

# **Effectiveness of Community Based Disaster Management in Bangladesh: An Exploratory Study**



**PhD Dissertation**

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# Effectiveness of Community Based Disaster Management in Bangladesh: An Exploratory Study



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**By**

**Md. Abdus Sattar**

For pursuing the degree of

***Doctor of Philosophy***

**Institute of Disaster Management and Vulnerability Studies  
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## Declaration

This is the declaration from me that the dissertation for the degree of Doctor of Philosophy titled “*Effectiveness of Community Based Disaster Management in Bangladesh: An Exploratory Study*” capitulated to the Institute of Disaster Management and Vulnerability Studies, University of Dhaka is an absolutely novel and empirical research work. This research work is conducted by me, the following signatory. This dissertation or any part of this dissertation did not submit previously to any other institute/university to achieve any degree.

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### **Certification from the Supervisors**

The dissertation titled “*Effectiveness of Community Based Disaster Management in Bangladesh: An Exploratory Study*” for pursuing the degree of Doctor of Philosophy submitted to Institute of Disaster Management and Vulnerability Studies, University of Dhaka has been conducted under our direct supervision and guidance. The researcher, Mr. Md. Abdus Sattar, declares that this research work is novel and empirical one and he did not submit it or any part of it earlier to other institute or university to achieve any degree. We certify that, we have carefully scrutinized and checked the subject matter, language, materials and other things. We also declare that this work is researcher’s own effort and achievement under our joint supervision.

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## **Abstract**

Bangladesh is globally known as vulnerable country to climate induced disasters and also famous as for its coping mechanisms and people's participation in the process of managing these disasters. The geographical location, formation of earth surface, downstream river estuaries, demographic characteristics of population, socioeconomic and cultural condition of population push vulnerability to floods, droughts, river bank erosions, cyclones, tidal surges, tornadoes, earthquakes, salinity, epidemic, etc.

The present study aims to explore the effectiveness of community based disaster management in Bangladesh. This study has been conducted in Merur Char, Bagar Char and Nilakshmia Union of Bakshiganj Upazila of Jamalpur district to examine the effectiveness of practiced/existing coping mechanisms of community people regarding disaster management, the government and NGOs' initiatives to strengthen those coping mechanisms, the community people and community-based organizations (CBOs) participation in risk reduction options at community level.

The methodological triangulation (quantitative and qualitative) has been used for collecting data on several issues like socioeconomic and demographic, disaster occurrence, practiced coping mechanisms within community, government and NGOs' initiatives, CBOs' activities for managing disasters, community people's participation in DRR options, application and effectiveness of those coping mechanisms, CBOs' activities and people's participation. For quantitative data, survey has been conducted with 390 respondents while 6 FGD and 16 KII have been conducted for qualitative data.

This study finds that the population has been experienced with flood, driving rain, nor'westerly, riverbank erosion, water logging, cold wave, drought, cyclone and tornado in the study area. The community people coped with changing situation by applying coping mechanisms regarding food, fodder and fuel crisis. Besides they applied coping mechanisms degrading dwelling places, losing livelihoods, agricultural damages, water, health and sanitation issues, protecting violence against women and girls. Furthermore,

the community applied the coping mechanisms regarding making the community neat and clean, mitigate disaster risks.

This study also finds that the practiced coping mechanisms within the community, government and NGOs' activities for strengthening those coping mechanisms, CBOs' activities and community people's participation in disaster risks reduction options were effective in managing the crisis regarding food, fodder and fuel due to disaster. The community people's mechanisms regarding dwelling places, losing livelihoods, agricultural damages, water, health and sanitation issues, agricultural damages, mitigating disaster risks & government and NGOs' initiatives were effective in strengthening the practiced coping mechanisms within community. The community people's participation in risk reduction options were effective in managing disasters.

Finally, this study recommends for involving all stakeholders in managing disasters, strengthening individual capacity for managing risk to reduce vulnerability, raising awareness regarding disaster management, making disaster resilient community through support from all stakeholders.



## Acronyms and Abbreviations

<b>ACAPS</b>	Assessment Capacities Project
<b>ADB</b>	Asian Development Bank
<b>ADPC</b>	Asian Disaster Preparedness Centre
<b>ASA</b>	Association for Social Advancement
<b>BADC</b>	Bangladesh Agricultural Development Corporation
<b>BBS</b>	Bangladesh Bureau of Statistics
<b>BDT</b>	Bangladeshi Taka
<b>BIRDEM</b>	Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders
<b>BRAC</b>	Bangladesh Rural Advancement Committee
<b>CBA</b>	Community Based Adaptation
<b>CBACC-CA</b>	Community Based Adaptation to Climate Change-Coastal Afforestation
<b>CBDM</b>	Community Based Disaster Management
<b>CBO</b>	Community Based Organization
<b>CEDMHA</b>	Center for Excellence in Disaster Management and Humanitarian Assistance
<b>CEGIS</b>	Center for Environmental and Geographic Information Services
<b>CPP</b>	Cyclone Preparedness Program
<b>CRED</b>	Centre for Research on the Epidemiology of Disasters
<b>DFID</b>	Department of International Development
<b>DM</b>	Disaster Management
<b>DMB</b>	Disaster Management Bureau
<b>DRM</b>	Disaster Risk Management
<b>DRR</b>	Disaster Risk Reduction
<b>EPA</b>	Environmental Protection Agency
<b>ESDO</b>	Eco Social Development Organization
<b>FAP</b>	Flood Action Plan
<b>FAO</b>	Food and Agriculture Organization
<b>FGD</b>	Focus Group Discussion
<b>FEMA</b>	History, Vulnerability, Maximum Threat and Probability/ Federal Emergency Management Agency
<b>GOB</b>	Government of Bangladesh
<b>GDP</b>	Gross Domestic Product
<b>IDNDR</b>	International Decade for Natural Disaster Reduction
<b>IFRC</b>	International Federation for Red Cross and Red Crescent Societies
<b>INGOs</b>	International Non-governmental Organizations
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>ISDR</b>	International Strategy for Disaster Reduction
<b>KII</b>	Key Informant Interview
<b>MoA</b>	Ministry of Agriculture
<b>MoDRM</b>	Ministry of Disaster Management and Relief

<b>MoFDM</b>	Ministry of Food and Disaster Management
<b>MoEF</b>	Ministry of Environment and Forest
<b>NCDEM</b>	North Carolina Division of Emergency Management
<b>NIPORT</b>	National Institute of Population Research and Training
<b>NGOs</b>	Non-governmental Organizations
<b>OECD</b>	Organization for Economic Cooperation and Development
<b>SHOUHARDO</b>	Strengthening Household Ability to Respond to Development Opportunities
<b>SDWF</b>	Safe Drinking Water Foundation
<b>SMUG</b>	Seriousness, Manageability, Urgency and Growth
<b>SWOT</b>	Strengths, Weakness, Opportunities, Threats
<b>TAR</b>	Technology Assisted Review
<b>UDMC</b>	Union Disaster Management Committee
<b>UKCIP</b>	United Kingdom Climate Impacts Programme
<b>UN</b>	United Nations
<b>UNICEF</b>	United Nations Children’s Fund
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>UNISDR</b>	United Nations International Strategy for Disaster Reduction
<b>UP</b>	Union <i>Parishad</i> /Upazila <i>Parishad</i>
<b>WFP</b>	World Food Programme
<b>WHO</b>	World Health Organization

## Glossary

<i>Aila</i>	Tropical cyclonic storm struck southern Bangladesh and eastern India
<i>Amphan</i>	Tropical cyclonic storm slammed in India and Bangladesh
<i>Bazaar</i>	Local market place
<i>Bondhu Chula</i>	One kind of stove made of clay
<i>Char</i>	Island surrounded by river estuary in Bangladesh
<i>Chira</i>	Flattened rice
<i>Churi</i>	Bangle
<i>Haat</i>	Local market place
<i>Mahasen</i>	Tropical cyclone made fall in Bangladesh
<i>Mohajon</i>	Local money lender
<i>Muri</i>	Puffed rice
<i>Nargis</i>	Cyclonic storm passed over Myanmar and Bangladesh
<i>Nakshi Kantha</i>	One kind of embroidered quilt
<i>Parishad</i>	Council office
<i>Pucca</i>	Walls of bricks and roofs of concrete
<i>Sidr</i>	Super cyclonic storm struck Bangladesh and Andaman Island
<i>T. Aman</i>	One variety of rice
<i>Thankuni pata</i>	Asiatic or Indian pennywort
<i>Tulsi pata</i>	Basil leaf
<i>Unnoto Chula</i>	One kind of stove made of clay
<i>Van</i>	One kind of rickshaw

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**Map: Study Area**

# **Chapter One**

## **Introduction**

### **1.1. Background of the study**

Bangladesh, is a lowland deltaic island which is formed by the Brahmaputra, the Meghna and Ganges rivers and ranking globally as one of the most vulnerable and disaster-prone areas. Eckstein et al. (2021) stated that according to Climate Risk Index, Bangladesh ranks 7<sup>th</sup> most affected among 180 countries by weather events during 2000-2019 whereas 9<sup>th</sup> in annual fatalities, 13<sup>th</sup> in losses, 37<sup>th</sup> in fatalities per 1,00,000 and 37<sup>th</sup> in losses per unit GDP. This country is vulnerable to disasters due to the geographical location, geological formation of the earth's surface, land characteristics, rivers and tributaries, funnel shape of coastal region, etc. Hence, the GOB (2010) mentioned several characteristics of this country in the National Plan for Disaster Management 2010-2015 and Standing Orders on Disaster. These characteristics are: large network of rivers and channels, huge amount of water discharge on the rivers and channels, islands between these channels, shallow and funnel type coastal region, strong wind action, etc. However, over the last three decades, this country has experienced more than two hundred natural disasters (CEDMHA, 2020) and these disasters include floods, droughts, river bank erosions, cyclones, tidal surges, tornadoes, earthquakes, salinity, epidemic, etc. Among these disasters, flood is an annual phenomenon which mostly occurs during the months of July and August. Different types of floods occur in Bangladesh such as, flash flood, rain flood, monsoon flood and coastal flood (GOB, 2010). The flood of 1988 affected more than sixty (61) percent of the entire land of the country, whereas the affected area was about seventy (67) percent by the flood of 1998, near to forty (38) percent by the flood of 2004 and up to forty (42) percent by the flood of 2007 (GOB, 2010). By considering the affected land areas these four floods are supposed to be the most devastating events in near past. As a result, flooding is one of the most noticeable sources of vulnerability. Besides, the cyclones are the most destroying events in the Bangladesh coast which causes the country to be victims of some of the worst casualties in the world. Over the

last few decades Bangladesh coast has faced several cyclone and cyclonic storm surges such as, Bhola cyclone in 1970, Urir *Char* cyclone in 1985, cyclone in 1991, cyclone *Sidr* in 2007, cyclone *Nargis* in 2008, *Aila* in 2009, *Mahasen* in 2013 and *Amphan* in 2020 (Hossain & Mullick, 2020 and GOB, 2010). Among these, the cyclones of 1970, 1991 and 2007 were recorded as the deadliest events. Moreover, the droughts of 1972, 1973, 1974, 1978-79, 1981, 1989 and 1999 and landslides of 2000, 2003, 2008, 2009, 2010, 2011 and 2012 were severely catastrophic.

The impacts of disasters on Bangladesh have become a significant issue across the globe. UNDP (2004) reported that Bangladesh faces major disasters every year which causes them on average to lose 3.02 % of its GDP over the last 10 years and (Huq, 2016). With huge vulnerability, Bangladesh has developed disaster management mechanisms over the decades through experience, own capacity and assistance from external sources. Special progress was found in the preparedness and mitigation, the death toll drastically reduced during cyclones. This success came from the government-led preparedness program in early warning and early evacuation. Bangladesh has several achievement tiers in managing disaster. The disaster management mechanisms of Bangladesh are guided by some national and global drivers. Such as, National Plan for DM (2010-2015), (2016-2020) and (2021-2025), National DM Policy (2015), DM Act (2012), Standing Orders Disaster (2010), Hyogo Framework for Action (2000-2015), SAARC Comprehensive Regional Framework for Action (2006-2015), etc. National Plan for DM is separated by the specific plans for disaster management (cyclone management plan, flood management plan, earthquake management plan, tsunami management plan, etc.), Ministry of Food and Disaster Management (agency plan, disaster management bureau, disaster risk reduction, cyclone preparedness plan) and sectoral development plans (local level plan, city corporation disaster management plan, district disaster management plan, *upazila* disaster management plan, union disaster management plan, municipality disaster management plan). Many inter related committees work in managing disaster in Bangladesh at sub-national level and national level. Along with the government initiatives the community people developed their own mechanisms for disaster

management at the local level. They apply those coping mechanisms in case of food, fodder, and fuel crisis, agricultural damages, losing livelihood options, water, health and sanitation issue, violence against women and girl, making the community neat and clean. Furthermore, they participate in creating hazard maps, risk assessing through identifying hazard and assessing vulnerability and analysing risk, carrying out awareness raising campaigns, providing psychological support, medical first aid, restoring agricultural activity, distributing relief, integrating development activities, search and rescue operation, maintaining physical and relational connectivity, etc.

Community based disaster management may emerge as the significant risk reduction holistic approach which gives importance to all phases of disaster such as, pre, during and post disaster. It is supposed in this approach that the community people participation is essential for sustainable disaster management. However, this approach aims to reduce the susceptibility of community people by their active participation, prioritizing the most vulnerable groups in the community, taking community specific risk reduction measures, recognizing existing coping mechanisms and capacities, reducing in vulnerability, linking disaster with development and taking support from outsiders. This study recognizes the community's practiced/existing coping mechanisms and their active participation in risk reduction options. Moreover, the application and effectiveness of practiced coping mechanisms and community People's participation in risk reduction options to reduce risk and also address the disaster resilient community.

## **1.2. Importance of the study**

Bangladesh is severely exposed to floods, cyclonic storm surges, seasonal droughts, riverbank erosion, etc. These disasters resulted in the loss of crops and damages to structures and infrastructure. The losses in household agricultural activities such as, vegetable gardening, poultry, fisheries, and planting resulted in loss of income. The damages to road and communication, bridges and culverts and other infrastructure may disrupt the normal economic activities. The damage and loss do not affect everyone

equally. The marginal and vulnerable community is more exposed to the effects of climatic natural disasters.

Bangladesh national economy is exposed to different disasters every year. For example, about 56 percent households affected by disaster once followed by 26 percent in twice and 16 percent at least three times. Among the households, about 24 percent are affected by flood followed by cyclone at 15 percent, 10 percent by thunderstorm, 10 percent by drought, 9 percent by water-logging, 8 percent by hailstorm and 6 percent by storm/tidal surge (BBS, 2016). The disasters that affect Bangladesh, have enormous impacts on life and property. For instance, the cyclone in 1970 killed about 5,00,000 people, 4,00,000 dwellings damaged, 2,300 dwellings destroyed and caused an estimated \$63 million-\$86 million in economic impact whereas the 1991 cyclone caused over 1,38,000 deaths and an estimated \$1.8 billion-\$3.0 billion economic impact (ADB, 2016). The super cyclone *Sidr* in 2007 caused more than 5,000 deaths and estimated economic damages of \$2.3 billion (Eskander & Steele, 2019 cited in Practical Action, 2021). They add that Bangladesh has allocated \$2.25 billion in the budget of 2018-2019 FY for managing disaster risks. On the other hand, the catastrophic floods of 1988 and 1998 affected over 60 percent of total land caused the economic losses of more than over \$12 billion in 2014 dollars. However, the major disasters during 2000-2013 estimated about \$771 million economic losses and affected 7.1 million people and 600 lives lost on average per year (ADB, 2016). Moreover, the slow onset of disasters (drought, salinization, sea level rise) have significant impacts on agriculture and agriculture-based livelihoods (Zamudio & Parry, 2016 cited in Practical Action, 2021).

Disaster management is a comprehensive and integrated approach which involves various stakeholders in pre (mitigation and preparedness); during (response and recovery) and post (reconstruction and rehabilitation) disaster phase. Disaster management is not an individual initiative, rather, the active participation of every stakeholder makes the management capacity effective and sustainable. Community-based disaster management refers to the actions which involves community People's active participation in



identification of hazards, assessment of vulnerability and risks, and implement the community induced plan for reducing disaster risks. Community people are the main performers and propellers who directly share the benefits of preparedness and mitigation for managing disasters and development. The community-based initiatives such as, the sharing and borrowing of agricultural means (seed, seedlings, fertilizer, pesticide and insecticide), loan, micro-credit, etc. are the important strategies in managing disaster.

However, in accordance to above roles and responsibilities of community people, it is significant to assess the role of the community people in disaster management. This study therefore, aims to assess the role of community people in managing disaster. The present study is very important for measuring the active role and advantages of community-based disaster management while Bangladesh has to face many problems and challenges.

### **1.3. Rationale of the study**

Research in disaster management by using any approach is important in Bangladesh as this country experiences various types of disasters. Many researchers conducted researches on disaster, its impact on population, social and economic issues, national economy etc. in different ways. Biswas et al. (2015) developed a framework for community-based disaster management for agricultural sector by analysing community's coping strategies and assessing the vulnerability of the community and their capacity to manage disaster risk. Besides, Baas & Ramasamy (2008) minutely addressed the community-based approach to disaster management by focusing the community adaptation strategies. Furthermore, Ahmed et al. (2017) discussed the effectiveness of community-based adaptation practices of on-farm crop-based production and on-farm non-crop-based initiatives in context of technical achievability, financial sustainability, social suitability and gender sensitivity. Gender issue in community-based disaster management has been explored by Hossain (2014) and his study found that women participate in disaster management process through decision making, awareness raising activities, adaptation strategies etc. On the other hand, Roy (2018) analysed the strengths,

weakness, opportunities and threats (SWOT) of community-based adaptation to flood and drought affected areas and coastal regions.

Researchers (Huq, 2016; Ahamed, 2013; Ikeda, 2009; Sahw, 2006 and Robert et al., 2006) identified the root causes of the susceptibility of community to disaster and the long term challenges to build future resilient and sustainable communities. Various coping strategies in reducing vulnerability, innovation and adaptation are compulsory to save the communities from climate induced disasters. The community takes initiatives to manage disaster risk by raising awareness among the people, receiving related information and disseminating among the people, taking appropriate prevention measures to lessen the risk, showing mutual respect to each other, communicating timely and providing regular specialized training. This integration of community initiatives in the policies of government makes the effort successful and sustainable. The interaction of the development partners and communities is important in managing disaster risk.

The present study tries to fill the gap of the previous studies by exploring the effectiveness of community-based disaster management in Bangladesh in the context of the effectiveness of community coping mechanisms along with government and NGOs' initiatives to strengthen those coping mechanisms, and the community people and community-based organizations participation in risk reduction options.

#### **1.4. Objectives of the study**

This study mainly aimed to explore the effectiveness of community-based disaster management in Bangladesh. The particular objectives of this study were:

- to identify the socioeconomic and demographic background of disaster affected community;
- to explore the practices of coping mechanisms of community people during disasters;

- to explore the community People's participation in disaster risk reduction options as part of community-based disaster management;
- to explain the application of coping mechanisms and community People's participation in risk reduction options; and
- to identify what kind of effectiveness of community-based disaster management prevails in Bangladesh?

### **1.5. Research questions**

- What are the socio-economic and demographic background of the people in the study area?
- What are the practiced/existing coping mechanisms within community for disaster management?
- How the community people participate in DRR options as part of community-based disaster management?
- What is the application of coping mechanisms and community People's participation in DRR options in community-based disaster management? and
- What kind of effectiveness of community-based disaster management prevails in Bangladesh?

### **1.6. Operational definition of community-based disaster management**

**In this study the community-based disaster management refers to the practiced/existing coping mechanisms of community people regarding disaster management, the government and NGOs' initiatives to strengthen those coping mechanisms, the community people and community-based organizations (CBOs) participation in risk reduction options at community level.**

## **1.7. Theoretical viewpoint of disaster management**

Various theoretical approaches examine the causes and impacts of disaster that is related to disaster management. The approaches are: Marxist interpretation on disaster; Weberian perspective of emergency management, management theory and integration in national, international and local.

### **1.7.1. Marxist interpretation on disaster**

The Marxist interpretation on disaster incorporates three views on disaster such as, economic and political condition; capacity to disaster; and links among development, vulnerability and disaster.

#### ***1.7.1.1. Economic and political condition***

The economic condition of a community's individual may increase vulnerability to disaster which creates risk of lives and properties. Lower economic condition makes higher vulnerability or vice versa. The economic condition of a community depends on various factors such as, education, employment, industry, cultivable land, social mobility, disaster attack, geographical location, poverty, dependency on external assistance, etc. On the other hand, political powerlessness also makes an individual of the community vulnerable, which indicates that the individual is not engaged in the decision making process. Financially poor, minorities, marginalized people are likely to live in dangerous areas which affect them and political powerlessness induces vulnerability. Community members who lack power were unable to participate in the decision making process regarding disaster management and were forced to obey the decisions made by the other stakeholders. However, the vulnerabilities and risks of these helpless community members were rarely taken into consideration, which further put these groups at risk.

#### ***1.7.1.2. Capacity to disaster***

Capacity refers to the economic prosperity and ability to fully recover in terms of property and other economic means. For instance, economic prosperity in the community makes them stronger than the community who does not have the opportunity. The poor people are more vulnerable to disasters than the rich people due to their less income, lack

of employment opportunity due to lack of education, unsustainable livelihood options, living in dangerous areas and unsafe housing, more dependency on agricultural production, taking loan from various sources, lack of property, more dependent family members, etc.

### ***1.7.1.3. Links among development, vulnerability and disaster***

According to Marxist view on disaster, there is a strong relationship among the development, vulnerability and disaster. Well planned development activities may mainstream the disaster issues which lessen the vulnerability of the community people and on the other hand, haphazardly occurred development activities induce more vulnerability. If the vulnerability lessens the impacts of disaster may automatically be reduced and if the vulnerability boosts the impacts of disasters may be increased.

Sustainable development activities or options may incorporate the technologies to lessen or manage the impacts of disasters and to build community's adaptive capacity to climate change induced disaster. Positive use of technological knowledge may generate ability to cope with disaster and on the other hand, negative use of that knowledge may induce extra vulnerability to disaster.

Therefore, the Marxist interpretation on disaster is related this study because this theoretical approach explains how economic condition make vulnerable community to disaster and also discuss how the economic capacity use in recovery from the aftermaths of disasters. The people in the community of this study area are poor, marginal, have lower economic condition and they are living in disastrous area which make them vulnerable to disaster.

### **1.7.2. Weberian perspective of emergency management**

Weberian perspective describes the emergency management in several ways, such as, cultural values, attitudes and practices viewpoints; social constructionist viewpoints; organizational behaviour viewpoints; emergent behaviour viewpoints and risk perception and communication viewpoints.

#### ***1.7.2.1. Cultural values, attitudes and practices viewpoints***

Community's cultural values, attitudes and practices make vulnerable condition of the individual especially for the women and girls mostly in developing and under developed nations. Sometimes the women in the disaster affected area were not allowed to leave the household without the permission of her male counterpart in disastrous situation. Due to lack of professionalism a strong institutional mechanisms among the stakeholders of disaster management could not be established, which further aggravated the vulnerability.

#### ***1.7.2.2. Social constructionist viewpoints***

Gender is constructed from the social constructionist view which makes women vulnerable to disaster due to their inadequate access to assets, education, decision making process and lack of technological knowledge, etc. Gendered division of labour in the community and other socio-economic, political and cultural attributes induce vulnerability to disaster. Sometimes, in the developing and under developed country girls or women are treated as social burden and they are not allowed to take decision without the permission of a male counterpart or household head.

#### ***1.7.2.3. Organizational behaviour viewpoints***

Quarantelli (1985) identifies three problems which are associated with organizational behaviour pattern in disaster management, these are: the communication process; the exercise of authority; and coordination and control. The existing communication gap induces vulnerability of the community in disastrous situation where the means of communication are far less than the process of communications. Before a disaster occurs, the authority may be stronger than after the occurrence of the event that creates vulnerability and imposes risks. Absence of synchronization amongst the organizations generates miscommunication in disaster management procedure.

#### ***1.7.2.4. Emergent behaviour viewpoints***

The behaviour of individual in the community may vary by time. In times of disaster, the first responders carry out the most crucial tasks, if they consist of untrained volunteers, it

may create serious issues, such as haphazard decision making further contributing to the already existing risks.

#### ***1.7.2.5. Risk perception and communication***

The community's individual perception about risk and communication among them may reduce or induce vulnerability.

The Weberian perspective on emergency management is related to this study because of this perspective may discuss the vulnerability of the community people in the cultural context. As the community people have their own cultural values, attitude and practices, so they use it to lessen susceptibility and upsurge adaptive capability. The perception of the community in terms of risk and its management, gender role in managing disaster, gender-based vulnerability, communication process, and authority in the community are the Weberian perspective of emergency management that also integrates in to community-based disaster management.

### **1.7.3. Management theory**

#### ***1.7.3.1. Political and organizational actions***

Community-based disaster management typically depends on the leadership of the people of the community. The political effective leadership and strategic planning may reduce the vulnerability or vice versa. The leadership quality in the community's people for combating disaster risk may incorporate public opinion and knowledge regarding disaster management. Weak political leadership also creates vulnerability.

#### ***1.7.3.2. Availability of information***

Lack of availability of information on hazards, risk, disaster and climate change make the community vulnerable to disaster that causes injury to health, loss of life and damages to property. Perception of the people on information of climate change related issues may vary the attitudes towards risk management.

### ***1.7.3.3. Socio-economic and organizational system***

Socio-economic and organizational system including the natural system, technological opportunity, social structure and organization, political process and leadership, economic opportunity and system, cultural diversities, organizational pattern and behaviour and socio-psychological system directly affect the level of vulnerability complicatedly.

The management theory addresses the leadership quality of the community member's, strategic planning for managing disaster, knowledge of the community people in making decision for disaster risk reduction, availability of disaster related information, socio-economic and organizational system that are very much involved in community people contribution in managing disaster risk.

### **1.7.4. Integration, networking and collaboration**

Integration among the national, international and local agencies and government authorities' initiatives regarding DRR and risk management options may consider lessening the susceptibility of the people. Networking and collaboration of the local government, central government and locally active INGOs, NGOs and research organization may also reduce the susceptibility and improve adaptive capacity of the disaster affected people. Therefore, the integration, networking and collaboration among the stakeholders may help to take measures in the preparedness and improvisation and also upgrade adaptive capability of the vulnerable people.

The sustainable disaster risk management or risk reduction options for effective community-based disaster management mostly depends on the integration, networking and collaboration among the national, international and local agencies, local government, central government and locally active INGOs, NGOs and research organization for preparedness and improvisation and improving adaptive capacity.

### **1.7.5. Vulnerability theory**

As the disaster comprises of susceptibility, hazards and risk, so, the theory of vulnerability has carried out the significance in the research of community-based disaster



management. Parker et al. (1997) assumed that vulnerability is experienced in a range of contexts or at various levels or sectors; national and sub national (regional), institutional, social (district, community or domestic), military, systems and networks, economies and environmental. Disaster in Bangladesh reports various types of vulnerability, such as, individual, household, social, economic, physical, environmental, institutional, system and place vulnerability. Each of the vulnerability in the community, thus, extends the magnitude of risk for the individual. The vulnerability of individual may vary by the context of age, gender, race, ethnicity, environmental set up, economic condition, social mobility, cultural dynamics etc. The vulnerability of the community people depends on types of natural disaster (drought, flood, cyclone, tornado, storm surge, salinity intrusion, etc.), political commitment, social capital, economic policies, government and NGO initiatives, access to resources, etc.

Different types of vulnerability among the community people increase the level of risk and magnitude of the impacts of disasters. As vulnerability theory addresses the factors behind the vulnerability of community.

#### **1.7.6. Resilience theory**

Some replicas of resilience are found in literature. Such as, Richardson (2002) model of resilience focusing on recovery, healing and getting past of an adverse event. On the other hand, Harris (2008) model of resilience deals with the individual's ability to bounce back and capacity to overwhelmed adverse effect. Greve & Staudinger (2006) model comprised both the risks and development work that is useful to understand the interface between the characteristics of an individual and their assets for creating the outcomes of resilience. Moreover, Trivedi et al., (2011) model deals with the individuals' ability to recover from stress which is discussed in primary, secondary and tertiary level of resilience in their model. They argue that the measures regarding resilience over time (cited in Coatta, 2014). Wild et al. (2013) described the resilience model by focusing individual resilience within the household, family, neighbourhood, community and

society at last (Cited in Coatta, 2014). This model focuses on the individual abilities and characteristics regarding his/her demand.

#### **1.7.7. Equity theory in disaster management**

The fairness and equity in addressing vulnerability to disasters and the risks and associated risks of disaster which motivate the individuals in the community to participate in the managing or reducing the impacts of disastrous events. The ideas of fairness and equity in the community are initiated by John Stacey Adams in 1963. If the community's individual identifies the equity in participation, then they input their best option and on the other hand, if they identify inequities in their participations, they do not refused to give any input due to lack of fairness in the process. Therefore, Adams argues that the higher perception of equity of an individual makes his or her to involve in the process, otherwise, vice versa.

The activities related to managing or reducing disaster risks protect human life, property and ensure food security. The mutual understanding among the community people, cooperation, friendships are promoted humanitarian actions of managing or reducing disaster risk. Thus, the humanitarian action deals with equity in the community and it involves human being irrespective of ethnicity, race, class, caste, gender, religion, nationality, education, social status, political ideology, and economic conditions. As a human being, every individual in the community entertains that the same opportunity must be provided to involve in disaster management activities by giving their plan to take measures to mitigate the impacts of disaster. The theory of equity based on the humanitarian principles while it does not allow biasness, nepotism, tribalism or nationality in involving the individual in the community disaster preparedness, mitigation, response, recovery and further sustainable disaster risk management or risk reduction initiatives. The theory of equity in disaster management rigorously addresses the vulnerability and risk of community people by focusing their needs. Types of vulnerability, extent of vulnerability among community people, assessment of vulnerability, risk perception of the people are well addressed by the theory of equity.

## Chapter Two

### Review of Literature

ADPC (2013) explained some cases on the community-based risk management in the context earthquake in the study titled “*Community-based Earthquake Risk Management in Dhaka City: Community empowerment for earthquake preparedness*” which focuses on the community empowerment for earthquake preparedness. ADPC conducts the study through selecting and linking communities and service providers (SPs), sensitizing the community people on earthquake, conducting participatory vulnerability assessment (PVA) and enhancing capability of the community of Dhaka City. This study has been conducted by using triangulation techniques of qualitative method to focus on the earthquake preparedness of Dhaka City. For this study, ADPC selected 30 communities of the multi-storey buildings, superstores, student dorms, schools, hospitals, garment workshops, staff accommodations and office buildings and the communities have been selected based on physical vulnerability of the community and who showed interest in this study. The study showed that the project’s stakeholders changed the mind-set of the communities and service providers through sensitizing, involved local ward commissioners as an owner to organize participatory vulnerability assessment meeting, enhanced the capacity of the communities through formation of Ward Disaster Preparedness Committee, school orientation, community integration with service providers, making blood donation group and ensuring linkage between service providers and communities and finally raised awareness among the people and the communities. Finally, this study found that the direct involvement of the local leaders (Ward Commissioners) help to mobilize the community, the involvement of community people help to plan for community sensitizing meeting in accordance with the People’s convenience, community participation as host help to encourage the people to take responsibility to ensure People’s participation and support by providing necessary logistic facilities. This study also found that Participatory Vulnerability Assessment (PVA) approach is very effective in making the community People’s realization about their

status regarding earthquake risk while the PVA considers the socio-economic condition of the community people, physical structure of the defined community, environmental condition and geographical location of the defined community existence, the views of the community people about service providers (SPs) on their capacity of recognize disaster response and the perception of the community people regarding earthquake disaster and policy matters. As the above case do not explore the effectiveness of the total community-based disaster management approach as disaster management initiative. It focuses on the process of empowering the community by connecting with service providers and community, raising awareness among the community, sensitizing the community on earthquake risk, improving the community's capacity, and involving the local leaders in risk management as all things are primary initiative to engage community in community-based disaster management.

ADPC (2014) again, besides, explored the hydro-meteorological hazards (landslides, cyclones, and floods), community-based disaster risk management efforts, local government actions and local leaders' involvement in the study titled "*Community Empowerment and Disaster Risk Reduction in Chittagong City*". This study disclosed the landslides, cyclones and floods affect typical community of Chawk Bazar, low lying North Potenga, and South Potenga area where the community knows how to drink and cook with saline water while the poor household collected drinking water from 5 km. far from their residents. The preparedness and mitigation measures to manage the risks of landslides, cyclones, and floods, the stakeholder's involvement in enhancing the community's preparedness tools and techniques and strengthening the link and networks among the stakeholders are explained through qualitative case studies. ADPC identified that the communities are aware about their need to reduce vulnerability through training for skill development, providing facilities of water and sanitation in the shelter, advocacy with service providers, awareness raising about disaster preparedness, etc.

Practical Action (2010), in the study titled "*Community Preparedness in Bangladesh: Learning from Gaibanda, Bogra, Sirajganj districts following the floods of 2007*" found

the people of Gaibanda, Bogra and Sirajganj districts of Bangladesh are prepared for future disasters as they have preparedness plan. The report of Practical Action revealed that the community people are able to prepare food during floods, arrange portable cooking stoves, preserve rice and dry foods, move the livestock to embankment from the residence and convey the message for preparedness better, if they received their training as community member and this situation is vice-versa for unprepared community. The prepared communities could identify and prioritize the problems and prepare community-based disaster management plans; they are able to create and understand mass awareness and develop disaster risk reduction plan as they received training on preparedness plan. The prepared communities are involved in making disaster preparedness plan with the help of Union Disaster Preparedness Committee while they are aware about disasters, its coping mechanisms, adaptation strategies, preparedness plans, roles, and responsibilities in disaster management activities while they have been trained up on making an action plan for community disaster management that the report stated. This report also identified that the prepared communities are more knowledge on community-based disaster preparedness because of their ability to cope with disaster, making secure livelihood options while the unprepared communities are not aware about disaster management, do not receive training on disaster preparedness, have no knowledge on coping mechanisms and adaptation strategies and as a result, they recover themselves from the crisis slower. It has been concluded in the report that the people who received the training on community-based disaster preparedness could reduce the loss of property and make them safer from others who not receive that type of training. The community people, who are not involved in the disaster preparedness and management, not capable of restoring their livelihood in the changed scenario and do not able to tackle the challenges of the disasters while the prepared communities are able to do so properly. The above literature reports that some initiative of community-based disaster management approach do not focus on the total approach while it is a pilot initiative of Practical Action. The methodology of the report is not clearly reported while it is an action-based research. Furthermore, the topic of the report and the study area are not similar with the present study.

Biswas et al. (2015) assessed the susceptibility of the community people, their capacity for facing disaster impacts and risk in agricultural sector by identifying local hazards and develop a framework for community-based disaster management for agricultural sector by analysing community's coping strategies in the study titled "*Community Based Risk Assessment of Agricultural Sector in Sreerampur Union of Bangladesh*". This study has been conducted through mixed method (qualitative and quantitative) while the data collection techniques are FGD, KII, direct observation and survey interview. The study has been conducted on the agricultural sector of Sreerampur Union of Dumki Upazila at Patukhali districts of Bangladesh. The authors identified the population, households, buildings, sources of income, livelihood options such as, agricultural farming, spinning, fishing, pulling of rickshaw and van, teaching at primary school, aquaculture as elements at risk. The authors mentioned that lack of water in the natural reservoirs induces vulnerability to agricultural sector in this region while it makes the need for supplementary irrigation and on the other hand, water scarcity causes drought and the heat increases pest attack and as a result seasonal crop production decreased. They also mentioned that the community in this area face a lack of finance, supplementary irrigation scarcity, lack of credit, etc. inherently and identify pest and diseases as epidemic, seasonal drought, thunderstorm, storm surge, storm wind, hail storm, tidal flood and salinization as the hazards in their study area and argued that these hazards affected agricultural resources, livestock, poultry, fisheries, infrastructural and structural sectors, health sector, etc. The pests and disease epidemic hazard bear the highest impact on agricultural sector while salinization bear the lowest impacts in the same sector and the hazards damaged property, crops, livelihood options, residence with high severity in the periods of April to May and September to November every year that the researchers stated and added that the farmers' community of this region take some adaptation strategies to lessen the effects of climate change on agriculture. They also reported that farmers adopt new vegetables for cultivating round the year, such as, raise beds fruits cultivation, salinity and submerged tolerant rice varieties, homemade compost, cultivation of seasonal vegetables, fruits in the homestead gardening and finally they

migrated to new livelihood options such as, small business, motorized or non-motorized rickshaw or van pulling, day labouring, handicraft, tailoring as non-farm activities. Finally, the researchers found that the communities are increasingly migrating into the non-farming activities and the farmers are applying alternative options for reducing disaster risks. The above literature mentions that a community-based disaster management is a tool for assessing the hazards, vulnerability, and capacity of the local community in the context of agricultural sector. It does not explore the effectiveness of community-based disaster management approach while it mentions various adaptation strategies to reduce risk that the community take to adjust their livelihood agricultural and other non-farming options. The topic of the above study is related to the community-based disaster risk assessment for agricultural sector and the methodology of the study covers both the quantitative and qualitative approaches.

Baas & Ramasamy (2008) explained the community-based adaptation practices for agricultural sector in Northwest region sub-districts of Chapainawabganj and Naogaon districts of Bangladesh in their study titled “*Community Based Adaptation in Action: A case study from Bangladesh*”. However, the report is based on the participatory demonstration, orientation meetings, field days, farmer field schools and community rallies of the stakeholders. The effectiveness of community-based disaster management is partly related to this report but do not fully address the system while the authors draw the preference of adaptation option by the community for their farming. They mentioned that homestead gardening, drought tolerant fruit tree gardening, mini nursery for fruit trees, improve stoves for household use and rain water harvesting is highly preferred by the farmers of Barind<sup>1</sup> tracts as livelihood adaptation options. The authors also stated that the farmers prefer homestead gardening for additional income for their household, creating alternative livelihood and ensure nutritional security while drought tolerant fruit trees gardening is preferred for cultivating drought tolerance crops for diversification, mini-nursery fruit trees as a community initiatives and for generating income, improved stove for household use for saving time and fuel and rain water harvesting for gaining

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<sup>1</sup> Undulating uplands with red/yellow clay soils of Northwest Bangladesh.

economic benefits through stable income. Moreover, the community prefer alternative cereals, e. g. maize as drought tolerance variety and income stabilization option. The community take some adaptation strategies which have benefit over existing practices such as, water saving rice cultivation, vegetable gardening in homestead, supplemental irrigation by mini-pond excavation, dry seedbed nursery for *T. Aman* rice, short duration *T. Aman* rice, chickpea and linseed cultivation in short duration, drought tolerant maize cultivation, papaya fruit tree cultivation for drought management, two chamber manure preparation in the Farm Yard, drought resistant fruit tree cultivation in the nursery, mango orchard management, existing stove improvement for household use, gardening of Apple Kul (Jujube), short duration *T. Aman* in block demonstration etc. Due to the climate change, the livelihood of disaster-prone area, inadequate capacities, limited access to livelihood options induce vulnerability which may be reduced by the community level intervention, awareness raising within the community and focusing on the current variability and factor in the climate change (Baas & Ramasamy, 2008). They mentioned that the adaptation strategies may include the social learning process of the community to impede impacts of related impacts by creating capacity to cope with adverse impacts. The focusing point of this issue covers the decision making and capacity building processes for shaping social learning, transferring technology, innovating, and developing pathways and this social learning may identify the best practices of community-based adaptation by participatory processes. For community-based adaptation, the authors included that multiple and integrated physical measures, for instance, water management by linking canals, irrigation and storage of water, water harvesting, adapting crops varieties, farming system diversification, seeds and fodder storing are needed. Livelihood diversification and market management, strengthening local institutional and individuals' capacities, structural and environmental facilities and raising awareness and advocating disaster risk management may be essential for community-based adaption to lessen the impacts of climate change. They suggested that institutional capacity building and organizational networking with responsibility, promoting local level adaptation by applying livelihood options and sustainable natural



resource management, linking between research and development, monitoring ongoing adaptation practices within the community, assessing the indigenous adaptation strategies, community level income generating options by crop diversification and promoting public-private partnership for community based adaptation.

Ahmed et al. (2017) discussed the effectiveness of community-based adaptation practices of on-farm crop production and on-farm non crop-based initiatives in context of technical achievability, financial feasibility, social suitability and gender sensitivity in the study titled “*Community-based Adaptation: An Analysis of the Best Practices in the South-western Region of Bangladesh*”. The study has been conducted by using key informant interview (KII), primary stakeholders’ interview through checklist and reviewing some secondary documents to evaluate the effectiveness of community-based adaptation modality of the agricultural sector in the southwestern several sub-districts of Satkhira, Khulna and Bagerhat district of Bangladesh. The study explored the on-farm crop production such as, vegetable gardening in the household, saline lenient paddy variety, combined cropping of paddy with vegetables, local market based high value crop production and on-farm non-crop community-based adaptation such as fisheries in the *ghers*/ponds, goat rearing, poultry farming, crab fattening, livestock /dairy farming, and fruit production. The study found that the on-farm crop production is technically feasible and has been successfully adapted while it is cultivating everywhere because of avoiding salinity. The financial issue of on-farm crop production is viable while it have the great opportunity in multiple harvesting and the farmer enjoys increased crops production and more income from the same land. The vegetable gardening, saline tolerant paddy cultivation and other crops production are financially viable although the land is inadequate. The on-farm paddy cultivation is the most socially acceptable initiative of community-based adaptation practices in the agricultural sector and the next initiative is vegetable production. The women related to on-farm crops production are trained and the provided support during the initial stage while they are found happy in continuing with their role in crops production system and other production related activities. On the other hand, the study also found that the on-farm non-crop such as shrimp’s cultivation in

ghers, crab fattening, sheep and goat rearing, poultry rearing, livestock rearing are technically feasible as on-farm non-crop production adaptation practices in saline water prone areas of south western regions while the crab fattening is the most financial viable practice and the other successful practice is duck rearing and local varieties chicken production and then the livestock, goat and fish production. All the top performing on-farm non-crop products such as sheep and goat production, fish, crab are social acceptability except eel fish, pork meat. Moreover, the gender sensitivity of on-farm non-crop product is found while the women are confident in handling of production system and marketing system.

Hossain (2013) discussed the government's plans, policies, and practices in community-based disaster management in Bangladesh, the role of social work in enhancing the community participation to manage disaster and the barriers to community participation in managing disasters while the paper based on the qualitative method and the information has been collected from reviewing secondary documents related to this topic. The study titled "*Community Participation in Disaster Management: Role of Social Work to Enhance Participation*" explored that the policies of Bangladesh in community participation in disaster management such as capacity building mechanisms of the community and institutions, capacity to assess risk by enhancing skills and knowledge, community based risk management and risk reduction program, mainstreaming livelihood option to disaster risk management and risk reduction, focus on the women, children, people with disability and all stakeholders based disaster management approach etc. The study also mentioned that the government's National Plan for DM emphasized on the community people participation in disaster management of Bangladesh under the umbrella of Flood, Earthquake, Drought, Cyclone, Storm Surge and Tsunami Management Plan and River Erosion Management Plan and the disaster management for each local government bodies such as, district, *upazila*, union, *pouroshobha* (Municipality) and City Corporation. The author explained the various national and sub-national institutional frameworks for disaster management in Bangladesh which ensure community participation in managing disaster. The practices of the government of

Bangladesh explored in this paper which focuses on the flood protection embankment, cyclone and flood shelters, drainage channels, sluice gates, warning system, institutional framework, disaster management plan, awareness campaigning, etc. The author found that the old-aged thinking of the distribution of relief, administrative hierarchy, scarcity of financial resources, religious and cultural values and norms, and lack of sanitation in the shelter make barriers in participating to manage disasters in Bangladesh while the role of social work used to enhance the community participation. This paper mainly based on the discussion of institutional frameworks, policy, plans and practices, barriers to community participation and roles of social work in enhancing the community participation in managing disaster while this paper is based on qualitative method.

Again, Hossain (2014) explored the gender perspective of community-based disaster management in Bangladesh through studying the flood affected people in his study titled *“Gender Issues in Community-based Disaster Management: A Study on Flood Affected People in Bangladesh”* while the researcher used the triangulation of qualitative and quantitative method for collecting both primary and secondary data from Belkuchi upazila of Sirajganj district, Bangladesh. For collecting the data on gender specific participation in disaster management, decision making process, gender specific needs and responsibilities, the author conducted KII, in person interview, FGD, non-participant observation and direct observation. This study found that the community level participation of people in structural preparedness phase is very low, while they are little bit involved in the non-structural measures such as, receiving training, raising awareness, and transferring money and technology. But the negligible number of women participate in the awareness building program as they do not attend training program due to social and religious constraints. But they play important role in preserving food, fuel, fodder, raising household plinth and bank of the pond as preparedness in pre-disaster phase. Although, the women play other roles for managing disaster risks but they had limited access in decision making process. The women collect water from far, purify water to drink while there is division of labour between men and women that the researcher explored. However, the women face problem in cooking or making food, collecting water

and fuel, maintaining reproductive health and *Purdah* etc. (Hossain. 2014). The researcher found a close correlation between adaptation strategies and sex of the respondents while women jointly take the decision for post flood situation. However, the study recommended community-based floods shelter construction, setting community-based meeting for every village, training for local leaders, providing loan/grant, providing educational materials among students, making flood control dam, arranging trainings and awareness building program, etc. This study explored the gendered role in flood management from the view point of community-based disaster management by following qualitative and quantitative method. As the study is based on the flood management and gender issues in community-based disaster management therefore, it do not explore the effectiveness of community-based disaster management approach in Bangladesh as a whole and the study area is different in nature.

Yodmani (2001) presented paper to the “social protection workshop 6: protecting communities-social funds and disaster management” titled “*Disaster Risk Management and Vulnerability Reduction: Protecting the Poor*” under the Asia and Pacific forum on poverty: reforming policies and institutions for poverty reduction. In this paper the author explored the evidences from Bangladesh on community-based approaches to disaster management and the experience of Bangladesh Red Crescent Society’s community-based disaster management program in Cox’s Bazar where the area is frequently affected by cyclone and tidal bore. The program of Bangladesh Red Crescent Society enable the community people to manage cyclone impacts by using participatory method for the formation of Village Disaster Preparedness Committees, campaigning for raising awareness, disaster preparedness training for community people, training on cyclone warning signals, first aid, maintaining shelter, implementing preparedness measures, etc. The cyclone preparedness program (CPP) has focused in this paper while highlighting the usability and understandability of cyclone related information and a good network for disseminating this information, volunteer training, campaigning for public awareness, etc. In addition, the author shared the experiences of CARE Bangladesh through explaining the food for work initiative to make the communities flood proofing through raising the

plinth of house and public and private infrastructure, making foot paths, saving money etc. after the flood of 1998 and the community-based flood mitigation and preparedness program for municipalities of Tongi and Gaibanda. The paper is based on the community-based initiative in Bangladesh but do not explore the effectiveness of community-based disaster management approach.

Shaw (2006) in his research titled *“Critical issues of community-based flood mitigation: Examples from Bangladesh and Vietnam”* shared the experience of Bangladesh. The researcher explored the launching and implementation process of Flood Action Plan (FAP) in Bangladesh with the help of multi-donor support after the devastating flood of 1988 which inundated 60 percent of total land and 52 districts out of 64 districts. The process of FAP launching and implementation focused on the issues of technical, economic and environmental rehabilitation and protection measures that the researcher mentions in this study. The author discussed the reason for implementing and designing this project to lessen the effects of flood on the rural poor communities, enhancing the local coping capacities, local level efforts institutionalizing and involving community while the project started by mobilizing community and raising awareness, taking measures for flood proofing at household level, small scale agriculture and social forestation, making flood shelters, raising tube well and house plinth and managing community based resources that the researcher added. Various initiatives for building capacity of communities such as, formation of Mother’s club, and a forum for the adolescent and children in each community to provide preparedness, health and nutrition related education, provide training for capacity building, raising household plinth, build evacuation centres, sanitation facilities and making embankment to protect flood, take measure for controlling riverbank erosion, etc. have been addressed in this study. This study also identified the community people as the change agent however they take measures for flood preparedness, flood mitigation and local level intervention. The local school teachers, businessmen, religious leaders involve in the community disaster management activities. This study is based on the implementation of the community-based initiatives taken by the government institutions with the help of the partner

organizations by involving the community but do not explore the effectiveness of that initiative and the methodology section is absent in this study.

Huq (2016) conducted a study titled “*Community Based Disaster Management Strategy in Bangladesh: Present Status, Future Prospects and Challenges*” by using secondary sources of data and information of relevant documents, reports, regulations, statistics, literature and articles. The author focused on the aim of the community based disaster management in Bangladesh through considering the issues of Yodmani’s (2001) thought such as, focusing the community’s role in disaster management, increasing community’s capacities to reduce vulnerability and improve coping strategies, linking of the community with development process, empowering the people of the community, recognizing community’s roles and interest in risk reduction, applying multi- and trans-disciplinary approaches and monitoring CBDM. The author also mentioned that the coping strategies of community for facing disaster include raising awareness among the community people where he cited the example of set up radio station for community empowerment (Nawaz & Shah, 2011) and local government dialogue program for community and the financial assistance (Haider, 1991). This study analysed the considering issues in community-based disaster management, barriers in the participation of community people participation in disaster management activities including social and cultural constraints and the community’s coping strategies. The methodology of this study is qualitative and the data and information has been collected from the secondary sources. Thus, the paper do not explore the effectiveness of community-based management in Bangladesh.

Ikeda (2009) in the paper titled “*How women’s concerns are shaped in community-based disaster risk management in Bangladesh*” addressed the gender concerned community-based disaster management in Bangladesh that is formed through local development agents and the communities where the researcher use the example from Gaibanda district of Bangladesh. The study has been conducted through qualitative method of case studies for exploring the way to make changes in the initiative in the char area by community

leader. The paper explored that lengthier and informal discussion on community susceptibility is needed where the ‘whole community approach’ is not relaying and the “target group approach” is also needed to establish women’s in the community. The experiences from disaster are varied for women and men and therefore, gender concern should be addressed fully and properly in the community to reduce disaster risks. To invite various stakeholders in implementing the responsibility for disaster risk management is one of the silent features of participatory approach and the stakeholders are not limited elected politician such as, union *Parishad* chairman or member but also the community leaders like traditional local and religious elites (*Matabbar* and *Molla*) that the paper disclosed. The necessity to build linkage among vulnerable groups, government and NGOs to reduce the vulnerability of the targeted population are also mentioned in this paper. However, this paper do not explore the effectiveness of the community-based disaster management in Bangladesh while it reveals the way to the interaction of the development partners and communities who are affected by disaster and focuses on the different experience of both men and women in disaster, gender concern in community participation in managing disaster risk.

Islam et al. (2013) in their study titled “*Community based disaster risk and vulnerability models of a coastal municipality in Bangladesh*” revealed the multi hazard risk and vulnerability for a coastal municipal and recommend some measures for disaster mitigation. This study has been conducted in the Matlab Municipality of Chandpur district, Bangladesh through focus group discussion (FGD), intensive field study, field visit, discussion with farmers and historical data review of qualitative method. The authors discussed two popular models to identify hazard, assess risk and analyse vulnerability. Such as the SMUG model and the FEMA model where SMUG model used for assessing the importance, manageability, urgency and growth of hazards not for providing the solutions to hazards and the FEMA model used for evaluating the history, susceptibility, extreme threat and likelihood of emergency. They found that the study area (Municipality) is susceptible to floods, cyclone, riverbank erosion, Nor ’wester, heavy rain, drought, sand carpeting, water logging etc. The study also identified the existing

mitigation strategies and their limitation that are not sufficient where they needed modern communication technologies, systematic coping strategies for mitigating their overall vulnerability. Therefore, the study suggested well-functioning early warning system, ensuring active participation of local communities, enhancing indigenous coping strategies by using modern technologies, etc. This paper is based on the integration of SMUG and FEMA models to identify hazard, assess vulnerability and analyse risk of the people of Matlab Municipality by using only the qualitative method and do not explore the effectiveness of any coping strategy of the community to reduce the vulnerability and risks.

Rawlani & Sovacool (2011) conducted the study titled “*Building Responsiveness to Climate Change through Community Based Adaptation in Bangladesh*” by using interview data, site visits and review of literature. The study mainly investigated the coastal afforestation program as an initiative for community-based adaptation to climate change while the drivers, benefits and challenges to the issue of adaptation to climate change. The authors described the susceptibility of Bangladesh to climate change such as, the most critical and worst situation is saline water intrusion in the shore belt due to sea level rise. Drainage congestion is another problem of sea level rise along with water logging. Damages and destruction of infrastructure and human settlements are also the result of climate change while the agricultural production, food security and natural and man-made forest the authors added. The authors expressed that the benefits of climate change make the community and social responsiveness among the people and effectiveness of dam, embankments and other infrastructures. They explored the contributions to adaptive capacity of the CBACC-CA (Community Based Adaptation to Climate Change-Coastal Afforestation) project such as, coastal afforestation by the community, disaster resilient cropping system and technologies, early warning and forecasting system for disasters, awareness among the people, training and education to migrate the climate refugees, insurance for the community people to lessen their loss from climate change, assistance for the vulnerable group etc. The vulnerable sectors and areas to climate change and the benefits from CBACC-CA project and challenges of this



project have been explored in this study. The qualitative method has been used for conducting this study in the three coastal districts namely Cox's Bazar, Noakhali and Chittagong of Bangladesh. This study do not explore the effectiveness of community-based disaster management in Bangladesh.

Ahamed (2013) discussed the role of community based approach for reducing the vulnerability of cyclone and storm surges in the coastal region of Bangladesh in the study titled "*Community based approach for reducing vulnerability to natural hazards (cyclone, storms) in coastal belt of Bangladesh*" This study is conducted in the Kutubdia, Hatiya, Manpura and Patharghata upazilas of Cox's Bazar, Noakhali, Bhola and Barguna districts respective to assess the community's vulnerability and coping ability by using questionnaires and focus group discussion (FGD) of quantitative and qualitative methods for primary data. On the other hand, the author also collected data from secondary sources to strengthen the primary data. In the analysis, the author described the presence of the hazard, household size and housing condition, adaptation strategies, information sharing within the community, disaster preparedness, prevention, etc. Regarding the issues of adaptation to indigenous coping strategies the author mentioned that the responses of the habitual coping strategies of the local people may vary over time and by the nature of disasters. The study found that income of the household determines the scale of vulnerability where the sources are from farming, self-employability, wage labourer and fishing which are marginal and uncertain. The level of income also affect the level of vulnerability. The certain sources and higher income level reduced vulnerability or vice-versa. The house quality also affect by the level of income and sources of income while the age, sex, level of education of the family members, location of the household, ownership in land, occupational status ever affects the level of vulnerability of the household, the author added. However, the author recommended that raising awareness among the coastal communities about characteristics of natural hazards (cyclone and storm surges) and their activities in disaster, empowering the rural communities by strengthening the capacity and making networking with all level stakeholders, promoting disaster management planning by the government with focus on

the local vulnerable communities. This study do not explore the effectiveness of community-based disaster management at all.

Roy (2018) conducted the study titled “*Evaluating the Suitability of Community Based Adaptation: A Case Study of Bangladesh*”. The study has been conducted for evaluating the community-based adaptation practices in Fulchhari, Porsha and Dumuria Upazilas of Gaibanda, Naogaon and Khulna districts respectively. This study is based on case study technique of qualitative method while the participants are selected on the basis of previous CBA activities and understandability of the method. The author analysed the strengths, weakness, opportunities and threats (SWOT) of community based adaptation to flood and drought affected and coastal areas in mentioned three Upazilas of three districts in Bangladesh where strengths indicate CBA as the forefront climatic agenda, option for expanding livelihood strategies, resilience and integrating DRR tools to climate change adaptation where the weakness indicates that mitigation is excluded from CBA, unable to alleviate poverty and lack of coordination, integration, monitoring and evaluation. Opportunities indicate the local institutions, national and international finance strengthening, involving private sector where threats indicate the adverse impacts of climate change, dependency on foreign aid and assistance and infrastructural limitations. Thus, the author recommended that for CBA by strengthening financial issue through proper utilization, effective financing for vulnerable group by emerging instruments in economy. Public-private partnership is another issue to strengthen CBA which includes private sector in facilitating coalition and partnership to develop the adaptation products and services and strengthening the local institutions through expanding capacity and providing resources for sustaining the CBA. This study is based on the case study techniques of qualitative method which has evaluated the perceptions of community members and CBA informants, and do not explore the effectiveness of community-based disaster management but community-based adaptation options.

**Table 2.1: Summary of the review of literature**

Author(s)/ Researcher(s)	Title of the study/ report	Methodology applied	Study area (s)	Year	Comment (s)
ADPC	<i>Community-based Earthquake Risk Management in Dhaka City: Community empowerment for earthquake preparedness</i>	Qualitative (observation by using checklist and triangulation)	Dhaka City Corporation	2013	
ADPC	<i>Community Empowerment and Disaster Risk Reduction in Chittagong City</i>	Qualitative (Case Study)	Chittagong City Corporation	2014	
Practical Action	<i>Community Preparedness in Bangladesh: Learning from Gaibanda, Bogra, Sirajganj districts following the floods of 2007</i>	Not specified (Action based research)	Gaibanda, Bogra and Sirajganj	2010	
Biswas et al.	<i>Community Based Risk Assessment of Agricultural Sector in Sreerampur Union of Bangladesh</i>	Both qualitative and quantitative (FGD, KII, direct observation and survey interview)	Patuakhali (Dumki Upazila)	2015	
Baas & Ramasamy	<i>Community Based Adaptation in Action: A case study from Bangladesh</i>	Qualitative (Direct participation)	Chapainawgonj and Naogaon	2008	
Ahmed et al.	<i>Community-based Adaptation: An Analysis of the Best Practices in the South-western Region of</i>	Qualitative (KII, primary stakeholders' interview)	Satkhira, Khulna and Bagerhat	2017	

	<i>Bangladesh</i>				
Hossain	<i>Community Participation in Disaster Management: Role of Social Work to Enhance Participation</i>	Qualitative	Plans, policies and practices of Bangladesh	2013	
Hossain	<i>Gender Issues in Community-based Disaster Management: A Study on Flood Affected People in Bangladesh</i>	Both qualitative and Quantitative (KII, face-to-face interview, FGD), non-participant observation and direct observation)	Sirajgonj (Belkuchi Upazila)	2014	
Yodmani	<i>Disaster Risk Management and Vulnerability Reduction: Protecting the Poor</i>	Not specified	Cox's Bazar, Gazipur (Tongi) and Gaibanda	2001	
Shaw	<i>Critical issues of community-based flood mitigation: Examples from Bangladesh and Vietnam</i>	Not specified	Bangladesh and Vietnam	2006	
Huq	<i>Community Based Disaster Management Strategy in Bangladesh: Present Status, Future Prospects and Challenges</i>	Qualitative (Secondary sources)	Bangladesh	2016	
Ikeda	<i>How women's concerns are shaped in community-based</i>	Qualitative (Case Study)	Gaibanda	2009	

	<i>disaster risk management in Bangladesh</i>				
Islam et al.	<i>Community based disaster risk and vulnerability models of a coastal municipality in Bangladesh</i>	Qualitative (FGD, intensive field study, field visit, and historical data review)	Chandpur (Matlab Upazila)	2013	
Rawlani & Sovacoo	<i>Building Responsiveness to Climate Change through Community Based Adaptation in Bangladesh</i>	Qualitative (Interview data, site visit etc.)	Cox's Bazar, Noakhali and Chittagong	2011	
Ahamed	<i>Community based approach for reducing vulnerability to natural hazards (cyclone, storms) in coastal belt of Bangladesh</i>	Both qualitative (FGD) and quantitative (Questionnaire survey)	Cox's Bazar (Kutubdia), Noakhali (Hatiya), Bhola (Manpura) and Barguna (Patahrghata)	2013	
Roy	<i>Evaluating the Suitability of Community Based Adaptation: A Case Study of Bangladesh</i>	Qualitative (Case Study)	Gaibanda (Fulchhari), Naogaon (Porsha) and Khulna (Dumuria)	2018	

## **Chapter Three**

### **Conceptual Framework of the Study**

#### **3.1. Introduction**

This chapter carries out the concepts and issues related to community-based disaster management and conceptual framework for this study. These concepts and issues are: hazard, vulnerability, risk, disaster, resilience, adaptation, coping mechanisms, capacity, climate change, hazard assessment, vulnerability analysis/assessment, risk assessment, disaster risk, DRR, disaster risk management, mitigation, preparedness, response, recovery and relief. This chapter also clarifies the practiced/existing coping mechanisms of community people (indigenous and new knowledge), government and NGOs' initiatives to strengthen those coping mechanisms, community people participation in hazard, vulnerability and risk assessment, search and rescue operation, early warning signals dissemination, providing first aid, integrating local knowledge to national development and maintaining relational and physical connectivity under the conceptual framework for this study.

#### **3.2. Hazard**

The event which has the potential to make changes by triggering wound to any kind of life and/or damages to property or environment dilapidation is generally called hazard. The extent of hazard, probability of incidence and event induced impacts may vary by time and space. As a dangerous phenomenon, hazard causes loss or injury to life, livelihoods, services, social and economic imbalance and harm to environment. Therefore, researchers identify hazard as elements of physical environment (Burton et al., 1993; Burton & Kates, 1964), phenomenon with potential cause to life and damage to property (Abarquez & Murshed, 2004), extreme natural events (Tobin et al., 2017), for instance, flood, earthquake, cyclone, storm surge, tornado, drought, riverbank erosion, nor 'wester, tsunami, landslide, hailstorm etc. Many researchers and scientists classify hazards in different ways, such as, atmospheric, hydrologic, geologic, biologic, technologic (Hewitt & Burton, 1971); hazards from the atmosphere and hydrosphere,

hazards from the lithosphere and hazards from the biosphere (Chapman, 1999); natural, technological, context hazard, super hazard (Smith & Petley, 2009); meteorological, geological, hydrological and extra-terrestrial (Tobin et al., 2017); and natural, social, biological, technological and chronic (Paul, 2011). Besides, some organizations classify hazard by different category, such as, natural physical, natural biotic, socio-pseudo natural, man-made technological and social (WHO, 1999) and climatologic, meteorological, hydrological, geophysical and biological (CRED, 2009).

### **3.3. Vulnerability**

In general sense, when someone cannot survive with any kind of hostile effects of any events due to the lack of his/her capacity is called vulnerability. But in the disaster management context, vulnerability or susceptibility refers to the position in which someone cannot cope with the impacts of the climatic hazards, for instance, flooding, cyclonic storm surges, earthquakes, saline water intrusion, droughts, tornadoes, etc. due to lack of capacity. IPCC TAR (2001) indicated the incapability in enduring with the opposing effects of climate change and later on UNDP (2005) specified perturbation or stress, deficiency of the capability to cope, recover or adapt as the exposures of vulnerability. Many researchers (Tompkins, 2005 and Bohle *et al.* 1993) and some organizations (Commonwealth Secretariat, 1997; UKCIP, 2003; IDNDR, 1992 and OECD, 1999) found the ‘lack of the ability to cope with....’ as the common feature related to vulnerability. Moreover, researchers identify different issues related to vulnerability, for example, Mitchell (1999); Barth & Titus (1984) and Schneider & Chen (1980) argued that physical exposure is the factor behind vulnerability where Susman, O’Keefe, & Wisner (1983), Timmerman (1981) and Blaikie et al. (1994) mentioned it is occurred due to the actions of socioeconomic status and access to resources (cited in Paul 2011).

Different types of vulnerability exists in the community, for instance, individual vulnerability, social vulnerability, economic vulnerability, household vulnerability, physical vulnerability, environmental vulnerability, institutional vulnerability, system

vulnerability and place vulnerability (Paul, 2011). Therefore, the individual vulnerability refers to the vulnerable situation which influences any individual to risk. It differs from person to person depending on individual's age, health, property, education, living place, race, gender and his or her experience in past disaster (Paul, 2011). For example, an elderly and poor widow living in a high disaster prone area is more vulnerable than a relatively young healthy, rich man who living in low disaster-risk zone. Pelling (2003) discovered that isolation is strong factor for elderly vulnerable People's vulnerability. Household vulnerability is another type of vulnerability that varies from household to household (Paul, 2011). The vulnerability of household depending on the educational level of the residents, income level, types of households (construction materials), age structure of the residents of the household, gender priority, location of the household, etc. For example, a household which has educated residents, high income, minimum number of children, no elderly and disabled members, concrete type building materials, safer location of household has relatively lowest vulnerability to disaster than a household which has illiterate residents, low-income level, maximum children, elderly and disabled people, type of building materials, unsafe location of household has relatively highest vulnerability to disasters. The people who are homeless, less income and low status, females, pregnant women, infant, children, elderly, disabled, migrants, poor, minorities, broken family members, people with poor communication network and disadvantage groups socially vulnerable. Social vulnerability depends on the uneven spreading of effects within a population (e.g., population of Bangladesh), with some population subgroups (e.g., indigenous people of Chittagong Hill Tracts) and localities (coastal zone of Bangladesh) affected unreasonably by disaster outcomes. High poverty ratio, low national reserves, lack of sustainable social and economic infrastructural facilities, lack of communication network, lack of services and utilities, high unemployment ratio, limited income sources, lack of equal distribution of land induce economic vulnerability.

### **3.4. Risk**

The probability or chance of hazards occurring with a certain magnitude that will impact on objectives which measures any event's consequence and its likelihood. Douglas



(1992) defines risk as the likelihood of any event and extents of the losses and gains. On the other hand, Mitchell (1999) explored risk as the combination of values at risk, hazard and vulnerability. Other researchers define risk as the purpose of hazard incidence chance, population, and vulnerability (UNDP, 2004), a measure of probability and severity of harm (Lowrance, 1976 cited in Paul, 2011), a function of hazard, vulnerability, exposure, and resilience (Thywissen, 2006 cited in Paul (2011), the likelihood of an event occurring multiplied by the consequences of that event (Paul, 2011), the likelihood or probability of occurring any hazard and its impacts.

### **3.5. Disaster**

Disaster is a natural or human induced event that affects the community or society and need external helps to manage it. Disastrous event is related to time and space (Fritz, 1961). However, Degg (1992) elucidated disaster as the result from the interaction between hazardous environmental process and a population likely to experience any loss and damage. Some researchers measure any event as disaster through the number of deaths, injuries, environmental damages and economic losses. For instance, Glickman et al. (1992) cited in Paul (2011) stated disaster consider by death while Sheehan & Hewitt (1969) say deaths, injuries and economic losses. Thus, Smith (1996) considered any incident as a disaster when it kills 10 or more people, affects more than 100 people, need international aid and assistance and require to declare emergency. Moreover, Hewitt (1997) and Smith (2004) identified some criteria to consider any event as disaster when it reaches the number of deaths (100 or more for each event) significant number of damages (1% or more of GDP) and significant number of affected people (1% or more of total population). However, killing people, pushing injuries and physical damage and destructions are the result of direct effect and on the other hand, goods and services disruption, unemployment, disruption of business and other economic activities is the secondary or indirect effect of disaster (Tierney et al., 2001 cited in Paul, 2011). Therefore, disaster could be defined as the event of losing lives, sustaining injuries, damaging or losing of property and degradation of environment.

### **3.6. Resilience**

The capacity or capability of any community or physical environment to recover from any stressful, harmful or disastrous situation and making the individuals to cope with changed condition without external resources or help is generally called resilience. Sometimes the term resilience denotes to the capability of a system to recover from harmful load (UKCIP, 2003), communities' capability (Bruneau et al., 2003), ability to withstand external shocks (Adger, 2000), ability to resist loss due to disaster (Zhou et al., 2010), measure for recovery from disastrous situation (Correira et al., 1987), speed of system to return to original form (Pimm, 1984), self-recognizing ability, defending trouble and building capacity to learn and adapt (Tompkins et al., 2005) etc. UNISDR (2004) mentioned that resilience mentions the aptitude of a system, community or society potentially to adapt by repelling or altering for reaching and maintaining a satisfactory level of functioning and structure of the system. Resilience also depends on socioeconomic ability, culture of the society, technological development, education, population etc.

