when the fishermen (interlocutors) who faced robber group in the river/sea (6) were asked to state the coping mechanisms they adopt to face the robber group (Graph- 6.103), 33.3% interlocutors each said they clashed with the robber group and became injured

Graph- 6.103: Coping Mechanisms of Fishermen to Face the Robber Group in the River/Sea (in per cent)



(2) and they reached the safe area quickly (2). Likewise, 16.7% interlocutors (1) said they jumped into the water to get rid of and another 16.7% interlocutors said they did nothing and lost all (1)

6.7.2 Climatic Impacts and Fishermen Coping Strategies

Table- 6.66 shows that when the interlocutors whose major profession is fishing (17) were asked whether climate change has any special impacts on their life and livelihoods, a significant number of them (94.1%, 16 out of 17) answered positively; of them, 50.0% (6) interlocutors catch fish from river or sea, 37.5% interlocutors' type of fishing profession is fish seller and 12.5% interlocutors' type of fishing profession is fish producer. On the other hand, a negligible number of them (5.9%, 1 out of 17) answered negatively and the fishing

type of this interlocutor is fish seller. Statistical data show that, at $df = 2$ and .05 level of significance, the table value (critical value) is 5.991 which is greater than chi-square value ($\chi^2 = 1.518^a$) i.e., alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So,

Table- 6.66: Types of Profession of Fishermen and whether Climate Change Has Any Special Impacts on Their Life and Livelihood (in number)

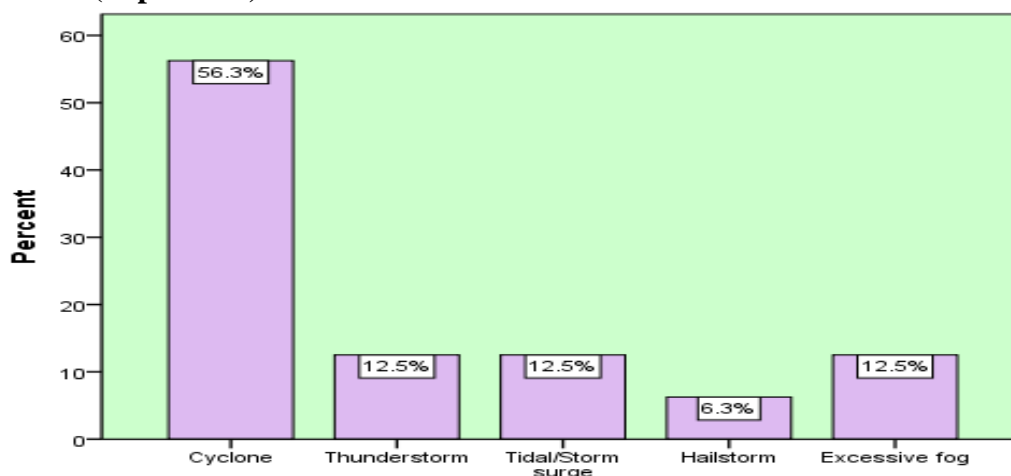
		Whether Climate Change Has Any Special Impacts on Their Life and Livelihood		Total
		Yes	No	
Types of Profession of Fishermen	Seller	6	1	7
	Producer	2	-	2
	Catcher from river/sea	8	-	8
Total		16	1	17

$$(\chi^2 = 1.518^a, df = 2, \alpha = .05, t\text{-value} = 5.991)$$

there is no significant relationship between types of profession of fishing and their conceptions about the impacts of climate change on livelihoods assets of livelihoods.

Graph- 6.104 points out that when the interlocutors (16) who said climate change has special impacts on their livelihoods were asked to mention the climatic hazards, the highest number of them (56.3%, 9 out of 16) mentioned cyclone while the lowest number of them (6.3%, 1 out of 16) mentioned hailstorm. Thunderstorm (2), tidal/storm surge (2) and excessive fog (2) were mentioned by 12.5% interlocutors each as climatic hazards that have special impacts on the life and livelihoods of fishermen. It is observed from the quantitative data that cyclone is a climatic hazard that is mentioned by the highest number of general interlocutors (19.7%, Graph- 6.8) and by special interlocutors as fishermen (56.3%, Graph- 6.131). Even in

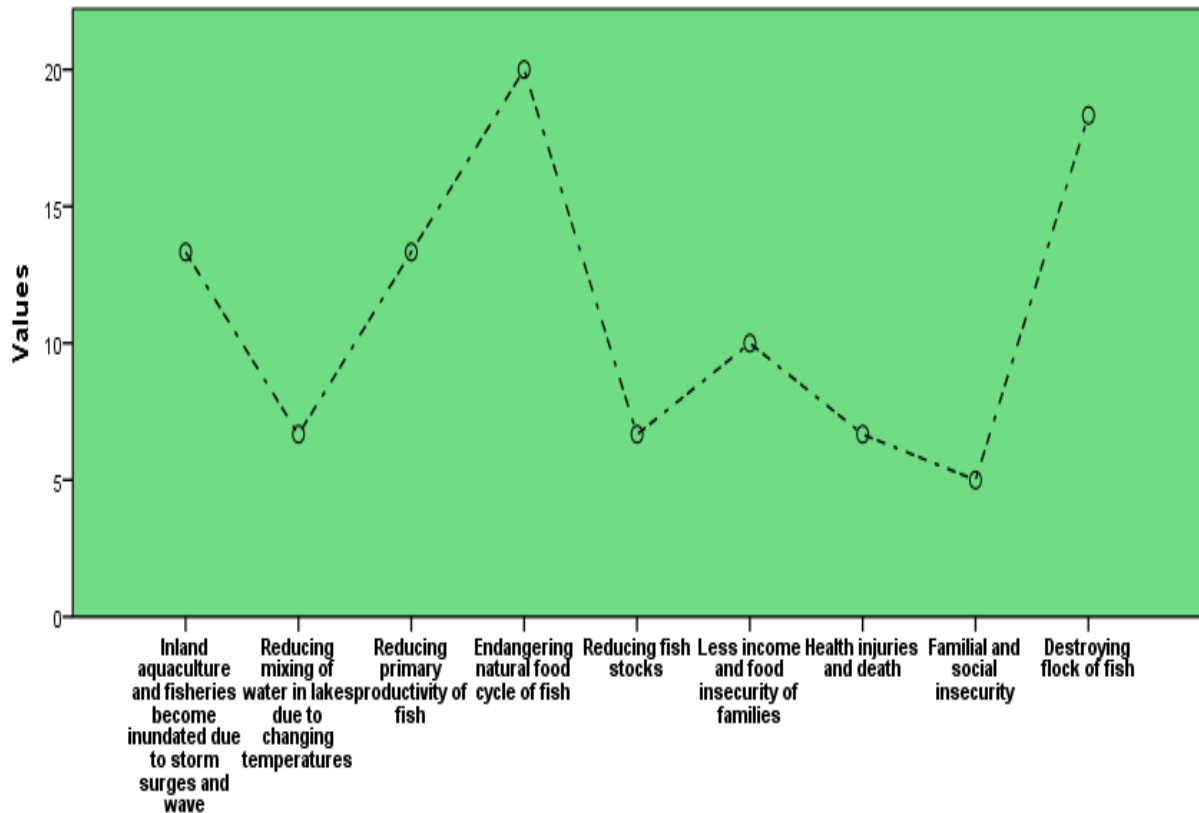
Graph- 6.104: Climatic Hazards That have Special Impacts on the Life and Livelihoods of Fishermen (in per cent)



