RESOURCING FOR POST-DISASTER HOUSING RECONSTRUCTION: THE CASE OF CYCLONES SIDR AND AILA IN BANGLADESH

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DEDICATION

‘’And my success is not but through Allah. Upon Him I have relied, and to Him I return’’

[Al-Quran 11:88]

This thesis is dedicated to my beloved wife Reshma and my little angels Raidah Rifayah and Aairah Ameenah without whom I will not be here.

DECLARATION OF AUTHORSHIP AND COPYRIGHT

I, Md Zahidul Islam, confirm that the work presented in this thesis is my own. In all cases, where it is relevant, material from the work of others has been acknowledged. I declare that the work in this thesis was carried out in accordance with the regulations of London South Bank University. I confirm that none of the work contained within this thesis has previously been submitted by me or any other person for a degree in this or any other University. The contents of this thesis herein have been composed by the author, Md Zahidul Islam. The copyright of this thesis rests with the author. No quotation from it should be published without prior written consent from the author.

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ABSTRACT

This study investigates the effectiveness of resourcing in post-disaster housing reconstruction with reference to Cyclones Sidr and Aila in Bangladesh. Through evaluating three key theories- Build Back Better approach, Balance Scorecard approach and Dynamic Competency theories, the synthesis of literature, and empirical fieldwork, this research develops a dynamic theoretical framework that moves the trajectory of post-disaster housing reconstruction towards the reconstruction of more resilient houses. The ultimate goal of any post-disaster housing reconstruction project is to provide quality houses and to achieve high levels of satisfaction for beneficiaries. However, post-disaster reconstruction projects often fail in their stated objectives; only 10-20% housing needs are met, with most houses constructed on a temporary rather than permanent basis**.** A number of scholars have argued that access to resources can significantly increase the capacity and capability of disaster victims to rebuild their lives, including the construction of new homes. This study draws on structured interviews of 285 villagers affected by cyclones to investigate the effectiveness of resourcing in rebuilding houses after Cyclone Sidr in 2007 and Cyclone Aila in 2009. Furthermore, semi-structured interviews were conducted with 20 key stakeholders in UNDP, OXFAM, government officials, and national and international NGOs. The results of this study show that recovery rate of cyclone resilient houses that can withstand cyclone is very low and majority of the population are still vulnerable. Furthermore, multiple regression of survey data and thematic analyses of qualitative data indicate that access to resources, level of education, quality of building materials and income-generating activities of the respondents are critical for effective post-disaster recovery. Conversely, resource availability, lack of coordination among participant organisations, corruption and lack of access to appropriate land constituted significant obstacles to livelihood recovery. Finally, this study makes significant theoretical contributions to the theories of post-disaster recovery by introducing access to resources, land, level of education and level of income generating activities as new variables and it also identifies relevant method of measuring the effectiveness of resourcing for post-disaster housing reconstruction by employing parameters of rate of housing reconstruction, vulnerability reduction, poverty reduction, livelihood recovery, beneficiaries' satisfaction and quality of reconstructed houses by which effectiveness of resourcing can be measured.

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CHAPTER 1 INTRODUCTION AND RESEARCH CONTEXT

1.0 Introduction

Natural disasters are a recurrent and rampant problem occurring with increasing frequency globally. The life and property of the affected population are at great risk. In 2015, more than 23,744 people were killed and approximately 597667 people were rendered homeless worldwide (EM-DAT, 2015). In 2016, 3,451 people were killed and 60,571 were rendered homeless due to natural disasters (EM-DAT, 2017). The damage caused by the Indian Tsunami (2004), the great earthquakes in Pakistan (2005), Indonesia (2009), Haiti (2010), Japan (2011), and the typhoon in Philippines (2013) were very severe in nature. The recent Nepal earthquake killed approximately 6,250 people as of 1st May, 2015, destroyed 167,969 houses fully and 57,435 partially (IFRC, 2015; Feener and Daly, 2016). The average reported losses due to natural disasters rose from around $US 50 billion a year in 1980 to almost $US 200 billion a year in the past few decades; totalling $US 3.8 trillion from 1980 to 2012 (World Bank, 2013). According to Global Humanitarian Assistance (GHA) 2014, the level of international humanitarian assistance responses rose to US$22 billion in 2013 which represented an increase of 12% in comparison to 2012.

While all losses and damages associated with natural disasters, including, cyclones, are on the rise, I will be focusing on the effects on housing, as it is arguably the sector that is most severely affected in comparison to other sectors. Quality housing is linked to the health and safety and income generated activities of disaster victims thus leading to a better quality of life. It furnishes them with increased coping skills and the ability to adapt and it aids their overall developments. The international community, including World Bank, UNDP, IFRC, local governments and national and international non-governmental organisations (NGOs) have extended their efforts to reduce the vulnerability of the people affected by natural disasters by providing humanitarian assistance. Despite their efforts, however, the post-disaster housing reconstruction project is still unsatisfactory (Freeman, 2004; Jones, 2006; Paul & Rashid, 2016; Kelman, *et al*. 2016) and the people affected by cyclones live in embankments and polders even years after the disasters (Kabir, 2009).

Scholars in this area of research have distinct arguments about resourcing and its implications in terms of post-disaster housing reconstruction. Freeman (2004), Jones (2006) and Jha *et al*. (2010) argued that resources for post-disaster reconstruction normally fall into the hands of the social and political elites and the aid, as a humanitarian assistance, lies paralysed in the account of governments and NGOs. On the other hand, Singh and Wilkinson (2008), Wilkinson *et al*. (2010) and Chang (2012) reported that post-disaster reconstruction projects generally suffer from resource bottlenecks but they did not identify the underlying causes; rather, they identified the factors that affect resource availability. In contrast, Burnell (2010) argues that the commodification of aid especially for housing reconstruction embodies cultural symbolism, social power dynamics, and political affiliations and can have negative effects on long-term and sustainable reconstruction.

Likewise, PDHR projects are considered by many disaster experts to be one of the least successful sectors in terms of project implementation (Barenstein and Pittet, 2007). This highlights three specific problems: a) PDHR projects are subject to uncertainty; b) there is a need for integration among the participant organisations and c) there is a need for urgency in implementing PDHR projects (Moe *et al*. 2007). Thus, handling post-disaster housing reconstruction projects poses serious challenges to resourcing managers, local governments, and national and international stakeholders. Effective and successful post-disaster housing reconstruction projects could result in reducing the vulnerabilities, risks and challenges inflicted by natural disasters and minimising the negative impacts on human, social and economic environments (Moe *et al*. 2007).

When exploring the effectiveness of resourcing, in terms of post-disaster housing reconstruction, it would be beneficial to examine the condition of houses built after cyclone Sidr and Aila and to identify the underlying challenges associated with these projects. This study explores the effectiveness of resourcing by employing specific parameters and develops a theoretical framework that shows successful post-disaster housing reconstruction through the progression of some critical stages. Moreover, the study also shows possible ways to rebuild dynamic cyclone-resilient houses and identifies the underlying challenges associated with PDHR projects by analysing data from questionnaire surveys and expert interviews from stakeholders working in post-Sidr and Aila housing reconstruction.

This introductory chapter will provide the background of the study, the research question, the research aim and the research objectives; it will detail the research approach and methodology; and finally, it will describe the overall structure of the thesis

1.1 Background of the study

Natural disasters are serious disruptions that impede the overall functioning of a community. They cause widespread human, material, economic, and environmental losses that exceed the abilities of the affected communities or societies to cope with by using their own resources (World Bank, 2013). Globally, natural disasters are on the rise, and the suffering of people from disasters is reaching colossal levels (Lyons, 2009; Ferris *et al*. 2013; Pantip, 2014). Disasters have the potential to damage the entire economy of a country, especially when they occur in developing countries. Whilst no country is entirely safe, the lack of capacity within developing countries to limit the impact of hazards resulting from major natural disasters has led to them becoming those which are most vulnerable (Amaratunga *et al*. 2014). The United Nations Development Programme (UNDP) reports that 24 out of 49 low-income, developing countries are subject to high level of disaster risk and on average six are hit by between two and eight disasters every year (Lloyd-Jones, 2006).

Due to the severe destruction of houses by natural disasters, repairing and rebuilding houses for the people affected is of significant consideration in terms of their wellbeing and economic health. To expedite post-disaster housing reconstruction projects, resourcing plays an indispensable role (Belassi and Tukel, 1996; Chua *et al*., 1999; Korde *et al*., 2005; Fewings, 2013). Generally, PDHR projects are impeded by a shortage of availability of resources (Wilkinson *et al*. 2010; Chang 2012), and post-disaster housing reconstruction projects often fail to achieve their stated objectives (Lyons, 2009). The overall failure rate of World Bank financed PDHR projects was 50% in 2012 (Ika, 2012). Jha *et al.* (2010) argued that post-disaster housing reconstruction is impossible without financial resources but a shortage of resources is not the greatest risk in managing the financial aspects of reconstruction; rather, greater risks are found in the lack of control of financial resources and in the lack of effectiveness of the resources that are spent.

From 1980 to 2012, disaster-related losses amounted to US$3,800 billion worldwide and 87% of these reported disasters (18,200 events), were caused by extreme weather, and were responsible for 74% of financial losses (US$2,800 billion) and 61% of lives lost (1.4 million in total) (Munich Re 2013, World Bank, 2013). Despite the increase of disaster-related losses globally, post-disaster housing reconstruction projects still lack a strategy compatible with their severity. Moreover, community, cultural and socio-economic requirements, environmental conditions, government legislations, and technical and technological situations, frequently fail to operate and respond effectively to the needs of the wider affected population (Haigh *et al*. 2011).

UNHABITAT (2012) has outlined the basic characteristics of post-disaster reconstruction; the houses built for the people affected by cyclones should be durable, permanent, and cyclone resilient. Despite these guidelines, it appears that agencies and governments involved in PDHR do not maintain the core principles provided by UNHABITAT. In addition, the World Bank, the UNDP, and other international actors provide humanitarian assistance to build houses in disaster-affected areas, but despite this aid, the beneficiaries are not satisfied with the quality or durability and resilience of the houses. The safety and security of disaster-affected people are in great danger due to recurrence of risk of cyclones in the future.

There is an increasing acknowledgement and general consensus among disaster researchers, policy makers, NGOs and stakeholders that resourcing plays a pivotal role in post-disaster housing reconstruction projects. However, lack of resources is not the only cause of failure relating to PDHR projects, a lack of control over financial resources and the effectiveness of how they are spent also play their part. Empirical evidence shows that reconstruction after disasters seems to take many years and is often left either incomplete or poorly executed (Silva, 2010; Jha *et al*. 2010; Hidayat, 2014; Nirooja, 2013; Amaratunga *et al*. 2014; Mallick *et al.*2017). More often than not, little is known about the fate of survivors after the cameras and humanitarian agencies depart from the scene of the wreckage. The humanitarian assistance which was allocated for post-disaster reconstruction was not used to achieve the aim of the projects (Jones, 2006). Many people affected by disasters are stranded in transitional accommodation, having no other alternatives, and their situation is being aggravated daily. Relief, recovery and reconstructions are often politically biased, reconstruction for long-term purposes is often ignored, and reconstruction projects typically suffer from a resource bottleneck. These are the issues that need further investigation to identify the underlying causes so that possible ways to reduce the vulnerability of the people affected by disasters can be found.

Reconstructing houses after a disaster is one of the most difficult and challenging tasks in the built environment due to the vulnerability of the people and high demand for housing. Quality housing is one of the key criteria for successful post-disaster reconstruction. It is not an easy task to undertake and it faces many problems from end to finish (Jones 2006; Barenstein *et al.* 2014; Amaratunga and Haigh 2011; Jha *et al*. 2010). The post-disaster housing reconstruction, in most cases, faces delays and increased cost; poor quality and low satisfaction are common problems among the beneficiaries (Hakim 2009; Mallick *et al*. 2011; Silva 2010).

Bangladesh is one of the most disaster prone countries in the world, ranking fifth globally (Wisner *et al*. 2004; Kelman, *et al.* 2016; Paul and Rashid, 2016; Mallick *et al*. 2017). The topography and geo-physical location generally makes it more vulnerable to different types of disasters. Cyclones, tidal surges, tornedos, earthquakes, flooding and river erosion are the most common climatic hazards that millions of people face every year in this country (Paul & Rashid, 2016; Kelman, 2016; Mallick *et al*. 2017). However, cyclones were amongst the most catastrophic disasters in Bangladesh, and Cyclone Sidr and Aila were the most devastating of these, affecting the lives, property and livelihood of the people severely. Housing was the sector which suffered most damage and as a result poor people are still living in embankments, polders and makeshift houses. Furthermore, according to Mallick *et al* (2017), a catastrophic cyclone is likely to hit the coastal region of Bangladesh almost every three years. From 1970 to 2016, a total of 143 cyclones occurred and 13 out of 143 were very severe in nature (EMDAT, 2017). The cyclone disasters of 1970, 1991, 2007and 2009 were the deadliest, with a fatality count of 44,3776 people (Ibid). Due to the catastrophic cyclones, the housing sector of Bangladesh was severely affected. Following Sidr and Aila, almost 1,752,285 houses were fully destroyed (IFRC, 2009; Roy *et al*. 2009; GOB, 2008; Kabir, 2009; GFDDR, 2014). International development partners including the World Bank and UNDP, and national and international NGOs undertook initiative to render humanitarian assistance to enhance rebuilding and to repair damaged houses. However, their efforts have been questioned in terms of the effectiveness of their post-disaster reconstruction projects by many disaster researchers (Freeman, 2004; Jones, 2006; Barenstein, 2013; Ophiyandri, 2013; Pantip, 2014; Bosher, 2013; Bilau *et al* 2015). For example, several scholars have reported that constructed houses in coastal Bangladesh are inadequate, not durable, and not cyclone resilient (Paul& Nadiruzzaman, 2013; Paul and Rashid, 2016; Mallick *et al*. 2017). The literature on PDHR recognises that the housing reconstruction after cyclone Sidr and Aila is very poor, and the government's slogan of "build back better" approach which is regarded as a core shelter policy, was absent in terms of durability and tolerance against super cyclones (Islam and Walkerden, 2015; Paul and Nadiruzzaman, 2013). Earlier studies related to PDHR stated that the projects were poor and generally failed to achieve their targets (Jones, 2006; Pheng *et al*., 2006).

However, little is known about resourcing and its effectiveness, the quality of reconstructed houses and the beneficiaries' satisfaction with their houses in the cyclone prone coastal area of Bangladesh. The ultimate goal of any post-disaster housing reconstruction project is to provide durable and cyclone resilient houses, achieve high levels of beneficiaries' satisfaction and ensure a long-term solution to the housing problems of the population. Fulfilling this target is very complex as there are challenges associated with PDHR projects that pose stumbling blocks to successful post-disaster housing reconstruction. Therefore, this study explores the effectiveness of resourcing in post-disaster housing reconstruction with reference to cyclones Sidr and Aila in Bangladesh.

1.2 The research question

Previous studies on resourcing for post-disaster housing reconstruction in Bangladesh have typically focused on availability of resources and the factors that affect the required resources. This investigation incorporates those factors that can have a negative impact on resource availability but acknowledges a fundamental weakness of previous studies that do not give adequate attention to the effectiveness of resourcing for post-disaster housing reconstruction. The study argues that resource effectiveness, and not just resource availability, is at the heart of problems associated with most post-disaster housing reconstruction projects. Difficulties and challenges are faced by the local governments, stakeholders, NGOs and INGOs involved in PDHR projects in areas affected by Cyclones. This research contends that a mere understanding of the availability of resources and the factors that affect resource availability do not lead to successful and durable post-disaster housing reconstruction. Examining the effectiveness of resourcing in reconstructing houses for the people affected by Cyclones can help us to better understand the underlying factors contributing to poor housing reconstruction.

This study is based on three main interrelated objectives, i) analysis of theories and approaches relating to PDHR projects and its applicability to Post-Cyclone Disaster Housing Reconstruction (PCDHR); ii) analysis of the components of resourcing for PDHR; iii) analysis of the key success factors of resourcing and key challenges of post-disaster housing reconstruction projects. To achieve these objectives, the following key research questions have been postulated, namely:

1. To what extent is resourcing effective in reconstructing houses for the people affected by Cyclone disasters in Sathkhira and Bagerhat regions of Bangladesh?

2. What are the impacts of access to resources to post-cyclone Sidr and Aila housing reconstruction?

3. What are the key success factors of resourcing that enhance post-disaster housing reconstruction and what are the major setbacks that impede post-disaster housing reconstruction in Bangladesh?

1.3 Research aim

The aim of the research is to examine the effectiveness of resourcing for post-disaster housing reconstruction and to develop a dynamic conceptual framework in order to show how a specific community affected by disasters can recover their homes following these disasters.

Research objectives

The overall objectives of the study are to:

1. Evaluate the current post-disaster housing reconstruction in Bangladesh.

2. Develop a dynamic theoretical framework for cyclone resilient houses.

3. Explore the key success factors of resourcing for post-disaster housing reconstruction.

4. Identify the factors that affect post-disaster housing reconstruction.

1.4 Research approach and methodology

This study adopts a mixed method approach with questionnaire survey of villagers affected by cyclone Sidr and Aila, followed by a semi-structured interview of key stakeholders. The emphasis of most of the studies on resourcing for post-disaster housing reconstruction is on the factors that affect resource availability. Little is known about resourcing, its effectiveness and key success factors in terms of rebuilding houses for disaster victims. Moreover, there is a dearth of empirical evidence on the impact of access to resources in the post-Sidr and Aila housing reconstruction in the coastal areas of Bagerhat and Satkhira in Bangladesh. This investigation seeks to fill the gap in knowledge by employing questionnaire survey with affected villagers and semi-structured interview with key stakeholders from national and international organisations in order to explore the success factors and the impact of access to resources in reconstructing houses for affected people. Moreover, this study also contributes to knowledge by employing parameters around the rate of housing recovery, livelihood recovery, vulnerability reduction, poverty reduction, quality of reconstructed houses and beneficiary's satisfaction to measure the effectiveness of resourcing in reconstructing houses.

To achieve this, a pilot study was conducted in March 2016 in the selected Unions of Gabura, Satkhira, Bangladesh. Twenty affected villagers, covering both sexes were interviewed in questionnaire survey. The pilot study was undertaken in order to identify any possible error in the questionnaire as well as to increase the robustness of the data and findings.

The main fieldwork was conducted in April, 2016 and a total of 285 respondents were interviewed using a questionnaire survey in two unions, i.e. in Satkhira and two unions in Bagerhat. Furthermore, there were semi-structured interviews of 20 stakeholders, including government officials and stakeholders from UNDP, OXFAM, IFRC and other organizations who were involved in post-cyclone Sidr and Aila housing reconstruction. Quantitative data were analysed by using frequency distribution, 95% confidence interval test, Chi-square, and multiple regressionanalysis and qualitative data were analysed using thematic analysis and NVivo version 10.

This study was conducted in the southern districts of Bagerhat and Satkhira in Bangladesh. These two districts of Bangladesh were severely affected and livelihoods were tremendously disrupted by cyclone Sidr in 2007 and Cyclone Aila in 2009. As this study employed a mixed method approach, a qualitative approach was used to investigate research questions (Chapters one and seven) and quantitative approach was used to test the theory based hypotheses (Chapter five and six). This study started with a comprehensive literature review on theories relating to disaster management and resourcing for post-disaster housing reconstruction in order to explore the effectiveness of resourcing in reconstructing houses. Due to the dearth of literature on resourcing for post-disaster housing reconstruction in Bangladesh, exploratory, and semi-structured interviews were administered to collect data. The details of the research approach are explained in chapter four.

1.5 Structure of the thesis

Following the overall introduction, background of the study, theoretical foundation and research questions in chapter one, chapter two is based on the review of the literature relating to disaster management and post-disaster housing reconstruction. More specifically, it evaluates theories and approaches and explores their applicability in post-disaster housing reconstruction. Therefore, in chapter two, there is a summary of the main models evaluated in this study; it also explores the key components and success factors of resourcing followed by a discussion on the conceptual framework of the study.

Chapter three is the second of two literature review chapters (Chapters 2-3) and is based on the empirical studies of post-disaster housing reconstruction in Bangladesh, focusing on the history and background of disasters and the condition of overall post-cyclone housing reconstruction in Bangladesh.

Chapter four provides the description of methodological considerations of this study. It further outlines research questions, aim and objectives, hypotheses and research variables employed for this study followed by detailed explanations of the methods used for sampling and data collection, and a description of both the quantitative and qualitative method of data analyses.

Chapter five, six and seven provide a discussion of the information obtained from fieldwork and in-depth interview with stakeholders. Chapter five focuses on the analyses and discussions of the impact of access to resources and socio-economic variables in post-disaster housing reconstruction. It also evaluates the factors that determine the effectiveness of resourcing in PDHR projects which is the central aim of this study.

Chapter six is based on both quantitative and qualitative data. It explores quantitative data from a questionnaire survey of 285 villagers affected by cyclone disasters and qualitative data from in-depth interviews. In addition, this chapter explores challenges associated with post-disaster housing reconstruction from questionnaire survey and exploratory interviews with stakeholders working in national and international organisations.

Chapter seven presents an explorative analysis of qualitative data using semi-structured interviews of key stakeholders who were involved in post-Sidr and Aila housing reconstruction. Here, the opinions and responses of expert interviewees were extracted from the audio files and were used to generate critical insights on practical and theoretical issues associated with creating a dynamic model for cyclone resilient houses for the Sidr and Aila affected coastal community of Bangladesh.

Chapter eight is the final chapter of this thesis. It presents the overall discussion of the findings of the research project in order to provide a link between the theoretical concepts and empirical findings. The implications of the research findings are also explored in this chapter together with the recommendations for future research.

CHAPTER 2 RESOURCING AND ITS IMPLICATIONS IN POST-DISASTER HOUSING RECONSTRUCTIONS

This research draws on theories and literature relating to resourcing for post-disaster housing reconstruction to illuminate the factors that affect post-disaster housing reconstruction, exploring key success factors of resourcing for post-disaster housing reconstruction and explore possible ways to rebuild cyclone resilient houses for the people affected by cyclone disasters. It is significant to review existing theories on disaster management and resourcing for post-disaster housing reconstruction to explore how a specific community has dealt with post-disaster housing reconstruction and how those existing theories can be applied to strengthen post-disaster housing reconstruction projects.

Although the study of disaster is a growing field, the research on resourcing for post-disaster housing reconstruction is relatively limited; specifically to the knowledge of this researcher, no primary investigation has been carried out on the effectiveness of resourcing for post-disaster housing reconstruction projects in Bangladesh or elsewhere. Therefore, in order to explore the effectiveness of resourcing in post-disaster housing reconstruction, this study has reviewed existing theories of Pressure and Release model (PAR), Sustainable Livelihood Framework (SLF), Access to Resource Model (ARM), Conceptual Linkages Model (CLM) and Sustainable and Resilient Community Framework (SRCF).

The examination of Post-Disaster Housing Reconstruction Theory (PDHRT) and further attention to developing a dynamic theoretical framework will enable resourcing managers, local governments, NGOs and INGOs, and international stakeholders to strengthen post-disaster housing reconstruction. The literature suggests that post-disaster housing reconstruction projects in the developing countries are at an unsatisfactory level, as they fail to meet the needs of poor communities trying to recover from disasters (Lizarralde, 2000; Jones, 2006; Alam, 2010; Lyons 2009). Post-disaster housing reconstruction is one of the least successful sectors in terms of implementation (Barenstein and Pittet, 2007); reconstructed houses are very fragile and risky for people affected by cyclones (Freeman, 2004; Jones, 2006; Moe *et al*. 2007; Amaratunga *et al*. 2011; Hakim, 2009; Kabir 2009; Paul

2009; and Mallick *et al*. 2011). The people affected by cyclones often live in embankments and polders years after disaster (Kabir, 2009; Paul and Routray. 2013; Ahmed and Haidar, 2014), and government's public spending decision making processes for post-disaster housing reconstruction projects is generally affected by other considerations rather than the need of affected people (Noy and Karim, 2015).

Scholars in this research area have distinct arguments about resourcing and its implications in terms of post-disaster housing reconstruction. For example, Freeman (2004) and Jones (2006) argued that post-disaster housing reconstruction resources normally go into the hands of the social and political elites and the aid lies paralysed in the accounts of governments and NGOs. On the other hand, Singh and Wilkinson (2008); Wilkinson *et al.* (2010) and Chang (2012) reported that post-disaster reconstruction projects generally suffer from resource bottlenecks, but they did not identify the underlying causes of these bottlenecks; rather they identified the factors that affect resource availability. In contrast, Burnell (2010) argued that the commodification of aid, especially for housing reconstruction, embodies cultural symbolism, social power dynamics, and political affiliations and can have negative effects on long-term and sustainable reconstruction.

The central purpose of this literature review is to evaluate theories and approaches relating to resourcing for post-disaster housing reconstruction and their applicability in terms of reconstructing houses for the people affected by Cyclones in Bangladesh. It also explores these theories in terms of the relationship between disaster vulnerability, coping capacity and resilience. This chapter has been organised into four sections: disaster management, theoretical perspective, resourcing and its implications on PDHR and theoretical framework for this study. The first section presents and discusses the conceptual definition of disaster management and its cycle. The second section evaluates the dominant theories of Pressure and Release Model (PAR), Sustainable Livelihood Framework (SLF), Access to Resource Model (ARM), Conceptual Linkages Model (CLM) and Sustainable and Resilient Community Framework (SRCF) in the field of disaster, with a view to highlighting the strengths and weaknesses of each theory. It then presents the applicability of dominant theories into the Post-Cyclone Housing Reconstruction (PCHR). The third section provides a brief description of resourcing and its components, interactions between the different components, key stages of resourcing, and key success factors of resourcing for post-disaster housing reconstruction. The fourth section presents a discussion on the theories and approaches of post-disaster housing reconstruction and it explores the strength and weaknesses of each theory. Finally, the fifth section provides a description about the important issues of theoretical framework followed by a discussion about the importance of permanent housing reconstruction in the post-disaster period.

2.1 Disaster management

Disaster management is extremely significant for reducing the vulnerability of the community affected by natural disasters. It has evolved as a popular field of research in the last few decades. More than half of the existing disaster research conducted over the last two decades has brought an evolution in the theories of disaster management (Alexander, 1997). Disaster management is a systematic process of undertaking multifarious strategies, activities and time-bound decisions and actions that can increase the coping capacity of affected communities to reduce their vulnerability to withstand future disasters. UNISIDR (United Nation International Strategy for Disaster Risk Reduction) (2007) has defined disaster management as a systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. Similarly, IFRC (International Federation for Red Crescent Committee) (2011) has defined disaster management as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters. Therefore, it can be argued that disaster management is a step by step process and the sum total of all activities, strategies and measures which can be undertaken before, during and after disasters in order to promote recovery, reduce vulnerability and withstand future disasters.

2.1.1 Definition of disaster

The term ‘disaster’ is derived from the Latin roots dis and astro which means away from the stars, and post means the stage after the disaster. Historically, a disastrous event was understood to be caused by an unfortunate astrological configuration (Coppola, 2007). Disasters that were thought to be acts of God have recently been associated with the acts of man (Drabek, and McEntire, 2003). Quarentelli (2000) critiques viewing disasters as phenomena; rather he suggests that disaster should be viewed as an extreme event with a natural, technological or social cause that has consequences in terms of casualties, destruction, damage and disruption. The debate continues today with a plethora of definitions arising from various sociological, anthropological and cultural perspectives (Gilbert, 1995; Hewitt, 1995; Oliver- Smith, 1990; Perry & Quarentelli, 2005). The most commonly and widely accepted definition of disaster was given by UNDHA (United Nation Department of Humanitarian Affairs) in 1992, which is: "disaster is a serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of the affected people to cope using its own resources". In recent decades, there has been much debate about how to define disasters accurately. The debate has been circling around what elements should be included in a definition to present a whole picture of disasters (Chang, 2012).

The Centre for Research on the Epidemiology of Disaster (CRED, 2013)) has provided this definition:

'Disaster is a situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering'. Though often caused by nature, disasters can have human origins'. The definition of UNDHA 1992 and CRED on disaster has actually explained the impact of a disaster on human society. However, these two definitions fail to explain what actually contributes to a disaster. In other words, the key meaning of what causes a disaster to happen is largely missing. Wisner *et al*. (2004) and Hewitt (1995) following the definition of UNDHA and CRED have emphasized this concern. To address this flaw in definition, Quarantelli (1995) has introduced the concept of vulnerability to portray disaster as being caused largely by social conditions. Over thirty years ago, O'Keefe *et al*. (1976) had suggested that many disasters are essentially the consequence of the combination of natural hazards, and social and human vulnerability.

2.1.2 Cycle of disaster management

Disaster management aims at reducing vulnerability and potential losses from hazard, by ensuring prompt assistance to the victims of disaster and achieving a rapid and effective recovery prior to disaster. The disaster management cycles broadly explain the ongoing process of how governments, businesses and civil societies plan for and reduce the impact of disasters, react during and immediately following a disaster and take steps to recover after a disaster has taken place. It provides appropriate actions at all points that would lead to being well prepared, have better warnings in place and help reduce vulnerability.