### **3.7. Adaptation**

IPCC TAR, (2001a) declares that adaptation is the process of modification of the system of natural or human which response to minimize climatic effects and makes beneficial opportunities. UNDP (2005) focused on the strategies of adaptation process that use to moderate and cope with adversative effects of climate change and take advantage of those effects. On the other hand, UKCIP (2003) described by focusing on the options for reducing risk or harm of climate inconsistency and climate change. Adaptation is essential for estimating risks of climate change by evaluating the impact and vulnerability (Pittock & Jones, 2000; UNEP, 1998; Tol et al., 1998; Yohe et al., 1996 and Fankhauser, 1996) and which is important response option to lessen the effect of climate change through mitigation of losses and damages (Pielke, 1998; Smith, 1996 and Fankhauser, 1996). However, in environmental science the adaptation refers to the situation how any species or organism coped with the changing environment and instead, in social science it

refers to the system of collective behaviour of individuals to cope with changing socioeconomic system (Abercrombie et al., 1997 and Lawrence, 1995).

### **3.8. Coping mechanisms**

Coping mechanisms are actions by people for survival and livelihood which has human and social costs. Two types of coping method are practiced in disastrous situation which are, positive coping method and negative coping method. Positive coping methods refer to the grounding skills, manage stress, get to know self, seek support from friends and family, communication, physical activity, healthy sleeping habits, enjoying nature etc. Instead, negative coping approaches refer to the violence and abuse, being passive, addiction, repression, developing a false self, depression, manipulating, running away, etc.

### **3.9. Capacity**

All collective strengths such as, socioeconomic, physical and institutional etc. and all types of resources which are available in the community or society can reduce the risks called capacity. Sometimes the term capacity may describe as capability (UNISDR, 2004) and refers to the skills of any individual or community to cope with changing situation.

### **3.10. Climate change**

Climate change is the variations in climate erraticism due to human induced or natural causes (IPCC TAR, 2001a). Climate change is an issue which closely depends on the climate erraticism and variations in climate system. Climate change operates over decades or longer which is resulting from the activities of internal climate variability and climate system and natural and anthropogenic factors (McMichael et al., 2003).

### **3.11. Hazard assessment**

Hazard assessment is one of the important steps in the procedure of assessing risk. This procedure includes gathering and analysing of the basic information on meteorological, geological, hydrological, climatological, biological or technological hazards in terms of nature, regularity and magnitude. Historical data are used to identify critical hazard zone

to assess a particular hazard. Scientific knowledge, academic research findings on hazards, expert observations and related computer software are needed for all hazard scenarios. The process of hazard assessment aims to know the comprehensive knowledge on the magnitude damaging effects of any hazard event (Rudolf-Miklau et al., 2011).

### **3.12. Vulnerability analysis/assessment**

For identifying the impact of disasters, the assessment of vulnerability is important. The process of vulnerability assessment needed to examine the disastrous events and their impacts and the magnitude of hazard and probability of risk occurrence. Many researchers (Ferrier, 2009; Adger, 2006; Hewit, 1997 and Blaikie et al., 1994) argued that for assessing vulnerability within the society to through holistic approach. Vulnerability assessment is an essential accompaniment to hazard valuation exercises. In spite the substantial exertions and attainments imitated in the better quality and coverage of scientific data on different hazards, the plotting and valuation of social, economic and environmental exposures of populations and/or communities are equally developed.

### **3.13. Risk assessment**

Risk assessment is the process to gather data on hazards which are likely to occur, the estimated probability of future events and its magnitude of effects. Various causes are involved in the occurrence of an event, effects and occurring processes of disaster are essential to assess future risk. Reliable information on geo-morphological conditions, soil formation, geographical position, effects of events, soil types etc. are helpful for the assessors to quantify future risk. The risks of small scale disasters are easier to quantify than the catastrophic events because the catastrophic events occurs less frequently and their data are not easily available. Slow onset occurring events like sea level rise, droughts and desertification may be predicted on the basis of historical data. Risk of events that have not yet happened such as, meltdown of a nuclear reactor which has no past experience and have to be predicted from probability of occurrence and forecast.

### **3.14. Disaster risk**

The probability of adverse consequences of natural or human induced hazard and exposed condition is generally called disaster risk. These consequences comprised of immediate or direct losses of lives, property and environment due to any disastrous event and indirect or long term socioeconomic and political impact. UNISDR (2009) described disaster risk as the losses of lives, health, livelihood, resources and facilities and disruption of the function of the community linking human, socioeconomic and environmental losses and the affected community cannot cope with its own assets. From a social science perspective, disaster risk takes into account the social vulnerability of any individual and community which depends on the socioeconomic and political issues. Therefore, researchers (Cardona, 1996; Lavell, 1996; Cardona, 1993 and Lavell 1992) suggested that some social factors such as, weakness of family and its credit limit, existence of political and ethnic discrimination, water and air pollution, enormous illiteracy and lack of educational opportunities. On the other hand, in natural and applied science perspective the disaster risk not only depends on the ruthlessness of natural phenomenon but also the weakness of exposed elements (Fournier d'Albe, 1985 and Whitman, 1975).

### **3.15. Disaster risk reduction (DRR)**

DRR generally demarcated as the process of reducing risk by analysing and managing reasons of disasters including exposure to hazards, defencelessness of people and assets, planned supervision of land and finally the development of preparedness initiatives for managing severe effects of those disasters. UNISDR (2009) defined DRR is the process to lessen disaster risk by decreasing exposure to hazards, lessening defencelessness of people and assets and supervision of land and the environment and improving preparedness. As DRR is the priority approach for managing disaster globally, so, the researchers find strong relationship between disaster risk, DRR and development planning and policies in the context of development countries (UNISDR, 2009; UNDP, 2004; Lavell, 2009).

### **3.16. Disaster risk management (DRM)**

The activities which were related to risk reduction of extreme climatic hazards, technological hazards or human induced hazards through decision making, organizational behaviour and overall capacity improvement of the population and the responsible stakeholders is known as Disaster Risk Management (DRM). These actors are expected to implement policies to lessen risk, and uptake strategies to recover from these hazardous events by adapting to the climate changes and coping with future possible extremities.

### **3.17. Mitigation**

Mitigation is one of the key measures for disaster risk management. By carrying some goals, mitigation measure tries to manage the risk through removing the probability of risk, reduce the adverse consequences of disaster risk, avoiding future risk of climate change related extreme events or human induced disaster, risk acceptance and transferring, sharing or spreading the future risk. It refers to the long-term policies and strategies to lessen the likelihood of occurring or to reduce the consequences of an event. Two types mitigation measures are practiced in disaster management such as, non-structural mitigation measures (land use zoning, preservation green spaces, denial of services of high risk areas, building codes, avoid density, safety regulations, natural resource use, environmental regulations, public awareness, insurance etc.) and structural mitigation measures (resistant construction, replacement, structural alteration, building of community shelters, barrier, deflection, detection systems, treatment systems etc.) (Coppola, 2010).

### **3.18. Preparedness**

Preparedness refers to the activities required to reduce disaster risk after an event. These activities including the formulation of disaster plans, testify, and practice that plans disaster strategies, provide training for responsible personalities, communicate with stakeholders, evacuate the people and conduct emergency response etc. (Tierney & Sutton, 2006). Preparedness related activities minimize the negative impacts of dangerous events which involve the communities, individuals and households. Tierney & Sutton

(2006) identified five phase of preparedness cycle such as, raising awareness, assessing hazard and vulnerability, gaining knowledge on hazard and coping mechanisms and planning and practice.

### **3.19. Response**

The response is an immediate action against disastrous events to limit or reduce loss of life and injuries to health, damage to assets and the protection of environment that are occupied pre-disaster phase (before onset an event), during (occurring time) and post-disaster (just after an event). Disaster response works on the basis of some principles such as, expectation, readiness, subsidiarity, track, information, combination, support, continuity etc. International Federation of Red Cross and Red Crescent Societies (2007) identified institutional disaster designing, risk analyses of hazard, vulnerability, capacity, identification and mobilization of resource, early warning systems, communications and networking and sectoral responsibilities as the disaster response initiatives.

### **3.20. Recovery**

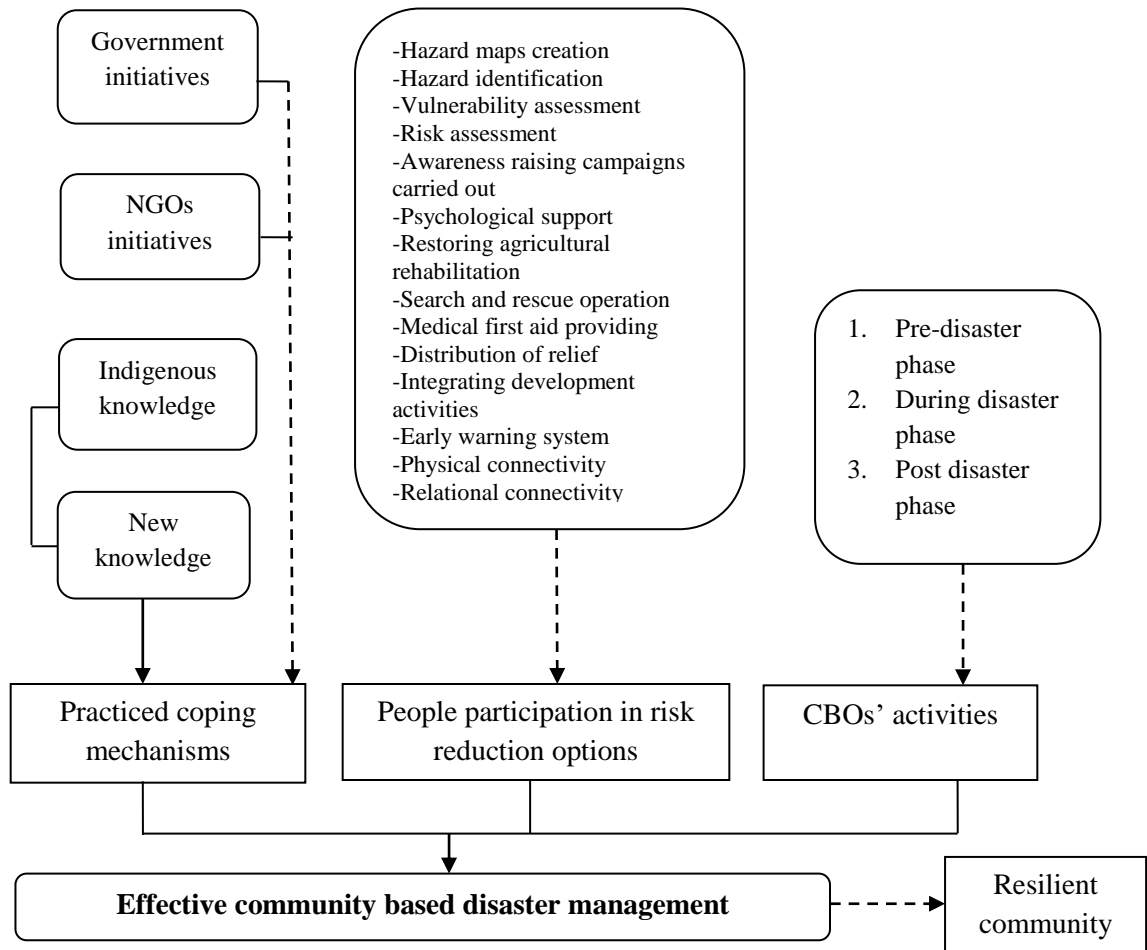
As an important phase of disaster risk management recovery refers to the activities during and/or after the response phase. Quarantelli (1998) indicated the word ‘recovery’ refers to the words rebuilding, refurbishment, and reintegration and after disaster improvement. In that sense, disaster recovery involves the task related to normalize the life of affected individual and community or society after a disaster. Rebuild the damaged buildings, reconstruction of the damaged structures and infrastructures, restoration of public and emergency utilities, rehabilitation of the affected people to their previous life or create another option for their survival and finally creates the opportunities for redevelopment or development.

### **3.21. Relief**

Disaster relief is important both in disaster response and recovery phases since the providers and suppliers of emergency support, the process of emergency aid distribution from non-impacted to impacted in disaster management (Paul, 2011). In this case, some areas are important in disaster relief such as, disaster mitigation planning, development of policy, preparedness training for emergency, response and recovery plan, assessment of

damage and losses, fields coordination and cooperation, inspection and security, fund raising and consultation.

### 3.22. Conceptual framework of the study



**Figure 3.1: Frameworks for community-based disaster management**

The practiced/existing coping mechanisms of the community people regarding disaster management along with the government and NGOs' initiatives to strengthen those mechanisms, the participation of community people in risk reduction options along with the activities of community-based organizations (CBOs) in pre, during and post disaster phases effectively manage disaster at community level.



### **3.23. Conclusions**

This chapter has helped to define hazard, vulnerability, risk, disaster, resilience, adaptation, coping mechanisms, capacity, climate change, hazard assessment, vulnerability analysis/assessment, risk assessment, disaster risk, DRR, DRM, mitigation, preparedness, response, recovery and relief. Making the differences and create correlation among the concepts and issues this chapter play important roles. The conceptual framework for this study also has addressed the community coping mechanisms, participation of community people in risk reduction options, CBOs' activities to make a disaster resilient community.

## **Chapter Four**

### **Methodology**

#### **4.1. Introduction**

The methodological instructions for this study have been discussed in this chapter which specifically focuses on the way of conducting the study of exploring the effectiveness of community-based disaster management in Bangladesh. The effectiveness of any model of disaster management depends on different perspective or approaches especially in disaster management research. However, Nasreen (2004) mentioned Alexander's (1993) six schools of thought on natural hazards and disaster studies, these are: sociological approach, anthropological approach, geographical approach, disaster medicine approach, development studies approach and technical approach. These approaches study the disaster related issues in different way by using appropriate methodology. Moreover, Nasreen adds that among the approaches the developing societies' disaster research are dominated by geographical and sociological approaches while the disaster research in Bangladesh generally follows geographical approach and the use of sociological approach in disaster research in Bangladesh is unusual. In the consideration of practical circumstances and context of research the qualitative and quantitative approaches may combine (Punch, 1998). Hence, to fulfil the requirements of the study objectives both qualitative and quantitative methods were used. Key informant interview (KII), focus group discussion (FGD), informal group discussion, direct observation, document review etc. have been followed as the tools of qualitative method. Moreover, questionnaire survey has been adopted to collect the data for quantitative part.

#### **4.2. Research design**

To explore the effectiveness of the community-based disaster management in Bangladesh, it is needed to use the mixed method of qualitative and quantitative approaches. One single approach is not sufficient to examine the effectiveness of any model of disaster management. Therefore, this study has rigorously applied all applicable

techniques of both qualitative and quantitative method. The methodology includes the following qualitative and quantitative techniques:

**Table 4.1: Methodology of the study**

Methodology	
<u>Quantitative</u>	<u>Qualitative</u>
<ul style="list-style-type: none"> <li>• Questionnaire survey</li> </ul>	<ul style="list-style-type: none"> <li>• Key informant interview (KII)</li> <li>• Focus group discussion (FGD)</li> <li>• Document review</li> </ul>

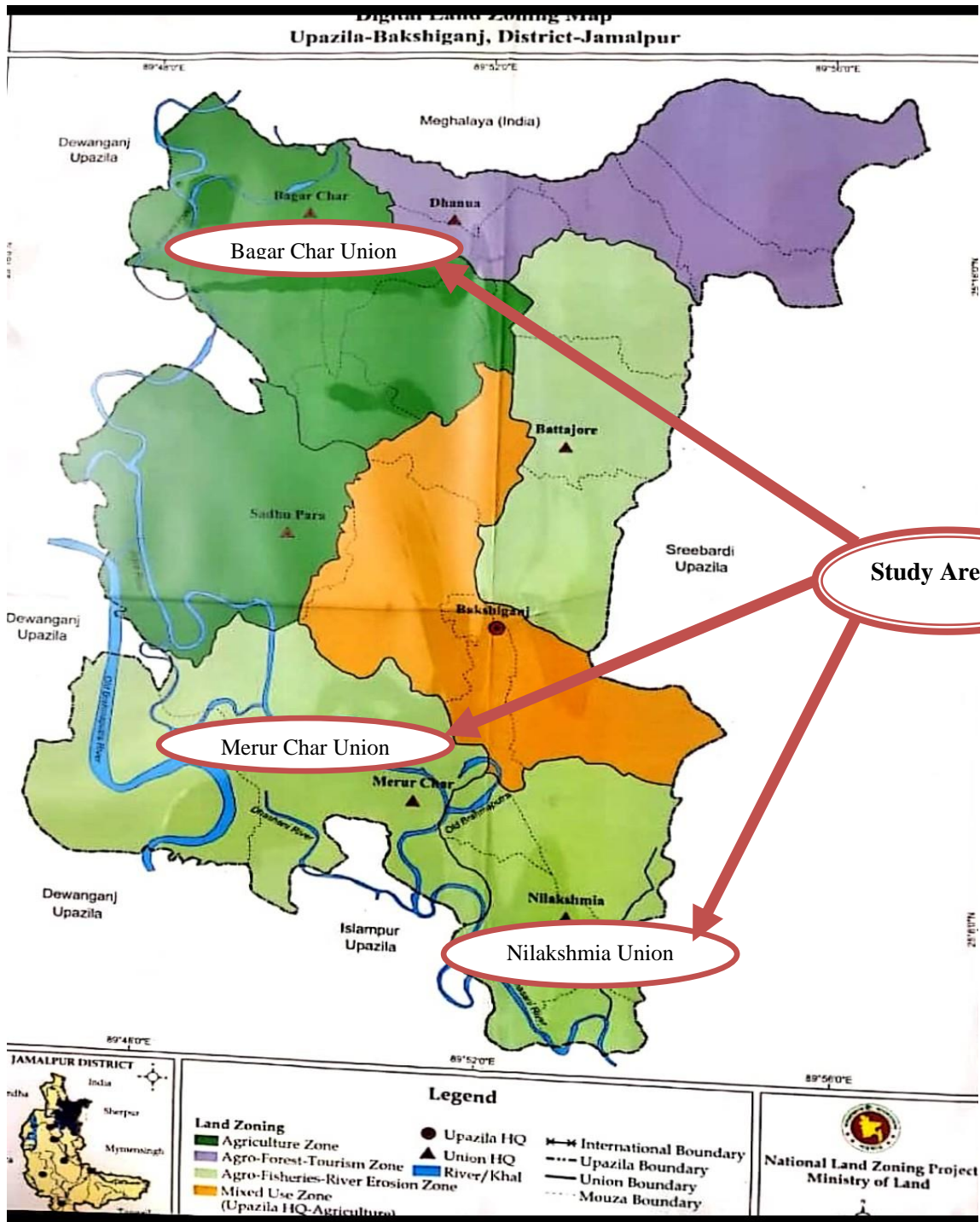
### 4.3. Study area

The present study has conducted on Bagar Char union, Merur Char union and Nilakshmia union of Bakshiganj *upazila* of Jamalpur district. This study area is surrounded by the Brahmaputra and Dashani rivers.

#### 4.3.1. Geographical location

Bakshiganj *upazila* is situated at a 34 km distance from Jamalpur district headquarters. This *upazila* is at the northern end of Bangladesh which geographical identity is Meghalaya state of India in the north, Islampur and Dewanganj *upazilas* of Jamalpur district in the south and in the west respectively and Sreebardi *upazila* of Sherpur district in the east. Bakshiganj is located in between 25°06' and 25°18' north latitudes and in between 89°47' and 89°57' east latitudes.

(<http://bokshiganj.jamalpur.gov.bd/bn/site/page/D5Ma> & Banglapedia).



Map: Study Area

**Table 4.2: Population and sex group in the study area (Approximately)**

Unions	Male	Female	Total	Sex Ratio
Merur Char	18567	18647	37214	99
Bagar Char	22123	23622	45745	94
Nilakshmia	14761	14927	29688	99
<b>Total</b>	<b>55,451</b>	<b>57,196</b>	<b>1,12,647</b>	<b>97</b>

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

**Table 4.3: Age group of population in the study area (Approximately)**

Unions	Age group and % on total population of the area						
	15-19	20-24	25-29	30-49	50-59	60-64	65+
Merur Char	6.6	7.5	8.8	22.6	6.0	2.7	3.9
Bagar Char	6.7	6.8	8.2	23.8	6.6	2.9	5.1
Nilakshmia	6.9	7.7	8.3	23.4	6.3	2.9	4.6

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

**Table 4.4: Marital status in the study area (Approximately)**

Union and Sex	Marital Status (%)			
<b>Merur Char Union</b>	<b>Never Married</b>	<b>Married</b>	<b>Widowed</b>	<b>Divorced</b>
Male	34.6	64.8	0.4	0.2
Female	20.5	70.7	7.6	1.1
<b>Bagar Char Union</b>	<b>Never Married</b>	<b>Married</b>	<b>Widowed</b>	<b>Divorced</b>
Male	31.8	67.2	0.7	0.3
Female	21.8	68.0	8.7	1.2
<b>Nilakshmia</b>	<b>Never Married</b>	<b>Married</b>	<b>Widowed</b>	<b>Divorced</b>
Male	32.8	66.2	0.6	0.4
Female	21.3	68.9	8.7	1.1

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

**Table 4.5: Religion in the study area (Approximately)**

Unions	No. of Population by religion				
	Muslim	Hindu	Christian	Buddhist	Other
Merur Char	32365	143	--	--	--
Bagar Char	39447	517	1	--	1
Nilakshmia	25709	226	--	--	2

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

**Table 4.6: Sources of drinking water in the study area (Approximately)**

Unions	%		
	Tap	Tube well	Other
Merur Char	00.0	96.8	3.2
Bagar Char	00.0	95.7	4.3
Nilakshmia	00.0	98.3	1.7

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

**Table 4.7: No. of household and average size in the study area (Approximately)**

Unions	No. of Household	Average household size
Merur Char Union	7462	4.4
Bagar Char Union	9675	4.1
Nilakshmia	6210	4.2
<b>Total</b>	<b>23,347</b>	<b>---</b>

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

**Table 4.8: Area and population density in the study area (Approximately)**

Unions	Area (Acres)	Population Density (sq. km)
Merur Char Union	10281	781
Bagar Char Union	8854	1115
Nilakshmia	5227	1226
<b>Total</b>	<b>24,362</b>	<b>--</b>

Source: *Upazila* Statistics Office (Data based on Bangladesh Population Census, 2011)

#### **4.4. Study population**

The population of the selected areas was subject to experience of disaster, risk management, community participation in disaster management (practice own coping mechanisms and participate in risk reduction options). The population of this study has been selected from three unions namely Bagar Char, Merur Char and Nilakshmia of Bakshiganj *upazila* of Jamalpur district.

#### **4.5. Unit of the study**

Head of the household (age not less than 21 years) who live in the selected areas were unit of the study.

#### **4.6. Sampling procedure**

Sampling is important in research which indicates the process of selecting a sub group of people from a big population to draw conclusion. The scientific sampling helps to select the small group to represent the large group. Sampling is needed in this research to save money and time and to gain detailed knowledge while it has greater adaptability, it's an economical technique, it has high speed of generalization, greater precision and accuracy in observation, it has greater scope in the field of research and it reduces the cost of data collection (Pandey & Pandey, 2015). They added that ideal sample may have homogeneity, adequacy, independence, and representativeness. Considering the above matters the probability and non-probability sampling procedure has been employed for data collection for this study based on its different objectives. As the study followed both qualitative and quantitative approach, so random sampling technique has been used for quantitative part and purposive sampling for qualitative part. The target group for this study has been comprised with male and female residing in the study areas of three unions of Bakshiganj *upazila* of Jamalpur district that has been selected as the sample by the help of Union *Parishad* chairman, Union *Parishad* member, *upazila* Vice-Chairman, *upazila* statistics officer, local leaders, community's influential, elderly people etc. The following steps were followed for sampling procedure:

- 12 wards from the three unions has been selected from Bakshiganj *upazila* of Jamalpur district as the study area.

- The selected male/female from each household of the selected wards was the study population and each of the household considered as the unit of analysis.
- Total 383 heads of households have been selected as total sample but 390 heads of households have been surveyed to avoid difficulties in missing information, overwriting on the responses, irrelevant responses etc. for quantitative data and 6 FGDs' and 16 KIIs' interviewees have been interviewed.
- The respondents for survey have been selected randomly and participants for FGDs and KIIs have been selected purposively.

#### **4.7. Sample framing and size**

According to the sample size determination table of Krejcie & Morgan's (1970), for a given population between 1, 00,000+ and below 2,50,000 with 95% level of confidence and 5% margin of error the sample size is 383. Therefore, 390 heads of households (male/female) have been surveyed for this study. The number of total populations of the study area has collected from the concerned government offices, Union *Parishad* office, *Upazila* statistics office, etc. Every respondent of this study has given equal importance, because they experienced disaster and its management process. Moreover, 6 FGD and 16 KII have been conducted in the particular areas. The samples have been considered the following criteria:

##### **Samples criteria for survey:**

- Male and female (94.36:5.64)
- Age of the respondent (21 to 70 years)
- Physically and psychologically fit to response
- Voluntarily wanted to response

##### **Samples criteria for FGD:**

- Heads of households (male/female) who have been surveyed previously
- Voluntarily wanted to participant in the discussion
- Age of the participant in between 21 to 70 years

##### **Samples criteria for KII:**

- Chairman Union *Parishad*



- Chairman/Vice Chairman of *upazila Parishad*
- NGO head
- Community Leader
- Religious Leader
- Government representative (Agriculture officer)
- Disaster management expert (*upazila* level)
- Volunteer in emergency management

#### 4.8. Sample determination

**Table 4.9: Survey interview**

Name of the Union	Ward No.	Quantitative	
		No. of survey	Tools
<i>Merur Char</i>	1	32	Survey Questionnaire
	2	33	
	4	32	
	7	33	
	<b>Total</b>	<b>130</b>	
<i>Bagar Char</i>	1	33	
	2	33	
	6	32	
	7	32	
	<b>Total</b>	<b>130</b>	
<i>Nilakshmia</i>	2	33	
	5	32	
	7	32	
	9	33	
	<b>Total</b>	<b>130</b>	
<b>Grand Total</b>		<b>390</b>	

**Table 4.10: Key informants' interview**

Sl. No	Category	Total	Tool
01.	Chairman/member Union of <i>Parishad</i>	03	Checklist
02.	Vice Chairman of <i>upazila Parishad</i>	01	
03.	NGO representative	02	
04.	Community Leader	02	
05.	Religious Leader	02	
06.	Government representative	03	
07.	Disaster management expert (local level)	01	
08.	Volunteer in emergency management	02	
<b>Total</b>		<b>16</b>	

**Table 4.11: Focus group discussion**

Name of the Union	No. of FGD	Tool
<i>Merur char</i>	2	Checklist
<i>Bagar char</i>	2	
Nilakshmia	2	
<b>Total</b>	<b>6</b>	

## 4.9. Data collection procedure

### 4.9.1. Quantitative approach

Generally quantitative approach is applied for quantifying and analysing data, however, Apuke (2017) mentioned some statistical techniques to get the results, such as, when, what, where, who, how much, how many and how. Therefore, the quantitative approach is a way to gather data in numerical form and analyse the data by using a particular statistical method (Aliaga & Gunderson, 2002). This approach uses to collect the data which can be quantified and statistical treatment for supporting alternative knowledge (Leedy & Ormrod, 2001 and Williams, 2011). Creswell (2003) argued that the researcher uses quantitative approach for developing knowledge by using experiments or survey to collect statistical data. The quantitative approach is helpful to develop human knowledge

by proving previously proposed or developed theory through appropriate research procedure. As the main aim of this study was to explore the effectiveness of the community-based disaster management in Bangladesh, so, to testify the effectiveness of the community-based disaster management was needed. However, the Swanson & Holton (2005) mentioned that the quantitative method can be exploratory to discover the characteristics, relationships of subjects and make interpretation for new theory and identify new problems. As a social research quantitative approach use empirical methods and statements and statements are presented numerically through particular norms and policy (Cohen & Manion, 1980). To explore the effectiveness of community-based disaster management in Bangladesh quantitative approach was needed because of this approach focused on measuring the social reality by viewing the problem objectively and establishing the research numerically. Quantitative approach is helpful in getting quantitative answer, conducting respondents' differentiations; quantify respondents' responses, explaining some phenomena, etc. Furthermore, for example, (Yauch & Steudal, 2003) argued that quantitative approach can administer and evaluate data quickly and make sharp comparison among the responses from group or respondents by showing extent of agreement or disagreement. ACAPS (2012) also mentioned quantitative approach helps to collect data meticulously by using appropriate methods as well as analysed the collected data critically although this approach cannot deeply observe the experience of the disaster affected people. Considering the importance of this study, the quantitative approach has applied to collect, analyse, sort of field data as it is the most scientific method to express the collected data in accordance with research objectives. The quantitative approach has used in this research for its vast advantages which has the opportunities of numerical estimation, simple data analysis and verifies, make comparison of data among different groups and location, etc. The trend analysis, surveys (customs surveys, mail/email/online surveys, telephonic surveys, self-administered questionnaire surveys, omnibus surveys), co-relational research, exploratory research, experimental research and descriptive research have been used as the techniques of data

collection in quantitative approach where this study has used the questionnaire survey technique.

#### **4.9.2. Qualitative approach**

The qualitative research is inductive approach which explores the insights meanings of given situations (Strauss & Corbin, 2008 and Levitt et al., 2017) which is very helpful in conducting research of deep issues like effectiveness as Punch (1998) indicated that this method discovers the hidden, sophisticated and complex social reality and helps the respondents to understand the core meaning of any situation. Moreover, Myers (1997) argued that qualitative method tries to make understandability any issue in the socio-cultural context. As an umbrella term (Creswell, 2009 & Hancock et al., 2009) interpretative approach qualitative research helps to reveal the behavioural subjective experiences of the participants on any social phenomena (Polgar & Thomas, 2000) and to build concepts, theories or hypotheses by “why”, “how” and “in what way” (Creswell, 1998 & Mertens, 2005) format questioning, to link the research questions to the research methodology (Mason, 1996), however, statistical or empirical calculations is excluded from the qualitative research (Brink, 1993) and qualitative research data do not indicate ordinal values (Nkwi et al., 2001). By using this explanatory and realistic approach the qualitative researchers study any phenomena in its natural settings (Denzin & Lincoln, 2005) and the researchers understand the meaning of constructed sense and experiences of the people that they have in the world (Merriam, 2009). The qualitative approach used to explore new phenomena, to add new knowledge, to understand the complex phenomena, to create new perspective etc. (Ospina, 2004). However, the qualitative approach gives opportunity to collect data directly from the participants to develop new models and concepts that make the opportunity to recognize thinking and attitudinal behaviour. It is also concerned about the people’s feelings, experiences, opinions and their everyday life which is conducted in the actual life and their everyday settings (Ely et al., 1991; Hammersley & Atkinson, 1993).

As the aim of this study was to explore the effectiveness of community based disaster management in Bangladesh, so, the study has incorporated qualitative approach for

understanding the issues clearly and strengthen the quantitative findings while Conger (1998) (cited in Mohajan, 2018) stated that the qualitative approach advances the research through flexibility in following unpredicted ideas, clear vision for expected issue, in-depth and in-detail evaluation of matter, save expenditure by choosing smaller sample size, symbolic and social meaning study, availability data based research framework, vast and in-depth interviewing, availability of powerful data from People's experiences, create empirically supported new ideas. This approach is also helpful to deal with the people with lack of sufficient knowledge about community-based disaster management. The in-depth interview, face to face interview, case study, focus group discussion, informal group discussion, content analysis, ethnography, key informant interview, participant observation, direct observation, phenomenology, document review etc. have been used as the techniques for collecting qualitative data where this study used the key informant interview, focus group discussion, document review techniques.

#### **4.10. Data collection techniques**

##### **4.10.1. Survey**

Generally, survey research is the technique to gather data from the respondents for predicting or understanding some features of the concern population that is based on the sampling procedure, designing and administering the questionnaire and analysing of the collected data. Thus, Salant & Dillman (1994) argued that survey employs in the estimation of the population not for extracting measurement. As the aim of this was to explore the effectiveness of community-based disaster management in Bangladesh, so, this study has chosen the survey method to collect quantitative data. However, this study has conducted 390 surveys for collecting quantitative data from the respondents. The survey has been conducted from June 2020 to June 2021 in the study area.

##### **4.10.2. Key informant interview (KII)**

The KII has been used to collect data from the people who have first knowledge about the community and they are aware of what is going in the community. These key informants including the chairman/member of *Union Parishad*, Vice Chairman of *upazila Parishad*, NGO representative, community leaders, government representative, religious leaders,

disaster management expert (local level) and volunteer in emergency management who have the awareness and understanding to afford vision of the nature of the problems and can provide recommendation to solve the problems. For instance, Kumar (1989) argued that key informant interviewee is the individual who can provide necessary ideas, information and insights on any particular subject. On the basis of the nature of this study, the key informant technique has been used to collect data from the key informant interviewees, as this technique collect the information directly from the participants; flexible in exploring new and unanticipated ideas and issues; easy to find the interviewee, provide descriptive information from knowledgeable people for decision making, provide support to interpret quantitative data and cost effective. The key informant interview technique provides information from the individual's perspective and experiences by setting a series of questions (Cited in ACAPS, 2012). In this study a key informant interviewee was the person who provides primary data on the disaster affected and who has the experience on managing disaster risk. Before conducting interviews, this study gathered and reviewed previous and existing data, determined about needed information, target population and interview documentation type, chosen the informants and interview type and developed interview tool. This study has conducted 16 both face to face and telephonic key informant interview to collect data. The key informant interviews have been held with members of the surveyed communities and the other stakeholders related to disaster management. The KII has been conducted from June 2020 to June 2021 in the study area. The following people in the table were the key informants for this study:

The KII has been guided by the following issues:

- Socioeconomic background;
- Information on disaster occurrence and impacts of disasters;
- Preparedness for reducing disaster risks;
- Identify vulnerable and resilient community;
- Indicators of community-based disaster management; and
- Effectiveness of community-based disaster management.

#### **4.10.3. Focus group discussion (FGD)**

Generally, FGD is the technique for qualitative data collection where the people share their beliefs, opinions, perception towards any issue. This technique has been used in this study to obtain community people's perception towards the issues related to community-based disaster management in Bangladesh. The researchers (Polgar & Thomas, 2000; Cohen et al, 2001 & Bell, 1999) mentioned that FGD is discussion with 5-10 people on their understanding and views on a particular issue while Palmer & Bolderston (2006) added that it is an extension interview with large group of people. Therefore, this study has conducted 6 focus group discussion (FGD) with different people and each of the FGD consisted with 7-10 individuals. The focus group discussions have been held with members of the surveyed communities who were stakeholders of disaster management. The FGD has been conducted from June 2020 to June 2021 in the study area. The below table shows the detail of FGDs:

Each FGD lasted between 45-60 minutes and has been held at schools, community club, shops and local leaders' house.

The FGD has been guided by the following issues:

- Socio-economic background;
- Information on disaster occurrence and impacts of disasters;
- Responses to disaster management;
- Identify vulnerability within the community;
- Identify capacity to defeat vulnerability;
- Participation in disaster management activity; and
- Evaluation the community-based disaster management.

#### **4.11. Data collection instruments**

The data collection instruments, i.e., questionnaire, checklist is varied in accordance with objectives of the study. This study has used the schedule survey interview to collect the quantitative data which has been used in descriptive, explanatory and exploratory purposes and this instrument was useful in collecting empirical data from the respondents with limited resource and time. This study has used semi-structured survey questionnaire

to collect data whereas the questions are both open and close ended. The survey questionnaire has been developed on the basis of reviewed literature, primary field visit, supervisors' recommendation, expert consultation and objectives of the study where the close ended questions' responses have been collected through Likert scale.

The survey questionnaire divided into 8 sections which consisted of 194 questions where section 'A' includes 18 questions on the socioeconomic information of the respondents; whereas section 'B' includes 7 questions on the information on disaster occurrence; section 'C' includes 43 questions on the information on practiced coping mechanisms within community, government and NGOs support facilities to strengthen coping mechanisms; section 'D' includes 32 questions on the information on community people participation in risk reduction options; section 'E' includes 5 questions on community based organization (CBO); section 'F' includes 36 questions on the coping mechanisms, government and NGOs' initiatives, participation in risk reduction options and activities of community based organizations; section 'G' includes 39 questions on effectiveness of practiced coping mechanisms within community, government and NGOs' support facilities to strengthen coping mechanisms, community people participation in risk reduction options and CBOs' activities and section 'H' includes 14 questions on resilient community.

For collecting qualitative data, this study has conducted FGD and KII through a developed checklist and the checklist has been developed to know participants' personal identity, vulnerability, risk and capacity of population, practiced/existing coping mechanisms with the community, NGOs and government supports to strengthen coping mechanisms, community people participation in risk reduction options, CBOs' activities in pre, during and post disaster phases and effectiveness of community coping mechanisms and their participation in risk reduction options..

Selected fieldworkers have been briefed about the surveying and interviewing (FGD and KII) techniques and allowed to trial in the preparation session.



#### **4.12. Pre-testing of questionnaire**

The survey questionnaire has been finalized after a pilot survey of the research issue with a selected number of respondents. The pilot study has conducted for checking the appropriateness and meaningfulness of the questionnaire as well as addressing the sensitive issues, sequencing of questions and avoiding misconception on any issues. After completing the pilot study, the questionnaire has been revised, made corrections, modifications and changes and then has been made final before collecting the actual field data.

#### **4.13. Data analysis and presentation**

Walliman (2011) mentioned that the main devotions of the quantitative data are assessing, making judgements, examining associations, making predictions, testing hypotheses, constructing concepts, and theories. Although in this study the quantitative data has been analysed in terms of frequency distribution by using SPSS (Statistical Package for Social Sciences) software and MS Excel. For coding, editing and processing numerical data the descriptive statistical method have been used. The collected data has been presented according to the Likert scale responses. For example, to know the impacts of disaster, the responses have been shown as 5= Extremely concerned; 4= Concern to a greater extent; 3=Moderately concerned; 2= Somewhat concerned; and 1= Not concerned whereas to know the experience of facing disasters, the responses have been shown as 4=Highly experienced; 3= Moderately experienced; 2=Somewhat experienced; and 1=Not experienced, involvement in managing disaster the responses have been shown as 4=Highly involved; 3=Moderately involved; 2=Somewhat involved and 1=Not involved. For examining the effectiveness of practiced coping mechanisms within community, government and NGOs' support facilities, community people participation in risk reduction options and community-based organizations (CBOs) for disaster management, the responses have been shown as, 5=Extremely effective; 4=Very effective; 3=Moderately effective; 2=Somewhat effective and 1=Not effective. Besides, to examine the indicators for resilient community, the responses have been shown as 5= Strongly agree; 4= Agree; 3=Neutral; 2=Disagree and 1=Strongly disagree. The collected data has

been presented in graphs, chart, tables etc. in accordance with research objects and questions where the tables were bi-variate and multi-variate.

Data reducing, data displaying and conclusion drawing/verification are the three concurrent flows of action in qualitative data analysis (Miles & Huberman, 1994 cited in Walliman, 2011) while for this study on the other hand, the qualitative data, that gathered from KIIs and FGDs have been analysed manually and presented in descriptive mode. The data has been sorted, broken into sub unit until any pattern emerged and the raw has been categorized meaningfully for communicating to others. The description of collected qualitative data has been presented in accordance with sequence of the questions of the checklist.

#### **4.14. Reliability and validity**

The acceptance of research is based on the quality of the research which indicates the appropriateness and accuracy of the procedure of conducting research to results. This appropriateness and accuracy of the research conducting process (study design, sampling procedure and strategy, findings formulate, conclusion drawn and the statistical procedure etc.) called the validity of the research where validity is based on the answers to the undertaken questions using appropriate methods and procedures. Reliability, on the other hand, based on the research instruments' consistency and stability which make the predictability and accuracy in research. The reliability also depends on the consistency and stability of the research instrument (Kumar, 2011). Healy & Perry (2000) developed ontology of realism, methodological trustworthiness, and triangulation, contingent and construct validity analytic generalization as the criteria for using to determine the validity and reliability of research. Reliability and validity are the important issues in scientific researches where reliability talks about dependability and consistency of an indicator and validity about the meaning of the construct captured by indicator in which we are interested. Denzin & Lincoln (1994) mentioned 'trustworthiness' and 'authenticity' as the standards for adjudicating the quality of a study and they also argue that integrity, transferability, steadiness and confirmability indicators determined the trustworthiness in

the qualitative study (Denzin & Lincoln, 1994 cited in Kumar, 2011) and internal validity, external validity, reliability and objectivity criteria for judging quantitative research (Trochim & Donnelly, 2007, cited in Kumar, 2011) that reflect the validity and reliability in study. The following steps have been occupied to expand the reliability and validity of this study:

- Clearly conceptualize the constructs in order to indicate one concept by each measure;
- All attempts were taken to measure the constructs at the most possible level ;

#### **4.15. Ethical concern**

All research works are guided by code of conduct including the norms, values, changing ethos, etc. that called in research ethical concern/issues. So, ethical issues have been strictly followed in this study through considering Kumar (2011) suggested areas such as, collecting information, seeing consent, providing enticements, looking for delicate information, maintaining confidentiality, avoiding biasness, avoiding lack of action, avoiding inappropriate use research methodology, avoiding incorrect reporting, avoiding inappropriate use of the information and avoiding misuse of the information. Consent of the respondents/participants have been taken before the collection of information in this study regarding the issues of protecting the human subject for example, Schinke & Gilchrist (1993) mentioned that participants/respondents must be capable to give consensus, adequate information must be provided to permit for a coherent decision and consensus must be charitable and un-coerced. The sensitive or confidential information has been collected by maintaining all types of privacy and confidentiality in this research by considering anxiety of the participants/respondents, discomfort, privacy invasion and harassment. This study has avoided biasness in taking and putting information, using inappropriate methodology, reporting incorrectly, using inappropriate and misinformation etc. Thus, the survey interview questionnaire has been submitted to the supervisors, director of the institutions of disaster management and vulnerability, University of Dhaka and faculties of the institute to examine the ethical issues in the questionnaire which did not push any unanticipated harming situation with

the respondents. The research assistants have been trained up on ethical issues before field work.

#### **4.16. Problems faced during data collection**

The researcher faced multidimensional problems during data collection. These were as follows:

- Interfering in interviewing by other family member of the respondents;
- Rapport building was difficult with the aged person although it was built;
- Female respondents have been reluctant in answering to the questions related to empowerment and decision making in FGD's sessions;
- Some of the respondents wanted relief as they assumed that the researcher is a relief distributor;
- The kids of the respondents sometimes made noise during survey interviewing as they did not know about the interview, and
- Communication and transportations were troublesome.

#### **4.17. Observations and limitations of the study**

Permission has been required to conduct survey among the regions from local government bodies, the concern administration and the community leaders within the schools, community club, local markets and common places of the villages. The survey was so time consuming as each of the questionnaire large number of questions. Sometimes the respondents were not interested to give long time this questionnaire as most of them have been engaged in agricultural activities. Some of the participants of focus group discussion (FGD) have delayed in participate in the discussion period, thus some FGDs took extra time to conduct. This study has employed research assistants although the researcher has limited access to resources. As this study has been conducted on the community-based disaster management in Bangladesh in small part of country so, it was not possible to generalize all over country and al the approaches to disaster management.

#### **4.18. Conclusions**

The methodological instructions focused on the way of conducting the study of exploring the effectiveness of community-based disaster management in Bangladesh and sketched out by emphasizing each requirement. Hence, the instructions fulfilled the requirements of this study objectives through using both qualitative and quantitative methods. The key informant interview (KII), focus group discussion (FGD), informal group discussion, direct observation, document review, etc. have been followed for qualitative method. Moreover, survey was conducted through using survey interview questionnaire for quantitative part. An overview of the study area and study population was drawn to make the justification of choosing the areas. Scientific sampling procedure was adopted for the determination of sample size for both qualitative and quantitative methods. Appropriate tools have been selected to collect field data and these tools have been finalized after pilot study. Furthermore, this chapter discussed the systematic of conducting this study scientifically.

## **Chapter Five**

### **Findings of the study**

#### **5.1. Introduction**

The chapter five comprises the findings of the study such as, socioeconomic and demographic information, information on disaster occurrence, practiced/existing coping mechanisms within the community, community people participation in risk reduction options, CBOs' activities, application of CBDM (community-based disaster management), level of effectiveness of CBDM and indicators of resilient community. The socioeconomic and demographic information includes the age structure and sex of the respondents, marital status, educational qualification, occupation, family size, dependent family members in the household, monthly income and expenditure of the respondents, land ownership, land holdings, ownership of livestock, and ownership of other movable properties, housing patterns, and household agricultural (farming) and non-agricultural (non-farming) activities. The information on disaster occurrence contains vulnerable sectors, impacts of disasters on household, concern of people about the impacts of disasters, experience of facing disaster and involvement in managing disaster. The practiced/existing of coping mechanisms regarding food, fodder and fuel crisis, dwelling places, losing livelihood, agricultural damages, water, health and sanitation issues and initiative to these issues, protecting violence against women, initiative to make the community neat and clean and measures to mitigate disaster risk have been discussed in this chapter. The NGOs' and government initiatives such as, training programs, support to agriculture and health services to strengthen the community's coping mechanisms, the resilient endeavours of the community people such as, preserved fuel for cooking, food and fodder, poultry rearing, construct hazard resilient houses, cattle rearing, disaster resilient cropping, raised awareness about early warning and disseminating signals, raised homestead ground, etc. are included here. The community people participation includes hazard map creation, hazard identification, vulnerability assessment, risk assessment, awareness raising campaigns, providing

psychological support, restoring agricultural rehabilitation, providing medical first aid, relief distribution, integrating development activities, early warning system and maintaining physical and relational connectivity. The application and level of effectiveness of existing coping mechanisms (regarding food, fodder and fuel crisis, dwelling places, agricultural damages, water, health and sanitation issues, violence against girls and women, making community neat and clean and mitigating disaster risk) community people participation in risk reduction options (creating hazard maps, identification of hazard, assessing vulnerability and risk, raising awareness, disseminating early warning signals, distributing relief, maintaining physical and relational connectivity) etc. are also discussed here.

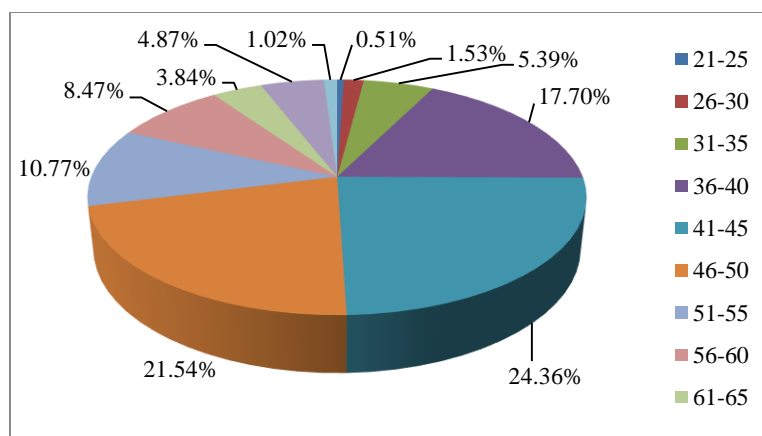
## **5.2. Socioeconomic and demographic information of the respondents**

### **5.2.1. Age structure**

Table 5.2.1 shows that the age structure of the respondents was between 21-70+ years. The highest limit of the age group of the respondents such as 70+ years represents the increasing life expectancy of Bangladesh. According to BBS report the average life expectancy of people in Bangladesh had risen to 72 years 8 months in 2020 (BBS, 2020 cited in The Financial Express, June 28, 2021). The table also represents that the highest 24.36 percent of the respondents were found within the age group of 41-45 years followed by 21.54 percent within 46-50 years, 17.70 percent within 36-40 years, 10.77 percent within 51-55 years, 8.47 percent within 56-60 years, 5.39 percent within 31-35 years, 4.87 percent within 66-70 years, 3.84 percent within 61-65 years, 1.53 percent within 26-30 years, 1.02 percent more than 70 years and 0.51 percent within 21-25 years. The highest number of the respondents (248) was found within the age range between 36-50 years among the total of (n=390) the respondents in the study area. The significant number of respondents (95 of 390) was found in middle age (41-45 years) as the average life expectancy of the people of Bangladesh is 72.8 years.

**Table 5.2.1: Frequency and percentage distribution of respondents by age group**

Age (in years)	Frequency	Percent
21-25	02	0.51
26-30	06	1.53
31-35	21	5.39
36-40	69	17.70
41-45	95	24.36
46-50	84	21.54
51-55	42	10.77
56-60	33	8.47
61-65	15	3.84
66-70	19	4.87
70+	04	1.02
<b>Total</b>	<b>390</b>	<b>100</b>



**Figure 5.2.1: Respondents by age group**

### 5.2.2. Sex

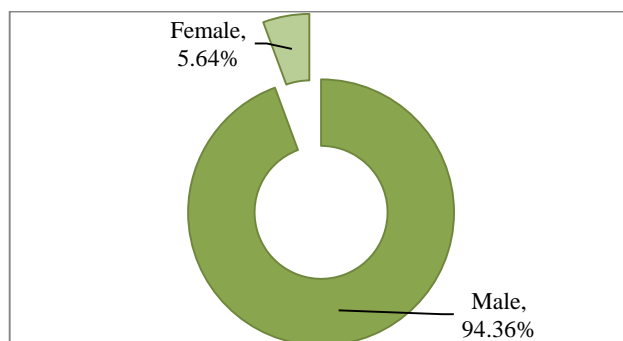
The sex ratio of the people of Bangladesh is 100.2:100 (BBS, 2019). The head of household was considered as the source of survey data and unit of analysis, so the sex ratio was not representing the national data. Table 5.2.2 shows that the sex ratio of this



study population was 94.36:5.64 while the male were 94.36 percent and female were 5.64 percent.

**Table 5.2.2: Frequency and percentage distribution of respondents by sex**

Sex	Frequency	Percent
Male	368	94.36
Female	22	5.64
<b>Total</b>	<b>390</b>	<b>100</b>



**Figure 5.2.2: Respondents by sex**

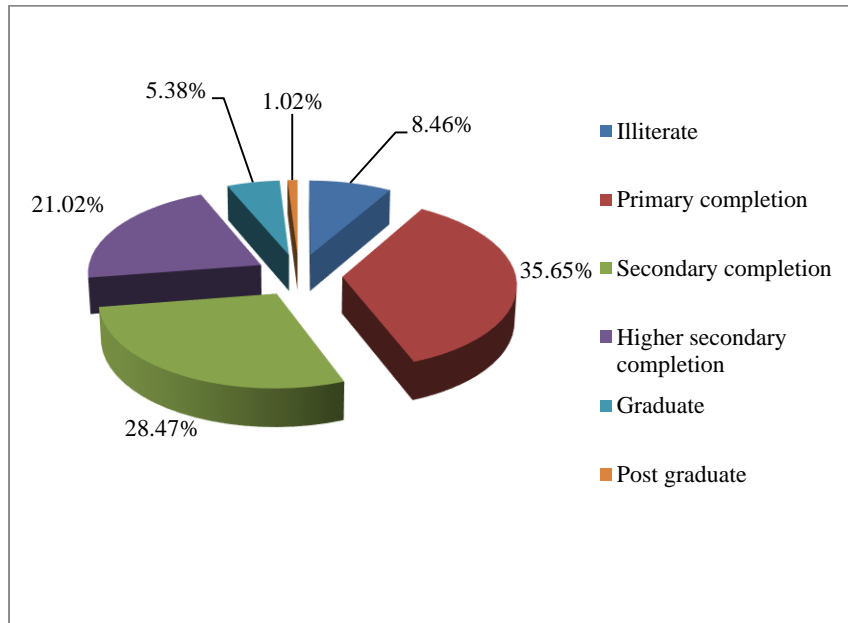
### 5.2.3. Educational qualification

Table 5.2.3 highlights that the majority 35.65 percent of the respondents completed primary level education followed by 28.47 percent secondary level education, 21.02 percent higher secondary level education, 5.38 percent graduation and 1.02 percent post-graduation. The significant 8.46 percent of the respondents was illiterate among study people while the literacy rate of the people of Bangladesh was 64.7 percent (BBS, 2019).

**Table 5.2.3: Frequency and percentage distribution of respondents by educational qualification**

Educational Qualification	Frequency	Percent
Illiterate	33	8.46
Primary completion	139	35.65

Secondary completion	111	28.47
Higher secondary completion	82	21.02
Graduate	21	5.38
Post graduate	04	1.02
<b>Total</b>	<b>390</b>	<b>100</b>



**Figure 5.2.3: Respondents by education**

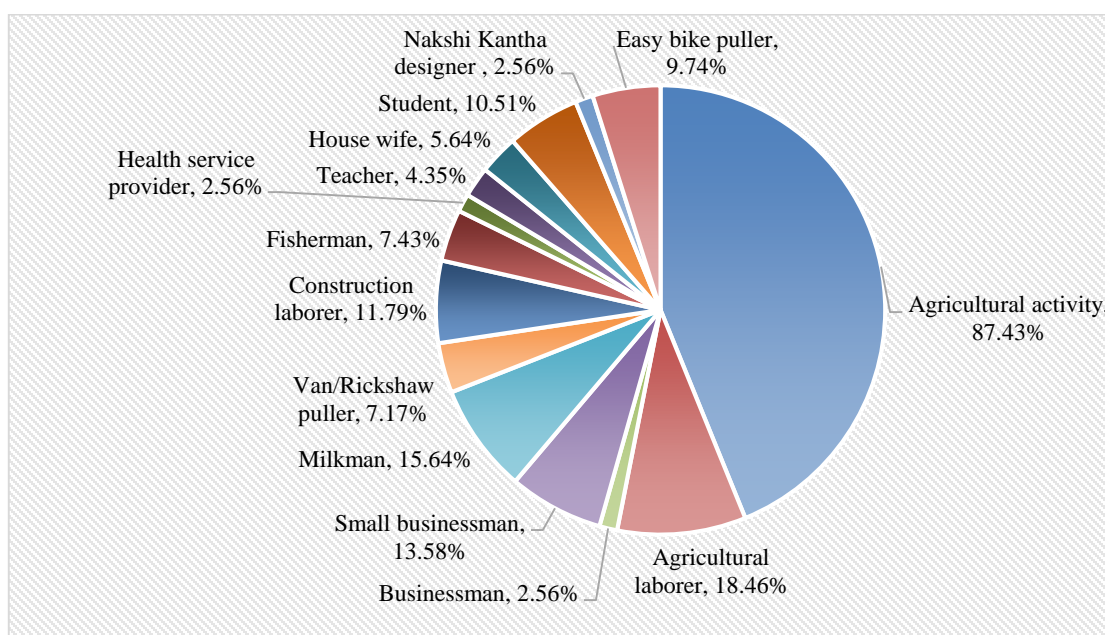
#### 5.2.4. Occupation

Table 5.2.4 illustrates that the majority 87.43 percent of the respondents were engaged in agricultural (farming) activities while it is the focal occupation of the rural society of Bangladesh followed by 18.46 percent agricultural labourer, 15.64 percent milkman, 13.58 percent small businessman, 11.79 percent construction labourer, 10.51 percent student, 9.74 percent easy bike puller, 7.43 percent fisherman, 7.17 percent van/rickshaw puller, 5.64 percent housewife, 4.35 percent teacher, 2.56 percent businessman, 2.56 percent *Nakshi Kantha* designer and another 2.56 percent health service provider.

**Table 5.2.4: Frequency and percentage distribution of respondents by occupation**

Occupation*	Frequency	Percent
Agricultural activity	341	87.43
Agricultural laborer	72	18.46
Businessman	10	2.56
Small businessman	53	13.58
Milkman	61	15.64
Van/Rickshaw puller	28	7.17
Construction laborer	46	11.79
Fisherman	29	7.43
Health service provider	10	2.56
Teacher	17	4.35
House wife	22	5.64
Student	41	10.51
<i>Nakshi Kantha</i> designer	10	2.56
Easy bike puller	38	9.74

\*Multiple responses n=390



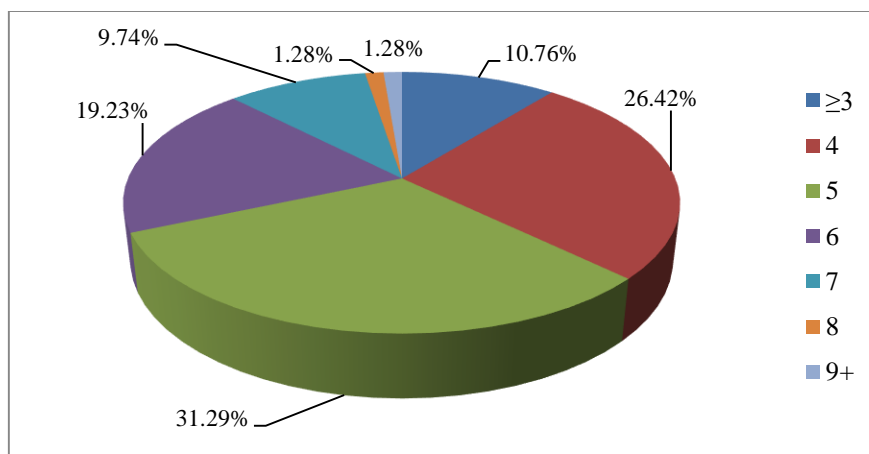
**Figure 5.2.4: Respondents by occupation**

### 5.2.5. Family size

Table 5.2.5 represents that the family size in the study area was ranged from  $\geq 3$  to more than 9 members. The majority 31.29 percent of the respondents' family consisted of 5 members whereas 26.42 percent 4 members, 19.23 percent 6 members, 10.76 percent 3 members, 9.74 percent 7 members, 1.28 percent 8 members and another 1.28 percent more than 9 members while the national average of family size in Bangladesh is 4.2 (BBS, 2018).

**Table 5.2.5: Frequency and percentage distribution of respondents by family size**

Family Member	Frequency	Percent
$\geq 3$	42	10.76
4	103	26.42
5	122	31.29
6	75	19.23
7	38	9.74
8	05	1.28
9+	05	1.28
<b>Total</b>	<b>390</b>	<b>100</b>



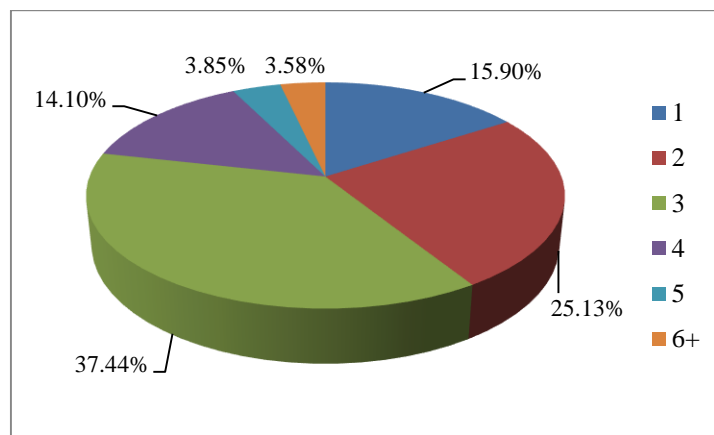
**Figure 5.2.5: Respondents by family size**

### 5.2.6. Dependent family member

The dependent family members on household head in the study area was ranged from 1 to more than 6 members. Table 5.2.6 shows that 37.44 percent of the respondents had 3 dependent members followed by 25.13 percent 2 members, 15.90 percent 1 member, 14.10 percent 4 members, 3.85 percent 5 members and 3.58 percent more than 6 members.

**Table 5.2.6: Frequency and percentage distribution of respondents by dependent family member**

<b>Dependent Family Member</b>	<b>Frequency</b>	<b>Percent</b>
1	62	15.90
2	98	25.13
3	146	37.44
4	55	14.10
5	15	3.85
6+	14	3.58
<b>Total</b>	<b>390</b>	<b>100</b>



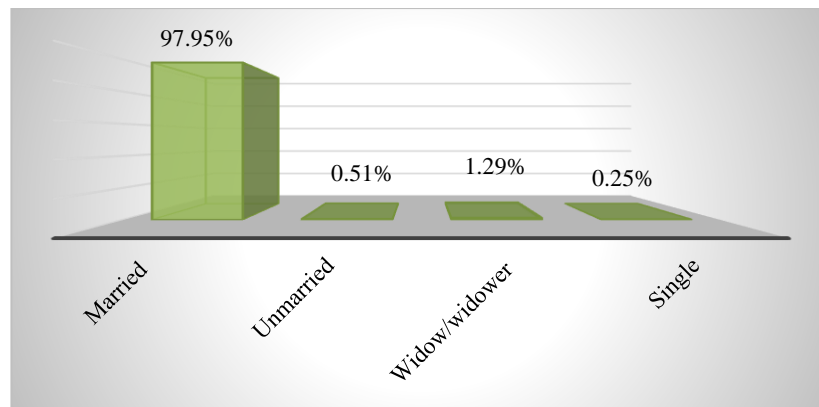
**Figure 5.2.6: Respondents by dependent family member**

### 5.2.7. Marital status

The overwhelming majority (97.95%) of the respondents were married followed by 1.29 percent widow/widower, 0.51 percent unmarried and 0.25 percent single. Table 5.2.7.

**Table 5.2.7: Frequency and percentage distribution of respondents by marital status**

Marital Status	Frequency	Percent
Married	382	97.95
Unmarried	02	0.51
Widow/widower	05	1.29
Single	01	0.25
<b>Total</b>	<b>390</b>	<b>100</b>



**Figure 5.2.7: Respondents by marital status**

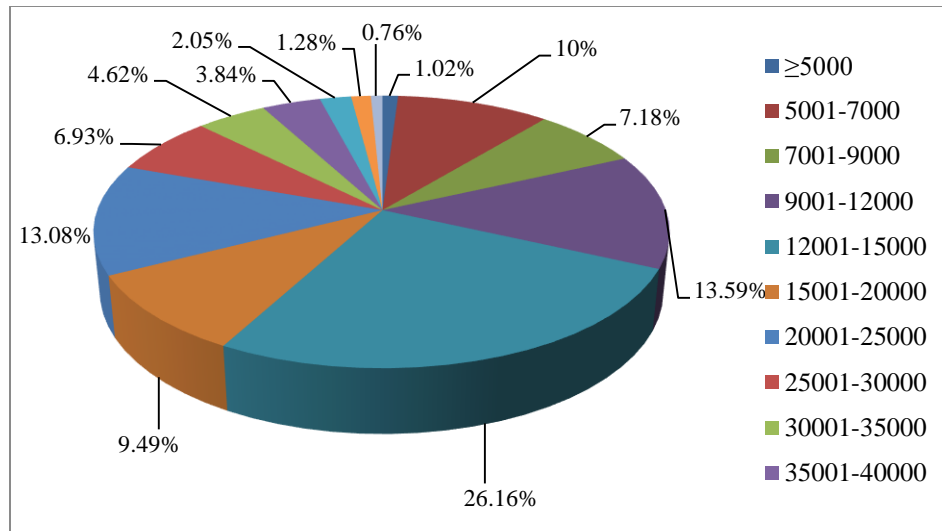
### 5.2.8 Monthly income

Table 5.2.8 highlights that the monthly income was ranged from BDT  $\geq 5000$  to BDT 50000+ while the per capita income of the people of Bangladesh is \$2500 in 2021 (The Financial Express, November 04, 2021). The highest 26.16 percent of the respondents' monthly income range were within BDT 12001-15000 followed by 13.59 percent within BDT 9001-12000, 13.08 percent within BDT 20001-25000, 10 percent within BDT 5001-7000, 9.49 percent within BDT 15001-20000, 7.18 percent within BDT 7001-9000, 6.93

percent within BDT 25001-30000, 4.62 percent within BDT 30001-35000, 3.84 percent within BDT 35001-40000, 2.05 percent within BDT 40001-45000, 1.28 percent within 45001-50000. A few percent (1.02) of the respondents' monthly income are BDT  $\geq$ 5000 while 0.76 percent of the respondents' monthly income is more than BDT 50000.

**Table 5.2.8: Frequency and percentage distribution of respondents by monthly income**

<b>Monthly Income (BDT)</b>	<b>Frequency</b>	<b>Percent</b>
$\geq$ 5000	04	1.02
5001-7000	39	10.00
7001-9000	28	7.18
9001-12000	53	13.59
12001-15000	102	26.16
15001-20000	37	9.49
20001-25000	51	13.08
25001-30000	27	6.93
30001-35000	18	4.62
35001-40000	15	3.84
40001-45000	08	2.05
45001-50000	05	1.28
50000+	03	0.76
<b>Total</b>	<b>390</b>	<b>100</b>



**Figure 5.2.8: Respondents by monthly income**

### 5.2.9. Monthly expenditure

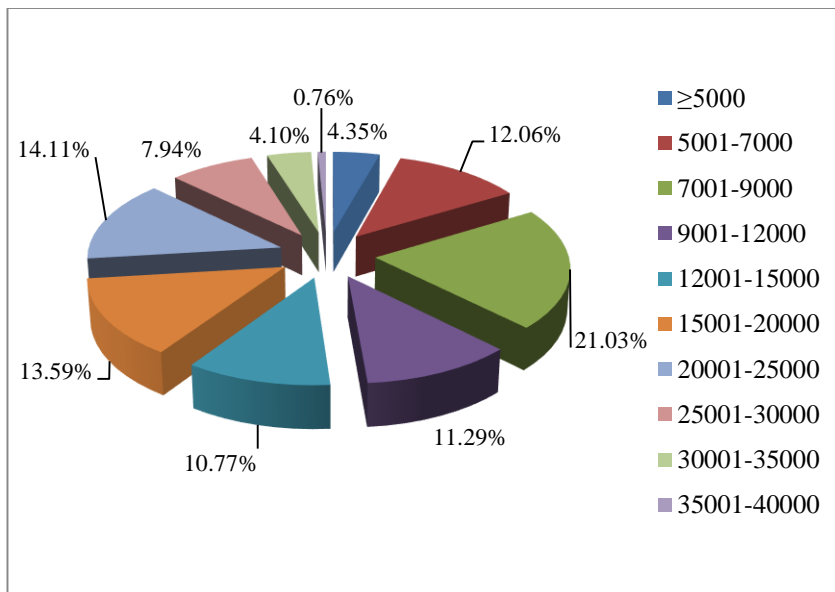
Table 5.2.9 highlights that the monthly expenditure was ranged from BDT  $\geq 5000$  to 40000. The significant 16.41 percent of the respondents' monthly expenditure range was less or equal to BDT 5000 to 7000. However, the table shows that the highest 21.03 percent of the respondents' monthly expenditure range was from BDT 7001-9000 followed by 14.11 percent from BDT 20001-25000, 13.59 percent from BDT 15001-20000, 11.29 percent from BDT 9001-12000, 10.77 percent from BDT 12001-15000, 7.94 percent from BDT 25001-30000 and 4.10 percent from BDT 30001-35000. Only 0.76 percent of the respondents' monthly expenditure range was from BDT 35001-40000 which is significant.

**Table 5.2.9: Frequency and percentage distribution of respondents by monthly expenditure**

Monthly Expenditure (BDT)	Frequency	Percent
$\geq 5000$	17	4.35
5001-7000	47	12.06
7001-9000	82	21.03



9001-12000	44	11.29
12001-15000	42	10.77
15001-20000	53	13.59
20001-25000	55	14.11
25001-30000	31	7.94
30001-35000	16	4.10
35001-40000	03	0.76
<b>Total</b>	<b>390</b>	<b>100</b>



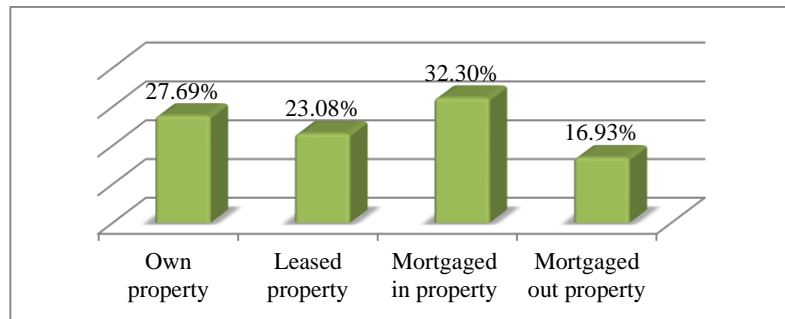
**Figure 5.2.9: Respondents by monthly expenditure**

### 5.2.10. Land ownership

Four types of land ownership were found in the study area such as, own property, leased property, mortgaged in property and mortgaged out property. Table 5.2.10 demonstrates that the highest 32.30 percent of the respondents' property type had mortgaged in property whereas 27.69 percent own property, 23.08 leased property and 16.93 percent mortgaged out property.