qualitative data, the interlocutors mentioned it first. So, it can be said that cyclone impacts the life and livelihoods of fishermen most like general people (Table- 6.5) of *Bayer Char* coastal community. Tidal surge is also holds a significant position in both general study (quantitative, 16.7%, second highest) and special study (fishermen, 12.5%, second highest jointly). No interlocutors of fishermen mentioned flood, water salinity, water salinity, drought and insect attack that were mentioned in general quantitative study. But the interlocutors of fishermen mentioned excessive fog (12.5%, second highest jointly) that was not mentioned in general quantitative study.

When these interlocutors (16) were asked to mention the different special impacts of climate change on their life and livelihoods and they were given the options of multiple responses (Graph- 6.105), the highest number of responses (12 out of 60, 20.0%) mentioned that climate change endangered natural food cycle of fish while the lowest number of responses (5.0%, 3 out of 60) said climate change causes their familial and social insecurity. The second

Graph- 6.105: Different Special Impacts of Climate Change on Livelihoods of Fishermen (in frequency of multiple responses)

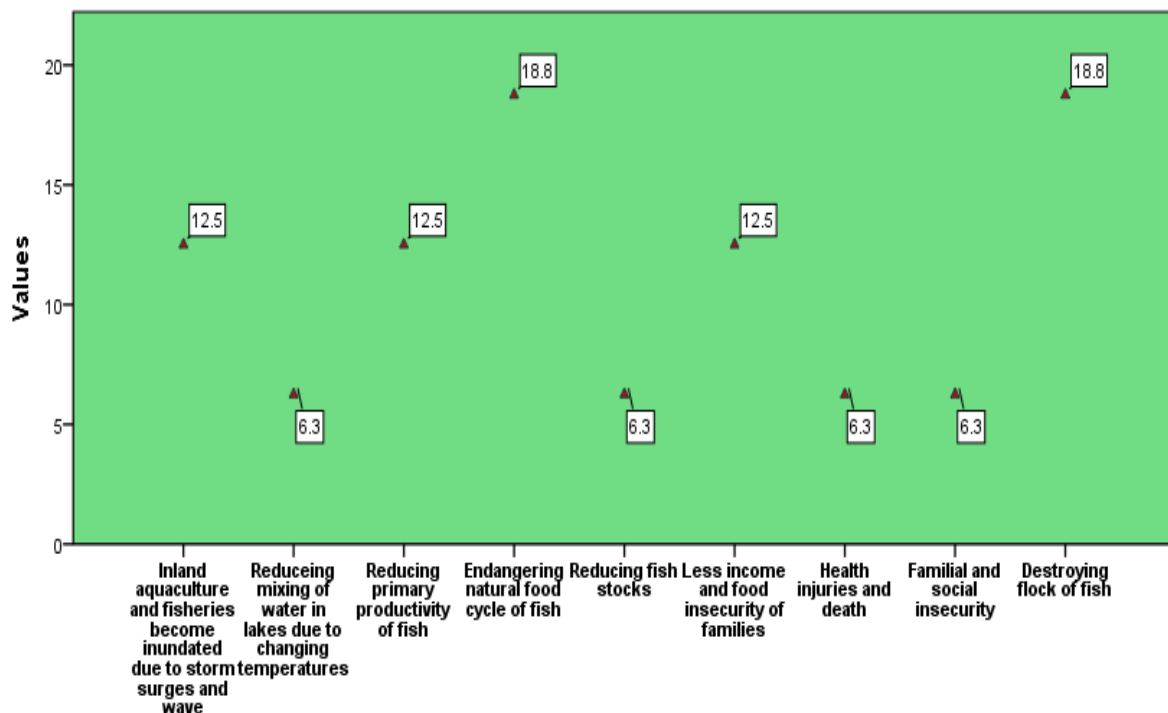


highest number of responses (18.3%, 11) said climate change is destroying the flock of fish. 13.3% interlocutors each said inland aquaculture and fisheries become inundated due to storm surges and wave (8) and primary productivity of fish is reducing for climate change

(8). Other special impacts of climate change on life and livelihoods of fishermen of *Bayer Char* are less income and food insecurity of families (10.0%, 6), reducing mixing of water in lakes due to changing temperatures (6.7%, 4), reduction of fish stocks (4) and health injuries and death (4).

At the same time, graph- 6.106 states that when these fishermen (16) were asked to mention the major special impacts of climate change on their life and livelihoods, the highest number of them (18.8% each) mentioned endangering natural food cycle of fish (3) and destroying the flock of fish (3) while the lowest number of them (6.3% each) mentioned reducing the mixing of water in lakes due to changing temperatures (1), reducing fish stocks (1), health injuries and death (1) and familial and social insecurity (1) as the major special impacts

Graph- 6.106: Major Special Impacts of Climate Change on Livelihoods of Fishermen (in percent)