Carr (1932) was the first disaster researcher who focused on different phases of activities involved in the aftermath of disaster events. He categorised events by time sequences to understand the series of changes and experiences (disruption, disorganisation, confusions, reorganisations and readjustments) caused by a disaster. Later, a number of disaster researchers classified disaster management into prevention, preparedness, warning, emergency relief, response, recovery, reconstruction, adjustment, and mitigation (Barton, 1969; Mileti, *et al*.1995). Recently, scholars like Amaratunga and Haigh (2011); Alexander, (2002); Amin *et al*. (2008); Lettieri *et al*. (2009) and Perera *et al*. (2011) have developed different models and stages of disaster management. Generally, disaster management consists of four main stages: mitigation, preparedness, response and recovery or reconstruction. Based on existing literature, a disaster management cycle can be developed as follows:

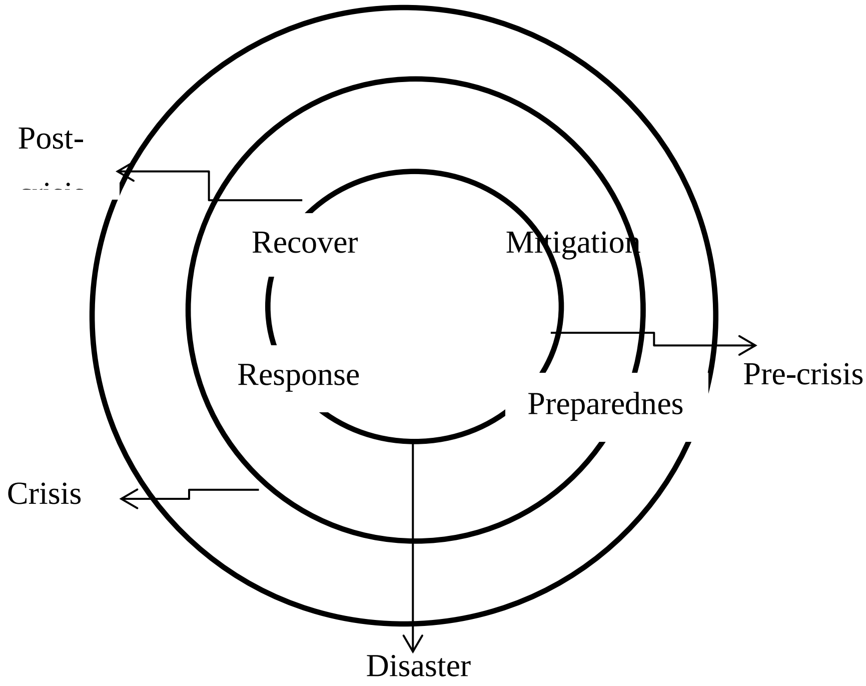


Figure 2. 1 Disaster management Cycle

Source: Adapted from Alexander, 2002

Mitigation and preparedness phases can take place before or after disaster strikes. Mitigation is the lessening or limitation of the adverse impacts of hazards and related disasters. Activities in this stage include the application of engineering techniques, hazard resistant construction and improved environmental policies and public awareness (UNISIDR, 2009).

Preparedness is the knowledge and capacities developed by governments, professional response and recovery organisations, communities and individuals to anticipate and effectively respond to and recover from, the impacts of likely, imminent or current hazardous events or conditions. This stage relates to the readiness to respond to disaster (Ophiyandri, 2013).

Response and recovery phases generally occur after disaster strikes. Response refers to a set of emergency actions taken during the disaster and shortly after the disaster. The main purpose of the response phase is to save human lives in the form of rescue and supply of victims' needs. The recovery phase normally takes longer and occurs after emergency actions in the response phase, the aims of the recovery are to repair damage, to restore services, and to reconstruct facilities after disaster has struck (Alexander, 2002).

Reconstruction is the essential element for mitigation and preparedness. Reconstruction plays an indispensable role in disaster management. The livelihoods of affected communities are restored by building new housing units and infrastructures which provide an opportunity to re-plan the community, beginning a new life with a new start (Hidayat, 2013).

2.1.3 Disaster management system in Bangladesh

Disaster management is the creation of plans or strategies to reduce the overall disaster, associated risks and vulnerabilities (Drabek, 1991). Disaster Management (DM) plans cannot eliminate threat related with disasters but disaster management strategies can be useful in terms of reducing the people's vulnerability. Although DM is very significant in terms of withstanding future disaster; its success depends on the people's active participation in the decision-making process (Pearce, 2000; Burnell, 2010; Amaratunga *et al*. 2011; Barenstein and Leeman, 2013). However, most of the countries in the world have their own disaster management plans to withstand and or to recover after they are struck by disasters.

Therefore, Bangladesh as a disaster-prone country, has disaster management plans to avoid disaster related vulnerabilities. The government of Bangladesh created a well-defined disaster management institutional mechanism by issuing the Standing Order on Disaster (SOD) in 1997. The Ministry of Food and Disaster Management of the Government of Bangladesh ((MoFDM)) has overall responsibility for coordinating national disaster management efforts across all agencies. Under the SOD, a series of inter-related committees, at both national and sub-national levels have been created to ensure the effective planning and coordination of disaster risk reduction and emergency response management (GOB, 2008).

a) Disaster management regulatory framework in Bangladesh

This section discusses and presents the disaster management regulatory framework of Bangladesh. It consists of three main disaster management acts namely: i) The Disaster Management Act; ii) National Disaster Management policy of Bangladesh; and iii) Standing Order of Disaster Management.

i) The Disaster Management Act

The Bangladesh Disaster Management Act (BDMA) forms the legislative basis for the protection of life and property to manage long term risks from the effect of hazards; natural, technological and human, and to respond to and recover from a disaster event (GOB, 2008; SOD, 2010). The Disaster Management Acts aims to:

a) Help communities to: (i) mitigate the potential adverse effects of hazard events, (ii) prepare for managing the after effects of a disaster event, (iii) effectively respond to and recover from a disaster or an emergency situation, and (iv) adapt to adverse effects of climate change.

b) Provide for effective disaster management for Bangladesh.

c) Establish an institutional framework for disaster management. d) Establish risk reduction as a core element of disaster management (GOB, 2008).

ii) National Disaster Management Policy in Bangladesh

The National Disaster Management Policy defines the national policy on disaster risk reduction and emergency response management, and describes the strategic policy framework and national principles of disaster management in Bangladesh. It is strategic in nature and describes the broad national objectives and strategies in disaster management. The Bangladesh National Plan for Disaster Management provides the overall guideline for the relevant sectors and disaster management committees at all levels to prepare and implement their area of role specific plans. The plan identifies the key sectoral policy agenda for disaster management. Additionally, there are a few hazards specific management plans, such as the Flood Management Plan, Cyclone and Storm Surge and Tsunami Management Plan, Earthquake Management Plan, Drought Management Plan, River Erosion Management Plan, etc. Moreover, there is a detailed Disaster Management Plan for each District, Upa-zila, Union and Paurashava and City Corporation of the country. A District Disaster Management Plan will be the compilation of the Upa-zila Disaster Management Plans of the district. Similarly, the Upa-zila Disaster Management Plan will be a compilation of the union disaster management plans of that Upazila prepared by the Union DMC.

iii) Standing Order of Disaster Management

The Standing Order on Disaster outlines the disaster management arrangements in Bangladesh and describes the detailed roles and responsibilities of committees, Ministries, Departments and other organizations involved in disaster risk reduction and emergency response management, and establishes the necessary actions required in implementing Bangladesh's Disaster Management Model, e.g., defining the risk environment, managing the risk environment, and responding to the threat environment.

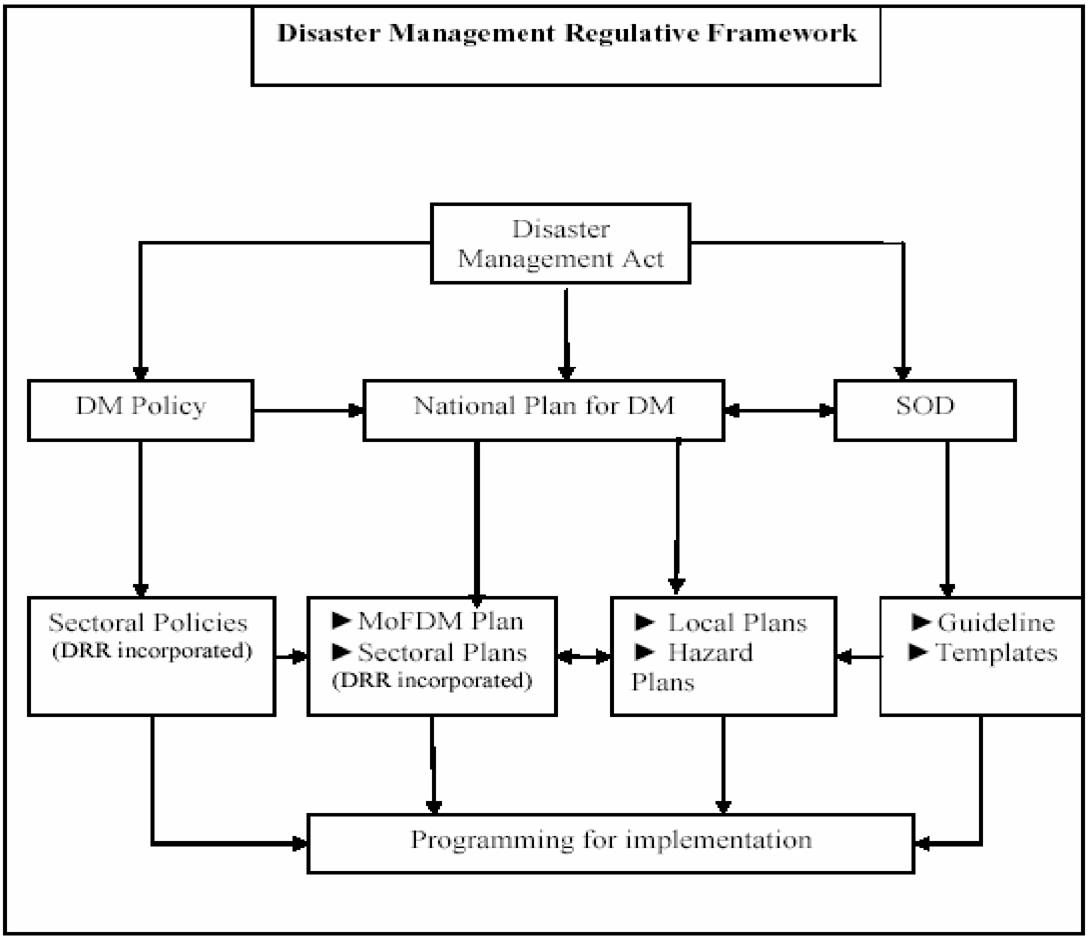


Figure 2. 2 Disaster management regulatory framework in Bangladesh

Source: SOD, 2010

2.2 Theoretical perspective

The theories which are used in this study are the Pressure and Release Model (PAR), Sustainable Livelihood Framework (SLF), Access to Resource Model (ARM), Conceptual Linkages Model (CLM) and the Sustainable and Resilient Community Framework (SRCF). PAR was developed by Wisner *et al*. (2004), and the central hypothesis of this model is based on how the impact of disaster increases when natural hazards hit and affect vulnerable people, and how vulnerability is generated and reduced. This model was used previously to examine natural hazards like flooding (Mustafa 1998) and typhoons (Gaillard *et al*. 2007), as well as complex pandemics such as HIV/AIDS (Tsasis and Nirupuma 2008).

ARM was also developed by Wisner *et al*. (2004), and this model was used by Winchester (1992), and Bosher *et al*. (2007) to present a resource accessibility vulnerability index in Andhra Pradesh in India, and to examine the factors that affect people having access to resources to resist, withstand and recover from disasters. The central hypothesis of this model deals with the amount of access that people must have to capabilities, assets, and livelihood opportunities which enable them to reduce their vulnerability and avoid disaster.

SLF was introduced by DFID in 1999 but the original concept of SLF was developed by Chambers and Conway in 1992. The central hypothesis of this model is that livelihood comprises of capabilities, assets including both material and social resources, and activities is sustainable and can recover from stresses and shocks.

CLM was introduced by Cutter *et al* (2008). The central purpose of this model is to explain the mutual relationships between disaster vulnerability, the coping capacity of disaster victims and disaster resilience. On the other hand, SRCF was introduced by Tobin in 1999. The central hypothesis of this model was to show how disaster victims can reduce their disaster exposure and vulnerability, increase their coping capacity and thereby become disaster resilient.

As applied to this research, these theories hold that the researcher of this study would expect the independent variable 'resourcing' to influence dependent variables 'reconstruction' because resources are required to enhance reconstruction; and people affected by disasters need to have access to resources to resist and/ or withstand disasters. However, the study presents and discusses the main theoretical models which are relevant to this research in the next part of this section.

2.2.1 PAR (Pressure and Release) model

PAR model developed by Wisner *et al*. (2004) is based on the hypothesis that a disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and the natural hazard event on the other. The PAR model is a simple tool that can be utilized to understand how the impact of disasters increases when natural hazards hit and affect vulnerable people, how vulnerability is generated, and how it is reduced. The conceptual framework of PAR emphasises the fact that vulnerability and the development of a potential disaster can be viewed as a process involving increasing pressure on the one hand and the opportunities to relieve the pressure on the other. According to the PAR model, those people who have limited access to power, resources, training, skills, political influence, and inadequate investments are susceptible to vulnerability because they live in unsafe conditions. For example, unprotected buildings and infrastructure, a dangerous physical environment, low income, and imperilled livelihood. According to this model risk means disaster, and the equation of this model is:

Risk = Hazard × vulnerability

According to the above equation, where there is more vulnerability, there is more hazard, and hazard generally multiplies in vulnerable condition. Therefore, hazard is created from risk factors.

Critique of PAR

PAR model is known worldwide as one of the best known theories and conceptual frameworks emphasising vulnerability assessment and its driving forces. This model is significant in addressing the release phase and root causes of vulnerability that contribute to disaster. It is very useful for this research because it provides a conceptual framework that analyses the vulnerability of poor people and their capacity to recover their livelihoods in response to disaster. If vulnerability is not reduced then livelihood is difficult to recover; which means people affected by cyclones may not be able to reconstruct their houses.

However, the PAR model is critized by several prominent researchers for not providing a detailed and theoretically informed analysis of the precise interactions of environment and society at the ‘pressure point’, i.e. at the point where and when the disaster starts to unfold (Wisner *et al.* 2004). It also fails to address the role of juxtaposition to the source of the threat making it more useful for descriptive analysis rather than empirical testing. In addition, it is argued that the model is mainly used for vulnerability analysis and not for measuring vulnerability (Birkman 2006). Furthermore, different elements in conceptual frameworks, including root causes and unsafe conditions, are dynamic and subject to constant change.

Therefore, the task of identifying and verifying the causal links between root causes, dynamic pressure and unsafe conditions in a quantitative way might be very difficult.

2.2.2 Sustainable Livelihood Framework

Sustainable Livelihood Framework (SLF) was introduced by DFID in 1999. But the original concept of SLF was developed by Chambers and Conway in 1992. The concept of SLF is becoming very popular and central to the debate about rural development, poverty reduction, and environmental management. It plays a pivotal role in eradicating poverty, bringing about development and managing or coping with natural disasters. There are two major terms in SLF which are sustainability and livelihood. A livelihood comprises the capabilities, assets and activities required to make a living; it is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation. Sustainability, in this context, means when people can cope with and recover from stress, shocks, destruction of houses or shelters and economic loss and maintain or enhance its capabilities and assets following a disaster both now and in the future (Chambers and Conway1992, and DFID, 1999). There are five criteria of a livelihood framework that play a major role in determining the vulnerability of impoverished people. People's livelihoods and the wider availability of assets are fundamentally affected by critical trends as well as by shocks and seasonality – over which they have limited or no control. The critical factors that make up the vulnerability context play a significant role because these key factors affect the assets status of people. For example, shocks can destroy assets directly in the case of floods, storms, civil conflict, but they can also force people to abandon their homes and dispose of assets prematurely as part of their coping strategies (DFID, 1999).

Critique of SLF

A sustainable livelihood framework is a very useful and important approach or model underpinning the capability of a person to cope when in a vulnerable situation and it is said to equip individuals to face natural calamities and recover from stress and shocks. The SLF approach combines a variety of activities that impoverished and disaster affected people can carry out to make a living. Researchers have identified this as particularly significant for people who depend on various source of income to make up the household economy

(Chambers, 1995; Hussein and Nelson, 1998; Birkmann, 2006). Finally, “the SL approach facilitates an understanding of the linkages between people’s livelihood strategies, their asset status, and their way of using available natural resources, and is therefore a useful approach for understanding both the problem and the scope for promoting sustainable development at the local level” (Krantz, 2001, p.26).

Despite being a popular and recognised model, SLF has been criticized by several prominent researchers such as Sanderson (2002) and Morse *et al*. (2009). First, the framework itself appears to be a complicated one which contains too much information which affects its ability to restore the livelihood of vulnerable people. Secondly, the key issues, such as access to the role of transforming structures remain unclear and very general. Haan, (2005) and Zoomers, (2005) suggested that access and the role of transforming structures are key issues which have not been sufficiently examined so far. They argued that access as a key element in the sustainable livelihood framework heavily depends on the performance of social relations. Therefore, more emphasis on sustainable livelihood research should be given to the role of power relations. Thirdly, it is very ambiguous to analyse and measure capitals within a sustainable livelihood framework because there is no guideline in the SLF on how to do this. For example, to restore livelihood, the status of vulnerability should be assessed and to assess vulnerability, all types of capitals need to be measured but it is difficult to measure natural, human, social and physical capital. However, SLF is still a dominant and very popular theory in disaster study, and is an effective tool for people to recover in a post disaster, chaotic environment.

2.2.3 Access to Resource Model (ARM)

ARM was designed by Wisner *et al*. in 2004 to recognise that a PAR model does not provide a detailed and theoretically informed analysis of the precise interactions of environment and society at the pressure point, i.e where and when the disaster starts to unfold. This model focuses on the precise detail of what happens at the pressure point between the natural event and the longer-term social processes (Wisner *et al*. 2004). The access model is a significant approach or strategy that deals with the amount of access that people need to have to capabilities, assets, and livelihood opportunities that will enable them to reduce their vulnerabilities and avoid disaster. Generally, access involves the ability of an individual, family, group, class or community to use resources which are directly required to secure a livelihood in normal, pre-disaster times, and their ability to adapt to new and threatening situations, and access to such resources is always based on social and economic relations including the social relation of production, gender ethnicity, status and age, meaning that rights and obligations are not distributed equally among all people. This means the access of people to required resources to withstand disaster and recover from it in post-disaster situations mainly depends on the political economy of social and economic relations that shape and limit their ability. For example, resourcing, including relief, humanitarian aid, and physical material, is provided to build shelters for the coastal cyclones affected Bangladeshi people. If those people have no access to resources directly, the housing reconstructions and livelihood recovery might be difficult.

Critique of ARM

This widely accepted model focuses on the ways unsafe conditions arise in relation to the economic and political processes that allocate assets, income and other resources in a society. It also shows how social systems create the conditions in which hazards impact differently within society. Moreover, nature itself constitutes a part of the resources that are allocated by social processes, and under these conditions people become vulnerable in varying degrees to hazard impacts. Finally, an ARM approach implies addressing vulnerabilities, root causes and dynamic pressure, and aims to build the social, economic, and physical capacities of a person to expedite the overall development of a society. Therefore, although it is very cumbersome to prevent disasters, the capacity of people to withstand them can be improved.

A number of scholars have criticised the work of Wisner *et al*. (2004) of 'Access to Resource Model' (Haghebaert 2001). One of the major problems of this model is that the framework does not link up with political and socio-economic processes. The model does not show clearly how poor people can have direct and quick access to resources to expedite their sustainable post disaster recovery and reconstruction, and non-tangible assets such as creativity, experience and inventiveness are under emphasised. However, it is very difficult to say that Wisner's *et al*. (2004) Access to Resource Model is not a dominant model as it is still popular especially for disaster risk reduction management and is engaged by a large number of researchers.

2.2.4 Applicability of dominant concepts to Post Cyclone Housing Reconstruction (PCHR)

This study provides a critical analysis of theories relating to disaster management and resourcing for post-disaster housing reconstruction; it compares and contrasts each theory, and it also shows how disaster theories can be applicable in terms of post-cyclone housing reconstruction projects.

Kelly (1999:25) argued that a disaster model can be useful to post-disaster reconstruction due to the following four reasons:

a) a model can ease complex events by exploring and distinguishing between critical elements; b) comparing actual conditions with a theoretical model can lead to a better understanding of the current situation and can thus facilitate the planning process and the comprehensive completion of disaster management plans; c) availability of a disaster management model is an essential element in quantifying disaster events; d) a documented disaster management model helps establish a common base of understanding for all involved.

Mohapatra (2009) and Jahan (2012) argued that well defined theories and models might be conducive in exploring the underlying causes of certain disasters and vulnerabilities to show ways to reduce that vulnerability and that they could manage the post-disaster reconstruction through providing proper and accurate guidelines.

Thus, it can be argued based on the above mentioned statements that an empirical, specific, and well defined theory can be very effective in guiding the post-disaster reconstruction because it facilitates the safe and secure supports for the affected pople. Hence, disaster management needs a formal system, or a model, to manage and possibly reduce the negative consequences of a disaster in order to reduce the vulnerability (Asghar *et al*. 2006).

The current research is concerned with the effectiveness of resourcing for post-disaster housing reconstruction in Bangladesh. The dominant concepts analysed in this study can be applied to explore the effectiveness of resourcing in administering post-disaster housing reconstruction. As the PAR model was used for post-disaster reconstruction after the Indian Tsunami of 2004, this model including SLF and ARM could be applicable and effective in managing PDHR projects in Bangladesh because those components are relevant for this current research. Root causes, dynamic pressure, and unsafe conditions of a PAR model are quite relevant for curerent research because cyclone affected people have limited access to power and resources and limited economic and political influences, as a dynamic pressure. They have a lack of education, training and skills, local investment, press freedom or ethical standards and livelihoods are at risk due to low incomes. High population growth, environmental degradation, unsafe conditions, dangerous locations and unsafe buildings all add to the problem.

However, coastal people get lower priority from the government to deal with hazard mitigation due to their low ability and economic power. The root causes according to PAR model of the disaster are related to the coastal zones of Bangladesh, where cyclones attacked the poverty stricken communities. Poverty is another root cause because, hypothetically, if poverty did not exist then there would be no residents in these areas. The coastal area of Bangladesh is generally affected by the natural disasters of cyclones or flood, and most of the reconstruction occurs due to the havoc and damage caused by cyclones. Therefore, it is very useful for this study to use the approaches of PAR model as a framework because the PAR model was introduced by Wisner *et al.* (2004) in order to reduce vulnerability by assessing the progression of vulnerability.

The dominant concepts cannot stop natural disasters but their application can reduce the vulnerability of the affected population through its approach because comparing actual conditions with a theoretical model can lead to a better understanding of the current situation and can thus facilitate the planning process and the comprehensive completion of disaster management plans. Thus, the PAR model indicates how the risk of disasters can be reduced by applying preventive and mitigating actions, addressing the underlying causes, and analysing the nature of hazards which lead to safer conditions which in turn help to prepare the community to deal disasters.

The SLF approach will also be useful for this research because it is founded on a belief that affected people require a wide range of assets to achieve positive livelihood outcomes, and a single category of asset is not sufficient for bringing about change in their lives. As cyclone affected people are very vulnerable, they need access to assets to recover shelter and livelihoods from the dire consequences of cyclones, this can help them to cope with the changing environment of cyclone disasters. As a human capital, cyclone affected people need to have access to sound health, nutrition, education and training, and the capacity to cope and adapt with the chaotic environment of post-disaster reconstruction; as social, physical and financial capital, they need to have access to cooperations, political participation, networks, secure shelter, access to banking facilities and natural resources that can boost their mental state and confidence which would result better disaster preparation and successful post-disaster housing reconstruction.

Access to resources is the most significant part of any reconstruction activities. The Access to Resource Model determines the demarcation of the amount of access that people have to have to reduce their vulnerabilities to avoid disaster; this model also explains how unsafe conditions emerged at the household level due to the political and economic processes that affect the allocation of resources. Generally, the level of access to resources at a household level strognly enables or hinders people in their response to the recurring hazard or natural disaster, which means the people in society who have less access to resources have less possibility of withstanding disaster and having a safer life. On the other hand, the people who have a more access to resources have a higher chance of avoiding disaster in comparison. For example, people who have a sufficient amount of access to resources in cyclones affected areas have tv or radio to receive warnings and can leave their houses with all valuable goods before disaster strikes. However, people with less access to resources can not make preparations to leave their houses and seek refuge in time.

Sanderson and Burnell (2013); Powel, (2011) and Amaratunga *et al*. (2014) argued that the most important goal of any post-disaster reconstruction programme must be to reduce the long-term vulnerability of affected communities through the construction of multi-hazard proof housing and appropriate knowledge transfer. As people of cyclone affected areas are vulnerable, they need to have access to resources to withstand disasters in order to reduce their vulnerability. This access to resource theory can be very useful for this reaserch because it provides a significant approach or strategy that deals with the amount of access that cyclone affected people have to the capabilities, assets, and livelihood opportunities that will enable them to reduce their vulnerability and avoid disaster. This access affects the ability of an individual, family, group, class or community to use resources which are directly required to secure a livelihood in normal, pre-disaster times, and their ability to adapt to new and threatening situations. Access to such resources is always based on social and economic relations including the social relation of production, gender ethnicity, status and age, meaning that rights and obligations are not distributed equally among all people.

2.3 Disaster vulnerability, coping capacity and resilience: an in-depth discussion

Disaster vulnerability, coping capacity and resilience are fundamentally inter-related concepts and are attracting increasing attention from disaster researchers, practitioners and academics (Vogel *et al*. 2007; Yin *et al*. 2013; Fekete *et al*. 2014). Though they are inter-related concepts, their mutual relationships are still unclear and ambiguous especially in disaster management literature (Yin *et al*. 2013; Fekete *et al*. 2014). However, this section of the study will discuss the links between vulnerability, coping capacity and resilience by evaluating the Conceptual Linkages Model introduced by Cutter *et al*. (2008) and will explore how disaster victims bounce back after being afflicted by natural disasters through evaluating 'Sustainable and Resilient Community Framework introduced by Tobin (1999).

2.3.1 Conceptualizing vulnerability

Vulnerability is a concept which has been used in different research fields without having a consensus definition (Adger, *et al*. 2005; Wandel and Smith, 2006; Gallopin, 2006). However, many researchers have defined vulnerability in different ways. Vulnerability derives from the Latin word vulnerare (to be wounded) or being prone to or susceptible to damage or injury and it describes the potential to be harmed and sensitivity to a perturbation or stress (Downing *et al*. 2001; Turner *et al*. 2003; Wisner *et al* 2004). In other words, vulnerability is the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist and recover from the adverse impact of natural hazards (Wisner *et al*. 2004; IPCC, 2007; Yin *et al*. 2014). It involves a combination of factors that determine the degree to which someone's life, livelihood, property and other assets are put at risk by a discrete and identifiable event in nature and society (Wisner *et al*. 2004). Therefore, from the above definition it can be summarised that vulnerability is the incapacity or inability of a person or group to cope with and recover from the adverse impact of natural disasters.

The literature is divided in terms of explaining the causal structure of vulnerability. Some researchers argue that vulnerability arises from underlying social conditions that are often remote from the initiating event (Cutter *et al*. 2003). Other researchers, for example, Wisner *et al*. (2004) argued that people's incapacity, social, economic and political processes make them vulnerable. However, Cutter *et al*. (2003) emphasized the three key criteria of vulnerability research; i) the exposure conditions that make people or places vulnerable to extreme natural events; ii) the societal resistance or resilience to hazards and iii) the integration of potential exposures and societal resilience with a specific focus on particular regions. Considering the multifaceted approaches of vulnerability, it is clear that vulnerability is an unavoidable social problem which is linked to people's poverty, low income, lack of education and training, unsafe conditions, and lack of political engagement.

2.3.2 Conceptualizing coping capacity and disaster resilience

Coping capacity has become a core concept in disaster management research. Capacity means the ability of a person or group that can enable them to acclimatize to an adverse or vulnerable situation. It is the combination of all the strengths, attributes and resources available within a community, society or an organisation, and that can be used to achieve agreed goals (Amaratunga and Ginige, 2011). But coping capacity in disaster literature indicates knowledge, skills and training, technology and available resources increase resistance capability to withstand disasters (Ibid). It means the level of resources and the way people or organisations use these resources and abilities to face adverse consequences of a disaster (ECHO, 2005). Therefore, coping capacity is the process, the action, or the ability of an individual or a system to improve their inherent genetic or behavioural characteristics in order to better adapt to adverse effects of natural disasters and to minimize these effects and maximize potential opportunities in response to the untameable disturbance (Yin *et al*. 2014)

The phenomenon 'resilience' is being considered by disaster researchers, practitioners, policy makers and academics as a key concept in the disaster management field. It derives from the Latin word resilio which means to jump back in a mechanical sense, resilience of a material is the quality of being able to store strain energy and deflect elastically under a load without breaking or being deformed (Klein *et al*.2004). Resilience can generally be defined as a response capacity to interferences or as the capacity to resist and recover from loss and change, which includes short term coping capacity and long term adaptive capacity (Folke *et al*. 2004; Fekete *et al*.2014). In other words, resilience indicates the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is also determined by the degree to which the social system is capable of organizing itself to increase its capacity for better protection to improve risk reduction measures (UNISIDR, 2004).

2.3.3 Disaster vulnerability, coping capacity and resilience

The literature suggests that the relationship between disaster vulnerability, coping capacity and resilience are overlapping (Wandel *et al*. 2006; Yin *et al*. 2014). Vulnerability is the condition where a person or group of people have a lack of access to resources and face difficulties to cope with and recover from adverse natural disasters. Coping capacity, on the other hand, is the system's ability to adjust to a disturbance, moderate potential damage, take advantage of opportunities, and cope with the consequences of a transformation that occurs (Gallopin, 2006). According to Gallopin (2006), the difference between vulnerability and coping capacity is the condition exposure that an individual is susceptible to, lack of access to resources and inability to cope with and recover from the adverse effects of natural disasters, whereas coping capacity is the response ability of an individual or group to cope with and recover from the adverse impact of natural disasters. Coping capacity means the short-term ability to just survive after disaster hits. In contrast, resilience is the flip side of vulnerability and has become an essential concept in disaster management research. It is a profound shift from traditionally attempting to control changes in systems to a more holistic and realistic viewpoint which aims to enhance the capacity of a system, individual of group to adapt to uncertainty and surprise (Adger *et al*. 2005). However, Folke *et al*. (2002) argued that there are three elements which need to be present in being resilient: i) having capability to response to disturbance; ii) capacity to self-organize; iii) recovery and capacity to learn and adapt. Therefore, for the above discussion it can be argued that vulnerability is the initial period of disaster and it is linked to poverty and lack of access to resources where an individual or group of people is unable to cope and recover. Coping capacity is the improved condition in comparison to vulnerability. In contrast, resilience indicates the robust adaptive capacity in which a system or individual can not only cope with but also recover their overall position from uncertainty and surprise prior to disaster. Moreover, this study will underpin the relationship between vulnerability, coping capacity and resilience in detail in the following section by evaluating the linkage model adapted from Cutter *et al*. (2008).