**Table 5.2.10: Frequency and percentage distribution of respondents by land ownership**

<b>Ownership status</b>	<b>Frequency</b>	<b>Percent</b>
Own property	108	27.69
Leased property	90	23.08
Mortgaged in property	126	32.30
Mortgaged out property	66	16.93
<b>Total</b>	<b>390</b>	<b>100</b>



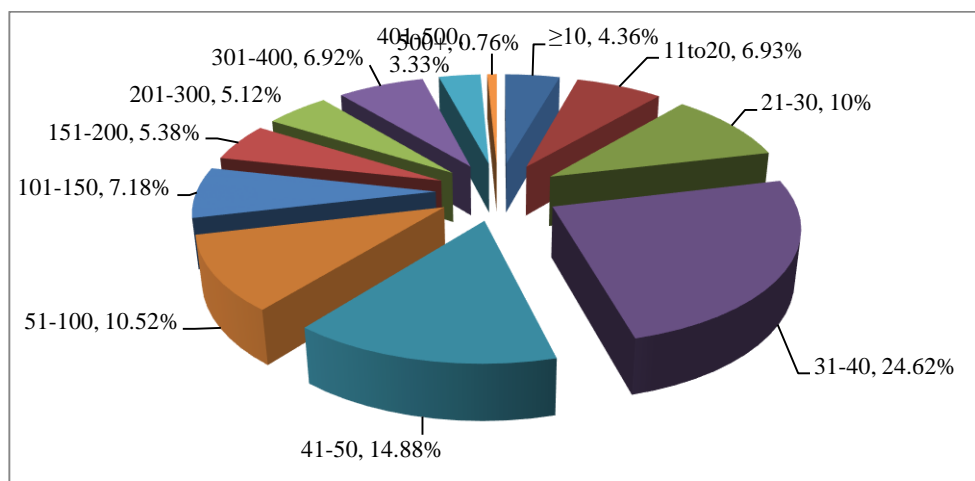
**Figure 5.2.10: Respondents by land ownership**

### **5.2.11. Land holdings**

The land holding of the respondents was ranged from  $\geq 10$  decimals to more than 500 decimals in the study area. The significant number of (11.32%) respondents hold from  $\geq 10$  to 20 decimals land. The highest 24.62 percent of the respondents hold the range from 31-40 decimals land followed by 14.88 percent 41-50 decimals land, 10.52 percent 51-100 decimals land, 10 percent 21-30 decimals land, 7.18 percent 101-150 decimals land, 6.92 percent 301-400 decimals land, 5.38 percent 151-200 decimals land and 5.12 percent 201-300 decimals land. The significant numbers (4.12%) of the respondents hold from 401 to more than 500 decimals land. Table 5.2.11.

**Table 5.2.11: Frequency and percentage distribution of respondents by land holdings**

Land holdings (in decimal)	Frequency	Percent
≥10	17	4.36
11-20	27	6.93
21-30	39	10.00
31-40	96	24.62
41-50	58	14.88
51-100	41	10.52
101-150	28	7.18
151-200	21	5.38
201-300	20	5.12
301-400	27	6.92
401-500	13	3.33
500+	03	0.76
<b>Total</b>	<b>390</b>	<b>100</b>



**Figure 5.2.11: Respondents by land holdings**

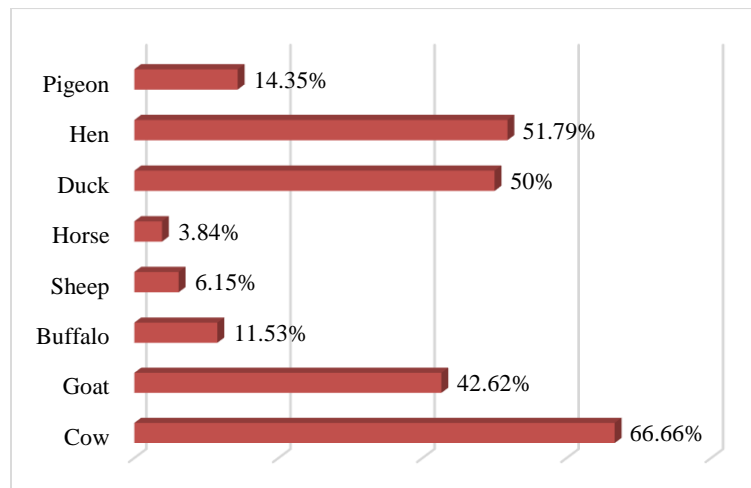
### 5.2.12. Ownership of livestock

Table 5.2.12 shows that the majority 66.66 percent had cow followed by 51.79 percent had hen followed by 50 percent had duck, 42.62 percent had goat, 14.35 percent had pigeon, 11.53 percent had buffalo, 6.15 percent had sheep and 3.84 percent had horse.

**Table 5.2.12: Frequency and percentage distribution of respondents by ownership of livestock**

Name of livestock*	Frequency	Percent
Cow	260	66.66
Goat	167	42.62
Buffalo	45	11.53
Sheep	24	6.15
Horse	15	3.84
Duck	195	50.00
Hen	202	51.79
Pigeon	56	14.35

\*Multiple responses n=390



**Figure 5.2.12: Respondents by ownership of livestock**

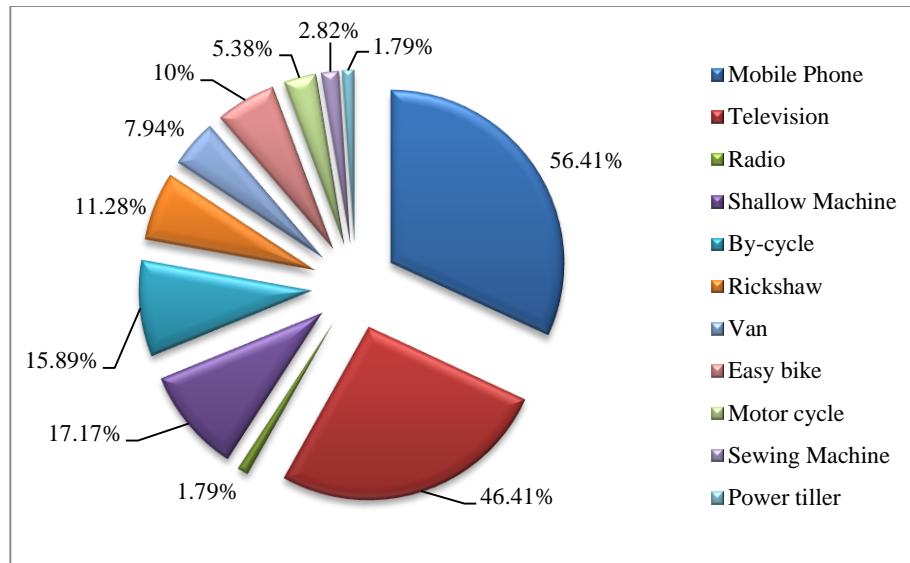
### 5.2.13. Ownership of other movable properties

The respondents of the study area had various movable properties such as, mobile phone, television, radio, shallow machine, bicycle, rickshaw, van, easy bike, motor cycle and sewing machine. Table 5.2.13 shows that the significant 56.41 percent of the respondents had mobile phone, 10 percent had easy bike and 5.38 percent had motor cycle. The table also represents that the highest 46.41 percent of the respondents had television followed by 17.17 percent had shallow machine, 15.89 percent had bicycle, 11.28 percent had rickshaw, 7.94 percent had van, 2.82 percent had sewing machine, 1.79 percent had radio and another 1.79 percent had power tiller.

**Table 5.2.13: Frequency and percentage distribution of respondents by ownership of movable properties**

<b>Movable properties*</b>	<b>Frequency</b>	<b>Percent</b>
Mobile Phone	220	56.41
Television	181	46.41
Radio	07	1.79
Shallow Machine	67	17.17
Bicycle	62	15.89
Rickshaw	44	11.28
Van	31	7.94
Easy bike	39	10.00
Motor cycle	21	5.38
Sewing Machine	11	2.82
Power tiller	07	1.79

*\*Multiple responses* n=390



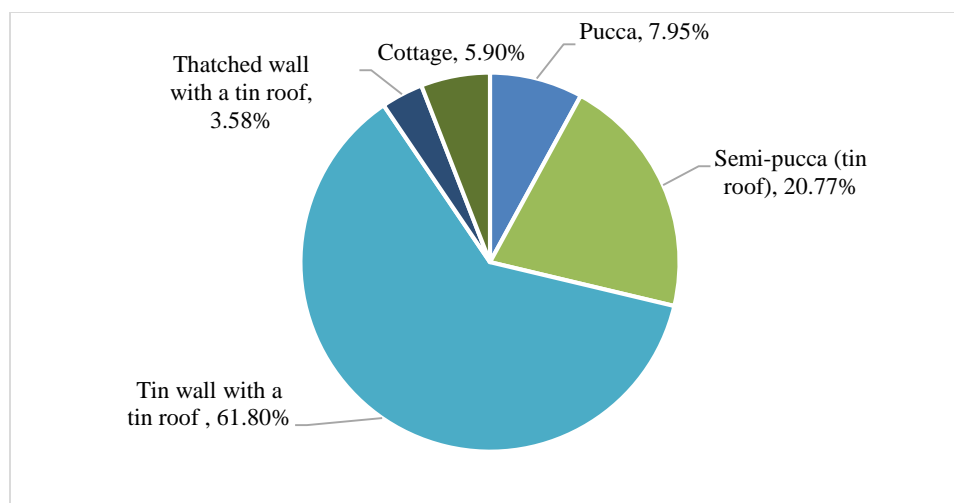
**Figure 5.2.13: Respondents by ownership of movable property**

#### 5.2.14. Housing pattern

The house type of the study area was *pucca*, semi-*pucca* (*tin* roof) *tin* wall with a *tin* roof, thatched wall with a *tin* roof and cottage. Table 5.2.14 highlights that the majority 61.80 percent of housing type were tin wall with a *tin* roof followed by 20.77 percent semi-*pucca* (*tin* roof), 7.95 percent *pucca*, 5.90 percent cottage and 3.58 percent thatched wall with a *tin* roof.

**Table 5.2.14: Frequency and percentage distribution of respondents by housing pattern**

Housing pattern	Frequency	Percent
<i>Pucca</i>	31	7.95
Semi- <i>pucca</i> ( <i>tin</i> roof)	81	20.77
<i>Tin</i> wall with a <i>tin</i> roof	241	61.80
Thatched wall with a <i>tin</i> roof	14	3.58
Cottage	23	5.90
Total	390	100



**Figure 5.2.14: Respondents by housing pattern**

### 5.2.15. Household agricultural activities

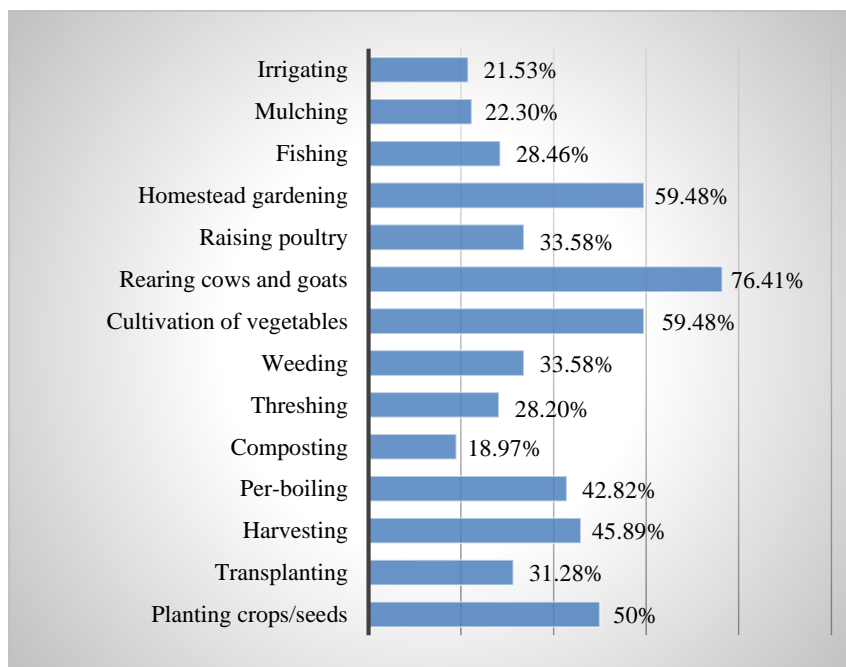
Table 5.2.15 shows that the majority 76.41 percent were rearing cows and goats followed by 59.48 percent cultivating vegetables and another 59.48 percent gardening around the homestead. Table also shows that 50 percent of the respondents' household were planting crops/seeds followed by 45.89 percent harvesting, 42.82 percent per-boiling, 33.58 percent weeding, another 33.58 percent raising poultry, 31.28 percent transplanting, 28.46 percent fishing, 28.20 percent threshing, 22.30 percent mulching, 21.53 percent irrigating and 18.97 percent composting.

**Table 5.2.15: Frequency and percentage distribution of respondents by household agricultural activities**

Agricultural activities*	Frequency	Percent
Planting crops/seeds	195	50.00
Transplanting	122	31.28
Harvesting	179	45.89
Per-boiling	167	42.82

Composting	74	18.97
Threshing	110	28.20
Weeding	131	33.58
Cultivation of vegetables	232	59.48
Rearing cows and goats	298	76.41
Raising poultry	131	33.58
Homestead gardening	232	59.48
Fishing	111	28.46
Mulching	87	22.30
Irrigating	84	21.53

\*Multiple responses n=390



**Figure 5.2.15: Respondents by household agricultural activities**

### 5.2.16. Household non-agricultural activities

The respondents' household was engaged in some non-agricultural activities such as, *Nakshi Kantha* design sewing, handicrafts production and house repairing. Table 5.2.16 shows that the highest 53.33 percent of the respondents' household were engaged in

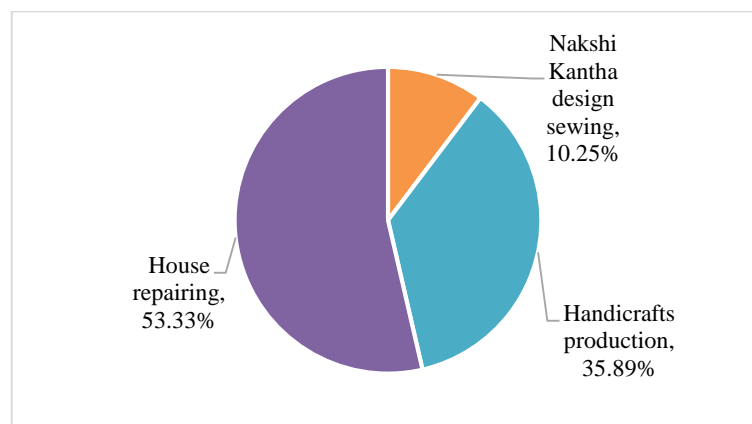


house repairing whereas 35.89 percent handicrafts production and 27.69 percent *Nakshi Kantha* design sewing.

**Table 5.2.16: Frequency and percentage distribution of respondents by household non-agricultural activities**

Non-agricultural activities*	Frequency	Percent
<i>Nakshi Kantha</i> design sewing	40	10.25
Handicrafts production	140	35.89
House repairing	208	53.33

\*Multiple responses n=390



**Figure 5.2.16: Respondents by household non-agricultural activities**

### 5.3. Information on disaster occurrence

#### 5.3.1. Existing hazards

As a disaster-prone delta, Bangladesh faces various disasters about every year. Nasreen (2004) stated disasters are yearly events in Bangladesh and it ranges from ravaging cyclones to devastating floods. The study area faced flood, driving rain, nor westerly, drought, riverbank erosion, water logging, cold wave, cyclone and tornado. As the study area is situated in the Brahmaputra basin, so, most of the disasters are categorized as hydrological and hydro meteorological event. All of the respondents (100%) mentioned that flood, driving rain and drought are existing hazards in their area followed by 95.64

percent riverbank erosion, 93.84 percent water logging, 88.97 percent cold wave, 88.20 percent nor westerly, 78.97 percent cyclone and 53.58 percent tornado as the existing hazards in their area (Table 5.3.1). Although, all of the hazards such as, flood, cyclone, storm/tidal surge, riverbank erosion, structural collapse, water congestion and logging, saline water intrusion, sea level rise, drought, landslide (Nasreen et al., 2017), nor-westerly, driving rain, cold wave, heat wave etc. existed in Bangladesh but, flood, driving rain, riverbank erosion and water logging are the most occurring disasters in study area. All of the respondents (100%) mentioned that the flood, drought and driving rain are most occurring disasters than the riverbank erosion (95.64%) and water logging (93.84%). Table 5.3.2.

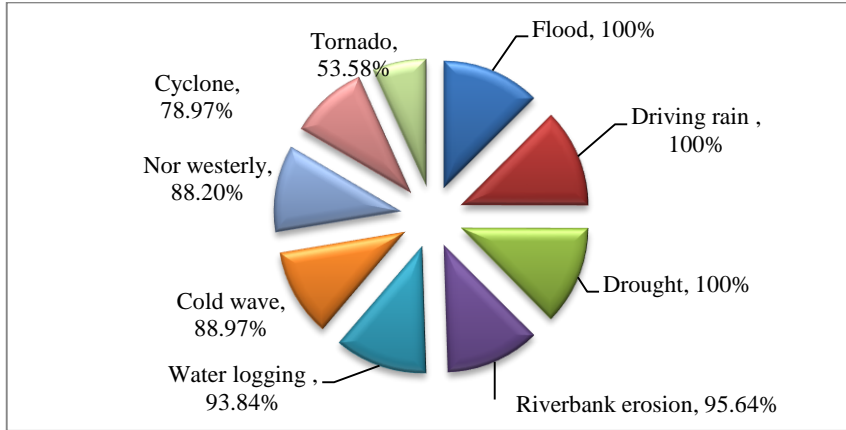
The qualitative data shows that most of the respondents faced floods as the main disaster which causes damages and losses. Then they faced driving rain which created water logging, drought as the disaster and nor westerly as well. The impacts of flood disaster depend on the frequency and velocity of water and the time of occurrence as well. The driving rain affects the agricultural activity and the nor westerly damages the standing crops. Somehow the community people of the study areas faced other disasters such as, riverbank erosion, water logging, cold wave, cyclone and tornado which affected the community's livelihood options, economic activities etc.

**Table 5.3.1: Frequency and percentage distribution of respondents by existing hazards**

<b>Existing hazards*</b>	<b>Frequency</b>	<b>Percent</b>
Flood	390	100.00
Driving rain	390	100.00
Drought	390	100.00
Riverbank erosion	373	95.64
Water logging	366	93.84
Cold wave	347	88.97
Nor westerly	344	88.20

Cyclone	308	78.97
Tornado	209	53.58

*\*Multiple responses* n=390

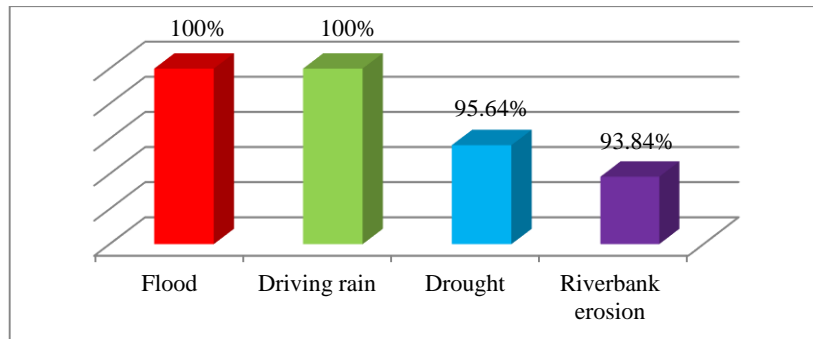


**Figure 5.3.1: Existed hazards in the area**

**Table 5.3.2: Frequency and percentage distribution of respondents by mostly occurring disasters**

Mostly occurring disasters*	Frequency	Percent
Flood	390	100.00
Driving rain	390	100.00
Drought	373	95.64
Riverbank erosion	366	93.84

*\*Multiple responses* n=390



**Figure 5.3.2: Mostly occurring disasters**

### **5.3.2. Vulnerable sectors**

The community's disaster resilience depends on the capability of some important sector such as, drinking water supply, crop production, food security, health and sanitation, education, housing, road communication, fisheries, energy sources, livestock, fiscal management, governance and industry. However, FAO (2021) stated that disasters have enormous threats on social, environmental and economic pillars of sustainable development. The agrarian economy and density of population makes the country exposed to disasters (CEDMHA, 2015) and United Nations (2014) World Risk Report mentioned that Bangladesh ranks 5<sup>th</sup> most 'at risk' among 171 countries in the world for disaster vulnerability (cited in CEDMHA, 2015). Among the respondents, the overwhelming majority (93.84%) pointed out that drinking water supply is scarce and, Hasan et al., (2018) stated that 80 percent of diseases are water borne in Bangladesh. The drinking water supply sector in the study areas is vulnerable due to the inundation of the water sources by flood water and contaminated by arsenic. As a result, drinking water supply scarcity induces malnutrition among women and children, reproductive health hazards for pregnant women, physical weakness and skin diseases (Setu et al., 2014). About 92.05 percent of the respondents mentioned that agricultural production sector is vulnerable to the disasters in their area. However, agriculture has been playing a vital role for economic development in Bangladesh for long time (Davis et al., 2018 & World Bank, 2000 cited in Rahman & Rahman 2018) by ensuring food security, reducing poverty, generating employment and gaining foreign currency (Mozumdar, 2012), directly or indirectly engaging a large number of people in agricultural activities (Rahman & Rahman, 2018) and overall loss in agricultural production in Myanmar, Bangladesh and India is comparatively higher due to massive disasters (FAO, 2021). Agricultural production and food security most commonly depends on each other. However, falling of agricultural production makes more threats for food security while 85.89 percent of the respondents picked out that food security is a vulnerable sector to disaster and it has negative impact on nutritional status while FAO (2021) stated that disasters interrupt normal food supply and makes insufficiencies in food system and

causes food insecurity at the local or national levels. For instance, many poor people suffered from food insecurity in 2007 and 2008 due to prolonged flood and devastating cyclone *Sidr* which damaged agricultural crops production (Mallick et al., 2012). Among the respondents, 80 percent mentioned that health and sanitation sector is vulnerable to disasters because of the destruction due to floods, cyclones and tornadoes. At national level about 74 percent of whole population have access to water supply and 86 percent household have sanitation facility and among them 59 percent have hygienic toilet (NIPORT, 2005). Despite the better situation of health and sanitation program of Bangladesh among developing countries, the water borne diseases spread out due to faecal-oral transmission (NGO Forum for Drinking Water Supply and Sanitation, 2006) and this particular situation is found in disaster affected and disaster-prone parts of the country (Eminence, 2008). The education system is vulnerable to natural disasters, because the infrastructures and study schedule were disrupted seriously due to prolonged floods and devastating cyclones. About 77.17 percent of the respondents said that education sector was vulnerable to disasters. Das (2010) mentioned that educational infrastructure is affected by severe cyclone and flood which has destroyed infrastructure and disrupting transportation system and interrupting learning process. He also added that these disastrous situation also spreads chronic diseases and water related health problems among the students and teachers and as a result educational programs are severely disrupted. The affected household needs assistance for repairing, or reconstructing or rebuilding a new house after a devastating disaster (Saha, 2020) which makes it a vulnerable sector to disaster stated by 69.23 percent of the respondents. Road communication disruption due to disaster pushes vulnerability of community people as most of the rural people have poor accessibility of road communication, transportation and lack of healthcare services, education and employment (Njenga & Davis, 2003). So, road communication sector is vulnerable to disaster in the study area which was mentioned by 64.87 percent of the respondents. About 64.35 percent of the respondents said that fisheries and livestock in their area are vulnerable to flood, flash flood and driving rain. The livestock suffers from crisis of fodder due to prolonged floods. The

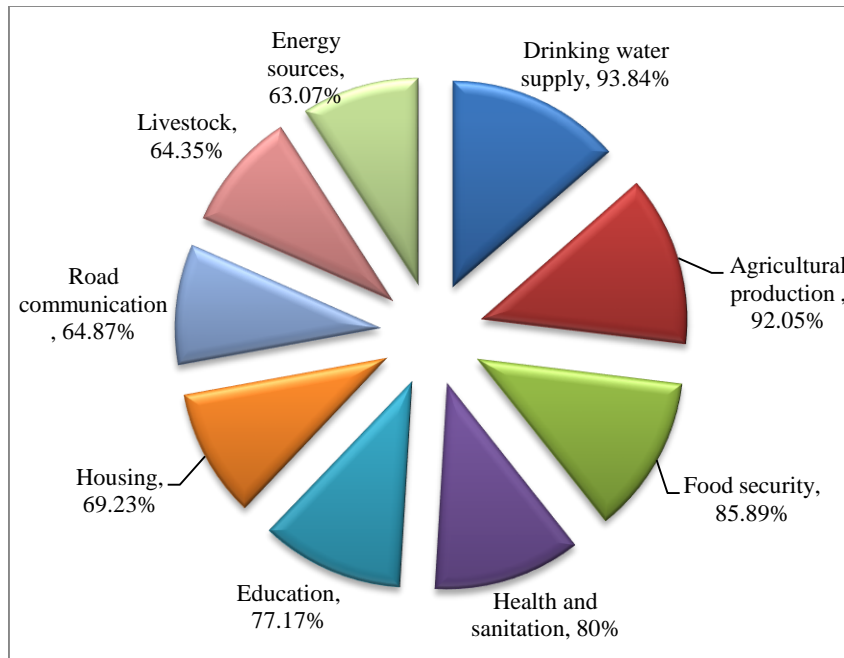
IPCC (2001) stated that outbreaks of new type diseases due to climate change will affect these sub-sectors and causes losses for fisheries and livestock production. The energy sources are vulnerable to disaster which was reported by 63.07 percent of the respondents. The sources of energy in disaster affected area disrupted due to disaster and women of the study area shouldered to collect the fuel to cook. Table 5.3.3.

The qualitative data shows that disasters affected the sources of drinking water supply severely and as a result the community people had to collect drinking water from far. Most of the water sources no longer supplied potable water, due to contamination which resulted in water-borne diseases. The qualitative data also shows that disasters affected agricultural productions such as, rice, wheat, vegetables, fish pond etc. in the study area. The qualitative data highlights that the community people faced deficiency of food for occurrence of disaster. Health and sanitation system disrupted for disaster while many diseases had broken out such as, diarrhoea, cholera, skin diseases, fever etc. However, education, housing and road communication system were the vulnerable sectors in the study area.

**Table 5.3.3: Frequency and percentage distribution of respondents by vulnerable sectors in the study area**

<b>Vulnerable sectors*</b>	<b>Frequency</b>	<b>Percent</b>
Drinking water supply	366	93.84
Agricultural production	359	92.05
Food security	335	85.89
Health and sanitation	312	80.00
Education	301	77.17
Housing	270	69.23
Road communication	253	64.87
Livestock	251	64.35
Energy sources	246	63.07

*\*Multiple responses*      n=390



**Figure 5.3.3: Vulnerable sectors in the area**

### 5.3.3. Impacts of disasters on household

Disasters have enormous impacts on households, community, social and economic condition. Mental, physical and psychological impacts on household member carry other effects. These impacts also involve illness of household member, crop failure, loss of employment, household business failure and death of earning member of household. The majority (90.25%) of the respondents reported that illness of household member is the impact of disaster in study area followed by 84.61 percent crop failure, 48.46 percent loss of employment, 40.76 percent household business failure and 2.05 percent death of earning member of household. Table 5.3.4.

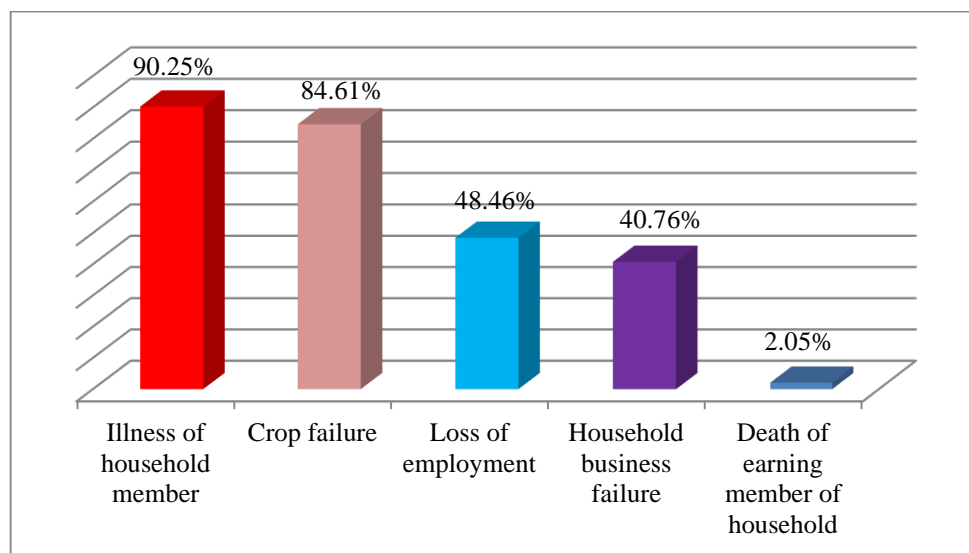
The qualitative data shows that the illness of household member was the common impacts of disasters on household in the study area. They community people suffered from fever, skin diseases, cholera, diarrhoea etc. Sometimes the community people were injured due to nor westerly, cyclone and tornado. Crop failure was also a common impact

of disasters which caused food scarcity. People lost their employability and depended on alternative livelihood options such as, migration, borrowing seeds, taking loan, etc.

**Table 5.3.4: Frequency and percentage distribution of respondents by impacts of disasters on household**

Impacts of disasters on household*	Frequency	Percent
Illness of household member	352	90.25
Crop failure	330	84.61
Loss of employment	189	48.46
Household business failure	159	40.76
Death of earning member of household	08	2.05

\*Multiple responses n=390



**Figure 5.3.4: Impacts of disasters**



#### **5.3.4. Concern about the impacts of disasters**

Table 5.3.5 shows the level concern of the community people about the impacts of the disasters.

47.4 percent of the respondents reported that they are concerned to a greater extent about the impacts of flood in their area followed by 25.9 percent extremely concerned, 12.1 percent somewhat concerned, and 5.4 percent moderately concerned. On the other hand, 9.2 percent of the respondents said that they are not concerned about the impacts of flood.

40 percent of the respondents stated that they are concerned to a greater extent about the impacts of water logging in their area followed by 20.3 percent extremely concerned, 16.2 percent somewhat concerned, and 11.3 percent moderately concerned. On the other hand, 12.3 percent of the respondents said that they are not concerned about the impacts of water logging.

36.7 percent of the respondents stated that they are concerned to a greater extent about the impacts of riverbank erosion in their area followed by 24.4 percent extremely concerned, 17.4 percent somewhat concerned, and 12.6 percent moderately concerned. On the other hand, 9 percent of the respondents said that they are not concerned about the impacts of riverbank erosion.

About 49.7 percent of the respondents stated that they are concerned to a greater extent about the impacts of driving rain in their area followed by 29 percent extremely concerned, 10 percent somewhat concerned, and 4.9 percent moderately concerned. On the other hand, 6.4 percent of the respondents said that they are not concerned about the impacts of driving rain.

The majority 45.9 percent of the respondents stated that they are concerned to a greater extent about the impacts of drought in their area followed by 25.9 percent extremely concerned, 11 percent somewhat concerned, and 10.5 percent moderately concerned. On

the other hand, 6.7 percent of the respondents said that they are not concerned about the impacts of drought.

About 26.2 percent of the respondents stated that they are concerned to a greater extent about the impacts of lateral water pressure in their area followed by 23.6 percent somewhat concerned, 21.3 percent extremely concerned, and 15.6 percent moderately concerned. On the other hand, 13.3 percent of the respondents said that they are not concerned about the impacts of lateral water pressure.

The majority 47.7 percent of the respondents stated that they are concerned to a greater extent about the impacts of tornado in their area followed by 26.9 percent extremely concerned, 12.1 percent moderately concerned, and 8.7 percent somewhat concerned. On the other hand, 4.6 percent of the respondents said that they are not concerned about the impacts of tornado.

About 44.1 percent of the respondents stated that they are concerned to a greater extent about the impacts of nor 'westerly, in their area followed by 22.1 percent extremely concerned, 15.9 percent moderately concerned and 10.8 percent somewhat concerned. On the other hand, 7.2 percent of the respondents said that they are not concerned about the impacts of nor 'westerly.

The majority 39 percent of the respondents stated that they are concerned to a greater extent about the impacts of sand heat in their area followed by 22.1 percent somewhat concerned, 19.7 percent extremely concerned, and 11.8 percent moderately concerned. On the other hand, 7.4 percent of the respondents said that they are not concerned about the impacts of sand heat.

Around 36.2 percent of the respondents stated that they are concerned to a greater extent about the impacts of heat wave in their area followed by 24.1 percent extremely concerned, 19 percent somewhat concerned, and 15.4 percent moderately concerned. On the other hand, 5.4 percent of the respondents said that they are not concerned about the impacts of heat wave.

**Table 5.3.5: Frequency and percentage distribution of respondents by their level of concern about disasters**

Disaster*	Level of Concern					Mean	Std. Dev.
	Extremely Concerned (5)	Concerned to a greater extent (4)	Moderately Concerned (3)	Somewhat Concerned (2)	Not concerned (1)		
Flood	25.9% (101)	47.4% (185)	5.4 % (21)	12.1% (47)	9.2% (36)	3.6872	1.23762
Water logging	20.3% (79)	40.0% (156)	11.3% (44)	16.2% (63)	12.3% (48)	3.3974	1.30787
Riverbank Erosion	24.4% (95)	36.7% (143)	12.6% (49)	17.4% (68)	9.0% (35)	3.5000	1.27614
Driving Rain	29.0% (113)	49.7% (194)	4.9% (19)	10.0% (39)	6.4% (25)	3.8487	1.13834
Drought	25.9% (101)	45.9% (179)	10.5% (41)	11.0% (43)	6.7% (26)	3.7333	1.15648
Lateral Water Pressure	21.3% (83)	26.2% (102)	15.6% (61)	23.6% (92)	13.3% (52)	3.1846	1.36115
Tornado	26.9% (105)	47.7% (186)	12.1% (47)	8.7% (34)	4.6% (18)	3.8359	1.06293
Nor' Westerly	22.1% (86)	44.1% (172)	15.9% (62)	10.8% (42)	7.2% (28)	3.6308	1.15042
Sand Heat	19.7% (77)	39.0% (152)	11.8% (46)	22.1% (86)	7.4% (29)	3.4154	1.23645
Cold Wave	24.1% (94)	36.2% (141)	15.4% (60)	19.0% (74)	5.4% (21)	3.5462	1.19840

*\*Multiple responses, n=390, Average of mean of all disasters=3.57795 & Average of SD value of all disasters=1.21258*

### 5.3.5. Experience of facing disasters

Table 5.3.6 shows that about 45.1 percent of the respondents mentioned that they are highly experienced in facing disasters followed by 27.7 percent moderately experienced and 24.9 percent somewhat experienced. On the other hand, 2.3 percent said that they are not experienced in facing disasters.

**Table 5.3.6: Frequency and percentage distribution of respondents by their experience of facing disasters**

Experience of facing disasters					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not experienced	9	2.3	3.1564	.87739
	Somewhat experienced	97	24.9		
	Moderately experienced	108	27.7		
	Highly experienced	176	45.1		
	Total	390	100.0		

### 5.3.6. Involvement in managing disasters

Table 5.3.7 shows that the majority 54.6 percent of the respondents mentioned that they are highly involved in managing disasters followed by 26.4 percent moderately involved and 17.7 percent somewhat involved. On the other hand, 1.3 percent said that they are not involved in managing disasters.

**Table 5.3.7: Frequency and percentage distribution of respondents by their involvement in managing disasters**

Involvement in managing disasters					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not involved	5	1.3	3.3436	.81117
	Somewhat involved	69	17.7		
	Moderately involved	103	26.4		
	Highly involved	213	54.6		
	Total	390	100.0		

## 5.4. Practiced/existing coping mechanisms within the community

### 5.4.1. Adaptation strategies

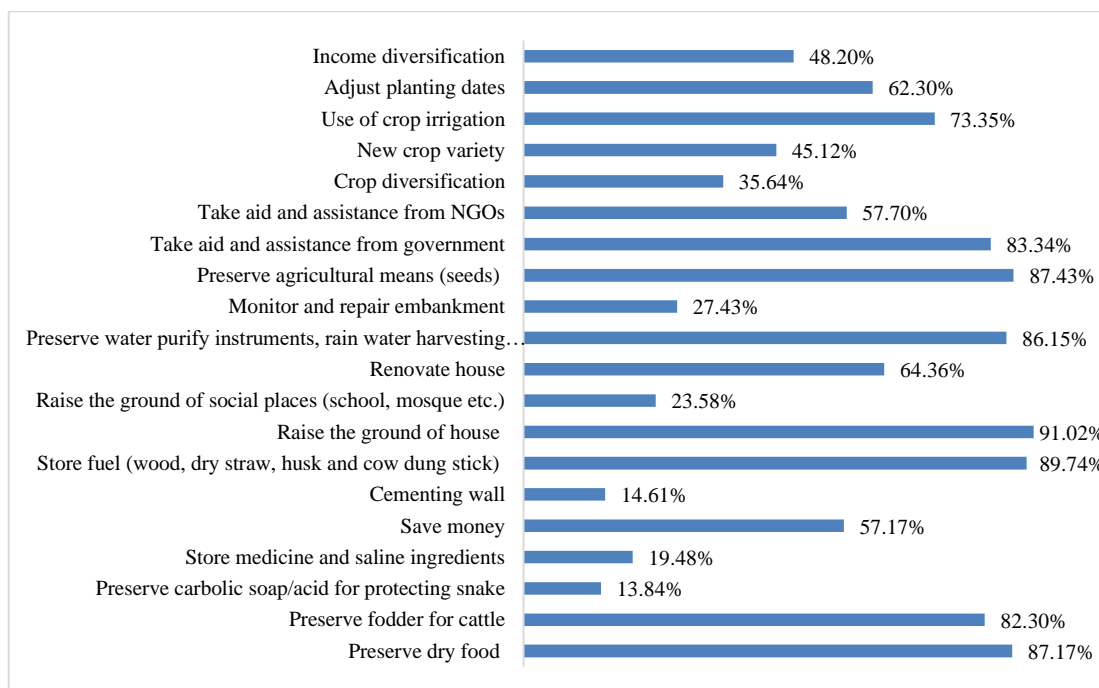
Table 5.4.1 highlights that the adaptation strategies of the community people. Since most of the houses inundated by flood water therefore, the community people (91.02%) raised the ground of house and social places (school, mosque etc.). The community people (89.74%) stored fuel (wood, dry straw, husk and cow dung stick) for mitigating the fuel crisis. As the agricultural is of the vulnerable sector in the study area, therefore, the community people (87.43%) preserved seeds for restoring the activities after a disaster. The community people (87.17%) preserved dry food and fodder to mitigate food and fodder shortage during disastrous situation. They (86.15%) also preserved water purifying instruments, rain water harvesting and raised the platform of the tube well to supply drinking water in the crisis. To adapt in the changing situation the community people (83.34%) took aid and assistance from the governmental authorities as well as the NGOs (57.70%). The majority 64.36 percent of the respondents mentioned that they renovate their house as an adaptation strategy followed by 62.30 percent adjust planting dates, 57.17 percent save money, 48.20 percent make income diversification, 45.12 percent use variety of crop, 27.43 percent monitor and maintained embankment, 19.48 percent store medicine and saline ingredients and 14.61 percent cementing wall and 13.84 percent preserve carbolic soap/acid for protecting snake.

**Table 5.4.1: Frequency and percentage distribution of respondents by local adaptation strategies**

Local adaptation strategies*	Frequency	Percent
Preserve dry food	340	87.17
Preserve fodder for cattle	321	82.30
Preserve carbolic soap/acid for protecting snake	54	13.84
Store medicine and saline ingredients	76	19.48
Save money	223	57.17
Cementing wall	57	14.61

Store fuel (wood, dry straw, husk and cow dung stick)	350	89.74
Raise the ground of house	355	91.02
Raise the ground of social places (school, mosque etc.)	92	23.58
Renovate house	251	64.36
Preserve water purify instruments, rainwater harvesting and raise ground of tube well	336	86.15
Monitor and repair embankment	107	27.43
Preserve agricultural means (seeds)	341	87.43
Take aid and assistance from government	325	83.34
Take aid and assistance from NGOs	225	57.70
Crop diversification	139	35.64
New crop variety	176	45.12
Use of crop irrigation	290	73.35
Adjust planting dates	243	62.30
Income diversification	188	48.20

\*Multiple responses n=390



**Figure 5.4.1: Adaptation strategies**

#### 5.4.2. Coping mechanisms regarding food crisis

A prolonged or devastating disaster imposes many crises to the people of a community. Mainly affected people manage this situation by their own capacity and sometimes take assistance from others. The poor household of flood prone areas fight with flood, river erosion (Yasmin & Ahmed, 2013) which creates the life of the community people miserable and causes loss of life, property, and crops (WFP, 2009). However, the people of the study area applied coping mechanisms regarding food crisis in case of emergency. Table 5.4.2 shows that about 97.44 percent of the respondents said that they apply coping mechanisms in case of food crisis.

**Table 5.4.2: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding food crisis**

<b>Did you apply coping mechanisms in case of food crisis?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	380	97.44
No	04	1.02
Not sure	06	1.54
<b>Total</b>	<b>390</b>	<b>100</b>

To meet the food crisis during and after a disaster the community people apply various coping strategies since Rahman (2010) reported that during and after flood food is the key apprehension of poor people/households. Among the respondents the majority 87.17 percent mentioned that they cope with changing situation by using preserved food while 57.17 percent use part of their savings for purchasing food. Sometimes the households would like to cope with the crisis by taking relief from government (49.23%) and NGOs (10.25%). Although, the current mission of the Ministry of Food and Disaster Management of Bangladesh to move the paradigm from conformist response and relief to DRR (disaster risk reduction) and promote mechanisms for food security to make resilience community (MoFDM, 2007). The community people used the money from selling livestock and household valuable (42.56%) and ornaments (36.66%) for

purchasing food. About 32.56 percent of the respondents reported that they cope with changing situation by receiving microcredit from different sources and 14.61 percent borrow food from others. Table 5.4.3.

The qualitative data shows that most of the community people applied coping mechanisms in case of facing food crisis in emergency. The participants said that generally they preserve dry food such as, *muri* (puffed rice), *chira* (flattened rice), etc. They also said that they use these preserved food items during emergency. Many of them borrowed money from other people in the community, received grants from donor organization, and microcredit from NGOs to manage the food crisis in disastrous situation. Sometimes they sold their valuable ornaments (*bangles*, nose pin, ear ring etc.) and household valuables (furniture, bicycle, motor bike, television, wrist watch, tree etc.) livestock (hen, duck, pigeon, goat, cow, buffalo, horse etc.) for buying food from local or distance market. Relief is another coping mechanism of the people, as a result they took relief from government through local government authorities (union *Parishad*, *upazila Parishad*, social welfare office, deputy commissioner etc.) and NGOs (BRAC, ASA, Grameen Bank, *Shouhardo-ESDO*, *Unnoyon Songho* etc.). Few of the community people saved money in their household for emergency.

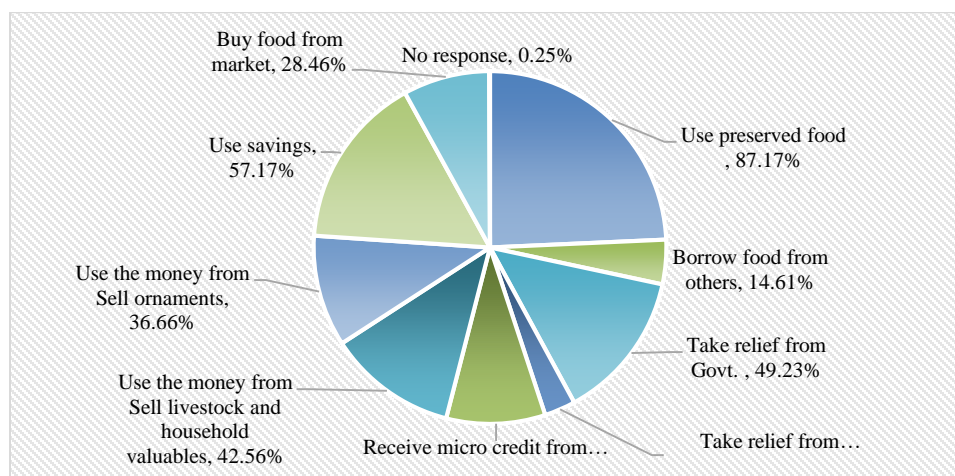
**Table 5.4.3: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding food crisis**

<b>Coping mechanisms regarding food crisis*</b>	<b>Frequency</b>	<b>Percent</b>
Use preserved food	340	87.17
Borrow food from others	57	14.61
Take relief from Government	192	49.23
Take relief from NGOs	40	10.25
Receive micro credit from NGOs	127	32.56
Use the money from selling livestock and household valuables	166	42.56
Use the money from selling ornaments	143	36.66



Use savings	223	57.17
Buy food from market	111	28.46
No response	10	0.25

\*Multiple responses n=390



**Figure 5.4.2: Coping mechanisms regarding food crisis**

### 5.4.3. Coping mechanisms regarding fodder crisis

The majority (92.31%) of the respondents said that they apply coping mechanisms regarding fodder crisis. Table 5.4.4.

**Table 5.4.4: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding fodder crisis**

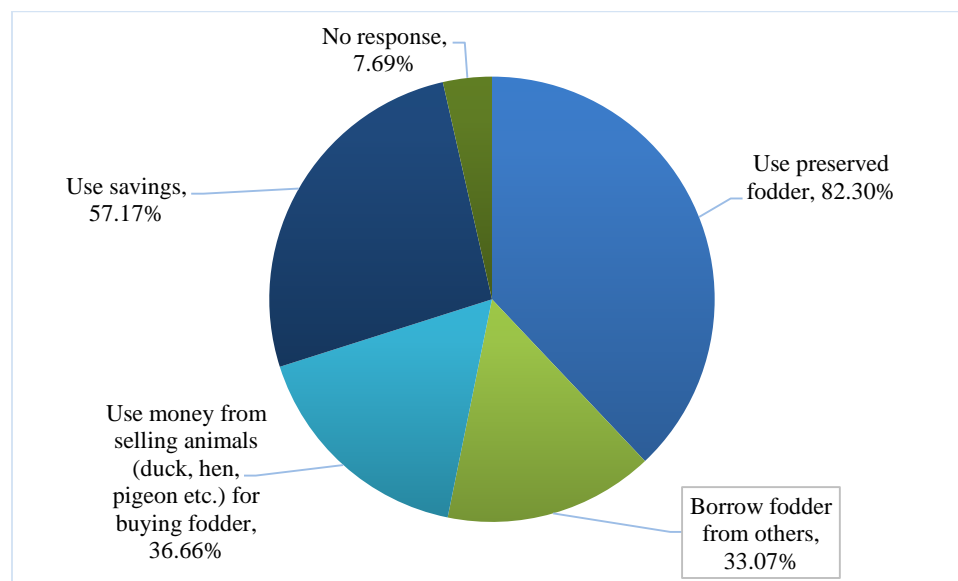
Did you apply coping mechanisms regarding fodder crisis?	Frequency	Percent
Yes	360	92.31
No	14	3.59
Not sure	16	4.10
<b>Total</b>	<b>390</b>	<b>100</b>

The majority (82.30%) of the respondents reported that they use preserved fodder to cope with changing situation whereas 57.17 percent use savings, 36.66 percent use money from selling animals for purchasing fodder and 33.07 percent borrow fodder from others. Table 5.4.5.

**Table 5.4.5: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding fodder crisis**

Coping mechanisms regarding fodder crisis*	Frequency	Percentage
Use preserved fodder	321	82.30
Borrow fodder from others	129	33.07
Use money from selling animals (duck, hen, pigeon etc.) for buying fodder	143	36.66
Use savings	223	57.17
No response	30	7.69

\*Multiple responses n=390



**Figure 5.4.3: Coping mechanisms regarding fodder crisis**

#### 5.4.4. Coping mechanisms regarding dwelling places

The ravaging and extended disasters destroyed dwelling places partially or fully. The recovery of dwelling places is the pre-condition for household recovery (Lindell, 2013) and without re-establishing dwelling places household cannot restart their routine activities (Peacock et al, 2009; Johnson, 2007; Quarantelli, 1982). The respondents reported that they (97.70%) apply coping mechanisms regarding dwelling places. Table 5.4.6.

**Table 5.4.6: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding dwelling places**

<b>Did you apply coping mechanisms regarding dwelling places?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	381	97.70
No	02	0.51
Not sure	07	1.79
Total	390	100

Various types of coping mechanisms are applied by the people of study area for repairing or re-establishing their dwelling places. To prevent the ground of dwelling places from water wave and erosion the dwellers planted trees, grass and raising homestead ground and some of them make temporary fence with bamboo and other available materials (Islam et al, 2011). The overwhelming majority (85.89%) of the respondents reported that they put mud around the homestead while 80.25 percent put polythene or dry leaves. Most of them (80.25%) used their savings and used their own labour to renovate (61.79%) their dwelling places. The community people arranged resources from different sources to renovate their damaged dwelling places, Peacoak et al. (2009) observed that financial resources are vital for temporary or permanent household recovery. About 52.30 percent collected construction materials from different sources, 32.56 percent of them took loan from informal sector (*Mohajon*), 32.56 percent took credit from microcredit

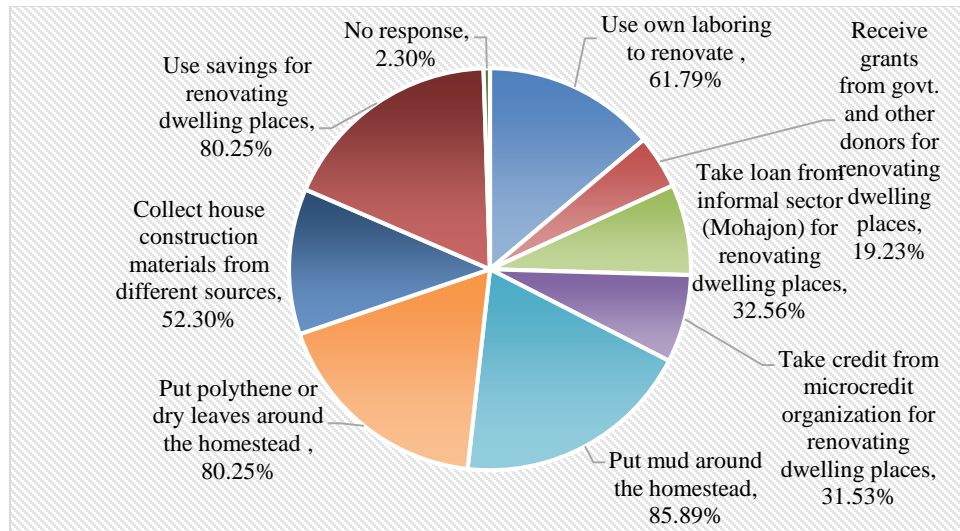
organization and 19.23 percent received grants from government and other donors for renovating dwelling places. Table 5.4.7.

The qualitative data shows that most of the community people renovated their damaged dwelling places by their own labouring while they took help from their household member especially from the women that the participants said. They putted mud, polythene, and dry leaves around the homestead to protect dwelling places from flood water which were the common practice in their area. The participants renovated their damaged household by borrowing money from local *Mohajon*, micro credit organization with high interest rate, collected construction materials from relatives, neighbour, donor organization, government authorities, etc.

**Table 5.4.7: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding dwelling places**

<b>Coping mechanisms regarding dwelling places*</b>	<b>Frequency</b>	<b>Percent</b>
Use own labouring to renovate	241	61.79
Receive grants from government and other donors for renovating dwelling places	75	19.23
Take loan from informal sector (Mohajon) for renovating dwelling places	127	32.56
Take credit from microcredit organization for renovating dwelling places	123	31.53
Put mud around the homestead	335	85.89
Put polythene or dry leaves around the homestead	313	80.25
Collect house construction materials from different sources	204	52.30
Use savings for renovating dwelling places	313	80.25
No response	09	2.30

\*Multiple responses n=390



**Figure 5.4.4: Coping mechanisms regarding dwelling places**

#### 5.4.5. Coping mechanisms regarding losing livelihood

People’s livelihood of disaster-prone area is severely disrupted by disasters and climate change events. As a result, the households of this study area took initiatives to cope with changing situation by diversifying livelihood means since Kamal (2013) added that the livelihood diversification strategies are commonly used in crisis. Table 5.4.8 digs out that the overwhelming majority (98.21%) of the respondents applied coping mechanisms in case of losing livelihood.

**Table 5.4.8: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding losing livelihood**

Did you apply coping mechanisms regarding losing livelihood?	Frequency	Percent
Yes	383	98.21
No	05	1.28
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

Households are dependent on their own resources and social networking for coping with changing situation and rehabilitate them into other options (Kamal, 2013) along with rehabilitation initiatives by government authorities and other stakeholders. However, households' strategies for livelihood diversification are determined by the ability of the household to access credit (Dercon & Krishnan, 1996). Ellis (1998) stated that by employing livelihood diversification process the rural families build their various group of actions and support to live and improve their standard of living. Mozumder et al. (2008) also added that households depend on various informal livelihood mechanisms in case of fewer alternative livelihood options. This study observes that the highest 63.07 percent of the respondents reported that they cope with changing situation by doing alternative occupation followed by 36.66 percent use the money from selling ornaments, 26.66 percent borrow money from others, 25.12 percent use savings, 22.30 percent migrate to cities, 21.02 percent take credits, 20.51 percent use the money from selling livestock and household valuables, 16.25 percent work outside (women) and 14.61 percent collect aid and assistance. Table 5.4.9.

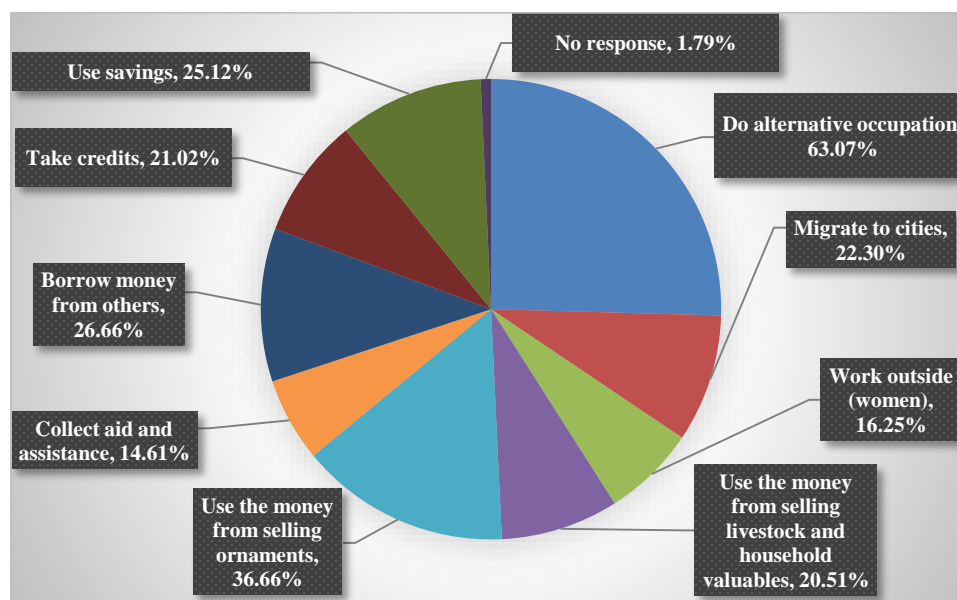
The qualitative data shows that the livelihood options affected due to disaster and community people became jobless. However, the community people coped with changing situation by doing alternative jobs such as, small farmer sold his labour to big farmer and migrated to Dhaka, Sylhet, Chattogram, Cumilla, Mymensingh etc. as a coping mechanism due to the loss of livelihood. The women of the household worked outside to shoulder the family responsibility by giving financial supports in absence or presence of household head.

**Table 5.4.9: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding losing livelihood**

<b>Coping mechanisms regarding losing livelihood*</b>	<b>Frequency</b>	<b>Percent</b>
Do alternative occupation	246	63.07
Migrate to cities	87	22.30

Work outside (women)	63	16.25
Use the money from selling livestock and household valuables	80	20.51
Use the money from selling ornaments	143	36.66
Collect aid and assistance	57	14.61
Borrow money from others	104	26.66
Take credits	82	21.02
Use savings	98	25.12
No response	07	1.79

\*Multiple responses n=390



**Figure 5.4.5: Coping mechanisms regarding losing livelihood**

#### **5.4.6. Coping mechanisms regarding agricultural damages**

As a significant source of income for developing countries, agricultural sector negatively affected by climatic disaster such as, flood, drought, irregular raining, and intrusion saline water (OECD, 2015 and Adams et al., 1998) and such type of agriculture-based country, Bangladesh experiences extreme weather variability climate change (MoEF) than the developed countries. As a result, agricultural sector in the study area mainly suffered

from flood and drought. Therefore, the people of study area have to apply particular coping mechanisms in case of agricultural damages. Table 5.4.10 shows that 98.47 percent of the respondents reported that they apply coping mechanisms in case of agricultural damages in the study area.

**Table 5.4.10: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding agricultural damages**

<b>Did you apply coping mechanisms regarding agricultural damages?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	384	98.47
No	01	0.25
Not sure	05	1.28
<b>Total</b>	<b>390</b>	<b>100</b>

Prolonged flood and drought negatively affect the production rate of agricultural sector. Bangladesh agriculture fights with drought as a critical problem (Habiba et al. 2012) and north-west region of this country susceptible to drought (Shahid & Behrawan, 2008 and Shahid, 2007). Besides, Emran et al. (2014) mentioned that every flood occurrence in Bangladesh seriously hampered crop productions and consequently famers practiced various coping mechanisms. After a catastrophic event the people of the study area have to apply some coping mechanisms to restoring activities. Heavy rain fall/driving rain or shortage of precipitation due to lack of weather moisture causes damages to agricultural production. As a result, the respondents (76.41%) mentioned that they engage in cattle rearing while 62.05 percent preserve seeds for agricultural damages. About 37.17 percent of them changed planting and harvesting schedule followed by 34.35 percent changed crops/crop switching/crop diversification, 33.07 percent planted new crops, 26.92 percent raised seeding ground and another 26.92 percent used high-yield water sensitive crops to cope in case of agricultural damages. On the other hand, they (20.76%) said that they purchase seed from relatives or neighbour or government while 13.35 percent borrow seeds from relatives or neighbour. The respondents (18.46%) got seeds from government

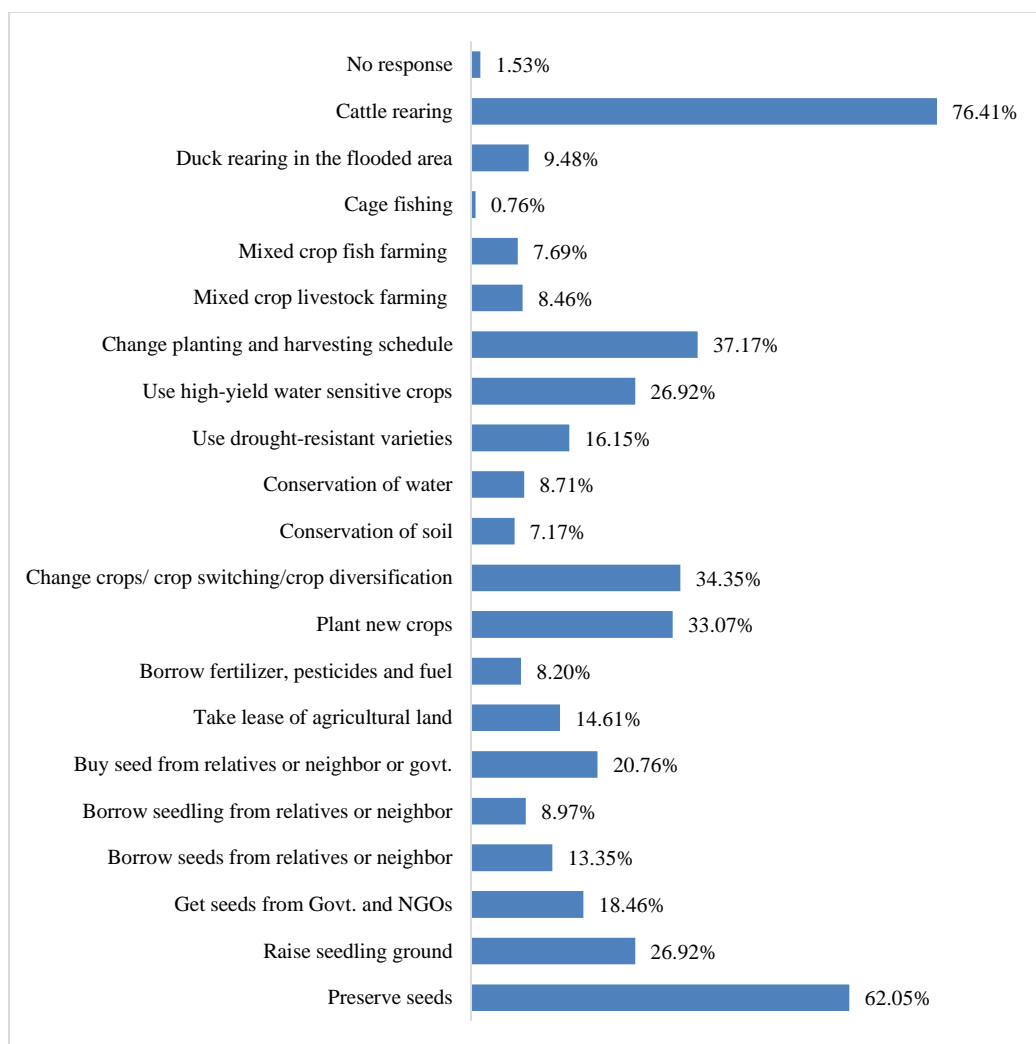


followed by 16.15 percent used drought resistant crops, 14.61 percent took lease of agricultural land, 9.48 percent engaged in duck rearing, 8.97 percent borrowed seedling from relatives or neighbour, 8.46 percent engaged in mixed crop livestock farming and 8.20 percent borrowed fertilizer, pesticides, and fuel. Table 5.4.11.

**Table 5.4.11: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding agricultural damages**

<b>Coping mechanisms regarding agricultural damages*</b>	<b>Frequency</b>	<b>Percent</b>
Preserve seeds	242	62.05
Raise seedling ground	105	26.92
Get seeds from Government and NGOs	72	18.46
Borrow seeds from relatives or neighbor	56	13.35
Borrow seedling from relatives or neighbor	35	8.97
Buy seed from relatives or neighbor or government	81	20.76
Take lease of agricultural land	57	14.61
Borrow fertilizer, pesticides, and fuel	32	8.20
Plant new crops	129	33.07
Change crops/ crop switching/crop diversification	134	34.35
Conservation of soil	28	7.17
Conservation of water	34	8.71
Use drought-resistant varieties	63	16.15
Use high-yield water sensitive crops	105	26.92
Change planting and harvesting schedule	145	37.17
Mixed crop livestock farming	33	8.46
Mixed crop fish farming	30	7.69
Cage fishing	03	0.76
Duck rearing in the flooded area	37	9.48
Cattle rearing	298	76.41
No response	06	1.53

\*Multiple responses n=390



**Figure 5.4.6: Coping mechanisms regarding agricultural damages**

#### **5.4.7. Coping mechanisms regarding fuel crisis**

The sources of fuel of daily usage merely damaged by disasters hit and consequently the collection of fuel from different sources may shouldered by women of the household. During the crisis, households cannot buy fuel for daily usage due to their socio-economic condition. Table 5.4.12 shows that the majority 98.97 percent of the respondents mentioned that they apply coping mechanisms regarding fuel crisis.

**Table 5.4.12: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding fuel crisis**

<b>Did you apply coping mechanisms regarding fuel crisis?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	386	98.97
No	01	0.25
Not sure	03	0.76
<b>Total</b>	<b>390</b>	<b>100</b>

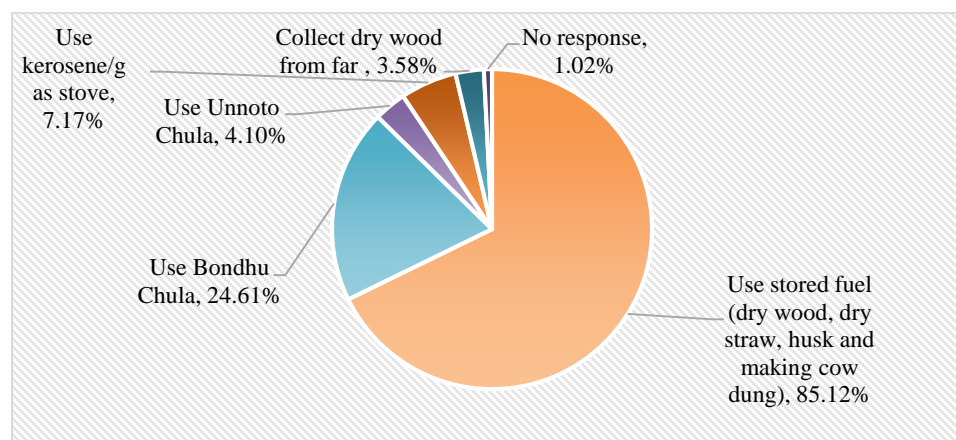
Rahman et al. (2018) stated that during flooding majority of the exaggerated household used bamboo or wood as fuel for cooking, fewer number of households used cow-dung and dry leaves as fuel and no household used kerosene as fuel due to economic crisis where 2.32% of rural people used kerosene as fuel in rural area of Bangladesh (BBS, 2011). On the other hand, Shaikh et al. (2015) mentioned that majority of the disaster affected household used dry leaves, woods, cow dung and kerosene as fuel for cooking. But the coping mechanisms regarding fuel during or after disasters varied from place to place. Therefore, the people of the study area used various elements as fuel for cooking in their household. They (85.12%) used stored dry wood, dry straw, husk, and cow dung stick as fuel for cooking followed by *Bondhu Chula* (24.61%), gas/kerosene (7.17), *Unnoto Chula* (4.10%) and collected dry wood from far (3.58%). Table 5.4.13.

The qualitative data shows that the community people faced crisis for fuel in the disastrous situation and generally female counterpart of the household collected or managed fuel. The community people used their stored fuel for cooking and borrowed fuel from neighbour or relatives if they need. The participants said that sometimes they cannot cook due to the lack of fuel. However, the female member of the household collected fuel from far for cooking and sometimes the male counterpart helped them.

**Table 5.4.13: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding fuel crisis**

Coping mechanisms regarding fuel crisis*	Frequency	Percent
Use stored fuel (dry wood, dry straw, husk and making cow dung)	332	85.12
Use <i>Bondhu Chula</i>	96	24.61
Use <i>Unnoto Chula</i>	16	4.10
Use kerosene/gas stove	28	7.17
Collect dry wood from far	14	3.58
No response	04	1.02

\*Multiple responses n=390



**Figure 5.4.7: Coping mechanisms regarding fuel crisis**

#### **5.4.8. Coping mechanisms regarding water, health, and sanitation issues**

Water, health, and sanitation of a community may be affected by the multiple pathways of climate change such as, safe drinking water (Abedin et al., 2018) and resulted by scarcity of safe water which finally effects on health. As WHO (2009) stated that it is great challenge of 21<sup>st</sup> century to protect health from the effects of climate change. Therefore, 98.21 percent of the respondents reported that they apply coping mechanisms regarding water, health, and sanitation issues. Table 5.4.14.