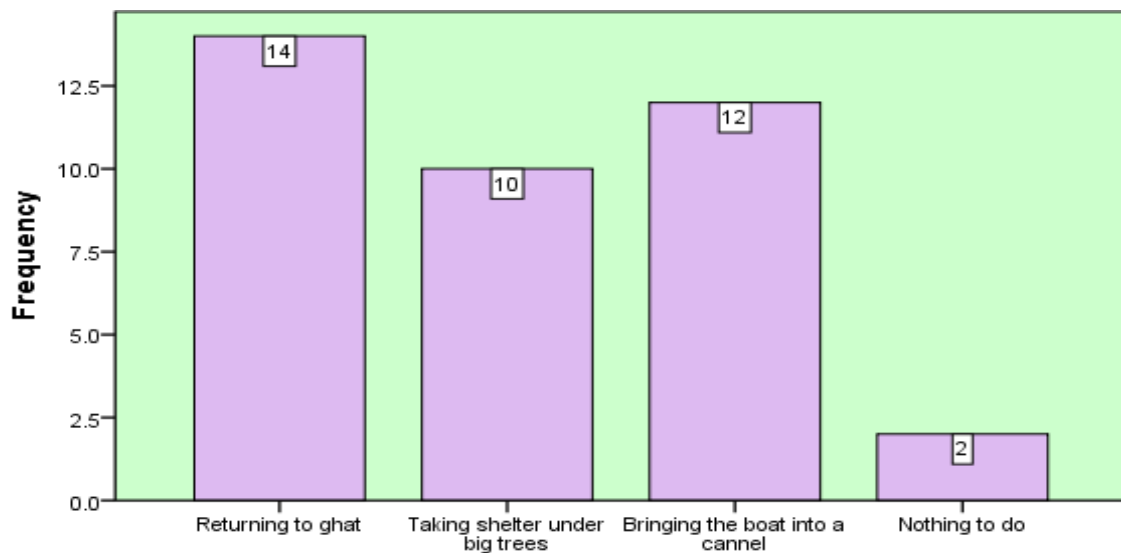
if climate change on their livelihoods. Other major special impacts of climate change on the life and livelihoods of fishermen are inland aquaculture and fisheries become inundated due to storm surges and wave (2), reducing primary productivity of fish (2) and less income and food insecurity of families (2) as mentioned by 12.5% interlocutors each.

Here, some special climatic impacts on life and livelihoods of fishermen are observed which were not observed in general quantitative study as endangering natural food cycle of fish, destroying the flock of fish, inland aquaculture and fisheries become inundated due to storm

surges and wave, reducing primary productivity of fish, reducing the mixing of water in lakes due to changing temperatures and reducing fish stocks.

Graph- 6.107 shows that when the fishermen whose livelihoods are specially impacted by climatic hazards, were asked to state the different coping mechanisms they adopt to face the climatic hazards and they were given the options of multiple responses, the highest number of responses (14 out of 38, 36.8%) said that they return to *ghat* (wharf) while the second highest

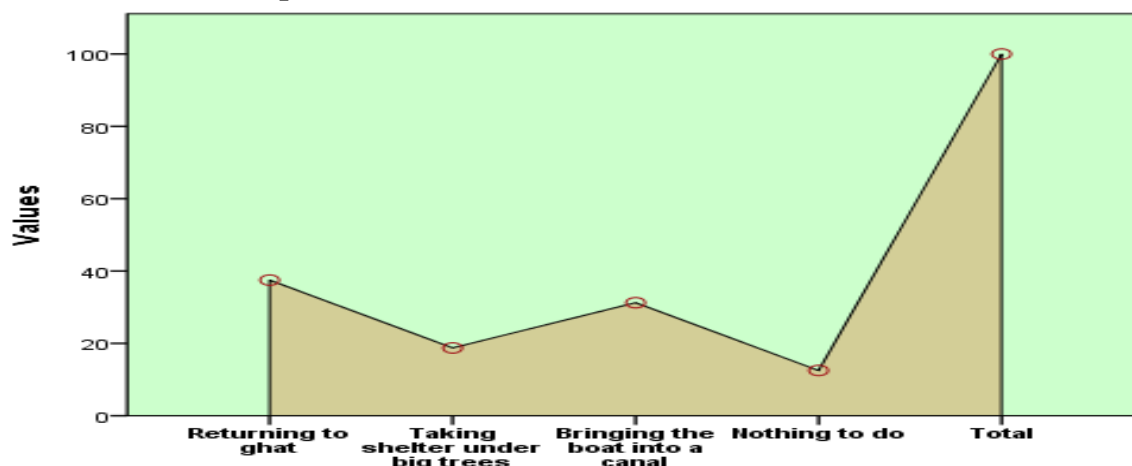
Graph- 6.107: Different Coping Mechanisms the Fishermen (Boatmen) Adopt to Face the Climatic Hazards (frequency of multiple responses)



number of responses (12,31.6%) said they bring the boat into a canal. Out of 38 responses, 10 responses (26.3%) said they take shelter under big trees to save them from hailstorm and thunderstorm after anchoring the boat at the bank of river. Besides, 2 responses (5.3%) said they have nothing to do to cope with climatic hazards.

At the same time, when these interlocutors (16 fishermen) were asked to state the major coping mechanisms they adopt to face the climatic hazards (Graph- 6.108), the highest number of responses (6 out of 16, 37.5%) said that they return to *ghat* (wharf) while the second highest number of responses (5, 31.3%) said they bring the boat into a canal. Out of 16 interlocutors, 3 interlocutors (18.8%) said they take shelter under big trees to save them from hailstorm and thunderstorm after anchoring the boat at the bank of river. Besides, 2 interlocutors (12.5%) said they have no strategies to cope with climatic hazards. Taking shelter under big trees to save them from hailstorm and thunderstorm (18.8%) and having nothing to do (12.5%) indicate lack of knowledge or vulnerable coping strategies with

Graph- 6.108: Major Coping Mechanisms the Fishermen (Boatmen) Adopt to Face the Climatic Hazards (in per cent)



climatic hazards and livelihood vulnerability of fishermen of *Bayer Char* coastal people respectively.

6.7.3 Climatic Impacts and Fishermen Adaptation Strategies

Table- 6.67 states that when the interlocutors-fishermen (16) whose life and livelihoods are specially impacted by climatic hazards, were asked whether they adopt any special adaptive strategies to climatic impacts, a significant number of them (93.8%, 15 out of 16) answered positively while 6.2% of them answered negatively. The interlocutors who answered

Table- 6.67: Educational Qualifications of Interlocutors and Whether They adopt Any Special Adaptive Strategies to Climatic Impacts (in number)