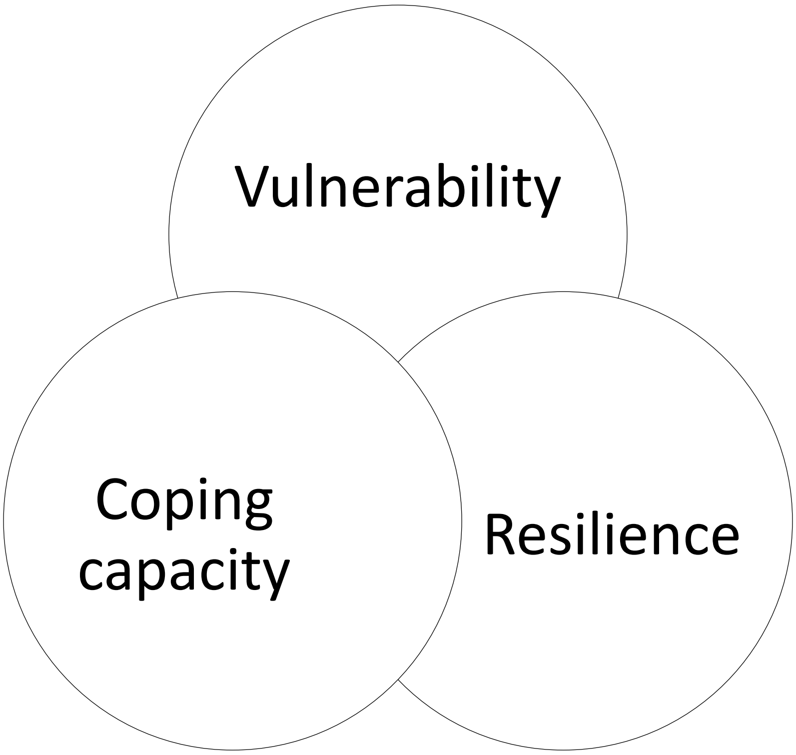


Figure 2. 3 Conceptual linkages between vulnerability, coping capacity and resilience

Source: Adapted from Cutter *et al*. 2008

The figure 2.3 shows that vulnerability is the flip side of resilience and coping or adaptive capacity is a must to be resilient as it is a core factor of vulnerability. Vulnerability and resilience is interlinked through coping or adaptive capacity. Vulnerability focuses on the situation of a system before disaster; exposure, and sensitivity are two aspects of vulnerability, while resilience is a process, mainly focused on the stages of pre and post-disaster, which helps to enhance the abilities of the system to resist and recover from hazards (Yin *et al*. 2014). Coping capacity, on the other, is the short term ability of a person or group or disaster affected people to resist natural hazards. As can be seen from figure 2.3 that resilience is embedded vulnerability and coping capacity. The degrees of disaster loss or potential losses are determined by the level of vulnerability and the level of resilience is determined by the adaptive measures undertaken to recover from the uncertainty. Vulnerability is an inner attribute of a system that makes it susceptible to the damaging effects of a hazard and it indicates the structural and functional disadvantages that are exposed to external stresses (Ibid). Thus, in hazardous situation, vulnerability is the catalyst that determines the potentiality of disaster and its level of losses which means systems or individuals with higher vulnerability have a higher chance of being affected by disasters such as cyclones. Furthermore, resilience is regarded as an effective response to certain disasters as it embodies the capability to withstand, absorb, cope with, accommodate and recover from the adverse effect of natural disasters in a timely and efficient manner (Berkes *et al*. 2003; Folke *et al*. 2006; Gallopin, 2006).

There is an increasing consensus among disaster researchers, policy makers and academics acknowledging people's ability to bounce back after being affected by natural disasters. There is a dearth of literature relating to the ways affected people bounce back from the adverse effect of disaster. However, this study explores the possible ways to bounce back by evaluating Sustainable and Resilient Community Framework (SRCF) introduced by Tobin (1999).

Sustainable and Resilient Community Framework (SRCF)

The Sustainable and Resilient Community Framework was introduced by Tobin in 1999. The underlying philosophy of this framework is based on assessing the resilience of disaster affected communities. Tobin (1999) has adapted three separate models into one model to show how sustainable and resilient communities could be created. The proposed models are i) the mitigation model, ii) the recovery model, and iii) the structural cognitive model. Figure 2.4 depicts a dynamic system and each model consists of integrated factors which are employed in assessing the resilience of disaster affected societies. The ultimate goal of this model is to attain community sustainability and resilience in the face of prevailing natural disasters. The three separate models are discussed in detail:

Mitigation is the primary model where disaster exposure and risks are reduced. Tobin (1999:14) said, "In a broad context, it is through mitigation programmes that exposure and risks are reduced". He (Tobin, 1999) cited an example: Flood embankments and levee systems generally protect communities up to their design standards and hence reduce risk for those living in hazardous environments and not all projects are necessarily successful and in some instances, it can exacerbate problems. Therefore, the implementation of mitigation policies requires certain conditions being met if success is to be assured. There are six conditions for effective implementation: i) there must be sound theory with casual linkages to assure that goals are reasonable and appropriate; ii) the tasks or programmes must be assigned to sympathetic and capable agencies with adequate resources; iii) there must be leaders with substantial managerial and political skill; iv) there must be clear policy objectives; v) the commitment must be supported by an organized constituency; and vi) there must be no undermining of the policy over time.

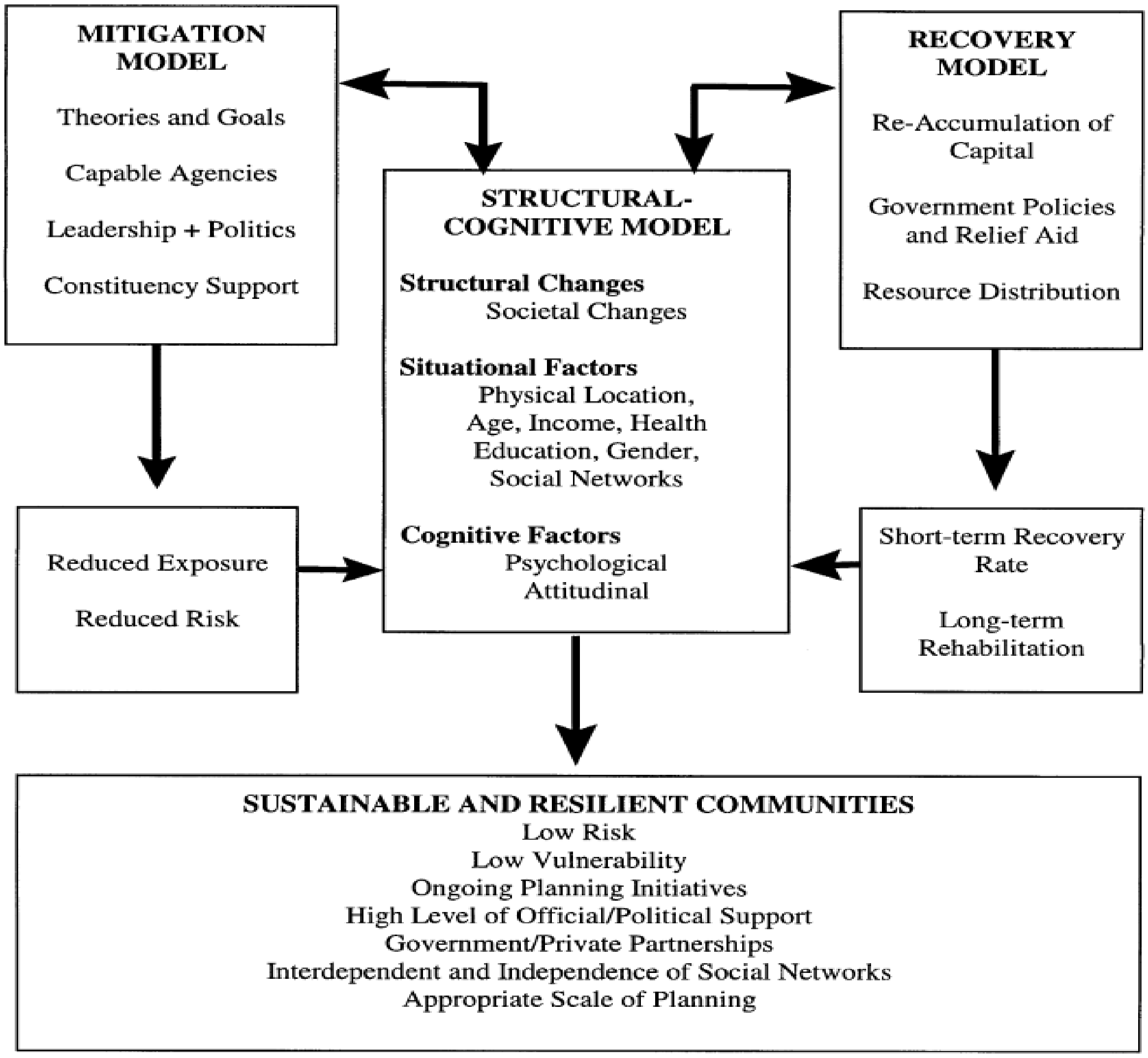


Figure 2. 4 Sustainable and resilient community framework

Source: Adapted from Tobin (1999)

Thus, according to the mitigation model, more attention needs to be devoted to causal linkages between elements, goals of the projects must be clearly articulated, sufficient resources should be made available and commitment needs to be made on a long-term basis.

Through implementing such strategies and policies, communities may reduce their vulnerable exposure and risks.

Given the severity of many geophysical events, it is certainly not possible to eliminate all disasters from hazard prone locations. Thus, there should be a focus on recovery and those factors which are conducive to facilitating recovery. Tobin (1999) postulates three basic elements: i) re-accumulation of the capital and physical infrastructure, ii) policies and programmes of government agencies, private organizations and business among others, and iii) resource distribution.

According to the recovery model, capital re-accumulation, relief policies and programmes and issues of equality and development need to be equalized to enhance disaster recovery.

Cognitive models indicate that there are many factors that hinder community resilience. The factors are physical, social, cultural and economic. Furthermore, there are some situational factors such as physical location, age, income, health, education, gender and social networks that can influence the disaster victim's resilience. For instance, people with sufficient resources generally have a higher chance of recovering from the adverse effects of natural disasters and can become resilient gradually in comparison with economically marginalized people.

Moreover, the last stage of Tobin's (1999) model shows how communities can be sustainable and disaster resilient through maintaining some critical factors. It shows that high levels of political support, support and involvement of local governments and private partnerships, social networks and appropriate disaster management policies and planning can play a crucial role in reducing disaster vulnerability and risks, positively impacting on the ability of people affected by natural disasters to bounce back. Though, SRCF is a useful framework, it has underestimated disaster preparedness and the disaster response phase that can play a pivotal role in successful post-disaster recovery and reconstruction.

2.4 Resourcing and its implications in post-disaster housing reconstructions

This section is based on resourcing and its implications in post-disaster reconstruction and theories and approaches relating to post-disaster housing reconstruction projects. Firstly, it describes resourcing and its implications and secondly, it evaluates theories and approaches relating to post-disaster housing reconstruction.

Despite humanitarian assistance for post-disaster housing reconstruction projects being provided by local governments and international NGOs, the affected people still live in embankments and polders with limited access to resources. In some cases, people are stranded in temporary shelter for a long time. As resourcing can play a major role in expediting PDHR projects, it is pertinent to understand the conceptual definitions of resourcing, post disaster and reconstruction.

2.4.1 Defining resourcing

The availability of resourcing is one of the most significant elements to the success of construction projects (Belassi and Tukel, 1996; Chua *et al*., 1999; Korde *et al*., 2005; Fewings, 2013). Project managers face challenges with every project, trying to execute the tasks required to meet quality standards, while expending the minimum time, cost and resources possible (Burke, 2013). A resource may be defined as machines or persons that perform the scope of work (Burke 2003). In other words, it (resourcing) means a wide range of activities or work which is carried out to find and provide money, materials or people necessary for the completion of a specific project. However, resourcing for post-disaster reconstruction means managing and organising resources, including construction materials, practitioners, and funding which are available. Therefore, it can be argued that resourcing for post-disaster reconstruction refers to the activity or process of managing construction materials, funding or humanitarian aid and labour.

2.4.2 Defining reconstruction

Post-disaster reconstruction is understood to be building works carried out during the relief and recovery phases including transitional shelter and permanent reconstruction, following a rapid onset natural event (Burnell, 2010; Silva, 2010). Generally, reconstruction is a process of building shelter or houses for the affected population in a post-disaster emergency period to get them back to pre-disaster conditions. It is defined in the Oxford English Dictionary as ‘the action or process of reconstructing something’, the rebuilding of something natural, artificial or abstract (Thompson, 1995). UNDP 1992 also defined it as ‘the action taken to re-establish a community after a period of rehabilitation subsequent to a disaster and these actions include the construction of permanent housing, a full restoration of all services, and complete resumption of the pre-disaster state. In the literature of disasters, reconstruction is not merely about rebuilding structures in bricks and mortar; it is about rebuilding the lives of communities impacted by a disaster who are undoubtedly the most important stakeholders in the reconstruction process (Barenstein *et al*. 2013).

2.4.3 Components of resourcing

The success of post-disaster reconstruction projects largely depends on resourcing and its effectiveness. In order to apply resources properly in terms of post-disaster reconstruction projects, resourcing managers need to consider different components of resourcing. As a concept, the idea of components of resourcing for post-disaster housing reconstructing projects is not incorporated into the body of knowledge. The researcher of this study identified the key components of resourcing by reviewing the study of Chang, (2012); Sears *et al*. (2008) and IFRC, (2010). However, the key components of resourcing that play a pivotal role in accomplishing of post-disaster housing reconstruction projects are resource planning and preparedness, resource management, resource procurement, resource allocation, resource supply chain management, resource delivery, and the development of resource alternatives. In this section, the study sheds light on the key components of resourcing and their roles in terms of post-disaster reconstruction; the section also shows how the components of resourcing interact with each other.

i) Resource preparedness and planning

The concept of preparedness and planning is very significant for those who are involved in disaster reduction management. An effective and quick action plan is required in an emergency period and generally this action depends on the plan in place before any disaster occurs. In a preliminary plan, even though the details of a disaster remain uncertain, you can identify emergency shelter sites, plan and publicise evacuation routes, identify emergency water sources, determine chains of command and communication procedures, train response personnel and educate people about what to do in case of an emergency (IFRC, 2000). Resourcing preparedness and planning means making preparation and action plans regarding the estimated amount of resources needed for upcoming disasters. Disaster preparedness and planning involves identifying organisational resources, determining roles and responsibilities, developing policies and procedures and planning activities in order to respond in a timely and effective way after a disaster occurs, plans must, however, be adapted to the actual situation (IFRC, 2000).

ii) Resource management

Normally the cyclone-affected people do not have sufficient capacity to meet the exceptional demand for reconstruction that is created after a major disaster (Masurier *et al*. 2006a; Seville and Metcalfe 2005). Mobilising resources for post-disaster reconstructions is especially difficult at the initial stage but normalises as time passes by (Singh and Wilkinson, 2008). Resource management generally means managing resources effectively to complete a specific project. The basic objective of resource management is to support construction operations so that established time objectives can be met and costs can be kept within the construction budget (Sears *et al*., 2008). The success of a specific project largely depends on how the total resources of a certain project are managed, and generally it is the responsibility of the project manager, whose techniques and skills are vital to the completion of a project. The project manager must determine long-range resource requirements for general planning and short-term resources for detailed planning (Chang, 2012).

iii) Resource procurement

Resource procurement means arrangement of the resources required for the completion of the project. It involves arrangements made by the project managers for the timely arrival of resources with regular follow-up actions taken by the related procurement personnel/procurement specialist to ensure that promised delivery dates are kept (Cox, 1996). As long as resources for a specific project are found, the project manager normally specifies the amount of resources required and orders the resources from the potential suppliers. Procurement is a specialist job and requires dedicated focus to make sure all items arrive on time (Fewings, 2005). To achieve the objective of the appropriate amount of resources being delivered on time, a system of checks and controls by the specialist procurement manager in all aspects of material procurement, from ordering to delivery, should be established (Sears *et al*., 2008).

iv) Supply chain management

Supply Chain Management (SCM) indicates the management of the goods and services by the managers of a specific project. It encompasses all of those integrated activities that bring a product to market and create satisfied customers, and the Supply Chain Management Program (SCMP) integrates elements from manufacturing operations, purchasing, transportation, and physical distribution into a unified program (Zigiaris, 2000). Supply chain management generally derives from two roots of practically oriented management theory: operations management and partnership philosophies (Jones, 2005), and it includes the steps involved in bringing the end product to the consumer (Wilkinson and Scofield, 2003). Within operations management a typical definition of a supply chain as proposed by Aitken (1998) is that a network of connected and interdependent organisations mutually and cooperatively work together to control, manage and improve the flow of materials and information from suppliers to end users (in Chang, 2012).

v) Resource allocation

Resourcing for post-disaster reconstruction is a relatively new approach in the literature of post-disaster housing reconstruction and is an effective approach to administering post-disaster reconstruction activities. Reducing the impact of natural disaster on poorer countries is directly related to their ability to access sufficient funding to reconstruct efficiently in post-disaster periods (Freeman, 2004). In reality, poorer countries are struggling to start off reconstruction work due to lack of required resources. Therefore, the success of a reconstruction project largely depends on the allocation of limited resources to expedite post disaster reconstruction. Resourcing managers always need to allocate resources properly and equally to strengthen project activities. Resource allocation involves the planning and utilization of all the resources required for the project (Majeed, 2017). Allocation of scarce resources among developmental phases and the activities within these phases is a realistic management opportunity for improving project schedule performance (Joglekar and Ford, 2005).

2.4.4. Interactions between the components of resourcing

The relationship between the key elements is apparent and how they relate to each other is the main question to be answered. All the key elements of resourcing are inter-related, and play a major role in the completion of a project, and the success of a disaster project largely depends on the right combination of all the elements of resourcing. Similarly, the failure of disaster reconstruction projects is largely due to a lack of synthesis between the components. For example, resourcing is required for housing reconstruction in the cyclone affected areas of Bangladesh. To finish housing reconstruction, proper planning and preparedness is required to undertake the specific project of housing reconstruction because it helps guarantee the availability and accessibility of resources (Kulatunga, 2011).

Firstly, preparedness and planning identifies how to find resources from alternative sources if they are not available from regular sources which ensures the rapid progress of reconstruction. Pre-identification of alternatives sources is particularly important at the initial stage of post-disaster planning. Planning and preparedness can include identifying what resources are already available and in what amount, managing and allocating labour and volunteers who can work during an emergency, identifying resources' suppliers limitation, and finally planning how to procure resources which are not readily available.

Secondly, effective resource management in the form of scheduling and pre-planning is essential to guarantee the resource availability and accessibility required for smooth post-disaster reconstruction (Palliaguru *et al.* 2013). Effective resource management expedites the mobility of resources; for example, labour, cement, brick, stone and iron rod are required for post-disaster housing reconstruction in cyclone affected areas of Bangladesh and if the resource management is not up to the mark, there may be shortage during reconstruction which would hinder the entire project.

Thirdly, post-disaster reconstruction generally depends on the timely arrival of required resources and a proper procurement strategy can ensure valuable resources arriving in time to start construction. A procurement strategy can be explained as obtaining the whole spectrum of goods, materials, plants, and services for design, build and possible value for money over its life cycle (Cartlidge, 2011).

Finally, supply chain management and resource allocation are important in ensuring access to available resources for reconstruction. Supply chain management ensures the required amount of resources and resource allocation are utilized efficiently for the different purposes of reconstruction, for example, how much money is to be allocated for a specific project is very difficult to decide, but prudent allocation (Freeman, 2004) of resources can figure out the amount of money that may be required for a specific project.

Therefore, this is pertinent from the critical analysis point of view, that key elements of resourcing are inter-related organisms. Poor implementation of one element will affect others, and will subsequently affect the whole project. For instance, funding, labour and reconstruction materials, including brick, cement, iron and sand, are required to make houses for the cyclone affected people. If the project manager fails to manage those resources, the whole housing reconstruction project will be disrupted which increases the suffering of the affected people. UNDP (2005); Steinberg, (2007); and Kennedy *et al.*, (2008) argued that inadequate procurement, ineffective resourcing, and poor resource management and the competition for scarce resources would further compound inflation; profiteering will affect reconstruction, undermining market function and obstructing longer-term economic development.

2.4.5. Key stages of resourcing

Having introduced the fundamental concepts of resourcing and post-disaster housing reconstruction in the preceding section, this section provides a brief description of the key stages of resourcing for post-disaster reconstruction that a resourcing manager needs to maintain.

Generally, the resourcing manager works through various stages before finally allocating resources for post-disaster housing reconstruction projects because the success of a project largely depends on maintaining the key stages of resourcing properly. Jha *et al.* (2010) argued that like most humanitarian and development activities, the process tends to follow a cycle of assessment, planning, project development, implementation and monitoring. As per the World Bank cycle, this study explores further the process of resourcing for post disaster reconstruction:

i) Assessment of damages and losses of disaster to acquire resources

Assessment is one of the key stages of resourcing for post-disaster reconstruction because without assessing the damage and loss, allocation of resourcing is impossible and if the allocation of resources is made without identifying the loss and damage physically, the resourcing manager might find the reconstruction project unsuccessful. Because of this, the assessment of damage and loss is very important for uninterrupted reconstruction. Disaster assessment refers to the survey and information collection activities carried out to determine the effects of a disaster on the affected population, and their resulting needs (EPC and TCG, 2004). It indicates a preliminary assessment is conducted immediately after a disaster to obtain an early but full assessment of the geographical extent of damage, and the number, categories, location, and circumstances of the disaster-affected population. Generally, this type of assessment provides an overall picture of where people are, what condition they are in, what they are doing, what their needs and resources are, and what services are still available to them.

ii) Planning for resources

Planning for resources means defining and refining objectives and selecting the best alternative courses of action to attain the objectives that the project was undertaken to address. Planning is of major importance to a project because the project involves doing something that has not been done before. The amount of planning performed should be commensurate with the scope of the project and the usefulness of the information developed (PMBOK, 2000). Planning is an ongoing effort throughout the life of the PDHR project. Kerzner (2003) argued that planning consists of determining how to plan; selecting the planning team; identifying deliverables and creating the work breakdown structure; identifying the activities needed to complete those deliverables and networking the activities in their logical sequence; estimating the resource requirements for the activities; estimating time and cost for activities; developing the schedule; developing the budget; risk planning and gaining formal approval to begin work.

iii) Acquiring resources

A lack of sufficient resources for post-disaster housing reconstruction significantly limits the prospects for successful post-disaster housing reconstruction. The stakeholders as well as resourcing managers need to concentrate efforts, including revising legislation and policy, enhancing capacity for rebuilding in the construction industry, strengthening the transportation network, restructuring market mechanisms, and incorporating environmental considerations into overall planning. The success of any post-disaster reconstruction project largely depends on the availability of resources required for the specific project. Acquiring resources means obtaining resources from different fields to run the project smoothly. For example, if resources are required for the cyclone affected coastal people of Bangladesh, either the government or resourcing manager needs to identify an available alternative source for resources to run the project.

iv) Managing and utilizing resources

Managing and utilizing resources for the post-disaster reconstruction activities are the hardest tasks in the resourcing process. Post-disaster housing reconstruction projects are normally undertaken by Governments or National or international NGOs, and resourcing is managed and utilized by them. Managing resources means reviewing the project scope and task, tracking resource progress, identifying resource allocation problems, managing shared resources, reviewing and refining the duration estimates, and using an expert to review your resource requirement. In a post-disaster reconstruction environment, the resourcing manager needs to play an active role to run the reconstruction activities smoothly. He needs to oversee the whole project carefully to review it for further requirements. For example, construction materials and funding are required to build houses for the cyclone affected coastal people of Bangladesh and the successful completion of the project largely depends on how they are utilized and managed. As this project suffers from resource bottlenecks, the resourcing manger should utilize available resources properly to tackle resource deficiency.

2.4.6 Key success factors of resourcing

This section investigates briefly the nature of post-disaster housing reconstruction projects and sheds light on the factors that tremendously affect the result of such projects. This section also underpins the key factors of resourcing that contribute to durable and successful post-disaster housing reconstruction. First, this section reviews the challenges associated with post-disaster reconstruction projects and secondly, it examines the key factors of resourcing that can lead to successful housing reconstruction.

A wide range of literature is reviewed to explore the reasons why post-disaster housing reconstruction often fails to meet its stated objectives and postulates the key success factors of resourcing that expedite post-disaster housing reconstruction. Post-disaster housing reconstruction is one of the most challenging tasks that international stakeholders including the World Bank, IFRC, and UNDP, Housing Reconstruction Practitioners (HRP), and local government face. Unlike most normal construction projects, PDHR projects are diverse in nature, having unique socio-cultural and economical requirements and are extremely dynamic and thus require a meaningful and dynamic response (Davidson, 2010). PDHR projects generally lack a strategy compatible with the severity of disasters, community culture and socioeconomic requirements, environmental conditions and government legislation, and technical and technological solution frequently fail to operate and respond effectively to the needs of the people affected by disasters (Amaratunga *et al*. 2011). Despite being identified as a critical and colossal problem, post-disaster housing reconstruction projects do not draw much attention and remain poorly researched (Wilkinson *et al.* 2010; Ophiyandri, 2013; Nirooja, 2013; Ismail *et al*.2014). Factors that frequently pose real threats to the eventual success of reconstruction projects are rarely given appropriate consideration while designing such projects (Sadiki *et al.* 2012).

Previous research conducted on the challenges of post-disaster housing reconstruction shows that bypassing those factors contributing to poor quality houses can affect the whole PDHR projects adversely. However, this study reviews the literature relating to the challenges associated with post-disaster housing reconstruction projects and sheds light on the key success factors of resourcing which have a tremendous impact on PDHR projects. In table 2.1, the list of setbacks to reconstruction projects, which have been identified in recent publications on post-disaster housing reconstruction, is shown.

Table 2. 1 Challenges of post-disaster housing reconstruction projects

No	Challenges	Author	Citations
1	Lack of coordination	Masurier et al., 2006, Moe and Pathranarakul, 2006, Pardasani, Ophiyandri et al., 2009, Rotimi et al., 2009)	20
2	Shortages of resources, corruption	Chang, 2013; Alexander, 2004,Moe and Pathranarakul, Siriwardena et al., 2009, Zuo et al., 2009,	17
3	Capacity of local government	Barenstein and Pittet, 2007, Johnson, 2007, Zuo et al., 2009)	12
4	Quality of construction	Kennedy et al., 2008, Koria, 2009, Lyons, 2009, Siriwardena et al., 2009)	10

5	Cultural consideration	Sharma, 2001, Jigyasu, 2002a, Boen and Jigyasu, 2005, Badri et al., 2006, Pardasani, 2006, Shaw, 2006,	9

Source: Adapted from Hidayat, 2013

According to the literature listed in the Table 2.1, coordination is the most cited challenge to PDHR projects. PDHR projects generally become unsuccessful and poor quality due to lack of coordination among the participant organisations and local government. A coordination problem generally creates gaps, inefficiencies, duplications and uncertainty (Hales, 2010; IKA *et al*. 2012; Ophiyandri, 2013).

The second most cited challenge in PDHR projects is the availability of resources. Available resources are prerequisite to enhance PDHR projects. Obtaining adequate funding is a primary issue for achieving a resilient post-disaster reconstruction and the reported failure of many projects can be attributed to the shortages and unavailability of resources required for reconstruction (Wilkinson *et al*.2010).

Poor quality of reconstructed projects is one of the significant barriers for PDHR. Several studies have revealed that reconstruction projects often fail to satisfy the beneficiaries (Lyons.2009; Barenstein 2007; Kennedy *et al.* 2008; Boen and Jigyasu 2005; Silva, 2010; Steinberg, 2007; Nadiruzzaman, 2013). A study conducted by Paul and Nadiruzzaman (2013) reported that post-disaster housing reconstruction in Bangladesh after cyclone Sidr in 2007 did not maintain a minimum quality and standard which could satisfy the end-users.

There are other studies that support cultural integration with reconstruction (Kopaei, 2009; Kamani-fard *et al*. 2012; Johnson, 2007). They argued that post-disaster housing reconstruction often does not fit culturally with local people. Boen and Jigaysu (2005) argued reconstruction projects that did not take social and cultural aspects into consideration faced difficulties in completing the projects. Sadiki *et al*. (2012); and World Bank (2013) reported that lack of community participation, relocation, fraud, corruption and waste of project funds severely affect the performance of PDHR projects. Post-disaster housing reconstruction often faces financial problems (Freeman, 2004); inappropriate assessment (Kennedy *et al*. 2008); ineffective design (Ika *et al*. 2012); delay in decision (World Bank, 2013, Iwai and Tabuchi, 2013; Moloney, 2014; Steinberg, 2007; and Barenstein and Leeman, 2013). Likewise, a study conducted by Hidayat (2013) reported that post-disaster housing reconstruction undergoes some critical barriers, which are lack of available resources, workmanship, construction quality, and corruption.

However, the analysis from the literature shows that there are some challenges which are closely related that affect the post-disaster housing reconstruction. They are, lack of coordination among the participant organisations, available resources, cultural barriers, lack of funding, corruption, poor quality work, cost overrun, lack of community participation, and relocation. Since the late 1960s, project management researchers have been trying to discover the factors that lead to the overall success of a project (Davies, 2002). But research in the field of project management success for post-disaster reconstruction is a quite new agenda in the field of disaster management and practice. There are a few researchers who have recently investigated the key success factors of PDHR projects that can play a significant role in successful post-disaster housing reconstruction projects (Belassi and Tukel, 1996; Steinfort and Wlaker, 2007; Wardak *et al*. 2012; Ophiyandi, 2013). However, no researcher identified the key success factors for resourcing in terms of post-disaster housing reconstruction. This study investigates probable key success factors of resourcing that can contribute to post-disaster housing reconstruction projects.

i) Effective monitoring and managing of resources

Effective monitoring is significant in terms of project success. It aims at achieving improved performance and demonstrable results. It is the routine collection and analysis of information to track progress against set plans and check compliance to established standards (IFRC, 2011). Thus, effective monitoring of resources means to check whether the required or sufficient amount of resources is spent or not in order to track the progress of a project. However, effective monitoring of resources in terms of PDHR projects means to assess what work has been completed in reconstruction projects and to assess costs, issues and risks against the success of the disaster reconstruction projects and to oversee the progress of products, outputs, and outcomes (DFC, 2015). In PDHR projects, the resourcing manager is generally responsible for tracking the progress of the projects and he or she assesses whether given outputs lead to achievement of the outcomes, whether the project's activities lead to the expected outputs and that activities are being implemented on schedule and within budget.