**Table 5.4.14: Frequency and percentage distribution of respondents whether they applied coping mechanisms regarding water, health, and sanitation issues**

<b>Did you apply coping mechanisms regarding water, health and sanitation issues?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	383	98.21
No	02	0.51
Not sure	05	1.28
<b>Total</b>	<b>390</b>	<b>100</b>

The people of the study area applied various coping mechanisms regarding water, health, and sanitation issues however, (Abedin et al., 2018) noted that human health is important issues in changing climate which is related to water availability and scarcity. Researchers (Howard & Bartram, 2003 and Motoshita et al., 2011) stated that water scarcity is resulted in inadequate safe drinking water which leads to spread of water contamination related diseases. Table 5.4.15 highlights that the respondents (84.61%) consulted with doctor of community clinic, Union health & welfare centre and Union sub-health & welfare centre whereas 15.12 percent with village doctor. They purified water to drink (76.66%), collected drinking water from far distance (21.53%), used purified rain water (12.05%) to ensure drinking water in emergency and other 3.84 percent raised their tube well ground to avoid water related contamination. Researchers argued that the people of disaster affected areas collect safe drinking water from farther away (Abedin et al., 2018) and sometimes the women of coastal region have to walk 6 to 12 kilometres for collecting drinking water to fulfil their household requirement (Swapan & Mamun, 2006). For health issues, the majority 50.51 percent of the respondents said that they make oral saline followed by 38.97 percent collect herbal medicine and taken self-treatment, 10 percent collect medicine and distributed among their affected relatives and neighbours. The community people (22.05%) also collected sanitary napkin for safe reproductive health.

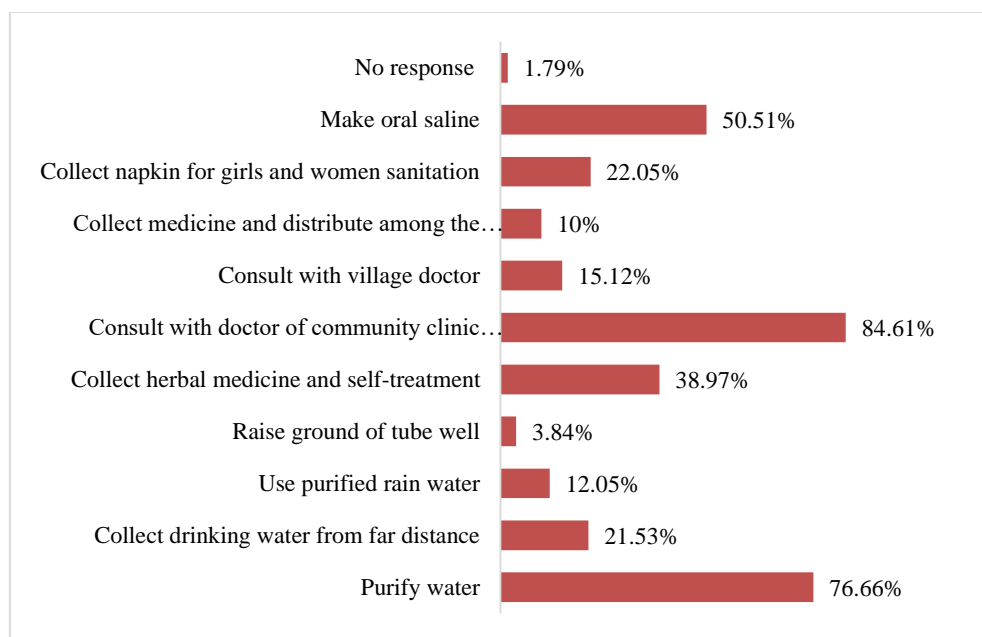
The qualitative data shows that the community people purified water through water purifying tablet (*Fitkiri*) and boiling. They harvested rain water for household using in

the crisis period and they also raised the ground of tube well by 4-7 feet to protect the tube well from flood water. The data also shows that the community people collected medicinal herb such as, *thankuni pata*, *tulshi pata*, etc. from their surrounding nature. For the better treatment for fever, skin diseases, diarrhoea, cholera, headache, liver problem, ulcer, etc. the community people consulted with the doctor of community clinic, Union *Parishad* health centre, Union *Parishad* health sub-centre and village doctor. The women and girls used napkins during menstruation and sometimes the older female member of the household collected napkin for the girls and women.

**Table 5.4.15: Frequency and percentage distribution of respondents by their applied coping mechanisms regarding water, health, and sanitation issues**

<b>Coping mechanisms regarding water, health, and sanitation issues*</b>	<b>Frequency</b>	<b>Percent</b>
Purify water	299	76.66
Collect drinking water from far distance	84	21.53
Use purified rainwater	47	12.05
Raise ground of tube well	15	3.84
Collect herbal medicine and self-treatment	152	38.97
Consult with doctor of community clinic Union health & welfare center and Union sub-health & welfare center	330	84.61
Consult with village doctor	59	15.12
Collect medicine and distribute among the affected relatives and neighbors	39	10.00
Collect napkin for girls and women sanitation	86	22.05
Make oral saline	197	50.51
No response	07	1.79

\*Multiple responses n=390



**Figure 5.4.8: Coping mechanisms regarding water, health, and sanitation issues**

#### **5.4.9. Initiatives to manage coping mechanisms regarding water, health, and sanitation issues**

The community people of the study area have to take some initiatives to fulfil the coping mechanisms regarding water, health, and sanitation issues. So, 98.21 percent of the respondents took initiative to fulfil coping mechanisms for these issues. Table 5.4.16.

**Table 5.4.16: Frequency and percentage distribution of respondents whether they took initiatives to manage coping mechanisms regarding water, health, and sanitation issues**

<b>Did you take initiatives to manage coping mechanisms regarding water, health, and sanitation issues?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	383	98.21
No	02	0.51
Not sure	05	1.28
<b>Total</b>	<b>390</b>	<b>100</b>

The respondents reported that the community people took versatile initiative to fulfil the coping mechanisms regarding water, health, and sanitation issues. Table 5.4.17 indicates that the majority (67.94 percent) of the respondents reported that they use money from their own savings as an initiative to cope with changing situations. They used money from selling livestock and household valuables (19.74%), selling food grains (17.94%) and selling ornaments (5.38%). Moreover, they (23.84%) reported that they borrow money from others, and they (18.20%) collect aid and assistance from government authorities, NGOs, microcredit organizations and other informal sources which were considered as the initiatives for coping mechanisms regarding water, health, and sanitation issues.

The qualitative data shows that the community people took initiatives regarding water management, health and sanitation issues by using money from selling food grains such as, rice, wheat, corn, potato, etc., using money from selling livestock and household valuables such as, cow, goat, hen, duck. They borrowed money from relatives, *Mohajon*, NGOs, neighbour etc. and collected aid and assistance from government authorities, union *Parishad* etc. They also used their own savings (savings in hand) and women sold their ornaments to manage the initiatives regarding managing the water, health, and sanitation issues.

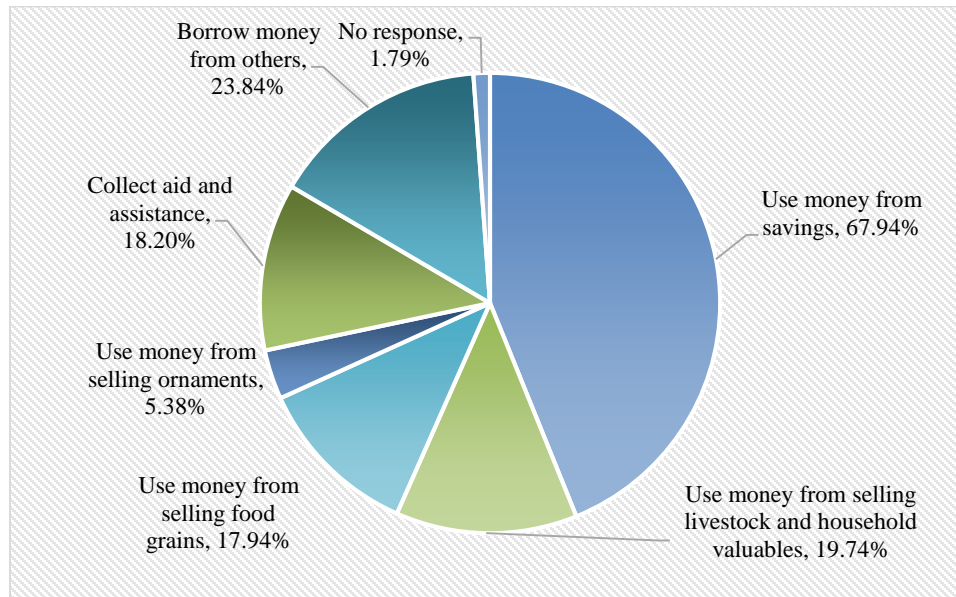
**Table 5.4.17: Frequency and percentage distribution of respondents by their taken initiatives to manage coping mechanisms regarding water, health, and sanitation issues**

<b>Initiatives to manage coping mechanisms regarding water, health, and sanitation issues*</b>	<b>Frequency</b>	<b>Percent</b>
Use money from savings	265	67.94
Use money from selling livestock and household valuables	77	19.74
Use money from selling food grains	70	17.94
Use money from selling ornaments	21	5.38
Collect aid and assistance	71	18.20



Borrow money from others	93	23.84
No response	07	1.79

\*Multiple responses n=390



**Figure 5.4.9: Initiatives to manage coping mechanisms regarding water, health, and sanitation issues**

#### **5.4.10. Coping mechanisms regarding the protection of violence against women and girls**

As a most susceptible group to disaster, women and girls have to face many unwanted situations in emergency period. Although disaster does not discriminate between man and woman, but women and girls remain most vulnerable group to disasters due to socially constructed roles because they have partial access to social and economic capital, decision making process and moreover, practices of social and cultural issues, responsibilities of women to domestic duties, etc. (World Bank, 2005). However, the community people (99.24%) applied coping mechanisms as measures to prevent violence against women and girls. Table 5.4.18.

**Table 5.4.18: Frequency and percentage distribution of respondents whether they applied coping mechanisms as the measures to protect violence against women and girls**

<b>Did you apply coping mechanisms as the measures to protect violence against women and girls?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	387	99.24
No	00	0.00
Not sure	03	0.76
<b>Total</b>	<b>390</b>	<b>100</b>

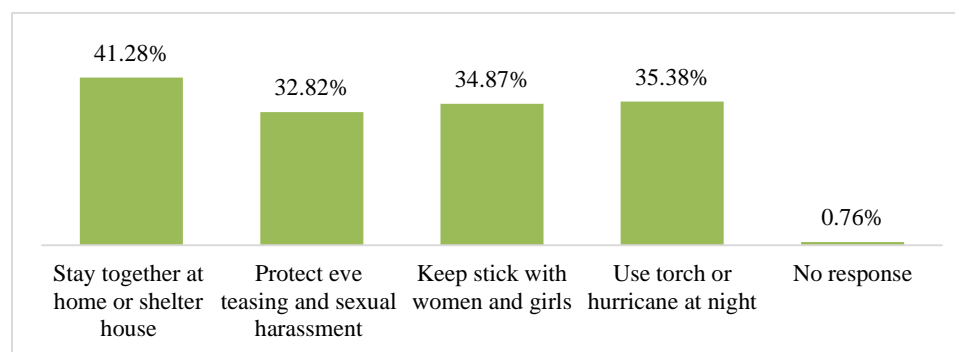
As women suffer from impacts of disasters (UN/ADPC, 2010) and they are more vulnerable to the adverse effects of hazards than men (Neumayer & Plumper, 2007), the vulnerability of women depends on sexuality, age, class, ethnicity, etc. (Bradshaw & Fordham, 2013). Hence, to prevent the violence against women and girls the community people took various initiatives, such as, they (41.28%) stayed together at home or shelter houses during and after disaster. They (35.38%) also used torch light or hurricane lamp as a measure to protect the women and girls in their home or shelter house to avoid redundant situation. Furthermore, 34.87 percent of the respondents reported that the women and girls keep stick with themselves, and 32.82 percent stated that they took initiative to protect eve teasing and sexual harassment. Table 5.4.19.

The qualitative data shows that the male member of the household stayed at home at night to protect the girls and women from violence and unexpected harassment during disaster. The male members of the household sacrificed their regular gossiping in the village shop, *haat* and *bazaar* at night and stayed with their women and girls in the shelter house.

**Table 5.4.19: Frequency and percentage distribution of respondents by their applied coping mechanisms as the measures to violence against women and girls**

<b>Coping mechanisms as the measures to protect violence against women and girls</b>	<b>Frequency</b>	<b>Percent</b>
Stay together at home or shelter house	161	41.28
Protect eve teasing and sexual harassment	128	32.82
Keep stick with women and girls	136	34.87
Use torch or hurricane lamp at night	138	35.38
No response	03	0.76

*\*Multiple responses* n=390



**Figure 5.4.10: Coping mechanisms as the measures to protect violence against women and girls**

#### **5.4.11. Initiatives for making the community neat and clean**

Disasters generate huge amount of debris and the nature of debris depends on disasters. For instance, floods uproot trees, displace sands, soil and sediments, cyclone also uproots, and breaks trees, displaces sediments, soil and sand, breaks and displaces household materials, utility pools, water pipes, roads, bridge, culverts etc. (EPA, 1995 & EPA, 2008). Hence, Table 5.4.20 shows that 98.98 percent of the respondents reported that they took initiatives for making the community neat and clean after disasters.

**Table 5.4.20: Frequency and percentage distribution of respondents whether they took initiatives to make the community neat and clean**

<b>Did you take initiatives to make the community neat and clean?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	386	98.98
No	02	0.51
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The initiatives taken by community people to make community neat and clean by cleaning up of debris which reproduced by disaster is essential issue in operating other activities. This debris resulted from disaster and often includes sand, sediments, personal property, vegetative debris etc. and this debris cleaning is costly and time consuming (FEMA, 2007). Table 5.4.21 shows that 97.69 percent of respondents participated in removal of debris from their places however, Paul et al. (2007) stated that not all the survivors of disaster participate in debris removal operations. Moreover, 88.46 percent of the respondents reported that they participate in removing dirt and garbage. Moreover, they took some other initiatives to remove debris from their places such as, taking away mud and silt from their home ground (67.17%), broken trees (46.66%) and putting line (14.61%) to discharge the clay water.

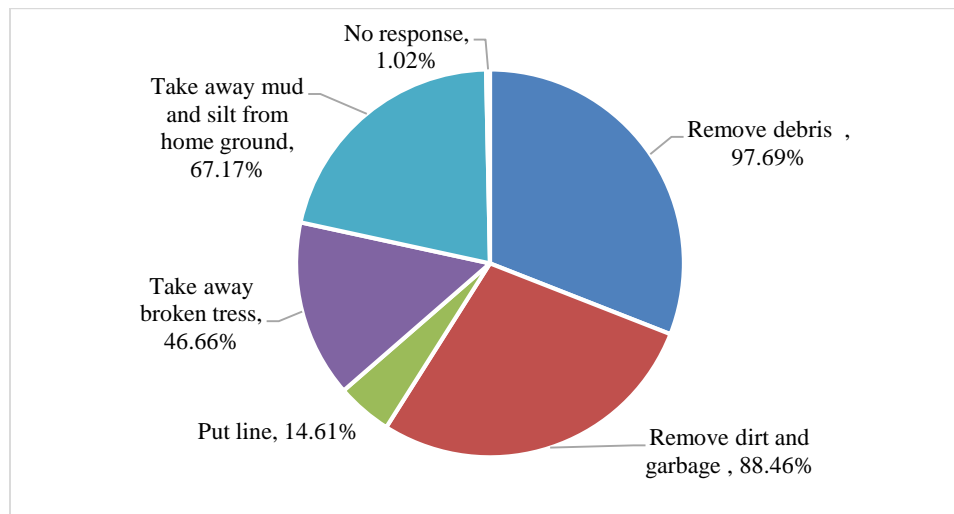
The qualitative data shows that women were more participatory in community cleaning than men in the study area. The data also shows that the broken tree leaves, uprooted banana trees and other garbage were cleaned mainly by the women and they putted line to run out the logged water.

**Table 5.4.21: Frequency and percentage distribution of respondents by their taken initiatives to make the community neat and clean**

<b>Initiatives to make the community neat and clean*</b>	<b>Frequency</b>	<b>Percent</b>
Remove debris	381	97.69

Remove dirt and garbage	345	88.46
Put line	57	14.61
Take away broken tress	182	46.66
Take away mud and silt from home ground	262	67.17
No response	04	1.02

\*Multiple responses n=390



**Figure 5.4.11: Initiatives to make the community neat and clean**

#### **5.4.12. Measures taken by community people to mitigate disaster risks**

Community people take measures to mitigate disaster risks which are to lessen loss of life, property, social and economic distraction IDNDR (1992) through technology and scientific knowledge (Tobin & Montz, 2004). Maskrey (1989) and NCDEM (1998) added that mitigation measures are taken before a disaster strikes which includes a set of events to lessen the risk of life and property for a long-term. Hence, the majority 99.50 percent of the respondents mentioned that they take measures to mitigate disasters risk for their community. Table 5.4.22.

**Table 5.4.22: Frequency and percentage distribution of respondents whether the community people applied measures to mitigate disaster risks**

Did community people apply measures to mitigate disaster risks?	Frequency	Percent
	F	%
Yes	388	99.50
No	01	0.25
Not sure	01	0.25
<b>Total</b>	<b>390</b>	<b>100</b>

As the mitigation measures covers all types of activities to eliminate the risk of a particular territory (Slobodan, 2011) yet it provides the window for the local government authority through local people for future safety (Alexander, 2000). Carter (2008) added that mitigation measures make buildings resistant against floods, cyclones, and earthquake, introduce less vulnerable crops planting by changing crop cycles and adopt land use planning. So, community people took versatile measures to mitigate the disaster risks in the study area. For instance, they (86.66%) made durable houses and other structures, structural modification (48.97%) and relocated infrastructure (43.84%). They also made land use planning (35.64%), redundancy of life safety infrastructure (34.61%) and monitored fault in embankment and water level (34.35%). To protect water, they repaired embankment (27.43%) and to drain the water they re-excavated canals (23.84%). The community people also took measures to protect embankment by putting sand bags (24.61%), making bamboo fence (22.56%), planting tress (22.05%) and grass (18.97%).

Table 5.4.23.

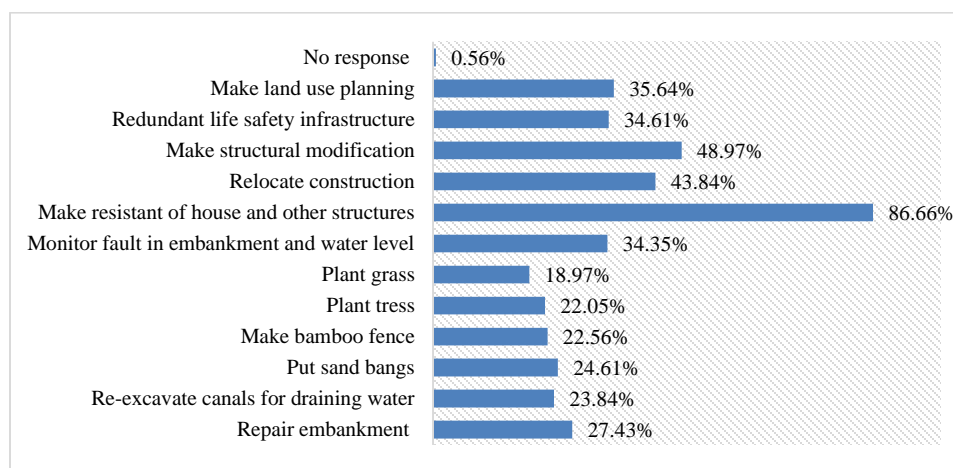
The qualitative data shows that the community people made structural modification, relocated their construction, made land use planning in making their houses, religious and educational institutes and planted trees to protect wind and embankment from destroying. Moreover, they monitored fault in embankment for repairing and water level to disseminate the early warning signals, made redundancy of life safety infrastructure, repaired embankment to protect flood water, put sand bags to protect dam and

embankment, re-excavated canals for draining water to protect water logging and made bamboo fence for protection as measures for mitigating disaster risks.

**Table 5.4.23: Frequency and percentage distribution of respondents by applied measures by community people to mitigate disaster risks**

Measures applied by community people to mitigate disaster risks*	Frequency	Percent
Repair embankment	107	27.43
Re-excavate canals for draining water	93	23.84
Put sand bangs	96	24.61
Make bamboo fence	88	22.56
Plant tress	86	22.05
Plant grass	74	18.97
Monitor fault in embankment and water level	134	34.35
Make resistant of house and other structures	338	86.66
Relocate construction	171	43.84
Make structural modification	191	48.97
Redundant life safety infrastructure	135	34.61
Make land use planning	139	35.64
No response	02	0.56

\*Multiple responses n=390



**Figure 5.4.12: Measures applied by community people to mitigate disaster risks**

### 5.4.13. Activities to make disaster resilient community

Practical Action (2007) and ISDR (2007) observed that community people try to adapt to changing situations due to disaster using their own knowledge and while the coping strategies are insufficient to meet their need they select alternative livelihood options by enhancing skills. Therefore, the community people in the study area practiced some activities to make disaster resilient community which was reported by the majority (99.49 percent) of the respondents. Table 5.4.24.

**Table 5.4.24: Frequency and percentage distribution of respondents whether they practiced activities to make disaster resilient community**

<b>Did you practice activities for making disaster resilient community?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

IFRC (2012) identified knowledgeable and healthy, organized and connected, strong infrastructure (housing, water and sanitation, power and transport) and services, availability of economic opportunities and ability to manage natural assets as the characteristics of strong community. The people practiced many activities to make disaster resilient community such as, the majority (89.74 percent) of the respondents stated that they preserve fuel for cooking followed by 87.17 percent preserve food and 82.30 percent preserve fodder. To make resilient community they practiced various activities such as, poultry rearing (70.51%), construct hazard resilient house (59.48%), cattle rearing (56.15%) and disaster resilient cropping (41.79%). They also raised awareness about early warning and disseminate signals (36.41%) and maintained relational connectivity with community people (9.74%). To protect the structure and other assets the community people elevated homestead ground (39.74%),



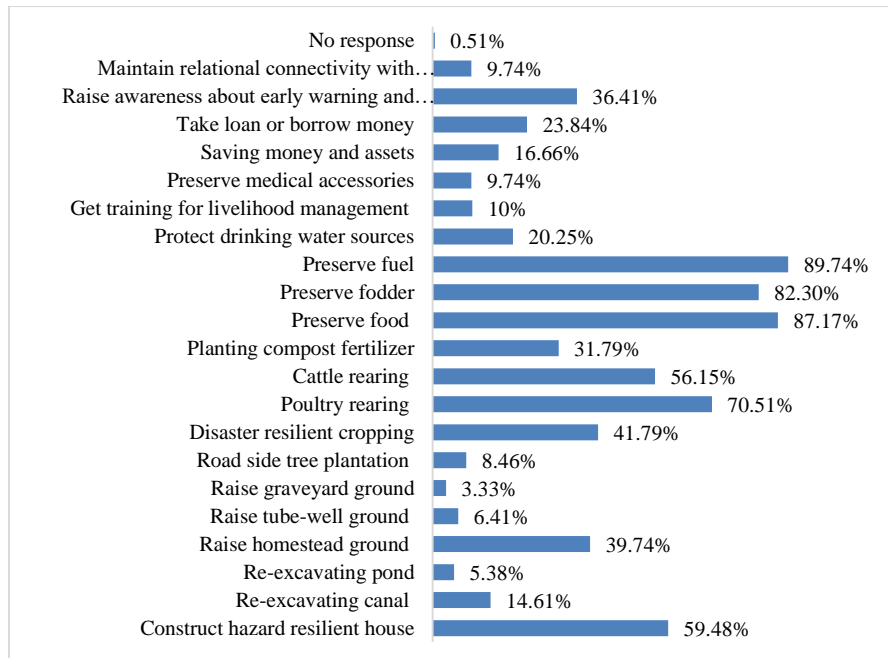
tube well ground (6.41%) and graveyard ground (3.33%). To ensure water supply for irrigation they re-excavated canals (14.61%) and ponds (5.38%). Furthermore, they planted compost fertilizer (31.79%), took loan or borrowed money (23.84%), protected drinking water sources (20.25%), saved money and assets (16.66%), got training for livelihood management (10%), preserved medical accessories (9.74%) and road side tree plantations (8.46%). Table 5.4.25.

**Table 5.4.25: Frequency and percentage distribution of respondents by their practiced activities for making disaster resilient community**

<b>Activities for making disaster resilient community*</b>	<b>Frequency</b>	<b>Percent</b>
Construct hazard resilient house	232	59.48
Re-excavate canal	57	14.61
Re-excavate Pond	21	5.38
Raise homestead ground	155	39.74
Raise tube-well ground	25	6.41
Raise graveyard ground	13	3.33
Road side tree plantation	33	8.46
Disaster resilient cropping	163	41.79
Poultry rearing	275	70.51
Cattle rearing	219	56.15
Plant compost fertilizer	124	31.79
Preserve food	340	87.17
Preserve fodder	321	82.30
Preserve fuel	350	89.74
Protect drinking water sources	79	20.25
Get training for livelihood management	39	10.00
Preserve medical accessories	38	9.74
Save money and assets	65	16.66
Take loan or borrow money	93	23.84
Raise awareness about early warning	142	36.41

and disseminate signals		
Maintain relational connectivity with community people	38	9.74
No response	02	0.51

\*Multiple responses n=390



**Figure 5.4.13: Practicing activities for making disaster resilient community**

#### 5.4.14. NGOs' initiatives for strengthening coping mechanisms

As disaster hits equally on people but its impacts are not equal and varied by age, gender, location of household, economic condition, familial structure etc. Hence, various NGO helps to reduce the impacts of disaster. Hossain (2013) mentioned that among international organization UN, UNICEF, WFP (World Food Program, Islamic Development Bank), CARE and non-governmental Muslim Aid, Oxfam Australia, World Vision, SKS, BRAC, ASA, Proshika, GUK are involved in relief and rehabilitation activities. On the other hand, ASA, Proshika, Grameen Bank, BRAC etc. operate microcredit activities in the disaster-prone area to build resilience among the people. About 98.98 percent of the respondents reported that they know about the NGOs such as,

local, national and international initiatives to strengthen community coping mechanisms in case of disaster management. Table 5.4.26.

**Table 5.4.26: Frequency and percentage distribution of respondents whether they knew about NGOs’ initiatives for strengthening community coping mechanisms**

<b>Did you know about the NGOs’ initiatives for strengthening community coping mechanisms?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	386	98.98
No	01	0.25
Not sure	03	0.77
<b>Total</b>	<b>390</b>	<b>100</b>

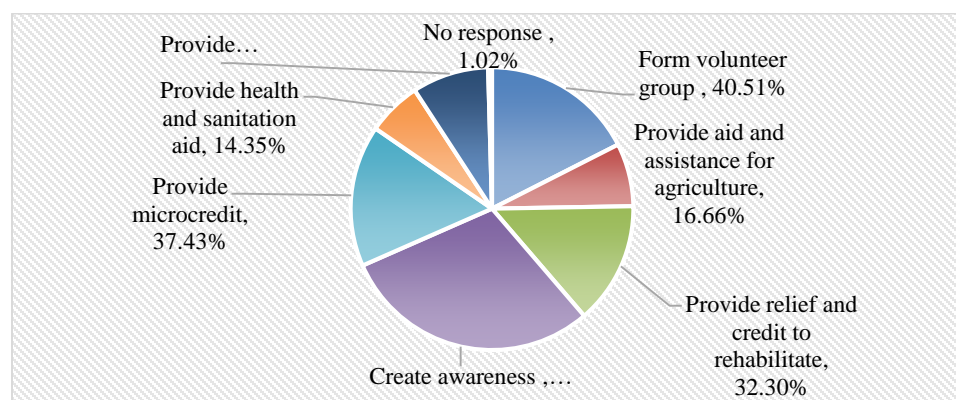
The NGOs help the people to strengthen community coping mechanisms in case of disaster management. The majority (68.71 percent) of the respondents reported that local, national and international non-governmental organizations took initiatives to raise awareness among the people about disaster management. Moreover, the respondents (40.51%) said that the NGOs form volunteer group, provided microcredit to the victims to cope with changing situation (37.43%), relief and credit to rehabilitate (32.30%), shelter (20.25%), aid and assistance for agricultural rehabilitation and (16.66%) and health and sanitation aid (14.35%). (Table 5.4.27). In that case, Bangladesh Red Crescent Society operates community-based preparedness programs by focusing on the self-capacities of community people in Cox’s Bazar district. CARE Bangladesh operates food-for-work program for 1998 flood affected people, many microfinance institutes operate microcredit program for the disaster affected people, and some of them operate relief programs through their micro credit network (Hossain, 2013). The microfinance institutions help their members to manage disaster risk or to cope with changing situations due to disasters (Khatun, 2001; Islam, 2008; Siddika, 2008 and Pender, 2010) through loans, rescheduling their loan payments, loan for restoring livelihood activities, loan for making or repairing houses, etc. (Nagarajan, 1998). NGOs have made up temporary shelter for disaster victims in their offices and sometimes in high places (Hossain, 2013).

The qualitative data shows that many NGOs such as, BRAC, ASA, Grameen Bank, *Shouhardo-ESDO*, *Unnoyon Songho* etc. helped to form volunteer group with youth to strengthen community coping mechanisms. The NGOs provided seeds, insecticides and pesticides, consultancy for agriculture and arranged awareness building campaign regarding preparedness for disaster; provide food, clothes, soaps and micro credit.

**Table 5.4.27: Frequency and percentage distribution of respondents by the type of initiatives by NGOs for strengthening community coping mechanisms**

Initiatives taken by NGOs for strengthening community coping mechanisms*	Frequency	Percent
Form volunteer group	158	40.51
Provide aid and assistance for agriculture	68	16.66
Provide relief and credit to rehabilitate	126	32.30
Create awareness	268	68.71
Provide microcredit	146	37.43
Provide health and sanitation aid	56	14.35
Provide shelter	79	20.25
No response	04	1.02

\*Multiple responses n=390



**Figure 5.4.14: Initiatives taken by NGOs for strengthening community coping mechanisms**

#### 5.4.15. Training programs provided by NGOs

Training programs are necessary for better preparedness to save the life of people and belongings from indeterminate disaster such as, flood (Hossain, 2020). Besides, Hossain (2013) added that training programs are also essential for imparting the knowledge for the volunteer who are involved in managing disaster. The majority 99.24 percent of the respondents stated that they know about the NGOs' training programs to strengthen community coping mechanisms in case of disaster management. Table 5.4.28.

**Table 5.4.28: Frequency and percentage distribution of respondents whether they knew about the training programs provided by NGOs**

<b>Did you know about the training programs of NGOs?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	387	99.24
No	01	0.25
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The NGOs provide training programs to support the community people for strengthening coping mechanisms in managing disaster. Table 5.4.29 highlights that the majority (56.41 percent) of the respondents reported that the NGOs provide training program on making oral saline to combat diseases that spread out due to disaster. On the other hand, about 30.25 percent of the respondents stated that the NGOs' provide training on pure drinking water, health and sanitation issues. The community people suffered from water borne health and reproductive sanitation issues due to water related diseases by drinking unsafe water, since, SDWF (2018) stated that most of the (80%) of the illness featured to unsafe drinking water in developing countries and Howard & Bartram (2003) and Motoshita et al. (2011) discussed that water scarcity is resulted in inadequate safe drinking water which leads to spreading of water contamination related diseases. Most of the disasters in the study area (floods, driving rain, drought and cyclone) cause damage to agricultural production. So, the training on cropping of new variants of crops is essential to reduce

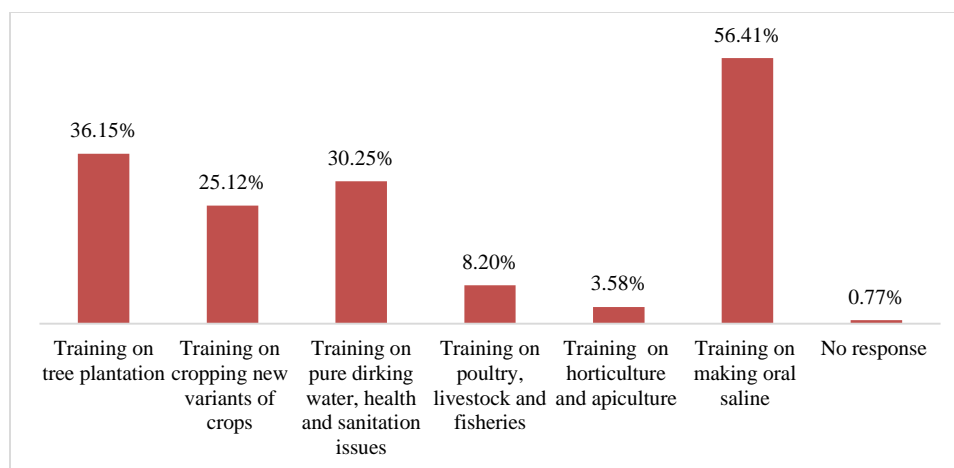
that damage and losses. Moreover, they (36.15%) reported that the NGOs provide training on tree plantation, cropping new variants (25.12%), poultry, livestock and fisheries (8.20%). However, Hossain (2020) argued that NGOs provide training programs effective for the community people while it creates awareness to protect the people and their valuables from disaster.

The qualitative data shows that the participants assured that the training provided by the NGOs such as, BRAC, ASA, Grameen Bank, *Shouhardo-ESDO*, *Unmoyon Songho* etc. make them expert to overcome their problem successfully. They said that the training on tree plantation make them expert in planting new variants in case of gaining profit and protecting households. Training on cropping new variants taught them to crop disaster resilient variants and training on pure drinking water, health and sanitation helped them to protect water related diseases. The training on making oral saline helped the community people to protect them from diarrhoea and cholera.

**Table 5.4.29: Frequency and percentage distribution of respondents by the type of training programs provided by NGOs for strengthening community coping mechanisms**

Training programs provided by NGOs *	Frequency	Percent
Training on tree plantation	141	36.15
Training on cropping new variants of crops	98	25.12
Training on pure drinking water, health and sanitation issues	118	30.25
Training on poultry, livestock and fisheries	32	8.20
Training on horticulture and apiculture	14	3.58
Training on making oral saline	220	56.41
No response	03	0.77

\*Multiple responses n=390



**Figure 5.4.15: Training programs provided by NGOs**

#### **5.4.16. Supports provided by NGOs for relief and agricultural rehabilitation**

Timothy et al. (2013) observed that climate change is a serious alarm of agricultural sector of Bangladesh because this sector has played a significant role in gross domestic product and this sector has provided 52 percent of labour force for Bangladesh (BBS, 2004). Table 5.4.30 underlines that 98.72 percent of the respondents declared that they know about the NGOs' support of relief and agricultural rehabilitation for strengthening community coping mechanisms.

**Table 5.4.30: Frequency and percentage distribution of respondents whether they knew about supports for relief and agricultural rehabilitation provided by NGOs**

<b>Did you know about supports for relief and agricultural rehabilitation provide by NGOs?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	385	98.72
No	02	0.51
Not sure	03	0.77
<b>Total</b>	<b>390</b>	<b>100</b>

According to IPCC (2014) climate variability affects the developing countries and as well as the agricultural sector, which is an important sector of Bangladesh's economy (Adams

et al., 1988 and Habiba et al., 2012). But the successful initiatives including governmental, non-governmental and individual may need to lessen the effects of climate change and to strength the coping mechanisms regarding agricultural rehabilitation. The majority of the respondents (53.58%) reported that the NGOs provide microcredit for agricultural rehabilitation to strengthen coping mechanisms of the community people. In addition, 42.30 percent reported that the NGOs provide loan for rehabilitation and provided seed, fertilizer and pesticide as rehabilitation instrument to agricultural production (23.07%). (Table 5.4.31). The agricultural rehabilitation is needed just after disaster, because CEGIS (2005) identified that about 56 percent of livelihoods of small farmers and 50 percent livelihood of large farmers come directly from agricultural crop cultivation in flood affected area.

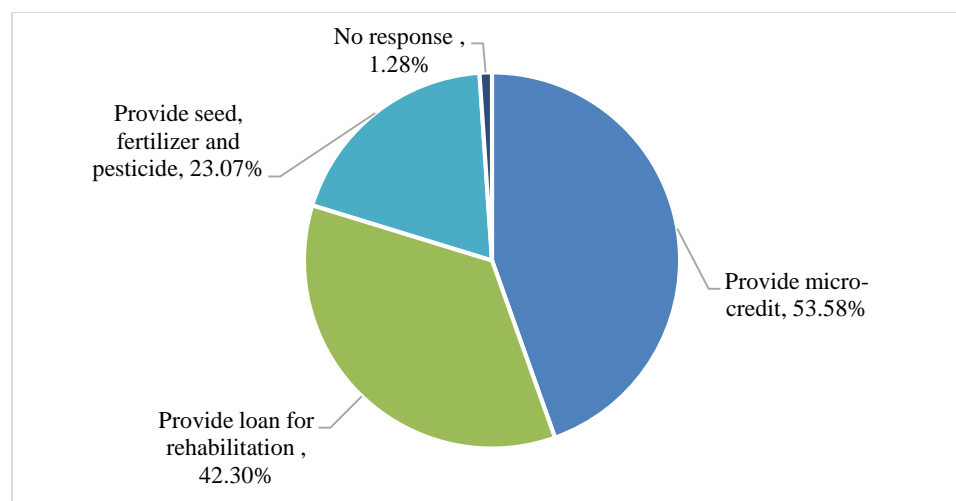
The qualitative data shows that NGOs (BRAC, ASA, Grameen Bank, *Unnoyon Songho* etc.) provided financial and technical support to agricultural rehabilitation strengthened the coping mechanisms of the community people while they took loan with minimum interest from the NGOs, along with seed, fertilizer and pesticide.

**Table 5.4.31: Frequency and percentage distribution of respondents by the type of supports for relief and agricultural rehabilitation provided by NGOs**

<b>Supports provided by NGOs for relief and agricultural rehabilitation *</b>	<b>Frequency</b>	<b>Percent</b>
Provide micro-credit	209	53.58
Provide loan for rehabilitation	165	42.30
Provide seed, fertilizer and pesticide	90	23.07
No response	05	1.28

*\*Multiple responses* n=390





**Figure 5.4.16: NGOs' supports for relief and agricultural rehabilitation**

#### 5.4.17. Health services provided by NGOs

Disasters such as, flood results contamination of drinking water in the affected area causes the outbursts of water borne diseases like diarrhoea is the major public health concern (Alderman et al., 2012 and Kosek et al., 2003). Water borne diseases affect the community people in the study area after a flood or driving rain. Although, the community people need medical services from other sources since they (98.21%) indicated that they know about medical accessories that provided by NGOs for strengthening the community coping mechanisms. Table 5.4.32.

**Table 5.4.32: Frequency and percentage distribution of respondents whether they knew about health services provided by NGOs**

Did you know about health services provided by NGOs?	Frequency	Percent
Yes	383	98.21
No	03	0.77
Not sure	04	1.02
<b>Total</b>	<b>390</b>	<b>100</b>

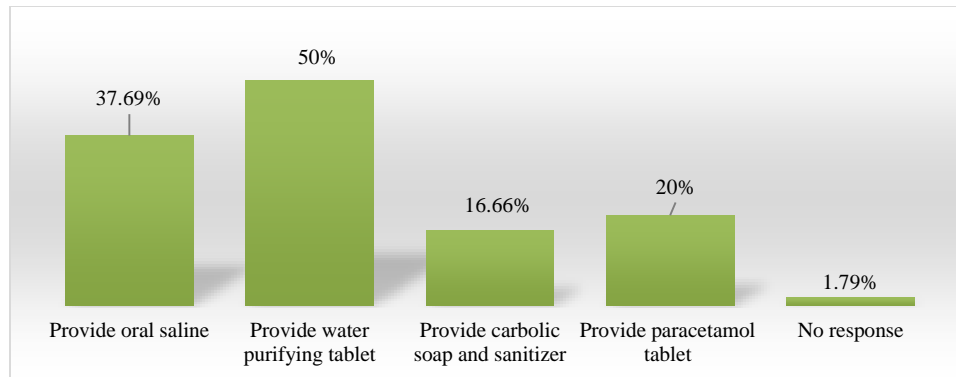
As the health is one of the key concerns of the effects of climate change, therefore, it is necessary to strengthen community coping mechanisms. Some non-governmental organizations provided medical accessories to strengthen coping mechanisms. For example, the respondents (50%) reported that the NGOs provide water purifying tablet to protect water contaminated disasters resulting the outbreaks of waterborne diseases. Moreover, 37.69 percent of the respondents also reported that the NGOs provide oral saline among the community people to protect diarrheal diseases. Outbreak of diarrheal type diseases and fever in the affected areas is the common scenario, so, NGOs provided paracetamol tablet that was reported by 20 percent of the respondents. About 16.66 percent of the respondents mentioned that the NGOs provide carbolic soap for protection against snake and sanitizer for disinfecting. Table 5.4.33.

The qualitative data shows that the NGOs (BRAC, ASA, Grameen Bank, *Unnoyon Songho* etc.) provided oral saline, water purifying tablet, carbolic and sanitizer and paracetamol tablet to strengthen community coping mechanisms regarding health services.

**Table 5.4.33: Frequency and percentage distribution of respondents by the type of health services provided by NGOs**

<b>Health services provided by NGOs*</b>	<b>Frequency</b>	<b>Percent</b>
Provide oral saline	147	37.69
Provide water purifying tablet	195	50.00
Provide carbolic soap and sanitizer	65	16.66
Provide paracetamol tablet	78	20.00
No response	07	1.79

*\*Multiple responses* n=390



**Figure 5.4.17: Health services provided by NGOs**

#### **5.4.18. Government initiatives for strengthening coping mechanisms**

Though disaster management is a collaborative procedure between governmental authority, non-governmental organization and community people, so, the government and NGOs have to work together to mitigate the suffering of people (Blair, 2005). These governmental and non-governmental organizations effectively worked for emergency response, recovery and rehabilitation to strengthen the People’s coping mechanisms for managing disaster (Hossain, 2020). Therefore, the majority (99.49 percent) of the respondents mentioned that they know about the government initiatives for strengthening the community coping mechanisms regarding disaster management. Table 5.4.34.

**Table 5.4.34: Frequency and percentage distribution of respondents whether they knew about government initiatives for strengthening the community coping mechanisms**

<b>Did you know about government initiatives for strengthening the community coping mechanisms?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

Table 5.4.35 shows that 97.44 percent of the respondents reported that government forecast early warning signals as the initiative to strengthen the coping mechanisms in case of risk management. Forecasting of early warning signals as a measure of preparedness by the government reduces the loss of lives and household valuables. They (93.84%) also reported that government build bridges, culverts, roads and embankments to strengthen the community's coping mechanisms in case of risk management whereas most of them (79.23%) said that government create awareness among the community people. Volunteering is an important component in disaster management, so, the government formed volunteer groups (52.56%). Provide shelter during disastrous situations and immediately after disaster to saves lives, property and reduce risk of the most vulnerable group thus the respondents (50.51%) said that government make shelters. To restore agricultural activities government provided aid and assistance (61.69%) and relief and credit (40.76%). To protect health hazard the government provided health and sanitation aid (37.17%). Study said that due to lack of available resources government has to make shelters in the educational institutions in disaster prone area (Hossain, 2020) and although considering the vast population shelter houses are few in Bangladesh. Hossain also says that organizations tried to create awareness about disaster for reducing disaster risk. National Disaster Management Policy and the National Plan for Disaster Management of Bangladesh 2010-2015 emphasized on strengthening coping mechanisms to build capacities of community people and institutional level in Bangladesh through community-based activities for preparedness, mitigation and disaster risk reduction.

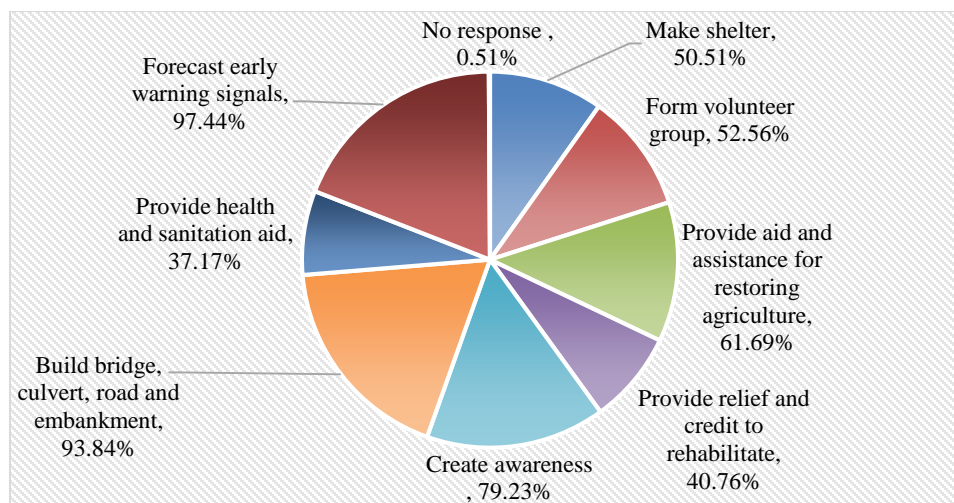
The qualitative data shows that government authorities made shelters in the local schools' and colleges' premises during disasters and formed volunteer groups with affected people to ensure equal distribution of aid and assistance, protecting violence against women, monitoring flood protecting embankment, etc. The data also shows that government authorities provided aid and assistance for agricultural restoration, relief and credit to rehabilitate the disaster affected people through local government representative (UP

member and chairman). The formed volunteer group by the government authority disseminated early warning signals to protect the vulnerable people and evacuate them.

**Table 5.4.35: Frequency and percentage distribution of respondents by the type of initiatives by government for strengthening the community coping mechanisms**

Government initiatives for strengthening the community coping mechanisms *	Frequency	Percent
Make shelter	197	50.51
Form volunteer group	201	52.56
Provide aid and assistance for restoring agriculture	241	61.69
Provide relief and credit to rehabilitate	159	40.76
Create awareness	309	79.23
Build bridge, culvert, road and embankment	366	93.84
Provide health and sanitation aid	145	37.17
Forecast early warning signals	380	97.44
No response	02	0.51

\*Multiple responses n=390



**Figure 5.4.18: Government initiatives for strengthening the community coping mechanisms**

#### 5.4.19. Government initiatives for agricultural rehabilitation

Agriculture is the base of employment and income generation sources of rural people of Bangladesh where country's total 41 percent labour force are involved in agricultural activities, 15 percent of GDP is contributed by 9 sub-sectors of agriculture (MoA, 2018). As a reason, the government provided various types of support to rehabilitate agriculture after disaster. The majority (99.23%) of the respondents reported that they know about government's supports to rehabilitate agriculture after a devastating disaster. Table 5.4.36.

**Table 5.4.36: Frequency and percentage distribution of respondents whether they knew about the supports provided by government for agricultural rehabilitation**

<b>Did you know about the supports provided by government for agricultural rehabilitation?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	387	99.23
No	00	0.00
Not sure	03	0.77
<b>Total</b>	<b>390</b>	<b>100</b>

Agriculture is one of the most susceptible segments to disasters (Masipa, 2017 and Liliana, 2005) because of the dependency of enormous portion of population on agricultural activities in Bangladesh (Rahman & Rahman, 2018). It plays an important role in alleviating poverty, ensuring food security, generating employment and earning foreign currency for the country (Mozumder, 2012). In order to minimize the risks of agricultural sector the government of Bangladesh has formulated National Agriculture Policy 2018 by emphasizing the use of environment friendly technology, welcoming socio-economic rehabilitation activities, producing appropriate seeds for unwanted environmental events. Moreover, the policy also prioritizing to preserve traditional and non-traditional crops for cultivation through encouraging farmers and to provide assistance to produce compost manure in the household by considering disasters or

climate change issues. This policy also focuses on the crop scheduling by taking into account the occurrence of disasters (MoA, 2018). The supportive initiatives by the government help to lessen the risk of agricultural sector. The respondents (62.30%) reported that government provide stress and diseases tolerant seed and locally adaptive technology (61.02%) because of acceptability, familiarity and usability of the technology by the local people. Early warning can reduce the losses and damages of agricultural production, and for this reason the government disseminated warning signal to the community people prior to a disaster (55.64%). About 54.61 percent of the respondents reported that the government purchase agricultural product from local market or the farmers as a support initiative. Agricultural loan is a necessary support for the farmers after a disaster. The respondents (44.35%) argued that government provide agricultural loan in the study area. The respondents also mentioned that government provide other supportive initiatives for agricultural rehabilitation such as, crop schedule (24.35%), fertilizer and pesticide (19.74%), and aid and assistance for agricultural means (14.87%).

Table 5.4.37.

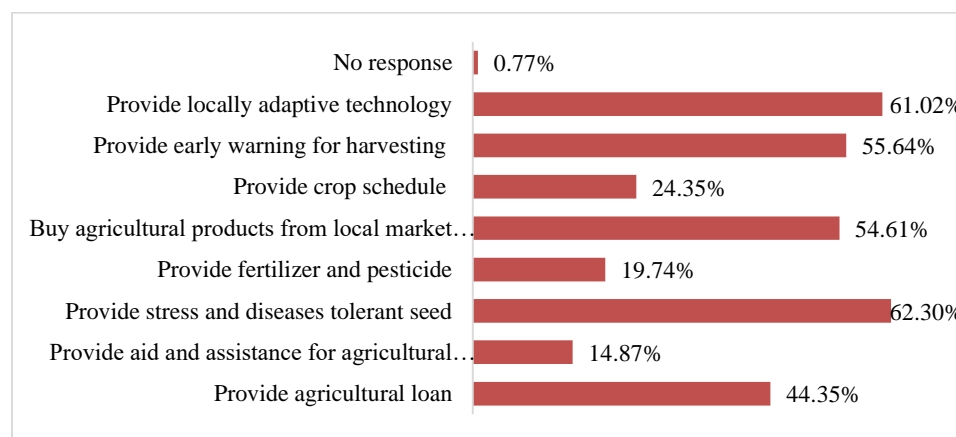
The qualitative data shows that the government authorities provided more support for the rehabilitation of the agricultural sector. The participants mentioned that government authorities provide agricultural loan with minimum interest, provide different types of disaster resilient high yield seeds, fertilizer, pesticide and insecticide and free consultancy for cropping. The consultancy provided by block supervisor from agricultural extension department for cropping schedule to reduce the losses in agricultural sector. The government purchased the agricultural products from the local market to give benefit to the marginal farmers.

**Table 5.4.37: Frequency and percentage distribution of respondents by the type of supports provided by government for agricultural rehabilitation**

<b>Government supports for agricultural rehabilitation*</b>	<b>Frequency</b>	<b>Percent</b>
Provide agricultural loan	173	44.35

Provide aid and assistance for agricultural means	58	14.87
Provide stress and diseases tolerant seed	243	62.30
Provide fertilizer and pesticide	77	19.74
Buy agricultural products from local market or farmers	213	54.61
Provide crop schedule	95	24.35
Provide early warning for harvesting	217	55.64
Provide locally adaptive technology	238	61.02
No response	03	0.77

*\*Multiple responses* n=390



**Figure 5.4.19: Government supports for agricultural rehabilitation**

#### **5.4.20. Government provided health services**

Like agriculture, human health is also susceptible to natural disaster. As climate change increases rate of disaster globally giving favour to increase of water borne diseases in disaster affected area (DFID, 2004) and the risk of this type of diseases such as, diarrheal, cholera, skin and eye infection increases due to floods and water logging in Bangladesh (BIRDEM, 2012). To protect these diseases and to strengthen the coping capability, the Government of the People's Republic of Bangladesh provides support to the disaster



affected people. Table 5.4.38 indicates that most of the respondents (97.44%) stated that they know about this issue.

**Table 5.4.38: Frequency and percentage distribution of respondents whether they knew about health services provided by government**

<b>Did you know about health services provided by government?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	380	97.44
No	03	0.77
Not sure	07	1.79
<b>Total</b>	<b>390</b>	<b>100</b>

Though flood, water logging, cyclone, drought increases waterborne diseases so, community people require health services in emergency. Kovats et al., (2005) and Costello et al., (2009) stated that water is affected by climate change and causes the utmost negative impacts on human health. The contamination of drinking water is the regular scenario in disaster affected area. Government provided water purifying tablet (74.87%) to protect contamination of water and water borne diseases. To be cured from diarrheal diseases and fever the government provided oral saline (56.92%) and paracetamol tablet (25.38%). Moreover, the government provided carbolic soap for protection against snakes and sanitizer for cleanliness (19.48%). Table 5.4.39.

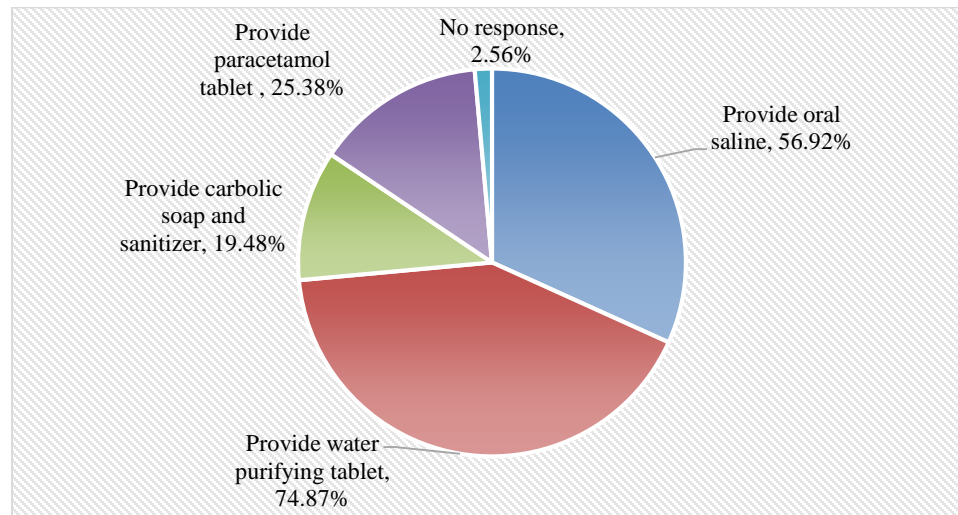
The qualitative data shows that the government authorities provided oral saline, water purifying tablet, carbolic soap and sanitizer and paracetamol tablet through community clinic, union health care centre and union sub-health care centre to strengthen community coping mechanisms regarding health services.

**Table 5.4.39: Frequency and percentage distribution of respondents by the type of health services provided by government**

<b>Health services provided by government*</b>	<b>Frequency</b>	<b>Percent</b>
Provide oral saline	222	56.92

Provide water purifying tablet	292	74.87
Provide carbolic soap and sanitizer	76	19.48
Provide paracetamol tablet	99	25.38
No response	10	2.56

\*Multiple responses n=390



**Figure 5.4.20: Health services provided by government**

#### 5.4.21. Government provided training programs

Standing Order on Disasters clearly declares the roles and responsibilities of all divisions, departments and local government bodies to arrange training programs for the disaster affected people to strengthen community coping mechanisms and to enhance capacity of the people (MoDMR, 2019). Due to these roles and responsibilities the local government authorities conducted training on the issues related to disaster management. For example, the 99.49 percent of the respondents stated that they know about the government training programs for building capacity for combating disaster. Table 5.4.40.

**Table 5.4.40: Frequency and percentage distribution of respondents whether they knew about the training programs provided by government**

<b>Did you know about training programs provided by government?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

According to Standing Orders on Disaster 2019 the responsibilities of the Disaster Management Training and Mass Awareness Taskforce is to coordinate, monitor and evaluate training and public awareness programs on disaster risk management. However, the Committee for Disaster Damage and Needs Assessment is duly responsible for conducting seminars, workshops and training programs to enhance the knowledge and skills of the disaster affected people and the stakes of damage, loss and needs assessment. Here, the responsibility of Union Disaster Management Committee is to conduct training and workshop on disaster risk management related issues with the help of *Upazila* Disaster Management Community. As a result, the local government authority conducted trainings on several issues such as, training on cropping new variants of crops (54.87%), training on making oral saline (52.82%), training on poultry, livestock and fisheries (38.46%), training on tree plantation (36.41%) training on pure drinking water, health and sanitation issues (21.02%), and training on horticulture and apiculture (5.89%). Table 5.4.41.

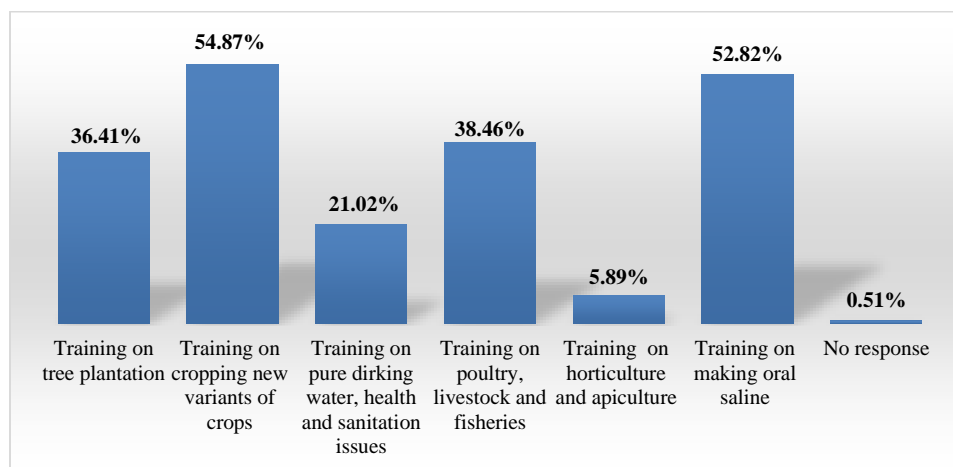
The qualitative data shows that the participants assured that the training provided by the government authorities train them well to overcome their problems successfully. They said that the training on tree plantation help them in planting new variants in case of gaining profit and protect households. Training on cropping new variants taught them to crop disaster resilient variants and training on pure drinking water, health and sanitation

help them to prevent water related diseases. The training on making oral saline help the community people to protect them diarrhoea and cholera.

**Table 5.4.41: Frequency and percentage distribution of respondents by the type of training programs provide by government**

<b>Training programs provide by government *</b>	<b>Frequency</b>	<b>Percent</b>
Training on tree plantation	142	36.41
Training on cropping new variants of crops	214	54.87
Training on pure dirking water, health and sanitation issues	82	21.02
Training on poultry, livestock and fisheries	150	38.46
Training on horticulture and apiculture	23	5.89
Training on making oral saline	206	52.82
No response	02	0.51

*\*Multiple responses*      n=390



**Figure 5.4.21: Training programs provide by government**

## 5.5. Community people’s participation in risk reduction options

### 5.5.1. Existing risk reduction options within community

**Table 5.5.1: Existing risk reduction options within community**

SL#	Existing risk reduction options within community
01.	Hazard maps creation
02.	Hazard identification
03.	Vulnerability assessment
04.	Risk analysis
05.	Risk assessment
06.	Awareness raising campaigns carry out
07.	Psychological support
08.	Restoring agricultural rehabilitation
09.	Search and rescue operation
10.	Medical first aid providing
11.	Distribution of relief
12.	Integrating development activities
13.	Early warning system
14.	Physical connectivity
15.	Relational connectivity

### 5.5.2. Community people’s participation in risk reduction options

The community people participated in the community risk reduction options. For instance, the majority 99.24 percent of the respondents reported that they participate in the several community risk reduction options (Table 5.5.2). However, the community people participation in the risk reduction option is needed for understanding the local needs and to meet the specific local needs (Zubir & Amirrol, 2011). Maskery (1989) added that disaster management is not a single issue as it has involved the socioeconomic activities of the local people.

**Table 5.5.2: Frequency and percentage distribution of respondents whether they participated in community risk reduction options**

<b>Did you participate in community risk reduction options?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.24
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

### **5.5.3. Sharing information with responsible personalities**

The success of DRR efforts depends on the effective involvement of the vulnerable community people and their involvement may be in the planning and decision-making phase and in the operational activities at all local level (Zubir & & Amirrol, 2011). The community people in the study area participated in the risk reduction options by sharing information/knowledge. Table 5.5.3 shows that, the majority 99.49 percent of the respondents shared information/knowledge with responsible personalities as the option for risk reduction.

**Table 5.5.3: Frequency and percentage distribution of respondents whether they shared information/knowledge**

<b>Did you share your information/knowledge on risk reduction options?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

Community people’s participation in the disaster risk reduction option involves active sharing of ideas, knowledge and views with other stakeholders towards making decisions and solving the problems (Banki, 1981) as this participation of community people motivates

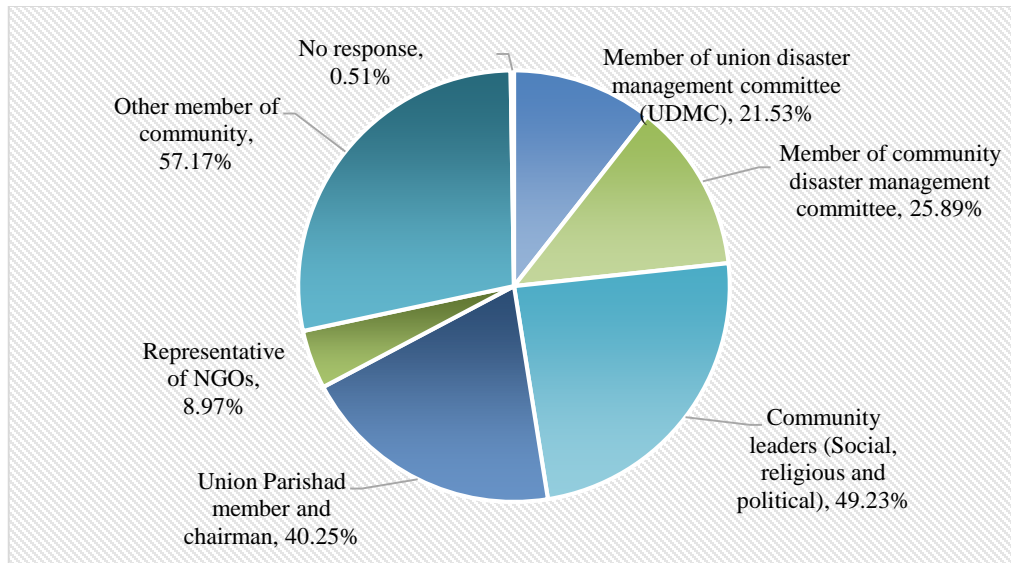
everyone to work together (Hossain, 2013). Community’s participation in risk reduction options by sharing their information/knowledge is the opposite of top-down intervention of disaster management. Top-down approach is not effective in bringing fruitful outcomes for disaster management (Islam, 1995 and Heijmans & Victoria, 2001) because this approach paid little attention to address community’s vulnerability, dynamics, perceptions, needs and local resources (Murshed, 2003). Disaster affected communities shared their information/knowledge mostly to other members of the community (57.17%) and community leaders such as, social, religious and political (49.23%), Union *Parishad* member and chairman (40.25%), member of community disaster management committee (25.89%), member of union disaster management committee (21.53%) and representative of NGOs (8.97%). Table 5.5.4.

The qualitative data shows that the community people shared various information on time of disaster occurrence, vulnerability of the community people, socioeconomic condition of the most vulnerable group, types of disaster risk, type of hazard, etc. to the responsible personalities within their community.

**Table 5.5.4: Frequency and percentage distribution of respondents by name of the personalities to share information/ knowledge**

<b>Name of the personalities to share information/ knowledge*</b>	<b>Frequency</b>	<b>Percent</b>
Member of union disaster management committee (UDMC)	84	21.53
Member of community disaster management committee	101	25.89
Community leaders (Social, religious and political)	192	49.23
Union <i>Parishad</i> member and chairman	157	40.25
Representative of NGOs	35	8.97
Other member of community	223	57.17
No response	02	0.51

\*Multiple responses n=390



**Figure 5.5.1: Name of the personalities to share information/ knowledge**

#### **5.5.4. Community people’s participation by sharing information/knowledge to create hazard maps**

Different areas are susceptible to different disasters such as some areas are subjected to floods, some droughts, water logging, cyclone, tornado, arsenic contamination, landslides, etc. The intensity and damageability of a disaster depends on the geographic location, geological formation and frequency of disasters occurrence. As a practical tool for indicating the geographic distribution of probable high-risk areas (Islam et al., 2017) hazards mapping is an important issue in mitigating disaster risk therefore, incorporating local People’s knowledge is also important for creating hazard mapping. Hazards maps are fundamental methods for collecting and displaying of vulnerabilities and risks through local People’s knowledge (Hatfield, 2006) for creating vulnerability inventory of community people (Noson, 2002 and Wisner et al, 2004) to motivate risk management activities (Pradan, 2004) by planning and allocating resources for disaster preparedness (Morrow, 1999). The majority (99.49 percent) of the respondents indicated that they share information/knowledge to create community hazard maps. Table 5.5.5.



**Table 5.5.5: Frequency and percentage distribution of respondents whether they shared information/knowledge to create community hazard maps**

<b>Did you share your information/knowledge to create community hazard maps?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The local community people’s knowledge is essential for managing disaster risk and this knowledge is visible in the hazard map (Tran et al., 2009), therefore, community people help the responsible personalities to create hazard maps through sharing vital information. For instance, they shared information on the location of houses (71.79%), public places (68.46%), livelihood options of community people (65.64%), local hazards, intensity, frequency, damage caused and risks, etc. (65.38%), drinking water sources (51.53%), road, water and other communication connectivity (51.53%), water reservoir (48.71%), land types (45.89%), health services providing centres (45.64%), trees, forest and garden (36.41%) and *haat* and *bazar* and other market places (31.53%). Table 5.5.6.

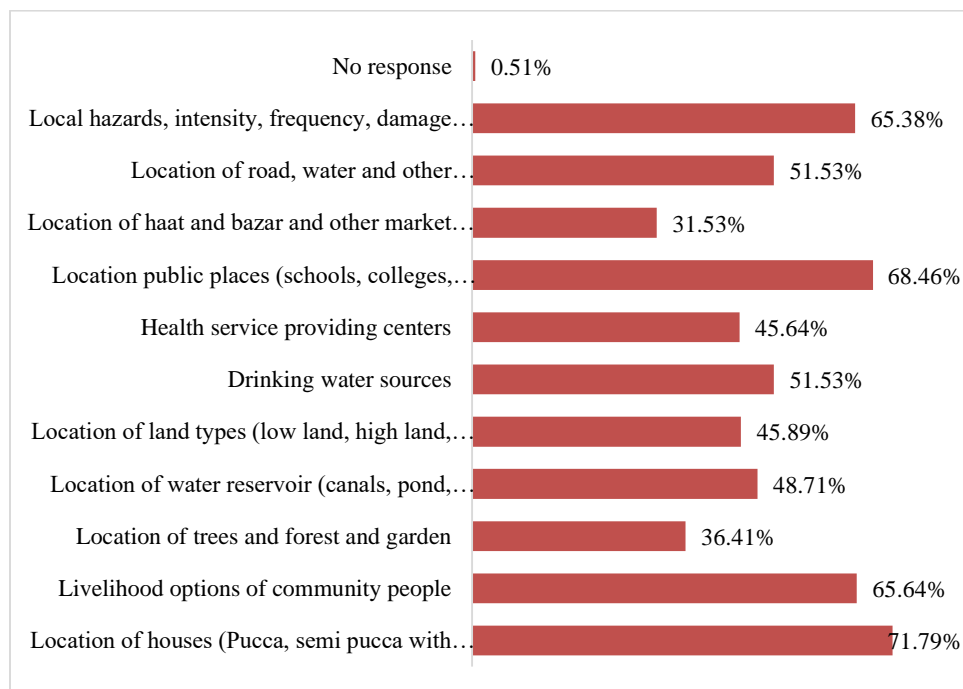
The qualitative data shows that the community people identified the places of water logging, most inundated areas with flood water, most vulnerable point on the embankment to damages, type of hazards in their locality, intensity of particular hazard, probability of loss and damage caused by a particular hazard, velocity of flood water, staying time of flood water, etc.