		Whether They Adopt Special Adaptive Strategies to Climatic Impacts		Total
		Yes	No	
Educational Qualifications of Interlocutors	Illiterate	9	1	10
	Can sign only	1	-	1
	Can read only	2	-	2
	Below class 8	1	-	1
	Below SSC	1	-	1
	Graduation	1	-	1
Total		15	1	16

$$(\chi^2 = .640^a, df = 5, \alpha = .05, t\text{-value} = 11.070)$$

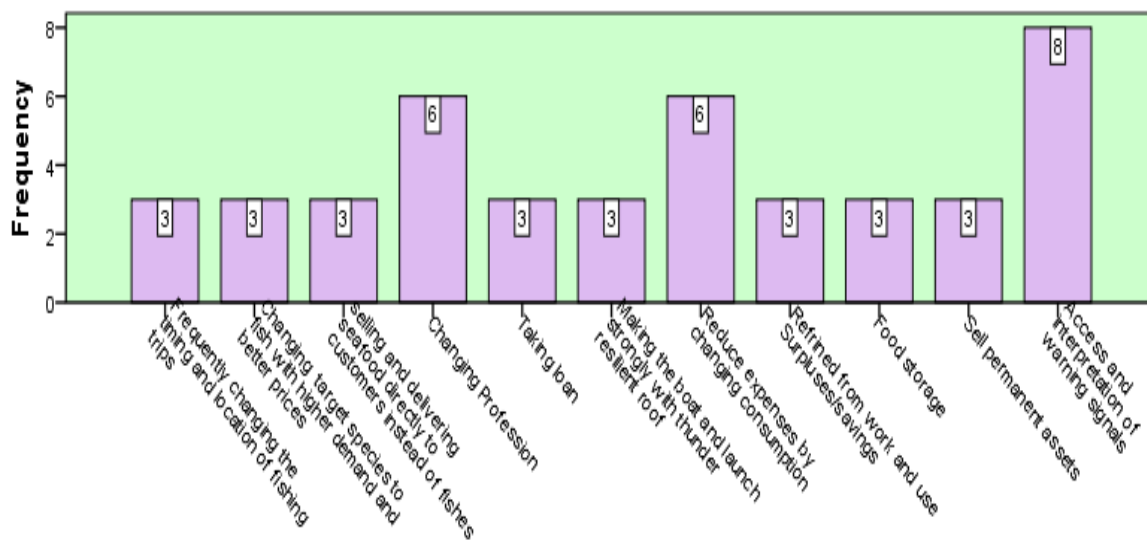
positively, 60.0% are illiterate, 13.3% can read only and 6.7% interlocutors each can sign only are below class 8, below SSC and graduate. The only interlocutor who answered negatively belongs to illiterate interlocutors.

Statistical data from table- 6.67 show that, at $df = 5$ and $.05$ level of significance, the table value (critical value) is 11.070 which is greater than chi-square value ($\chi^2 = .640^a$) i.e.,

alternative hypothesis (H_1) is rejected and null hypothesis (H_0) is accepted. So, there is no significant relationship between educational qualifications of fishermen and their adopting special adaptive strategies to climatic impacts on their life and livelihoods. It describes that irrespective of educational qualifications, about all fishermen adopt special (something different from others) adaptive strategies to climate change induced hazards and impacts.

When the interlocutors (fishermen) who said they have special adaptive strategies to climatic impacts were said to mention their adaptation strategies and they were given options of multiple responses (Graph- 6.109), the highest number of responses (8 out of 44, 18.2%) mentioned access to and interpretation of warning signals while the second highest number of responses (6 responses each, 13.6% each) mentioned changing profession and reducing expenses by changing consumption (reducing the number of meals) as the different adaptive strategies. Their other special adaptation strategies are

Graph- 6.109: Different Special Adaptive Strategies to Climatic Impacts on Livelihoods of Fishermen. (in frequency of multiple responses)

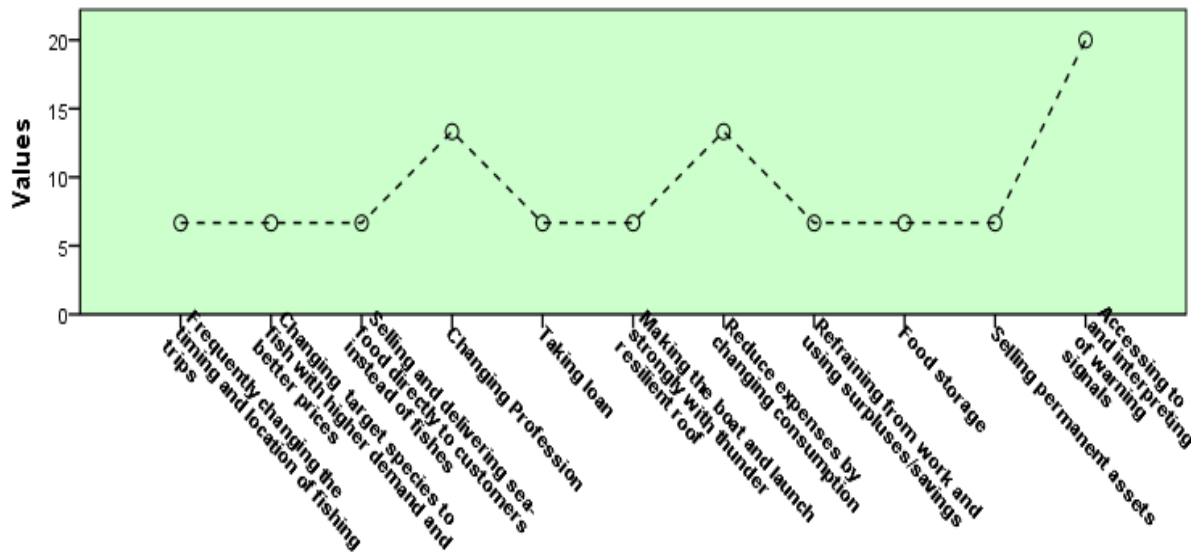


frequently changing the timing and location of fishing trips (3, 6.8%), changing target species to fish with higher demand and better prices (6.8%), selling and delivering seafood directly to customers instead of fishes (6.8%), taking loan (6.8%), making the boat and launch strongly with thunder resilient roof (6.8%), refrained from work and use surpluses/savings, (6.8%), food storage (6.8%), and selling permanent assets (6.8%).

On the other hand, graph- 6.110 points out that when the same interlocutors were said to mention their major adaptation strategy, the highest number of them (3 out of 15, 20.0%)

mentioned access to and interpretation of warning signals while the second highest number of responses (2 interlocutors, 13.3% each) mentioned changing profession and reducing expenses by changing consumption (reducing the number of meals) as the major adaptive strategies. Their other major adaptation strategies are frequently changing the timing and location of fishing trips (1, 6.7%), changing target species to fish with higher demand and