Furthermore, IFRC (2011) has categorised monitoring as results monitoring, process or action monitoring, compliance monitoring, context or situation monitoring, beneficiary monitoring, financial monitoring and organisational monitoring. Results monitoring tracks effects and impacts which means determining if the disaster project is on target to meet its expected results. Whereas process monitoring ensures and checks the use of inputs and resources, the programme of activities and delivery outputs. Compliance monitoring ensures compliance with donor regulations and expected results. For example, a PDHR project may monitor that houses adhere to agreed national international safety standards in reconstruction. Context or situation monitoring generally tracks whether any identified risks and assumptions can affect the project, and beneficiaries monitoring tracks beneficiaries' perception and satisfaction towards the PDHR projects. Financial monitoring tracks costs by input and activities whereas organisational monitoring tracks sustainability and capacity building in PDHR projects.

ii) Supporting community self-reliance

There is a growing body of literature about the advantages and risks related to different post-disaster housing reconstruction approaches (Barenstein, 2013). But what we often see is missing are the voices of the affected people and their involvement in reconstruction. Supporting community self-reliance generally ensures the success of the disaster projects. A research conducted by Barenstein (2013) reported that 94.5% of the households who opted for self-reconstruction were fully satisfied with all major features of their new houses. Therefore, the resourcing manager, as a key success factor, can rely on and support the affected people's self-reliance in their reconstruction projects.

iii) Community participation in DMP (Decision Making Process)

Community participation in housing reconstruction is widely recognised as the key to achieving any satisfactory level of recovery (Barakat, 2003; Davidson *et al*.2007). Previous case studies of PDHR projects show that projects without active local community participation pose a real threat of failing and destroying community cohesion. For example, after the Indian Ocean Tsunami 2004 in Aceh Indonesia, many NGOs did not pay any attention to the needs of affected beneficiaries and local people were excluded from the decision-making process. The houses built by these NGOs were found structurally defective and culturally ineffective, and failed to meet the required budgetary requirements which built further tensions and anger within the Acehnese communities (Sadik *et al*. 2012). Thus, active community participation as one of the key success factors of resourcing can lead to successful PDHR projects.

iv) Adequate funding

The availability of funds is very significant in PDHR projects because without sufficient funds the PDHR projects won't progress and will take too long. A number of scholars such as Ye and Okada (2002) and Sullivan (2003) agreed that successful post-disaster housing reconstruction could only be possible by systematic planning to make the required resources available. Chang (2013) reported that the repeated failure of many projects can be attributed to the shortages of available resources. Research by Hoai *et al*. (2008) report that owner's financial hardships were one of the important causes of project delays in Vietnam.

v) Competent resourcing managers

Generally resourcing managers can play a major role achieving the project success and the success and failure of the project largely depends on their competence. Patanakul (2011) argued that the success or failure of a project, to a large degree, depends on who manages it. Competence combined with skills and knowledge is the attributes which should be possessed by project managers. Fotwe and McCaffer (2000) proposed that a competent project manager needs to have technical, managerial, financial, legal, communication and general skills. The quality of the project manager is critical to achieve project success.

vi) Beneficiaries' satisfaction

Satisfaction of the beneficiary is one of the most significant success factors of resourcing. Research by Takim (2005) reported that client's satisfaction with service; products, project effective services, project functionality and lack of defects are the success factors of a project. Unlike, Takim (2005), Mueller *et al*. (2007) adopted a balance score card approach to measure the performance of disaster reconstruction projects in their research. Findings from their research show that performance of PDHR projects can be measured from the beneficiary's perspective by a measurement of how his life condition is restored back to a pre-disaster condition. Likewise, Burnell (2010) argued that factors that may be used to evaluate the benefits disaster victims achieved may also be used to measure how well the reconstruction programme has been conducted. The factors are durability (How well has it lasted?), process (How has it delivered and how were local people involved?), likeability (What do people think of living in them?), adaptability (How has it been used, changed or amended over the years?), and usability (How the shelter was used, for what purpose and how did it impact on their livelihood). A similar type of research conducted my Muller and Turner (2007) argued that customer satisfaction is very significant as success criteria on high complexity projects.

vii) Transparency and accountability

It is one of the most significant factors that can play a crucial role in making the PDHR projects successful. Dasgupta and Beard (2007) and Labadie (2008) highlighted the importance of these factors in community based projects. In addition, Labadie (2008) argued that the chance of success of post-disaster housing reconstruction can be increased by maintaining the transparency and accountability required in the project. Transparency and accountability are required not only in terms of funding but in all aspects of the housing reconstruction projects (Ophiyandri 2013). Ophiyandri also argued that transparency, in terms of information, programme details, objectives of the project, the decision-making process, availability of funding and its disbursement and project time scales, is very important for the success of the project. In a PDHR project, resourcing managers are required to maintain all aspects of the process for its implementation. Transparency and accountability are strong tools that can prevent corruption in the entire project. Failure to address this issue can lead to high dissatisfaction from beneficiaries (Ophiyandri, 2013).

2.5 Theories and approaches of post-disaster housing reconstruction

Despite a growing and emerging concern for the people affected by cyclone disasters, little is known about the durable and cyclone resilient houses in the post-disaster reconstruction phase. Post-disaster housing reconstruction is considered to be one of the most challenging and difficult tasks in the built environment, but theories and approaches are scarce in terms of exploring the possible ways to enhance reconstruction. This section reviews existing theories and approaches relating to post-disaster housing reconstruction and explores strengths and weaknesses of each theory in terms of rebuilding durable and cyclone resilient houses.

There are strong debates among the PDHR researchers, policy makers and housing reconstruction practitioners about whether temporary or permanent shelters or temporary or permanent houses should be built. In a post-disaster chaotic environment, the strategies which are generally applied in terms of providing shelter can be categorised as follows: shelters are objects and housing is a process. However, according to Davis (1978), shelter must be considered as a process not as an object. If we scrutinize his argument, we will find that shelter is a process of taking actions for protection and not an object such as a tent. This is because an object can exist as an autonomous entity until it is placed within a process involving a sequence within time of intentions, decisions and actions (Babister and Kelman, 2002). After Davis (1978), UNHCR (2000) has stated that shelter must, at a minimum, provide protection from the elements, a space to live and store belongings, privacy and emotional security. In contrast, Kelman *et al*. (2011) underpin the significance of the durability of reconstructed shelter rather than temporary shelter. They argued that when shelter is provided to adisaster affected population, it should be erected and finished in such a way that the community and occupant’s livelihoods and wider environment are supported.

According to the first approach, shelter an emergency, temporary or even permanent basis has been provided to meet the demand of people's needs for homes. However, in the second approach, scholars have proposed the affected population's participation in reconstruction, ambitious plan reconstruction, self- help construction and holistic measures of development. Maskrey (1989) emphasized community participation in PDHR projects and the empowerment of communities in reconstructing their houses. However, his study lacks some important aspects in providing a permanent solution for the affected people. Like Maskrey (1989), a study conducted by Aysan and Oliver (1987) argued against the forced relocation of settlements unless there were strong ecological reasons to do so. Finding suitable land on which to rebuild is difficult and the landless people will be the ones that suffer.

2.5.1 Post-disaster housing reconstruction theories and approaches

As stated earlier, post-disaster housing reconstruction theories are scarce but recently some researchers have used the importance of durable and resilient PDHR to underpin their work. However, their studies do not provide a systematic plan of how to provide this. The researchers who emphasized the significance of durability and resilience are Quarantelli (1995); Barkat (2003); John Twigg (2006); Tucker *et al*. (2014); and Ahmed and

Charlesworth, (2015). The approaches that are generally used in post-disaster housing reconstruction are; the building back better approach, the system approach, the balance scoreboard approach and the dynamic competency theory.

i) Building back better approach

Building Back Better (BBB) is an ideal approach for post-disaster housing reconstruction; it is a process that delivers a resilient, sustainable, effective and efficient solution for post-disaster housing recovery. The devastation and large-scale disaster reconstruction effort following the Indian Ocean Tsunami in 2004 was the catalyst that helped generate the concept of BBB approach. Clinton (2006) is the pioneer of introducing this concept of BBB, and his "Key Propositions for BBB" was the earliest official document to be published that attempted to provide a comprehensive guideline for implementing BBB. Researchers such as Boano and Khasalamwa (2009), and Ozcevik *et al*. (2009) proposed that the post-disaster reconstruction stage should be used not only in order to restore communities to their pre-disaster situation, but also to undertake the opportunity present to create a safer, durable and more resilient community which can withstand future disasters; this is underpinned by the theory of BBB (Clinton, 2006; Twigg, 2007).

The propositions that Clinton (2006) proposed as a guideline for BBB are;

- Proposition 1: Governments, donors and aid agencies must recognize that families and communities drive their own recovery.
- Proposition 2: Recovery must promote fairness and equity.
- Proposition 3: Governments must enhance preparedness for future disasters.
- Proposition 4: Local Governments must be empowered to manage recovery efforts, and donors must devote greater resources to strengthening government recovery institutions, especially at the local level.
- Proposition 5: Good recovery planning and effective coordination depend on good information.
- Proposition 6: The UN, World Bank, and other multilateral agencies must clarify their roles and relationships, especially in addressing the early stages of a recovery process.

- Proposition 7: The expanding role of NGOs and the Red Cross/Red Crescent Movement carries greater responsibilities for quality in recovery efforts.
- Proposition 8: From the start of recovery operations, governments and aid agencies must create the conditions for entrepreneurs to flourish.
- Proposition 9: Beneficiaries deserve the kind of agency partnerships that move beyond rivalry and unhealthy competition.
- Proposition 10: Good recovery must leave communities safer by reducing risks and building resilience.

The implementation of the building back better approach in post-disaster housing reconstruction has had some setbacks. Some of the concepts actually cause complications and hinder successful implementation of PDHR projects (Mannakkara, 2014). Mannakkara (2014) argued that issues regarding the affordability and practicability of adopting the enforced structural improvements and the inability to avoid developments in high-risk lands due to land scarcity are still prevalent. Furthermore, no guideline is provided about how to achieve more resilient houses, which will be incorporated by this research.

ii) System approach

The system approach is a very useful strategy that provides guidelines for PDHR projects by putting all related information and components in a system. It is a systematic approach which provides the basic information to the service provider and service receivers about how to rebuild houses in post-disaster reconstruction. This approach was first introduced by Limoncu and Celebioglu in 2006. They argued that post-disaster housing reconstruction should incorporate all related components in order to establish the decision steps that the regions would follow when a disaster occur, by putting its local data on the system in order to be prepared and ready. They also argued that the development of the systems approach has made it possible to take all the components of a system into consideration, understand their relationships, perceive alternative solutions, foresee their impact and adjust when needed through constantly checking results.

Despite being a good approach, it has some weaknesses in terms of reconstructing houses for the people affected by disasters. First, this approach does not emphasize community participation in the decision-making process of PDHR, although community participation is considered to be one of the main components of sustainable housing reconstruction. Secondly, this approach totally ignores the cultural knowledge and its importance in PDHR. Thirdly, this approach has acknowledged the importance of sustainable housing reconstruction but it doesn't provide adequate guidelines about how to achieve it.

iii) Balance scorecard approach

Balance Scorecard (BSC) is an effective approach which is generally used in checking the status of performance in business organizations. This approach was first introduced by Kaplan and Norton (1992) for measuring the performance of business projects. Later, this approach was applied to project management (Stewart, 2001). Likewise, this approach was later applied to the projects of post-disaster housing reconstruction by Mueller *et al.* 2007. According to this approach, project managers in natural disaster management can easily identify problem areas that require improvement, leading towards the effective and successful implementation of the natural disaster reconstruction projects. Mueller *et al*. (2007) has modified the BSC approach into four areas to fit with the nature and stakeholders of natural disaster reconstruction projects:

a) Donors' perspective

Disaster management projects can be financed by a government's own budgets as well as funds donated by international donors and development agencies. In business organisations, through focusing on the levels of strategies, financial aspects look at increasing shareholder's value which are: a) revenue growth; and b) productivity (Kaplan and Norton, 1992). According to Mueller *et al*. (2007), like business organisations, natural disaster management projects should not focus on revenue growth. However, the shareholders should expect an increase in productivity in delivering services in disaster preparedness, mitigation, emergency relief, rehabilitation and post-disaster reconstruction within the budget and with quality standards.

b) Target beneficiary's perspective

According to this approach, customer's concerns generally fall into four categories:

i) Time; ii) quality; iii) performance and service; and iv) costs (Kaplan and Norton, 1992).

In post-disaster housing reconstruction projects, customers are the beneficiaries who require quality, time-bound, high performance base products (houses) and low costs services for disaster preparedness, mitigation, response, recovery and reconstruction activities (Mueller et al. 2007). Resourcing managers should clearly understand the affected people's needs and problems at the outset, which will in turn help them to meet the demands of the beneficiary.

c) Internal business perspective

It means customer based measures must be translated correctly so that companies understand the necessary measures needed to meet beneficiary's expectations. Resourcing managers need to use knowledge, skill and experience effectively to run the disaster reconstruction projects. Therefore, resourcing managers and responsible organizations must carefully examine anything that will have an impact on the process of providing products and services in regard to disaster preparations, mitigation, emergency relief, rehabilitation and reconstruction.

d) Innovation and learning perspective

It is very important for resourcing managers and construction workers to be innovative and to learn lessons from past projects to adapt best practices (Mueller *et al*. 2007). In post-disaster housing reconstruction projects, resourcing managers should be aware of improving the core competencies of their team members, creating an effective information network which can expedite PDHR projects.

Critique of BSC approach

BSC is a very familiar and acceptable approach in measuring the performance of business management projects. Though it is a popular approach, it has some strengths and weaknesses in terms of measuring the performance of a specific project.

One of its most significant strengths is that it possesses strong causal interrelations between the different elements that are mapped using the core strategy of an organisation as a source. Financial measures are considered merely a reflection of past activities (Rillo, 2003). However, this approach is criticised by several researchers. Norreklit (2000) reported that Kaplan and Norton (1992) do not define the cause-and-effect relationship with the level of detail necessary. Norreklit (2000) argued that the Balanced Scorecard is a static model without the dimension of time that would establish or follow a sequential setup of measures.

Schoenfeld (1991) argued that measuring the effect of an action related to new and complex activities is particularly problematic since it is difficult, or impossible, to establish performance measures for activities of which the organization has little or no experience. Thus, measuring effects is particularly difficult in companies which constantly have to adapt to new situations.

iv) Dynamic competency theory

Dynamic Competency Theory (DCT) is a very useful approach which is introduced and created by Meding in 2014. It is based on creating dynamic competencies of framework that can be used by NGOs in post-disaster housing reconstruction projects. DCT is very relevant to the current research because this study attempts to explore the effectiveness of resourcing in post-disaster housing reconstruction projects, and the main objective of this approach is to create a dynamic competency framework so that NGOs can finish their reconstruction with competencies and effectiveness. The researcher in this model has divided the framework into three main categories which are:

a) Resource based views

b) Competence based views

c) Dynamic capabilities view

a) Resource-based views

The resource based view is a strategic thought by which an organisation can avail its success by depending on the available resources and the proper implementation of those resources. According to this approach, there should be a balance between the external market context and a company's internal capabilities; the benefit to the company relies on its use of the appropriate combination of resources.

b) Competence-based views

Individual competency is a vehicle for achieving organisational performance. It generally articulates both expected outcomes of an individual effect and the manner in which activities are carried out. Resources must be utilized to develop capabilities which form competencies while driving change towards success of the organisation.

c) Dynamic capabilities view

Dynamic capabilities indicate an approach that deploys and exploits resources to increase the capabilities and competencies that ensure that an organisation can adapt to change quickly to perform better and to grow. According to Meding (2014), to pursue a dynamic capabilities view, an organization must be well equipped to reconfigure its operation to respond to changing environments.

DCT is an effective approach in terms of enhancing NGOs competencies in post-disaster reconstruction. One of the advantages of this approach is that it links in with disaster management, strategic management and project management in which NGOs can get the best knowledge in the practice of post-disaster reconstruction.

However, this approach has weaknesses. First, DCT postulates three strategies for NGOs to follow in order to define the standard of best practice; these are a resource-based view, a competence-based view, and a dynamic capabilities view; however these strategies offer no advice on how to exploit resources to define best practice. Secondly, this approach overlooks the process of identifying the effectiveness of the reconstruction projects undertaken by NGOs. Thirdly, this approach lacks strategies in matching the internal resources to the external environment, which might make it difficult for NGOs to provide best practices.

2.6 Conceptual Framework

This section focuses on the issues related to creating a conceptual framework adopted for this study. The conceptual framework of a research study entails the system of concepts, approaches, assumptions, expectations, beliefs and theories that inform the study (Miles and Huberman, 1994). A conceptual framework is a visual or written product that delineates graphically or in narrative form and it considers key factors, concepts, or variables and the relationship among them. It assists the design of research questions, literature reviews and all issues relating to methodology, methods, data collection and analysis (Ravitch and Riggan, 2012). Accordingly, this section is categorised into three parts. Part one describes the key issues relating to the development of conceptual framework for this study, part two explains the importance of permanent post-disaster housing reconstruction and part three covers the conceptual framework for this study.

2.6.1 Key issues relating to theoretical framework

The conceptual framework of this study has been developed based on the key concepts, ideas and theories which were evaluated and identified by exploring existing studies relating to resourcing and its implication in post-disaster housing reconstruction projects. There were some issues and concepts which were integral parts of this research and that can play a significant role in successful post-disaster housing reconstruction. The issues are discussed below:

i) Unsafe condition and disaster

Risk arises from uncertainty and uncertainty is associated with people's low level of capacity to withstand natural disasters like cyclones. There is a relationship between unsafe conditions and disasters. Unsafe conditions mean an environment in which people are not safe. More specifically, unsafe conditions are the specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard; for instance, people having to live in hazardous locations, being unable to afford safe buildings, lacking effective protection by the state, having to engage in dangerous livelihoods such as ocean fishing in small boats and wildlife poaching (Wisner *et al*. 2004). The environment can be more risky and disastrous if there is vulnerability. People with vulnerability are more at risk from disaster due to their inability to withstand it. Disasters are a result of the intersection of both vulnerability and hazard; there cannot be disaster if there are either hazards but no vulnerability or vulnerability but no hazard. Vulnerability refers to the potential for casualty, destruction, damages, disruption or other form of loss in a particular situation. Risk combines this with the probable level of loss to be expected from a predictable magnitude of hazard (Alexander, 2000).

There are root causes of vulnerability for the population affected by disasters and these are economic, demographic, and political process which can either reduce or increase vulnerability. Political processes affect the allocation and distribution of resources among different groups of people, those who are involved in politics are not marginalised; they control most of the resources in society. On the other hand, poor people, having no political affiliation, remain poor as they have no access to resources. Wisner *et al*. (2004) reported that root causes generally affect and exercise the distribution of power. They added that people who are economically marginal or who live in environmentally marginal, for instance flood prone areas, tend to be of marginal importance to those who hold economic and political power and this creates vulnerability in three ways. Firstly, if people only have access to livelihoods and resources that are insecure and unrewarding, their activities are likely to generate higher levels of vulnerability. Secondly, they are likely to be a low priority for government interventions intended to deal with hazard mitigation. Thirdly, people who are economically and politically marginal are likely to stop trusting their own methods for self-protection, and to lose confidence in their own local knowledge.

In summary, unsafe condition, hazards, vulnerability and disasters are closely related; disasters occur when all of the above elements are present in a situation or environment. People with assets and wealth can easily withstand disasters and can recover quickly but people having insufficient resources and with vulnerability cannot recover after the disasters.

ii) Resourcing and its implications in PDHR projects

A resource may be defined as machines or persons that perform the scope of work (Burke 2003). In other words, it (resourcing) means a wide range of activities or work which is carried out to find and provide money, materials or people required for the completion of a particular project. But resourcing for post-disaster reconstruction means managing and organising available resources including construction materials and practitioners, and funding to start and accomplish reconstruction projects.

The availability of resources is one of the most significant elements for the successful construction projects (Belassi and Tukel, 1996; Chua *et al*., 1999; Korde *et al*., 2005; Fewings, 2013). Project managers face a challenge with every project, trying to execute the tasks to meet the required quality standard, while expending minimum possible time, cost and resources (Burke, 2013). The success of post-disaster reconstruction projects largely depends on the available resources and its proper implementation. This is because poor people affected by disasters lost almost everything. They do not have available resources to rebuild their damaged and destroyed houses. They depend on resources provided by either local governments or donor agencies. The coastal people affected by cyclones in Bangladesh take out cheap rate loans from relatives, microcredit or microfinance institutions as a way of coping and adapting to the adverse effects of natural disasters. Resources in this case play an indispensable role in recovering their livelihoods.

iii) Coping capacity and dynamic competency and capability

In disaster management, coping is the manner in which people act within the limits of existing resources and range of expectations to achieve various ends in an adverse situation (Wisner *et al*. 2004). Adaptation Strategies are the set of activities or mechanism by which people try to survive in disasters, recover their situation and develop their conditions in post-disaster (Islam, 2011). In other words, the term 'coping capacity' is concerned with how people or organisations use available resources and abilities to face adverse consequences that could lead to disaster. Therefore, coping is the process of adjusting to the adverse effects of natural calamities using available resources and adaptation strategies are the techniques and mechanisms that disaster affected people use to protect themselves from the clutch of disasters. Dynamic competency and capability, on the other, is the ability or capacity of a group or individuals to make use of resources to perform task or activities and in terms of post-disaster housing reconstruction, resources susch as building materials, tools, labour skills, training and filed experience need to be utilized in order to augment individual's capability. Meding (2014) also argued that individual competency is attained by developing capability. Disaster victims increase their resisting capability by having access to resources such as humanitarian aid, construction materials, labour, income generating activities and training and skills and by turn it increases their resistance capabilities which leads to increasing their competencies by developing individuals capability in terms of withstanding future disasters, restoring their livelihoods and thereby rebuilding their houses successfully.

Disaster victims need to the ability to cope and adapt. Coping and adaptive capacity is emerging as a key policy response for reducing the adverse effects of climate change and to protect the livelihood recovery (Alam, *et al*.2017; Paul and Rashid, 2017). The coastal people of Bangladesh are highly vulnerable. Their coping and adaptive capacity is very low and the measures that they normally take to withstand cyclones are extremely ineffective

(Paul and Rashid, 2017). Empirical evidence indicates that the most common coping and adaptive strategies are using new crop varieties, diversifying crop varieties, adopting mixed crop and livestock farming systems, changing planning dates, planting trees, irrigation, soil conservation, and switching from farm to non-farm activities (Deressa *et al.*2010; Molua, 2009). As soon as the disaster strikes, the coastal people of Bangladesh first take shelter in the cyclone centre or embankments as a coping and adaptive strategy. Temporary shelter plays a significant role for cyclone affected people because they cannot rebuild permanent houses due to lack of financial ability, which was exacerbated by previously selling off their resources to meet other needs. Sultana and Mallick (2015) reported in their study that 17.40% respondents sold their resources to cope with adverse situations induced by cyclones; 66% of them sold their cattle and other livestock, because of monetary urgencies and the burden of a shortage of fodders and adequate shelters; 56% sold their broken or even non-broken trees and plants and only 5.9% sold their ornaments or other households assets like TV, mobile, phone, radio etc. The other strategies that they apply are migration, selling lands, and diversifying jobs or changing jobs and shrimp cultivation. As a coping and adaptive strategy for housing, they also raise the plinth of their houses and build small core houses using cyclone resistant materials so that it can protect them during category 4 cyclones.

iv) Stakeholders' involvement in PDHR projects

Stakeholders are persons, groups, organisations, communities or disaster victims who have a common interest in seeing successful projects. They can generally play a significant role from relief to reconstruction. The roles of stakeholders are associated with the initial assessment of loss and damage, planning, project development, funding for the project, project implementation and monitoring and evaluation of the projects Jha *et al.* (2010). Haigh and Siriwardena (2011) mentioned in their study that the contribution of stakeholders in PDHR projects is the supply of resources or funding which can expedite the progress of the projects. Davidson *et al.* (2007) have categorised the roles of stakeholders as programme initiation, project initiation, project financing, design, construction and post-project modification-addition. Likewise, Jha *et al* (2010) mention affected populations, local governments, humanitarian communities and bilateral and multilateral organisations as important stakeholders for PDHR projects.

Post-disaster reconstruction is complex, challenging and fraught with potential pitfalls (Jha *et al.*2010). The success of PDHR projects largely depends on the active participation of different stakeholders such as local governments, UN organisations and national and international non-governmental organisations. In recent years, stakeholders and their participation in disaster management projects, especially in the reconstruction phase, is considered an integral part because it not only helps to streamline the reconstruction process but also creates resilience among the disaster victims for the future (Zafari *et al.*2011; Chandrasekhar, 2012).

The overall role of stakeholders relating to post-disaster housing reconstruction projects is to:

- Conduct initial damage and loss assessment;
- Channel and disseminate information;
- Provide relief among the affected population;
- Coordinate participating organisations;
- Calculate the amount of resources (materials fund and labour) required;
- Identify the sources of resources;
- Select beneficiaries according to the severity of their loss and damage;
- Have contact with builders and engineers who have knowledge and experience in reconstruction;
- Assess and select the available land for reconstruction;
- Postulate or lay down strategies for reconstruction;
- Budget the whole reconstruction projects;
- Start the projects;
- Ensure community participation;
- Monitor and evaluate the projects;
- Hand over the projects to the end users;
- Empower vulnerable people withstanding future disasters.

Therefore, the stakeholders play a pivotal role from start to finish. The success of the whole reconstruction project depends on the stakeholder's active participation, monitoring and evaluation, accountability and competency of resourcing managers, and finally active community participation.

v) Income generating programmes and activities

Income-Generating Programmes (IGPs) are those types of vocational training and educational programmes that help and equip participants achieve or upgrade vocational skills and training which enable them to conduct income generating activities. Income generating activities are those activities that help impoverished people to earn the money necessary to support them and their families. But in post-disaster conditions, it means the activities that help and equip the disaster affected population to increase their income to face the adverse environment of natural disasters. The main aim of IGP (Income Generating Activities) is to improve the living standard and the capacity of people to produce goods and services- that is to generate income (UNESCO, 1993).

Income generation simply means obtaining or increasing income. UNESCO (1993) mentioned that there are three ways income can be generated; firstly, income generation does not always mean the immediate acquisition of money; for instance, a monetary value can be placed on the food produced by a person through his skills so that it can be seen as income. Secondly, a person can generate income by astute investment of existing resources. For example, development of a piece of land through planting a crop for sale, the money gained from it is income. A third way to generate income is for people to use their skills by serving another person who pays for the use of those skills. That is they earn wages. UNESCO (1993) suggests that there are some factors that can influence participants in increasing their income. Those factors can help disaster victims to increase their income. The diagram is as follows:

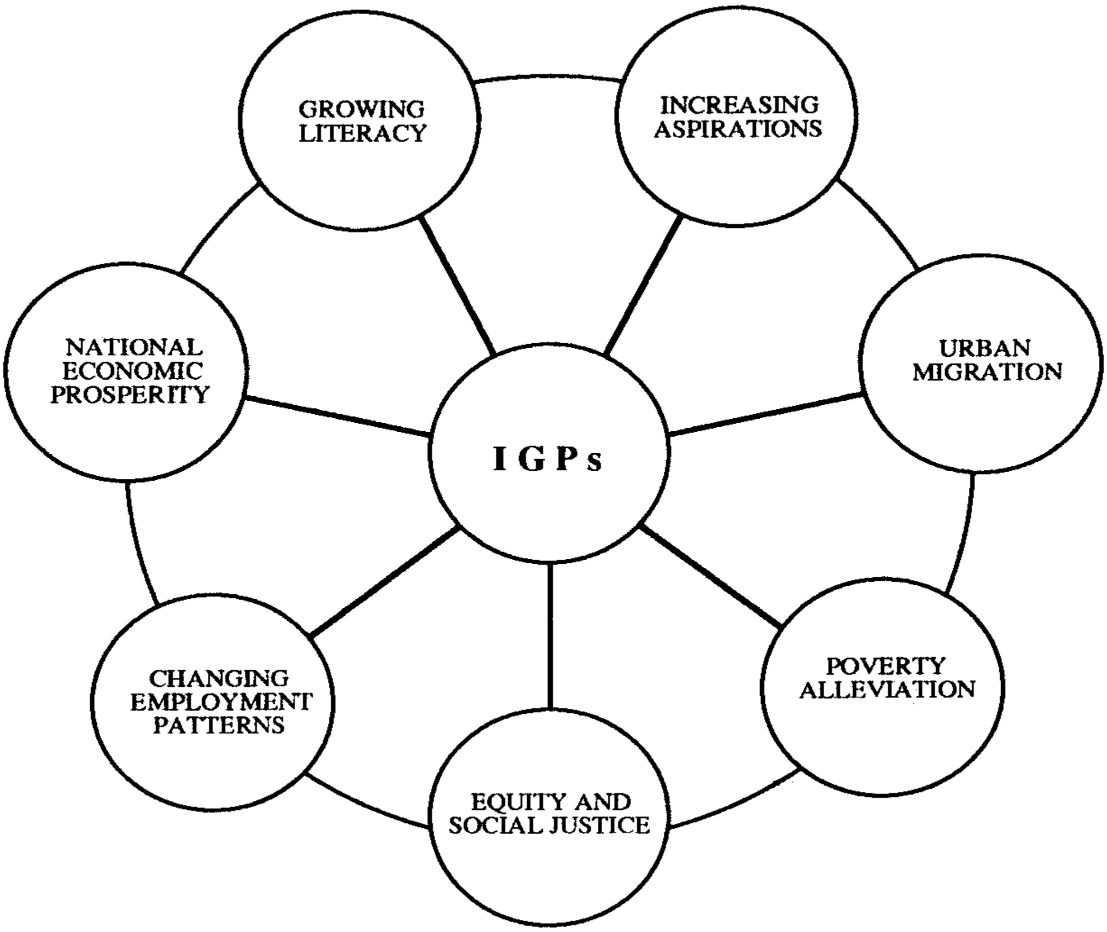


Figure 2. 5 Socio-economic factors that influence disaster affected people to increase their income through IGPs

Adapted from UNESCO, 1993

According to the above diagram, there are several factors that can influence the disaster victims' ability to increase their income. These are increasing literacy rate, increasing aspiration, migration, poverty alleviation, equity and social justice, diversification of employment pattern and national economic prosperity. Increased income means an improved living standard and quality of life. Apart from these factors, disaster affected coastal populations need to be provided with low rate loans either from local banks or microfinance institutions for income generating activities, such as poultry rearing, fishing boats, and nets, homestead vegetable cultivation, cows and goats rearing. These activities help them to increase their income and increased income helps them to improve their living standard and quality of life.

vi) Restoration of livelihoods

Natural disasters such as cyclones, earthquakes and Tsunami seriously disrupt the functioning of society. An immediate impact of natural disaster is the destruction of livelihoods and local economies leading to insecurity, poverty, hunger, and frustration. Thus, it creates greater vulnerabilities among the affected population (UNDP, 2013). To reduce their vulnerabilities, livelihood recovery is very significant. Livelihood recovery means affected people need to have access to food, shelter, education, health care and capabilities to manage emergencies. Livelihood consists of capabilities, assets, and activities required for a means of living (Joakim, & Wismer 2015). It equips individuals in facing natural calamity and recovering from stress and shocks. The process of their livelihood recovery is associated with employment creation, supporting self-employment and involving them in income generating activities.