**Table 5.5.6: Frequency and percentage distribution of respondents by type of information shared for creating hazards maps**

<b>Information shared for creating hazards maps on*</b>	<b>Frequency</b>	<b>Percent</b>
Location of houses ( <i>Pucca</i> , semi <i>pucca</i> with tin roof, tin wall tin roof, cottage, thatched wall with a tin roof)	280	71.79

Livelihood options of community people	256	65.64
Location of trees and forest and garden	142	36.41
Location of water reservoir (canals, pond, tanks and other water bodies)	190	48.71
Location of land types (low land, high land, plain land)	179	45.89
Drinking water sources	201	51.53
Health service providing centers	178	45.64
Location public places (schools, colleges, mosque)	267	68.46
Location of <i>haat</i> and <i>bazar</i> and other market places	123	31.53
Location of road, water and other communication connectivity	201	51.53
Local hazards, intensity, frequency, damage caused and risks etc.	255	65.38
No response	02	0.51

\*Multiple responses n=390



**Figure 5.5.2: Types of information shared for creating hazards maps**

### 5.5.5. Community people’s participation in hazard/disaster identification

Hazard identification is one of the important issues in assessing risk and it may not be successful without the knowledge of local people/community about risks. All potential hazards identification is fundamental for ensuring success in risk assessment (Simmons et al., 2015). Without proper identification of hazards risk assessment process for community may be disrupted because Quarantelli (1991) observed that in all disasters occurrence there are more similarities in individual and organizational behavioural than differences in that case. So, Showalter & Myers, (1992) identified nineteen differences in the technological and natural disasters and fourteen similarities. Identification of hazard is an important issue because of overlooking probable any hazard never be assessed (Gowland, 2012). Therefore, the community People’s participation in the process of hazard identification is necessary for assessing disaster risks through sharing the knowledge on local risks. Table 5.5.7 shows that the majority (99.49 percent) of the respondents declared that they participate in the process of hazard in identification for assessing risk.

**Table 5.5.7: Frequency and percentage distribution of respondents whether they participated in the process of hazard/disaster identification for assessing risk**

<b>Did you participate in the process of hazard/disaster identification for assessing risk?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The community people participated in the process of hazard/ disaster identification for assessing risk through sharing the information on hazard related issues in their area. They participated in the process of identifying hazards in several ways such as, by sharing information on hazards-based warning and damages (76.15%), experience of last hazards faced (71.53%), type and nature of disasters and hazards faced (63.84%),

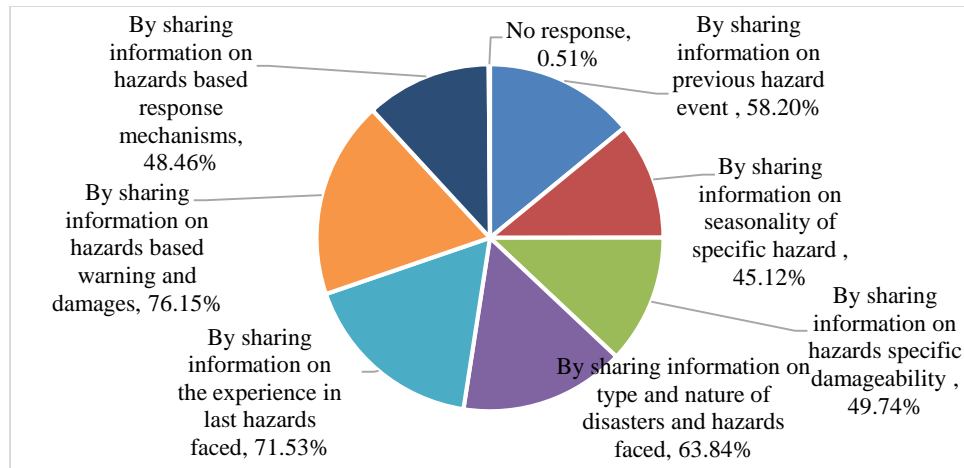
previous hazard event (58.20%), hazards specific damageability (49.74%), hazards-based response mechanisms (48.46%) and seasonality of specific hazard (45.12%). Table 5.5.8.

The qualitative data shows that the community people shared information on previous hazards in the community such as, flood, drought, tornado, water logging, cyclone, etc. They shared the time of occurrence and risks associated with those hazards. However, these hazards cause damages to economic activities, losses to health and lives and environmental degradation.

**Table 5.5.8: Frequency and percentage distribution of respondents by their participation in the process of hazard/disaster identification for assessing risk**

<b>Participation in the process of hazard/disaster identification for assessing risk*</b>	<b>Frequency</b>	<b>Percent</b>
By sharing information on previous hazard event	227	58.20
By sharing information on seasonality of specific hazard	176	45.12
By sharing information on hazards specific damageability	194	49.74
By sharing information on type and nature of disasters and hazards faced	249	63.84
By sharing information on the experience in last hazards faced	279	71.53
By sharing information on hazards-based warning and damages	297	76.15
By sharing information on hazards-based response mechanisms	189	48.46
No response	02	0.51

*\*Multiple responses* n=390



**Figure 5.5.3: Participation in the process of hazard/disaster identification**

### 5.5.6. Community people’s participation in vulnerability assessment

Vulnerability assessment is a key issue in assessing the impact of disaster. Because this term varies by demographic composition of population, location of the regions and sectors (Dowing et al., 2005). Community people’s participation in the process of vulnerability assessment is also important in managing disaster risk as they are well informed about their situation. Therefore, the majority (99.49%) respondents reported that they participate in the process of vulnerability assessment to help the stakeholders who are involved in the disaster management. Table 5.5.9.

**Table 5.5.9: Frequency and percentage distribution of respondents whether they participated in the process of vulnerability assessment for assessing risk**

Did you participate in the process of vulnerability assessment for assessing risk?	Frequency	Percent
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The community people's information on vulnerability is important for assessing disaster risk, because the vulnerability is comprised of several issues such as, the likelihood of death, injury, losses, damages and barriers to recovery (Wisner et al., 1994), socioeconomic, environmental and physical issues (ISDR, 2004) and susceptible to negative impacts of climate change and lack of capability to cope with this changing situation (IPCC, 2001). Therefore, the community people participated in the process of susceptibility assessment for assessing risk by: sharing information on alternative livelihood option and access to natural resource, market, public and health services (85.38%), physical and relational connectivity (82.30%) and low land areas, areas adjacent water bodies and wind directions (71.53%), Moreover, they shared the information on household gender ratio, age structure and education (69.74%), sources of aid and assistance (68.20%), vulnerable infrastructure (66.66%), number of dependent individuals (64.61%) and vulnerable population (63.58%). In addition they shared the information on preserve of pure drinking water, sanitation and hygiene (57.94%), livelihood assets (56.66%), drinking water sources (51.53%), resistance of houses (46.15%) and savings and assets (37.17%). Table 5.5.10.

The qualitative data shows that the participants mentioned some indicators for assessing the vulnerability. For example, most of the houses in riverbank line are not resistant to flood, tornado or cyclone however, the houses far from the riverbank line are resistant to erosion, the age range of the household members are 0-70 and the sex ratio in the household is 98. The participants also added that most of the affected people lost their livelihoods and they have to search alternative livelihood option and have to end up migrating to the cities. Lack of equal access to natural resources, market and health services was a common phenomenon due to the socioeconomic and political issues. The qualitative data represents that most of the tube wells and latrines were inundated by flood water and the community faced deficiency of safe drinking water. Girls and women faced the problem of sanitary napkins which affected the sanitation and hygiene situation of the community. The people received food, water purifying tablet, blanket, seeds, medicine, etc. from various government authorities and non-governmental organizations.

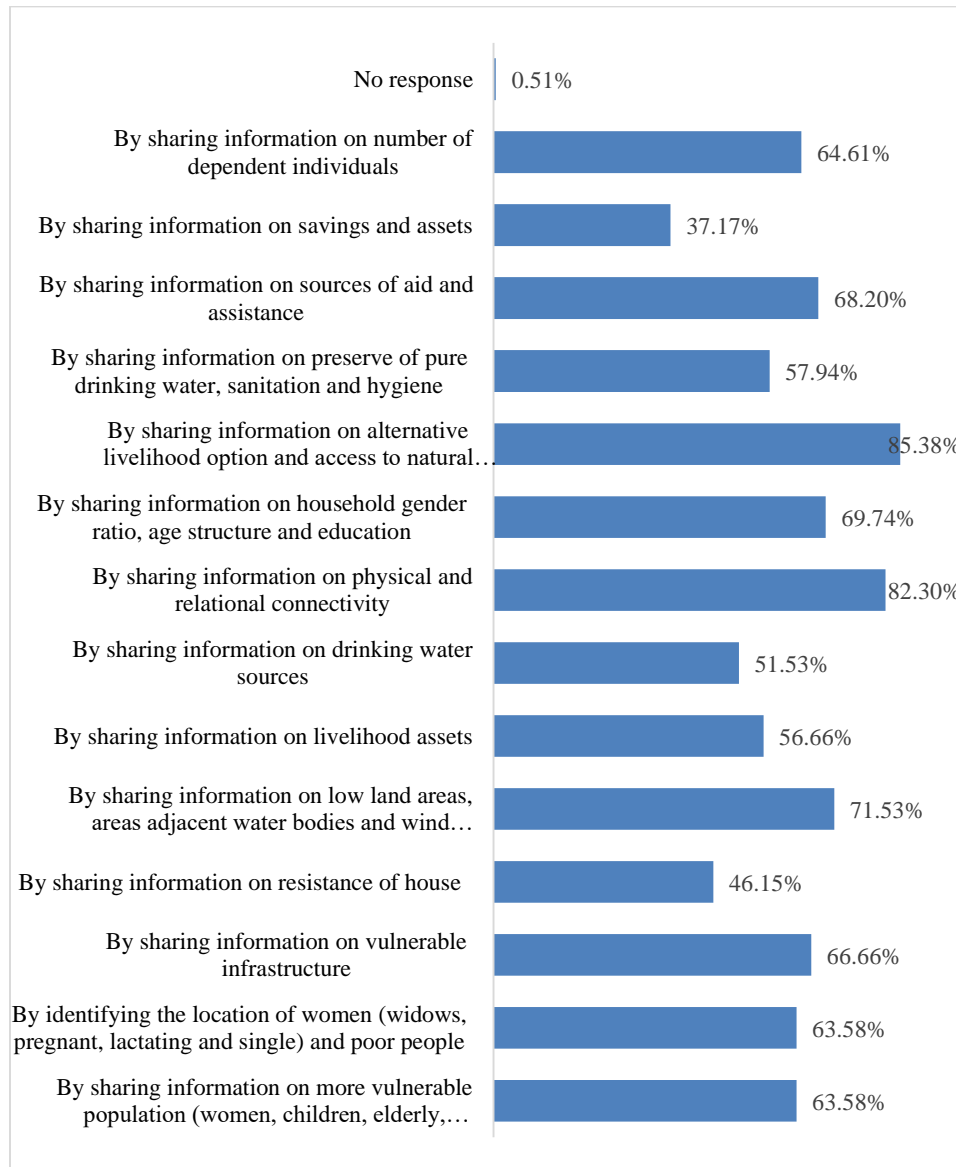
They could not save money due to the socio-economic condition and disaster occurrence. They managed to save some money to face challenges in the emergency situation. The dependent family members in the household was high but the rate of education was low.

**Table 5.5.10: Frequency and percentage distribution of respondents by their participation in the process of vulnerability assessment for assessing risk**

<b>Participation in the process of vulnerability assessment for assessing risk*</b>	<b>Frequency</b>	<b>Percent</b>
By sharing information on more vulnerable population (women, children, elderly, mentally and physically challenged people)	248	63.58
By identifying the location of women (widows, pregnant, lactating and single) and poor people	248	63.58
By sharing information on vulnerable infrastructure	260	66.66
By sharing information on resistance of house	180	46.15
By sharing information on low land areas, areas adjacent water bodies and wind directions	279	71.53
By sharing information on livelihood assets	221	56.66
By sharing information on drinking water sources	201	51.53
By sharing information on physical and relational connectivity	321	82.30
By sharing information on household gender ratio, age structure and education	272	69.74
By sharing information on alternative livelihood option and access to natural resource, market, public and health services	333	85.38
By sharing information on preserve of pure drinking water, sanitation and hygiene	226	57.94
By sharing information on sources of aid and assistance	266	68.20
By sharing information on savings and assets	145	37.17
By sharing information on number of dependent	252	64.61

individuals		
No response	02	0.51

\*Multiple responses n=390



**Figure 5.5.4: Participation in the process of vulnerability assessment**



### 5.5.7. Community people’s participation in risk analysis

Risk analysis process involves the community people who cannot address the core causes of their susceptibility to disasters due to the absence of socioeconomic, environmental and physical capacity. However, past decades paid attention to address the core causes of susceptibility of community people to disaster risk instead of paying attention to analyse the disasters (Wisner et al., 1994), because most of the susceptible groups such as, women, people with disability and elderly people (United Nations, 2009) and elements such as, population of the affected area, structures, public service facilities, economic and livelihood activities, livestock, agriculture, fisheries, water and sanitation facilities are susceptible to disasters. So, community people participation is important for analysing the risk for assessment of risk. In this study, the community people participated in the process of risk analysis for assessing risk which was reported by 99.49 percent of the respondents. Table 5.5.11.

**Table 5.5.11: Frequency and percentage distribution of respondents whether they participated in the process of risk analysis for assessing risk**

<b>Did you participate in the process of risk analysis for assessing risk?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

As a participatory process risk analysis involves various activities such as, assessing hazards, vulnerabilities, risk and ability to cope (Iqbal & Mahmud, 2012) the community people in the study area participated in the risk assessment process of risk analysis by identifying local hazard, sharing information on local environmental set up, identifying natural and man-made elements at risk, identifying the risks for crops and livestock, identifying risk for health, sanitation, water supply and hygiene and identifying risk for most vulnerable groups. However, the majority of the respondents reported that they

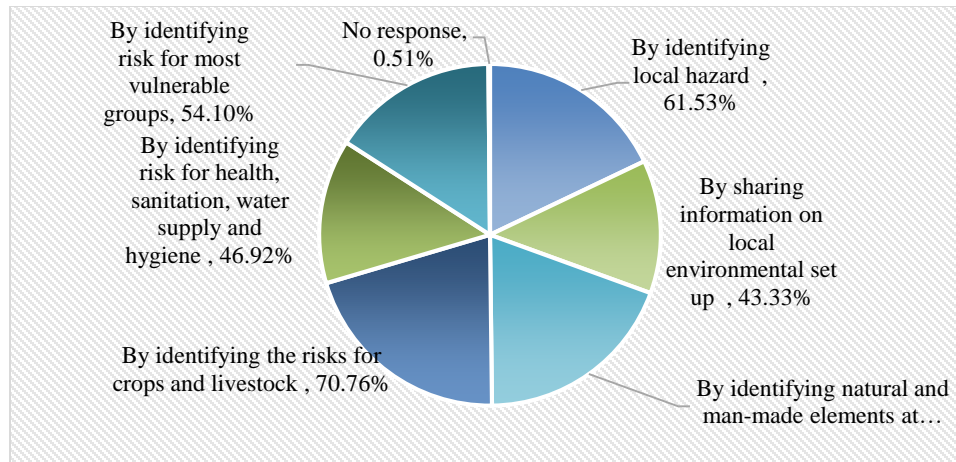
participate in identifying the risks for crops and livestock (70.76%), natural and man-made elements at risk (66.15%), local hazard (61.53%), risks for most vulnerable groups (54.10%), risk for health, sanitation, water supply and hygiene (46.92%) and sharing information on local environmental set up (43.3%). Table 5.5.12.

The qualitative data shows the participants actively participated in the process of risk analysis; however, they identified flood, tornado, drought, water logging, cyclone, cold wave, etc. as the local hazard in their area. They also identified the low land area, jungles, river estuaries, erosion prone area etc., the dwelling places, mosques, schools and college buildings, shops, bazaars etc. as the elements at risk in their area. The paddy field, vegetables field and other crops were vulnerable to disaster and the livestock suffered from lack of fodder and water related diseases. On the other hand, the girls, women, aged people and differently abled people were the most vulnerable group.

**Table 5.5.12: Frequency and percentage distribution of respondents by their participation in the process of risk analysis for assessing risk**

<b>Participation in the process of risk analysis for assessing risk*</b>	<b>Frequency</b>	<b>Percent</b>
By identifying local hazard	240	61.53
By sharing information on local environmental set up	169	43.33
By identifying natural and man-made elements at risk	258	66.15
By identifying the risks for crops and livestock	276	70.76
By identifying risk for health, sanitation, water supply and hygiene	183	46.92
By identifying risk for most vulnerable groups	211	54.10
No response	02	0.51

\*Multiple responses n=390



**Figure 5.5.5: Participation in the process of risk analysis for assessing risk**

### 5.5.8. Community people's participation in awareness raising campaigns

Although awareness raising campaign is related to marketing (Anderson, 2004; Kotler et al., 2002 and Kotler & Zaltman, 1971) but it leads to change in thinking and attitude towards social problems (Spolecznej, 2010 cited in Borawska, 2017). As the crises produced by disastrous situation has social implications, therefore the awareness raising campaigns regarding disaster risk management is an essential element (UNISDR, 2002) and thus, the community people participate in the process of raising awareness. The community people of the study area participated in awareness raising campaigns which was reported by 97.17 percent of the respondents. Table 5.5.13.

**Table 5.5.13: Frequency and percentage distribution of respondents whether they participated in awareness raising campaigns**

Did you participate in awareness raising campaigns?	Frequency	Percent
Yes	379	97.17
No	05	1.29
Not sure	06	1.54
<b>Total</b>	<b>390</b>	<b>100</b>

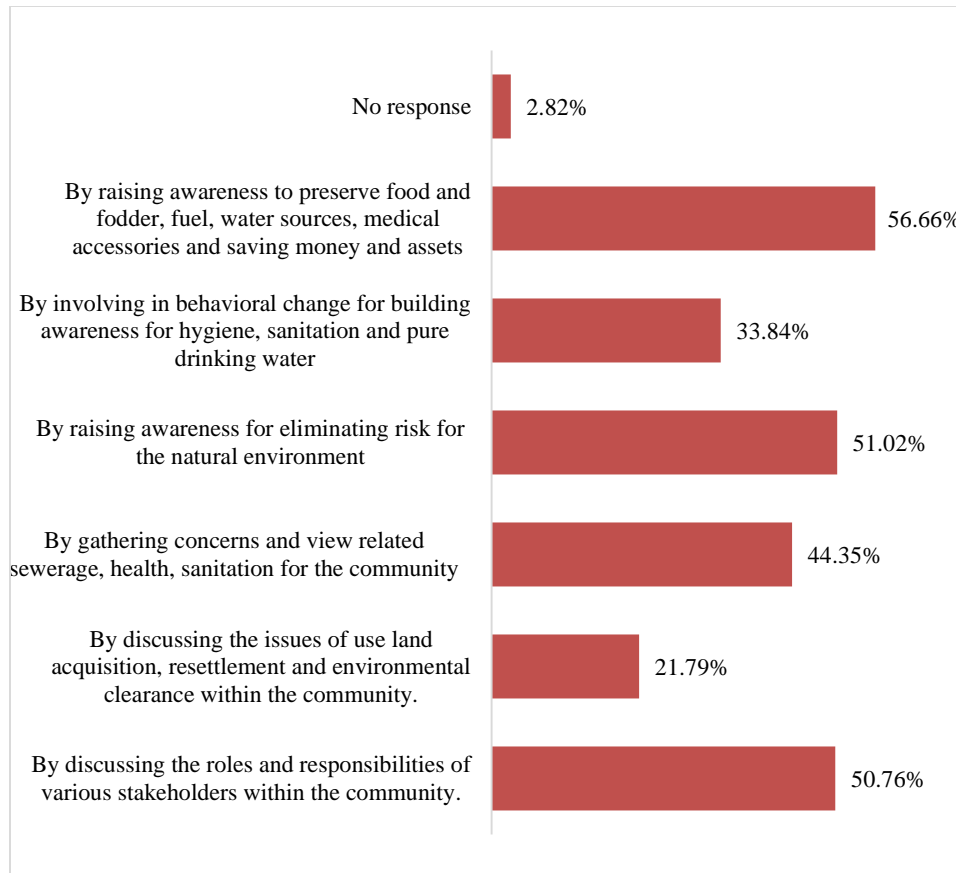
Participatory disaster management approach is forwarded through awareness campaign and community people participation in campaign adds worth to be successful. Community people participate in awareness campaigns through several ways such as, raising awareness to preserve food and fodder, fuel, water sources, medical accessories and saving money and assets (56.66%) and for eliminating risk for the natural environment (51.02%). They participated by discussing the roles and responsibilities of various stakeholders within the community (50.76%) and the issues of use land acquisition, resettlement and environmental clearance within the community (21.79%). On the other hand, they participated in gatherings with concerns and views related to sewerage, health and sanitation for the community (44.35%) and involving themselves in behavioural change for building awareness for hygiene, sanitation and pure drinking water (33.84%) and preserve food and fodder, fuel, water sources, medical accessories and saving money and assets (56.66%). Table 5.5.14.

The qualitative data shows that the community people discussed the hazard specific risk, land use planning, preparedness issues, climate change risk, probable disaster damages and losses, shelter house locations, aid and assistance and cropping pattern within the community during awareness raising campaigns. Regarding the issues of hazard specific risks, the community people identified the risks of several disasters in their area and discussed with other community members as the initiatives for awareness raising campaign. They raised awareness among the people about making of their houses in a hazard free area; the roles and responsibilities of various stakeholders within the community; environmental degradation, losing of forest, water, and air and soil pollution. Moreover, they participated in the issues of raising awareness on safe drinking water, sanitation and hygiene, getting health care services from union sub-health care centre, union health care centre and community clinic. In addition, they discussed with other members of the community about the crisis of savings in disastrous situation, however they could save money for emergency, preserve *Chira* (Flattened rice) *Muri* (Puffed rice) and other dry food items in case of shortage of food, preserved fodder for cattle and preserved saline, paracetamol tablet etc. for managing the crisis in emergency.

**Table 5.5.14: Frequency and percentage distribution of respondents by their participation in awareness raising campaigns**

<b>Participation in awareness raising campaigns*</b>	<b>Frequency</b>	<b>Percent</b>
By discussing the roles and responsibilities of various stakeholders within the community.	198	50.76
By discussing the issues of use land acquisition, resettlement and environmental clearance within the community.	85	21.79
By gathering concerns and view related sewerage, health, sanitation for the community	173	44.35
By raising awareness for eliminating risk for the natural environment	199	51.02
By involving in behavioral change for building awareness for hygiene, sanitation and pure drinking water	132	33.84
By raising awareness to preserve food and fodder, fuel, water sources, medical accessories and saving money and assets	221	56.66
No response	11	2.82

*\*Multiple responses* n=390



**Figure 5.5.6: Participation in awareness raising campaigns**

### **5.5.9. Community people's participation in early warning system**

The early warning system indicates to generate and disseminate timely and meaningful information on disaster occurrence which enables community people and organizations to prepare and act appropriately to reduce damages and losses of an event (UNISDR, 2004). Whatever IFRC (2012) indicated the warning signals as set of components which connects the people who need to response these signals. However, this complex activity is not easy to implement without the help of all the people in the community. Therefore, about all of the respondents (98.98%) mentioned that they participate in community early warning signals. Table 5.5.15.

**Table 5.5.15: Frequency and percentage distribution of respondents whether they participated in community early warning system to help to reduce damages and losses**

<b>Did you participate in community early warning system?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	386	98.98
No	02	0.51
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The majority respondents (84.61%) mentioned that they participate by disseminating translated warning signals through word of mouth, gossiping in public places, loud speaker, showing flag and using mobile technology. About 61.41 percent of the respondents participated by receiving the warning signals of the government through radio, television, newspaper, and social media and translate it into their local signals. Moreover, 39.48 percent of the respondents participated in this process by taking special responsibility to disseminate the warning signal to most vulnerable people and remote area whereas 16.41 percent by selecting the media for disseminating the warning signals. Table 5.5.16.

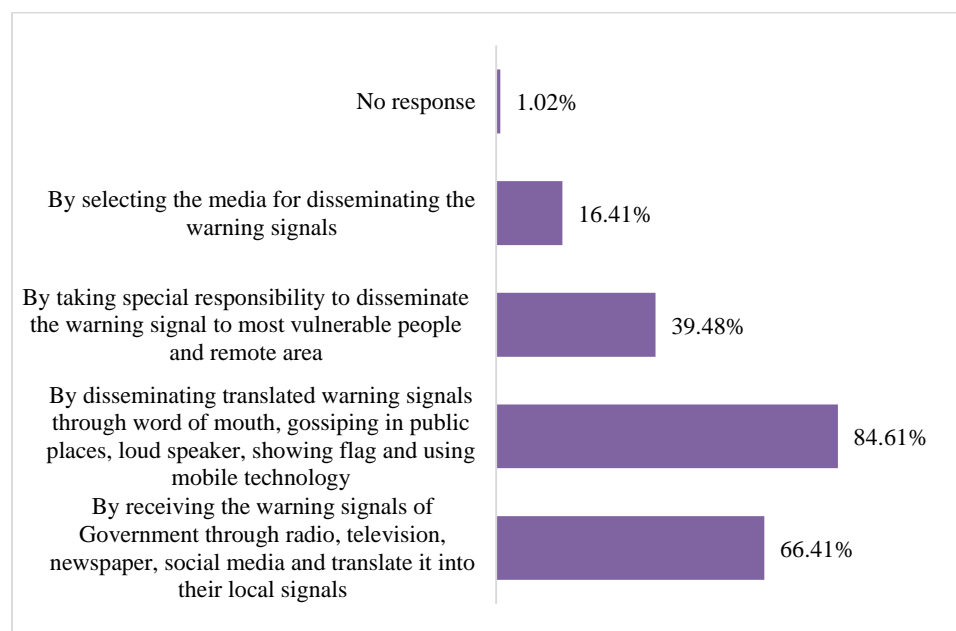
The qualitative data shows that the community people formed volunteer groups to disseminate the information of the government authorities on disaster occurring lead time, water level, embankment condition etc. to the community people by door to door and announcing in the public places such as, local market, mosque, schools and colleges, government offices, non-governmental organization offices etc.

**Table 5.5.16: Frequency and percentage distribution of respondents by their participation in early warning system to reduce damages and losses**

<b>Participation in early warning system*</b>	<b>Frequency</b>	<b>Percent</b>
By receiving the warning signals of Government	259	66.41

through radio, television, newspaper, social media and translate it into their local signals		
By disseminating translated warning signals through word of mouth, gossiping in public places, loud speaker, showing flag and using mobile technology	230	84.61
By taking special responsibility to disseminate the warning signal to most vulnerable people and remote area	154	39.48
By selecting the media for disseminating the warning signals	64	16.41
No response	04	1.02

\*Multiple responses n=390



**Figure 5.5.7: Participation in early warning system**

#### **5.5.10. Community people's participation in search and rescue operation**

The victims of disaster are the first responders to rescue from a dangerous situation. The activities related to search and rescue operation may be easier since the community



people are well aware of the vulnerable sector and population in their area and they share related information to rescue team. Although Coppola (2011) identified the task such as, searching collapsed buildings for victims and rescuing them, locating and rescuing victims buried under the earth, rescuing victims from swiftly moving or high water, locating and rescuing victims from damaged and/or collapsed mines, locating and rescuing victims lost in wildness areas, providing emergency medical care to trapped victims, providing dogs trained to locate victims by sound or smell, assessing and controlling gas, electric services and hazardous materials and evaluating and stabilizing damaged structures. Table 5.5.17 shows that 82.05 percent of the respondents reported that they participate in search and rescue operation.

**Table 5.5.17: Frequency and percentage distribution of respondents whether they participated in search and rescue operation**

<b>Did you participate in search and rescue operation?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	320	82.05
No	27	6.92
Not sure	43	11.03
<b>Total</b>	<b>390</b>	<b>100</b>

According to Aghamohammadi et al. (2013) the rescue operation is needed to successfully response to emergency in order to save lives. If the rescue operation is delayed by 72 hours, there is a chance of the injured people dying In this case, the respondents mentioned that they participate in search and rescue operation by identifying the area of more vulnerable people (62.30%), vulnerable infrastructure (48.46%) and vulnerable assets (40.76%). They also participated in this process by sharing the location of hazards prone area (57.94%) and risk area (47.94%). On the other hand, they provided help to rescue operation team (58.97%) as the option for risk reduction. Table 5.5.18.

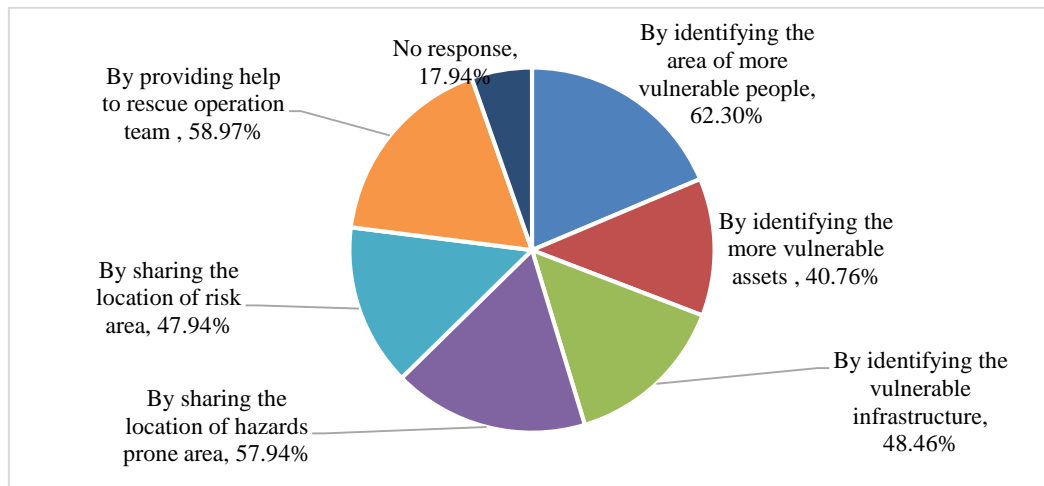
The qualitative data shows that the community people helped the search and rescue team by identifying the most vulnerable places such as, river side house, house adjacent to

jungle, separated house from the crowded area, etc. and most susceptible group such as, pregnant and lactating women, children, aged people and differently able people. They also helped the rescue team who were well equipped with medical services and rescue item (such as saws, ropes, hammers, lumber and drills), communication equipment (such as walkie-talkies, radios, mobile phones), technical supports (such as camera, flash light), and detector and logistics support (such as special clothing, water and food).

**Table 5.5.18: Frequency and percentage distribution of respondents by their participation in search and rescue operation**

<b>Participation in search and rescue operation*</b>	<b>Frequency</b>	<b>Percent</b>
By identifying the area of more vulnerable people	243	62.30
By identifying the more vulnerable assets	159	40.76
By identifying the vulnerable infrastructure	189	48.46
By sharing the location of hazards prone area	226	57.94
By sharing the location of risk area	187	47.94
By providing help to rescue operation team	230	58.97
No response	70	17.94

\*Multiple responses n=390



**Figure 5.5.8: Participation in search and rescue operation**

### 5.5.11. Community people’s participation in providing medical first aid

During any disaster, the number of injuries increase unlike the non-disaster period, this in turn puts more pressure on the healthcare service providers who fail to provide proper medical services. As a result, first aid services as an immediate solution to normalize the adverse effects. In that situation the search and rescue operation team locate the injured and wounded victims by the help of local people and provide first aid. The injuries vary by disasters, for example, hypothermia is produced by extended period of flooding time (Brenner & Noji, 1995; Brown et al., 2002 and Paul, 2010). Two type of triage such as, less injured and worst injured victims is operated (Coppola, 2011) for providing first aid services for community people. Table 5.5.19 shows that the majority (96.66%) respondents reported that they participated in providing medical first aid during emergency.

**Table 5.5.19: Frequency and percentage distribution of respondents whether they participated in providing medical first aid**

<b>Did you participate in providing medical first aid?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	377	96.66
No	03	0.77
Not sure	10	2.57
Total	390	100

The community people participate in providing medical first aid for the victims or the first aid providers through many ways, such as, mostly they participated by sharing the knowledge of making saline and purifying water (58.20%) and herbal medicine (54.61%) and then by sharing the emergency medical first aid equipment with other members of the community (44.61%). Table 5.5.20.

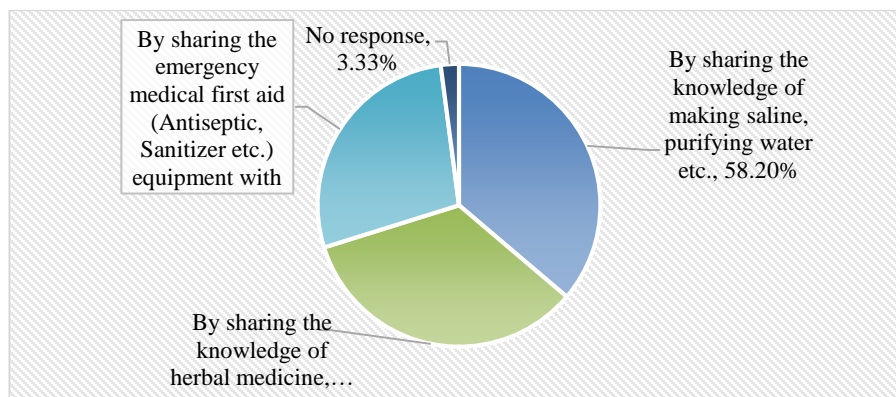
The qualitative data shows that the community people shared knowledge on how to make oral saline with sugar, salt and water, how to purify water to drink and make the familiar

the herb around the nature. Sometimes they shared their medical first aid kits such as, bandage, tablet, oral saline etc. to the incapacitated individual.

**Table 5.5.20: Frequency and percentage distribution of respondents by their participation in providing medical first aid**

Participation in providing medical first aid*	Frequency	Percent
By sharing the knowledge of making saline, purifying water etc.	227	58.20
By sharing the knowledge of herbal medicine	213	54.61
By sharing the emergency medical first aid (Antiseptic, Sanitizer etc.) equipment with other members of the community	174	44.61
No response	13	3.33

\*Multiple responses n=390



**Figure 5.5.9: Participation in providing medical first aid**

### 5.5.12. Community people’s participation in providing psychological support

Any disastrous events or emergency, not only affects physically or socially but also mentally or psychologically. It is important to develop and evaluate community-based settings to understand susceptibilities, capabilities/capacities and psychological risks wide range of individual level interventions (Genereux et al., 2019) such as, support from humanitarian perspective, self-help programs, medications, and psychological first aid

(Usami et al., 2018 and Kim, 2011) to reduce the risk of trauma and stress (Suzuki et al., 2014). These interventions at an individual level is needed to develop and evaluate community level interventions through enhancing knowledge (Genereux et al., 2019). Therefore, the community people participate in providing psychological support for traumatized individual. Table 5.5.21 shows that 97.43 percent of the respondents reported that they provide psychological support for traumatized individual.

**Table 5.5.21: Frequency and percentage distribution of respondents whether they participated in providing psychological support for traumatized individual**

Did you participate in providing psychological support for traumatized individual?	Frequency	Percent
Yes	380	97.43
No	03	0.77
Not sure	07	1.80
<b>Total</b>	<b>390</b>	<b>100</b>

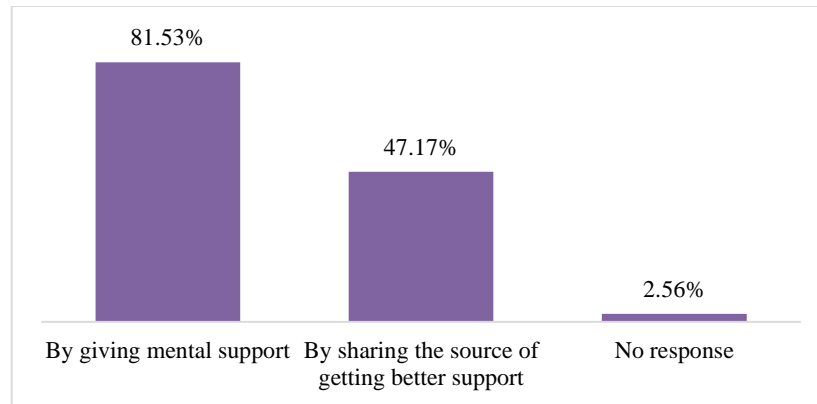
The community people participated in providing various psychological support to the traumatized people in the study area by giving mental support (81.53%) and sharing the source of getting better support (47.17%). Table 5.5.22.

The qualitative data shows that the participants mentioned that the community people discuss with the traumatized people and provide time to them. They also shared the name of consultant for the better treatment centre for the traumatized individual.

**Table 5.5.22: Frequency and percentage distribution of respondents by their participation in providing psychological support for traumatized individual**

Participation in providing psychological support for traumatized individual*	Frequency	Percent
By giving mental support	318	81.53
By sharing the source of getting better support	184	47.17
No response	10	2.56

\*Multiple responses n=390



**Figure 5.5.10: Participation in providing psychological support**

### **5.5.13. Community people’s participation in restoring activities for agricultural rehabilitation**

Bangladesh’s national economy is mainly dependent on agriculture (Talukder et al., 2018) which is the single largest sector and it has included 30 percent of the country’s GDP and employs about 60 percent of the total labour force (Bishwajit et al., 2014 and BBS, 2010). This sector has an enormous impact on the food security of the population, alleviating poverty, developing human resources and generating employment as major microeconomic objectives (Bishwajit et al., 2014) although the impacts of climate change adversely affects the agricultural food production in Bangladesh (Davis et al., 2018; Basak et al., 2010; Dasgupta et al., 2010; Faisal & Parveen, 2004 and Mahmuduzzaman et al., 2014) by heavy rainfall, salinity in water and soil, temperature up and down, seasonal changes (Faisal & Parveen, 2004 and Gain et al., 2012), floods, cyclones, droughts, storms, tornadoes. However, as an important sector agricultural rehabilitation is essential for food security, employability, poverty reduction, etc. This rehabilitation depends on the involvement of the community people through sharing materials and knowledge. Table 5.5.23 highlights that 99.23 percent of the respondents reported that they participate in restoring activities for agricultural rehabilitation.

**Table 5.5.23: Frequency and percentage distribution of respondents whether they participated in restoring activities for agricultural rehabilitation**

<b>Did you participate in restoring activity for agricultural rehabilitation?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	387	99.23
No	00	0.00
Not sure	03	0.77
<b>Total</b>	<b>390</b>	<b>100</b>

The community people participate in restoring activities for agricultural rehabilitation in many ways. In this study, the respondent said that they participate in restoring activities for agricultural rehabilitation by sharing knowledge on best practices of cropping, harvesting (61.63%) and providing information on market accessibility (59.74%), giving preserved seed as loan (31.79%), sharing information on getting support for better services (29.74%) and providing money as loan (22.82%). Table 5.5.24.

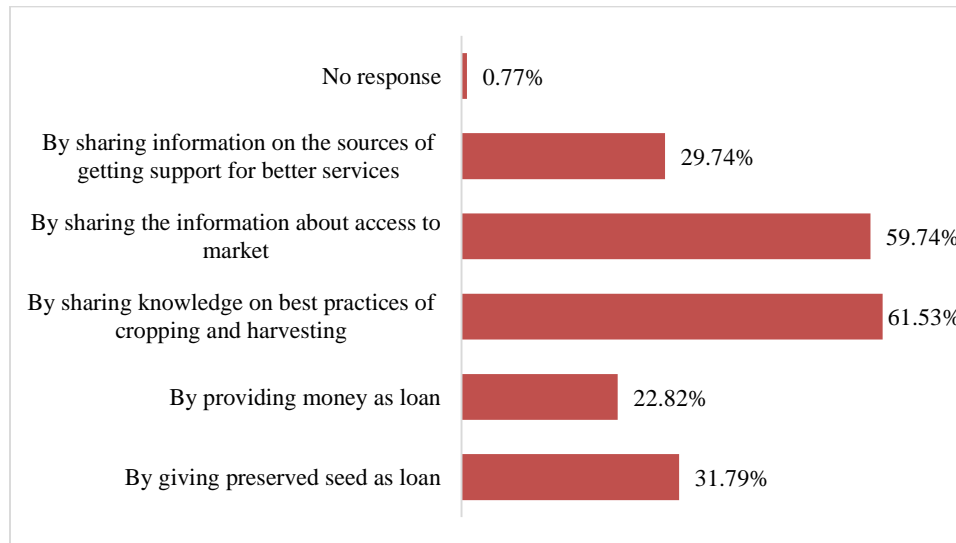
The qualitative data shows that the community people who stored rice, wheat, mustard, jute, vegetables etc. seeds gave to the farmers who lost their agricultural products due to disaster. The shared the information on the best time to cultivate and harvest the crops and process of marketing the products.

**Table 5.5.24: Frequency and percentage distribution of respondents by their participation in restoring activities for agricultural rehabilitation**

<b>Participation in restoring activities for agricultural rehabilitation*</b>	<b>Frequency</b>	<b>Percent</b>
By giving preserved seed as loan	124	31.79
By providing money as loan	89	22.82
By sharing knowledge on best practices of cropping and harvesting	240	61.53
By sharing the information about access to market	233	59.74
By sharing information on the sources of getting	116	29.74

support for better services		
No response	3	0.77

\*Multiple responses n=390



**Figure 5.5.11: Participation in restoring activities for agricultural rehabilitation**

#### **5.5.14. Community people's participation in distribution of relief**

Disaster management at community level often derives within a social network (Bourdieu, 1985) which consists of people of different socioeconomic background. Both national and international organizations (International Federation of Red Cross, World Vision, World Food Programme, UNDP, UNICEF, SCF Alliance, OXFAM, Care Bangladesh, Islamic Relief, Caritas, Christian Aid, Concern Worldwide, BRAC etc.) distribute relief in Bangladesh for disaster recovery (GoB, 2008; MoFDM, 2008; DMB, 2007 and IFRC, 2010). The distribution of relief is tough at local level without the help of local People's social network. In this network the wealthy members often provide the aid to the poorer/vulnerable member. For instance, Paul (2011) argued that in this social network a vulnerable member may receive their proper share or sometimes they may receive larger amount of relief, therefore, the majority (96.42 percent) of the respondents reported that they participate in the process of relief distribution. Table 5.5.25.



**Table 5.5.25: Frequency and percentage distribution of respondents whether they participated in distribution of relief**

<b>Did you participate in distribution of relief?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	376	96.42
No	04	1.02
Not sure	10	2.56
<b>Total</b>	<b>390</b>	<b>100</b>

The elderly people, pregnant women and other people with disability are unable to collect their relief items (food, water, cloth and medical assistance) when competing against younger and stronger people. So, the younger and stronger people collect relief more easily than the elderly, pregnant and people with disability. As a result, this situation creates further vulnerability for vulnerable segment of the population. For this reason, the community people participate in distribution of relief in several ways. However, Table 5.5.26 shows that the majority (74.35 percent) of the respondents declared that they participate in distribution of relief by sharing the information among the community people, followed by 58.71 percent help to avoid unexpected situation and 43.33 percent provide help to elderly people, pregnant women and disables in getting the relief.

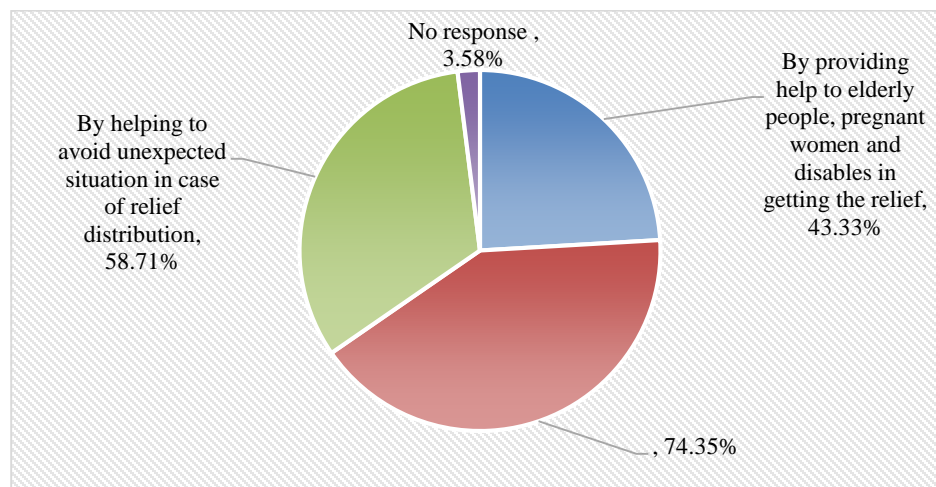
The qualitative data shows that the participants mentioned that the community people help the elderly people, differently able people and pregnant women to get relief in the crowded situation. They also participate as unpaid helper to distribute the relief without hassle.

**Table 5.5.26: Frequency and percentage distribution of respondents by their participation in distribution of relief**

<b>Participation in distribution of relief*</b>	<b>Frequency</b>	<b>Percent</b>
By providing help to elderly people,	169	43.33

pregnant women and disables in getting the relief		
By sharing the information of distribution of relief among the community people	290	74.35
By helping to avoid unexpected situation in case of relief distribution	229	58.71
No response	14	3.58

\*No response



**Figure 5.5.12: Participation in distribution of relief**

### **5.5.15. Community people’s participation in integrating the local disaster reduction options with national development**

Disaster and development are two interrelated words. However, disasters affect development activities and on the other hand, development in proper way may reduce the risk of disaster. So, interlink between disaster and development with help of local communities might be effective in managing disasters. In that case, Kelman & Gaillard (2008) stated that to tackle the impacts of climate change and disasters it is necessary to develop strategies by integrating wider development contexts. The integrating efforts to mitigate disaster risk may focus on infrastructural development such as, building

embankment, dam, road, multi-purpose shelter house, etc. Therefore, the local and indigenous knowledge on DRR can play an essential role in integrating the development activities for managing disaster by transferring and adapting to the knowledge of other communities and incorporating such knowledge for encouraging the participation of community people and empowering them to reduce risk (Shaw et al., 2008). Hence, community People’s participation is important in integrating local disaster reduction options with national development activities. Table 5.5.27 shows that the majority (97.70%) of the respondents mentioned that they participate in integrating local disaster reduction options with national development activities as the measure.

**Table 5.5.27: Frequency and percentage distribution of respondents whether they participated in integrating local disaster reduction options with national development**

<b>Did you participate in integrating the local disaster reduction option with national development activities?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	381	97.70
No	04	1.02
Not sure	05	1.28
<b>Total</b>	<b>390</b>	<b>100</b>

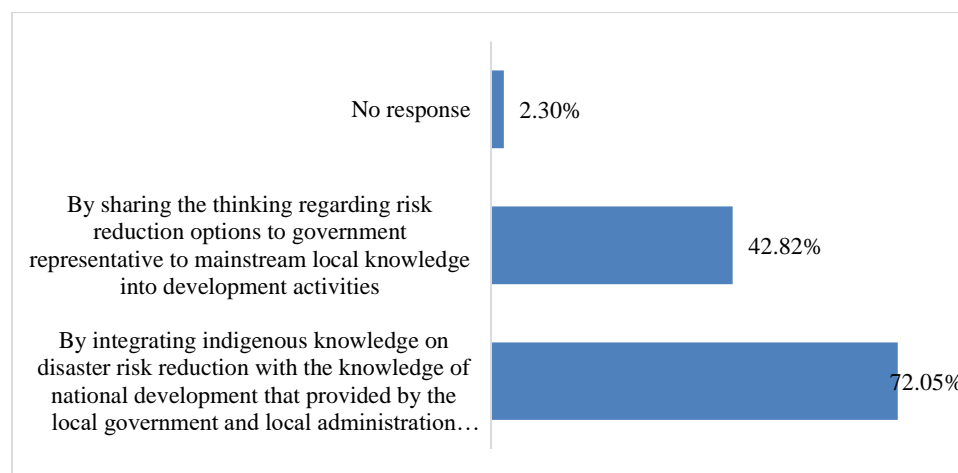
Hiwasak et al. (2014) mentioned that in integration of local disaster reduction option with development activities all parties such as, local governments, communities, national government agencies working for gender, education and climate change and disasters play significant role in DRR. However, Table 5.5.28 shows that the majority (72.05 percent) of the respondents reported that they participate in integrating indigenous knowledge on DRR options with the knowledge of national development that is provided by the local government and representative from local administration followed by 42.82 percent participate by sharing the thinking of risk reduction to government representative for mainstreaming the local/indigenous knowledge into national development activities.

The qualitative data shows that the community people planned their disaster preparedness integration with national development. For example, they raised their homestead ground to avoid flood water, cultivated homestead gardening and cropped disaster resilient variants. They also incorporated the indigenous knowledge such as, knowledge on preserving seeds, food and fodder, tree plantation, cropping and harvesting schedule etc. to national planning.

**Table 5.5.28: Frequency and percentage distribution of respondents by their participation in integrating the local disaster reduction option with national development activities**

Participation in integrating the local disaster reduction options*	Frequency	Percent
By integrating indigenous knowledge on disaster risk reduction with the knowledge of national development that provided by the local government and local administration representative	281	72.05
By sharing the thinking regarding risk reduction options to government representative to mainstream local knowledge into development activities	167	42.82
No response	09	2.30

\*Multiple responses n=390



**Figure 5.5.13: Participation in integrating the local disaster reduction options with national development**

### 5.5.16. Community people’s engagement in maintaining physical connectivity

Maintaining physical connectivity is one of the key components of strengthening community risk reduction options. The respondents reported that they (99.23%) engage in physical connectivity to strengthen community risk reduction options. Table 5.5.29.

**Table 5.5.29: Frequency and percentage distribution of respondents whether they engaged in maintaining physical connectivity**

<b>Did you engage in physical connectivity?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	387	99.23
No	00	0.00
Not sure	03	0.77
<b>Total</b>	<b>390</b>	<b>100</b>

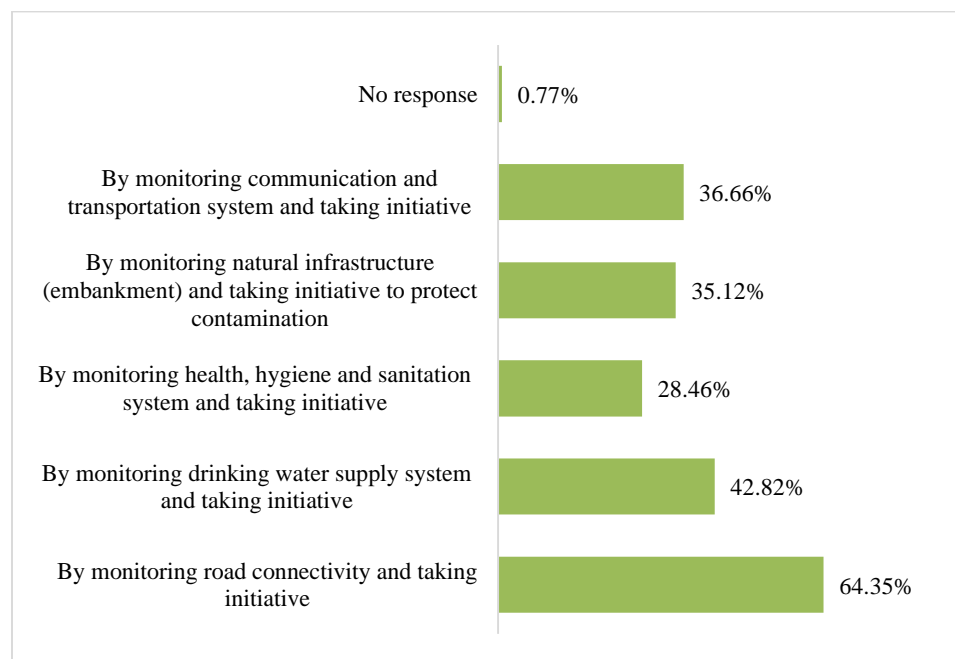
The engagement of community people in maintaining physical connectivity is executed through several ways in the study area. In this case, Table 5.5.30 shows that the majority (64.35 percent) of the respondents reported that they engage in maintaining physical connectivity by monitoring road connectivity and taking initiative. Moreover, 42.82 percent engaged in maintaining drinking water supply system and taking initiative and 36.66 percent engaged in maintaining communication and transportation system and taking initiative. In addition, 35.12 percent engaged in maintaining natural infrastructure and taking initiative to protect contamination and 28.46 percent engaged in maintaining health, hygiene and sanitation system and taking initiative.

The qualitative data shows that the community people monitored the fault of road, embankment and informed the local government authority and other responsible personalities. They also shared the condition of drinking water supply and sanitation and the health condition of the community people to the responsible personalities.

**Table 5.5.30: Frequency and percentage distribution of respondents by their engagement in maintaining physical connectivity**

<b>Engagement in physical connectivity *</b>	<b>Frequency</b>	<b>Percent</b>
By monitoring road connectivity and taking initiative	251	64.35
By monitoring drinking water supply system and taking initiative	167	42.82
By monitoring health, hygiene and sanitation system and taking initiative	111	28.46
By monitoring natural infrastructure (embankment) and taking initiative to protect contamination	137	35.12
By monitoring communication and transportation system and taking initiative	143	36.66
No response	03	0.77

\*Multiple responses n=390



**Figure 5.5.14: Engagement in physical connectivity**

### 5.5.17. Community people’s engagement in maintaining relational connectivity

Maintaining relational connectivity is also important in disaster management like physical connectivity. Therefore, the community people engage in maintaining relational connectivity to strengthen community risk reduction options. The data shows that 99.49 percent of the respondents reported that they engage in maintaining relational connectivity to strengthen community risk reduction options. Table 5.5.31.

**Table 5.5.31: Frequency and percentage distribution of respondents whether they engaged in maintaining relational connectivity**

<b>Did you maintain relational connectivity to strengthen?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	388	99.49
No	00	0.00
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

The community people maintain relational connectivity to strengthen community risk reduction options through several ways. For example, the majority (82.05 percent) of the respondents reported that they maintain relational connectivity with members of the Union *Parishad* to strengthen community risk reduction options followed by 47.17 percent members of Union Disaster Management Committee (UDMC), 34.61 percent representatives of NGOs, 27.17 percent representatives of BADC and 14.61 percent micro-finance and financial organizations. Table 5.5.32.

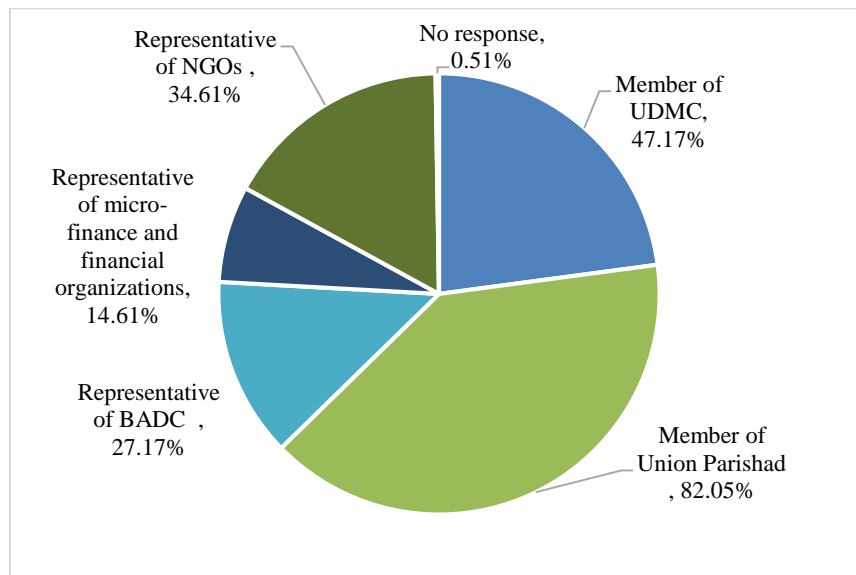
The qualitative data shows that the community people maintained relational connectivity with the members of union disaster management committee, members of Union *Parishad* to share the knowledge of vulnerability and risk of the community people. They also maintained relational connectivity with the local representatives (Block supervisor) of Bangladesh Agricultural Development Corporation (BADC) to get various supports (such

as, seeds, fertilizer, pesticide, herbicide and insecticide selection, scheduling crop production etc.).

**Table 5.5.32: Frequency and percentage distribution of respondents by their engagement in maintaining relational connectivity**

Maintenance of relational connectivity *	Frequency	Percent
Member of UDMC	184	47.17
Member of Union Parishad	320	82.05
Representative of BADC	106	27.17
Representative of micro-finance and financial organizations	57	14.61
Representative of NGOs	135	34.61
No response	02	0.51

\*Multiple responses n=390



**Figure 5.5.15: Maintaining relational connectivity**



## 5.6. Community based organizations (CBOs)

### 5.6.1. Existing community-based organizations in disaster management process

As disaster management is a combined work for different stakeholders such as, government authorizes, local government representative, non-governmental, international non-governmental, private initiatives, local leaders and volunteers so, every stakeholders' performance in risk reduction will make the whole system effective. Governmental risk reduction options push volunteerism and social coherence during disaster in Bangladesh. Although, sometimes it is absent in incorporating volunteer and its related organizations through government policy and framework in many countries (UNDP, 2005 cited in Zubir & Amirrol, 2011). Decentralization of disaster risk reduction authorities and leadership through existing community-based organizations at local level encourage the local people in volunteering for their community wellbeing and their own interest. This decentralization process helps to create greater participation of the community people (Zubir & Amirrol, 2011). They also added that the involvement of communities in building capacity for managing risk through local coping mechanisms, raising awareness about risk encourages other people to get involved in disaster management process. The community-based organizations try to address the local People's needs to disaster management to the government authorities and it makes the community-based disaster management effort through direct participation of local community people. Therefore, some community organizations exists in the study area such as, local government team, government authorities, NGOs, INGOs, and donors, community-based volunteer committee and social-cultural groups. Table 5.6.1.

**Table 5.6.1: Existing community-based organizations in disaster management process**

SL#	Existing community-based organization
01.	Local government team
02.	Government representatives

03.	NGOs, INGOs actors and donors
04.	Community based volunteer committee
05.	Social and cultural groups

The effectiveness of community-based organization in managing disaster depends on the formation of such types of organizations. So, the representation from most vulnerable group of people who are most likely to be at risk, leaders from social and cultural group such as, school or college teachers, religious leaders, women entrepreneurs, unelected local influential, young leaders, elected member of local government authority, members from government authorities such as, BADC, representative from social welfare authority and representative from NGOs and other stakeholders' involvement will make the initiative successful regarding to managing disaster. However, the community-based organizations (CBOs) included representatives from the most vulnerable group by community leaders with concern of other members of community and local government authorities, NGOs representatives and other stakes which was reported by 98.98 percent of the respondents. Table 5.6.2.

**Table 5.6.2: Frequency and percentage distribution of respondents whether CBOs did include the representative from different stakes**

<b>Did the existing CBOs include the representative from different stakes?</b>	<b>Frequency</b>	<b>Percent</b>
Yes	386	98.98
No	02	0.51
Not sure	02	0.51
<b>Total</b>	<b>390</b>	<b>100</b>

### 5.6.2. CBOs' activities in pre-disaster phase

The CBOs participate in pre-disaster phase through various ways to manage disaster while this phase indicates the mitigation and preparedness. The mitigation is important in disaster management process because of its need in sustainable development (Twigg et al., 2000) and it has been seen as the fresh start of disaster management just after a devastating disaster in the community (Coppola, 2007) and in other words, actions are in place before disaster (Maskery, 1989 and NCDEM, 1998) which create opportunity for local government to sensitize public opinion and facilitate political agreement (Alexander, 2000). There are two types of preparedness; physical and social (Tierney et al., 2001) but the community people participate in few. Therefore, the community-based organizations in the study area participated in non-structural mitigation measures in pre-disaster phase. For, example, the majority (68.97%) respondents reported that the CBOs participate in pre-disaster phase through analysing vulnerability and risk. About 43.07 percent of the respondents reported that the CBOs participate in this stage through understanding the nature of disasters and their effects, followed by 42.82 percent assessing and mobilizing resources, 35.12 percent preparing disaster preparedness plan and 32.30 percent promoting measures for mitigating disasters. Table 5.6.3.

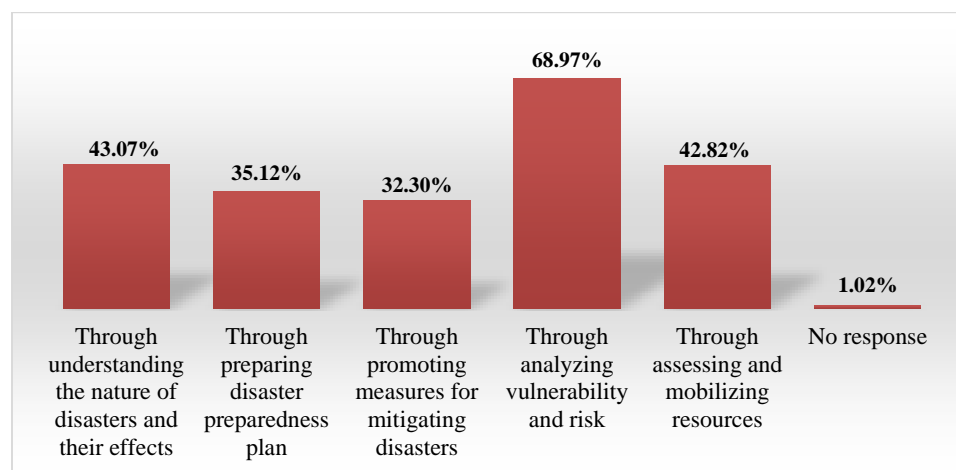
The qualitative data shows that the community-based organization helped the community people in the pre-disaster phase by understanding the nature of various disasters and its related effects, preparing the community disaster preparedness plan, identifying risk mitigating measures, analysing community's vulnerability and risks, and mobilizing the resources within the community.

**Table 5.6.3: Frequency and percentage distribution of respondents by the participation of CBOs in pre-disaster phase**

<b>Participation in pre-disaster phase*</b>	<b>Frequency</b>	<b>Percent</b>
Through understanding the nature of disasters and their effects	168	43.07

Through preparing disaster preparedness plan	137	35.12
Through promoting measures for mitigating disasters	126	32.30
Through analyzing vulnerability and risk	269	68.97
Through assessing and mobilizing resources	167	42.82
No response	04	1.02

\*Multiple responses n=390



**Figure 5.6.1: Participation in pre-disaster phase**

### 5.6.3. CBOs' activities during disaster phase

Community Based Organizations (CBOs) participate during disaster phase, Paul (2011) stated that after identifying a hazard the responsible authority have to accumulate further information on hazard, open operation centre for emergency management, disseminate warning signals, and initiate response activities. Therefore, the respondents reported that the CBOs participate in during disaster phase activities in the study area through providing first aid (48.71%), disseminating information on hazards and preventing the spread of rumours (44.35%) and distributing food, water, medicine and fodder (43.58%). Furthermore, CBOs participated through assisting the rescue team (38.46%), assessing the immediate damages and losses (25.12%) and providing shelter for victims (19.23%). Besides, CBOs participated through filing claims (13.33%), disposal of dead humans,

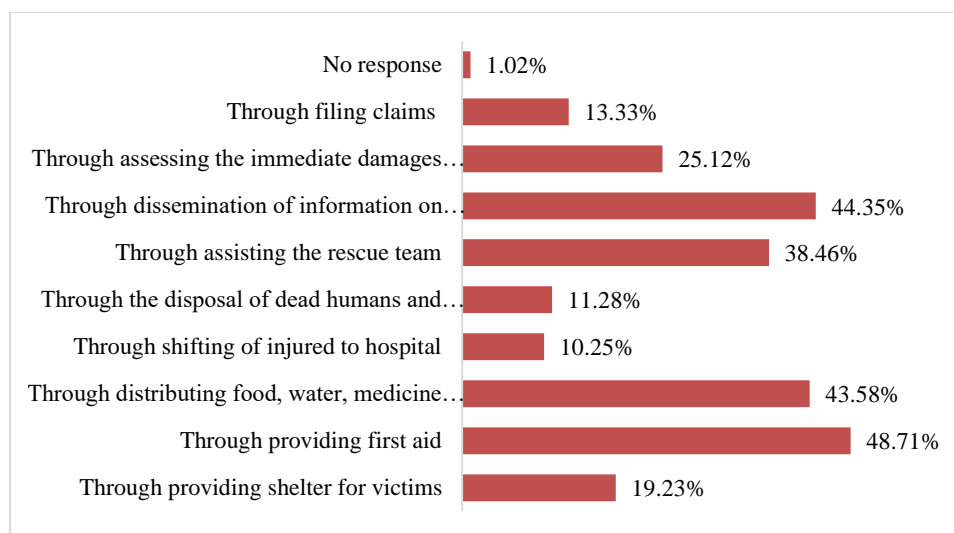
animals and clearance of debris (11.28%) and shifting of injured to hospital (10.25%).  
Table 5.6.4.

The qualitative data shows that the community-based organizations (CBOs) help the community people during disaster phase by search, rescue and evacuation operation, providing shelter for the disaster victims, providing first aid equipment (such as, bandage, oral saline, paracetamol etc.), disposal of dead bodies and disseminating warning signals and information to the community.

**Table 5.6.4: Frequency and percentage distribution of respondents by the participation of CBOs during disaster phase**

<b>Participation during disaster phase*</b>	<b>Frequency</b>	<b>Percent</b>
Through providing shelter for victims	75	19.23
Through providing first aid	190	48.71
Through distributing food, water, medicine and fodder	170	43.58
Through shifting of injured to hospital	40	10.25
Through the disposal of dead humans and animals and clearance of debris	44	11.28
Through assisting the rescue team	150	38.46
Through dissemination of information on hazards and preventing the spread of rumors	173	44.35
Through assessing the immediate damages and losses	98	25.12
Through filing claims	52	13.33
No response	04	1.02

\*Multiple responses n=390



**Figure 5.6.2: Participation during disaster phase**

#### 5.6.4. CBOs' activities in post-disaster phase

The respondents said that the CBOs participate in post disaster phase for reducing risk in the study area through protecting women, children, elderly people, poor, destitute, infirm and minority (58.71%), social rehabilitation (39.74%), assessing the damages (36.15%), and economic rehabilitation (13.58%). Table 5.6.5.

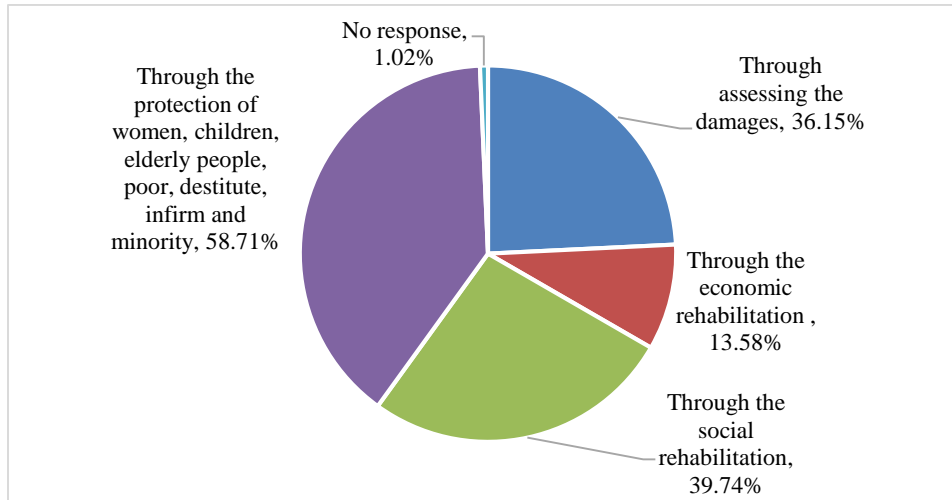
The qualitative data shows that the community-based organizations (CBOs) help the community people by assessing the damages due to disaster and make flash appeal to get relief, aid and assistance.

**Table 5.6.5: Frequency and percentage distribution of respondents by the participation of CBOs in post-disaster phase**

Participation in post disaster phase*	Frequency	Percent
	F	%
Through assessing the damages	141	36.15
Through the economic rehabilitation	53	13.58
Through the social rehabilitation	155	39.74
Through the protection of women, children,	229	58.71

elderly people, poor, destitute, infirm and minority		
No response	04	1.02

\*Multiple responses n=390



**Figure 5.6.3: Participation in post disaster phase**

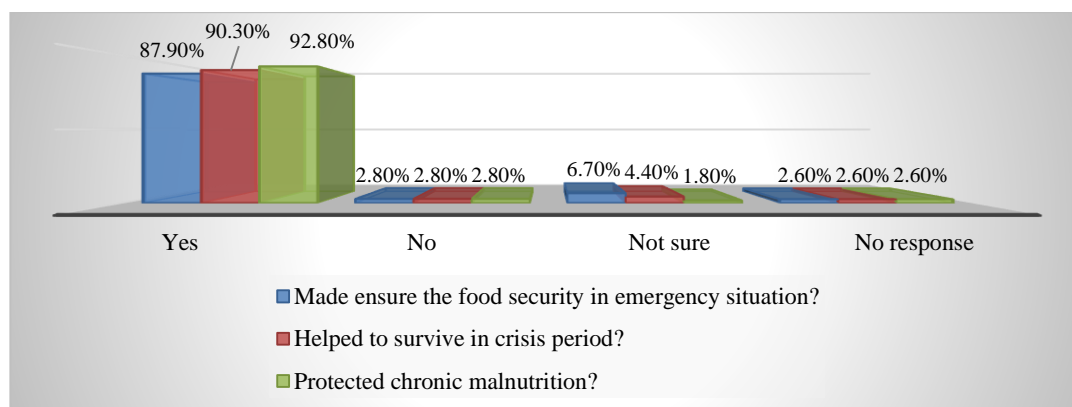
## 5.7. Application of Community Based-Disaster Management

### 5.7.1. Application of coping mechanisms regarding food crisis

The coping mechanisms that the community people applied regarding food crisis ensured food security during emergency (87.9%), helped to survive in the crisis (90.3%) and protected chronic malnutrition (92.8%). The data observes that the coping mechanisms (such as, using preserved food, buy and borrow food from market and others, selling ornaments and other valuables, taking loan and credits etc.) regarding food crisis which were applied by the community people assisted to reduce the risks and played effective role in managing disaster. Table 5.7.1.