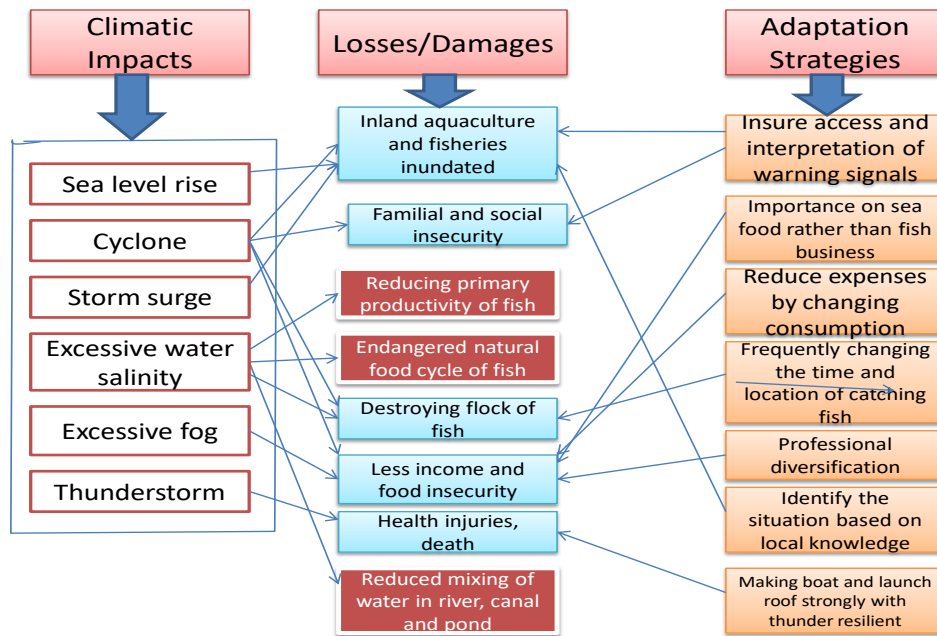
Graph- 6.110: Major Special Adaptive Strategies to Climatic Impacts on Livelihoods of Fishermen (in per cent)



better prices (6.7%), selling and delivering seafood directly to customers instead of fishes (6.7%), taking loan (6.8%), making the boat and launch strongly with thunder resilient roof (6.7%), refrained from work and use surpluses/savings, (6.7%), food storage (6.7%), and selling permanent assets (6.7%). Comparing the data of multiple responses (Graph- 6.134, Different strategies) with those of single response (Graph- 6.135, Major Strategy), it is observed that there is no notable difference in percentage of interlocutors.

Figure- 6.5 presents special climatic impacts that cause different losses and damages of fishermen livelihoods and adaptation strategies of them to the impacts of climate change. The climatic impacts cause special losses and damages of fishermen livelihoods are sea level rise, cyclone, storm surge, excessive water salinity, excessive fog and thunderstorm. The losses of inland aquaculture and fisheries inundation caused by sea level rise, cyclone and storm surge; familial and social insecurity caused by cyclone; reducing primary productivity of fish caused by excessive water salinity; endangering natural food cycle of fish caused by excessive water salinity, destroying flock of fish caused by excessive water salinity and cyclone; less income and food insecurity caused by excessive fog and cyclone, health injuries and death caused by

Figure- 6.5: A Diagram on Climatic Impacts on Fishermen Livelihoods and Their Adaptation Strategies



(Source: Field Work, 2021-2022)

thunderstorm and reducing mixing of water in river, canal and pond caused by excessive water salinity. The fishermen adopt different specific strategies to the losses /damages caused by climatic impacts. The fishermen adopt ensuring access to and interpretation of warning signals as adaptation to inland aquaculture and fisheries inundation and familial and social insecurity, giving importance on sea food rather than fish business as adaptation to less income and food insecurity, reducing expenses by changing consumption as adaptation to less income and food insecurity, frequently changing the time and location of catching fish as adaptation to destruction of flock of fish, professional diversification as adaptation to less income and food insecurity, identifying the situation based on local knowledge as adaptation to inland aquaculture and fisheries inundation and making boat and launch roof strong with thunder resilient materials to protect health injuries and death as adaptation to thunder.

From the diagram it is proved that there is an adaptive relationship between ecology and special adaptation strategies of fishermen.

CHAPTER SEVEN
CONCLUSION AND WAY OUT

CHAPTER SEVEN: CONCLUSION AND WAY OUT

Coastal communities like *Bayer Char* community remained secluded from the people living in main lands of Bangladesh. Most of the coastal areas are chars which are another Bangladesh within the political boundary of Bangladesh. They have their own livelihood system, own culture and economic system originated from the adaptation strategies to climate change induced impacts on their livelihood assets. Here, it was observed that there is an adaptive relationship between the environment and the subsistence system of *Bayer Char* community as conceptualized in cultural ecology theory. The adaptive relationships or causal connections between ecology and culture i.e., among natural environmental conditions, subsistence technology and social structures in *Bayer Char* coastal community were proved by the collected data of present study. Here, it was observed in the present study that, most of the time, the people of *Bayer Char* community use natural resources of their environment to adapt to the climatic impacts on their livelihood assets which creates the social system of *Bayer Char* community.

Basically for the highly dynamic cultural, physical and socio-economic conditions characterizing the coastal char and coastal communities of Bangladesh, the coastal-char communities like *Bayer Char* coastal community have not been in the focus of development policies, programs and efforts of the public or the private agencies of the country. They remained as the poorest of the poor in Bangladesh.

In this study, the present livelihood assets based adaptation strategies of poor coastal people of *Bayer Char* community to ongoing rapid climate change impacts were explored and the need and possibilities were identified to attract the attention of the management of the coastal char areas of Bangladesh. So, the findings of this anthropological study are expected to extend the epistemological domain, help government, national and international NGOs form strategically short, mid and long-term appropriate climate change adaptation policies and programs, to facilitate the coastal char people directly and also contribute to achieve Sustainable Development Goals (SDGs) in Bangladesh as well as in the world. Since the climatic impacts on coastal-char people livelihoods specially the impacts of cyclone, flood, tidal surge, soil salinity, water salinity and erosion are very difficult to control through structural measures, management intervention should aim at policies and administrative improvements incorporating the coastal community in the mainstream development so that these poor coastal people can more successfully adapt to the upcoming more critical and

vulnerable situation of climate change and save them from being ‘environmental refugees’. In formulating long-term approaches, it would be important to devote special attention to the possible changes in the physical environment of coastal chars.