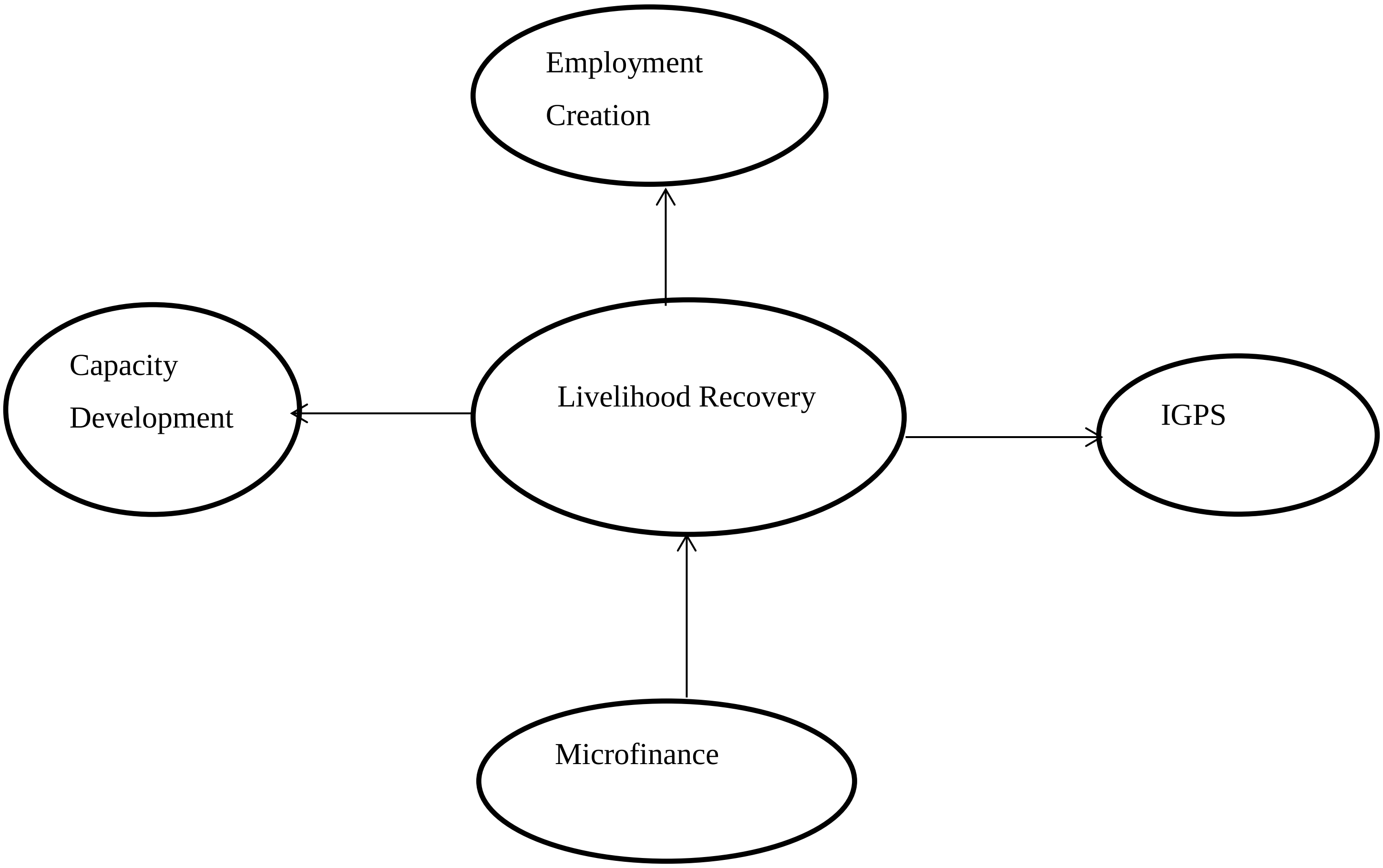


Figure 2. 6 Process of livelihood recovery

The above graph shows how disaster affected people can recover their livelihoods. There are four critical stages in the graph and the livelihood recovery progresses through these critical stages. One option is for them to create employment. As soon as they are in employment, they need to be included in Income Generating Programmes (IGPs) which will help them increase their income. Another option is to provide them with low rate from microfinance institutions which result in building up their capacity. As soon as their capacity is developed, they can recover their livelihoods.

2.6.2 The importance of permanent housing reconstruction

Housing reconstruction is probably the most significant project during the reconstruction programmes following the massive destruction by natural disasters (Ophiyandri, 2014). But the importance of building permanent houses is more than that. Successful post-disaster recovery and reconstruction needs durable and permanent housing. Post-disaster housing reconstruction as a temporary cannot provide a solution to the housing problems of the disaster hit coastal people of Bangladesh.

There are different types of houses which can be seen in the coastal area of Bangladesh. Some of them are kutcha, some are semi-pucca, some of them are tin shed, and some are pucca. But most of them are deplorable and fragile in terms of safety and security of the people affected by natural disasters (Ahmed & Charlesworth, 2015; Paul & Rashid, 2016; Alam *et al*. 2017). As a result, their livelihood recovery and overall development becomes difficult because they need a house where they will feel safe and comfortable to be able to start a new life. Furthermore, building permanent and durable houses is associated with the mental and physical wellbeing that can inspire them to concentrate on income generation which in turn leads to an improved quality of life. Thus, rebuilding permanent and durable houses on time and within budget is very important; however this task is fraught with problems.

2.6.3 Proposal as a theoretical framework for this research

As the current research is concerned exploring the effectiveness of resourcing in reconstructing houses for the people affected by cyclones Sidr 2007 and Aila 2009 in Bagerhat and Satkhira in Bangladesh, there was a need to establish a theortical framework that integrates the different ideas and concepts of existing theories in order to show how people affected by cyclones can rebuild their houses. As such, the theoretical framework of this research is based on PAR Model, SLF, ARM, SRCF AND DCT. Therefore, this study integrates the components of the PAR model (Wisner *et al.*2004); ARM (Wisner *et al.*2004); SLF (DFID,1999); SRCF (Tobin, 1999); and DCT (Meding, 2014) that inform the theoretical framework of this study. For example, from the PAR model, root causes, dynamic pressure, and unsafe conditions are quite relevant for this research because cyclone affected people have limited access to power and resources, limited economic and political influences; and as a dynamic pressure, they have a lack of education, training and skills, local investments, press freedom, ethical standard, high population growth, and environmental degradation; and regarding unsafe conditions, they live in dangerous locations, unsafe buildings, and livelihoods that are at risk due to low incomes. As introduced by Wisner *et al*. (2004), these components of the PAR model highlight the progression of vulnerability.

Some approaches of SLF that are useful for this study are livelihood assets and strategies because this theory is founded on a belief that affected people require a wide range of assets to achieve positive livelihood outcomes, and a single category of assets is not sufficient for bringing about changes in their lives. As cyclone affected people are highly vulnerable, they need access to assets to recover their houses and livelihoods. As a human capital, cyclone affected people need to have access to sound health, nutrition, education and training, and the capacity to cope with and adapt to the chaotic environment of post-disaster reconstruction. In relation to social, physical and financial capital, they need to have access to cooperations, political participations, networks, secure shelter, banking facilities and natural resources that can boost their mental health and confidence resulting in better disaster preparation and successful housing reconstruction. Furthermore, they need to have access to financial capital in the shape of remittances, wages, savings, and credit in order to generate income generating activities to achieve livelihood recovery and successful housing reconstruction.

Besides these, cyclone affected people can be benefitted through the application of livelihood strategies as this approach seeks to develop an understanding of the factors that lie behind people's choices and then reinforces the positive aspects that mitigate constraints or negative influences. Extended choice and value provides people with opportunities for self determination and the flexibility to adapt over time. Cyclone affected populations need diversification of work to achieve expected outcomes. For example, if a fisherman retrains as a truck driver, he can increase his income; more income means an improved life, and an improved life equals better opportunities to withstand future disasters.

Access to resources is the most significant part of any housing reconstruction projects. Access to resource theory determines the demarcation of the amount of access that people need to reduce their vulnerability to disaster; this model also explains how unsafe conditions emerge at the household level due to the political and economic processes that affect the allocation of resources. Generally, having the access to resources at a household level enables or hinders people's ability to respond to the recurring hazrds or natural disasters. Sanderson and Burnell, 2013 argued that the most important goal of any post-disaster reconstruction programme must be to reduce the long-term vulnerability of affected communities through the construction of multi-hazard proof housing and appropriate knowledge transfer. According to Sanderson and Burnell (2013), vulnerability should be reduced first in order to make the disaster affected people able to reconstruct their own house because the factors that make up vulnerability are significant as they directly impact upon people’s assets status and the options that are open to them in the pursuit of beneficial livelihood outcomes (DFID, 1999).

As people of cyclone affected area are vulnerable, they need to have access to resources to withstand disasters. The access to resource theory can be very useful for this research because its approach deals with the amount of access that Aila affected people need to have in terms of the capabilities, assets, and livelihood opportunities that will enable them to reduce their vulnerability and avoid disaster. This access determines the ability of an individual, family, group, class or community to use resources which are directly required to secure a livelihood in normal, pre-disaster times, and their ability to adapt to new and threatening situations. Access to such resources is always based on social and economic relations including the social relation of production, gender ethnicity, status and age, meaning that rights and obligations are not distributed equally.

Furthermore, SRCF is quite relevent for this study because the central purpose of this model is to show how disaster victims can reduce their disaster exposure and vulnerability, increase their coping capacity and thereby become disaster resilient. In spite of having theoretical differences, it is similar to the aim of the theoretical model of this study. The main aim of the theoretical model of this study is to show how people affected by clone disasters can increase their coping and adaptive capacity that leads to successful post-disaster housing recovery. Therefore, component of SRCF that can play a contributory role to inform the theoretical model of this study is mitigational measures. As a mitigational measures disasters victims are provided resources as humanitarina assistance that enables them to cope with and recover from the adverse impact of natural disasters. According to Tobin (1999), in a broad context, disaster vulnerabilty and risks are reduced through mitigational measures and the implementation of mitigational measures requires that certain conditions be met if success is to be achieved. He (Tobin, 1999) argued that goals of the projects must be clearly articulated, sufficient measures made and commitments made for the long-term basis rather than short term so that people affected by disaster can reduce their vulnerabilities, increase coping capacity and gradually become disaster resilient.

Likewise, the components of dynamic competency theory that underpin the theoretical model of this study are dynamic competency and capabilities view. According to Meding (2014), dynamic competency and capability refers indiviaduals ability to make use of resources to perform task or activities and it terms of post-disaster reconstruction, resources susch as building materials, tools, labour skills, training and field experience need to be utilized in order to augment individual's capability. Meding (2014) also argued that individual competency is attained by developing capability. Disaster victims increase their coping capacity by having access to resources such as humanitarian aid, construction materials, labour, income generating activities and training and skills and by turn it increases their resistance capabilities which leads to increasing their competencies in terms of withstanding future disasters, restoring their livelihoods and thereby rebuilding their houses successfully. Therefore, it can be summarized from the above discussion that individual's capability and competency is interelated and in post-disaster reconstruction environment, individual's capability indicates coping capacity that an individual requires to cope with and recover from natural disasters.

2.6.4 Conceptual framework for this research

The conceptual framework of this study was developed from the synthesis of literature reviews, approaches and theories relating to resourcing and its implications in post-disaster housing reconstruction. The researcher has reviewed the theories and approaches critically and explored concepts and factors which can play a pivotal role in durable and successful housing reconstruction for the coastal people of Satkhira and Bagerhat in Bangladesh. Concepts and factors such as unsafe conditions and disasters, mitigational measures, coping capacity, dynamic competency and capability, stakeholders involvement, income generating activities, and restoration of livelihoods can play a significant role in building up the coping and adapting capacity of disaster affected people which leads to the recovery of their houses.

Proposed model

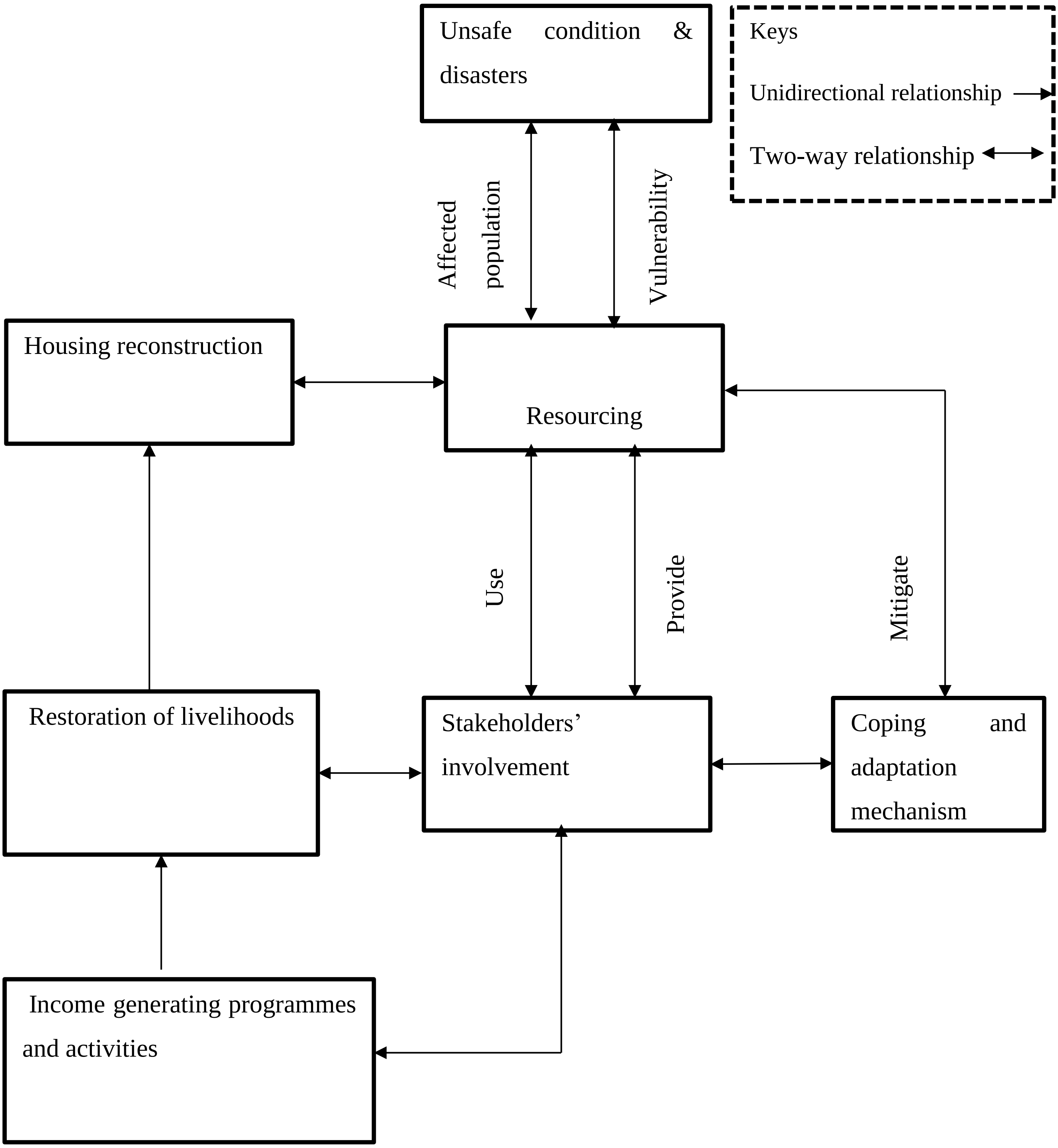


Figure 2. 7 Conceptual framework

This suggested model shows how post-disaster housing recovery and reconstruction progress through some critical stages. There are seven critical stages of the conceptual framework, and each stage represents inter-related ideas, thoughts and processes that lead to the progression of housing recovery and reconstruction. The stages in the framework are critical in the sense that it is really difficult for affected people to overcome each stage without fulfilling the previous stage.

In the framework, resourcing is central because resourcing as a humanitarian, developmental and financial aid plays a major role in recovering livelihoods and houses in a post-disaster chaotic environment. This framework shows how households are dependant upon the social and political process that allocates assets, income and other resources in the society. Social systems actually create conditions in which hazards have different impacts within the social hierarchy. The framework also shows that people live in unsafe conditions, that is disaster prone areas and unstable buildings which are not cyclone resilient, thereby increasing their vulnerability.Where there is no vulnerability, there are no disasters (Schilderman, 2010; Lyons, 2009). When a trigger event occurs, affected people normally try to minimise the effects by applying coping and adapting strategies, these include using temporary shelters provided by the government and national and international stakeholders. Local government and national and international stakeholders need to arrange income generating programmes to provide training and assistance so that disaster affected communities can improve their living standards and quality of life through attaining higher income levels. The restoration of livelihoods will gradually lead to housing reconstruction.

2.6.5 Summary and link

This chapter presents the most significant part of this study. It starts with the literature review of disaster management, dominant concepts on resourcing for post-disaster housing reconstruction, an in-depth discussion between disaster vulnerability, coping capacity and resilience, resourcing and its implications on post-disaster housing reconstruction. In the early part of this section, it provides a brief description of disaster and its origin and debates the definition of disaster, the disaster management cycle, and disaster management system in Bangladesh. It presents and discusses the dominant concepts of PAR model, SLF, ARM, CLM and SRCF model. In the early part of this section, it provides brief descriptions of PAR, SLF, and ARM models. Then it discusses the strengths and weaknesses of each model. This section also provides arguments about how existing models can be applied in terms of post disaster reconstruction, and it also explains why this research follows and applies ARM in terms of PDHR in Bangladesh. The next section underpins the relationship between disaster vulnerability, coping capacity and resilience and it also discusses how disaster victims bounce back after being affected by disasters through evaluating sustainable and resilient community framework. The section after discusses and presents a definition of resourcing, its components, the interaction between the different components of resourcing, key success factors, and key stages of resourcing for PDHR. Finally, this chapter proposes the theoretical framework for this study followed by a discussion of the key issues which were used in constructing the framework. The conceptual framework was developed on the basis of extended review of literature relating to resourcing and its implications on post-disaster housing reconstruction projects. The literature relating to the field of this study was synthesised and ideas and concepts were explored from the review which leads to building a conceptual framework.

Therefore, from the discussion throughout the chapter, the following conclusion can be made:

- Disaster reconstruction projects suffer from resource shortage;
- Resourcing for PDHR is a combination of activities of construction materials, funding or humanitarian aid, labour, brick or sand;
- Disaster is a serious disruption of the functioning of society;
- Reconstruction is not merely about rebuilding structures in bricks; it is about rebuilding the lives of communities who are devastated by disasters.
- Vulnerability contributes to disaster,
- A theory can ease complex events by exploring and distinguishing between critical elements. Its usefulness is more significant when responding to disasters with severe time constraints.
- Access to resource model is the best suited model for this study.
- Disaster vulnerability, coping capacity and resilience are inter-related concepts.

After having evaluated the dominant theories, components, key stages and key success factors of resourcing for PDHR and theoretical framework for this study as central issues of this research, the next chapter presents a more detailed discussion about the empirical context of post-disaster housing reconstruction in Bangladesh.

CHAPTER 3 POST-DISASTER HOUSING RECONSTRUCTION IN BANGLADESH

This chapter draws on empirical studies relating to post-disaster housing reconstruction in Bangladesh and aims to review them in relation to the history and background of disasters and the condition of overall post-disaster housing reconstruction in Bangladesh. The chapter includes the geographical location and economy of Bangladesh, tropical cyclones that strike the housing sectors, the impact of cyclone Sidr and Aila on housing in the coastal areas, a critical discussion of post-disaster housing reconstruction in Bangladesh and assistance for temporary and permanent housing reconstruction in Bangladesh.

Bangladesh was ranked as 5th in a list of 173 disaster risk prone countries with a risk value score of 19.17% and ranked 10th worldwide, as an exposed country with an exposed value of 31.70% (UNU-EHS, 2016). Bangladesh has a population of 154,695,368, and it is particularly prone to natural disasters: 26% of the population is affected by cyclones and 70% live in flood-prone regions; increasingly, flood and cyclone interventions have leveraged community resilience, and general activities for poverty reduction have integrated disaster management (Martin *et al.* 2013; Alam and Rahman, 2014; World Bank, 2014), and 31.5% of her population lives below the national poverty line (World Development Report, 2013). It has a long history of natural disasters; between 1980 and 2011, it experienced 221 natural disasters, causing over US$16 billion in total damages (Amaratunga *et al*. 2014; UNDP, 2014) and is currently ranked as the most climate vulnerable country in the world (Ali 1999; Paul 2009; Wisner *et al*. 2004; World Bank, 2012; Paul & Rashid, 2016; Mallick *et et al*. 2017).

3.1 Geographic location, politics and Bangladesh economy

Geography is a key factor of the socio-physical interface that can shape disasters like flood and cyclones. In this sense, the physical geography represents a process of setting off active roles within the assemblage of people, things and ideas that contest constrain and inform disaster management (Robert, 2010). As a small nation, Bangladesh is located between 20°34″ and 26°38″ north and 88°01″ and 92°41″ east, it has a tropical and humid climate (average annual temperatures range between 25° and 35°C) and is dominated by the Indian

Ocean and the annual monsoon (July – October) (Robert, 2010). The land mass of Bangladesh is 147,500 square kilometres. Bangladesh is a densely populated country. It has a population of 162,951,560 crores in 2016. Thus, nearly 80% of the nation is labelled as floodplain with more than 50% of that land within 5 metres of mean sea level (Hossain, 2006).

Table 3. 1 Poverty rate and population of Bangladesh

Indicators	1981	1991	2001	2011	2016
Population (crore)	87.12	106.31	124.33	144.04	162,951,560
Land area (square kilometre)	144,000	147,500	147,500	147,500	147,570
Percapita income (US $)	246.01	272.17	361.53	568.73	1358.78
GDP growth (percentage)	7.23%	3.40%	5.07%	6.46%	7.11%
Poverty rate (percentage)	74.00%	56.60%	40%	31.50%	24.30%

Source: World Bank, 2017

Bangladesh was ranked 142 out of 188 countries in the HDI (Human Development Index) that mainly focuses on literacy and GNI (Human Development Report, 2015). It has maintained a good track record on economic growth and development where the total GDP (Per-capita Income) was US$ 246.01 in 1981 that rose to US$ 1358.78 in 2016 (World Bank, 2017). Likewise, the percentage of GDP growth fluctuated as it was 7.23% in 1981 and increased to 7.11% in 2016. Despite making remarkable progress in fulfilling the Millennium Development Goal (MDG) of halving the rate of extreme poverty, Bangladesh is still in poverty. The poverty rate was 74% in 1981 and decreased to 31.50% in 2011. The ratio of poverty in Bangladesh indicates that it is reducing poverty gradually.

The political history of Bangladesh has been turbulent, and its institutions of government remain cumbersome, fragile and unresponsive to people’s needs (Lewis, 2014). Parliamentary democracy exists in Bangladesh where the Prime Minister is the main leader in government. There are two main political parties in Bangladesh since it started the practice of parliamentary democracy in1991 (Lewis, 2014). Bangladesh Nationalist Party won the general election in 1991 and 2001 whereas Bangladesh Awami League won the 1996, 2006, and 2009 general election. However, there are always power clash between the political parties in Bangladesh.

3.2 The tropical cyclones of Bangladesh

In Bangladesh, tropical cyclone and storm surges are quite common and the region is considered to be one of the most vulnerable and disaster-prone area in the world (Ali, 1999; Wisner *et al*.2004; Paul *et al*. 2010; Dasgupta *et al*. 2010; Paul *et al*.2010; Hossain, 2015). Generally, the unique natural setting of the country and its tropical monsoon climate modify and regulate the climate conditions which make the country more vulnerable to cyclone and storm surges (As-Salek, 1998; Paul and Rahman, 2006; Paul, 2009). As a result, Bangladesh experiences 53% of the world's deaths from tropical cyclones (Ali, 1999; UNDP, 2004; Nadiruzzaman, 2013). On average, 12-13 depressions are formed and at least one powerful cyclone strikes Bangladesh per year (Paul 2009; Dhakal & Mahmud, 2014; Haigh *et al*.2014). Cyclones cause extensive damage to human lives and properties, create great economic losses, and severely damage the housing sector limiting the people's ability to cope with the post-disaster period and to rebuild their houses for recovery.

Table 3. 2 Cyclone severity and deaths in Bangladesh 1911-2016

Year	Number of death	Wind speed	Severity index
1911	120,000	n.a	n.a
1965	36000	210	5
1970	300000	223	6
1991	138866	225	6
2007	4234	250	6
2009	3363	95	4
2010	26	n/a	n/a
2011	13	n/a	n/a
2012	133	n/a	n/a
2013	50	n/a	n/a
2014	20	n/a	n/a
2015	117	n/a	n/a
2016	86	n/a	n/a

Notes: n/a = not available

Source: WHO, 2012; CRED, 2017 [Access 20.02.2017]

According to the above table 3.2, the most severe cyclone that struck Bangladesh was cyclone in 1970 with a wind speed of 223kph that killed 3 lakh Bangladeshi people.

Likewise, a cyclone in 1991 was also devastating as it killed 138866 with a wind speed of 225 and storm surges. The recent cyclones that struck Bangladesh were cyclone Sidr in 2007 and Aila in 2009. Cyclone Sidr was more severe than Cyclone Aila in accordance with the number of death occurred due to its fatalities. With a wind speed of 250kph super cyclone Sidr killed 4,234 people whereas Cyclone Aila with a wind speed of 95 killed 363 people in the southwestern part of Bangladesh.

Table 3. 3 Top ten global devastating cyclone events 1900-2015

Human death-toll			Affected people			Economic damage		
Country	Year	No. of people killed	Country	Year	Affected people	Country	Year	Damage (Milliom US$
BD	1970	300000	CH	2002	100000000	USA	2005	125000
BD	1991	138866	CH	1989	30007500	USA	2008	30000
MY	2008	138366	CH	2006	29622000	USA	1992	26500
CH	1922	100000	CH	2011	22000150	USA	2004	18000
BD	1942	61000	CH	2005	19624000	USA	2004	16000
IN	1909	60000	BD	1965	15600000	USA	2005	16000
BD	1912	50000	BD	1991	15438849	USA	2005	14300
IN	1942	40000	CH	1996	15005000	USA	2011	14000
BD	1965	36000	CH	2001	14998298	USA	2004	11000
BD	1963	22000	IN	1977	14469800	USA	2011	11000
BD	2007	4234	BD	2007	8978541	BD	2007	2300000
BD	2009	180	BD	2013	1498644	BD	2013	20000

Notes: BD = Bangladesh, MY =Myanmar, CH =China, IN =India, and USA =United State of America.

Source: Adapted from Nadiruzzaman, 2012 and EMDAT (Emergency Events Database), Created on 27.12.2015.

The cyclones that struck Bangladesh severely were in 1911, 1965, 1970, 1991, 2007 and 2009 (Shaw *et al*. 2013; Ahmed and Charlesworth, 2015). According to the above table 3.3, six out of the ten deadliest cyclones occurred in Bangladesh and this fact hints at how much the problem is geographical in nature and is associated with human response to cyclones (Nadiruzzaman, 2013). The 1970 cyclones in Bhola hit the entire coast of the Bay of Bengal with a storm surge of 10m high, which led to a total death count of about 300,000 (Khalil, 1992; EMDAT, 2015). It was the most devastating cyclone recorded and one of the deadliest natural disasters in modern history (Hossain *et al*. 2008). The cyclone that occurred in 1991 was also one of the high fatality cyclones in Bangladesh and it killed 138,866. The suffering of the people affected by cyclones was augmented in most of the cyclones due to high population density, poverty and to vulnerability. The present research will explore more about the vulnerability and the impact of cyclones Sidr and Aila on housing in Bangladesh.