**Table 5.7.1: Application of coping mechanisms regarding food crisis**

Did the coping mechanisms regarding food crisis -	Responses				
	Yes	No	Not sure	No response	Total
Ensure the food security in emergency situation?	87.9% (343)	2.8% (11)	6.7% (26)	2.6% (10)	100% (390)
Help to survive in crisis period?	90.3% (352)	2.8% (11)	4.4% (17)	2.6% (10)	100% (390)
Protect chronic malnutrition?	92.8% (362)	2.8% (11)	1.8% (7)	2.6% (10)	100% (390)



**Figure 5.7.1: Application of coping mechanisms regarding food crisis**

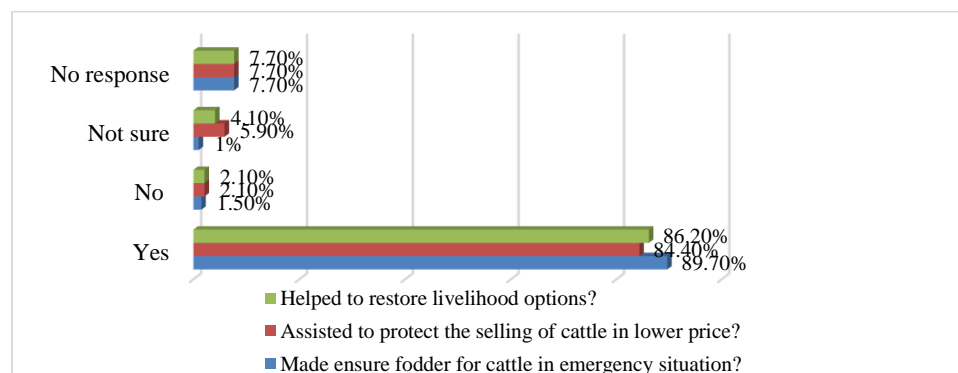


### 5.7.2. Application of coping mechanisms regarding fodder crisis

Same situation was found in the coping mechanisms (such as, using preserved fodder, buy and borrow fodder from market and others, selling, animals, ornaments and other valuables, using savings, etc.) regarding fodder crisis. The data shows that the coping mechanisms regarding fodder crisis ensured fodder during crisis (89.7%), assisted the disaster affected people to protect the selling of cattle in lower price (84.4%) and helped the community people to restore their livelihood options after disaster (86.2%). The data indicates that the coping mechanisms regarding fodder crisis which were applied by community people effectively managed disaster. Table 5.7.2.

**Table 5.7.2: Application of coping mechanisms regarding fodder crisis**

Did the coping mechanisms regarding fodder crisis-	Responses				
	Yes	No	Not sure	No response	Total
Ensure fodder for cattle in emergency situation?	89.7% (350)	1.5% (6)	1% (4)	7.7% (30)	100% (390)
Assist to protect the selling of cattle in lower price?	84.4% (329)	2.1% (8)	5.9% (23)	7.7% (30)	100% (390)
Help to restore livelihood options?	86.2% (336)	2.1% (8)	4.1% (16)	7.7% (30)	100% (390)



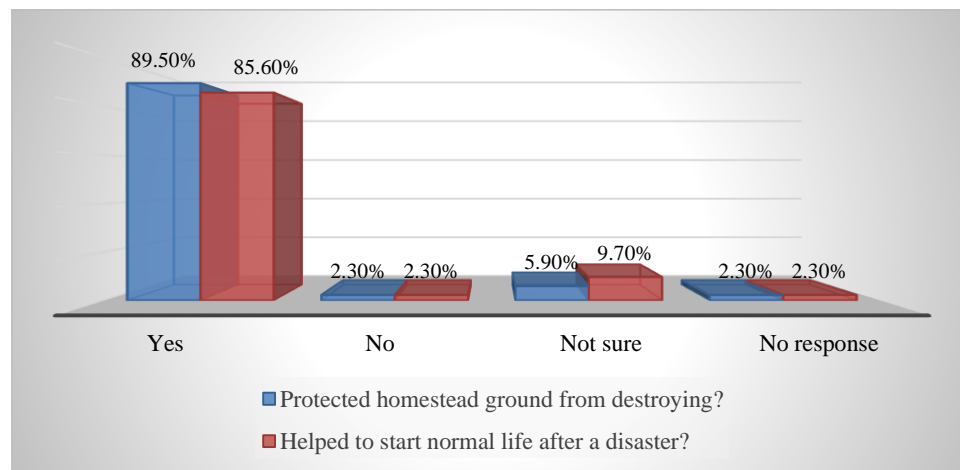
**Figure 5.7.2: Application of coping mechanisms regarding fodder crisis**

### 5.7.3. Application of coping mechanisms regarding dwelling places

The homestead ground was protected from destroying (89.5%) by the coping mechanisms (put mud and polythene or dry leaves around the homestead) of community people regarding dwelling places. The coping mechanisms helped the community people to start a normal life after a disaster (85.6%) while they took loan from an informal source (*Mohajon*), microcredit organization, received grants from different sources and used their savings and renovated on their own. The data is evident that the coping mechanisms regarding dwelling places protected the house from disaster and assisted them to start their normal life after a disaster. Table 5.7.3.

**Table 5.7.3: Application of coping mechanisms regarding dwelling places**

Did the coping mechanisms regarding dwelling places-	Responses				Total
	Yes	No	Not sure	No response	
Protect homestead ground from destroying?	89.5% (349)	2.3% (9)	5.9% (23)	2.3% (9)	100% (390)
Help to start normal life after a disaster?	85.6% (334)	2.3% (9)	9.7% (38)	2.3% (9)	100% (390)



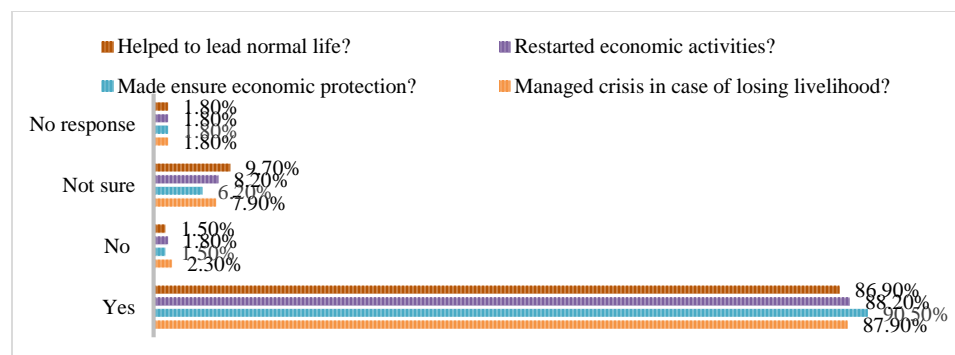
**Figure 5.7.3: Application of coping mechanisms regarding dwelling places**

#### 5.7.4. Application of coping mechanisms regarding losing livelihood

The community people managed their livelihood options by coping mechanisms in crisis situation when they became jobless due to disaster. The community people managed crisis (87.9%) through coping mechanisms such as, alternative occupation, migrating to cities, selling ornaments and other household valuables, collecting aid and assistance, borrowing money and taking credits. These mechanisms made ensure economic protection of the affected people (90.5%), helped to start normal life (86.9%) and restarted economic activities (88.2%). The data shows that coping mechanisms regarding losing livelihood helped the community people to manage crisis period and later on helped them to restart normal life by restoring economic activities. Table 5.7.4.

**Table 5.7.4: Application of coping mechanisms regarding losing livelihood**

Did the coping mechanisms regarding losing livelihoods-	Responses				Total
	Yes	No	Not sure	No response	
Manage crisis in case of losing livelihood?	87.9% (343)	2.3% (9)	7.9% (31)	1.8% (7)	100% (390)
Ensure economic protection?	90.5% (353)	1.5% (6)	6.2% (24)	1.8% (7)	100% (390)
Restart economic activities?	88.2% (344)	1.8% (7)	8.2% (32)	1.8% (7)	100% (390)
Help to lead normal life?	86.9% (339)	1.5% (6)	9.7% (38)	1.8% (7)	100% (390)



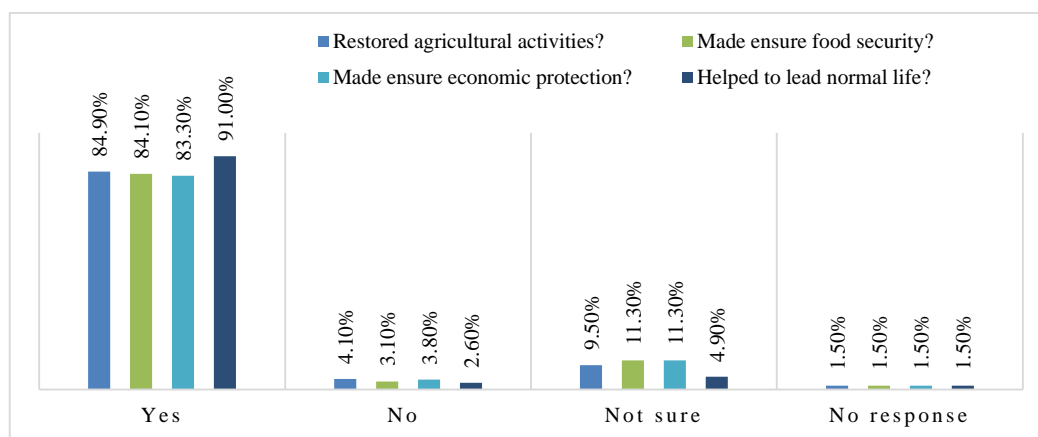
**Figure 5.7.4: Application of coping mechanisms regarding losing livelihood**

### 5.7.5. Application of coping mechanisms regarding agricultural damages

The coping mechanisms regarding agricultural damages restored agricultural activities (84.9%), ensured food security (84.1%), economic protection (83.3%) and helped community people to start normal life after a disaster (91%). The data reports that the coping mechanisms such as, changing cropping schedule, preserving seeds, regarding agricultural damages, planting new crops, crop diversification, using stress resistant variety, water and soil conservation, animals rearing, buying and borrowing of seed, seedlings etc. effectively managed the risk in agricultural sector. Table 5.7.5.

**Table 5.7.5: Application of coping mechanisms regarding agricultural damages**

Did the coping mechanisms regarding agricultural damages-	Responses				
	Yes	No	Not sure	No response	Total
Restore agricultural activities?	84.9% (331)	4.1% (16)	9.5% (37)	1.5% (6)	100% (390)
Ensure food security?	84.1% (328)	3.1% (12)	11.3% (44)	1.5% (6)	100% (390)
Ensure economic protection?	83.3% (325)	3.8% (15)	11.3% (44)	1.5% (6)	100% (390)
Help to lead normal life?	91.0% (355)	2.6% (10)	4.9% (19)	1.5% (6)	100% (390)



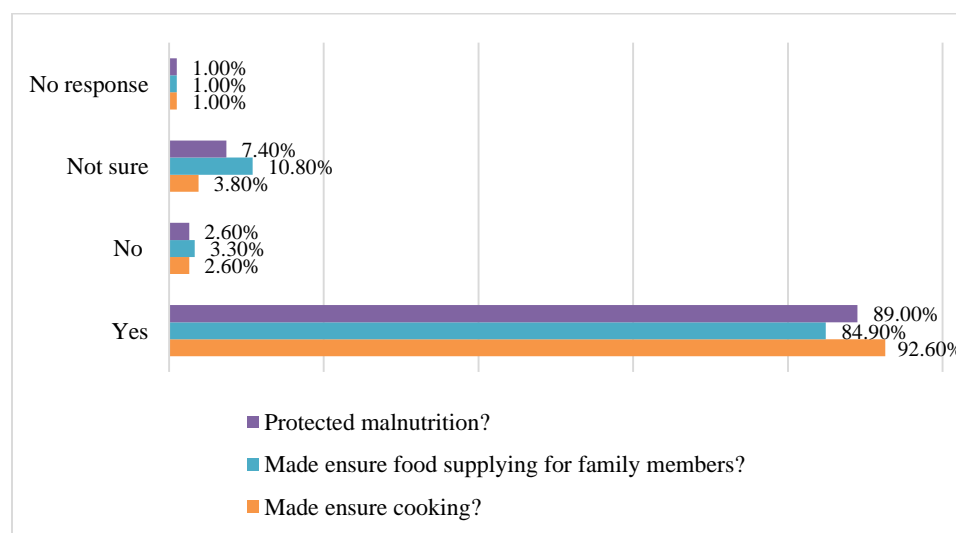
**Figure 5.7.5: Application of coping mechanisms regarding agricultural damages**

### 5.7.6. Application of coping mechanisms regarding fuel crisis

Storing dry wood, dry straw, husk and making cow dung and using *Bondhu* and *Unnoto Chula*, buying gas stove and collecting dry wood from far as coping mechanisms of community people ensured cooking in emergency (92.6%), ensured the supplying of food for family members (84.9%) and protected malnutrition (89%). Therefore, the data notes that the coping mechanisms regarding fuel crisis ensured the food supply system of the affected people and protected them from various health complexity. Table 5.7.6.

**Table 5.7.6: Application of coping mechanisms regarding fuel crisis**

Did the coping mechanisms regarding fuel crisis-	Responses				
	Yes	No	Not sure	No response	Total
Ensure cooking?	92.6% (361)	2.6% (10)	3.8% (15)	1.0% (4)	100% (390)
Ensure food supplying for family members?	84.9% (331)	3.3% (13)	10.8% (42)	1.0% (4)	100% (390)
Protect malnutrition?	89.0% (347)	2.6% (10)	7.4% (29)	1.0% (4)	100% (390)



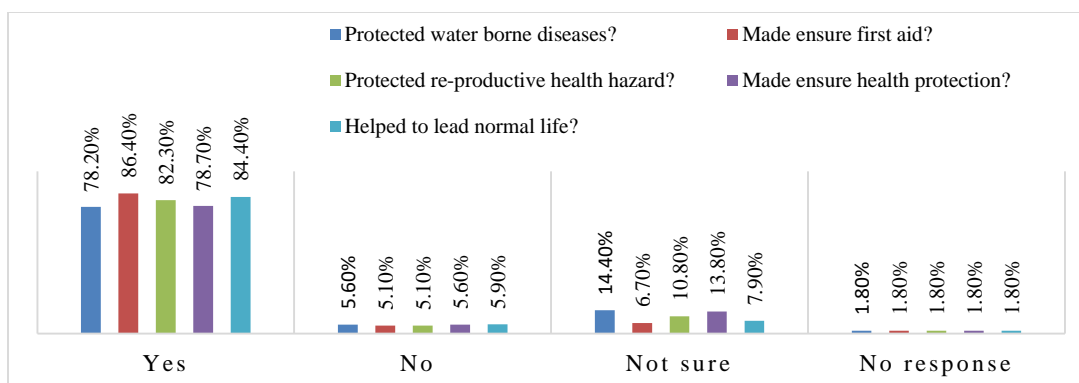
**Figure 5.7.6: Application of coping mechanisms regarding fuel crisis**

### 5.7.7. Application of coping mechanisms regarding water, health and sanitation issues

People were protected from the water borne diseases (78.2%) by the coping mechanisms (such as, purifying of water and using purified rain water, raising ground of tube well to protect from contamination and collecting drinking water from far). The coping mechanisms (such as, using herbal medicine, consulting with doctor, making oral saline and collecting sanitary napkin) regarding health and sanitation issues ensured first aid in the emergency (86.4%), protected re-productive health hazard (82.3%), ensured health protection (78.7%) and finally helped the community people to lead a normal life (84.4%). The data says that the coping mechanisms regarding water, health and sanitation issues managed emergency and assisted the community people to protect diseases after a disaster. Table 5.7.7.

**Table 5.7.7: Application of coping mechanisms regarding water, health and sanitation issues**

Did the coping mechanisms regarding water, health and sanitation issues-	Responses				
	Yes	No	Not sure	No response	Total
Protect from water borne diseases?	78.2% (305)	5.6% (22)	14.4% (56)	1.8% (7)	100% (390)
Ensure first aid?	86.4% (337)	5.1% (20)	6.7% (26)	1.8% (7)	100% (390)
Protect reproductive health hazard?	82.3% (321)	5.1% (20)	10.8% (42)	1.8% (7)	100% (390)
Ensure health protection?	78.7% (307)	5.6% (22)	13.8% (54)	1.8% (7)	100% (390)
Help to lead normal life?	84.4% (329)	5.9% (23)	7.9% (31)	1.8% (7)	100% (390)



**Figure 5.7.7: Application of coping mechanisms regarding water, health and sanitation issues**

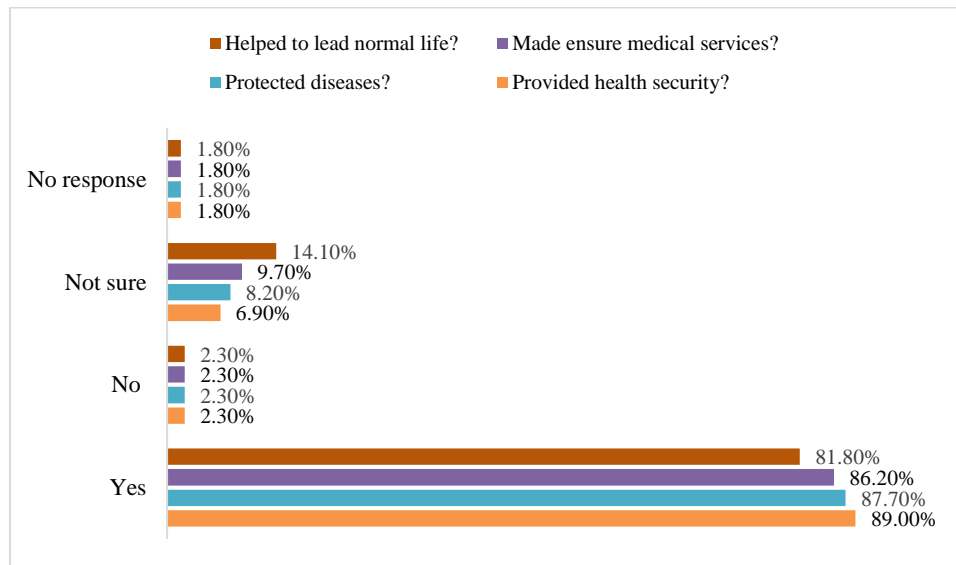
### 5.7.8. Application of initiatives to manage coping mechanisms regarding water, health and sanitation issues

The community people took some initiatives to manage the coping mechanisms regarding water, health and sanitation issues that provided health security (89%), protected diseases (87.7%), ensured medical services (86.2%) and helped the community people to lead a normal life after a disaster (81.8%). The data shows that the initiatives (using own savings, selling livestock, ornaments, food grains and household valuables, borrowing money from others etc.) ensured effectively the coping mechanisms regarding water, health and sanitation issues. Table 5.7.8.

**Table 5.7.8: Application of initiatives to manage coping mechanisms regarding water, health and sanitation issues**

Did the initiatives to coping mechanisms regarding water, health and sanitation issues-	Responses				
	Yes	No	Not sure	No response	Total
Provide health security?	89.0% (347)	2.3% (9)	6.9% (27)	1.8% (7)	100% (390)
Protect diseases?	87.7%	2.3%	8.2%	1.8%	100%

	(342)	(9)	(32)	(7)	(390)
Ensure medical services?	86.2%	2.3%	9.7%	1.8%	100%
	(336)	(9)	(38)	(7)	(390)
Help to lead normal life?	81.8%	2.3%	14.1%	1.8%	100%
	(319)	(9)	(55)	(7)	(390)



**Figure 5.7.8: Application of initiatives to manage coping mechanisms regarding water, health and sanitation issues**

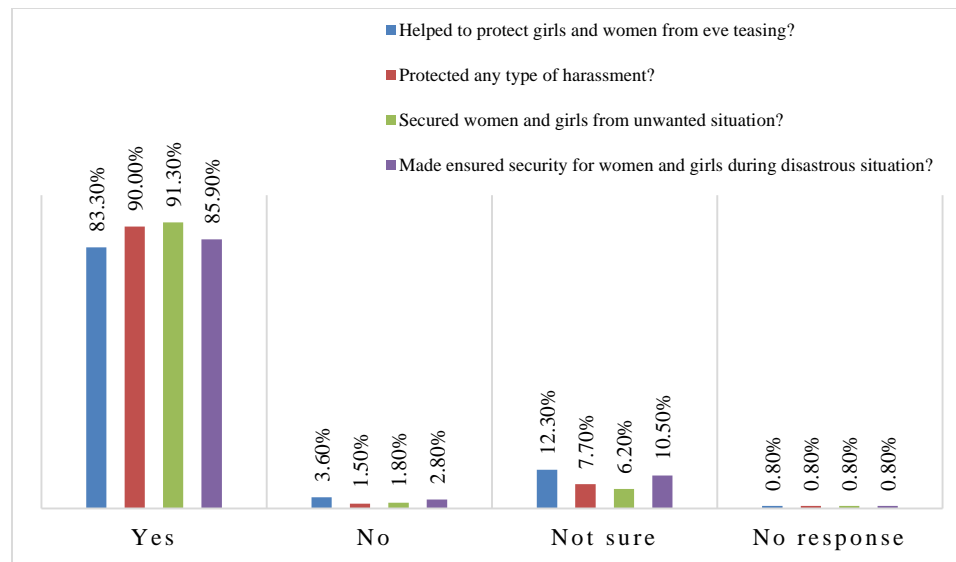
### 5.7.9. Application of coping mechanisms regarding violence against women and girls

The women and girls were protected from eve teasing (83.3%) during the disastrous situation through the mechanisms of community people while they were living in shelter house or gathering in public places. Moreover, the coping mechanisms (such as, staying together, keeping torch or hurricane lamp and stick with girls and women etc.) regarding violence against women and girls- protected them from sexual and psychological harassment (90%), secured from unwanted situation (91.3%) and ensured security of women and girls (85.9%). The data observes that the coping mechanisms regarding violence against women and girls protected them and ensured their normal living. Table 5.7.9.



**Table 5.7.9: Application of coping mechanisms regarding protecting violence against women and girls**

Did the coping mechanisms regarding protecting violence against women and girls-	Responses				
	Yes	No	Not sure	No response	Total
Help to protect girls and women from eve teasing?	83.3% (325)	3.6% (14)	12.3% (48)	0.8% (3)	100% (390)
Protect any type of harassment?	90.0% (351)	1.5% (6)	7.7% (30)	0.8% (3)	100% (390)
Secure women and girls from unwanted situation?	91.3% (356)	1.8% (7)	6.2% (24)	0.8% (3)	100% (390)
Ensure security for women and girls during disastrous situation?	85.9% (335)	2.8% (11)	10.5% (41)	0.8% (3)	100% (390)



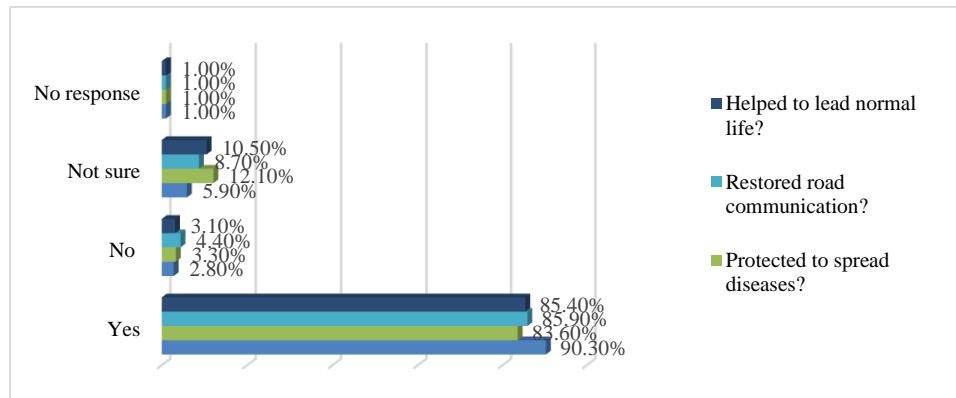
**Figure 5.7.9: Application of coping mechanisms regarding protecting violence against women and girls**

### 5.7.10. Application of initiatives for making the community neat and clean

The initiatives (such as, removing debris, dirt and garbage, putting line for draining water, taking away broken trees, mud and silt, etc.) of community people protected the surrounding environment from air, water and soil pollution (90.3%), protected from spreading of diseases (83.6%), restored road communication (85.9%) and helped the community people to lead a normal life (85.4%) after a disaster. The data is evident that the initiatives for making the community neat and clean managed the disaster effectively. Table 5.7.10.

**Table 5.7.10: Application of initiatives for making the community neat and clean**

Did the initiatives for making the community neat and clean-	Responses				
	Yes	No	Not sure	No response	Total
Protect the surrounded environment from air, water and soil pollution?	90.3% (352)	2.8% (11)	5.9% (23)	1.0% (4)	100% (390)
Protect to spread diseases?	83.6% (326)	3.3% (13)	12.1% (47)	1.0% (4)	100% (390)
Restore road communication?	85.9% (335)	4.4% (17)	8.7% (34)	1.0% (4)	100% (390)
Help to lead normal life?	85.4% (333)	3.1% (12)	10.5% (41)	1.0% (4)	100% (390)



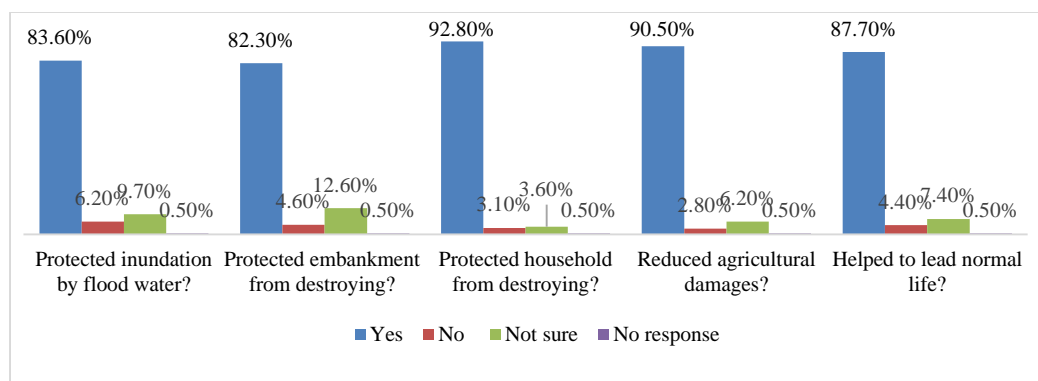
**Figure 5.7.10: Application of initiatives for making the community neat and clean**

### 5.7.11. Application of measures to mitigate disaster risks

Measures (such as, monitoring and repairing embankment, re-excavating canals, planting trees and grass, making bamboo fence, relocating and modifying structures etc.) of community people for mitigating disaster risks protected inundation by flood water (83.6%), and embankment from destroying (82.3%). Moreover, these measures protected household from destroying (92.8%) and reduced agricultural damages (90.5%). Finally, helped to lead a normal life after a disaster (87.7%). The data shows that the measures by community people for mitigating disaster risks managed disaster effectively. Table 5.7.11.

**Table 5.7.11: Application of measures taken by community people to mitigate disaster risks**

Did the measures taken by community people to mitigate disaster risks-	Responses				
	Yes	No	Not sure	No response	Total
Protect inundation by flood water?	83.6% (326)	6.2% (24)	9.7% (38)	0.5% (2)	100% (390)
Protect embankment from destroying?	82.3% (321)	4.6% (18)	12.6% (49)	0.5% (2)	100% (390)
Protect household from destroying?	92.8% (362)	3.1% (12)	3.6% (14)	0.5% (2)	100% (390)
Reduce agricultural damages?	90.5% (353)	2.8% (11)	6.2% (24)	0.5% (2)	100% (390)
Help to lead normal life?	87.7% (352)	4.4% (17)	7.4% (29)	0.5% (2)	100% (390)



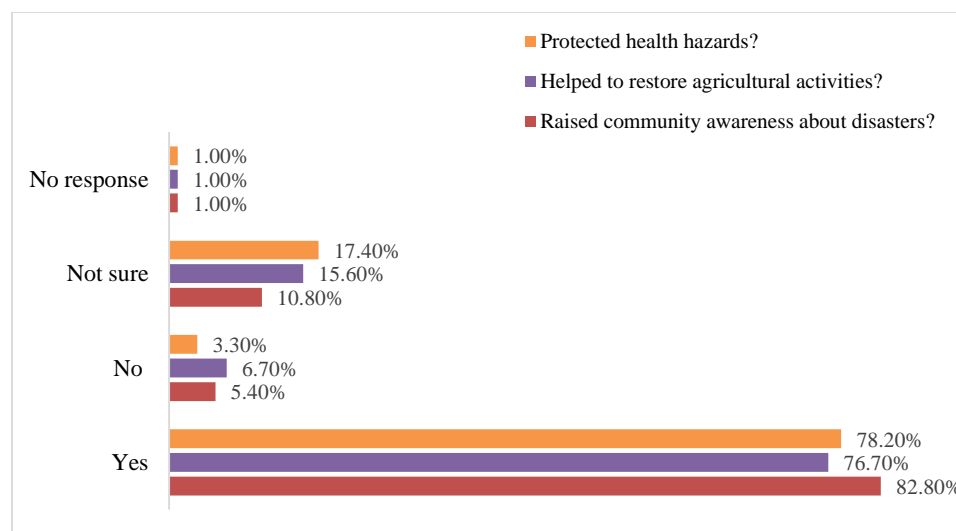
**Figure 5.7.11: Application of measures to mitigate disaster risks**

### 5.7.12. Application of NGOs' initiatives

The NGOs' initiatives (such as, forming volunteer group, providing relief, credit, aid and assistance, shelter etc.) raised awareness about disaster among community people (82.8%), helped to restore agricultural activities (76.7%) and protected health hazards (78.2%). The data perceives that NGOs' initiatives strengthened community coping mechanisms. Table 5.7.12.

**Table 5.7.12: Application of NGOs' initiatives**

Did NGOs' initiatives for strengthening community coping mechanisms-	Responses				Total
	Yes	No	Not sure	No response	
Raise community awareness about disasters?	82.8% (323)	5.4% (21)	10.8% (42)	1.0% (4)	100% (390)
Help to restore agricultural activities?	76.7% (299)	6.7% (26)	15.6% (61)	1.0% (4)	100% (390)
Protect health hazards?	78.2% (305)	3.3% (13)	17.4% (68)	1.0% (4)	100% (390)



**Figure 5.7.12: Application of NGOs' initiatives**

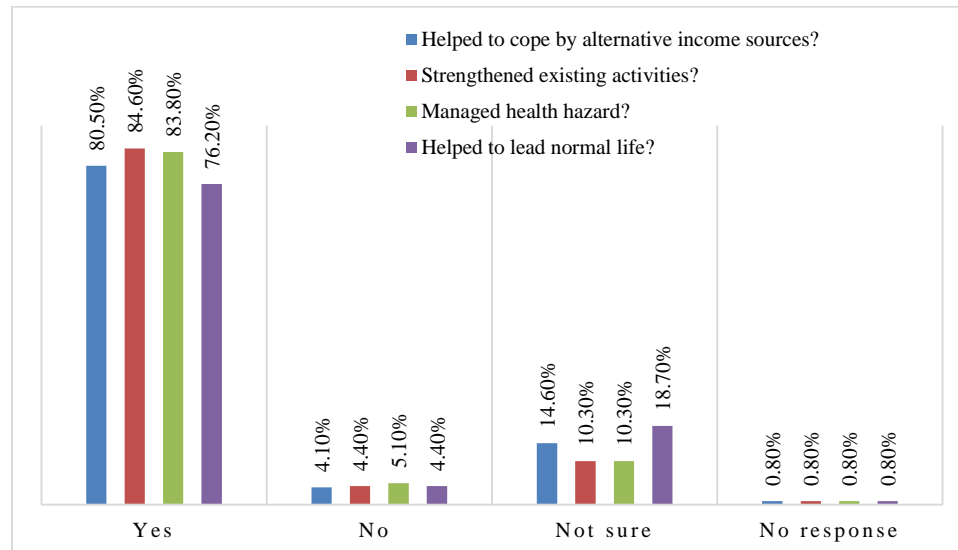
### 5.7.13. Application of NGOs provided training programs

The training programs (such as, training on cropping new variant, tree plantation, water, health and sanitation issues, poultry, livestock and fisheries, making oral saline, etc.) of NGOs for strengthening the community coping mechanisms helped the community people to cope with changing situation by alternative income sources (80.5%). Furthermore, it strengthened existing activities (84.6%), managed health hazard (83.8) and helped to lead normal life (76.2%). The data evident that training programs of NGOs strengthened community coping mechanisms. Table 5.7.13.

**Table 5.7.13: Application of training programs provided by NGOs**

Did the training programs provided by NGOs for strengthening community coping mechanisms-	Responses				Total
	Yes	No	Not sure	No response	
Help to cope by alternative income sources?	80.5% (314)	4.1% (16)	14.6% (57)	0.8% (3)	100% (390)
Strengthen existing activities?	84.6% (330)	4.4% (17)	10.3% (40)	0.8% (3)	100% (390)

Manage health hazard?	83.8% (327)	5.1% (20)	10.3% (40)	0.8% (3)	100% (390)
Help to lead normal life?	76.2% (297)	4.4% (17)	18.7% (73)	0.8% (3)	100% (390)



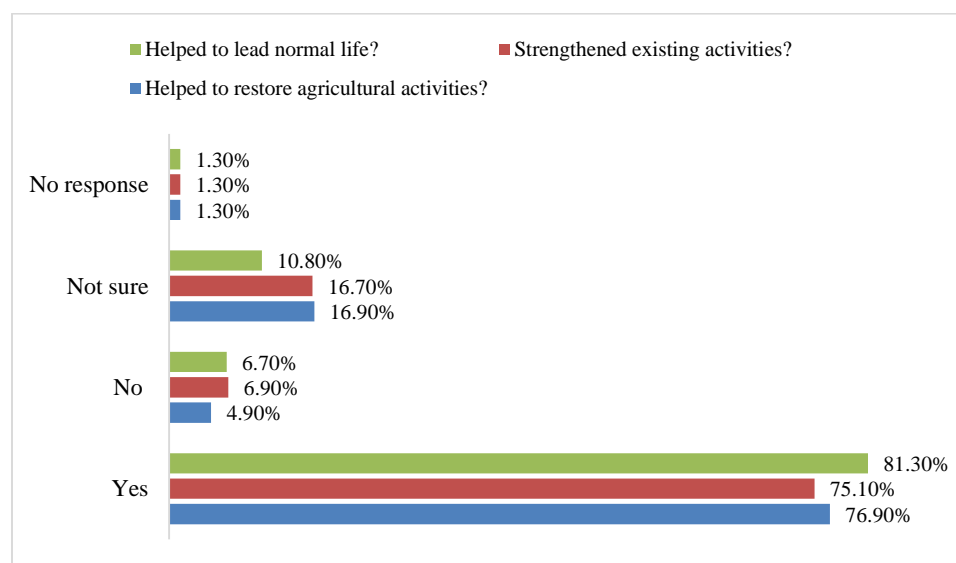
**Figure 5.7.13: Application of training programs provided by NGOs**

#### **5.7.14. Application of the supports of NGOs for relief and agricultural rehabilitation**

The supports of NGOs to relief and agricultural rehabilitation through providing micro credit, loan with minimum interest, providing loan for seed, fertilizer pesticide and construction materials helped to restore agricultural activities (76.9%), strengthened existing activities (75.1%) and helped to lead normal life after a disaster (81.3%). The data observes that the supports of NGOs for relief and rehabilitation strengthened community coping mechanisms effectively. Table 5.7.14.

**Table 5.7.14: Application of supports of NGOs for relief and agricultural rehabilitation**

Did the supports of NGOs for relief and agricultural rehabilitation-	Responses				
	Yes	No	Not sure	No response	Total
Help to restore agricultural activities?	76.9% (300)	4.9% (19)	16.9% (66)	1.3% (5)	100% (390)
Strengthen existing activities?	75.1% (293)	6.9% (27)	16.7% (65)	1.3% (5)	100% (390)
Help to lead normal life?	81.3% (317)	6.7% (26)	10.8% (42)	1.3% (5)	100% (390)



**Figure 5.7.14: Application of supports provided by NGOs for relief and agricultural rehabilitation**

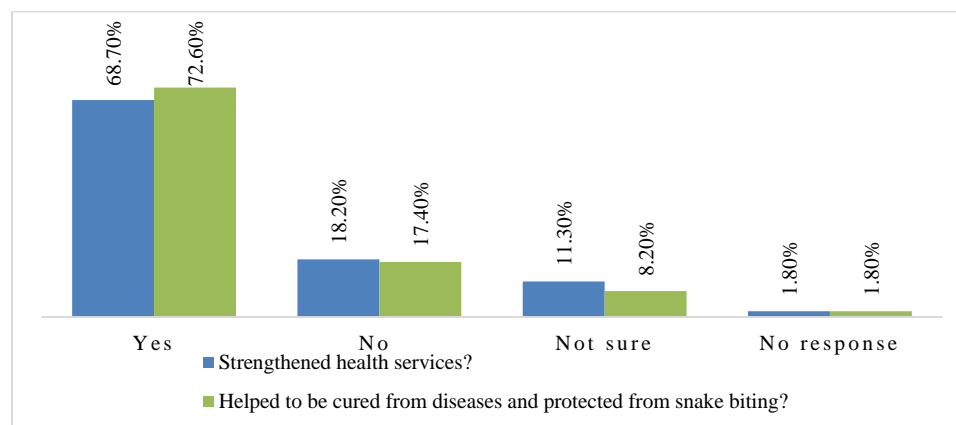
### 5.7.15. Application of health services provided by NGOs

Health services (providing oral saline, water purifying tablet, carbolic soap, paracetamol tablet etc.) provided by NGOs strengthened existing health systems within the community (68.7%) and helped the community people to be cured from diseases and

protected from snake bites (72.6%). The data shows that the health services that was provided by the NGOs strengthened community coping mechanisms. Table 5.7.15.

**Table 5.7.15: Applications of health services provided by NGOs**

Did the health services provided by NGOs-	Responses				
	Yes	No	Not sure	No response	Total
Strengthen health services?	68.7% (268)	18.2% (71)	11.3% (44)	1.8% (7)	100% (390)
Help to be cured from diseases and protected from snake biting?	72.6% (283)	17.4% (68)	8.2% (32)	1.8% (7)	100% (390)



**Figure 5.7.15: Application of health services provided by NGOs**

### 5.7.16. Application of government initiatives

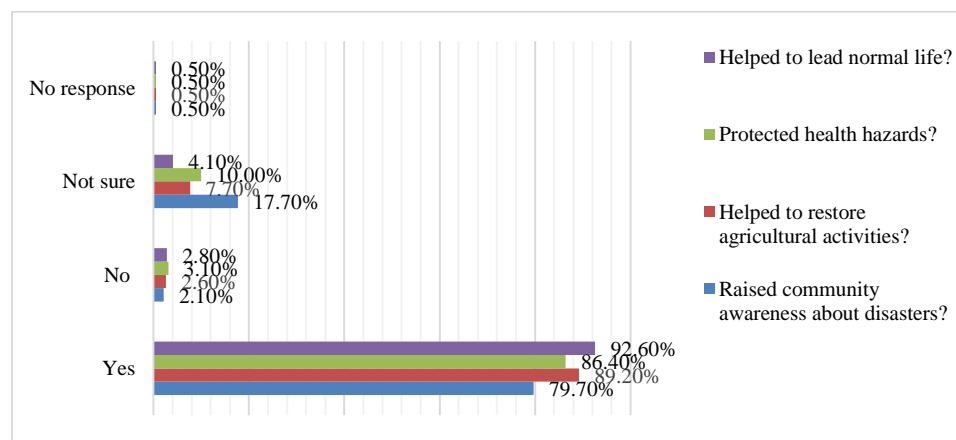
The government initiatives (such as, making shelter, creating awareness, building bridge, culvert, road and embankment, forming volunteer group, providing relief, credit, aid and assistance, forecasting early warning, etc.) raised awareness about disaster among community people (79.7%). These initiatives also helped to restore agricultural activities (89.2%), protected health hazards (86.4%) and helped to lead normal life after a disaster



(92.6%). The data perceives that government initiatives strengthened community coping mechanisms. Table 5.7.16.

**Table 5.7.16: Application of government initiatives**

Did the government initiatives-	Responses				
	Yes	No	Not sure	No response	Total
Raise community awareness about disasters?	79.7% (311)	2.1% (8)	17.7% (69)	0.5% (2)	100% (390)
Help to restore agricultural activities?	89.2% (348)	2.6% (10)	7.7% (30)	0.5% (2)	100% (390)
Protect health hazards?	86.4% (337)	3.1% (12)	10.0% (39)	0.5% (2)	100% (390)
Help to lead normal life?	92.6% (361)	2.8% (11)	4.1% (16)	0.5% (2)	100% (390)



**Figure 5.7.16: Application of government initiatives**

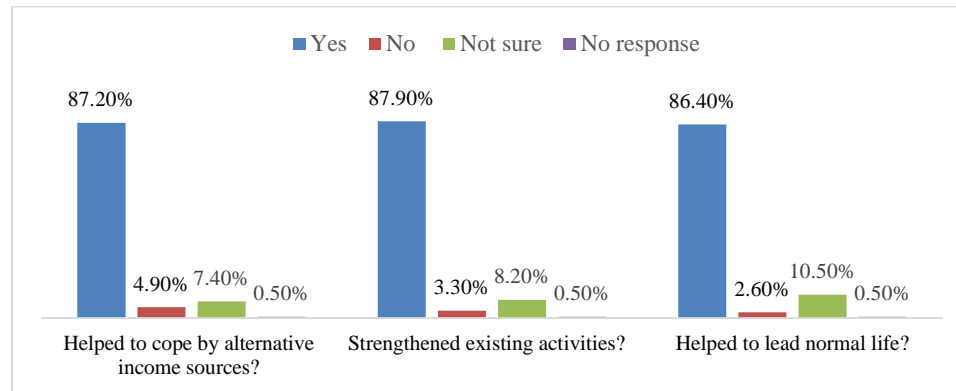
### 5.7.17. Application of government provided training programs

The training programs (such as, training on cropping new variant, tree plantation, water, health and sanitation issues, poultry, livestock and fisheries, making oral saline etc.) of government for strengthening the community coping mechanisms helped the community people to cope with changing situations by alternative income sources (87.2%).

Moreover, these training programs strengthened existing activities (87.6%) and helped to lead normal life (86.4%) after a disaster. The data shows that training programs of government strengthened community coping mechanisms. Table 5.7.17.

**Table 5.7.17: Application of training programs provided by government**

Did the training programs provided by government-	Responses				
	Yes	No	Not sure	No response	Total
Help to cope by alternative income sources?	87.2% (340)	4.9% (19)	7.4% (29)	0.5% (2)	100% (390)
Strengthen existing activities?	87.9% (343)	3.3% (13)	8.2% (32)	0.5% (2)	100% (390)
Help to lead normal life?	86.4% (337)	2.6% (10)	10.5% (41)	0.5% (2)	100% (390)



**Figure 5.7.17: Application of training programs provided by government**

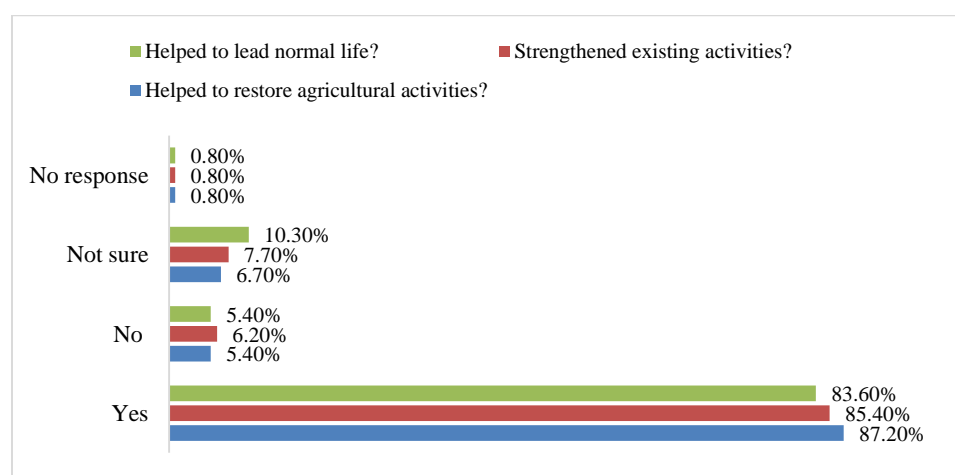
### 5.7.18. Application of the supports of government for relief and agricultural rehabilitation

The support of the government to relief and agricultural rehabilitation through providing agricultural loan with minimum interest, aid and assistance for compost manure, cropping schedule, early warning for harvesting, locally adaptive technology, seed, fertilizer and pesticide, stress and diseases tolerant seeds, etc. helped to restore agricultural activities

(87.2%). In addition, these supports strengthened existing activities (85.4%) and helped to lead normal life after a disaster (83.6%). The data observes that the support of the government for relief and rehabilitation strengthened community coping mechanisms effectively. Table 5.7.18.

**Table 5.7.18: Application of support services provided by government for relief and agricultural rehabilitation**

Did the supports provided by government for relief and agricultural rehabilitation-	Responses				
	Yes	No	Not sure	No response	Total
Help to restore agricultural activities?	87.2% (340)	5.4% (21)	6.7% (26)	0.8% (3)	100% (390)
Strengthen existing activities?	85.4% (333)	6.2% (24)	7.7% (30)	0.8% (3)	100% (390)
Help to lead normal life?	83.6% (326)	5.4% (21)	10.3% (40)	0.8% (3)	100% (390)



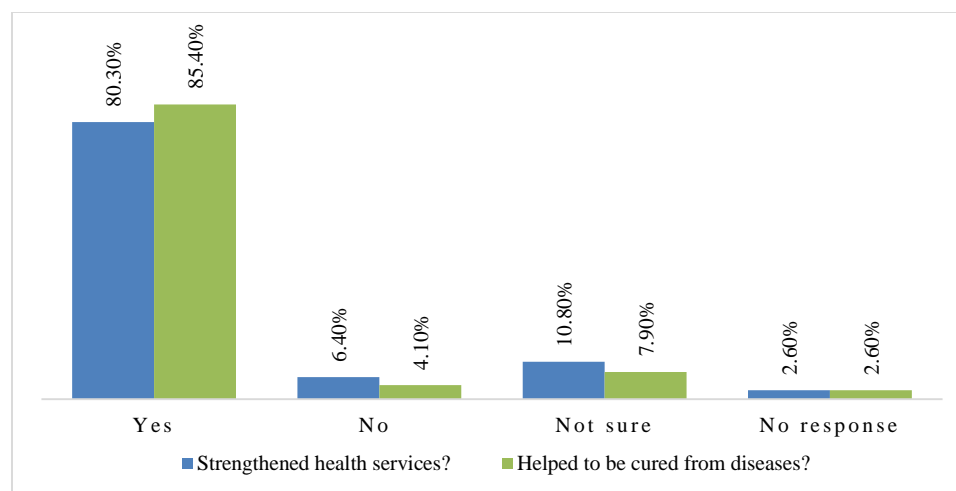
**Figure 5.7.18: Application of support services provided by government for relief and agricultural rehabilitation**

### 5.7.19. Application of health services provided by government

Health services (providing oral saline, water purifying tablet, carbolic soap, paracetamol tablet etc.) provided by government strengthened the existing health systems within the community (80.3%) and helped the community people to be cured from diseases and protected from snake bites (85.4%). The data shows that the health services that provided by the government strengthened community coping mechanisms. Table 5.7.19.

**Table 5.7.19: Application of health services provided by government**

Did the health services provided by government -	Responses				
	Yes	No	Not sure	No response	Total
Strengthen health services?	80.3% (313)	6.4% (25)	10.8% (42)	2.6% (10)	100% (390)
Help to be cured from diseases?	85.4% (333)	4.1% (16)	7.9% (31)	2.6% (10)	100% (390)



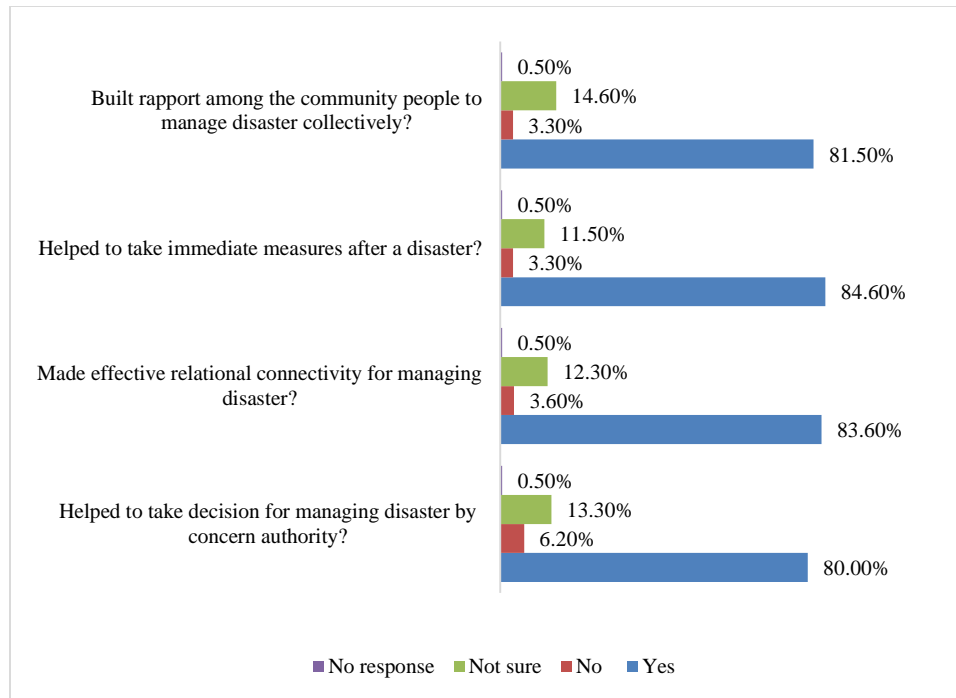
**Figure 5.7.19: Application of health services provided by government**

**5.7.20. Application of community people’s participation in risk reduction options by sharing knowledge/information with responsible personalities**

The participation of community people by sharing knowledge/information with responsible personalities (such as, member of union disaster management committee, community disaster management committee, social, religious and political leaders, Union *Parishad* member and chairman, NGO representative and other members of the community) helped to take decision by concerned authority for managing disaster (80%). This participation made effective relational connectivity (83.3%), helped to take immediate measures after a disaster (84.6%) and built rapport among the community people to manage disaster collectively (81.5%). The data shows that the community people participation by sharing knowledge/information with responsible personalities assisted to manage disaster effectively at community level. Table 5.7.20.

**Table 5.7.20: Application of community people’s participation in risk reduction options by sharing knowledge and information with responsible personalities**

Did community people’s participation in risk reduction options by sharing knowledge and information with responsible personalities-	Responses				
	Yes	No	Not sure	No response	Total
Help to take decision for managing disaster by concern authority?	80.0% (312)	6.2% (24)	13.3% (52)	0.5% (2)	100% (390)
Make effective relational connectivity for managing disaster?	83.6% (326)	3.6% (14)	12.3% (48)	0.5% (2)	100% (390)
Help to take immediate measures after a disaster?	84.6% (330)	3.3% (13)	11.5% (45)	0.5% (2)	100% (390)
Build rapport among the community people to manage disaster collectively?	81.5% (318)	3.3% (13)	14.6% (57)	0.5% (2)	100% (390)



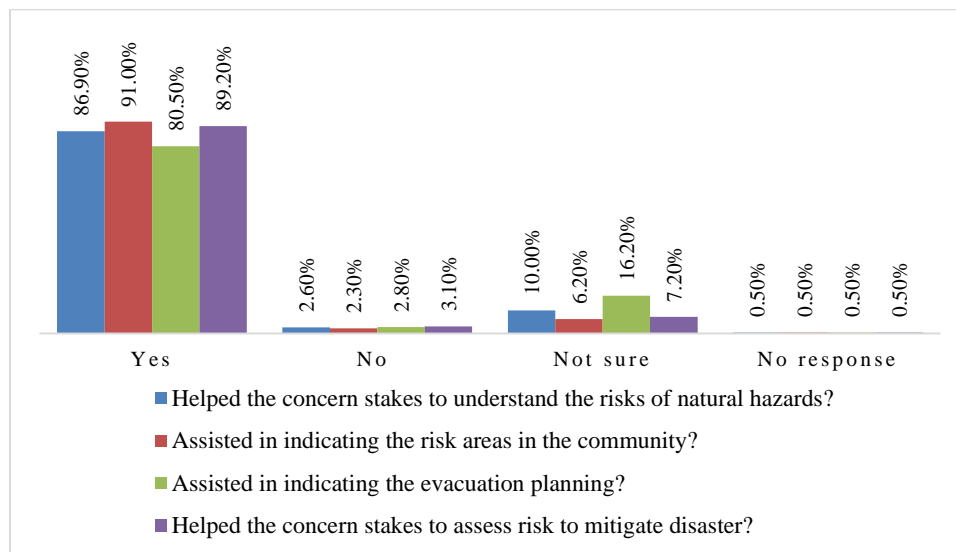
**Figure 5.7.20: Application of community people’s participation in risk reduction options by sharing knowledge and information with responsible personalities**

### **5.7.21. Application of community people’s participation in sharing information/knowledge to create hazard maps**

Hazard maps creation with the help of community people by locating houses, forest and trees, water reservoir, land types, drinking water sources, public places, communication facilities, service centres and identifying local hazards’ intensity, frequency, damageability and risk effectively helped the concern stakes to understand the risks of natural hazards in the community (86.9%). Moreover, the participation of community people in hazard maps creation assisted in indicating risk area in the community (91%) and indicating evacuation planning (80.5%). Finally, this participation helped the concern stakes to assess the risks to mitigate disaster (89.2%). The data observes that the community people participation by sharing information/knowledge to create hazard maps assisted to manage disaster at community level. Table 5.7.21.

**Table 5.7.21: Application of community people’s participation by sharing information/knowledge to create hazard maps**

Did community people’s participation by sharing information/ knowledge to create hazard maps-	Responses				
	Yes	No	Not sure	No response	Total
Help the concern stakes to understand the risks of natural hazards?	86.9% (339)	2.6% (10)	10.0% (39)	0.5% (2)	100% (390)
Assist in indicating the risk areas in the community?	91.0% (355)	2.3% (9)	6.2% (24)	0.5% (2)	100% (390)
Assist in indicating the evacuation planning?	80.5% (314)	2.8% (11)	16.2% (63)	0.5% (2)	100% (390)
Help the concern stakes to assess risk to mitigate disaster?	89.2% (348)	3.1% (12)	7.2% (28)	0.5% (2)	100% (390)



**Figure 5.7.21: Application of community people’s participation by sharing information/knowledge to create hazard maps**

### 5.7.22. Application of community people's participation in hazard/disaster identification

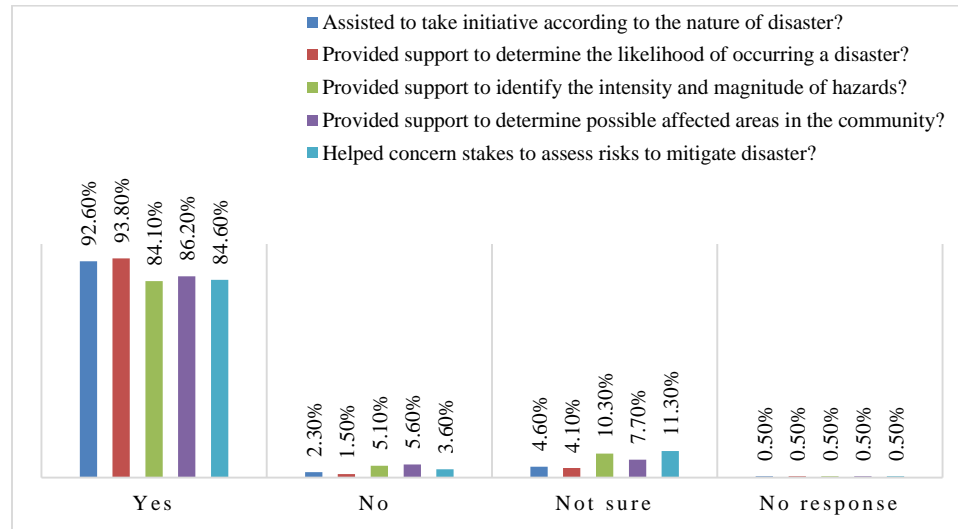
Identification of hazard/disaster is important in assessing disaster risks, however, the community people participated in this process by sharing the information on previous hazard/disaster, its seasonality and damageability, type of disaster that the people faced, hazard base warning and response mechanisms. This participation assisted to take initiative according to the nature of disaster (92.6%) and provided support to determine the likelihood of occurring a disaster (93.8%). Besides this participation provided support to identify the intensity and magnitude of hazards (84.1%) and provided support to determine possible affected areas in the community (86.2%). The data detects that the participation of community people in hazard/disaster identification assisted to assess risk for managing disaster at community level. Table 5.7.22.

**Table 5.7.22: Application of community people's participation in hazard/disaster identification**

Did community people's participation in hazard/disaster identification-	Responses				
	Yes	No	Not sure	No response	Total
Assist to take initiative according to the nature of disaster?	92.6% (361)	2.3% (9)	4.6% (18)	0.5% (2)	100% (390)
Provide support to determine the likelihood of occurring a disaster?	93.8% (366)	1.5% (6)	4.1% (16)	0.5% (2)	100% (390)
Provide support to identify the intensity and magnitude of hazards?	84.1% (328)	5.1% (20)	10.3% (40)	0.5% (2)	100% (390)
Provide support to determine possible affected areas in the community?	86.2% (336)	5.6% (22)	7.7% (30)	0.5% (2)	100% (390)



Help concern stakes to assess risks to mitigate disaster?	84.6% (330)	3.6% (14)	11.3% (44)	0.5% (2)	100% (390)
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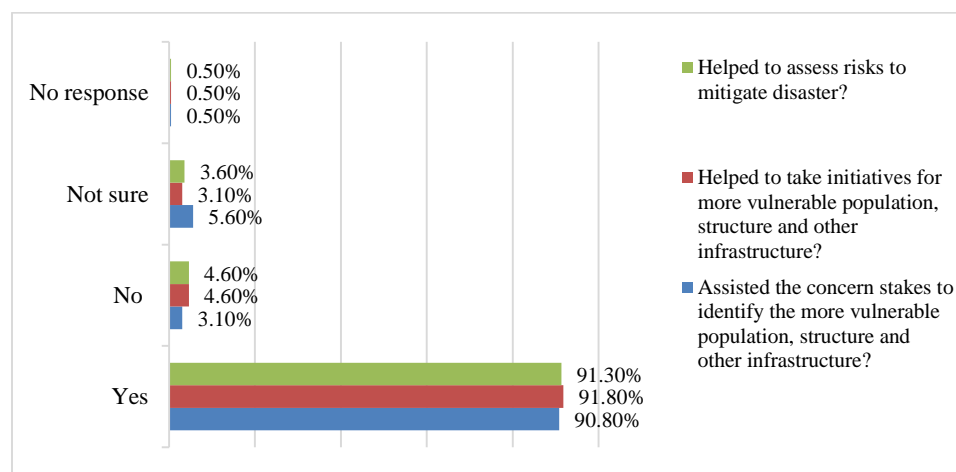
**Figure 5.7.22: Application of community people's participation in hazard/disaster identification**

### 5.7.23. Application of community people's participation in vulnerability assessment

The community people's participation in vulnerability assessment by sharing the information on vulnerable population, area, structure, infrastructure, livelihood options, water, health and sanitation issues, physical and relational connectivity, aid and assistance, savings, demographic characteristics etc. for assessing risk assisted the concerned stakeholders to identify the more vulnerable population, structure and other infrastructures (90.8%). Vulnerability assessment also helped to take initiatives for more vulnerable population, structure and other infrastructure (91.8%) and to assess risks to mitigate disasters (91.3%). Therefore, the data shows that the community People's participation in vulnerability assessment assisted to assess risk for mitigating disaster at community level. Table 5.7.23.

**Table 5.7.23: Application of community people’s participation in vulnerability assessment**

Did community people’s participation in vulnerability assessment-	Responses				
	Yes	No	Not sure	No response	Total
Assist the concern stakes to identify the more vulnerable population, structure and other infrastructure?	90.8% (354)	3.1% (12)	5.6% (22)	0.5% (2)	100% (390)
Help to take initiatives for more vulnerable population, structure and other infrastructure?	91.8% (358)	4.6% (18)	3.1% (12)	0.5% (2)	100% (390)
Help to assess risks to mitigate disaster?	91.3% (356)	4.6% (18)	3.6% (14)	0.5% (2)	100% (390)



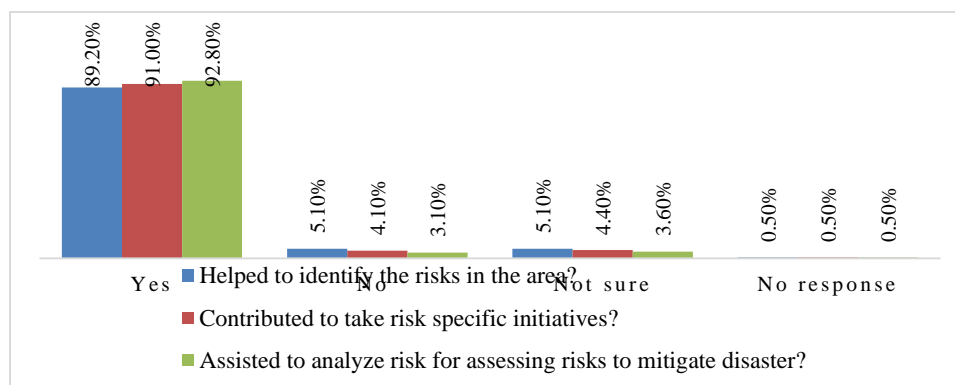
**Figure 5.7.23: Application of community people’s participation in vulnerability assessment**

### 5.7.24. Application of community people’s participation in risk analysis

Table 5.7.24 shows that the community people participation in risk analysis by identifying local hazards, natural and man-made elements, risk for health, water, hygiene and sanitation and vulnerable groups and sharing the information on environmental set up for assessing disaster risk helped to identify the risks in the area (89.2%). It also contributed to take risk specific initiatives to mitigate disaster (91%) and assisted to analyse risk for assessing risks to mitigate disasters (92.8%). Table 5.7.24 also highlights that the community People’s participation in risk analysis assisted to assess risk regarding disaster management at community level.

**Table 5.7.24: Application of community people’s participation in risk analysis**

Did community people’s participation in risk analysis-	Responses				
	Yes	No	Not sure	No response	Total
Help to identify the risks in the area?	89.2% (348)	5.1% (20)	5.1% (20)	0.5% (2)	100% (390)
Contribute to take risk specific initiatives?	91.0% (355)	4.1% (16)	4.4% (17)	0.5% (2)	100% (390)
Assist to analyze risk for assessing risks to mitigate disaster?	92.8% (362)	3.1% (12)	3.6% (14)	0.5% (2)	100% (390)



**Figure 5.7.24: Application of community people’s participation in risk analysis**

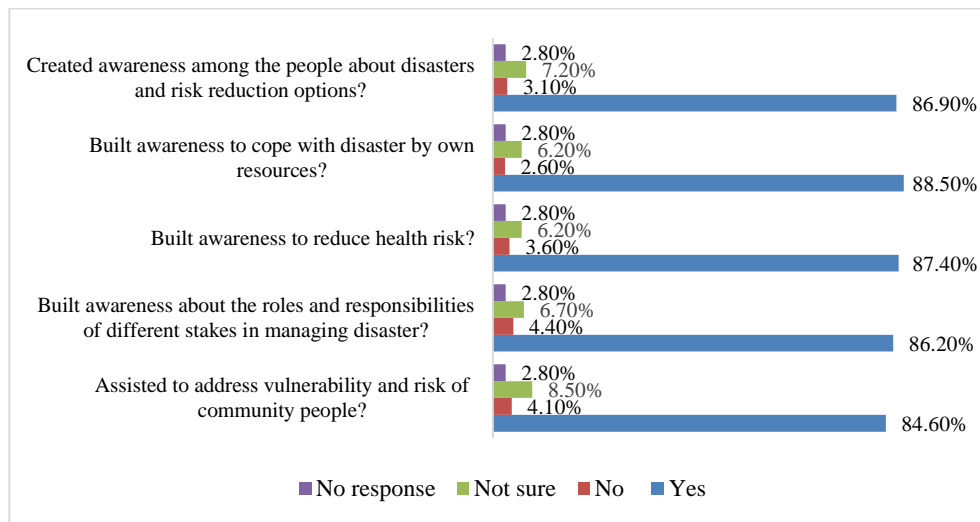
### 5.7.25. Application of community people’s participation in awareness raising campaigns

The issues related to raise awareness about the roles and responsibilities of various stakes within the community, land acquisition and environment, health, water, sanitation, behavioural changes, preserving food, fodder, fuel and medical accessories assisted to address vulnerability and risk through the active participation of the community people (84.6%). This participation also built awareness about the roles and responsibilities of different stakeholders in managing disaster (86.2%), built awareness to reduce health risk (87.4%) and built awareness to cope with disaster using their own resources (88.5%). Furthermore, the participation of community people in awareness raising campaigns created awareness among the people about disasters and risk reduction options (86.9%). Therefore, it is observed from the data that the community People’s participation in awareness raising campaigns created awareness among the people regarding disaster management at community level. Table 5.7.25.

**Table 5.7.25: Application of community people’s participation in awareness raising campaigns**

Did community people’s participation in awareness raising campaigns-	Responses				
	Yes	No	Not sure	No response	Total
Assist to address vulnerability and risk of community people?	84.6% (330)	4.1% (16)	8.5% (33)	2.8% (11)	100% (390)
Build awareness about the roles and responsibilities of different stakes in managing disaster?	86.2% (336)	4.4% (17)	6.7% (26)	2.8% (11)	100% (390)
Build awareness to reduce health risk?	87.4% (341)	3.6% (14)	6.2% (24)	2.8% (11)	100% (390)
Built awareness to cope with disaster by own resources?	88.5% (345)	2.6% (10)	6.2% (24)	2.8% (11)	100% (390)

Created awareness among the people about disasters and risk reduction options?	86.9% (330)	3.1% (12)	7.2% (28)	2.8% (11)	100% (390)
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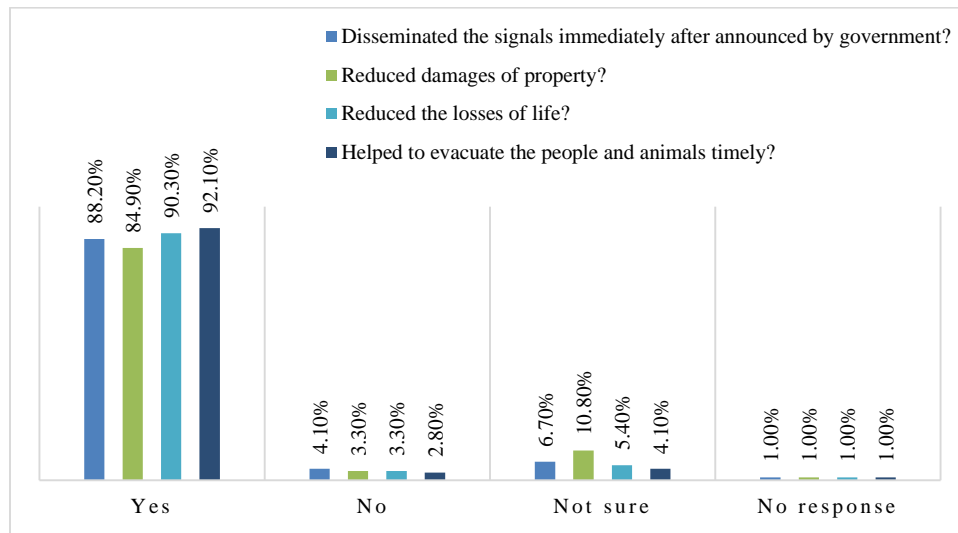
**Figure 5.7.25: Application of community people’s participation in awareness raising campaigns**

### 5.7.26. Application of community people’s participation in early warning system

Early warning signals were disseminated immediately after announced by the government due to the active participation of community people (88.2%). Timely dissemination of the warning signals reduced the damages to property (84.9%) and losses of life (90.3%). It also helped to evacuate the people and animals timely (92.1%). Hence, the data shows that the community People’s participation in early warning system through receiving the warning signals of government, disseminating those signals to vulnerable group and selecting the media for disseminating the signals assisted to mitigate disaster risk at community level. Table 5.7.26.