Based on the findings of the present study it is intended to present some recommendations would be implemented at international, national and local level:

7.1 International Level

- International organizations and states need to consider human beings of all over the world at the centre of concerns to ensure sustainable development.
- The right to development of present and future generations all over the world needs to be fulfilled equitably ensuring the conservation of environment and nature.
- In a spirit of global partnership, states need to cooperate among them to conserve, protect and restore the health and integrity of the earth's ecosystem so that the impact severity and frequency of climate change induced natural hazards and people’s vulnerability to them are reduced.
- Humans of the World need to change in behavior and/or belief in response to improve the conditions of existence, including a culturally meaningful life
- States of the globe need to enhance the opportunity for all people of the world to meet basic needs of food, shelter, cloth, safe water, employment, energy and sanitation.
- States and international organizations need to take necessary measures to limit the emission of Green House Gases (GHGs) and conversion of forest resources, halt massive deforestation process to ensure zero population growth and preserve the bio-diversity.
- States need to seriously and sincerely address the root cause of climate change stated before four decades in Brundtland Report of 1978 titled ‘Our Common Future’ and other successive sustainable development related summits, policies, protocols, programs and action plans.
- International Organizations and States need to aim at achieving Sustainable Development Goals (SDGs) by 2030 as a strategy of adaptation to climate change induced calamities that endangered human survivability in this world.
- The marginal and destitute coastal-char people of all over the world need to be prioritized in including mainstream development policies and programs of the states and international organizations.

- Global climate change governance need to take measures to help formulate climate change policy mobilize global climate finance and supervise the activities related to climate change adaptation prioritizing the adaptation process of coastal and char people to climatic impacts.
- Donor or international financial institutions need to provide technical and financial assistance to the governments of most climate vulnerable countries like Bangladesh.

7.2 National Level

7.2.1 ImprovementsofPolicy and Administration

● ● Institutional Arrangements

- The government of Bangladesh and various national organizations have been formulating and implementing different development programs for the overall improvement of the livelihood and adaptation strategies of coastal-char people of Bangladesh, but till now very little changes are visible. Coastal char people and their livelihoods are the most vulnerable to climate change induced impacts. The reason is, without understanding environmental context and the relationship between climate change adaptation and cultural evolutions, most of these programs were formulated and implemented and as a result, in most cases, the implemented programs have been back lashing.

- Special program interventions on adaptation to climate change in coastal-char community are needed to be planned and implemented by the Climate Change Cell (CCU), the central point of climate change governance in Bangladesh under the National Environment Committee (NEC) headed by the Prime Minister and the National Steering Committee on Climate Change chaired by the Minister, Ministry of Environment and Forest (MoEF).

- Planning Commission (PC) of Bangladesh needs to formulate development plans and policies to mainstream the climate change adaptation of coastal and char community into development process.

- For effective output of adaptation program to climate change in coastal-char area in Bangladesh, it is imperative to pay profound and proper attention to the following aspects of institutional management:

► **Involving Local Beneficiaries.** It is the reality that the coastal char people have their own livelihood system, own culture, economic system and every coastal-char area has unique cultural ecology which is difficult to realize for the outsiders. So, national policy plan and program for strengthening the adaptation process of coastal-char community need to be

formulated ensuring the participation of local beneficiaries to increase the chance of its success.

► **Recognizing Existing Social Groups:** To develop policy and program regarding the adaptation strategies of coastal char people to climate change induced natural calamities and to make the program successful, the local ideas, knowledge, experience and initiatives of existing social groups as kin groups and neighborhoods of char community need to be recognized and included

► **Making the Local Government Strong:** Local government bodies, specially the Ward and the Union Parishad (UP) play vital role in collecting the information of climate change, assessing the impacts (loss and damages) of climate change on livelihood assets of coastal and char people and developing the required strategies of adaptation to climate change and recommending it to the central body of the government. So, it needs to make the local government strong.

► **Reformulate the Climate Change Plans:** Some new climatic impacts are explored in the study. So, the existing climate change plans of the Bangladesh government as National Adaptation Program of Action (NAPA) and Bangladesh Climate Change Strategy and Action Plan (BCCSAP) need to be reformed and reformulated ensuring the participations and contributions of all stakeholders and prioritizing the local knowledge, networks and cultural aspects of adaptation of coastal and char communities.

Developing CSO Capacity to Ensure SDGs: Government needs to develop a policy framework that will support CSO capacity development and effective engagement with SDGs implementation at all levels.

7.2.2 Special Program Interventions

The following special programs need to be intervened to strengthen the adaptation strategies, to alleviate the negative impacts of poverty, gender, patriarchy and networks on adaptation to climate change and to ensure equal right of char people on resources or assets.

● **Administrative Boundaries:** Demarcation problem is one of the basic problems in char and coastal areas like *Bayer Char* and the conflicts between chars generally occur based on natural assets of livelihoods originated from the confusion or lack of clarity of administrative boundaries that need to be resolved.

- **Land Laws Reformation:** The local elites and leaders (*Neta*) control the land in chars or coastal areas like *Bayer Char*. They distribute the homestead and cultivable land among poor landless people in exchange of money, grain or fighting for them and exploit the landless people. They are able to subvert the laws because there is confusion in the existing land laws regarding alluvium and diluvium. So, it needs to reform the land laws regarding alluvium and diluvium of char areas so that the locally dominant people would not be able to keep public land under their control violating the directives of government and the adaptation strategies of coastal char people to climate change would be strengthened and they would not be exploited by the local elites.
- **Policy Changes for Effective Use of Public Land:** For the effective use of public land in char and coastal areas, the concern policies need to be reformed and improved. Particularly it needs to review the existing policy regarding the leasing out of public land to individuals for cultivation to ensure the proper identification of public land, to stop illegal occupation of public land in coastal chars and to ensure the priority of land-poor households in leasing out the public land. A policy to establish cooperatives needs to be formulated for proper use of public land and resources in coastal-char areas as the land is impermanent and the population is transitory in nature in most of the coastal chars.
- **Development of Information Resources:** Climatic impacts on life and livelihoods of coastal and char people and different cultural adaptation strategies of char community to climate change need to be explored, mapped and quantified to develop information resources that will play important role in formulating national plans and policies about climate change.
- **Modernization of the Forecasting and Warning System:** The inhabitants of coastal and char community adopt accessing to and interpreting of warning signals as their major adaptation strategy to climate change induced natural hazards. So, the forecasting and warning system regarding the climatic impacts (cyclone, flood, soil and water salinity, hailstorm and thunderstorm) on life and livelihoods of coastal and char people made and disseminated by the Forecasting and Warning Centre (FWC) need to be modernized so that authority and the people of coastal and char community are warned before sufficient time to take decisions to evacuate the vulnerable groups and livestock to safe places.
- **Role of NGOs in Raising Awareness and Capacity Building:** National NGOs need to raise awareness among coastal community, form adaptation policies for strengthening capacity and produce climate change knowledge through study.