3.2.1 Overview of Cyclone Sidr and its impact on housing

Coastal Bangladesh was devastated by cyclone Sidr on November 15, 2007 (GOB, 2008; Paul, 2009; Kabir, 2009; IFRC, 2010; Nadiruzzaman, 2013; Kelman *et al*.2016; Mallick *et al*.2017). This was a category 4 storm and it swept across the western coast and ripped through the heart of the country with 155 mph (248kph) winds triggering up to 20 feet high (6m) tidal surges, breaching coastal and river embankments flooding low-lying areas and causing extensive physical destruction (GOB, 2008; Paul, 2009; IFRC, 2010; Nadiruzzaman, 2013). Cyclone Sidr tremendously affected the southwest coast of Bangladesh and approximately 2.3 million households and about one million people were affected severely. The number of deaths caused by Sidr is estimated at 3,406 with 1,001 missing and over 55,000 people sustaining physical injuries (GOB, 2008; IFRC, 2010). 30 out of 64 districts of Bangladesh were affected by this storm. The government of Bangladesh and the international experts undertook a comprehensive damage and loss and needs assessment to identify the extent of damages caused by the storm and formulate a comprehensive and feasible recovery plan (GOB, 2008). According to JDNLA (The Joint Damage, Loss, and Needs Assessment), the estimated total damages caused by Sidr were US$ 1.7 billion. The overall summary of the damages and losses are listed below:

Table 3. 4 Damages and losses of Cyclone Sidr

Sector	Damages (US$m)	Losses (US$m)	Total
Infrastructures	1029.9	30.9	1061
Social sectors	65	21.1	86.1
Productive sectors	25.1	465	490.1
Environment	6.1	-	6.1
Housing Sector	839.3	-	839.3

Source: GOB, 2008

According to the table 3.4, the infrastructure was severely damaged. The total damages and losses were 10,660.8m US$. The total damage of 1.7 billion due to Sidr represents about three percent of the total gross national product of Bangladesh (GoB, 2008). More than two-thirds of the disaster damage was physical and one-third was economic with most damage and losses incurred in the private sector. Nearly two million people lost income and employment in the most severely impacted districts (Nadiruzzaman, 2013). Primarily, the Bangladesh government identified Bagerhat, Barguna, Patuakhali, satkhira and Pirojpur as the districts most severely affected.

Bangladesh is highly vulnerable to all types of disaster hazards (Wisner *et al*.2004; Roy *et al*.2015). Since 1970, on a yearly basis, hazards ranging from floods and cyclones to tornadoes and river erosion have been responsible for destroying approximately 300,000 houses and partially damaging about 500,000 houses (UNDP, 2014). A house in Bangladesh does not mean merely having a roof and walls; it has a significant symbolic meaning that determines the house owner's social position, cultural identity and economic status (Alam, 2010). A typical house in a rural area would have to provide adequate accommodation, security, comfort and protection from inclement weather, storage space for assets and privacy. However, most of the houses in the coastal area of Bangladesh are kuctha because primary and natural materials such as bamboo, wood, mud and clay tiles are used to build those houses (Alam, 2010; Mallick *et al*.2010; Kabir, 2009; UNDP, 2014; Paul & Rashid, 2016; Mallick *et al*. 2017). As a result, most of the houses are fragile and deplorable at withstanding disasters like cyclones due to the weak and poor materials used in building them. Around 70% of houses are kutcha and 30% houses are semi-pucca or semi-permanent houses built with a mixture of brick bordered mud plinth and cement pillars added to the traditional timbers and beam construction (Kabir, 2009; GFDDR, 2014). As the houses are very fragile due to their poor materials used for construction, strong cyclones like Sidr severely affect and destroy them.

The total number of damaged and destroyed houses due to cyclone Sidr was 1,522,077 of which over 564,967 houses were partially destroyed (GOB, 2008; Kabir, 2009; IFRC, 2010). The bulk of the damage was borne by semi-pucca houses, kutcha houses and jhupris, and in contrast, pucca houses, with brick walls and a concrete roof, remained structurally intact (GFDDR, 2014). They sustained minimal damage that could be remedied by replastering the walls (World Bank, 2010). The houses which were damaged were more than 98 percent kutcha houses. The average cost of damaged houses amounted to BDT 39235 (US$574). Sidr affected the lives and livelihoods of 8.7 million in 30 districts but mostly it affected the districts of Bagerhat, jhalakathi, Pirojpur, Satkhira and Khulna. The overall impact on the housing was very diverse in nature and significant in the sense that the worth of the damages was enormous, amounting to US$845 million which is more than half of the damage and losses of all sectors (Kabir, 2009).

3.2.2 Overview of Cyclone Aila and its impact on housing

Developing countries tend to bear the brunt of the impact of disasters, with the poorest in these countries often being the most severely affected (Schilderman, 2004). Bangladesh, as a developing country, bears the brunt of disasters like cyclones. Almost every three years Bangladesh faces a deadly cyclone and 50% deaths worldwide are caused by cyclones occurred there (Ali, 1996; UNDP, 2014). Cyclone Aila, a category 1 storm, affected the coastal districts of Bangladesh especially Khulna and Satkhira. It occurred on 25th May 2009 (IFRC, 2009; UNDP, 2014). Despite being category 1, Aila brought heavy rains and storm surges that combined with high tides to breaching flood protection embankments, affected the housing sectors. The government of Bangladesh reported that 3,709,334 people have been affected in 15 coastal districts, with 325 dead, 1131 missing, up to 230,208 houses reportedly destroyed and 3,150,18 houses partially damaged (IFRC, 2009; Roy *et al*. 2009).

Housing is generally one of the most valuable assets for people in the rural disaster-prone areas of Bangladesh. In disasters, particularly rapid onset, housing is the first and foremost element that is damaged and destroyed and it often represents the greatest share of loss in the national economy (Lyons, 2009). As 70% of rural houses are kutcha, those houses can not provide safety and security for the people when strong cyclones like Sidr 2007 and Aila 2009 occur. The total damages and losses due to cyclone Aila were enormous, and go beyond the capacity and capability of coastal Bangladesh to cope with.

Table 3. 5 Damages and losses due to Cyclone Aila

Area affected	Khulna Districts	Satkhira Districts
Number of affected population	152496	158622
Number of affected households	41043	33740
Number of fully damaged houses	23820	45722
Number of partially affected houses	18620	21128
Fully damaged educational institutions	9	10
Partially damaged educational institutions	70	141
Embankments fully damaged (km)	22	20
Embankments partially damaged (km)	58	66

Source: Action Aid *et al.* 2009

According to the table 3.5, both Khulna and Satkhira districts were severely affected by cyclone Aila. The number of people affected in Satkhira is greater than that of Khulna. But in contrast, the number of affected households in Khulna is greater than that of Satkhira. The total number of fully damaged houses in Satkhira is 45,722 and the total number of fully damaged houses of Khulna is 23,820 which demonstrate the fact that in the case of housing damage, Satkhira suffered the most.

3.3 Overview of PDHR in Bangladesh

Housing reconstruction is a key element of post-disaster recovery initiatives in developing countries (Ahmed, 2011); their homes, for many people, are their most valuable and they are usually the most visibly damaged assets (Ahmed and Charlesworth, 2015). Post-disaster housing reconstruction in Bangladesh is not satisfactory and the coastal population wait for many years for habitable homes following cyclone damage (Islam, 1996; Mallick *et al*. 2009, Kabir, 2010,). In 1960, the former Pakistan government (currently Bangladesh) undertook an initiative to construct of 2000 units of two-storey buildings as coastal community centres and singled-storey buildings as sub-coastal community centres. After the devastating cyclone of 1970, which resulted in the loss of some 300,000 lives, lead to the construction of designated cyclone-shelters for the first time, and between1972–79, some 238 shelters were constructed in various locations in the coastal belt of Bangladesh (Mallick *et al.* 2011a). The construction of shelter started in Bangladesh in 1972 to protect the coastal population from severe cyclones and storm surges (Paul *et al*. 2002; Paul, 2008; Paul, 2009). The coastal area of Bangladesh consists of 16 districts and in 2009 it had 2,583 functioning cyclone shelters to serve a population of 38.2 million which was inadequate, as they can only accommodate 7.3% of the total coastal population. The cyclone shelters by district are listed below:

Table 3. 6 District wise Cyclone shelters in Bangladesh

Districts	Population census	Destroyed shelter	Unused shelter	Usable shelter	Capacity
Bagerhat	1,476,090	-	11	98	86,159
Barguna	892,781	2	10	147	147,590
Barisal	2,324,310		-	37	41050
Bhola	1,776,795	49	53	429	390050
Chandpur	2,416,018		1	21	26350
Chittagong	7,616,352	11	29	573	683010
Coxs Bazar	2,289,990	6	10	504	607310
Feni	1,437,371	3	12	57	61275
Jhalokati	682,669		2	12	7650
Khulna	2,318,527		2	77	76541
Lakshmipur	1,729,188	5	10	106	118000
Noakhali	3,108,083	5	33	245	266112
Patuakhali	1,535,854	7	72	165	157675
Pirojpur	1,113,257		1	36	32300
Satkhira	1,985,959		-	65	55071
Shariatpur	1,358,325		-	11	14,375
Total		88	246	2583	2,770,518

Source: GOB, 2009

i) Assistance for temporary housing in Bangladesh

As soon as disaster struck the Bangladeshi coast, the Bangladesh government undertook an initiative to run an early recovery programme to provide transitional shelters for those in need; this includes a shelter repair assistance programme. Therefore, in the case of Cyclone Sidr in 2007 and Cyclone Aila in 2009, the Bangladesh government initiated an early recovery project to provide temporary shelter for the people affected by cyclones (GOB, 2008). Due to the need for financial resources, the Bangladesh government provide a onetime housing assistance of 5000 BD takas (£50) to around 100,000 families whose houses were completely destroyed. In addition, 13,000 bundles of corrugated iron sheets, 13,406 tents, and 15,000 plastic sheets distributed to provide transitional shelters (GOB, 2008; Nadiruzzaman and Paul, 2013). Nadiruzzaman and Paul, (2013) argued that although temporary housing provided by the Government and other NGOs help the victims to solve their housing problems in short term, the aid was insufficient, and many individuals did not use the assistance for its intended purpose rather they sold donated house items and bought other essential commodities.

ii) Assistance for permanent housing in Bangladesh

Bangladesh, as a developing country, mainly depends on external aid to cope with the additional expenditure which is required for post-disaster reconstruction. Thus, the government generally faces increasing budgetary pressures which it is obliged to meet by increasing the money supply, running down foreign exchange reserves or increasing levels of domestic and or external borrowing (Benson and Clay, 2002). Historically, there has been heavy reliance on donor funding to meet disaster-related costs, both in Bangladesh and elsewhere, at a time when donor resources globally are on the decline (Benson and Clay, 2002). Bangladesh was the 24th largest recipient of official humanitarian aid in 2012 at US$87 million, and from the year 2000 to March of 2013, Bangladesh received $678m in humanitarian aid for flood and cyclone related disasters; humanitarian aid for the most recent disaster, the 2012 prolonged floods in the north and south of Bangladesh, totalled $5,848,778.9 (Global Humanitarian Assistance, 2014).

Despite the humanitarian assistance provided by international communities, post-disaster housing reconstruction in Bangladesh is not at a satisfactory level rather disaster survivors still living in embankments and polders. To improve the quality and standard of current PDHR projects, the Bangladesh government introduced the build back better approach to rebuild safer homes for the people affected by cyclones. The key components of the build back better approach is to improve the construction quality of destroyed and damaged houses in Cyclone Sidr and Aila affected areas which incorporates the methods used for the wind resistant houses developed after the 1997 cyclone in the Chittagong area (UNHABITAT and IFRC, 2010).

UNDP, like the Bangladesh government launched an initiative to build 1500 core shelters in Sidr affected areas. In 2010, UNDP built over 9000 cyclone resistant core houses in the most severely affected districts and the design is backed by local environmental and cultural needs, these new structures allow for future expansion, giving households options for investing their resources into expanding their homes (Nadiruzzaman and Paul, 2013). Besides UNHABITAT, many national and international NGOs (BRAC, Concern Worldwide, World Vision, and Muslim Aid) give preference to the Core Shelter Programme (CSP) which can withstand strong cyclones. However, the constructed houses, as a principle of core shelter, fail to meet the standard of cost effective analysis. Despite their efforts, the government's and NGOs constructed houses did not meet with public expectations (Paul and Nadiruzzaman, 2013). They argued that there are some factors which are responsible for poor housing reconstruction: cultural insensitivity, liveability, lack of separate chambers for privacy, lack of accountability, and lack of community ownership in the housing assistance programme that ultimately creates widespread dissatisfaction.

iii) A critical analysis of PDHR in Bangladesh

A house is not merely a structure; the housing process is tied in with social, cultural, psychological and economic attributes (Alam, 2010; Lyons *et al.* 2010; Nadiruzzaman and Paul, 2013). Post-disaster housing reconstruction is not merely about rebuilding bricks structures but is also about rebuilding the lives of communities to a state comparable to pre-disaster conditions. In order to rebuild and repair damaged and destroyed houses and to increase resilience in post-disaster interventions, the government of Bangladesh used the 'building back better' slogan as a reconstruction approach during cyclone Sidr and Aila. The basic principle of a build back better approach is to construct a small house out of strong cyclone resistant materials. However, the build back better approach implemented by the Government of Bangladesh in PDHR of Cyclone Sidr and Aila did not meet the public expectations rather it failed to fulfil its basic principle of core shelter. Nadiruzzaman and Paul (2013) found in their study on post-Sidr housing reconstruction in Bangladesh that the building back better approach was lacking with regard to the housing scheme's cost efficiency, management, livelihood, public health aspects, and tolerance against a super cyclone.

The leading scholars in the research area of post-disaster housing reconstruction of Bangladesh are Bern *et al.* 1993; Hodgson 1995; Hodgson *et al*. 1996 &1999; Islam 1996; Ahmed 2011; Hakim 2009; Mallick *et al.* 2011; Paul *et al*. 2010; Gupta *et al*. 2007; Kabir 2009; Leon *et al*. 2010; Paul and Dutt 2010; Rahman and Biswas 2011; Nadiruzzaman and Paul, 2013. The leading scholars and their arguments are summarised in table 3.7 below:

Table 3. 7 Existing study on post-disaster housing reconstruction in Bangladesh

Researchers	Theme of their studies
Bern *et al.*1993	Existing shelter is risky to face cyclone, and 14% population surveyed died during cyclone and no deaths occurred to 2% who lived in pukka house.
Hodgson 1995	Improved housing is not the most appropriate aid in post disaster phase, while temporary shelter is vital.
Islam 1996	Housing situation in Bangladesh is not at all satisfactory and its sustainability in housing an extremely low-income country like Bangladesh is very poor.
Hodgson *et al.* 1996&1999	Findings from 54 houses surveyed reflect the poor durability of most untreated kutcha building materials does the problem of exposure to natural hazard.
Gupta *et al.* 2007	The types of houses damaged were predominantly semi-pucka, kacha, and jhupris, and the constructed shelter cannot protect the affected people during cyclone.
Hakim 2009	Most of the shelters did not maintain standard; mud has been predominantly used for construction of plinths while CGI sheets are used for outer wall and covering.
Paul 2009	Current shelter is fragile, shortage of shelter, and situated far from their houses.
Kabir 2009	Despite of having core shelter preference as a recovery strategy, most of the houses did not provide durable solution for affected people due to the donor driven approaches.
Leon *et al*. 2010	Post-disaster reconstruction in Bangladesh always suffers from a lack of agreed standards and process, and there is no pre-agreed post disaster housing.
Biswas and Rahman 2011	In spite of having sufficient shelter centre and modernized warning system, the integrated management for preservation of land, embankment, infrastructure,
	temporary house is very fragile because they are made of plastic sheets, and bamboo.
Mallick *et al.* 2011	House is not sustainable and the condition of existing houses is very dilapidated.

Paul and Dutt 2010	The overwhelming majority of coastal residents are impoverished and live in poorly constructed houses and the number of constructed shelter centre is inadequate.
Ahmed 2011	90% of the respondents live in rental accommodation, and the houses they live are shaggy, sapra type unsafe houses made of bamboo, polythene, thatch/leaves
Routary *et a*. 2013	The poor road network and the long distance of cyclone shelters from homes, the fear of stealing, disbelief, fatalism, and the low capacity of shelters.
Paul& Rashid, 2016	Climatic hazards inn costal Bangladesh: structural and non -structural solution
Vogt *et al*.2017	Living with the risk of cyclone disasters and how to deal with threat of it.

There are similarities as well as clear differences between the arguments made by leading scholars about the housing reconstruction in Bangladesh. The study conducted by Bern *et al.* (1993); Hakim, (2009); Kabir (2009); Paul (2009); and Mallick *et al*. (2011) analysed the fragile condition of houses in cyclone affected areas. Their findings are quite similar, and they have expressed their concerns about the types of housing prevailing in the coastal region of Bangladesh. Similarly, Leon *et al*. (2010) reported that post-disaster reconstruction in Bangladesh always suffers from a lack of agreed standards and processes, and there is no pre-agreed post-disaster housing construction in Bangladesh. Hodgson (1995) argued that improved housing is not the most appropriate course of action in the immediate post-disaster phase, while temporary shelter is vital. There are debates on the opinion of Hodgson about the housing built in a post-cyclone period, namely improved housing is needed for the post cyclone affected people because they need to rebuild their economic capacity and temporary shelter does not allow for this so is therefore not a solution.

Similarly, Hakim (2009) argued that houses did not need to be sustainable since they were never meant for the long term. Though, the view of Hodgson (1995) is totally similar to the thoughts of Hakim (2009) but the debate should surround what we see in reality in terms of post-disaster housing reconstruction. Hodgson and Hakims' (1995) view can not be upheld, because durable and improved housing is essential for the affected people as they have lost everything; they cannot buy emergency food let alone spend money for reconstruction. However, on the flip side, if fragile housing is erected on a temporary basis, the most complex post-cyclone reconstruction programme will be thwarted and the suffering of impoverished people will be augmented without a solution in sight.

Housing can only be durable if considers the following parameters: a) cyclone resilient, b) help rebuild community lives and confidence; c) implementation of realistic and permanent reconstruction; d) seek a long-term solution; e) support structures for civic responsibility and governance through a participatory approach; f) enhance capacity development and help raise awareness of affected people. f) resilient to future risk.

However, according to the current literature, post-disaster housing reconstruction did not adhere to the above-mentioned criteria for durability. Literature on hazard-resistant housing in Bangladesh is generally centred on traditional building materials versus improved construction (Burton *et al*. 1993). The main criticism of the latter was due to its increased cost; traditional materials were well-adapted to local conditions, easily affordable and locally available (Chowdhury and Hodgson, 1996). The above argument can generate debate regarding traditional and construction of improved houses. On the one hand, traditional materials are very cheap and culturally adaptive but those materials are not available. Secondly, though those materials are cheap, houses built with them are not cyclone resilient. On the other hand, improved construction comes with innovative technology resulting in cost effective benefits; they are very durable and cyclone resilient and can thus improve the technological performance and enhance access to low income users.

Thus, from the above discussion, following inferences can be reached on the basis of existing studies of post-disaster housing reconstruction in Bangladesh:

i) The condition of existing housing is not satisfactory at all;

ii) The quality of houses is very poor and inadequate;

iii) Poor and cheap materials are used for reconstruction;

iv) There is no pre-agreed post-disaster housing reconstruction policy in Bangladesh; and

v) Existing housing can not provide safety to the people affected by cyclones.

3.4 Summary and Link

This chapter has explored the condition of post-disaster housing reconstruction by reviewing empirical studies relating to post-disaster housing reconstruction in Bangladesh. It starts with a brief description about geographical location, politics and the economy of Bangladesh. In the early part of this chapter, it discusses the history of devastating cyclones in Bangladesh that killed tens of thousands of coastal people. Similarly, the impact of cyclone Sidr in 2007and Cyclone Aila in 2009 was discussed respectively. In the next section of this chapter, it provides a critical analysis of post-disaster housing reconstruction in Bangladesh.

Following the critical analysis of empirical studies relating to post-disaster housing reconstruction in Bangladesh, the next chapter presents a more in-depth discussion of the methodological considerations for this study.

CHAPTER 4 METHODOLOGY AND DATA SOURCE

The preceding chapters have focused on reviews of the literature on resourcing for post-disaster housing reconstruction and empirical studies relating to post-disaster housing reconstruction in the coastal districts of Bangladesh. Different theories relating to disaster management and post-disaster housing reconstruction have been examined, followed by a critical review of post-disaster housing reconstruction in Bangladesh and challenges associated with such reconstructions. In summary, post-disaster housing reconstruction in Bangladesh is beset with a lack of available resources, coordination among the participant organisations, and poor quality of reconstructed houses, delays in implementation, corruption and cultural inappropriateness. It was observed that the Bangladesh government, national and international stakeholders including UNDP, IFRC and OXFAM can play a crucial role in successful post-disaster housing reconstruction in coastal Bangladesh.

This chapter is based on outlining research methods adopted for this study. In order to achieve the research aim and objectives, and answer research questions, this study employs a mixed method approach. The first section of this chapter presents research design and procedures of conducting questionnaires of this study. The next section presents research questions, aims and objectives of the study. The third section presents an overall description and definition of the research hypothesis and how it can be tested. The fourth section presents an overall description and definition of research variables, and how to measure them. The fifth section presents and discusses research approaches for this study followed by a discussion on deductive stance as a research approach for this study. The next section presents philosophical underpinnings of this study. The final section presents and discusses the research techniques and within the research techniques, the processes and procedures of collecting and analysing data are described logically.

4.1 Research Design

A research design is the logical sequence that connects the empirical data to a study’s initial research questions and ultimately to its conclusions (Yin, 2003). Social research needs a design or a structure before collecting data. A research design is not just a work plan; it is a whole research plan that entails what has to be done to complete the research project (Vaus, 2001). He also added that the function of the research design is to make sure that the evidence obtained enables us to answer the initial question as unambiguously as possible. In contrast, Creswell (2014) argued that research designs are plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis; it involves several decisions, and the overall decision involves which design should be used to study a topic, procedures of inquiry (called strategies); and specific methods of data collection, analysis, and interpretation. He also added that the selection of a research design is also based on the nature of the research problem or issue being addressed, the researchers' personal experiences, and the audiences for the study. The definition of research design by Vaus (2001) can be supported because research design is not merely a work plan it is more than that; it is a logical and an orderly maintained step by step process in which a social research can be conducted in order for making the research valid and reliable. However, the figure 4.1 depicts the research design of this study:

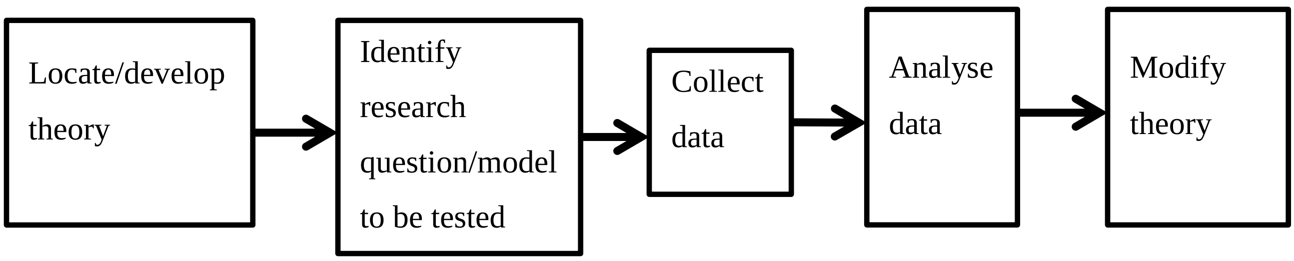


Figure 4. 1 Research design

Source: Adapted from Kolade, 2016

The research begins with the selection of research problem and theories to be studied. Researcher of this study chose resourcing and its implications in post-disaster housing reconstruction in Bangladesh as a research problem for this study. After selecting the research topic, there were review of literature, theories and approaches relating to disaster management and resourcing for post-disaster housing reconstruction. Research questions emerged from the literature review. Research questions of this study were based on resourcing and its effectiveness in reconstructing houses, impact of access to resources, key success factors of resourcing and factors that affect post-disaster housing reconstruction in Bangladesh. After refining research questions, hypotheses were formulated from research questions, synthesizing the literature review and theories and approaches relating to disaster management and resourcing for post-disaster housing reconstruction. The hypotheses of this study focus on disaster victims' level of access to resources, their perception and satisfaction with the quality of the reconstructed houses and the impact of access to resources, access to land, education, and level of their income generating activities, rate of livelihood recovery, poverty reduction and vulnerability reduction.

Data collection techniques were determined after the formulation of hypothesis. Questionnaire survey was employed by maintaining the procedures introduced by Sarantakos (2005). The procedures which were maintained in term of constructing questionnaire are:

a) Questionnaires are developed according to research aim and objectives;

b) Questions must be easy to read and easy to follow;

c) Questions and response categories must be easy to identify and distinguishable from other questions and response categories.

d) Clear instructions about how to answer the questions must be given.

e) The questionnaire should be presented in a way that encourages the respondents to complete and return it.

Besides these, questionnaires were determined on the basis of respondents' level of access to resources for housing reconstruction, factors that affect PDHR projects, beneficiaries' satisfaction on the quality of reconstructed houses, level of their poverty and vulnerability reduction, rate of their housing recovery, stakeholders' involvement and community participation in PDHR projects and the key success factors of resourcing that contribute to successful PDHR projects. The questionnaire in this study was designed in Likert Scale format with some questions about their demographic information. There are two parts to this research; structured and semi-structured interview schedules. The questions for the structured interviews were made based on the following categories; personal information (including age, gender, marital status and educational qualification), shelter and permanent housing, infrastructure, government assistance, livelihood restoration, vulnerability reduction, poverty reduction, and the beneficiaries' satisfaction. After determining data collection procedure, data analysis techniques were also determined, Chi-square, 95% confidence interval, and multiple regression analyses were selected for quantitative data analysis and thematic analyses were selected for qualitative data analysis.

4.2The research question

The research questions of this study were based on the synthesis of literature review, theoretical underpinnings, disaster victims' resilience, impacts of socio-economic factors to housing reconstruction and key success factors and challenges of post-disaster housing reconstruction in Cyclone Sidr and Aila affected areas in Bangladesh. As outlined in chapter one, the research questions are summarised below:

1. *To what extent is resourcing effective in reconstructing houses for the people affected by Cyclone disasters in the Satkhira and Bagerhat regions of Bangladesh?*

2. What are the impacts of access to resources to post-cyclone Sidr and Aila housing reconstruction?

3. What are the key success factors of resourcing that enhance post-disaster housing reconstruction and what are the major setbacks that impede post-disaster housing reconstruction in Bangladesh?

Most of the studies on resourcing for post-disaster housing reconstruction have focused on the factors that affect the availability of resources, challenges associated with resources, and approaches of resourcing for reconstruction (Sing, 2007; Wilkinson *et al*.2010; Chang, 2012). The central theme of this study is that the factors that affect resource availability should not be considered mainly with reference to resourcing for PDHR projects but with the effectiveness of resourcing in terms of successful post-disaster housing reconstruction projects. Furthermore, the existing literature hardly contains any empirical evidences on the impact of access to resources to PDHR projects and key success factors of resourcing that can play a crucial role in rebuilding the disaster victims' houses. Therefore, this study offsets this weakness in the body of knowledge of resourcing for post-disaster housing reconstruction by employing a mixed method to answer the research questions of this study.

Research aim

The aim of the research was to examine the effectiveness of resourcing for post-disaster housing reconstruction projects and to develop a dynamic conceptual framework in order to show how a specific community affected by cyclone disaster can actually recover their houses prior to disasters.

Research objectives

The overall objectives of the study are to:

1. Evaluate the current post-disaster housing reconstruction in Bangladesh;

2. Develop a dynamic theoretical framework for cyclone resilient houses;

3. Explore the key success factors of resourcing for post-disaster housing reconstruction; and

4. Identify the factors that affect post-disaster housing reconstruction

Limitations of the study

The following limitations have been identified in this study:

i) The study area of this research was conducted on the basis of only two coastal districts of Bangladesh, however, cyclone Sidr and Aila hit 31 districts out of 64 districts. Therefore, this study does not cover the whole population affected by Sidr and Aila. Although, this study does not cover the entire population affected, Bagerhat and Satkhira were the worst affected districts (Nadiruzzaman and Paul, 2013; Kabir, 2014).

ii) The aim of this research is to evaluate the effectiveness of resourcing in reconstructing houses for the people affected by cyclones Sidr and Aila. Therefore, it may not entail the entire post-disaster housing reconstruction policy of Bangladesh, although some policies are implicated.

4.3 Hypothesis

The hypotheses of this study were developed based on research questions, the synthesis of literature review, theories relating to disaster management and housing reconstruction and the theoretical framework chosen for this study. The hypotheses of this study focus on disaster victims' level of access to resources, their perception and satisfaction with the quality of the reconstructed houses and the impact of access to resources, access to land, education, and level of their income generating activities, rate of livelihood recovery, poverty reduction and vulnerability reduction. A summary of the hypotheses is given in table 4.1:

Table 4. 1 Hypotheses of the study

Cases	Hypotheses
1	Disaster victims with access to resources are more likely to rebuild durable and cyclone resilient houses than people having no access to resources.
2	People in poverty and with vulnerability have very low levels of affordability, capacity, resilience, satisfaction and managing emergency.
3	Disaster victims with access to education have better opportunities to recover houses than people having no access to education.
4	People with access to resources such as land have higher chances to recover houses and livelihood.
5	Cyclone resilient houses are more likely to ensure the safety of the people during cyclone than non-cyclone resilient houses.
6	People with access to income generating activities have higher chances to maintain the quality of reconstructed houses than people with limited access.

H1. Disaster victims with access to resources are more likely to rebuild durable and cyclone resilient houses than people having no access to resources.

This hypothesis was developed on the basis of Access to Resource Model (ARM) and it was introduced by Wisner *et al*. (2004). This is an assessment of the impact of access to resources in terms of housing reconstruction. Access to resources can play an important role in reducing the vulnerability of people affected by disasters (Bosher *et al*. 2007). Similarly, Wisner *et al.* (2004) argued that people those who have better access to resources such as information, cash, assets and social networks are less vulnerable to hazards and can avoid disasters. However, little is known about the impact of access to resources to post-cyclone housing recovery. Thus, this hypothesis examines whether or not people having access to the required resources can recover their own houses in post-cyclone housing reconstruction, and specific questions were used to test this hypothesis.