**Table 5.7.26: Application of community people’s participation in early warning system**

Did community people’s participation in early warning system-	Responses				
	Yes	No	Not sure	No response	Total
Disseminate the signals immediately after announced by government?	88.2% (344)	4.1% (16)	6.7% (26)	1.0% (4)	100% (390)
Reduce damages of property?	84.9% (331)	3.3% (13)	10.8% (42)	1.0% (4)	100% (390)
Reduce the losses of life?	90.3% (352)	3.3% (13)	5.4% (21)	1.0% (4)	100% (390)
Help to evacuate the people and animals timely?	92.1% (359)	2.8% (11)	4.1% (16)	1.0% (4)	100% (390)



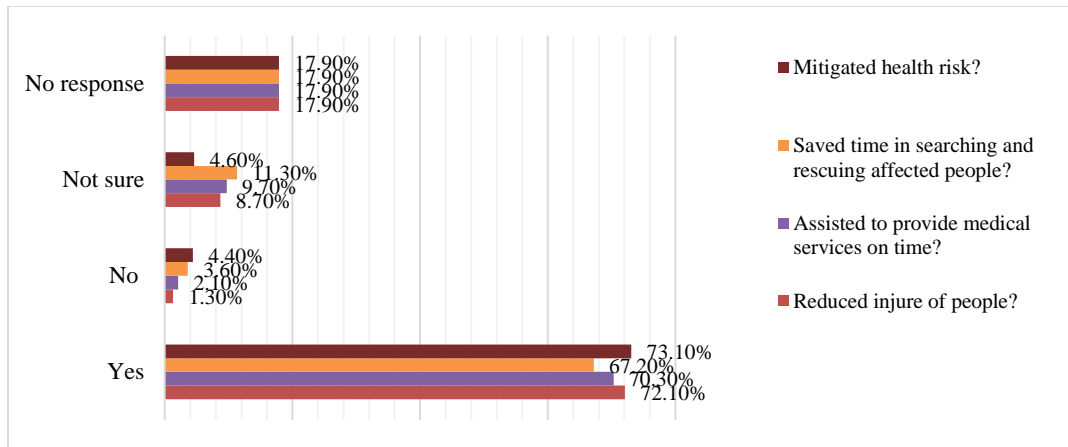
**Figure 5.7.26: Application of community people’s participation in early warning system**

**5.7.27. Application of community people’s participation in search and rescue operation**

Table 5.7.27 shows that community people’s participation by identifying more vulnerable group, assets, infrastructure, sharing the locations of hazard prone and risk areas and providing help to rescue operation teams reduced the number of injured people (72.1%). Furthermore, this participation assisted to provide medical services on time (70.3%), saved time in searching and rescuing affected people (67.2%) and mitigated health risk (73.1%). The data shows that community people’s participation in search and rescue operation helped to mitigate disaster risk.

**Table 5.7.27: Application of community people’s participation in search and rescue operation**

<b>Did community people’s participation in search and rescue operation-</b>	<b>Responses</b>				
	<b>Yes</b>	<b>No</b>	<b>Not sure</b>	<b>No response</b>	<b>Total</b>
Reduce the number of injured people?	72.1% (281)	1.3% (5)	8.7% (34)	17.9% (70)	100% (390)
Assist to provide medical services on time?	70.3% (274)	2.1% (8)	9.7% (38)	17.9% (70)	100% (390)
Save time in searching and rescuing affected people?	67.2% (262)	3.6% (14)	11.3% (44)	17.9% (70)	100% (390)
Mitigate health risk?	73.1% (285)	4.4% (17)	4.6% (18)	17.9% (70)	100% (390)



**Figure 5.7.27: Application of community people’s participation in search and rescue operation**

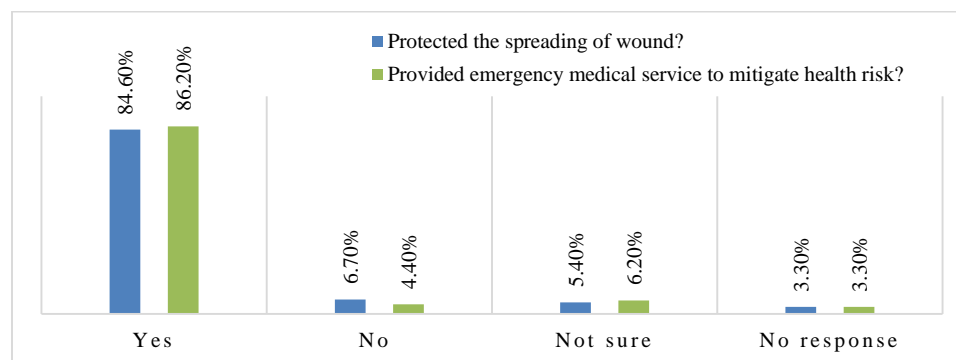
**5.7.28. Application of community people’s participation in providing medical first aid**

The spreading of wound was protected (84.6%) due to the active participation of the community people in providing medical first aid. Additionally the emergency medical services were provided to mitigate health risk by the active participation of community people (86.2%). The data proves that the participation of community people by sharing the knowledge of making saline, purifying water, herbal medicine, and medical first aid reduced injuries and mitigated risk at community level. Table 5.7.28.

**Table 5.7.28: Application of community people’s participation in providing medical first aid**

Did community people’s participation in providing medical first aid-	Responses				
	Yes	No	Not sure	No response	Total
Protect the spreading of wound?	84.6% (330)	6.7% (26)	5.4% (21)	3.3% (13)	100% (390)
Provide emergency medical service to mitigate health risk?	86.2% (336)	4.4% (17)	6.2% (24)	3.3% (13)	100% (390)





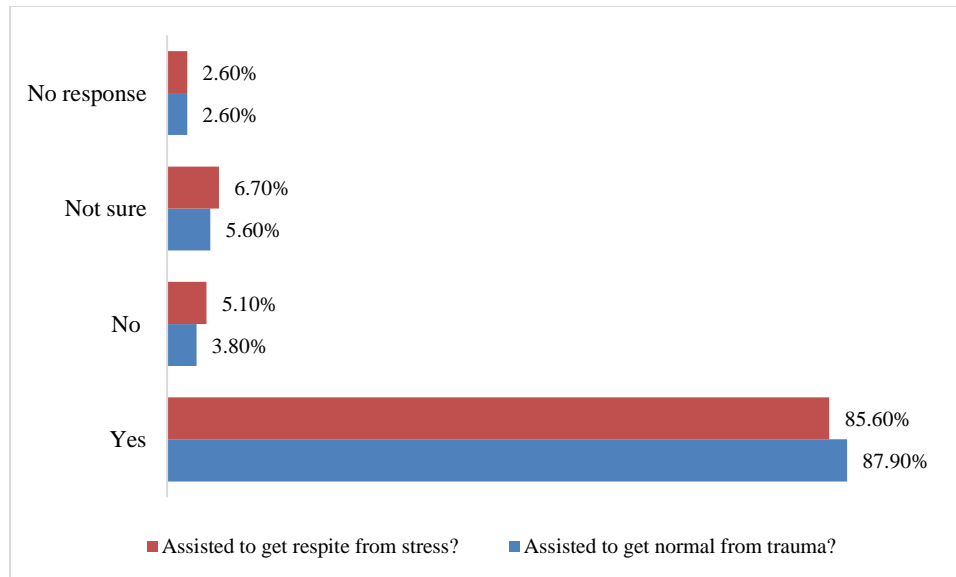
**Figure 5.7.28: Application of community people’s participation in providing medical first aid**

### **5.7.29. Application of community people’s participation in providing psychological support**

The data shows that the community people’s participation in providing psychological support for the traumatized individuals by giving mental support and sharing the sources for getting better support assisted them to get normal (87.9%) and to get respite from stress (85.6%). The data also shows that community people’s participation in providing psychological support helped the traumatized individual to return to living a normal life. Table 5.7.29.

**Table 5.7.29: Application of community people’s participation in providing psychological support**

Did community people’s participation in providing psychological support-	Responses				
	Yes	No	Not sure	No response	Total
Assist to get normal from trauma?	87.9% (343)	3.8% (15)	5.6% (22)	2.6% (10)	100% (390)
Assist to get respite from stress?	85.6% (334)	5.1% (20)	6.7% (26)	2.6% (10)	100% (390)



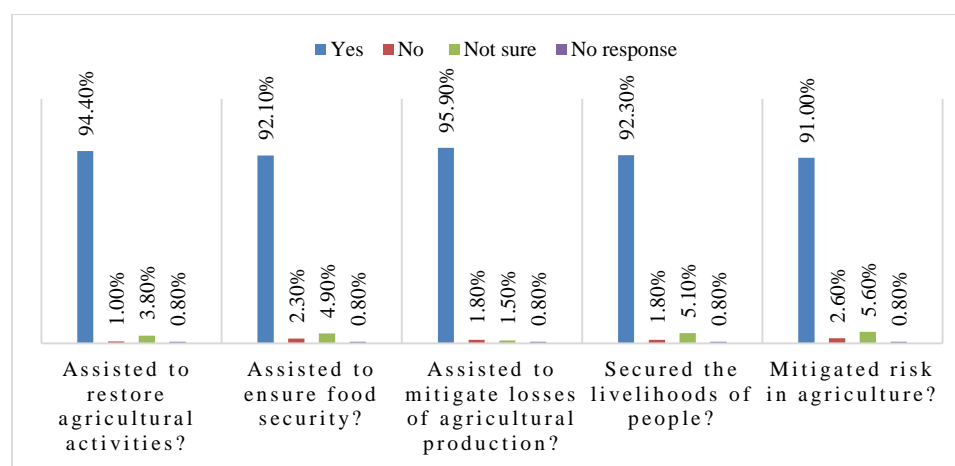
**Figure 5.7.29: Application of community people’s participation in providing psychological support**

### **5.7.30. Application of community people’s participation in restoring activities for agricultural rehabilitation**

The agricultural activities were restored by the participation of community people (94.4%) which assisted to ensure food security (92.1%) and secured the livelihoods of people (92.3%). The participation also assisted to mitigate losses of agricultural production (95.9%) and mitigated risk in agriculture (91%). The data evident that community people participation by providing seed and money as loan and sharing the information on cropping mechanisms, market accessibility and sources of getting better support in restoring activity for agricultural rehabilitation reduced the risks. Table 5.7.30.

**Table 5.7.30: Application of community people’s participation in restoring activities for agricultural rehabilitation**

Did community people’s participation in restoring activities for agricultural rehabilitation-	Responses				
	Yes	No	Not sure	No response	Total
Assist to restore agricultural activities?	94.4% (368)	1.0% (4)	3.8% (15)	0.8% (3)	100% (390)
Assist to ensure food security?	92.1% (359)	2.3% (9)	4.9% (19)	0.8% (3)	100% (390)
Assist to mitigate losses of agricultural production?	95.9% (374)	1.8% (7)	1.5% (6)	0.8% (3)	100% (390)
Secure the livelihoods of people?	92.3% (360)	1.8% (7)	5.1% (20)	0.8% (3)	100% (390)
Mitigate risk in agriculture?	91.0% (355)	2.6% (10)	5.6% (22)	0.8% (3)	100% (390)



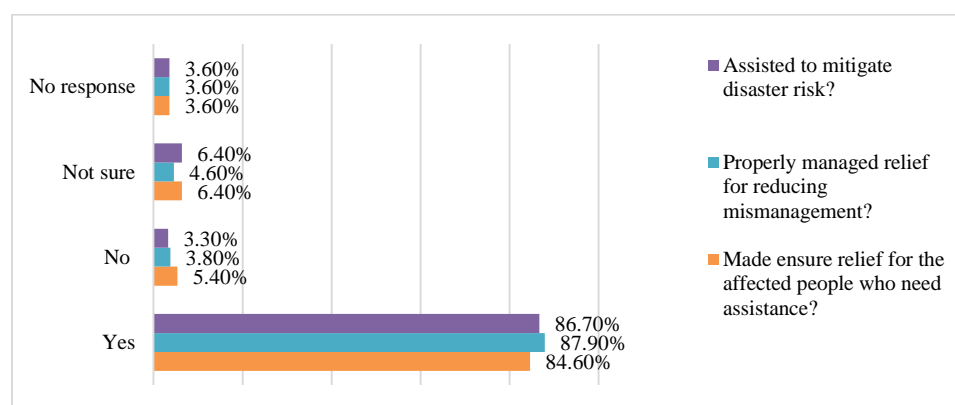
**Figure 5.7.30: Application of community people’s participation in restoring activities for agricultural rehabilitation**

### 5.7.31. Application of community people’s participation in distribution of relief

The relief was ensured for affected people who needed the assistance (84.6%) by the actively participation of community people. In addition the participation in relief distribution reduced mismanagement (87.9%) and assisted to mitigate disaster risk (86.7%). The community people provided help to the elderly people and pregnant women in getting relief, sharing the information on affected people and helping to avoid unexpected circumstances as the participation in distributing relief. The data shows that community people’s participation in distributing relief managed disaster. Table 5.7.31.

**Table 5.7.31: Application of community people’s participation in distribution of relief**

Did community people s’ participation in distribution of relief-	Responses				
	Yes	No	Not sure	No response	Total
Ensure relief for the affected people who need assistance?	84.6% (330)	5.4% (21)	6.4% (25)	3.6% (14)	100% (390)
Properly manage relief for reducing mismanagement?	87.9% (343)	3.8% (15)	4.6% (18)	3.6% (14)	100% (390)
Assist to mitigate disaster risk?	86.7% (338)	3.3% (13)	6.4% (25)	3.6% (14)	100% (390)



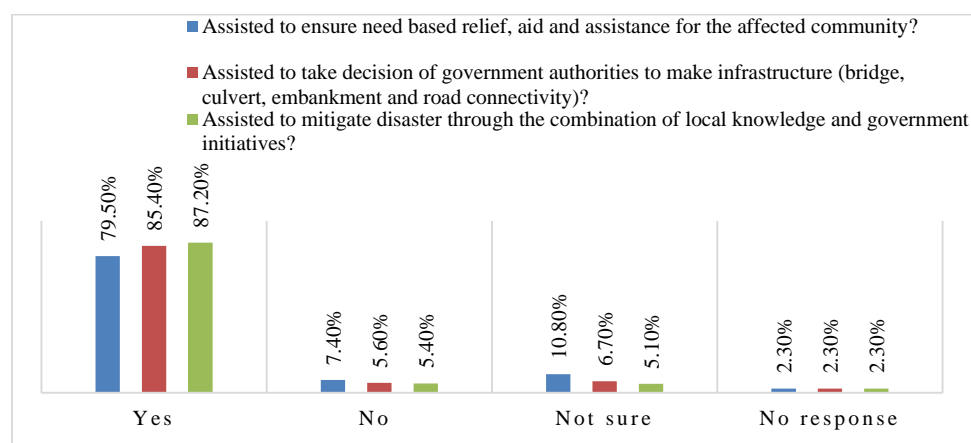
**Figure 5.7.31: Application of community people’s participation in distribution of relief**

### 5.7.32. Application of community people’s participation in integrating the local disaster reduction options with national development

The community people’s participation in integrating local disaster reduction options with national development by integrating local indigenous knowledge on disaster risk and sharing the thinking of risk reduction options assisted to ensure need-based relief, aid and assistance for the affected community (79.5%). Furthermore, this participation assisted government authorities to take decision to make infrastructure (85.4%) and assisted to mitigate disaster through the combination of local knowledge and government initiatives (87.2%). The data observes that the community people’s participation in integrating local disaster reduction options with national development reduced disaster risk at community level. Table 5.7.32.

**Table 5.7.32: Application of community people’s participation in integrating the local disaster reduction options with national development**

Did community people’s participation in integrating the local disaster reduction options with national development-	Responses				
	Yes	No	Not sure	No response	Total
Assist to ensure need-based relief, aid and assistance for the affected community?	79.5% (310)	7.4% (29)	10.8% (42)	2.3% (9)	100% (390)
Assist to take decision of government authorities to make infrastructure (bridge, culvert, embankment and road connectivity)?	85.4% (333)	5.6% (22)	6.7% (26)	2.3% (9)	100% (390)
Assist to mitigate disaster through the combination of local knowledge and government initiatives?	87.2% (340)	5.4% (21)	5.1% (20)	2.3% (9)	100% (390)



**Figure 5.7.32: Application of community people's participation in integrating the local disaster reduction options with national development**

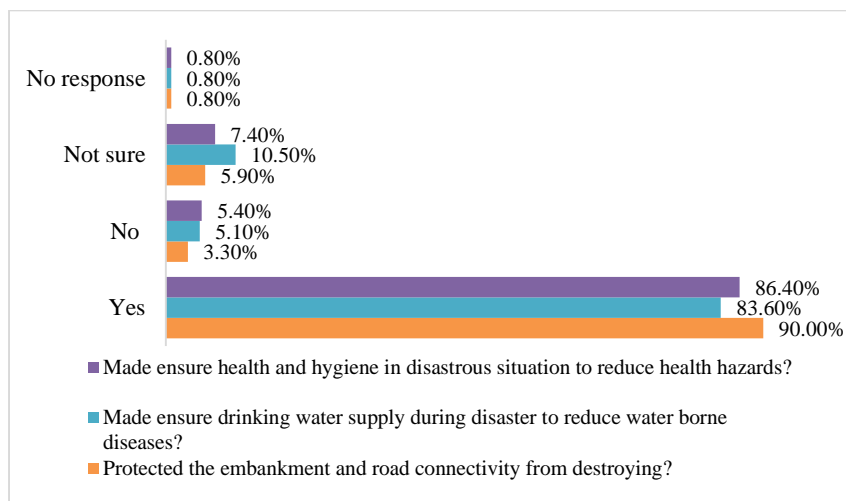
### 5.7.33. Application of community people's engagement in maintaining physical connectivity

The data shows that the embankment and road connectivity were protected from destroying (90%) while the community people maintained physical connectivity. Moreover, the community people's monitoring ensured drinking water supply during disaster to reduce water borne diseases (83.6%) and ensured health and hygiene in disastrous situation to reduce health hazards (86.4%). The data also shows that the community people's engagement in maintaining physical connectivity strengthened community risk reduction options. Table 5.7.33.

**Table 5.7.33: Application of community people's engagement in maintaining physical connectivity**

Did community people's engagement in maintaining physical connectivity-	Responses				
	Yes	No	Not sure	No response	Total
Protect the embankment and road connectivity from	90.0% (351)	3.3% (13)	5.9% (23)	0.8% (3)	100% (390)

destroying?					
Ensure drinking water supply during disaster to reduce water borne diseases?	83.6% (326)	5.1% (20)	10.5% (41)	0.8% (3)	100% (390)
Ensure health and hygiene in disastrous situation to reduce health hazards?	86.4% (337)	5.4% (21)	7.4% (29)	0.8% (3)	100% (390)



**Figure 5.7.33: Application of community people's engagement in maintaining physical connectivity**

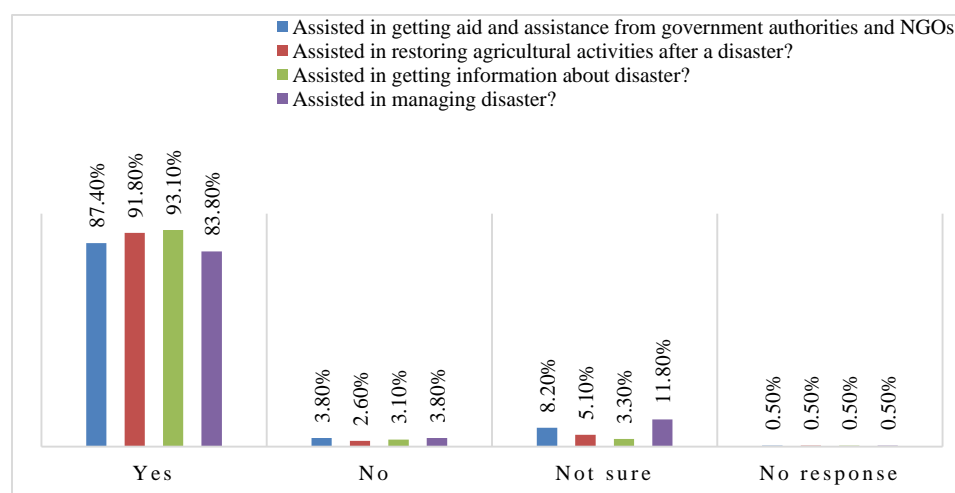
#### **5.7.34. Application of community people's engagement in maintaining relational connectivity**

The relational connectivity with member and chairman of Union *Parishad*, representative of NGOs, microfinance and financial organizations and BADC assisted in getting aid and assistance from government authorities and NGOs (87.4%). Besides this type of connectivity assisted to restore agricultural activities after a disaster (91.8%), get information about disaster (93.1%) and manage disaster (83.8%). The data shows that

community people’s engagement in maintaining relational connectivity assisted in managing disaster at community level. Table 5.7.34.

**Table 5.7.34: Application of community people’s engagement in maintaining relational connectivity**

Did community people’s engagement in maintaining relational connectivity-	Responses				
	Yes	No	Not sure	No response	Total
Assist in getting aid and assistance from government authorities and NGOs?	87.4% (341)	3.8% (15)	8.2% (32)	0.5% (2)	100% (390)
Assist in restoring agricultural activities after a disaster?	91.8% (358)	2.6% (10)	5.1% (20)	0.5% (2)	100% (390)
Assist in getting information about disaster?	93.1% (363)	3.1% (12)	3.3% (13)	0.5% (2)	100% (390)
Assist in managing disaster?	83.8% (327)	3.8% (15)	11.8% (46)	0.5% (2)	100% (390)



**Figure 5.7.34: Application of community people’s engagement in maintaining relational connectivity**

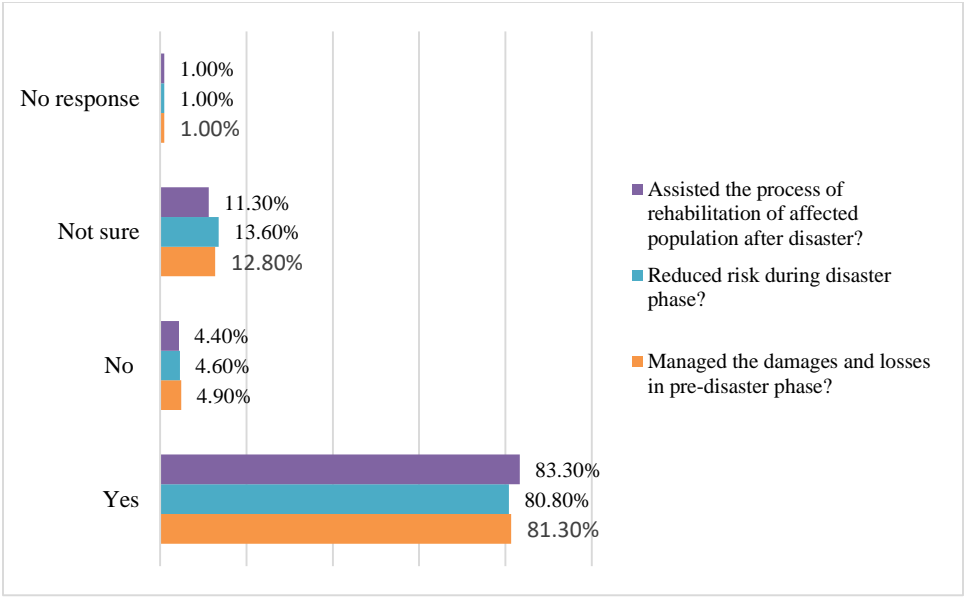


### 5.7.35. Application of CBOs' activities

The CBOs' activities regarding disaster management at community level managed the damages and losses in pre-disaster phase (81.3%), reduced risk during disaster phase (80.8%) and assisted the process of rehabilitation of affected population after disaster (83.3%). The data observes that the CBOs' activities in pre-disaster phase (understanding the nature of disasters and effects, preparing disaster preparedness plan, promoting measures for mitigating disasters, analysing vulnerability and risk and assessing and mobilizing resources) managed disaster at community level. Additionally CBOs helped to manage disaster during disaster phase (operating search, rescue and evacuation, providing shelter for victims, providing first aid, distributing food, water, medicine and fodder, cleaning of debris, disposal of dead humans and animals, assisting the rescue team, dissemination of information on hazards and preventing the spread of rumours and assessing the immediate damages and losses). Furthermore, CBOs' activities in post disaster phase (assessing the damages, social and economic rehabilitation and protection of women, children, elderly people, poor, destitute, infirm and minority) managed disaster at community level. Table 5.7.35.

**Table 5.7.35: Application of CBOs' Activities**

Did CBOs' activities-	Responses				
	Yes	No	Not sure	No response	Total
Manage the damages and losses in pre-disaster phase?	81.3% (317)	4.9% (19)	12.8% (50)	1.0% (4)	100% (390)
Reduce risk during disaster phase?	80.8% (315)	4.6% (18)	13.6% (53)	1.0% (4)	100% (390)
Assist the process of rehabilitation of affected population after disaster?	83.3% (325)	4.4% (17)	11.3% (44)	1.0% (4)	100% (390)



**Figure 5.7.35: Application of CBOs' Activities**

## 5.8. Level of Effectiveness of Community Based Disaster Management

### 5.8.1. Effectiveness of coping mechanisms regarding food crisis

Coping mechanisms regarding food crisis is important in managing disaster risk. However, the community people coped with changing situation by using preserved food, purchasing and borrowing food from market and others, selling ornaments and other valuables, taking loan and credits etc. in case of food crisis in emergency. Table 5.8.1 shows that coping mechanisms regarding food crisis were effective (42.8% extremely effective, 37.7% very effective, 5.4% moderately effective, 2.8% somewhat effective) in managing disaster (Mean=4.0579 and Std. Dev=1.19003).

**Table 5.8.1: Effectiveness of coping mechanisms regarding food crisis**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	34	8.7	4.0579	1.19003
	Somewhat Effective	11	2.8		
	Moderately Effective	21	5.4		
	Very Effective	147	37.7		
	Extremely Effective	167	42.8		
	No response	10	2.6		
	Total	390	100.0		

In qualitative portion the participants said that their coping mechanisms through using preserved dry food such as *muri* (puffed rice), *chira* (flattened rice) etc. were extremely effective. On the other hand, selling valuable ornaments (*churi*, nose pin, ear ring etc.) and household valuables (furniture, bicycle, motor bike, television, wrist watch, tree etc.), livestock (hen, duck, pigeon, goat, cow, buffalo, horse etc.) for buying food were moderately effective while using savings, borrowing money and receiving grants were somewhat effective. Coping mechanisms regarding food crisis through taking relief from government through local government authorities (Union *Parishad*, Upazila *Parishad*,

social welfare office, deputy commissioner etc.) were very effective while the relief from NGOs was somewhat effective and sometimes not effective in managing disasters.

### 5.8.2. Effectiveness of coping mechanisms regarding fodder crisis

The Mean value 4.0306 and Std. Dev. value 1.20660 indicates that the coping mechanisms of community people regarding fodder crisis by using preserved fodder, purchasing and borrowing fodder from market and others, selling animals, ornaments and other valuables, using savings etc. were effective (40.5% extremely effective, 34.2% very effective, 5.6% moderately effective, 4.1% somewhat effective) in managing fodder crisis. Table 5.8.2.

**Table 5.8.2. Effectiveness of coping mechanisms regarding fodder crisis**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	31	7.9	4.0306	1.20660
	Somewhat Effective	16	4.1		
	Moderately Effective	22	5.6		
	Very Effective	133	34.2		
	Extremely Effective	158	40.5		
	No response	30	7.7		
	Total	390	100.0		

In qualitative portion the participants said that their coping mechanisms regarding fodder by preserved fodder for cattle was extremely effective. On the other hand, coping mechanisms by selling valuable ornaments (*churi*, nose pin, ear ring etc.) and household valuables (furniture, bicycle, motor bike, television, wrist watch, tree etc.), animals (hen, duck, pigeon, goat, cow, buffalo, horse etc.) for purchasing fodder from others were moderately effective while using savings was somewhat effective.

### 5.8.3. Effectiveness of coping mechanisms regarding dwelling places

Coping mechanisms regarding dwelling places by putting mud and polythene or dry leaves around the homestead, renovating the house on their own, receiving grants, loan, credit from government, other donors and informal sector (*Mohajon*) for renovating the dwelling places were effective (43.8% extremely effective, 36.1 very effective, 3.6% moderately effective, 2.1% somewhat effective) in managing disaster (Mean=4.0000 and Std. Dev=1.29777). Table 5.8.3

**Table 5.8.3: Effectiveness of coping mechanisms regarding dwelling places**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	47	12.1	4.0000	1.29777
	Somewhat Effective	8	2.1		
	Moderately Effective	14	3.6		
	Very Effective	141	36.1		
	Extremely Effective	171	43.8		
	No response	9	2.3		
	Total	390	100.0		

The qualitative data shows that coping mechanisms regarding dwelling places were overtaken through putting mud around the homestead, polythene or dry leaves around the homestead to protect from water were extremely effective and renovating the house on their own was very effective in managing disasters. On the other hand, the coping mechanisms regarding dwelling places by collecting house construction materials from different sources, using savings for renovating dwelling places and receiving grants from government and other donors for renovating dwelling places were moderately effective and taking loan from informal sector (*Mohajon*) for renovating dwelling places and taking credit from microcredit organization for renovating dwelling places were somewhat effective in managing disasters.

#### 5.8.4. Effectiveness of coping mechanisms regarding losing livelihood

Disasters affect livelihood options of the community people and consequently the community people have to cope with the changing situations through various ways. The Mean value 4.0104 and Std. Dev. value 1.21504 shows that the coping mechanisms regarding losing livelihood options by doing alternative occupation, migrating to cities, selling ornaments and other household valuables, collecting aid and assistance, borrowing money and taking credits were effective (42.6% extremely effective, 35.4% very effective, 7.9% moderately effective, 3.3% somewhat effective) in managing disasters. Table 5.8.4.

**Table 5.8.4: Effectiveness of coping mechanisms regarding losing livelihood**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	35	9.0	4.0104	1.21504
	Somewhat Effective	13	3.3		
	Moderately Effective	31	7.9		
	Very Effective	138	35.4		
	Extremely Effective	166	42.6		
	No response	7	1.8		
	Total	390	100.0		

The qualitative data shows that coping mechanisms regarding losing livelihood by doing alternative (small farmer sold his labour to big farmer) occupation was extremely effective; migrating to cities (Dhaka, Sylhet, Chattogram, Cumilla, Mymensingh etc.) was very effective. Working outside (women have to work outside to shoulder the family responsibilities), selling ornaments, livestock and household valuables and borrowing money from others and taking credits were moderately effective in managing disasters. On the other hand, the coping by collecting aid and assistance was somewhat effective in managing disasters.

### 5.8.5. Effectiveness of coping mechanisms regarding agricultural damages

The coping mechanisms regarding agricultural damages by changing cropping schedule, preserving seeds, regarding agricultural damages, planting new crops, crop diversification, using stress resistant variety, water and soil conservation, animals rearing, buying and borrowing of seed, seedlings etc. were effective (42.2% extremely effective, 39.7 very effective, 5.1% moderately effective, 3.8% somewhat effective) in managing disaster (Mean=4.0625 and Std. Dev=1.15677). Table 5.8.5.

**Table 5.8.5: Effectiveness of coping mechanisms regarding agricultural damages**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	30	7.7	4.0625	1.15677
	Somewhat Effective	15	3.8		
	Moderately Effective	20	5.1		
	Very Effective	155	39.7		
	Extremely Effective	164	42.2		
	No response	6	1.5		
	Total	390	100.0		

The qualitative data shows that coping mechanisms regarding agricultural damages by changing plantation and harvesting schedule, changing crops/crop switching/crop diversification, planting new crops, preserving seeds, raising seedling ground, using high-yield water sensitive crops, purchasing seed from relatives, neighbours or government were extremely effective in managing disasters. The coping mechanisms by getting seeds from government and NGOs, using drought-resistant varieties, borrowing seeds from relatives or neighbour, taking lease of agricultural land, duck rearing in the flooded area were very effective and mixed crop livestock farming, mixed crop fish farming, borrowing seedling from relatives or neighbours were moderately effective in managing disasters. On the other hand, the coping mechanisms regarding agricultural damages by

borrowing fertilizer, pesticides and fuel, conservation of water, conservation of soil and floating garden in the flooded area were somewhat effective in managing disasters.

#### 5.8.6. Effectiveness of coping mechanisms regarding fuel crisis

The women of the community have to face fuel crisis during and after a disaster as they have to shoulder their family responsibilities. The Mean value 4.0052 and Std. Dev. value 1.16216 shows that coping mechanisms regarding fuel crisis through borrowing dry wood from distant relatives, buying gas stoves, using stored dry wood, dry straw, husk and cow dung stick, using *Bondhu* and *Unnoto Chula* etc. were effective (41.8% very effective, 38.7% extremely effective, 7.2% moderately effective, 2.8% somewhat effective) in managing crisis in emergency. Table 5.8.6.

**Table 5.8.6: Effectiveness of coping mechanisms regarding fuel crisis**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	33	8.5	4.0052	1.16216
	Somewhat Effective	11	2.8		
	Moderately Effective	28	7.2		
	Very Effective	163	41.8		
	Extremely Effective	151	38.7		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that coping mechanisms regarding fuel crisis by using stored dry wood, dry straw, husk and cow dung stick, using *Bondhu* and *Unnoto Chula* were extremely effective while borrowing dry wood from distant relatives was very effective, collecting dry wood from far by women was moderately effective and buying gas stove was somewhat effective in managing disasters.



### 5.8.7. Effectiveness of coping mechanisms regarding water, health and sanitation issues

To manage the crisis of water, health and sanitation the community people applied coping mechanisms. Such as, collecting herbal medicine, fetching drinking water from far, medicine, purifying water, making oral saline, consulting with doctor of community clinic, village doctor, collecting napkin for girls and women, using purified rain water, raising ground of tube well etc. These coping mechanisms of community people were effective (42.3% extremely effective, 32.6 very effective, 6.2% somewhat effective, 5.1% moderately effective) in managing water, health and sanitation issues in emergency (Mean=3.8851 and Std. Dev=1.35266). Table 5.8.7.

**Table 5.8.7: Effectiveness of coping mechanisms regarding water, health and sanitation issues**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	47	12.1	3.8851	1.35266
	Somewhat Effective	24	6.2		
	Moderately Effective	20	5.1		
	Very Effective	127	32.6		
	Extremely Effective	165	42.3		
	No response	7	1.8		
	Total	390	100.0		

The qualitative data shows that coping mechanisms regarding water, health and sanitation issues by purifying water by *fitkiri* and boiling, making oral saline and using purified rain water were extremely effective while collecting herbal medicine (*thankuni pata*, *tulshi pata*, etc.) and self-treatment, drinking water from far distance and raising platform of tube well by 4-7 feet were very effective in managing disasters. On the other hand, consulting with doctors in the community clinic and village doctors for the better treatment for fever, skin diseases, diarrhoea, cholera, headache, liver problem, ulcer etc.

and collecting napkin for girls and women sanitation were moderately effective while collecting medicine and distributing among the affected relatives and neighbours was somewhat effective in managing disasters.

#### **5.8.8. Effectiveness of initiatives to manage coping mechanisms regarding water, health and sanitation issues**

The initiatives to manage the coping mechanisms regarding water, health and sanitation by selling livestock and household valuables, selling food grains, using own savings, collecting aid and assistance, borrowing money from others and selling ornaments were effective (44.1% extremely effective, 32.8 very effective, 7.7% moderately effective, 4.4% somewhat effective) in emergency (Mean=4.0000 and Std. Dev.=1.24699). Table 5.8.8.

**Table 5.8.8: Effectiveness of initiatives to manage coping mechanisms regarding water, health and sanitation issues**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	36	9.2	4.0000	1.24699
	Somewhat Effective	17	4.4		
	Moderately Effective	30	7.7		
	Very Effective	128	32.8		
	Extremely Effective	172	44.1		
	No response	7	1.8		
	Total	390	100		

The qualitative data shows that the initiatives regarding managing water, health and sanitation issues by selling food grains (rice, wheat, corn, potato etc.), livestock (cow, goat, hen, duck) and household valuables were extremely effective while borrowing money from others (relatives, *Mohajon*, NGOs, neighbours etc.) and collecting aid and assistance (from government authorities, union *Parishad* etc.) were very effective in

managing disasters. On the other hand, initiative to manage coping mechanisms regarding water, health and sanitation issues by own savings (savings in hand) was moderately effective while selling ornaments of women was somewhat effective in managing disasters.

### **5.8.9. Effectiveness of coping mechanisms regarding protecting violence against women and girls**

The protection of women and girls from violence is a priority for managing disasters. Therefore, the Mean value 4.0284 and Std. Dev. value 1.21379 indicates that the coping mechanisms regarding protecting violence against women and girls through staying together at home or shelter house, protection against eve teasing and sexual harassment, keeping stick with women and girls and using torch or hurricane lamp at night were effective (44.6% extremely effective, 34.6 very effective, 6.2% moderately effective, 5.9% somewhat effective) in ensuring protection of women and girls during emergency. Table 5.8.9.

**Table 5.8.9: Effectiveness of coping mechanisms regarding protecting violence against women and girls**

<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Not Effective	31	7.9	4.0284	1.21379
	Somewhat Effective	23	5.9		
	Moderately Effective	24	6.2		
	Very Effective	135	34.6		
	Extremely Effective	174	44.6		
	No response	3	.8		
	Total	390	100.0		

The qualitative data shows that coping mechanisms regarding violence against women and girls by staying together at home or shelter house when male member sacrificed their

regular gossiping in the village shop, *haat and bazaar* at night was extremely effective while protecting eve teasing, sexual harassment and using torch or hurricane lamps at night were very effective in protecting violence against women and girls. Moreover, keeping sticks with girls and women to save them from sexual harassment and snakes was somewhat effective.

#### 5.8.10. Effectiveness of initiatives for making the community neat and clean

The community's environment may be unclean as an aftermath of disaster. The cleanliness of community after a disaster is important to protect infectious, water borne and other diseases. The initiatives (such as, removing debris, dirt and garbage, putting line for draining water, taking away broken trees, removing mud and silt etc.) were effective (46.2% extremely effective, 31.3 very effective, 7.4% moderately effective, 6.4% somewhat effective) in managing disaster (Mean=4.0285 and Std. Dev.=1.22600). Table 5.8.10.

**Table 5.8.10: Effectiveness of initiatives for making the community neat and clean**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	30	7.7	4.0285	1.22600
	Somewhat Effective	25	6.4		
	Moderately Effective	29	7.4		
	Very Effective	122	31.3		
	Extremely Effective	180	46.2		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that initiatives for making the community neat and clean by taking away broken trees' leaves, uprooted banana trees and mud, silt from home ground and removing dirt and garbage and removing debris were extremely effective while putting line for running out the logged water was somewhat effective.

**5.8.11. Effectiveness of measures taken by community people to mitigate disaster risks**

Mitigating disaster risks is the priority of disaster management especially community-based disaster management. Table 5.8.11 shows that the measures by making structural modification, relocating of their construction, making land use planning, making resistant construction, monitoring fault in embankment and water level, making redundancy of life safety infrastructure, repairing embankment, putting sand bags, re-excavating canals for draining water, making bamboo fence, planting trees and grass and making cement square shape were effective (40.8% very effective, 40.3% extremely effective, 5.6% somewhat effective, 5.4% moderately effective) in mitigating disaster risk (Mean=4.0129 and Std. Dev.= 1.16687).

**Table 5.8.11: Effectiveness of measures taken by community people to mitigate disaster risks**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	29	7.4	4.0129	1.16687
	Somewhat Effective	22	5.6		
	Moderately Effective	21	5.4		
	Very Effective	159	40.8		
	Extremely Effective	157	40.3		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that the measures taken by community people for mitigating disasters risks by structural modification, relocating of their construction, making land use planning (making their house, religious and education institutes) and planting trees to protect wind and embankment and grass to protect embankment from destroying were extremely effective while making resistant construction was very effective in managing disaster risk. Furthermore, monitoring fault in embankment for repairing and water level

to disseminate the early warning signals, making redundancy of life safety infrastructure were moderately effective while repairing embankment to protect flood water, putting sand bags to protect dam and embankment, re-excavating canals for draining water to protect water logging and making bamboo fence to protect embankment were somewhat effective in managing disaster risk.

#### 5.8.12. Effectiveness of NGOs' initiatives

The Mean value 4.0207 and Std. Dev. value 1.15526 indicates that NGOs' initiatives to strengthen coping mechanisms by creating awareness among the community people, forming volunteer group, providing relief and credit to the victims to cope with changing situation, providing aid and assistance for agricultural rehabilitation, providing shelter, health and sanitation and providing micro credit were effective (43.1% very effective, 38.7% extremely effective, 6.4% somewhat effective, 2.1% moderately effective) in strengthening the coping mechanisms. Table 5.8.12.

**Table 5.8.12: Effectiveness of NGOs' initiatives**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	34	8.7	4.0207	1.15526
	Somewhat Effective	8	2.1		
	Moderately Effective	25	6.4		
	Very Effective	168	43.1		
	Extremely Effective	151	38.7		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that NGOs' initiatives to strengthen community coping mechanism by forming volunteer group with youth and creating awareness on vulnerability and disaster risks among the community people were extremely effective while providing relief and credit to the victims to cope with changing situation was

moderately effective in strengthening community coping mechanisms. Moreover, providing shelter, health and sanitation aid, providing seeds, pesticide and insecticides for agricultural rehabilitation and providing micro credit were somewhat effective in strengthening community coping mechanisms.

### 5.8.13. Effectiveness of NGOs provided training programs

Table 5.8.13 shows the training programs provided by NGOs on cropping new variants of crops, pure drinking water, health and sanitation issues, poultry, livestock and fisheries, tree plantation, horticulture and apiculture and making oral saline were effective (41.8% extremely effective, 38.5 very effective, 5.6% somewhat effective, 4.1% moderately effective) in strengthening community coping mechanisms (Mean=4.0026 and Std. Dev.=1.21838).

**Table 5.8.13: Effectiveness of NGOs provided training programs**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	36	9.2	4.0026	1.21838
	Somewhat Effective	16	4.1		
	Moderately Effective	22	5.6		
	Very Effective	150	38.5		
	Extremely Effective	163	41.8		
	No response	3	.8		
	Total	390	100.0		

The qualitative data shows that NGOs' trainings on poultry, livestock and fisheries and pure drinking water, health and sanitation issues were very effective while tree plantation was moderately effective in strengthening community coping mechanisms. Moreover, training on making oral saline to protect from diarrhoea and cholera was somewhat effective in strengthening community coping mechanisms.

**5.8.14. Effectiveness of NGOs provided supports for relief and agricultural rehabilitation**

Relief is important in managing disaster while agricultural rehabilitation is important in restoring the livelihood option. The Mean value 3.7169 and Std. Dev. value 1.26876 specifies that the supports of NGOs to relief and agricultural rehabilitation through providing micro credit, loan, providing loan for seed, fertilizer pesticide and construction materials were effective (39.5% very effective, 30.3 extremely effective, 12.6% somewhat effective, 6.6% moderately effective) in strengthening community coping mechanisms. Table 5.8.14.

**Table 5.8.14: Effectiveness of NGOs provided supports for relief and agricultural rehabilitation**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	42	10.7	3.7169	1.26876
	Somewhat Effective	26	6.6		
	Moderately Effective	49	12.6		
	Very Effective	150	38.5		
	Extremely Effective	118	30.3		
	No response	5	1.3		
	Total	390	100.0		

The qualitative data shows that NGOs’ supports which provides cash in hand was very effective while providing seed, fertilizer and pesticide and providing construction materials were somewhat effective and sometimes not effective in strengthening community coping mechanisms.



### 5.8.15. Effectiveness of NGOs provided health services

The NGOs health services provides water purifying tablet, oral saline, carbolic soap and sanitizer and paracetamol tablet were effective (25.4% very effective, 23.6 somewhat effective, 16.4% extremely effective, 14.6% moderately effective) in strengthening community coping mechanisms (Mean=2.9817 and Std. Dev. value=1.38321). Table 5.8.15.

**Table 5.8.15: Effectiveness of NGOs provided health services**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	71	18.2	2.9817	1.38321
	Somewhat Effective	92	23.6		
	Moderately Effective	57	14.6		
	Very Effective	99	25.4		
	Extremely Effective	64	16.4		
	No response	7	1.8		
	Total	390	100.0		

The qualitative data shows that NGOs' supports by providing water purifying tablet was very effective while providing oral saline was moderately effective and providing carbolic soap and paracetamol tablet were somewhat effective and sometimes not effective in strengthening community health services.

### 5.8.16. Effectiveness of government initiatives

Table 5.8.16 shows that the initiatives of government authorities through making shelter, forming volunteer group, providing aid and assistance for restoring agriculture, creating awareness, forecasting early warning signals, building bridge, culvert, road and embankment, providing health and sanitation aid and providing relief and credit for rehabilitation were effective (48.2% extremely effective, 32.8 very effective, 4.6% moderately effective, 3.6% somewhat effective) in strengthening community coping mechanisms (Mean=4.0567 and Std. Dev.=1.26650).

**Table 5.8.16: Effectiveness of government initiatives**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	40	10.3	4.0567	1.26650
	Somewhat Effective	14	3.6		
	Moderately Effective	18	4.6		
	Very Effective	128	32.8		
	Extremely Effective	188	48.2		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that government authorities initiatives for making shelter in the local schools' and colleges' premises during disasters and forming volunteer group with affected people to ensure equal distribution of aid and assistance and disseminating early warning signals to protect the vulnerable people, building bridge, culvert road and embankment, creating awareness were extremely effective while providing aid and assistance for restoring agriculture was very effective and providing relief and credit through local government representative (UP member and chairman) for rehabilitation was moderately effective in strengthening coping mechanisms.

**5.8.17. Effectiveness of government provided supports for relief and agricultural rehabilitation**

Supports of government authorities for agricultural rehabilitation by providing locally adaptive technology, early warning for harvesting, purchasing agricultural products from local market or farmers, providing agricultural loan, aid and assistance for compost manure, stress and diseases tolerant seed, fertilizer and pesticide, cropping schedule etc. were effective (42.8% extremely effective, 34.1 very effective, 9.2% moderately effective, 6.9% somewhat effective) in strengthening community mechanisms (Mean=4.0129 and Std. Dev.= 1.16838). Table 5.8.17.

**Table 5.8.17: Effectiveness of government provided supports for relief and agricultural rehabilitation**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	24	6.2	4.0129	1.16838
	Somewhat Effective	27	6.9		
	Moderately Effective	36	9.2		
	Very Effective	133	34.1		
	Extremely Effective	167	42.8		
	No response	3	.8		
	Total	390	100.0		

The qualitative data shows that government supports for agricultural rehabilitation by providing locally adaptive technology and early warning for harvesting or farmers were extremely effective while purchasing agricultural products from local market or farmers, providing agricultural loan and aid and assistance were very effective and cropping schedule was moderately effective in strengthening coping mechanisms.

**5.8.18. Effectiveness of government provided supports for health services**

Table 5.8.18 highlights that the health supports of government authorities by providing water purifying tablet, oral saline, carbolic soap and sanitizer and paracetamol tablet were effective (34.4% extremely effective, 32.8 very effective, 11.7% moderately effective, 10% somewhat effective) in strengthening community health mechanisms (Mean=3.7658 and Std. Dev.= 1.27090).

**Table 5.8.18: Effectiveness of government provided supports for health services**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	33	8.5	3.7658	1.27090
	Somewhat Effective	39	10.0		
	Moderately Effective	46	11.7		

	Very Effective	128	32.8		
	Extremely Effective	134	34.4		
	No response	10	2.6		
	Total	390	100.0		

The qualitative data shows that government supports to health services by providing water purifying tablet was extremely effective while providing oral saline and carbolic soap were moderately effective and providing paracetamol tablet through community clinic, union health care centre and union sub-health care centre was somewhat effective in strengthening coping mechanisms.

#### **5.8.19. Effectiveness of government provided training programs**

The Mean value 4.0103 and Std. Dev. value 1.08782 indicates that government provided training programs on cropping new variants of crops, pure drinking water, health and sanitation issues, poultry, livestock and fisheries, tree plantation, horticulture and apiculture and making oral saline were effective (41% very effective, 37.9% extremely effective, 9% moderately effective, 6.7% somewhat effective) in strengthening community coping mechanisms. Table 5.8.19.

**Table 5.8.19: Effectiveness of government provided training programs**

<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Not Effective	19	4.9	4.0103	1.08782
	Somewhat Effective	26	6.7		
	Moderately Effective	35	9.0		
	Very Effective	160	41.0		
	Extremely Effective	148	37.9		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that trainings by government on new variants of crops, poultry, livestock and fisheries, tree plantation and making oral saline were extremely effective while training on pure drinking water, health and sanitation issues was very effective and training on horticulture and apiculture was moderately effective and sometimes was somewhat effective in strengthening coping mechanisms.

#### 5.8.20. Effectiveness of shared information/knowledge with responsible personalities

Community people's participation in risk reduction options by sharing information with members of union disaster management committee, community disaster management committee, social, religious and political leaders, Union *Parishad* member and chairman, NGOs' representative and other member of community were effective (44.4% extremely effective, 33.8 very effective, 6.9% moderately effective, 6.2% somewhat effective) in managing disaster (Mean=4.0052 and Std. Dev. = 1.22842). Table 5.8.20.

**Table 5.8.20: Effectiveness of shared information/knowledge with responsible personalities**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	32	8.2	4.0052	1.22842
	Somewhat Effective	24	6.2		
	Moderately Effective	27	6.9		
	Very Effective	132	33.8		
	Extremely Effective	173	44.4		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that sharing information/knowledge on risk reduction options such as, on time of disaster occurrence, vulnerability of the community people, socio-economic condition of the most vulnerable group, types of disaster risks, types of hazards etc. with the representative of local government (Union *Parishad* member and chairman

were extremely effective in managing disaster while members of community disaster management committee, community leaders (social, religious and political) were very effective. Moreover, sharing information with other members of community was moderately effective and sharing information with representatives of NGOs was somewhat effective in managing disaster.

**5.8.21. Effectiveness of community people’s participation in sharing information/knowledge to create hazard maps**

Hazard map is an essential instrument for community-based disaster management approach. The creation of hazard map needs information from local people to put it in the perfect location. So, effective hazard map depends on the information from community people. The Mean value 4.0103 and Std. Dev. value 1.23677 shows that the community people’s participation in risk reduction options by locating houses, forest and trees, water reservoir, land types, drinking water sources, public places, communication facilities, service centres and identifying local hazards’ intensity, frequency, damageability and risk were effective (47.3% extremely effective, 27.9 very effective, 10% moderately effective, 6.9% somewhat effective) in helping the concerned stakeholders to understand the risks of natural hazards in the community. Table 5.8.21.

**Table 5.8.21: Effectiveness of community people’s participation in sharing information/knowledge to create hazard maps**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	29	7.4	4.0103	1.23677
	Somewhat Effective	27	6.9		
	Moderately Effective	39	10.0		
	Very Effective	109	27.9		
	Extremely Effective	184	47.3		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that shared information/knowledge on the type of hazards in the locality, intensity of particular hazard, probability of loss and damages caused by a particular hazard, velocity of flood water and staying time of flood water to create hazards map were extremely effective in managing disaster while the places of water logging, most inundating area with flood water and most vulnerable point on the embankment to damages were very effective.

**5.8.22. Effectiveness of community people’s participation in hazard/disaster identification**

Hazard/disaster identification is tough without the help of local community people. The community people’s participation in hazard/disaster identification for assessing risk is essential in community disaster risk reduction options. Table 5.8.22 shows that the community people’s participation by sharing the information on previous hazard/disaster, its seasonality and damageability, types of disaster that the people faced, hazard based warning and response mechanisms were effective (44.7% extremely effective, 31% very effective, 11% moderately effective, 5.9% somewhat effective) in hazard/disaster identification for assessing risk (Mean= 4.0103 and Std. Dev.= 1.19426)

**Table 5.8.22: Effectiveness of community people’s participation in hazard/disaster identification**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	27	6.9	4.0103	1.19426
	Somewhat Effective	23	5.9		
	Moderately Effective	43	11.0		
	Very Effective	121	31.0		
	Extremely Effective	174	44.7		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that the community people’s participation in identification of hazards by sharing information/knowledge on previous hazard in the locality such as, flood, drought, tornado, water logging, cyclone and seasonality of disasters was extremely effective in assessing risk. Moreover, they shared the time of the occurrence and risk of those hazards, damages and losses to health and lives, and environmental degradation were very effective in assessing risk.

**5.8.23. Effectiveness of community people’s participation in vulnerability assessment**

Community people are well aware of their vulnerability to disaster. Their participation is needed to assess the vulnerability within the community for assessing disaster risk. Therefore, Mean value 4.0232 and Std. Dev. value 1.12154 indicates that the community people’s participation in assessing vulnerability by sharing the information on vulnerable population, area, structure, infrastructure, livelihood options, water, health and sanitation issues, physical and relational connectivity, aid and assistance, savings, demographic characteristics, etc. were effective (41% extremely effective, 36.9% very effective, 9.8% moderately effective, 6.4% somewhat effective) in assessing risk. Table 5.8.23.

**Table 5.8.23: Effectiveness of community people’s participation in vulnerability assessment**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	21	5.4	4.0232	1.12154
	Somewhat Effective	25	6.4		
	Moderately Effective	38	9.8		
	Very Effective	144	36.9		
	Extremely Effective	160	41.0		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that the community people’s participation in assessing vulnerability to assess the risks by sharing the information on resistant houses, the



information on demography and sharing the information on alternative livelihood options were extremely effective in assessing risks. Furthermore, the community people's participation in assessing vulnerability to assess the risks by sharing the information on access to natural resources, market, public and health services, the information on savings and assets and the information to preserve pure drinking water, sanitation and hygiene (most of tube wells and latrine were inundated by flood water and the community faced a lack of safe drinking water) was very effective in assessing vulnerability to assess the risks.

#### **5.8.24. Effectiveness of community people's participation in risk analysis**

Risk analysis is an important issue in disaster management especially in community-based approach. To identify the root causes of risk community people's participation is essential since they are informed about the disaster risks. Therefore, community people's participation in analysing risk by identifying local hazards, natural and man-made elements, risk for health, water, hygiene and sanitation and vulnerable groups and sharing information on environmental set up for assessing disaster risks was effective (Mean=4.0284 and Std. Dev.= 1.20795). Table 5.8.24.

**Table 5.8.24: Effectiveness of community people's participation in risk analysis**

<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Not Effective	26	6.7	4.0284	1.20795
	Somewhat Effective	33	8.5		
	Moderately Effective	22	5.6		
	Very Effective	130	33.3		
	Extremely Effective	177	45.4		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that the community people’s participation in analysing risk by identifying risk for most vulnerable, identifying the risks for crops and livestock and identifying locals was extremely effective in analysing risk to assess the risks. Sharing information on local environmental set up was very effective in the analysis for assessing the risks.

**5.8.25. Effectiveness of community people’s participation in awareness raising campaigns**

Awareness about disaster helps to manage disaster risk. The Mean value 4.0264 and Std. Dev. value 1.14288 means that to raise awareness about the roles and responsibilities of various stakeholders within the community, land acquisition and environment, health, water, sanitation, behavioural changes, preserving food, fodder, fuel and medical accessories assisted to address vulnerability and risk through the active participation of community people were effective (40.3% extremely effective, 37.2% very effective, 8.2% moderately effective, 5.1% somewhat effective) in managing disasters. Table 5.8.25.

**Table 5.8.25: Effectiveness of community people’s participation in awareness raising campaigns**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	25	6.4	4.0264	1.14288
	Somewhat Effective	20	5.1		
	Moderately Effective	32	8.2		
	Very Effective	145	37.2		
	Extremely Effective	157	40.3		
	No response	11	2.8		
	Total	390	100.0		

The qualitative data shows that the community people's participation in awareness raising campaigns to preserve food and fodder, fuel, water sources, medical accessories and saving money and assets, other dry food items and gathering concerns and view related sewerage, health, sanitation for the community was extremely effective in managing disasters. Discussing the roles and responsibilities of various stakeholders within the community and eliminating risk for the natural environment were very effective in managing disasters. Moreover, the community people's participation in discussing the issues of land acquisition, resettlement and environmental clearance within the community was moderately effective and involving in behavioural change for building awareness for hygiene, sanitation and pure drinking water was somewhat effective in managing disaster.

**5.8.26. Effectiveness of community people's participation in early warning system**

The effective dissemination of warning signals reduces damages and losses in a mentionable rate. Table 5.8.26 shows that the people participation in community early warning system by receiving the warning signals from the government and translate it into their local signals, disseminating translated warning signals, taking special responsibility to disseminate the warning signals to the most vulnerable people and remote area and selecting the media for disseminating the warning signals was effective (43.8% extremely effective, 36.8% very effective, 9.7% moderately effective, 4.6% somewhat effective) in reducing risk (Mean=4.1269 and Std. Dev. = 1.04295).

**Table 5.8.26: Effectiveness of community people's participation in early warning system**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	16	4.1	4.1269	1.04295
	Somewhat Effective	18	4.6		
	Moderately Effective	38	9.7		
	Very Effective	143	36.8		

	Extremely Effective	171	43.8		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that community people’s participation in early warning system by receiving the warning signals of the government and translate it into their local signals; disseminating translated warning signals, taking special responsibility to spread the warning signals to most susceptible people and remote areas was extremely effective in managing disaster. Moreover, their participation in warning system by selecting the media for disseminating the warning signals was very effective in managing disaster.

**5.8.27. Effectiveness of community people’s participation in search and rescue operation**

Effectiveness of search and rescue operation depends on the active participation of the community people. The Mean value 4.1625 and Std. Dev. value 1.11354 utters that community people’s participation by identifying more vulnerable people, assets, infrastructure, sharing the location hazard prone and risk area and providing help to rescue operation team was effective (39.5% extremely effective, 30% very effective, 4.4% moderately effective, 2.8% somewhat effective) in reducing risk. Table 5.8.27.

**Table 5.8.27: Effectiveness of community people’s participation in search and rescue operation**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	21	5.4	4.1625	1.11354
	Somewhat Effective	11	2.8		
	Moderately Effective	17	4.4		
	Very Effective	117	30.0		
	Extremely Effective	154	39.5		
	No response	70	17.9		
	Total	390	100.0		

The qualitative data shows that community people’s participation in search and rescue operation by sharing information on damage and risks prone area (such as, identifying the most vulnerable places- river side house, house adjacent to jungles, separated houses from the crowded area, etc. and most vulnerable groups- pregnant and lactating women, children, aged people and differently abled people) was extremely effective while providing help to rescue operation team was very effective in managing disaster.

**5.8.28. Effectiveness of community people’s participation in providing medical first aid**

Medical first aid is an essential instrument for managing health risk. The community people’s participation in providing medical first aid by sharing the knowledge of making saline, purifying water and herbal medicines and sharing the emergency medical first aid equipment with other members of the community was effective (42.6% extremely effective, 32.5% very effective, 8.2% moderately effective, 6.2% somewhat effective) in reducing health risk (Mean=4.0053 and Std. Dev=1.20503). Table 5.8.28.

**Table 5.8.28: Effectiveness of community people’s participation in providing medical first aid**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	28	7.2	4.0053	1.20503
	Somewhat Effective	24	6.2		
	Moderately Effective	32	8.2		
	Very Effective	127	32.5		
	Extremely Effective	166	42.6		
	No response	13	3.3		
	Total	390	100.0		

The qualitative data shows that community people’s participation in providing medical first aid by sharing the knowledge of making saline, purifying water and herbal medicines

(such as, how to make oral saline with sugar, salt and water, how to purify water to drink and make themselves familiar with the herb around the nature) was extremely effective and sharing the emergency medical first aid equipment with other members of the community was very effective in managing disaster.

### **5.8.29. Effectiveness of community people’s participation in providing psychological support**

Psychological support is needed for traumatized individual after a disaster. The relatives, neighbours, friends and family members provide psychological support for traumatized individuals to recover them from that trivial situation. Table 5.8.29 shows that the community people’s participation in providing psychological support was effective (42.6% extremely effective, 34.8% very effective, 6.4% moderately effective, 5.4% somewhat effective) in reducing mental stress and problem (Mean=4.0079 and Std. Dev. =1.21878).

**Table 5.8.29: Effectiveness of community people’s participation in providing psychological support**

<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Not Effective	32	8.2	4.0079	1.21878
	Somewhat Effective	21	5.4		
	Moderately Effective	25	6.4		
	Very Effective	136	34.8		
	Extremely Effective	166	42.6		
	No response	10	2.6		
	Total	390	100.0		

The qualitative data shows that psychological support provided by community people to the traumatized individual by providing them with mental support (such as, discussing the problems and giving time) was extremely effective while sharing the source of getting

better support (such as, sharing the name of the consultant) was very effective in managing disaster.

### **5.8.30. Effectiveness of community people’s participation in restoring activities for agricultural rehabilitation**

Agricultural rehabilitation is important in livelihood management after a disaster. The Mean value 4.1395 and Std. Dev. value 1.09458 speaks that the community people participation in restoring the activities for agricultural rehabilitation by sharing the knowledge on best practices of cropping, harvesting and access to market, giving preserved seed as loan and sharing information on getting support was effective (46.7% extremely effective, 35.6% very effective, 6.7% somewhat effective, 5.6% moderately effective) in reducing risk. Table 5.8.30.

**Table 5.8.30: Effectiveness of community people’s participation in restoring activities for agricultural rehabilitation**

<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Not Effective	18	4.6	4.1395	1.09458
	Somewhat Effective	26	6.7		
	Moderately Effective	22	5.6		
	Very Effective	139	35.6		
	Extremely Effective	182	46.7		
	No response	3	.8		
	Total	390	100.0		

The qualitative data shows that community people’s participation in restoring the activities for agricultural rehabilitation by giving preserved seed (such as, rice, wheat, mustard, jute, vegetables seeds) as loan was extremely effective while sharing the knowledge on best practices of cropping, harvesting and access to market (such as, information on the best time to cultivate and harvest the crops and process for marketing)

were very effective and sharing information on getting support was moderately effective in managing disaster.

### 5.8.31. Effectiveness of community people’s participation in distribution of relief

Relief distribution is tough after a disaster without the active participation of community people. The community people’s participation by providing help to elderly people, pregnant women and disables in getting the relief and helping to avoid unexpected situation in case of relief distribution was effective (37.9% extremely effective, 31.8% very effective, 11.3% moderately effective, 6.4% somewhat effective) in managing distribution of relief (Mean=3.8644 and Std. Dev. =1.26500). Table 5.8.31.

**Table 5.8.31: Effectiveness of community people’s participation in distribution of relief**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	35	9.0	3.8644	1.26500
	Somewhat Effective	25	6.4		
	Moderately Effective	44	11.3		
	Very Effective	124	31.8		
	Extremely Effective	148	37.9		
	No response	14	3.6		
	Total	390	100.0		

The qualitative data shows that community people’s participation in the distribution of relief by providing help to elderly people, pregnant women and disabled people’s in getting the relief was extremely effective and helping to avoid unexpected situation in case of relief distribution was very effective in managing disaster.



**5.8.32. Effectiveness of community people’s participation in integrating the local disaster reduction options with national development**

The sustainability of the activities regarding disaster management depends on the successful integration of those activities with national development initiatives and/or vice versa. Table 5.8.32 shows that the community people’s participation in integration of local disaster reduction options with national development activities by integrating indigenous knowledge on DRR with the knowledge of national development that was provided by the local government and representative from local administration and sharing the thinking regarding risk reduction to government representative to mainstream local knowledge into development activities was effective (35.4% extremely effective, 34.8% very effective, 10.3% somewhat effective, 9% moderately effective) in managing disaster (Mean=3.8084 and Std. Dev. = 1.26388).

**Table 5.8.32: Effectiveness of community people’s participation in integrating the local disaster reduction options with national development**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	32	8.2	3.8084	1.26388
	Somewhat Effective	40	10.3		
	Moderately Effective	35	9.0		
	Very Effective	136	34.8		
	Extremely Effective	138	35.4		
	No response	9	2.3		
	Total	390	100.0		

The qualitative data shows that community people’s participation in the integration of local disaster reduction options with national development activities by integrating indigenous knowledge on DRR with the knowledge of national development that was provided by the local government and representatives from local administration was very effective in managing disaster. Moreover, their participation in integration of local

disaster reduction option with national development activities by sharing the thought-process regarding risk reduction to government representatives and finally to mainstream local knowledge into development activities was moderately effective in managing disaster.

**5.8.33. Effectiveness of community people’s engagement in maintaining physical connectivity**

Physical connectivity is severely affected by disasters and which may affect the disaster management activities in the affected territory. The Mean value 4.0258 and Std. Dev. value 1.13783 says that the community people’s engagement in maintaining physical connectivity for strengthening community risk reduction options by monitoring drinking water supply system, health, hygiene and sanitation system, natural infrastructure, road connectivity communication and transportation system and taking initiatives was effective (42.3% extremely effective, 34.9% very effective, 9.7% moderately effective, 6.9% somewhat effective) in managing disaster. Table 5.8.33.

**Table 5.8.33: Effectiveness of community people’s engagement in maintaining physical connectivity**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	21	5.4	4.0258	1.13783
	Somewhat Effective	27	6.9		
	Moderately Effective	38	9.7		
	Very Effective	136	34.9		
	Extremely Effective	165	42.3		
	No response	3	.8		
	Total	390	100.0		

The qualitative data shows that community people’s participation in maintaining physical connectivity to strengthen community risk reduction options by monitoring drinking water supply system, health, hygiene and sanitation system and taking initiatives was

extremely effective in managing disaster while monitoring natural infrastructure and taking initiatives to protect contamination and monitoring road connectivity was very effective. Moreover, their participation in maintaining physical connectivity to strengthen community risk reduction options by monitoring communication and transportation system and taking initiative was moderately effective in managing disaster.

#### **5.8.34. Effectiveness of community people’s engagement in maintaining relational connectivity**

Effectiveness of disaster management varies by the engagement of the community in maintaining relational connectivity with different stakeholders since it is a network-based activity. The relational connectivity with the member of UDMC; member of Union *Parishad*; representative of BADC, representative of micro-finance and financial organizations; and representative of NGOs was effective (40.4% extremely effective, 35.6% very effective, 12.3% moderately effective, 7.4% somewhat effective) in strengthening community risk reduction options (Mean= 4.0155 and Std. Dev. =1.08538). Table 5.8.34.

**Table 5.8.34: Effectiveness of community people’s engagement in maintaining relational connectivity**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	15	3.8	4.0155	1.08538
	Somewhat Effective	29	7.4		
	Moderately Effective	48	12.3		
	Very Effective	139	35.6		
	Extremely Effective	157	40.4		
	No response	2	.5		
	Total	390	100.0		

The qualitative data shows that community people’s engagement in maintaining relational connectivity with the member of UDMC; and member of Union *Parishad* was

very effective in managing disaster while maintaining relational connectivity with representative of NGOs was moderately effective. Moreover, maintaining relational connectivity with representative of BADC (such as, Block supervisor); and representative of micro-finance and financial organizations was somewhat effective in managing disaster.