7.2.3 Basic Services

The livelihood system of coastal and char community is tuned to the ecology they live in as found in the present study. Their livelihood assets i.e., natural, material, human, social and physical assets are developed as a result of interaction between culture and environment. As adaptation to climate change they developed a unique livelihood pattern which has high vulnerability to ongoing climatic variability and this vulnerability will be much more in absence of effective institutional supports (the supports of GOs and NGOs). In this perspective, the following institutional supports in basic services are recommended to be extended to reduce livelihood vulnerability and strengthen the coastal-char people's adaptation strategies to ongoing climate change:

- **Agricultural Extension Services:** As adaptation to climate change impacts on material assets of livelihoods, coastal and char people adopt the strategies of crop diversification, using animals (eater bird) to feed the pests on the farm, accessing to and interpreting of warning signals, adapting sowing time, seed storage, irrigation and removal of insects by hands. So, the extension services of crop diversification, ensuring availability of eater birds, better and effective warning signals, seed storage and irrigation are crucial to be provided.
- **Education, Health and Sanitation Services.** The people of *Bayer Char* community use the strategies of taking religious education, saving life by taking shelter in relatives' paka house and cyclone shelter, depending on traditional medicine, building educational institutions on very high places as adaptation to climatic impacts on human assets. So, government needs to take steps immediately in establishing required number of educational institutions (primary, secondary, higher secondary and vocational institutions), modernizing education system, constructing sufficient cyclone shelters, providing modern health facilities in coastal chars especially during the rainy season. Coastal-char people use pit latrine. So, to improve sanitation facilities, the people of coastal-char areas need to be trained to build low-cost latrines and set them on very high places.
- **Public Transport Services:** Coastal chars are fragmented by small rivers and canals originated from the river or sea. For this different geophysical characteristics, commercial and private ownership based small boats (*Dingy or Dinga Nouka*) propelled by oars or/and sails are the main transport in coastal chars. Transport system in coastal chars is not easy and comfortable. Even, during natural calamities this water based transport system has broken down and people face indescribable sufferings. So, government needs to provide public transport services especially regular boat services in coastal chars or coastal community to

make the people's transport easy and comfortable and to ensure the easy and effective evacuation of coastal people during climate change induced natural disasters.

- **Public Assistance in Developing Small and Medium Enterprises:** As adaptation to climate change induced impacts of tidal surge, drought and flood, the poor coastal community engage in different cottage industries as handicrafts. On the other hand, poverty, gender and patriarchy play different negative role in their adaptation strategies to climate change. So, small and medium enterprises for poor coastal community especially for women need to be established by GOs and NGOs to generate employment, reduce poverty, eliminate gender and patriarchy and strengthen the adaptation strategies of coastal char people to the impacts of climate change on their livelihoods.

- **Providing Public Institutional Credit:** To adapt to the impacts of climate change on their livelihood assets, the crying need of the people of coastal char community is money to meet their basic needs as food, cloth, shelter, fishing equipment and agricultural inputs. For the lack of financial support of government, they take credit in high interest from local NGOs and *mohajons* (local usurers), and caught in the net of compounding interest and become exploited. So, government needs to provide credit to coastal char people in low interest so that they can meet their basic needs and strengthen their adaptation strategies to climate change.

7.3 Local Level

7.3.1 Local Government and Communities

- Local government authority needs to make awareness among the people of coastal-char community providing effective training, and agricultural and other required equipment to adapt to climate change induced impacts especially the climatic impacts of cyclone, flood, soil salinity, water salinity on their livelihood assets.

- Local government authority needs to adopt required initiatives to supervise, control and follow-up the policy, programs and the activities of local NGOs and local usurers (*mohajons*) who run their usury and exploitative activities in poverty-stricken coastal-char areas, make the people of coastal-char communities aware about their exploitation. This local authority also needs to take measures to manage basic needs required during climate change induced natural calamities in coastal-char areas as food, cash money, shelter, safe drinking water and sanitation facilities.

- Local rich and solvent people need to help poor coastal-char people providing financial assistance for strengthening the livelihood adaptation strategies of coastal-char communities to climate change.
- To protect law and order situation in coastal-char areas, equal and fair implementation of law needs to be ensured by local law enforcement authority.

7.3.2 Local Level NGOs

- Local NGOs need to adopt necessary measures to mobilize coastal-char community, develop their adaptation capacity to climate change impacts implementing human resources development programmes, providing sanitation and safe drinking water facilities at free or minimal interest in coastal areas and setting up some modern primary, secondary and higher secondary schools, colleges and madrashas in coastal-char communities where modern educational institutions are not available, people have strong religious beliefs and are overwhelmed by various types of superstitions.
- Local NGOs need to take initiatives to execute pilot projects in poor and vulnerable coastal communities, explore cultural knowledge of local adaptation and supply input to national policy formation regarding coastal-char people.
- Small and medium enterprises for poor coastal community especially for women and aged people need to be established by local NGOs to generate employment, reduce poverty, eliminate gender and patriarchy and strengthen the adaptation strategies of coastal char people to the impacts of climate change on their livelihoods.