H2. People in poverty and with vulnerability have very low level of affordability, capacity, resilience, satisfaction and managing emergencies.

Poverty is the root causes of all types of disaster vulnerabilities and it is mainly viewed as an indicator of lack of access to resources and income generating activities as well as lack of social and political networks (Yodmani, 2001). Philip and Rayhan, (2004) argued that poverty is associated with deprivation of health, education, food, knowledge and the poor are more vulnerable than any other group of people to health hazard, natural disasters and economic down-turn. Likewise, Wisner *et al*. (2004) argued that people who are economically and environmentally marginal are more susceptible to natural hazards and high risk of vulnerability. This hypothesis was developed from the Pressure and Release model of Wisner *et al.* (2004). This hypothesis assesses whether or not disaster affected people with poverty and vulnerability have very low levels of affordability, capacity, resilience, satisfaction and managing emergencies.

H3. Disaster victims with access to education have better opportunities to recover houses than people having no access to education.

This hypothesis is the synthesis of the Access to Resource Model (ARM) introduced by Wisner *et al*. (2004). Education is linked with skills and training and the income of people with skills and training is higher than non-skilled people. But little is known about the impact of education in post-disaster housing recovery. Therefore, by employing this hypothesis, the researcher of this study tests ARM model and examines whether or not people having access to education can rebuild their houses more easily than people with limited access to education.

H4. People with access to land have higher chances to recover houses and livelihood than people having no access to land.

This hypothesis was developed after critically reviewed the Pressure and Release model of Wisner *et al.* 2004 and literature relating to post-disaster housing reconstruction in Bangladesh. Landlessness is a major problem that contributes to disaster vulnerability and in terms of post-disaster housing reconstruction for the people affected by cyclones in the coastal areas of Bangladesh (Wisner *et al*. 2004; Alam, 2010). The number of landless people has increased from 22% in 1972 to 28% in 2010 (Hossain *et al.*2010) and it shows that about 4.5 million of the total population of Bangladesh is completely landless (BBS, 2010). Studies on the impact of access to land in post-disaster housing recovery are relatively limited.

Therefore, this study incorporates this and explores whether people with land have a higher chance to recover their houses and livelihood than people lacking this resource. In addition, qualitative analysis of semi-structured interviews provides further theoretical insights into the impact of access to land to recover houses and livelihoods.

H5. Cyclone resilient houses can provide more safety to the people during cyclone than non-cyclone resilient houses.

The vulnerability of disaster affected people is exacerbated with the low quality of housing as those houses can not give them safety and security during strong cyclones (Tran, 2016). Buildings are considered vulnerable if they can not withstand the forces of high winds and most vulnerable to cyclones are light-weight structures with wood frames and poorly constructed houses (Agarwall, 2007). He (Agarwall, 2007) also argued that whether or not a building will be able to resist the effects of wind is dependent not so much upon the materials used but the manner in which they are used and it is true that a well-built and properly-engineered houses offer a better margin of safety than other types of buildings. Therefore, on the basis of existing literature, this study further explores whether cyclone resilient houses provides more safety to the people affected by cyclones by employing questionnaire survey.

H6. People with access to income generating activities have better opportunities to maintain the quality of reconstructed houses than people having no access.

Income generating activities are associated with increased income and increased income can reduce the vulnerability of disaster victims that leads to restore their livelihoods *(*Robson *et al. 2011).* As the study on the impact of income generating activities is relatively limited, this study explores further whether people who have access to income generating activities have a higher chance of reconstructing houses than people with no access. In addition, the researcher examines how people have a higher chance of constructing houses and maintain the quality if they have access to income generating activities by employing questionnaires.

4.4 Parameters and research variables

The main variables in this research are post-disaster reconstruction and resourcing. The study presents and defines key variables and it also explains how to measure those dependent and independent variables in the next section of this study.

a) Access to Resources

This is the main independent variable which has been explored in this research; this is because resources as humanitarian assistance can influence the whole reconstruction project. For example, super cyclones have destroyed the houses of affected people; without resources, it is quite impossible to start the reconstruction of houses. Therefore, resourcing is an independent variable in this study. Resource may be defined as the machine or persons who will perform the scope of work (Burke 2003). However, resourcing is a process or activity of acquiring the required or sufficient amount of resources in order to accomplish a specific project. It is stock or supply of money, materials, staff, and other assets that can be drawn on by a person or organization in order to function effectively (Encyclopaedia of Britannica 2014). In other words, it (resourcing) means a wide range of activities or work which is carried out to find and provide money, materials or people required for the completion of a specific project. Resourcing for post-disaster reconstruction means managing and organising available resources including construction materials and reconstruction practitioners, people and funding to start and accomplish reconstruction activities. Access to resources was measured using a multi-dimensional construct in which binary (yes/no) responses to the followings were aggregated: access to humanitarian assistance, access to reconstruction materials, and access to cash grants and access to local government assistance.

b) Level of education

A respondent's level of education can play a crucial role in changing their overall condition. It can influence access to information. It is also often related to better training and higher levels of skills of disaster victims. These, in turn, typically result in increased income and increased income can reduce vulnerability. Reducing vulnerability can increase resilience in terms of withstanding future disasters. Studies have shown that socio-economic variables such as land ownership and education can play a significant role in gaining access to resources (Bosher *et al*. 2007) and education has been identified as a significant predictor in post-disaster recovery (Barkat *et al*. 2013). Level of education is the one of the main independent variables in this study. The level of education was measured by respondents' selection of one option from a list ranging from "no education to post-graduate qualification. There were six separate groups which were; no formal education, primary education, secondary education, further education, university education and post-graduate degrees.

Participants were invited to take part in a questionnaire survey and rank their level of education according to the six groups. Their responses were measured using SPSS version 21.

c) Access to land

Access to land is another independent variable in this study. It plays a significant role for disaster victims to rebuild their houses. Therefore, to explore their level of access to land can give clear picture of the respondent's housing reconstruction. This is because they cannot rebuild their houses without having access to land. Respondents level of access to land is measured using the five point Likert Scale from 1 = very low to 5 = very high. Their responses were identified by using frequency distribution and t-test of SPPS version 21.

d) Income generating activities

Income Generating Activities (IGA) is associated with increase in their income. It can play a pivotal role in livelihood recovery for disaster victims. Recovery of livelihood is associated with overall developments. Villagers affected by both cyclones Sidr and Aila can recover their livelihoods through active involvement of income generating activities. Respondent's level of income generating activities is measured using the five point Likert Scale from 1 = very low to 5 = very high.

e) Measuring housing reconstruction

Reconstruction is a dependent variable and it has been measured in this study. This is because reconstruction can be severely influenced by resourcing and the success of the whole post-disaster reconstruction project depends on the application of resources. It is understood to be building works carried out during the relief and recovery phases including transitional shelter and permanent reconstruction of aid response, following a rapid onset natural event (Burnell, 2010; Silva, 2010). Generally, reconstruction is a process of building shelter or houses for the affected population in a post-disaster emergency period to get them back to a pre-disaster state. But in the literature of disasters, reconstruction is not merely about rebuilding structures in bricks and mortar; it is about rebuilding the lives of communities impacted by a disaster who are undoubtedly the most important stakeholders in the reconstruction process (Barenstein *et al*. 2013).

There is a dearth of literature relating to measuring housing reconstruction or whether the housing reconstruction has become effective or not. However, few studies attempt to measure the success of the disaster project. A study conducted by Moe *et al.* (2007) used a balanced scoreboard approach to measure the performance of projects associated with disasters. They argued that the performance of disaster reconstruction projects can be measured from the beneficiaries' perspective by a simple measurement of whether their life condition is restored to pre-disaster conditions. However, their study lacks some vital determinants in which measuring housing reconstruction would be incomplete because restoring life condition is not only the determinant to measure the success of PDHR. However, another study conducted by Burnell (2010) recommends five factors that can be used to measure the performance of post disaster reconstruction programmes. The factors that Burnell (2010) suggested are durability (How well has it lasted?), process (How was it delivered and how were local people involved?), likeability (What do people think of living in them?), adaptability (How has it been used, changed or amended over the years), and usability (How the shelter was used, for what purpose and how did it impact on their livelihood). The five factors that Burnell (2010) suggests to measure the project performance lack some significant factors that can be used to measure housing reconstruction; these are durability, resilience, quality, cost and safety. Therefore, housing reconstruction has been measured by using a multi-dimensional construct in which binary yes/no questions were asked and their responses to the housing recovery were measured by frequency distribution of SPSS. Housing reconstruction was also measured by asking questions of what types of houses have you recovered. When do you recover your houses? And what are the materials that were used for reconstruction?

f) Measuring effectiveness of resourcing

As stated earlier in this research, resourcing encompasses a combination of stock or supply of aid money, construction materials, and labour and construction practitioners. Therefore, it is very cumbersome to measure the effectiveness of resourcing in terms of a post-disaster housing reconstruction project. Nevertheless, the existing literature is very scarce on measuring the effectiveness of resourcing and no researcher defined how to measure the effectiveness of resourcing in post disaster housing reconstruction. This study employs a specific parameter in which the effectiveness of resourcing can be measured, and this parameter consists of Rate of Housing Recovery (RHR), Rate of Livelihood Recovery (RLR), Level of Income Generating activities (LIGA), Vulnerability Reduction Rate (VRR), Poverty Reduction Rate (PRR), Beneficiary's Satisfaction Rate (BSR), and Quality of Reconstructed Houses (QRH). Questions were asked to the affected villagers about RHR, LRR, LIGA, VRR, PRR, BSR and QRH and the answers were ranked to identify the option which has been fulfilled most.

4.5 Research approach

This study adopts mixed method approach with semi-structured interviews to collect data. A mixed method approach is the combination of both quantitative and qualitative approaches. Quantitative research is an inquiry into a social or human problem based on testing a hypothesis or a theory composed of variables, measured with numbers and analysed with statistical procedures, to determine whether the hypothesis or the theory hold true (Creswell, 2014; Bryman and Bell, 2015). This study employs a quantitative approach in order: i) to establish the relationship between the dependent and independent variables of access to resources and other socio-economic variables ii) to test theory relating to post-disaster housing reconstruction; iii) to meet research aims, objectives and research questions; and iv) to deduce hypothesis from the theories.

A qualitative research approach is an explorative approach which is generally applied to look into the social problem and it involves discovery. It is also described as an unfolding model that occurs in a natural setting that enables the researcher to develop a level of detail from high involvement in the actual experiences (Creswell, 2014). This approach is the most suitable approach to analyse data of social problems. The researcher of this study employs a qualitative approach in order to collect qualitative data by using semi-structured interviews with national and international stakeholders working in post-disaster housing reconstruction in Sidr and Aila affected areas. Semi-structured interview is a qualitative data collection tool where researcher has a list of questions on specific topics to be covered and it is often referred to as an interview guide but the interviewee has a great deal of leeway in how to reply (Sarantakos, 2005; Bryman & Bell, 2015). Responses against each question were recorded in semi-structured interview schedule.

Mixed method is effective in scrutinizing the causes of the problem; comparing results from both qualitative and quantitative data to increase the reliability and validity of the data. The current research is on resourcing for post-disaster housing reconstruction, and the main aim of the research is to evaluate the effectiveness of resourcing in terms of post-disaster housing reconstruction in Bagerhat and Sathkhira regions of Bangladesh. To explore the effectiveness of resourcing in terms of post-disaster reconstruction, mixed method is appropriate because it integrates both quantitative and qualitative data and such integration permits the researchers a more complete and synergistic utilization of the data. However, the reasons for employing mixed method in this study are given below:

i) To integrate thematic and statistical data, combine qualitative and quantitative data that enables researchers to combine theory generation and hypothesis testing;

ii) Mixed method research can answer research questions that cannot be answered by quantitative or qualitative alone;

iii) To get satisfactory results from the respondents that can improve the validity and reliability of the data.

iv) To meet the aim and answers of the research questions and to compare and contrast the pre- and post-disaster housing reconstruction, a method that contains both quantitative and qualitative data would be the best fit;

v) To address research problems, mixed method permits researchers to use a wide range of data collection tools. This study has used a questionnaire survey and semi-structured interviews to collect data. So data collection in this study is not limited to only one single tool.

Moreover, as a research approach, by considering the aims and objectives of the study, research questions, synthesis of literature review and the philosophical underpinnings, this study employs deductive, quantitative approach. Thus, hypotheses are formulated and tested from the theory and are then rejected or confirmed as depicted below:

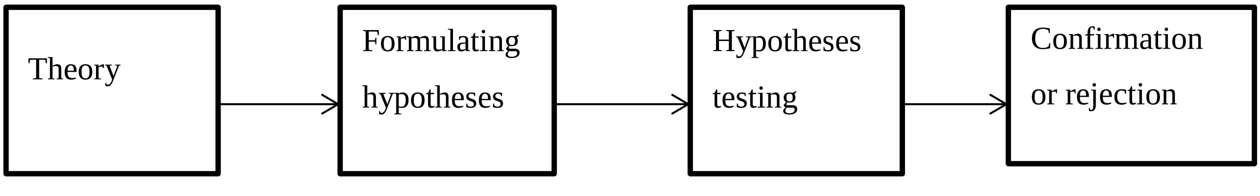


Figure 4. 2 Process of deductive approach

Source: Creswell, 2014; Bell & Bryman, 2015

In this study, hypotheses are generated from the theory of access to resource model, sustainable livelihood framework and pressure and release model, hypotheses are then tested through a fieldwork questionnaire survey and finally inferences are made per the test results of either confirmation or rejection of hypotheses. Furthermore, this study develops a theoretical framework by synthesizing the theories relating to this study.

4.6 Research philosophy

Research philosophy is a guideline to conduct study using the appropriate method. This is quite significant to decipher philosophical underpinning because the knowledge on philosophy can eke out the researcher to identify the research design which will best suit to the research problem. Research philosophy is a term that relates to development of knowledge and the nature of knowledge which contains assumptions of how we see the world (Saunders *et al*., 2007). This can avoid the researcher from falling into the wrong path and also can indicate the limitations of a particular approach, and can help to clarify research designs from data collection to analysis (Nirooja, 2013). This also could help the researcher identify and create designs which are out of his/her experience and, may suggest how to adapt research designs according to the constraints of different subjects (Easterby-Smith, *et al*., 2008).

Researchers can view the social problem of the world through the important aspects and contents of research philosophy. Particularly, assumptions regarding the researcher's view on the relationship between knowledge and the process in which it is developed and play an important part for the design of research strategy and research methods. Saunders and his colleagues (2012) view research philosophy as a multidimensional set of continua. There are three main philosophical positions that underlie the designs of management research: Epistemology, Ontology and Axiology (Saunders, *et al*., 2012). These three philosophical positions actually influence the whole research process. The study presents those three philosophical elements in the following section:

i) Epistemology

An epistemological issue is generally concerned with the question of what is regarded as acceptable knowledge in a discipline (Collis and Hussey 2003, Bryman 2012, Saunders *et al.* 2012). Collis and Hussey (2003) also argued that epistemology is concerned with the study of knowledge and what accepted as being valid knowledge that involves an examination of the relationship between the researcher and that which is being researched. Saunders *et al*. (2007) considered the most important distinctions of epistemology as positivism at the end and interpretivism at the other end. However, Easterby-Smith *et al*. (2008) denote these two positions as positive and social constructionism. The authors have actually used various terms to explain both extremes in the literature of epistemology continuum. The main idea behind the positivism stance is that the social world exists externally and its properties should be measured through objective methods than being inferred subjectively (Easterby-Smith, *et al*., 2008). After summarising some of the characteristics of positivisms, Easterby-Smith and *et al*. (2008) state that the observer is independent from what is being observed and the choice of what to study and how to study is determined by objective criteria rather than by human beliefs and interests. Their research is conducted in a value freeway as far as possible. Under positivism, researchers are most likely to use highly structured methodologies to facilitate replication (Gill and Johnson, 2010). Natural scientists generally adopt positivism as a philosophical stance in their research.

In contrast, under social constructivism, the reality is not objective and it is determined by people rather than by external factors**.** Generally, this philosophical position is developed as a reaction to positivism in the Social Sciences. Easterby-Smith *et al.* (2008) have summarised the features of positivism and social constructionism by compositing various authors view in both paradigms.

Table 4. 2 Contrasting implications of positivism and social constructionism

Cases	Positivism	Constructionism
The observer	Must be independent	Is part of what being observed?
Humanities	Should be irrelevant	Are the main drivers of science
explanations	Must demonstrate causality	Aim to increase the general understanding of the situation
Research progresses through	Hypothesis and deduction	Gathering rich data from which ideas are induced
Concepts	Needs to be defined	Should incorporate stakeholders perspective

Units of analysis	Should be reduced to simplest term	May include the complexity of whole situations
Generalisation through	Statistical probability	Theoretical abstraction
Sampling required	Large number selected randomly	Small number of cases chosen for specific reason

Source: Easterby-Smith *et al*., 2008

The current research is on resourcing for post-disaster housing reconstruction: the case of Cyclones in Bangladesh where the aim of this research is to evaluate the effectiveness of resourcing for post-disaster housing reconstruction and designing appropriate research methods. In order to achieve research aim and answer research question, appropriate method should be selected, and to choose appropriate method, the study takes the stance of positivism approach as an epistemological consideration. This is because under the paradigm of positivism, the reality is not objective and it is determined by people rather than by external factors. Beside this, as the aim of this research is to explore the effectiveness of resourcing for post-disaster housing reconstruction, there should be an investigation about what are the determinants of effective post-disaster housing reconstruction? The determinants are related with social, political, economic, environmental factors, and the reality exists in the community's process of reconstruction, income generating activities, and livelihood recovery. Therefore, this study has taken the positivism stance as philosophical position which is depicted in the above table.

ii) Ontology

As a philosophical stance, ontology is concerned with the nature of social entities. This actually relates to the assumption that researchers have about the way the world operates. Clark and Creswell (2008) call this metaphysics which consists of issues related to the nature of reality. They further state that ontological assumption hold a diversity of viewpoints of social realities but they need to be placed within political, central, historical and economic value system to understand the differences. Ontology consists of two main aspects which are objectivism and subjectivism. Objectivism assumes that social entities exist in reality external to social actors (Hidayat, 2013). Subjectivism believes that social phenomena are created from the perceptions and consequent actions of social actors, this is a continual process in that through the process of social interaction those social phenomena are in a constant state of revision (Saunders *et al*., 2007). Therefore, as the determinants of effective post-disaster housing reconstruction are related with social factors, this study takes subjectivism as ontological approach.

iii) Axiology

The last philosophical assumption is axiology and is concerned with the judgements about values of the researcher. That is, whether the researcher's own values play a part in the stages of the research process (Saunders *et al*, 2012). It is a branch of philosophy that studies judgements about value (Saunders *et al*., 2007). In this continuum, an assumption has to be made about whether it is value free and unbiased or value laden and biased (Collis and Hussey, 2003). In order to achieve credible, reliable and valid research, generally the results incorporate the role of researcher's value in all stages of research process, and this is of great importance. Heron (1996) claims that researchers reveal axiological skill by being able to articulate their values as a basis for making judgements about what research they are conducting and how they go about doing it. The value of judgements may differ in the study's conclusions from other researchers' studies. In this philosophy, researcher needs to make an assumption about whether it is value free and unbiased (Collis and Hussey, 2003). In this study, the selection of researcher data collection techniques shows that the researcher gives importance to the interviews in the data collection process as it helps to capture important and rich information about reality. Therefore, the researcher in this study takes the value laden approach because the researcher needs to gather information by personal interaction and through the interpretation of the data collected.

4.7 Research context

a) Study place and target population

The fieldwork for this study was carried out in two parts. In the first part, a pilot study was conducted in March 2016 in the selected unions of Gabura, Satkhira, Bangladesh where the main fieldwork was undertaken in April 2016 in the coastal cyclone-affected areas of Bagaerhat and Satkhira in Bangladesh. The study area for this investigation was based on cyclone-prone coastal districts of Bangladesh. The data on the damages and losses due to cyclone Sidr in 2007 and Aila in 2009 show that the districts of Bagerhat and Satkhira were the most severely affected (Mallick *et al*. 2017), so for this reason they were selected by the researcher.

Bagerhat was one of the worst hit districts by cyclone Sidr in 2007. The total number of damaged and destroyed houses due to cyclone Sidr was 1,522,077 of which over 564,967 houses were partially destroyed (GOB, 2008; Kabir, 2009). In Bagerhat, South Khali and Sarankhola were selected to collect data. According to the population census 2011, the population of Southkhali is 24,980 and Sarankhola is 119084 (Nadiruzzaman, 2013; BBS, 2015).

Satkhira districts were the worst hit by Cyclone Aila in 2009. Gabura and Padmapukur were selected due to being severely affected by Aila (Amaratunga *et al.* 2014; Ahmed and Haidar 2014; Mallick *et al.* 2017). According to population census 2011, the population of Gabura is 32,417 and Padmapukur is 22,858. An estimated 243,000 houses were fully destroyed and over 373,000 were partially damaged which forced thousands of people to take shelter in cyclone shelters, schools, makeshift houses and embankments (IFRC, 2010).

The researcher chose Southkhali and Sarankhola in Bagerhat and Gabura and Padmapukur in Satkhira districts due to the following reasons:

i) These areas were the worst hit and affected by both cyclones Sidr and Aila;

ii) These areas are the most cyclone-prone areas in Bangladesh;

iii) Most of the households and their livelihoods in these areas were greatly affected by cyclones.

b) Data collection process

Data collection is a systematic process of gathering and measuring research related information on variables of interest that enable researchers to answer research questions, test hypotheses and evaluate outcomes. This section provides data collection techniques for this study.

i) Sampling method

Sampling is the modus-operandi or techniques in which a researcher can choose the segment of the population for the investigation of their study (Bell & Bryman, 2015). It is a key step in designing research studies and identifying an adequate sample size, it enables researchers to ensure that a specific study provides accurate and reliable findings (Srarantakos, 2005;

Kasiulevicius *et al.* 2006). However, a sample is the targeted population that represents the whole population. Bryman & Bell (2015) stated that whatever the research aim and research questions, it can be conducted precisely and accurately if the sample size determination of the investigation is appropriate. Therefore, the sample size determination plays a crucial role in enabling the researchers to obtain findings of the study which are generally reliable and trustworthy. However, this study employs multi-stage purposive sampling, rather than using purely random sampling in order to prevent the possibility of losing important information. At each stage of the sampling process specific criteria were maintained and finalised through the inference of a field study.

Before going to start fieldwork, the researcher of this study established initial contact with the Chairman of Gabura and Padmapukur Union of Stakhira districts and with the Chairman of Southkhali and Sarankhola Upazila. The Chairman of both districts provided important relevant information about the local government offices and Union Parishads (UP) addresses. From the UP and local government offices, lists of the most disaster affected villagers were collected. The gatekeepers of local government offices and UP were very helpful in providing relevant information on the most vulnerable areas after the cyclones hit. Musharraf, a member of Southkhali, helped the researcher greatly by informing the most affected people about the questionnaire survey and their requested attendance.

ii) Sample size determination

The sample size of this study was determined by using the following cluster sampling:

Formula

$$N = P \times (1\text{-}P) \left(\frac{Z}{E}\right)^{\surd}$$

Where N = Required sample size

Z = 95% Confidence interval

P = Proportion of targeted population affected by cyclone disasters = 0.50 (assumed)

E = Margin of error of 0.060 percent

CI (Confidence Interval) = 1.96

P = 0.50

E = 0.060 (Margin of error)

Therefore, $N = 0.50\times(1\text{-}0.50)\left(\frac{1.96}{0.060}\right)^{\surd}$

$N = 0.50\times0.50(32.6666)^{\surd}$

$= 0.25\times\mathit{1067.1111}$

= 266.77

Source: Adapted from Kasiulevičius *et al.* 2006

According to the above sample target, questionnaires were given to 380 people affected by both cyclones Sidr and Aila. In total, 285 respondents took part in questionnaire survey with a response rate of 75%.

To help the main investigator of this study, three facilitators from the University of Dhaka, representing cyclone-affected people, were employed to collect data under the direct supervision of the main researcher. There was a training session that provided a clear description and overview of the purpose of the study. A pilot study was also conducted to test the feasibility and robustness of research questionnaires and the research plan. This pilot study also assesses and determines the required resources for planned study and proposed data analysis techniques to reveal potential problems with the questionnaires, including the sequence of questions, to ensure that they are explicit and well understood by respondents. Most of the questions were multiple choices, and were tested as open questions.

Structured and semi-structured interviews were used to collect quantitative and qualitative data because structured and semi-structured interviews may be more manageable than unstructured interviews (Hammond and Wellington, 2013). Likewise, structured interviews are generally used for quantitative research and semi-structured interviews for qualitative research. Quantitative data was collected from questionnaires and qualitative data was collected from semi-structured interviews.

iii) Interviewers

Three trained interviewers were employed for the purpose of data collection, under the direct and daily supervision of the main researcher. The interviewers were selected on the basis of their educational qualification, fluency in both English and native Bengali languages, and gender balance. Therefore, each of the three interviewers was educated to a bachelor degree level and is currently doing their postgraduate course. Also, two of them were female, so that, together with the principal investigator, there were two males and two females. All three interviewers were, along with the principal investigator, fluent in Bengali, in addition to their good command of English. They are familiar with local culture, and practices, and were effective in engaging respondents during the interview process, including dealing with the sensitivity of interviewing general respondents.

Training incorporated a clear description of the purpose and goals of the investigation, as well as a detailed discussion of survey methods and an explanation of sampling logic and process. Both structured and exploratory types of interviews were used in this study to obtain both quantitative and qualitative data. Questions were asked in the exact order in which they were written and with respect to open-ended questions and semi-structured interviews, responses were recorded exactly according to the way they were delivered. Care was taken to avoid other sources of bias that may impact on the integrity and accuracy of data collected. These included adverse impression management, poor maintenance of rapport, rephrasing attitude questions, altering factual questions, asking questions out of sequence, and poor management of 'problem' respondents (Oppenheim, 1992; 2000).

iv) Pilot study

A pilot study is a small-scale replica and a rehearsal of the main study and is carried out to find out possible pitfalls, as well as to critique, test and validate the research instruments (Srarantakos, 2005; Fink, 2006; Bryman, 2016). It also allows the researchers to develop a more specific understanding of the research topic and provides experimental learning in order to be familiar with methodological considerations of the research (Kabir, 2014).

A pilot study was administered to test the suitability of the research methods and instruments, robustness and adequacy of the questionnaires and to identify possible weaknesses, inadequacies, ambiguities and problems in all aspects of the research to ensure they were corrected before actual data collection took place. The pilot study refined all aspects of the questionnaire including proper use of wording and coherence of the questions in order to ensure that research assistants as well as respondents could understand the meaning of the questions. Most of the questions were multiple choice and were tested as open-ended questions. Respondents who took part in the pilot survey were excluded from the main study. The main objectives of the pilot survey were:

1) To identify the setbacks of the questionnaire through correcting the questions which are found to be ambiguous or unclear. The questionnaires were modified and refined and unwanted questions were removed to increase the reliability of the data.

2) To ensure that the questionnaire was clear, concise and coherent according to the main aim and research questions of the study.

3) To be familiar with the disaster affected people and their day to day life.

4) To carry out an initial assessment of the cyclone affected villages and communities in order to determine the approximate number of respondents that could be approached.

5) To identify the probable challenges and barriers and duration of the original interview.

6) To meet local government officials and personnel from non-governmental organisations in order to get lists of the most vulnerable people affected by cyclones.

7) To estimate the costs and duration of the main study.

v) Questionnaire

A questionnaire survey design provides quantitative or numeric descriptions of trends, attitudes or opinions of a population by studying a sample of that population (Creswell, 2014). The questionnaire survey in this study was used in order to identify respondents' level of access to resources for housing reconstruction, factors that affect PDHR projects, beneficiaries' satisfaction on the quality of reconstructed houses, level of their poverty and vulnerability reduction, rate of their housing recovery, stakeholders' involvement and community participation in PDHR projects and the key success factors of resourcing that contribute to successful PDHR projects. The questionnaire in this study was designed in Likert Scale format with some questions about their demographic information. There are two parts to this research; structured and semi-structured interview schedules. The questions for the structured interviews were made based on the following categories; personal information (including age, gender, marital status and educational qualification), shelter and permanent housing, infrastructure, government assistance, livelihood restoration, vulnerability reduction, and the beneficiary's satisfaction. Furthermore, there are twelve semi-structured questions which were asked and data were collected and stored in audio device. A copy of the survey questionnaire is provided in the appendix.

vi) Semi-structured interview

A semi-structured interview is more manageable than an unstructured interview while avoiding the inflexibility of the fully structured approach. Semi-structured interviews were used in this study to conduct interviews with the stakeholders who were involved in the post-cyclone Sidr and Aila housing reconstruction. Trained interviewers, under the direct supervision of the researcher, were equipped with interview guides. Interviewees had sufficient flexibility on how to reply, and follow-up and probing questions were employed to explore in further detail certain aspects of interviewees' replies that are especially relevant to the themes of this research.

c) Method of data analysis

This study employs a mix method approach in order to increase the validity and reliability of the findings of the study. Therefore, descriptive statistics, frequency distribution, Chi-square tests, 95% confidence interval test, and multiple regression analyses were conducted to evaluate the overall research results by using acceptance or rejection of null hypotheses on the basis of evaluation (Pallant, 2010; Bell and Bryman, 2015).

Descriptive statistics in SPSS were used to obtain the frequency distributions; cross-tabulation analysis and Chi-square tests were run to identify the relationship between variables. 95% confidence interval test was conducted to compare the sample mean with population mean.

Using SPSS version 21, multiple regression analyses were conducted to assess the combined effects of the independent variables of access to resources and other socio-economic variables of age, gender, level of education, construction expertise, building materials and level of income generating activities. Standardised Beta Coefficients were used to obtain the combined effects of the independent variables on the dependent variable (Bryman, 2016).

i) Chi-square tests

The Chi-square test of independence is often used either as a test of association or as a test of differences between the groups of independent variables. It is typically used to compare the observed frequencies or proportion of cases that occur in each of the categories with the values that would be expected if there was no association between variables being measured (Pallant, 2016).