### 5.8.35. Effectiveness of CBOs' activities in pre-disaster phase

The CBOs' activities in pre-disaster phase through understanding the nature of disasters and their effects, through preparing disaster preparedness plan, promoting measures for mitigating disasters, analysing vulnerability and risk and assessing and mobilizing resources were effective (40.6% extremely effective, 36.9% very effective, 9.2% moderately effective, 6.9% somewhat effective) in managing disaster (Mean=4.0130 and Std. Dev=1.12923). Table 5.8.35.

**Table 5.8.35: Effectiveness of CBOs' activities in pre-disaster phase**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	21	5.4	4.0130	1.12923
	Somewhat Effective	27	6.9		
	Moderately Effective	36	9.2		
	Very Effective	144	36.9		
	Extremely Effective	158	40.6		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that the community-based organizations' (CBOs) participation in pre-disaster phase through understanding the nature of disasters and their effects; constructing disaster preparedness plan; and promoting measures for mitigating disasters were extremely effective in managing disasters while analysing vulnerability and risk assessing and mobilizing resources was very effective.

### 5.8.36. Effectiveness of CBOs' activities during disaster phase

The Table shows that CBOs' activities during disaster phase through operating search, rescue and evacuation, providing shelter for victims, providing first aid, distributing food, water, medicine and fodder, the clearance of debris, shifting of injured to hospital, disposal of dead humans and animals, assisting the rescue team, dissemination of information on hazards and preventing the spreading of rumours, assessing the immediate damages and losses and filing claims were effective (43.3% extremely effective, 34.4% very effective, 10.3% moderately effective, 6.4% somewhat effective) in managing disaster (Mean=4.0648 and Std. Dev.= 1.10416). Table 5.8.36.

**Table 5.8.36: Effectiveness of CBOs' activities during disaster phase**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	18	4.6	4.0648	1.10416
	Somewhat Effective	25	6.4		
	Moderately Effective	40	10.3		
	Very Effective	134	34.4		
	Extremely Effective	169	43.3		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that the community-based organizations' (CBOs) participation during disaster phase through distributing food, water, medicine and fodder, the clearance of debris, shifting of injured to hospital, the disposal of dead humans and animals and assisting the rescue teams were extremely effective in managing disaster while operating search, rescue and evacuation, providing shelter for victims and providing first aid were very effective. Moreover, the community-based organizations' (CBOs) participation during disaster phase through dissemination of information on hazards and preventing the spreading of rumours, assessing the immediate damages and losses and filing claims was moderately very effective in managing disaster.

### 5.8.37. Effectiveness of CBOs' activities in post disaster phase

The Mean value 4.0233 and Std. Dev. value 1.12214 indicates that the activities of CBOs in post-disaster phase through the social rehabilitation, the protection of women, children, elderly people, poor, destitute, infirm and minority, assessing the damages, and the economic rehabilitation were effective (41.3% extremely effective, 35.9% very effective, 9.5% moderately effective, 7.4% somewhat effective) in managing disaster. Table 5.8.37.

**Table 5.8.37: Effectiveness of CBOs' activities in post disaster phase**

Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Not Effective	19	4.9	4.0233	1.12214
	Somewhat Effective	29	7.4		
	Moderately Effective	37	9.5		
	Very Effective	140	35.9		
	Extremely Effective	161	41.3		
	No response	4	1.0		
	Total	390	100.0		

The qualitative data shows that the community-based organizations' (CBOs) participation in post-disaster phase through the protection of women, children, elderly people, poor, destitute, infirm and minority; and through assessing the damages was extremely effective in managing disaster while through assessing the damages and the economic rehabilitation was very effective.

### 5.8.38: Effectiveness of CBDM (Statistical Analysis at a glance)

SL. No	Item	Mean	Std. Dev.	Remark
Practiced coping mechanisms	Coping mechanisms regarding Food Crisis	4.0579	1.19003	Very Effective
	Coping mechanisms regarding Fodder Crisis	4.0306	1.20660	Very Effective
	Coping mechanisms regarding damaged dwelling places	4.0000	1.29777	Very Effective
	Coping mechanisms regarding losing livelihood	4.0104	1.21504	Very Effective
	Coping mechanisms regarding agricultural damages	4.0625	1.15677	Very Effective
	Coping mechanisms regarding fuel crisis	4.0052	1.16216	Very Effective
	Coping mechanisms regarding water, health and sanitation issues	3.8851	1.35266	Moderately Effective
	Initiatives to manage coping mechanisms regarding water, health and sanitation issues	4.0000	1.24699	Very Effective
	Coping mechanisms regarding violence against girls and women	4.0284	1.21379	Very Effective
	Initiatives for making the community neat and clean	4.0285	1.22600	Very Effective
	Measures taken by community people to mitigate disasters risk	4.0129	1.16687	Very Effective
	<b>Average of all items' mean</b>	<b>4.0110</b>	<b>1.22133</b>	<b>Very Effective</b>
NGOs initiatives	NGOs' initiatives for strengthening community coping mechanisms for managing disasters	4.0207	1.15526	Very Effective
	NGOs' provided training programs for strengthening coping mechanisms	4.0026	1.21838	Very Effective
	NGOs provided supports for relief and agricultural rehabilitation for strengthening coping mechanisms	3.7169	1.26876	Moderately Effective
	NGOs' provided health services for strengthening coping mechanisms	2.9817	1.38321	Somewhat Effective
	<b>Average of all items' mean</b>	<b>3.6804</b>	<b>1.25640</b>	<b>Moderately Effective</b>
Government initiatives	Government initiatives for strengthening community coping mechanisms	4.0567	1.26650	Very Effective
	Government provided supports for relief and agricultural rehabilitation for strengthening community coping mechanisms	4.0129	1.16838	Very Effective
	Government provided supports for health services for strengthening community coping mechanisms	3.7658	1.27090	Moderately Effective
	Government provided training programs for strengthening community coping mechanisms	4.0103	1.08782	Very Effective

	<b>Average of all items' mean</b>	<b>3.9614</b>	<b>1.1984</b>	<b>Moderately Effective</b>
Community People's participation in risk reduction options	Shared information/knowledge with responsible personality to assist in managing disaster	4.0052	1.22842	Very Effective
	Community people's participation in sharing information/knowledge to create hazard maps	4.0103	1.23677	Very Effective
	Community people's participation in hazard/disaster identification	4.0103	1.19426	Very Effective
	Community people's participation in vulnerability assessment	4.0232	1.12154	Very Effective
	Community people's participation in risk analysis	4.0284	1.20795	Very Effective
	Community people's participation in awareness raising campaigns	4.0264	1.14288	Very Effective
	Community people's participation in early warning system	4.1269	1.04295	Very Effective
	Community people's participation in search and rescue operation	4.1625	1.11354	Very Effective
	Community people's participation in providing medical first aid	4.0053	1.20503	Very Effective
	Community people's participation psychological supports to normalize traumatized individual	4.0079	1.21878	Very Effective
	Community people's participation in restoring activities for agricultural rehabilitation	4.1395	1.09458	Very Effective
	Community people's participation in distribution of relief	3.8644	1.26500	Moderately Effective
	Practiced activities by community people to make disaster resilience	3.4842	1.21200	Moderately Effective
	Community people's participation in integrating the local disaster risk reduction options with national development	3.8084	1.26388	Moderately Effective
	Community people's engagement in maintaining physical connectivity	4.0258	1.13783	Very Effective
	Community people's engagement in maintaining relational connectivity	4.0155	1.08538	Very Effective
	<b>Average of all items' mean</b>	<b>3.9840</b>	<b>1.1731</b>	<b>Moderately Effective</b>
CBOs activities	CBOs' activities in pre-disaster phase	4.0130	1.12923	Very Effective
	CBOs' activities during disaster phase	4.0648	1.10416	Very Effective
	CBOs' activities in post disaster	4.0233	1.12214	Very Effective
	<b>Average of all items' mean</b>	<b>4.0337</b>	<b>1.11851</b>	<b>Very Effective</b>



## 5.9. Resilient Community

### 5.9.1. Practice of hazard resistant construction

Table 5.9.1 highlights that the community people practiced hazard resilient construction for managing disaster risks (Mean=4.0974 and the Std. Dev=1.27694).

**Table 5.9.1: Practice of hazard resistant construction**

<b>Hazard resistant construction practices were followed by the community people</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	20	5.1	4.0974	1.27694
	Disagree	47	12.1		
	Neutral	39	10.0		
	Agree	53	13.6		
	Strongly agree	231	59.2		
	Total	390	100.0		

### 5.9.2. Environment friendly activities

The Mean value 3.8462 and Std. Dev. value 1.42757 indicates that the community people adopted the environment friendly practices to protect environmental pollution and degradation. Table 5.9.2.

**Table 5.9.2: Environment friendly activities**

<b>Environment friendly activities were adopted by the community people</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	46	11.8	3.8462	1.42757
	Disagree	35	9.0		
	Neutral	50	12.8		
	Agree	61	15.6		
	Strongly agree	198	50.8		
	Total	390	100.0		

### 5.9.3. Sustainable livelihood options

Table 5.9.3 shows that the community people practiced sustainable livelihood options to secure their livelihood in disastrous situation (Mean=4.1718 and Std. Dev=1.12175).

**Table 5.9.3: Sustainable livelihood options**

Sustainable livelihood options were practiced by the community people to avoid the crisis					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Strongly disagree	17	4.4	4.1718	1.12175
	Disagree	25	6.4		
	Neutral	40	10.3		
	Agree	100	25.6		
	Strongly agree	208	53.3		
	Total	390	100.0		

### 5.9.4. Better hygiene practices

The Mean value 3.9026 and Std. Dev. Value 1.19155 proves that the community people enjoyed health safety due to their better hygiene practices in the community in case of protecting health hazard. Table 5.9.4.

**Table 5.9.4: Community hygiene practices**

Community people enjoyed health safety due to better hygiene practices					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Strongly disagree	23	5.9	3.9026	1.19155
	Disagree	36	9.2		
	Neutral	51	13.1		
	Agree	126	32.3		
	Strongly agree	154	39.5		
	Total	390	100.0		

### 5.9.5. Lower stress level

Table 5.9.5 remarks that the stress level of community was reduced due to their practiced coping mechanisms and their participation in risk reduction options at community level (Mean=4.1231 and Std. Dev=1.12244).

**Table 5.9.5: Lower stress levels**

<b>Community people's stress levels were reduced</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	18	4.6	4.1231	1.12244
	Disagree	24	6.2		
	Neutral	44	11.3		
	Agree	110	28.2		
	Strongly agree	194	49.7		
	Total	390	100.0		

### 5.9.6. Appropriate precautionary measures

The Mean value 4.1923 and Std. Dev. Value 1.24460 highlights that the appropriate precautionary measures were taken by individuals, families and community members to reduce the disaster risks. Table 5.9.6.

**Table 5.9.6: Appropriate precautionary measures**

<b>Appropriate precautionary measures were taken by the individuals, families and community members</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	18	4.6	4.1923	1.24460
	Disagree	43	11.0		
	Neutral	34	8.7		
	Agree	46	11.8		
	Strongly agree	249	63.8		
	Total	390	100.0		

### 5.9.7. Role of community leaders

Table 5.9.7 shows that the social, political, religious, influential personalities and community leaders played important role in reducing disaster risk at community level (Mean=4.0615 and Std. Dev=1.14335).

**Table 5.9.7: Role of community leaders**

<b>The religious, social and community leaders were played vital role in risk reduction</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	20	5.1	4.0615	1.14335
	Disagree	28	7.2		
	Neutral	39	10.0		
	Agree	124	31.8		
	Strongly agree	179	45.9		
	Total	390	100.0		

### 5.9.8. Reduced damages to property

The Mean value 4.1564 and Std. Dev. Value 1.00059 illustrates that the damages to property was reduced by the effective participation of community people in risk reduction options. Table 5.9.8.

**Table 5.9.8: Reduced damages to property**

<b>Damage to property was reduced due to effective participation of community people in risk reduction options</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	10	2.6	4.1564	1.00059
	Disagree	17	4.4		
	Neutral	58	14.9		
	Agree	122	31.3		
	Strongly agree	183	46.9		
	Total	390	100.0		

### 5.9.9. Reduced loss of life

Table 5.9.9 demonstrates that enhanced emergency response of community people and other stakeholders assisted to reduce the loss of life (Mean=4.0308 and Std. Dev=1.11732).

**Table 5.9.9: Reduced loss of life**

Due to the enhanced emergency response assistance the loss of life was reduced					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Strongly disagree	18	4.6	4.0308	1.11732
	Disagree	27	6.9		
	Neutral	48	12.3		
	Agree	129	33.1		
	Strongly agree	168	43.1		
	Total	390	100.0		

### 5.9.10. Cooperation existed

The Mean value 4.0615 and Std. Dev. Value 1.08094 utters that the community people maintained more cooperation in case of assistance for disaster response in evacuation, search and rescue operation, lending money during emergency, giving food and fodder, providing physical assistance. Table 5.9.10.

**Table 5.9.10: Cooperation existed**

More cooperation existed at the family and community level					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Strongly disagree	16	4.1	4.0615	1.08094
	Disagree	22	5.6		
	Neutral	54	13.8		
	Agree	128	32.8		
	Strongly agree	170	43.6		
	Total	390	100.0		

### 5.9.11. Hazard map created

Table 5.9.11 displays that the community people identified the level of vulnerability, hazards in the area, risk prone area and evacuation plan and drawn map to take the better preparedness regarding disaster management (Mean=4.2897 and Std. Dev=1.07107).

**Table 5.9.11: Hazard map created**

Vulnerability level, hazards, risk prone areas and evacuation areas were identified and mapped					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Strongly disagree	13	3.3	4.2897	1.07107
	Disagree	23	5.9		
	Neutral	36	9.2		
	Agree	84	21.5		
	Strongly agree	234	60.0		
	Total	390	100.0		

### 5.9.12. NGOs' initiatives

The Mean value 3.7897 and Std. Dev. Value 1.11401 shows that the NGOs initiatives strengthened community coping mechanisms regarding disaster management. Table 5.9.12.

**Table 5.9.12: NGOs' initiatives**

Community people's coping mechanisms were strengthened by NGOs initiatives					
Responses		Frequency	Percent	Mean	Std. Deviation
Valid	Strongly disagree	15	3.8	3.7897	1.11401
	Disagree	40	10.3		
	Neutral	81	20.8		
	Agree	130	33.3		
	Strongly agree	124	31.8		
	Total	390	100.0		

### 5.9.13. Government initiatives

The Table 5.9.13 highlights that initiatives of government strengthened community coping mechanisms regarding disaster management (Mean=4.1026 and Std. Dev=1.05125).

**Table 5.9.13: Government initiatives**

<b>Community people's coping mechanisms were strengthened by government initiatives</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	14	3.6	4.1026	1.05125
	Disagree	21	5.4		
	Neutral	50	12.8		
	Agree	131	33.6		
	Strongly agree	174	44.6		
	Total	390	100.0		

### 5.9.14. Community people's awareness

The Mean value 3.8769 and Std. Dev. Value 1.15183 states that community people were aware about disaster and its management plan. Table 5.9.14.

**Table 5.9.14: Community people's awareness**

<b>Community people were aware about disaster and its management plan</b>					
<b>Responses</b>		<b>Frequency</b>	<b>Percent</b>	<b>Mean</b>	<b>Std. Deviation</b>
Valid	Strongly disagree	21	5.4	3.8769	1.15183
	Disagree	39	10.0		
	Neutral	42	10.8		
	Agree	153	39.2		
	Strongly agree	135	34.6		
	Total	390	100.0		

### **5.10. Conclusions**

Versatile characteristics of socioeconomic and demographic information was found among the respondents. The variation of socioeconomic and demographic information justified the study. The flood, drought and driving rain were most occurring disasters in the study area and had enormous impacts on the community people. Thus, the community people faced illness of household members, crop failure, loss of employment and household business failure as the result of disaster. However, they were involved in managing these disasters at community level. The practiced coping mechanisms of community people to reduce risk was applied through using preserved food, fodder and fuel, taking loan or borrowing money from different sources, using own savings, selling ornaments, food grains, livestock and household valuables, using own labour, receiving micro credit and relief, putting mud, dry straw or polythene, etc. on homestead ground, raising the ground of different structures, etc. The NGOs and government took initiatives to strengthen community coping mechanisms. The community people shared the information on disasters with responsible personalities. The information on hazard, vulnerability, risk, disaster etc. helped to create hazard maps. Their participation in providing psychological support, medical first aid, search and rescue operation, integrating national development activities, early warning system etc. also strengthened community risk reduction options. The application of community coping mechanisms and participation of community people in risk reduction options helped them to lead a normal life. On the other hand, the application of the community-based organizations (CBOs) activities managed risk in the pre, during and post disaster phases and assisted to rehabilitate the affected population after disaster. The community coping mechanisms and the government and NGOs initiatives to strengthen that coping mechanisms were effective in managing disaster. Furthermore, the community people participation in creating hazard maps, identification of hazard, assessing vulnerability and risk, raising awareness, disseminating early warning signals, distributing relief, maintaining physical and relational connectivity etc. was effective in reducing risk.



## Chapter Six

### Discussion

#### 6.1. Occurrence of disaster

The flood, driving rain, nor westerly, riverbank erosion, water logging, cold wave, drought, cyclone and tornado were found as the major disasters in this area. Among these disasters flood, driving rain, river bank erosion and water logging were mostly occurring events in that area. These disasters push vulnerability to drinking water supply sources, agricultural production, food security, education, housing, road communication, fisheries and livestock and energy sources, etc.

#### 6.2. Coping mechanisms: Application and Effectiveness

The community people took some adaptation strategies to cope with changing situations. As a result, they preserved food and fodder, carbolic acid, water purifying instruments, agricultural means, stored medicine and fuel, raised ground of the house, renovated house, cementing the wall of the house, saved money, monitored embankment, formed community disaster management committee and took aid and assistance from government and NGOs.

Mostly, to cope with disasters the community people depended on their preserved food and fodder, savings and relief from government. Moreover, they collected money by selling livestock, ornaments and other household valuables for managing the food and fodder crisis. Their mechanisms regarding food crisis ensured food security to survive and protect malnutrition effectively (Mean=4.0579 and Std. Dev=1.19003).

As the individual is the first responder to manage disaster, so, the people renovated their damaged dwelling places on their own. To protect their dwelling places the community people covered the homestead ground using mud, dry leaves and polythene. They took loan from *Mohajon* (informal source) and micro credit organization for maintaining the cost for renovating damaged dwelling places. These mechanisms effectively

(Mean=4.0000 and Std. Dev=1.29777) protected the dwelling places and helped the community people to start normal life.

The community people managed the crisis of losing livelihoods by doing alternative occupation. For this they migrated to cities, women worked outside and used money from selling their ornaments and other valuables, took loan and borrowed money from formal and informal sources. The mechanisms regarding livelihood options effectively (Mean=4.0104 and Std. Dev. =1.21504) managed crisis, made economic protection, restarted economic activities to start normal life after disaster.

The community people restored the agricultural activities after a disaster by using preserved seed, purchasing, getting and borrowing seeds from government, neighbour or relatives, changing the cropping and harvesting schedule, using new variety of crops, cultivating disaster resilient high yield crops to reduce the damages in agricultural sector. As a result, these activities effectively (Mean=4.0625 and Std. Dev=1.15677) managed the crisis and helped the community to start normal life.

Mainly the community's coping mechanisms regarding fuel crisis by using stored dry wood, dry straw, husk and dry cow dung, used kerosene/gas stove, *Bondhu Chula* and *Unnoto Chula* ensured the cooking and supplying of food for the family members and protected malnutrition effectively (Mean=4.0052 and Std. Dev.=1.16216).

Herbal medicinal plants and self-treatment were the best practices for reducing health risk in disastrous situation and consulting with doctors was the way to minimize the risks. During and after the disaster the female members collected sanitary napkin for menstruating women and girls. The females were responsible to collect drinking water from far. In case of health, sanitation and water issues the community people managed the financial crisis through using the money from selling ornaments, livestock and other household valuables and borrowed money from different sources. All of the initiatives of the community people regarding water, health and sanitation issues effectively

(Mean=4.0000 and Std. Dev.=1.24699) protected diseases, health hazard and helped to lead normal life.

Staying together at home and shelter house was the best option of community people to protect violence against women in disastrous situation whereas keeping stick and using torch and hurricane lamp also was the technique to protect snake biting. These mechanisms effectively (Mean=4.0284 and Std. Dev.=1.21379) protected any type of harassment and secured the girls and women.

The community people mitigated disaster risk by making structural modification, relocating the structures, making redundancy of life safety infrastructure, resistance of structure, monitoring the fault in the embankment and making land use planning. Moreover, they took some other measures for mitigating the risk such as, repairing embankment, planting grass and trees, putting sands bags on erosion prone areas and bamboo fence, etc. The measures for mitigating disaster risk effectively (Mean=4.0129 and Std. Dev.=1.16687) protected inundation, destroying structures and damages of property and helped to start normal life.

Government authority's initiatives effectively strengthened community coping mechanisms (Mean=4.0567 and Std. Dev.=1.26650) in the context of agricultural rehabilitation (Mean=4.0129 and Std. Dev.=1.16838), health services (Mean=3.7658 and Std. Dev.=1.27000) and training programs (Mean=4.0103 and Std. Dev.=1.08782) by strengthening existing activities and health services, managing health hazard, restoring agricultural activities, raising awareness etc. and helped to lead normal life.

Moreover, the NGOs initiatives effectively strengthened (Mean=4.0207 and Std. Dev.=1.26876) the coping mechanisms of community people in the context of agricultural rehabilitation (Mean=3.7169 and Std. Dev.=1.16838), health services (Mean=2.9817 and Std. Dev.=1.38321) and training programs (Mean=4.0026 and Std. Dev.=1.21838) by strengthening existing activities and health services, managing health

hazard, restoring agricultural activities, raising awareness, etc. and helped to lead a normal life.

### **6.3. Community people's participation: Application and Effectiveness**

Mainly the people participated in the risk reduction options through sharing their information with other member of the community. They also shared the information with Union *Parishad* member and chairman, member of the community disaster management committee, social, political and religious leaders within the community, etc. Their participation in risk reduction options by sharing the hazard, disaster, vulnerability and risk related information about the community people effectively (Mean=4.0103 and Std. Dev. =1.23677) assisted the concern stakeholders to understand and indicate risk and evacuation planning to create hazard maps.

Risk assessment activity is important in the process of risk reduction which includes hazard identification, vulnerability analysis and risk analysis. The community people participation in hazard identification through sharing the information on damageability, seasonality, typology of hazard, hazard-based warning system and response mechanisms was effective (Mean= 4.0103 and Std. Dev.=1.19426) in assessing risk.

The shared information by community people on demographic variation, sources of aid and assistance, family size, resources, housing pattern etc. for assessing vulnerability was effective (Mean=4.0232 and Std. Dev.=1.12154) in assessing risk. Furthermore, their participation in the risk analysis process through identifying vulnerability, risks, etc. effective (Mean=4.0284 and Std. Dev.=1.20795) in assessing risk of the community.

The community people participation in awareness raising campaigns by discussing different stakeholders' roles and responsibilities in managing disasters, land use related activity, health, hygiene and sanitation, protection of natural environment and emergency goods preservation effectively (Mean=4.0264 and Std. Dev.=1.14288) built awareness about coping by own resources, health issues and responsibilities of different stakeholders in disaster management.

The community people participated in disseminating early warning signals which effectively (Mean=4.1269 and Std. Dev.=1.04295) disseminated among the people to reduce the damages and losses. Their participation in the search and rescue operation through providing help to the team and sharing the information on risk prone areas effectively (Mean=4.1625 and Std. Dev.=1.11354) reduced the health risk and minimized time consumption and mitigated disaster.

The community people's participation by sharing the knowledge of making oral saline, purifying water and sources of herbal medicine and other health related issues was effective (Mean=4.0053 and Std. Dev.=1.20503) in minimizing the health risk. The support for psychologically traumatized people is essential to reduce risk. However, the community people provided mental support for the traumatized individuals that effectively (Mean=4.0079 and Std. Dev. =1.21878) assisted in getting normal life.

The community people's participation in agricultural rehabilitation by sharing agricultural means and experiences with other members of the community effectively (Mean=4.1395 and Std. Dev.=1.09458) restored activities for ensuring food security and mitigated losses of agricultural production. Their participation in the process of relief distribution through providing help to elderly people, pregnant women and disabled in getting relief was effective (Mean=3.8644 and Std. Dev. =1.26500) in relief management.

Maintaining the relational connectivity by community people with responsible personalities to get support for reducing disaster was effective (Mean= 4.0155 and Std. Dev. =1.08538) in managing disaster whereas the physical connectivity to ensure the services road and transportation system, water supply system, sanitation system etc. in crisis period which also was effective (Mean= 4.0258 and Std. Dev. =1.13783) in managing disaster risk at community level.

The CBOs' participation in the pre-disaster phase through understanding the nature of disasters and their effects, preparing disaster preparedness plans, promoting measures for mitigating disasters, analysing vulnerability and risk and assessing and mobilizing

resources effectively (Mean=4.0130 and Std. Dev=1.12923) reduced risk. During disaster phase, the participation through operating search, rescue and evacuation, providing shelter for victims, providing first aid, distributing food, water, medicine and fodder, shifting of injured to hospital, disposal of dead humans and animals, assisting the rescue team, disseminating the information on hazards, and preventing the spread rumours, assessing the immediate damages and losses and filing claims effectively (Mean=4.0648 and Std. Dev.=1.10416) managed crisis. And in the post disaster phase CBOs participated in risk reduction process through assessing the damages, rehabilitating socially and economic and protecting the women, children, elderly people, poor, destitute, infirm and minority which effectively (Mean=4.0233 and Std. Dev.=1.12214) restarted their normal life.

#### **6.4. Resilient Community**

By practicing coping mechanisms, participating risk reduction options and along with the help of other stakeholders (such as, government authorities and non-governmental organization) the community was resilient in the context of hazard resistant construction, environment friendly activities, sustainable livelihood options, better hygiene, lower stress level, appropriate precautionary measures, role of community leaders, reduced damages to property and losses of life, existed cooperation, created hazard map, initiatives taken by the government and NGOs and community people awareness. The average of the all mean regarding all these issues is 4.0501.

## Chapter Seven

### Conclusions and Recommendations

#### 7.1. Conclusions

The community-based disaster management is one of the most inclusive approaches in disaster risk management which ensure the participation of community people in all the phases of decision making, taking initiatives, using previous knowledge, etc. The data shows that the study area experienced floods, droughts, driving rain, riverbank erosion, cyclones, tornadoes, cold wave, etc. where the flood, driving rain, drought and riverbank erosion were recurring events. These disasters had enormous impacts on the population, socio-economic condition, properties, assets, structures and infrastructures, environmental set up, physical set up, etc. The drinking water supply system, agricultural production, food security, health and sanitation, education, housing, road communication, livestock and energy sources were the most vulnerable sectors to disaster in the study area. The population of the study area were concerned about the disasters (average of mean of all disasters=3.57795) and they had experienced (mean=3.1564) these disasters whereas they were involved (mean=3.3436) in managing risk of these events.

The data shows that the community people took some adaptation strategies such as, preserving dry food, fodder, carbolic acid/soap, seeds, water purifying instrument tablet, medicine and saline, saving money, using crop diversification and new crop, take loan, aid and assistance etc. for managing the risks. However, they practiced some coping mechanisms within the community for managing disaster risk. In that case, they applied coping mechanisms in various ways regarding food crisis, fodder crisis, dwelling places, losing livelihood, agricultural damages, fuel crisis, water, health and sanitation issues, violence against women and girls, making the community neat and clean and measures to mitigate disaster risk. The NGOs and government took initiatives to strengthen those coping mechanisms. Moreover, they participated in different ways through creating hazard maps, identification of hazard/disaster, vulnerability assessment and risk analysis for assessing risk. They also participated in awareness raising campaigns, early warning

system, providing first aid, psychological support, agricultural rehabilitation, distribution of relief, integrating local disaster reduction option with national development and maintaining physical and relational connectivity. The data is evident that CBOs participated in the pre, during and post disaster activities through different ways. Such as, through analysing vulnerability and risk, understanding the nature of disaster and their effects, etc. in pre disaster phase; providing first aid, disseminating of information on hazards and prevent spreading of rumours, distributing food, water, medicine and fodder, etc. during disaster phase and protection of women, children, elderly people, poor, destitute, infirm and minority and assessing the damages in post disaster phase, etc.

The data highlights that the application of practiced coping mechanisms assisted the community people in different ways such as, ensured the food security in emergency situations, assisted to protect the selling of cattle at lower price, protected homestead ground from getting destroyed, managed crisis in case of losing livelihood, restored agricultural activities, ensured food supplies for family members, provided protection from water borne diseases, precautionary measures took for reproductive health hazard, ensured security for women and girls during disastrous situations, protected the surrounding environment from air, water and soil pollution, etc. Their participation in risk reduction options assisted to understand the risks of natural hazards by concern stakes, to take initiative according to the nature of disaster, to identify the more vulnerable population, structure and other infrastructures, to take risk specific initiatives, to create awareness among the people about disasters and risk reduction options, to reduce damages of property and injuries of people, to provide emergency medical service to mitigate health risk, to secure the livelihoods of people, to ensure relief for the affected people who need assistance, to mitigate disaster through the combination of local knowledge and government initiatives, etc.

The data remarks that the effectiveness of coping mechanisms of community people was very effective in managing risk (average of all items' mean=4.0110) whereas NGOs and government initiatives to strengthen those coping mechanism was moderately effective



with average of all items' mean 3.6804 and 3.9614 respectively. The effectiveness of community people participation in risk reduction options was moderately effective (average of all items' mean=3.9840) and the effectiveness of CBOs' activities was very effective (average of all items' mean=4.0337).

Therefore, the community-based disaster management was an effective approach regarding the coping mechanisms, the government and NGOs initiatives to support those mechanisms, community people participation in risk reduction options along with CBOs' activities. However, this study recommended some issues regarding community disaster management as follows:

## **7.2. Recommendations**

- 1) As the community-based disaster involves all the members within the community so, it is required to involve more people in managing disaster risks;
- 2) Strengthening individual capacity of community people by providing education and creating income generating opportunities;
- 3) Raising awareness among the people about climate change, its impacts, disaster risk, loss and damage, early warning, evacuation, roles and responsibilities of different stakes in managing disaster, etc.;
- 4) Providing government assistance to strengthen the existing coping mechanisms of community people by diversification of livelihood options, providing more assistance in agriculture, training programs on livelihood options, cropping, water, health, sanitation, etc.
- 5) Reducing vulnerability of marginalized group and improving capacity by more social safety net programs, economic rehabilitation, etc.; and
- 6) Involving the people for making more resilient community in case of hazard resistance construction, environment friendly initiatives, sustainable livelihood options, better hygiene practices, precautionary measures, reducing loss and damage, mutual cooperation, etc.

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- q) Household agricultural activities .....
- r) Household non-agricultural activities.....

**Section-B**  
**Information on disaster occurrence**

**2. Information on Disaster Occurrence**

**a) What are the hazards in your area? (Tick all that apply)**

- |                           |                                 |
|---------------------------|---------------------------------|
| 1] Flood                  | 7] Tornado                      |
| 2] Water logging          | 8] Nor westerly                 |
| 3] Riverbank erosion      | 9] Sand heat                    |
| 4] Driving rain           | 10] Cold wave                   |
| 5] Drought                | 11] Other (please specify)..... |
| 6] Lateral water pressure |                                 |

**b) What are the major disasters in your area? (Tick all that apply)**

- |                       |                                |
|-----------------------|--------------------------------|
| 1] Flood              | 4] Driving rain                |
| 2] Drought            | 5] Other (please specify)..... |
| 3] River bank erosion |                                |

**c) Which are the most vulnerable sectors to disaster? (Tick all that apply)**

- 1] Drinking water supply 2] Drinking water supply 3] Food security  
 4] Health and sanitation 5] Education 6] Housing 7] Road communication  
 8] Livestock 9] Other (please specify).....

**d) Impacts of disasters on household. (Tick all that apply)**

- 1] Illness of household member 2] Crop failure 3] Loss of employment  
 4] Household business failure 5] Other (please specify).....

**e) What concern you have about the impact of disaster that affects your community?**

5= Extremely concerned; 4= Concerned to a greater extent; 3=Moderately concerned; 2= Somewhat concerned and 1= Not concerned

Name of disaster	5	4	3	2	1	Name of disaster	5	4	3	2	1
1] Flood						6] Lateral water pressure					
2] Water logging						7] Tornado					
3] Riverbank erosion						8] Nor westerly					
4] Driving rain						9] Sand heat					
5] Drought						10] Cold wave					

**f) Years for living in this area.....**

**g) Experience of facing disasters.**

- 4] Highly experienced 3] Somewhat experienced 2] Somewhat experienced 1] Not experienced

**h) Involvement in managing disasters.**

- 4] Highly involved 2] Moderately involved 3] Somewhat involved 1] Not involved

**Section-C**

**Information on practiced/existing coping mechanisms, government and NGOs initiatives to strengthen coping mechanisms**

3.1. **Practiced coping mechanisms within community**

- a) Which adaptation strategies did you apply before disaster?**  
*(Tick all that apply)*
- 1] Preserve dry food and fodder
  - 2] Preserve carbolic acid for protecting snake
  - 3] Store medicine and saline ingredients
  - 4] Save money
  - 5] Cementing wall
  - 6] Store fuel (wood, dry straw, husk and making cow dung)
  - 7] Raise ground of house and social places (school, mosque etc.)
  - 8] Renovate house
  - 9] Preserve water purify instruments, rain water harvesting and raise ground of tube well
  - 10] Monitor and maintain embankment
  - 11] Preserve agricultural means (seeds, seedling etc.)
  - 12] Form community disaster management committee
  - 13] Take aid and assistance from government
  - 14] Take aid and assistance from NGOs
  - 15] Other (please specify).....

- b) Did you apply coping mechanisms regarding food crisis?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- c) Which coping mechanisms did you apply regarding food crisis?**  
*(Tick all that apply)*
- 1] Use preserved food and fodder
  - 2] Borrow food from others
  - 3] Take relief from Govt.
  - 4] Take relief from NGOs
  - 5] Receive grants from donor organization
  - 6] Use money from selling livestock's and household valuables
  - 7] Use savings
  - 8] Other (please specify).....

- d) Did you apply coping mechanisms regarding fodder crisis?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- e) Which coping mechanisms did you apply regarding fodder**
- 1] Use preserved fodder
  - 2] Borrow food from others





10] Other (please specify).....

**l) Did you apply coping mechanisms regarding fuel crisis?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**m) Which coping mechanisms did you apply regarding fuel crisis?**  
*(Tick all that apply)*

- 1] Use stored fuel [dry wood, dry straw, husk and making cow dung]
- 2] Use gas stove
- 3] Collect dry wood from far distance
- 4] Other (please specify).....

**n) Did you apply coping mechanisms regarding water, health and sanitation issues?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**o) Which coping mechanisms did you apply regarding water, health and sanitation issues?** *(Tick all that apply)*

- 1] Purify water
- 2] Collect drinking water from far distance
- 3] Use purified rain water
- 4] Raise ground of tube well
- 5] Collect herbal medicine and self-treatment
- 6] Consult with doctor of community clinic
- 7] Consult village doctor
- 8] Collect medicine and distribute among the affected people
- 9] Collect napkin for girls and women sanitation
- 10] Make saline
- 11] Other (please specify).....

**p) Did you apply initiatives to manage coping mechanisms regarding water, health and sanitation issues?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**q) How did you manage the coping mechanism regarding the water, health and sanitation issues?** *(Tick all that apply)*

- 1] Use savings
- 2] Use money from selling livestock’s and household valuables
- 3] Use money from selling food grains
- 4] Use money from selling ornaments
- 5] Collect aid and assistance
- 6] Other (please specify).....

**r) Did you apply coping mechanisms as the measures to violence against women and girls?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**s) Which coping mechanisms did you**

- 1] Stay together at home or shelter house

**apply as the measures to violence against women and girls?** (*Tick all that apply*)

- 2] Protect eve teasing and sexual harassment
- 3] Keep stick with women and girls
- 4] Use torch or hurricane at night
- 5] Other (please specify)....

**t) Did you apply coping mechanism to make the community neat and clean?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**u) Which coping mechanisms did you apply to make the community neat and clean?** (*Tick all that apply*)

- 1] Remove debris
- 2] Remove dirt and garbage
- 3] Put line
- 4] Take away broken tress
- 5] Take away mud and silt from home ground
- 6] Other (please specify).....

**v) Did community people take measures in case of mitigate disaster risk?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**w) Which coping mechanisms did community people apply in case of mitigate disaster?** (*Tick all that apply*)

- 1] Build embankment
- 2] Draining logged water by re-excavating canals
- 3] Putt sand bangs
- 4] Make bamboo fence
- 5] Make resistant of house and other structures
- 6] Road side tree plantation
- 7] Plant grass
- 8] Monitor fault in embankment and water level
- 9] Other (please specify)

**x) Did you practice activities for making disaster resilient community?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**y) Which activities did you practice for making disaster resilient community?** (*Tick all that apply*)

- 1] Construct hazard resilient house
- 2] Re-excavate canal
- 3] Re-excavate pond
- 4] Raise homestead ground
- 5] Raise tube-well ground
- 6] Raise graveyard ground
- 7] Disaster resilient cropping
- 8] Poultry rearing
- 9] Cattle rearing
- 10] Preserve food
- 11] Preserve fodder

- 12] Preserve fuel
- 13] Raise awareness about early warning and disseminate signals
- 14] Protect drinking water sources
- 15] Other (please specify).....

**z) Did you practice activities for making disaster resilient community?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**aa) Which activities did you practice for making disaster resilient community? (Tick all that apply)**

- 1] Construct hazard resilient house
- 2] Re-excavate canal
- 3] Re-excavate pond
- 4] Raise homestead
- 5] Raise tube well ground
- 6] Raise graveyard and
- 7] Road side tree plantation
- 8] Disaster resilient cropping
- 9] Preserve food
- 10] Preserve fodder
- 11] Preserve fuel
- 12] Protect drinking water sources
- 13] Get training for livelihood management
- 14] Preserve medical accessories
- 15] Saving money and assets
- 16] Get loan or borrow money
- 17] Raise awareness about early warning and disseminate signals
- 18] Help the most vulnerable people
- 19] Make relational connectivity with community people
- 20] Other (please specify).....

### 3.2. NGOs initiatives to strengthen community coping mechanism

**a) Did you know the initiatives by NGOs to strengthen community coping mechanism?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**b) Which initiatives taken by NGOs to strengthen community coping mechanisms? (Tick all that apply)**

- 1] Form volunteer group
- 2] Provide aid and assistance for agriculture
- 3] Provide relief and credit to rehabilitate
- 4] Create awareness
- 5] Provide microcredit
- 6] Provide health and sanitation aid
- 7] Other (please specify).....

**c) Did you know about NGOs provide training programs?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**d) Which training programs provided by NGOs? (Tick all that apply)**

- 1] Training on tree plantation
- 2] Training on cropping new variants of crops
- 3] Training on pure drinking water, health and sanitation issues
- 4] Training on poultry, livestock and fisheries
- 5] Training on horticulture and apiculture
- 6] Training on making saline
- 7] Other (please specify)....

**e) Did you know about NGOs provide supports to relief and agricultural rehabilitation?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**f) Which supports to relief and agricultural rehabilitation? (Tick all that apply)**

- 1] Provide microcredit
- 2] Provide loan for rehabilitation
- 3] Providing seed, fertilizer, pesticide, livestock
- 4] Other (please specify).....

**g) Did you know about NGOs provide medical accessories?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**h) Which medical accessories provided by NGOs? (Tick all that apply)**

- 1] Provide saline
- 2] Provide water purifying tablet
- 3] Provide carbolic soap and sanitizer
- 4] Other (please specify).....

### **3.3. Government support facilities to community coping mechanism for DM**

**a) Did you know about the initiatives taken by govt. to strengthen the community coping mechanisms?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**b) Which initiatives taken by govt.? (Tick all that apply)**

- 1] Make shelter
- 2] Form volunteer group
- 3] Provide aid and assistance for agriculture
- 4] Provide relief and credit to rehabilitate
- 5] Create awareness
- 6] Build bridge, culvert, road and embankment
- 7] Provide health and sanitation aid
- 8] Forecast early warning

9] Other (please specify).....

- c) **Did you know the supports to relief and agricultural rehabilitation by govt.?** 1] Yes  
2] No  
3] Not sure
- If “Yes”

- d) **Which supports to relief and agricultural rehabilitation? (Tick all that apply)**
- 1] Provide agricultural loan
  - 2] Provide aid and assistance for agriculture
  - 3] Provide seed, fertilizer, pesticide, livestock
  - 4] Provide food, medical accessories
  - 5] Buy agricultural products from local market
  - 6] Provide construction materials
  - 7] Other (please specify).....

- e) **Did you know about govt. provided medical accessories?** 1] Yes  
2] No  
3] Not sure
- If “Yes”

- f) **Which medical accessories provided by govt.? (Tick all that apply)**
- 1] Provide oral saline
  - 2] Provide water purifying tablet
  - 3] Provide carbolic soap and sanitizer
  - 4] Provide paracetamol tablet
  - 5] Other (please specify).....

- g) **Did you know about the training programs provided govt.?** 1] Yes  
2] No  
3] Not sure
- If “Yes”

- h) **Which training programs provide by govt.? (Tick all that apply)**
- 1] Training on tree plantation
  - 2] Training on cropping new variants of crops
  - 3] Training on pure drinking water, health and sanitation issues
  - 4] Training on poultry, livestock and fisheries
  - 5] Training on horticulture and apiculture
  - 6] Training on making saline
  - 7] Other (please specify).....

#### **Section-D**

#### **Information on community people participation in risk reduction options**

##### **4.1. Information on community people participation in risk reduction options**

- a) **Which risk reduction options exist within the community? (Tick all that apply)**
- 1] Hazard maps
  - 2] Hazard identification, vulnerability assessment and risk assessment
  - 3] Awareness raising campaigns carry out

apply)

- 4] Psychological support
- 5] Restoring agriculture
- 6] Search and rescue
- 7] Medical first aid
- 8] Distribution of relief
- 9] Integrate development activities
- 10] Early warning system
- 11] Physical and relational connectivity
- 12] Other (please specify).....

**b) Did you participate in community risk reduction options for disaster management?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**c) Did you share your information/knowledge on risk reduction options for disaster management?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**d) To which personality did you share your information/knowledge on risk reduction options? (Tick all that apply)**

- 1] Member of union disaster management committee (UDMC)
- 2] Member of community disaster management committee
- 3] Community leaders (Social, religious and political)
- 4] Union parishad member and chairman
- 5] Other member of community
- 6] Other (please specify)....

**e) Did you share your information/knowledge to create community hazard maps?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**f) Which information did you share with responsible personality to create community hazard maps? (Tick all that apply)**

- 1] Location of houses
- 2] Livelihood options of community people
- 3] Location of trees and forest and garden
- 4] Location of water reservoir
- 5] Location of land types
- 6] Drinking water sources
- 7] Health service providing centers
- 8] Location public places
- 9] Local hazards, intensity, frequency, damage caused and risks etc.
- 10] Other (please specify).....

**g) Did you participate in the process of hazard identification for assessing risk?**

- 1] Yes
- 2] No
- 3] Not sure

If “Yes”

**h) How did you participate in the process of hazard**

- 1] By sharing information on previous hazard event
- 2] By sharing information seasonality of specific hazard

- identification for assessing risk?** *(Tick all that apply)*
- 3] By sharing information hazards specific damageability
  - 4] By sharing information on type and nature of disasters and hazards faced
  - 5] By sharing information on the experience in last hazards faced
  - 6] By sharing information on hazards based warning and damages
  - 7] By sharing information on hazards based response mechanisms
  - 8] Other (please specify).....

- i) Did you participate in the process of vulnerability assessment for assessing risk?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- j) How did you participate in the process of vulnerability assessment for assessing risk?** *(Tick all that apply)*
- 1] By sharing information on more vulnerable population (women, children, elderly, mentally and physically challenged people
  - 2] By identifying the location of women (widows, pregnant, lactating and single) and poor people
  - 3] By sharing information on vulnerable infrastructure
  - 4] By sharing information on resistance of house
  - 5] By sharing information on low land areas, areas adjacent water bodies and wind directions
  - 6] By sharing information on livelihood assets
  - 7] By sharing information on drinking water sources
  - 8] By sharing information on physical and relational connectivity
  - 9] By sharing information on household gender ratio, age structure and education
  - 10] By sharing information on alternative livelihood option and access to natural resource, market, public and health services
  - 11] Other (please specify).....

- k) Did you participate in the process of risk analysis for assessing risk?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- l) How did you participate in the process of risk analysis for assessing risk?** *(Tick all that apply)*
- 1] By identifying local hazard
  - 2] By sharing information on local hazard
  - 3] By identifying natural and man-made elements at risk
  - 4] By identifying the risks for crops and livestock
  - 5] By identifying risk for health, sanitation, water supply and hygiene
  - 6] By identifying risk for most vulnerable groups
  - 7] Other (please specify).....

- m) Did you participate in awareness raising campaigns?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- n) How did you participate in awareness raising campaigns for disaster management?** *(Tick all that apply)*
- 1] By discussing the roles and responsibilities of various stakeholders within the community.
  - 2] By discussing the issues of use land acquisition, resettlement and environmental clearance within the community.
  - 3] By gathering concerns and view related sewerage, health, sanitation for the community
  - 4] By raising awareness for eliminating the natural environment
  - 5] By involving in behavior change awareness building in hygiene, sanitation and pure drinking water
  - 6] By raising awareness to preserve food and fodder, fuel, water sources, medical accessories and saving money and assets
  - 7] Other (please specify).....

- o) Did you participate in community early warning system?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- p) How did you participate in community early warning system?** *(Tick all that apply)*
- 1] By receiving the warning signals of Government through radio, television, newspaper, social media and translate it into their local signals
  - 2] By disseminating translated warning signals through word of mouth, gossiping in public places, loud speaker, showing flag and using mobile technology
  - 3] By taking special responsibility to disseminate the warning signal to most vulnerable people and remote area and to select the media for disseminating the warning signals
  - 4] Other (please specify).....

- q) Did you participate in search and rescue operation?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- r) How did you participate in search and rescue operation?** *(Tick all that apply)*
- 1] By identifying the area of more vulnerable people
  - 2] By identifying the more vulnerable assets
  - 3] By identifying the vulnerable infrastructure
  - 4] By sharing the location of hazards prone area
  - 5] By sharing the location of risk area
  - 6] By providing help to rescue operation team
  - 7] Other (please specify).....

- s) Did you participate in providing medical first aid?**
- 1] Yes
  - 2] No
  - 3] Not sure

If “Yes”

- t) How did you participate**
- 1] By sharing the knowledge of making saline, purifying water and herbal



- in providing medical first aid?** *(Tick all that apply)* medicine  
 2] By sharing the knowledge of herbal medicine  
 3] By sharing the emergency medical first aid equipment with other members of the community  
 4] Other (please specify).....
- u) Did you participate in providing psychological support for traumatized individual?** 1] Yes  
 2] No  
 3] Not sure
- If “Yes”
- v) How did you participate in providing psychological support for traumatized individual?** *(Tick all that apply)* 1] By giving mental support  
 2] By sharing the source of getting better support  
 3] Other (please specify).....
- w) Did you participate in restoring activity for agricultural rehabilitation?** 1] Yes  
 2] No  
 3] Not sure
- If “Yes”
- x) How did you participate in restoring activity for agricultural rehabilitation?** *(Tick all that apply)* 1] By giving preserved seed as loan  
 2] By providing money as loan  
 3] By sharing knowledge on best practices of cropping, harvesting  
 4] By sharing the information about access to market  
 5] By sharing information on getting support  
 6] Other (please specify).....
- y) Did you participate in distribution of relief?** 1] Yes  
 2] No  
 3] Not sure
- If “Yes”
- z) How did you participate in distribution of relief?** *(Tick all that apply)* 1] By providing help to elderly people, pregnant women and disables in getting the relief  
 2] By sharing the information of distribution of relief among the community people  
 3] By helping to avoid unexpected situation in case of relief distribution  
 4] Other (please specify).....
- aa) Did you participate in integrating of local disaster reduction option with national development activities as the measure for disaster management?** 1] Yes  
 2] No  
 3] Not sure
- If “Yes”
- bb) How did you participate in** 1] By integrating indigenous knowledge on disaster risk reduction

**integrating of local disaster reduction option with national development activities as the measure for disaster management?** *(Tick all that apply)*

with the knowledge of national development that provided by the local government and local administration representative  
 2] By sharing the thinking regarding risk reduction to government representative to mainstream local knowledge into development activities  
 3] Other (please specify).....

**cc) Did you engage in physical connectivity to strengthen community risk reduction options?** 1] Yes  
 2] No  
 3] Not sure

If “Yes”

**dd) How did you engage in physical connectivity to strengthen community risk reduction options?** *(Tick all that apply)*

1] By monitoring road connectivity and taking initiative  
 2] By monitoring drinking water supply system and taking initiative  
 3] By monitoring health, hygiene and sanitation system and taking initiative  
 4] By monitoring natural infrastructure and taking initiative to protect contamination  
 5] By communication and transportation system and taking initiative  
 6] Other (please specify)

**ee) Did you maintain relational connectivity to strengthen community risk reduction options?** 1] Yes  
 2] No  
 3] Not sure

If “Yes”

**ff) To which personality did you maintain relational connectivity to strengthen community risk reduction options?** *(Tick all that apply)*

1] Member of UDMC  
 2] Member of Union Parishad  
 3] Representative of BADC  
 4] Representative of micro-finance and financial organizations  
 5] Representative of NGOs  
 6] Other (please specify)

**Section-E**

**Information on community based organization (CBO)**

**5.1. Information on existence of community based organization (CBO) and CBO activities for disaster management.**

**a) Which community organizations existed in your area?** *(Tick all that apply)*

1] Local government team  
 2] Government authorities  
 3] NGOs, INGOs actors and donors  
 4] Community based volunteer committee  
 5] Social and cultural groups  
 6] Other (please specify)

**b) Were CBOs include the representative from most vulnerable group, by community leaders with concern of other members of community and local government authorities, NGOs representative and other stakes?** 1] Yes  
 2] No  
 3] Not sure

If “Yes”

- c) **How the community based organizations participate in pre-disaster phase?** (Tick all that apply)
- 1] Through understanding the nature of disasters and their effects
  - 2] Through preparing disaster preparedness plan
  - 3] Through promoting measures for mitigating disasters
  - 4] Through analyzing vulnerability and risk
  - 5] Through assessing and mobilizing resources
  - 6] Other (please specify).....
- d) **How the community based organizations participate in during disaster phase?** (Tick all that apply)
- 1] Through operating search, rescue and evacuation
  - 2] Through providing shelter for victims
  - 3] Through providing first aid
  - 4] Through distributing food, water, medicine and fodder
  - 5] Through the clearance of debris
  - 6] Through the movement of injured to hospital
  - 7] Through the disposal of dead humans and animals
  - 8] Through assessing the rescue team
  - 9] Through dissemination of information and preventing the spread rumors
  - 10] Through assessing the immediate damages and losses
  - 11] Through filing claims
  - 12] Other (Please specify).....
- e) **How the community based organizations participate in post-disaster phase?** (Tick all that apply)
- 1] Through assessing the damages
  - 2] Through the economic rehabilitation
  - 3] Through the social rehabilitation
  - 4] Through the protection of women, children, elderly people, poor, destitute, infirm and minority
  - 5] Other (please specify).....

**Section-F**

**Application of practiced coping mechanisms, government and NGOs initiatives, participation in risk reduction options and community based organizations (CBOs) in managing disaster**

**6.1 Practiced coping mechanism and govt. and NGOs initiatives**

<b>a) Did the coping mechanisms regarding food crisis –</b>	Yes	No	Not sure
Ensure the food security in emergency situation?			
Help to survive in crisis period?			
Protect chronic malnutrition?			

<b>b) Did the coping mechanisms regarding fodder crisis-</b>	Yes	No	Not sure
Ensure fodder for cattle in emergency situation?			
Assist to protect the selling of cattle in lower price?			

Help to restore livelihood options?			
<b>c) Did the coping mechanisms regarding dwelling places-</b>	Yes	No	Not sure
Protect homestead ground from destroying?			
Help to start normal life after a disaster?			
<b>d) Did the coping mechanisms regarding losing livelihoods -</b>	Yes	No	Not sure
Manage crisis in case of losing livelihood?			
Ensure economic protection?			
Restart economic activities?			
Help to lead normal life?			
<b>e) Did the coping mechanisms regarding agricultural damages-</b>	Yes	No	Not sure
Restore agricultural activities?			
Ensure food security?			
Ensure economic protection?			
Help to lead normal life?			
<b>f) Did the coping mechanisms regarding fuel crisis-</b>	Yes	No	Not sure
Ensure cooking?			
Ensure food supplying for family members?			
Protect malnutrition?			
<b>g) Did the coping mechanisms regarding water, health and sanitation issues-</b>	Yes	No	Not sure
Protect from water borne diseases?			
Ensure first aid?			
Protect reproductive health hazard?			
Ensure health protection?			
Help to lead normal life?			
<b>h) Did the initiatives to coping mechanisms regarding water, health and sanitation issues-</b>	Yes	No	Not sure
Provide health security?			
Protect diseases?			
Ensure medical services?			
Help to lead normal life?			
<b>i) Did the coping mechanisms regarding protecting violence against women and girls-</b>	Yes	No	Not sure
Help to protect girls and women from eve teasing?			
Protect any type of harassment?			
Secure women and girls from unwanted situation?			
Ensure security for women and girls during disastrous situation?			

<b>j) Did the initiatives for making the community neat and clean-</b>	Yes	No	Not sure
Protect the surrounded environment from air, water and soil pollution?			
Protect to spread diseases?			
Restore road communication?			
Help to lead normal life?			
<b>k) Did the measures taken by community people to mitigate disasters risk-</b>	Yes	No	Not sure
Protect inundation by flood water?			
Protect embankment from destroying?			
Protect household from destroying?			
Reduce agricultural damages?			
Help to lead normal life?			
<b>l) Did NGOs' initiatives to strengthen community coping mechanisms-</b>	Yes	No	Not sure
Raise community awareness about disasters?			
Help to restore agricultural activities?			
Protect health hazards?			
<b>m) Did the training programs provided by NGOs to strengthen community coping mechanisms-</b>	Yes	No	Not sure
Help to cope by alternative income sources?			
Strengthen existing activities?			
Manage health hazard?			
Help to lead normal life?			
<b>n) Did the supports provided by NGOs to relief and agricultural rehabilitation-</b>	Yes	No	Not sure
Help to restore agricultural activities?			
Strengthen existing activities?			
Help to lead normal life?			
<b>o) Did the health services provided by NGOs-</b>	Yes	No	Not sure
Strengthen health services?			
Help to be cured from diseases and protected from snake biting?			
<b>p) Did the government initiatives-</b>	Yes	No	Not sure
Raise community awareness about disasters?			
Help to restore agricultural activities?			
Protect health hazards?			
Help to lead normal life?			
<b>q) Did the training programs provided by government-</b>	Yes	No	Not sure
Help to cope by alternative income sources?			
Strengthen existing activities?			

Help to lead normal life?			
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<b>r) Did the supports provided by government for relief and agricultural rehabilitation-</b>	Yes	No	Not sure
Help to restore agricultural activities?			
Strengthen existing activities?			
Help to lead normal life?			

<b>s) Did the health services provided by government -</b>	Yes	No	Not sure
Strengthen health services?			
Help to be cured from diseases?			

## **6.2. Community people participation in risk reduction options**

<b>a) Did community people's participation in risk reduction options by sharing knowledge and information with responsible personality-</b>	Yes	No	Not sure
Help to take decision for managing disaster by concern authority?			
Make effective relational connectivity for managing disaster?			
Help to take immediate measures after a disaster?			
Build rapport among the community people to manage disaster collectively?			

<b>b) Did community people's participation by sharing information/ knowledge to create hazard maps-</b>	Yes	No	Not sure
Help the concern stakes to understand the risks of natural hazards?			
Assist in indicating the risk areas in the community?			
Assist in indicating the evacuation planning?			
Help the concern stakes to assess risk to mitigate disaster?			

<b>c) Did community people's participation in hazard/ disaster identification-</b>	Yes	No	Not sure
Assist to take initiative according to the nature of disaster?			
Provide support to determine the likelihood of occurring a disaster?			
Provide support to identify the intensity and magnitude of hazards?			
Provide support to determine possible affected areas in the community?			
Help concern stakes to assess risks to mitigate disaster?			

<b>d) Did community people's participation in vulnerability assessment-</b>	Yes	No	Not sure
Assist the concern stakes to identify the more vulnerable population, structure and other infrastructure?			
Help to take initiatives for more vulnerable population, structure and other infrastructure?			
Help to assess risks to mitigate disaster?			

<b>e) Did community people's participation in risk analysis-</b>	Yes	No	Not sure
Help to identify the risks in the area?			

Contribute to take risk specific initiatives?			
Assist to analyze risk for assessing risks to mitigate disaster?			
<b>f) Did community people's participation in awareness raising campaigns-</b>	Yes	No	Not sure
Assist to address vulnerability and risk of community people?			
Build awareness about the roles and responsibilities of different stakes in managing disaster?			
Build awareness to reduce health risk?			
Built awareness to cope with disaster by own resources?			
Created awareness among the people about disasters and risk reduction options?			
<b>g) Did community people's participation in early warning system-</b>	Yes	No	Not sure
Disseminate the signals immediately after announced by government?			
Reduce damages of property?			
Reduce the losses of life?			
Help to evacuate the people and animals timely?			
<b>h) Did community people's participation in search and rescue operation-</b>	Yes	No	Not sure
Reduce the number of injured people?			
Assist to provide medical services on time?			
Save time in searching and rescuing affected people?			
Mitigate health risk?			
<b>i) Did community people's participation in providing medical first aid-</b>	Yes	No	Not sure
Protect the spreading of wound?			
Provide emergency medical service to mitigate health risk?			
<b>j) Did community people's participation in providing psychological support-</b>	Yes	No	Not sure
Assist to get normal from trauma?			
Assist to get respite from stress?			
<b>k) Did community people's participation in restoring activity for agricultural rehabilitation-</b>	Yes	No	Not sure
Assist to restore agricultural activities?			
Assist to ensure food security?			
Assist to mitigate losses of agricultural production?			
Secure the livelihoods of people?			
Mitigate risk in agriculture?			
<b>l) Did community people s' participation in distribution of relief-</b>	Yes	No	Not sure
Ensure relief for the affected people who need assistance?			
Properly manage relief for reducing mismanagement?			
Assist to mitigate disaster risk?			
<b>m) Did community people's participation in integrating of local disaster</b>	Yes	No	Not sure

<b>reduction option with national development-</b>			
Assist to ensure need-based relief, aid and assistance for the affected community?			
Assist to take decision of government authorities to make infrastructure (bridge, culvert, embankment and road connectivity)?			
Assist to mitigate disaster through the combination of local knowledge and government initiatives?			
<b>n) Did community people's engagement in maintaining physical connectivity-</b>	Yes	No	Not sure
Protect the embankment and road connectivity from destroying?			
Ensure drinking water supply during disaster to reduce water borne diseases?			
Ensure health and hygiene in disastrous situation to reduce health hazards?			
<b>o) Did community people's engagement in maintaining relational connectivity-</b>	Yes	No	Not sure
Assist in getting aid and assistance from government authorities and NGOs?			
Assist in restoring agricultural activities after a disaster?			
Assist in getting information about disaster?			
Assist in managing disaster?			
<b>p) Did CBOs activities-</b>	Yes	No	Not sure
Manage the damages and losses in pre-disaster phase?			
Reduce risk during disaster phase?			
Assist the process of rehabilitation of affected population after disaster?			

### Section-G

#### Effectiveness of practiced coping mechanism, government and NGOs initiatives, community people participation in risk reduction options and community based organizations (CBOs)

##### 7.1. Effectiveness of practiced coping mechanism within community, government and NGOs support facilities for disaster management

<b>Practiced community coping mechanisms</b>					
5= Extremely effective; 4= Very Effective; 3=Moderately effective; 2=Somewhat effective; 1=Not effective					
Questions	5	4	3	2	1
a) How much effective was coping mechanisms regarding food crisis?					
b) How much effective was coping mechanisms regarding fodder crisis?					
c) How much effective was coping mechanisms regarding dwelling places?					
d) How much effective was coping mechanisms regarding losing livelihood?					
e) How much effective was coping mechanisms regarding agricultural damages?					
f) How much effective was coping mechanisms regarding fuel crisis?					
g) How much effective was coping mechanisms regarding water, health and sanitation?					
h) How much effective was the initiatives in managing the coping mechanisms regarding					



water, health and sanitation?					
i) How much effective was the measures regarding violence against girls and women?					
j) How much effective was coping mechanisms regarding community neat and clean?					
k) How much effective was the measures taken by community people?					
<b>NGOs support facilities to community coping mechanism for DM</b>					
l) How much effective was the initiatives of NGOs to strengthen coping?					
m) How much effective was the training programs of NGOs to strengthen mechanisms?					
n) How much effective was the supports of NGOs for relief and agricultural rehabilitation?					
o) How much effective was the supports of medical accessories provided by NGOs?					
<b>Govt. support facilities to community coping mechanism for DM</b>					
p) How much effective was the initiatives of govt. to strengthen coping mechanisms?					
q) How much effective was the supports of govt. for relief and agricultural rehabilitation?					
r) How much effective was the supports of medical accessories provided by govt.?					
s) How much effective was the training programs provided by govt.?					

## 7.2. Effectiveness of community people participation in risk reduction options for disaster management

<b>Effectiveness of community people participation in disaster management/risk reduction options</b>					
5= Extremely effective; 4= Very Effective; 3=Moderately effective; 2=Somewhat effective; 1=Not effective					
Questions	5	4	3	2	1
a) How much effective was your participation in community risk reduction options?					
b) How much effective was your shared information/knowledge with responsible personality assist in managing disaster?					
c) How much effective was your shared information/knowledge with responsible personality to create community hazard maps?					
d) How much effective was your participation in hazard identification?					
e) How much effective was your participation in vulnerability assessment f)?					
f) How much effective was your participation in risk analysis for assessing risk?					
g) How much effective was your participation in awareness raising campaigns?					
h) How much effective was your participation in community early warning system?					
i) How much effective was your participation in search and rescue operation?					
j) How much effective was your participation in providing medical first aid?					
k) How much effective was your participation in providing psychological support?					
l) How much effective was your participation in restoring activities for agricultural rehabilitation?					
m) How much effective was your participation in distribution of relief?					
n) How much effective was your participation in integration of local disaster reduction option with national development activities?					
o) How much effective was your engagement in physical connectivity to strengthen community risk reduction options?					
p) How much effective was your engagement in relational connectivity with responsible personality to strengthen community risk reduction options?					
q) How much effective was your practiced activities to make resilient community?					

### 7.3. Information on the effectiveness of community based organization (CBO) for disaster management.

<b>Effectiveness of community based organization (CBO) for disaster management</b>					
5= Extremely effective; 4= Very Effective; 3=Moderately effective; 2=Somewhat effective; 1=Not effective					
Questions	5	4	3	2	1
a) How much effective was the activities of community based organizations in pre-disaster phase?					
b) How much effective was the activities of community based organizations in during disaster phase?					
c) How much effective was the activities of community based organizations in post disaster phase?					

### Section-H Resilient Community

#### 8. Disaster resilient community

<b>Disaster resilient community</b>					
5=Strongly agree; 4=Agree; 3=Neutral; 2=Disagree; 1=Strongly disagree					
Indicators	5	4	3	2	1
a) Hazard resistant construction practices were followed by the community people					
b) Environment friendly activities were adopted by the community people					
c) Sustainable livelihood options were practiced by the community people to avoid the crisis					
d) Community people enjoyed health safety due to better hygiene practices					
e) Community people's stress levels were reduced					
f) Appropriate precautionary measures were taken by the individuals, families and community members					
g) The religious, social and community leaders were played vital role in risk reduction					
h) Damage to property was reduced due to effective participation of community people in risk reduction options					
i) Due to the enhanced emergency response assistance the loss of life was reduced					
j) More cooperation existed at the family and community level					
k) Vulnerability level, hazards, risk prone areas and evacuation areas were identified and mapped					
l) Community people's coping mechanisms were strengthened by NGOs initiatives					
m) Community people's coping mechanisms were strengthened by govt. initiatives					
n) Community people were aware about disaster and its management plan					

**Thank you very much for sharing your information!**

## Appendix-2: Checklist

### Checklist on

#### Effectiveness of Community Based Disaster Management in Bangladesh: An Exploratory Study

1. Socioeconomic and demographic information
2. Vulnerability, risk and capacity of the population
3. Practiced/existing coping mechanisms with the community-
  - a) Regarding food crisis
  - b) Regarding fodder crisis
  - c) Regarding dwelling places
  - d) Regarding losing livelihood
  - e) Regarding agricultural damages
  - f) Regarding fuel crisis
  - g) Regarding water, health and sanitation issues
  - h) Initiatives to manage coping mechanisms regarding water, health and sanitation issues
  - i) Measures to protect violence against women and girls
  - j) Initiatives to make community neat and clean
  - k) Measures to mitigate disaster risk
  - l) Activities to make disaster resilient community
4. NGOs supports to strengthen coping mechanisms
  - a) Initiatives to strengthen coping mechanisms
  - b) Provided training programs
  - c) Supports to relief and agricultural rehabilitation
  - d) Health services
5. Govt. supports to strengthen coping mechanisms
  - a) Initiatives to strengthen coping mechanisms
  - b) Provided training programs
  - c) Supports to relief and agricultural rehabilitation
  - d) Health services
6. Community people participation in risk reduction options
  - a) Existing risk reduction options with the community
  - b) Responsible personalities to share information
  - c) Information for creating hazard maps
  - d) Participation in identifying hazard/disaster
  - e) Participation in assessing vulnerability
  - f) Participation in analysing risk
  - g) Participation in awareness raising campaigns
  - h) Participation in early warning system

- i) Participation in search and rescue operation
  - j) Participation in providing medical first aid
  - k) Participation in providing psychological support
  - l) Participation in restoring agricultural activities
  - m) Participation in distribution of relief
  - n) Participation in integrating of local disaster reduction option with national development
  - o) Participation in in maintaining physical connectivity
  - p) Participation in in maintaining physical connectivity
7. CBOs activities in pre, during and post disaster
8. Effectiveness
- a) Coping mechanisms regarding food crisis
  - b) Coping mechanisms regarding fodder crisis
  - c) coping mechanisms regarding dwelling places
  - d) coping mechanisms regarding losing livelihood
  - e) coping mechanisms regarding agricultural damages
  - f) coping mechanisms regarding fuel crisis
  - g) coping mechanisms regarding water, health and sanitation issues
  - h) Initiatives to manage coping mechanisms regarding water, health and sanitation issues
  - i) Measures to protect violence against women and girls
  - j) Initiatives to make community neat and clean
  - k) Measures to mitigate disaster risk
  - l) Activities to make disaster resilient community
9. Effectiveness of NGOs supports to strengthen coping mechanisms
- a) Effectiveness of initiatives to strengthen coping mechanisms
  - b) Effectiveness of provided training programs
  - c) Effectiveness of supports to relief and agricultural rehabilitation
  - d) Effectiveness of health services
10. Effectiveness of govt. supports to strengthen coping mechanisms
- a) Effectiveness of initiatives to strengthen coping mechanisms
  - b) Effectiveness of provided training programs
  - c) Effectiveness of supports to relief and agricultural rehabilitation
  - d) Effectiveness of health services
11. Effectiveness of community people participation in risk reduction options
- a) Effectiveness of shared information with responsible personalities
  - b) Effectiveness of information for creating hazard maps
  - c) Effectiveness of participation in identifying hazard/disaster
  - d) Effectiveness of participation in assessing vulnerability
  - e) Effectiveness of participation in analysing risk

- f) Effectiveness of participation in awareness raising campaigns
- g) Effectiveness of participation in early warning system
- h) Effectiveness of participation in search and rescue operation
- i) Effectiveness of participation in providing medical first aid
- j) Effectiveness of participation in providing psychological support
- k) Effectiveness of participation in restoring agricultural activities
- l) Effectiveness of participation in distribution of relief
- m) Effectiveness of participation in integrating of local disaster reduction option with national development
- n) Effectiveness of participation in in maintaining physical connectivity
- o) Effectiveness of participation in in maintaining physical connectivity

12. Effectiveness of CBOs activities in pre, during and post disaster