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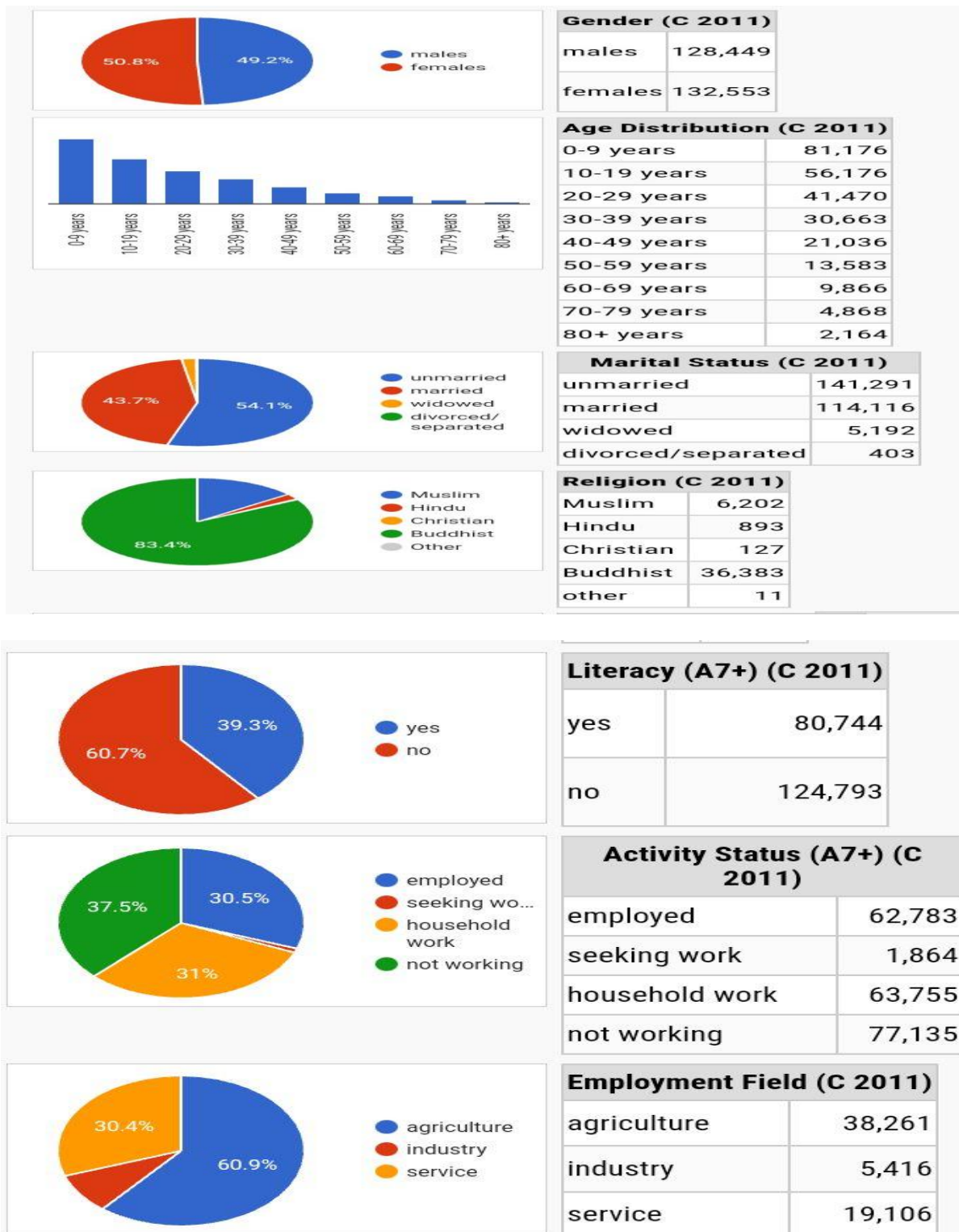
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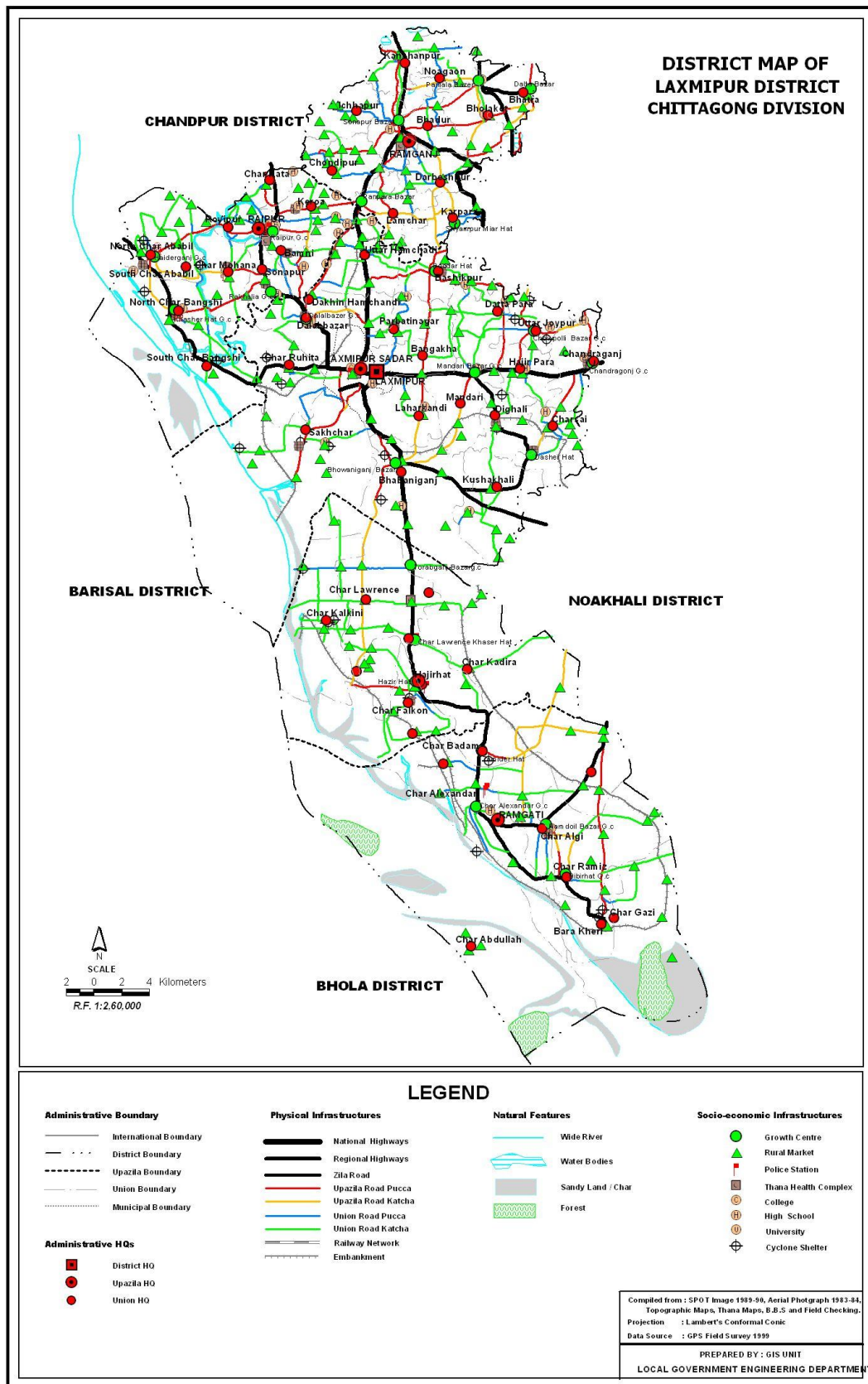
APPENDICES

Annexure One: Ramgati Upazila Census Results at a Glance



(Source: Population and Housing Census-2011, BBS; citypopulation.de/en/bangladesh)

Annexure Two: Map and Some Photographs of Study Area



Source: <https://oldweb.lged.gov.bd/UploadedDocument/Map/CHITTAGONG/laxmipur/laxmipur.jpg>

**By Increased
Riverbank Erosion,
Costal Char People of
Ramgati, Lakshmipur
are Disoriented and
Worried about the
Future**



**House Built on
Embankment by
Coastal Displaced
People (Environmental
Refugee) of Ramgati,
Lakshmipur.**





Fishermen and their fishing boats at a *ghat* in Ramgati, Lakshmipur



River is eroding the homestead land of coastal char people of Ramgati, Lakshmipur