The Chi-square test was used in this study for quantitative data analyses. More specifically, it was used to assess the statistical significance and relationship between the variables. The Chi-square value was produced by calculating the differences between the actual and expected values for each cell in a contingency table and in turn was used to attain the p-value which provides a numerical estimate of the associated level which is statistically significant. In this study, null hypothesis was rejected for the significance level of $p < 0.05$ in the assumption that there are relationships between groups of variables. By using Chi-square, the relationship between access to resources and housing reconstruction was explained and Chi-square tests were identified. Moreover, the researcher of this study has sought to identify the impact of access to resources in terms of reducing disaster victims' vulnerability, poverty, livelihood recovery, quality of reconstructed houses and beneficiaries' satisfaction on the quality of reconstructed houses by using Chi-square tests.

ii) 95% Confidence interval

Confidence interval provides an estimate of a population parameter which is computed from observed data. The confidence level is the frequency of possible confidence intervals that contain the true value of their corresponding parameter (Cox, and Hinkley, 1974; Smithson, 2003). The 95% confidence interval is generally employed when comparing the mean scores on different continuous dependent variables (Cohen *et al*. 2007). The 95% confidence interval was used in this study to identify the mean score of different variables used in this study. For example, 95% confidence interval was employed in this study to explore the mean score of respondents level of access to resources such as land, human resources, technological application and financial resources by using Likert scale from 1 =

very low to 5 = very high. If the mean score of their level of access to resources is above 4.00 which means their level of access to resource is very high.

iii) Multiple Regression analysis and model accuracy

Multiple regression is not just one technique but a family of techniques that can be used to explore the relationship between one continuous dependent variable and a number of independent variables or predictor variables (Pallant, 2016). It is based on exploring the correlation between the variables or coefficients of different variables but it can be used for more sophisticated identification or exploration of interrelationships among the group of independent variables.

Using SPSS version 21, multiple regression analyses were used in this study in order to test the hypotheses of the study and to evaluate the combined effects of the independent variables (access to resources and socioeconomic variables) on the predictor variable (housing reconstruction). More specifically, multiple regression was employed in this study to explore the value of a given parameter based on the factors that are considered as influencing the parameter. The predicted parameter is a dependent variable and the influencing parameter is referred to as an independent variable. Therefore, multiple regression analyses were employed to explore the impact of access to resources, level of education and income generating activities of respondents on their post-disaster housing reconstruction. Furthermore, multiple regression provides information about the accuracy of the model created in this study as a whole and the relative contribution of each of the variables that makes up the model and it allows the researcher to test whether adding a variable contributes to the predictive ability of the model above those variables already included in the model. Standardized Beta coefficients and p-value obtained were used to measure the combined effects of the independent variables on the dependent variables (Pallant, 2005, Bell and Bryman, 2015). The equation for the multiple regression models is listed as follows:

$$Y = B. {}_{+}B_1X_1 {}_{+}B_2X_2 {}_{+}B_3X_{3+} B_4X_{4+}B_5X_{5+}B_6X_{6+}B_7X_{7+}B_8X_{8+}B_9X_{9+}B_{10}X_{10+}B_{11}X_{11}.\varepsilon$$

Where,

Y is the dependent variable

ß is the p-dimensional parameter or intercept

X_1 is the age of the respondent (Independent variable or regressors)

X_2 is the gender of the respondent (Independent variable or regressors)

X_3 is the monthly income in BD Taka (Independent variable or regressors)

X_4 is the marital status of the respondent (Independent variable or regressors)

X_5 is the level of education (Independent variable or regressors)

X_6 is the level of access to land (Independent variable or regressors)

X_7 is the access to sufficient resources (Independent variable or regressors)

X_8 is the level of access to income generating activities (Independent variable or regressors)

X_9 is the level of access to the quality of building materials (Independent variable or regressors)

X_{10} is the level of access to construction expertise (Independent variable or regressors)

X_{11} is the level of access to technological application (Independent variable or regressors)

B_1, B_2, B_3, B_4, B_5, B_6, B_7, B_8, B_9, B_{10}, and B_{11} are the regression coefficients for independent variables,

ε is the random variable called the error term.

d) Qualitative data analysis techniques

Lacey and Luff (2007) suggest that analysis of qualitative data is the processes of describing and summarising the text which may include discovery of the relationship between the themes and relates ideas of the respondents' characteristics, draws implication from the data for policy or practice purposes, and helps to interpret findings from previous studies. However, qualitative data in this study were analysed using thematic analysis techniques introduced by Braun and Clark (2006) and NVivo version 10, qualitative research software that is useful for arranging and classifying information, and then examining relationships and analysing trends in the data and to ensure the best use of the data.

i) Transcription of the interview data

The interview data were prepared and organised before analysis. First, the audio data which was recorded while conducting interviews was played on the computer. After that data was transcribed in Microsoft Word according to what was said by the interviewee against each question. In the data transcription process, audio tapes were played and replayed several times to ensure the originality of the data. Theme was screened and extracted from the Microsoft word files after it was retrieved from the recording device.

ii) Process of data analysis

Qualitative research often yields enormous volumes of data that is usually in a textual format and can be challenging and time consuming (Samwinga, 2009; Smith *et al.*2009; Bryman and Bell, 2015). Qualitative data analysis refers to reducing the data from a large volume by reducing the raw information, sifting trivia from significance, identifying significant patterns and constructing a framework that is meant to guide the analysis of data (Patton, 2002). In this study, data was prepared and organised from the office documents making sure that important information was not missing. This involved transcribing interview, optically scanning material, typing up field notes, cataloguing all of the visual material, and sorting and arranging the data into different types depending on the sources of information (Creswell, 2014). This study employed a thematic analysis as well as analysis by NVivo software version 10 in order to ensure the best use of the data. Theme was screened and extracted from the Microsoft Word files after it was retrieved from the recording device. To analyse data, a six-phase qualitative data analysis technique of thematic method suggested by Braun and Clark (2006) have been applied. The details of six-phase data analysis techniques given by Braun and Clark (2006) are explained in chapter seven.

e) Reliability and validity of the questionnaire results

Identifying the reliability scale for questionnaire results is very important before conducting any further analyses. Reliability of the study is fundamentally concerned with the issues of consistency in measuring a concept. In order to assess the reliability of empirical measurement, four methods can be used (Bell and Bryman, 2015). The methods to measure the reliability of the study are as follows:

1. The test-retest method
2. The alternative form method
3. The split-halves method and
4. The internal consistency method (Bryman & Cramer, 2011; Pallant, 2016; Bell and Bryman, 2015; Bryman, 2016)

The first three methods have major limitations particularly for field studies such as requiring two independent administrations on the same sample or the need for two alternate forms of measuring instruments ((Nunnally & Bernstein, 1994**;** Bell and Bryman, 2015). However, this study uses the internal consistency method to measure the reliability of questionnaire results. The internal consistency method refers to the degree to which the items that make up the scale are Cronbach's alpha coefficient and the value of it should be above .70 (Pallant, 2016). In this study, Cronbach's alpha was computed by using SPSS version 21. The details of Cronbach's are shown in the appendix.

Table 4. 3 Results of Cronbach's alpha

Questionnaire sections	No of items	Alpha value	deleted item	Alpha if item deleted
Access to resources	34	0.882	0	0.882
Impediment to PDHR	9	0.782	0	0.782
Success factors, satisfaction & resilient house	20	0.437	0	0.437
Quality of reconstructed houses	5	0.826	0	0.826
Safety and security	4	0.785	0	0.785
Livelihood recovery	5	0.809	0	0.809
Factors contributing to livelihood	5	0.754	0	0.754
Factors hindering livelihood	5	0.754	0	0.754
Vulnerability reduction	9	0.377	0	0.377
Social capital	12	0.59	0	0.59
Income generating activities & quality of life	12	0.669	0	0.669
Managing emergency & community	12	0.527	0	0.527

Table 4.3 shows that most of the computed Cronbach's alpha values for the sections and sub-sections of the questionnaire results are greater than the minimum standard value of .70 apart

from a few of the sections. This result indicates that there is strong internal consistency in the results of the questionnaire in this study which shows the greater reliability of the study.

f) Ethical consideration

Ethics is one of the many considerations employed by researchers when coducting rersearch (Adams and Lawrence, 2015). It is necessary to safeguard respondents, the research process and the credibility of the research findings (Flick, 2009; Bryman and Bell 2015). In this study, the researcher has considered the two main ethical issues of participants consent and confidentiality of the data. As a process, an ethical application was sought from the Ethics Committee of London South Bank University and it was approved by the Committee (Ref in appendix). Before collecting data, each participant was provided with a participant information sheet (appendix) that explained the purpose and nature of the study. The respondents were given the assurance that all information gathered during interviews would be used for research purposes only and their anonymity would be maintained from data collection to dessimination. They were recruited voluntarily had the option to withdraw from the research at any time. Furthermore, a clear explanation about the purpose of the interview was given to each participant at the beginning of the each interview.

CHAPTER 5 IMPACT OF RESOURCING FOR POST-DISASTER HOUSING RECONSTRUCTION

5.1 Introduction

This chapter discusses and sheds light on the impact of access to resources on post-disaster housing reconstruction after cyclones Sidr in 2007 and Aila in 2009 in Bangladesh. It also explores the characteristics of disaster victims of cyclone Sidr and Aila affected areas and provides a concise and clear understanding of the respondents who are included in this study. It is mainly based on analysis of quantitative data obtained from a questionnaire survey of 285 affected villagers in Satkhira and Bagerhat in Bangladesh. This chapter is categorised into four main parts; socio-economic profile of the respondents; resourcing for post-disaster housing reconstruction; factors determining the effectiveness of resourcing in PDHR projects; and key success factors of resourcing for PDHR projects. The first section in first part of the analysis shows the socio-economic profile of the respondents. It describes respondents' marital status, religion, employment status, level of education, level of access to land, occupation and monthly income of the respondents followed by quality of accommodation and access to recreation. It also delineates the main actors involved in post-Sidr and Aila housing reconstruction and the humanitarian assistance that disaster victims received. Finally, it provides information about respondents' rate of housing reconstruction.

The second part analyses disaster victims' level of access to resources. The third part explores the effectiveness of resourcing. The fourth part examines the key success factors of resourcing and challenges of post-Sidr and Aila housing reconstruction in Bangladesh. It also discusses and analyses the impact of resources on post-disaster housing reconstruction. Then, it explains the impact of access to resources, level of education and level of income generating activities and other socioeconomic variables on post-disaster housing reconstruction through multiple regression analysis.

5.2 Socio-economic profile of the respondents

This section shows the demographic characteristics of the disaster victims. As shown in table 5.1 below, this section summarises data on age, gender, marital status, level of education, occupation and monthly income, and employment status.

Table 5. 1 Socio-economic profile of respondents

Age	Frequency	Percentage
15-25	38	13.33%
26-35	96	33.68%
36-45	86	30.17%
46-55	28	9.82%
56-65	29	10.18%
66-75	8	2.82%
Gender		
Male	227	78.80%
Female	58	20.20%
Marital status		
Married	268	93.10%
Unmarried	13	4.50%
Widow	2	0.70%
Separated	1	0.30%
Religion		
Muslim	271	94.10%
Hindu	13	4.50%
Christian	0	0%
Others	1	0.30%
Employment status		
Unemployed	227	80.00%
Employed	25	8.70%
Self-employed	28	9.70%
House wife	2	0.70%
Pensioner	3	1.00%
Level of education		
No formal education	230	80%
Primary education	36	12.00%
Secondary education	10	4.00%
Further education	4	1.40%
University degree	2	0.70%
Postgraduate	3	1.00%
Occupation		
Day labourers	198	68.00%
Farmer	54	18.00%
Fishing	13	4.50%
Carpenters	2	0.70%
Others	17	5.90%
Monthly income		
500-1000	9	3.30%
1001-2000	33	11.00%

2001-3000	54	19.00%
3001-5000	104	36.00%
5001-9000	63	21.70%
9001-20,000	22	7.50%

As can be seen from Table 5.1, the largest age group among the respondents is the 26-35 group, representing a third of the respondents. Furthermore, the table 5.1 also shows the ratio of male and female respondents. Of the 285 respondents, 227 are male and 58 are female and the percentage of male and female is 79.6 and 20.40 respectively which shows majority of the respondents are males. This is because of the cultural difficulties associated with getting female household members to participate in the survey.

The frequency distributions in table 5.1 also shows that most of the respondents are married that represents more than 93% of the total respondents and almost 5% are unmarried and rest of the respondents that represents no more than 1% are widow and separated. As can be seen from the above table that about 94.0% of respondents of the households are Muslims followed by 4.50% Hindus.

Furthermore, the data also shows that most of the respondents are unemployed that represents about 80.0% of the total respondents, more than 9% are self-employed and about 9% of respondents have job opportunities. As shown in table (5.1) that more than 80% of the total respondents have no formal education; with a further 87.0% having no primary education.

The rate of further education or post-graduate is not satisfactory either. A mere 0.70% respondent has higher education which is undoubtedly a very significant factor in terms of not merely creating awareness about the negative impact of cyclone disasters but for increasing their income generating activities. The lower rate of education is associated with a low level of income and a lower level of resistance to withstand disasters. The majority of the respondents from both the study areas have a lack of education that results in a vicious cycle of poverty due to their low income and low productivity. There is a lack of primary schools as well as high schools and a shortage of qualified teachers in both of the study areas of Satkhira and Bagerhat. Furthermore, the schools that they have are located far from their houses which make it difficult for them to send their children to school.

Moreover, the occupations of the affected people in this study are diverse in nature. Though most of them are day labourers and farmers, they are from different occupations. Of the total number of respondents, more than 69% are day labourers and farmers, 4.6% are fishermen, 5.6% are from other professions which mean that some are teachers and some are NGO workers. Table 5.1 shows that the vast majority of the respondents are farmers and day labourers and more than 33% of respondents earn between 500-3000 BD taka which is equivalent to £5 to £30. Similarly, the income of 46% respondents is between 3001-6000 BD takas, 17.20% earn between 6001-10,000 and 2.80% respondents earn between 10001 to 20,000. The data displayed on table 5.1 also shows that the median income of the total respondents is 5000 BD takas monthly which is equivalent to £50, and only 1% respondents earn between 15000-20000. Furthermore, 80% of the total respondents earn between 500-6000 which actually shows the acute poverty of the coastal people of Satkhira and Bagerhat in Bangladesh.

The researcher of this study employed Chi-square test along with cross tabulation to examine the relationship of two categorical variables of housing reconstruction which has two categories 0 = yes and 1 = no and respondents' level of education which has six categories 1 = no formal education and 6 = post-graduate degree.

Table 5. 2 Housing reconstruction and level of education: Chi-square tests

	Level of education						
Housing reconstruction	no formal education	primary education	secondary education	further education	university degree	post graduate	Total
No	71	11	1	0	1	0	84
Yes	159	25	9	4	1	3	201
Total	230	36	10	4	2	3	285
Chi-square value	*Value*	*df*	*Sig.*				
	3.598[a]	2	0.370				

The chi-square results in table 5.2 show that there is no significant relationship between housing reconstruction and respondents' level of education as the chi-square value is 3.598 and level of significance is 0.370 which is not statistically significant. The cross tabulation results in table 5.2 also show that more than 29% (84) respondents did not recover their houses and about 70% (201) respondents recovered their houses. Furthermore, table 5.2 shows that more than 80% (230) respondents have no formal education and more than 12% (36) have only primary education which shows their poor level of education.

5.3 Quality of accommodation and access to recreation

To explore the quality of the houses, disaster victims were invited to complete a questionnaire. Table 5.3 shows that in both cyclones Sidr and Aila affected areas, most of the houses are kutcha and tin-shed houses that represent more than 25.30% and 23.30% in the Sidr area and 29.62% and 35.55% in the cyclone Aila area respectively.

Table 5. 3 Quality of accommodation and access to recreation

Variables	Frequency	Percent
Sidr affected area		
Kutcha house	73	25.30%
Pucca house	34	11.80%
Detached house	13	4.50%
Tin-shed house	67	23.30%
Temporary fragile house	19	6.60%
Aila affected area		
Kutcha house	40	29.62%
Pucca house	22	16.29%
Detached house	15	11.11%
Tin-shed house	48	35.55%
Temporary fragile house	10	7.40%
Respondents' access to recreation		
TVS	17	5.90%
Radio	84	29.20%
No access to recreation	183	63.50%
Watching movies in cinema hall	0	0%
Watching movies at home	0	0%

Table 5.3 also shows that only 11.80% houses in Sidr area and 16.29% in Aila areas are Pucca and 9.20% and 7.43% houses are fragile in Sidr and Aila areas respectively. As displayed in table 5.3 that about 6% of respondents have access to TV, 29.20% of respondents have access to radio and more than 63% of respondents have no access to recreation which means most of the respondents have no access to recreation.

5.4 Humanitarian assistance and actors involved in reconstruction

Table 5.4 shows that different materials were used for post-Sidr and Aila housing reconstruction. About 51% disaster victims said that they used permanent tin roof in their housing reconstruction, approximately 14% mentioned temporary thatch was used for reconstruction, only 3.80% opted for reinforced concrete and 0.70% respondents used brick for their housing reconstruction.

Table 5. 4 Humanitarian assistance and actors involved in reconstruction

Materials used for reconstruction	Frequency	Percentage
Permanent tin roof	146	50.70%
Temporary thatch	40	13.90%
Reinforced concrete	11	3.80%
Brick	2	0.70%
Plinth	4	1.40%
Amount of assistance received		
5000-10,000	95	33.00%
10001-15000	3	1.00%
15001-20,000	95	33.00%
20001-0ver	54	18.80%
Did you receive housing assistance?		
Yes	244	84.70%
No	35	12.20%
How did you receive assistance?		
Via local government	106	36.80%
Via local and national NGOs	7	2.40%
Via international NGOs	35	12.20%
Via international stakeholders	97	33.70%
Don’t receive	3	1.00%
Others	0	0%
Who provided assistance for reconstruction?		
Local Government	109	37.80%
IFRC	29	10.10%
UNDP	87	30.20%
World Bank	1	0.30%
Local and international NGOs	17	5.90%
I don't know	2	0.70%
Who actually rebuilt your houses?		
IFRC	7	2.40%
UNDP	79	32.10%
Local Government	84	34.10%
Self-reconstruction	45	17.80%
Local and international NGOs	32	13.00%
Are resources sufficient for reconstruction?		
Yes	9	3.10%
No	240	83.30%
Why are the resources insufficient?		

Misallocation of resources	134	46.50%
Delay in implementation	16	5.60%
Corruption	77	26.70%
Spent fund for other purposes	19	6.60%

Disaster victims also stated their accounts in receiving humanitarian assistance. About 33% respondents said that they received between 5000-10000 (£50-£100) BD takas as humanitarian assistance, 33% disaster victims also received between 15001-20000 and more than 18% received between 20,000 and over. These statistics show that about 66% of respondents received between 5000-20,000 BD taka as humanitarian assistance for their housing reconstruction. In response to the question of the ways in which they received housing assistance, about 37% mentioned they received assistance via local government, more than12% mentioned they received it via international NGOs, and approximately 33.70% of respondents stated that they received assistance for reconstruction via international stakeholders.

Similarly, more than 83% of disaster victims opted that they did not receive sufficient resources for their housing reconstruction and only 3.10% think they received sufficient resources in terms of rebuilding their houses. Likewise, about 38% of respondents who have been affected by cyclone disasters said that they received assistance from local government, 10.10% received it from IFRC, and 30.20% received assistance for housing reconstruction from UNDP followed by 5.90% by local and international NGOs.

Table 5.4 also shows that more than 34% mentioned that their houses were built by local governments, 32.10% said that UNDP had rebuilt their houses, about 13% opted for local and international NGOs and approximately 18% mentioned that their houses were self-reconstructed. The frequency distribution table no. 5.4 also shows the reasons for the insufficient amount of assistance they received. About 46% of respondents mentioned misallocation is the reason, more than 26% think corruption is the reason, and 6.60% opted that funds were spent for other purposes.

5.5 Rate of housing recovery

The housing recovery or reconstruction rate is measured by the durability and quality of the house, safety to the affected population during cyclones, time boundaries and the percentage of affected villagers who have recovered and reconstructed their houses after cyclone Sidr and Aila in Satkhira and Bagerhat in Bangladesh. As shown in table 5.5 that more than 69% of affected respondents have recovered their houses and more than 30% respondents did not recover their houses years after the cyclones hit.

Table 5. 5 Housing recovery

Access to resources and rate of housing reconstruction	
Cases	Percentage
kutcha house	25.60%
pucca house	11.90%
detached house	4.60%
tin-shed house	23.50%
temporary fragile house	6.70%
Years to receive houses	
After one year	21.40%
After three years	21.10%
After five years	28.40%
After seven years	1.10%
Rate of housing recovery	
Yes	69.50%
No	30.50%
Are the houses Cyclone resilient?	
Yes	6%
No	94%
Reasons for not cyclone resilient houses	
Poorly made	79.30%
Lack of maintaining building code	1.10%
Corruption	6.30%
Beneficiary's opinion is not considered	9.50%
Ignoring local culture	1.80%

The housing recovery or reconstruction rate is also measured by whether those houses are cyclone resilient or not, types of houses e.g kutcha (built with mud) or Pucca (built with concrete), temporary house or tin-shed house. The results of the frequency distribution table 5.5 show that 94% of total respondents have answered 'no' to the question, "is your current house cyclone resilient?" About 6% think their houses are strong enough to protect them from upcoming cyclones. To the question of why they believe that their houses are not cyclone resilient, more than 79% of respondents think their houses have been poorly made, 1.15% of respondents think their houses have been built without maintaining building code, 6% assume corruption, 9.5% think their opinions regarding rebuilding houses have not been considered and 1.8% think local culture is ignored. In response to the question of the types of house they received, five types of houses were given as options to choose from in the original questionnaire which were kutcha house, pucca house, detached house, tin-shed house, and temporary fragile house. In choosing the options, more than 25% of respondents received kutcha (built with mud) houses, 11.9% respondents received pucca (built with brick) houses, 4.6% respondents received detached houses, 23.5% respondents received tin-shed houses and 6.7% respondents got temporary fragile houses. Respondents were asked questions about the time span of receiving their houses after cyclones Sidr and Aila. In response to the question of when did they receive houses after cyclones Sidr and Aila, more than 42% of respondents received houses between 1 to 3 years, 81% of respondents received houses after 5 years, and more than 28% of respondents did not receive houses at all. This result is quite consistent with Kabir (2014) that most of the houses of coastal area of Bangladesh are tin-shed houses.

5.6 Resourcing for post-disaster housing reconstruction

This section is mainly based on questionnaire survey results from the respondents affected by cyclone disasters in Satkhira and Bagerhat regions of Bangladesh. It presents and highlights the level of different resources of the respondents and how those resources are influencing their housing recovery.

5.6.1 Housing reconstruction and access to resources

Access to resources is the capability of an individual, family, group, class or community to use resources which are required to secure a livelihood prior to disasters and access to resources includes relief, humanitarian assistance, labour and physical materials which are required to rebuild houses for coastal people affected by cyclone. According to the questionnaires, the respondents' level of access to resources is:

Table 5. 6 Access to resources to rebuild houses

Cases	Valid cases	Frequency	Percentage	Valid percent
Yes	13	4.60%	4.60%	4.60%
No	272	95.40%	95.40%	95.40%
Total	285	100	100	100

Table 5.6 shows that more than 95% of the total respondents have no access to resources and only 4.6% respondents have access to resources which means that the majority of the affected population have no access to a sufficient amount of resources to rebuild their houses after the disaster. A chi-square test of independence was performed to examine the relationship of two categorical variables housing reconstruction which has two categories 0 = yes and 1 = no and access to resources which has also two categories 0 = yes and 1 = no.

Table 5. 7 Housing reconstruction and access to resources: Chi-square tests

		Access to resources		
Housing reconstruction		NO	Yes	Total
	No	83	1	84
	Yes	189	12	201
	Total	272	13	285
Chi-square value		*Value*	*df*	*Sig.*
		3.109[a]	1	0.016

The chi-square results in table 5.7 show that there is statistically significant relationship between housing reconstruction and access to resources because its p-value is lower than 0.05. The cross tabulation results show that 272 (94.40 %) respondents have no access to resources and about 70% (189) respondents recovered their houses. Furthermore, table 5.7 shows that about 5% (13) respondents have to access to resources and more than 29% (84) did not recover their houses.

5.6.2 Housing reconstruction and access to level of resources

The level of access to land plays a major role in reconstructing the houses after disasters, such as cyclones occur. This is because poor people in coastal areas have no access to land to rebuild their houses.

Table 5. 8 95% confidence interval results of resources for PDHR

Resources for PDHR Projects	Mean	Confidence interval	Lower bound	Upper bound
Access to land	1.57	95%	1.5	1.64
Human resources (skilled & unskilled) labour	1.52	95%	1.44	1.61
Institutional resources (GOVT., NGOs)	1.49	95%	1.41	1.57
Community resources	1.44	95%	1.37	1.51
Building materials	1.38	95%	1.31	1.45
Technology	1.41	95%	1.33	1.49

Financial resources	1.32	95%	1.25	1.38
Construction expertise	1.27	95%	1.21	1.33
Information on housing	1.57	95%	1.48	1.67

Table 5.8 shows that the average mean value of respondents' level of different resources is no more than 1.44 which shows that the affected population has a very poor level of access to different types of required resources as its mean value is under 1.50 which is very low and it indicates the disaster victims of the affected areas of Satkhira and Bagerhat have very low access to resources which can significantly affect their housing reconstruction.

Table 5.8 also shows that the mean value of level of access to land is 1.57 which is the second highest mean value among the other resources in table 5.8. The 95% confidence interval result shows that the affected population has a very poor level of access to land as its mean value is below 2 but access to land has significant impact on post-disaster housing recovery.

Table 5. 9 Respondents' level of resources for PDHR projects

Respondents' level of resources for PDHR projects	very low	low	moderate	high	very high
Access to land	47.20%	46.90%	4.90%	0%	0%
Institutional resources (GOVT., NGOs)	62.80%	25.00%	10.80%	0.30%	0%
Community resources	61.80%	30.90%	5.60%	0.30%	
Building materials	66.30%	28.80%	3.10%	0.70%	0%

The frequency distribution table no. 5.9 shows that more than 47% of respondents have a very low level of access to land, and 136 people who represent 47.4% of respondents affected by cyclones have a low level of access to land. Furthermore, about 5% of respondents have a moderate level of access to land.

5.6.3 Housing reconstruction and access to institutional resources

In this study, institutional resources mean assistances from the local and international NGOs, local governments, and international stakeholders' e.g UNDP and IFRC. Generally, institutional resources play a major role in rebuilding houses for the people affected by disasters. To assess the level of access to institutional resources, respondents were invited to participate in a structured questionnaire survey in the format of five-point Likert scale. They were asked to rank the level of their access from 1 to 5, where 1= very low, 2= low, 3= moderate, 4= high, and 5= very high. The frequency distribution table no. 5.9 shows that about 63% of respondents have a very low level of access to institutional resources, 25 % have a low level of access, 10.87% of respondents have a moderate level of access and only .30% respondent have a high level of access to institutional resources. The mean score of 95% confidence interval test results of institutional resources in table 5.8 is 1.49 which indicates respondents of cyclone Sidr and Aila affected areas have very low level of access to institutional resources.

5.6.4 Housing reconstruction and access to building materials

Construction materials play a major role in rebuilding the houses after disasters (Chang *et al.* 2010b). However, after disasters, the price of construction materials generally increases and the availability of building materials decreases due to poor communication and damaged infrastructure (Chang, 2012). Table 5.8 shows that the mean score for building materials is only 1.38 which means respondents affected by cyclone disasters have less access to building materials to rebuild their houses. Table 5.9 shows that about 63% of respondents have a very low level of access to building materials, more than 25 % have a low level access, about 11% respondents have a moderate level of access and only .30% respondents have a high level of access to building materials.

5.6.5 Housing reconstruction and level of access to construction expertise

Construction specialists are very significant in post-disaster housing reconstruction (Chang, 2012; Hidayat, 2014). In post-disaster reconstruction, they play a major role to expedite the reconstruction activities and to make reconstruction more effective and accountable (Podger *et al*. 2013)**.** The 95% confidence interval test result in table 5.8 shows that the mean score for construction expertise is 1.27, lower bound value is 1.21 and upper bound value is 1.35 which means respondents affected by cyclone disasters have limited access to construction expertise to rebuild their houses.

Table 5. 10 Frequency distribution results of respondents' level of resources for PDHR projects

Respondents' level of resources for PDHR projects	very low	low	moderate	high	very high
Technology	68.80%	20.80%	8.70%	0.70%	0%
Financial resources	70.50%	25.00%	2.40%	0.30%	0%
Construction expertise	74.70%	22.20%	1.70%	0.30%	0%

The frequency distribution table no.5.10 shows that about 75% of respondents have a very low level of access to construction expertise, more than 22 % have a low level of access, only 1.70% respondents have a moderate level of access and only .30% respondents have a high level of access to construction expertise. Table 5.10 also shows that respondents' level of technological use is very low as well. It shows that about 69% of respondents have very low level of technological application in their housing, more than 20% have low level, and about 9% have moderate level of use in their housing reconstruction.

5.6.6 Housing reconstruction and level of access to financial resources

Financial resources play a major role in reconstruction projects (Chang *et al.* 2011; Hidayat, 2014). Disaster victims face serious challenges in rebuilding their houses in a post-disaster reconstruction environment. In developing countries, people affected by disasters have no insurance or financial resources for building their houses (Hidayat and Egbu, 2010). The 95% confidence interval result in table no.5.8 shows that the mean score for financial resources is 1.32, lower bound value is 1.25 and upper bound value is 1.38 which means respondents affected by cyclone disasters have little access to financial resources to rebuild their houses. The frequency distribution table no.5.10 shows that more than 70% of respondents have very low levels of access to financial resources, 25% have low levels of access, 2.40% respondents have moderate levels of access and only .30% respondents have high levels of access to financial resources.

5.6.7 Access to resources and transportation and communication infrastructure

Transportation and communication networks have a significant impact on post-disaster housing reconstruction projects. In post-disaster housing reconstruction, there is scarcity of construction materials locally. Most of the time, construction materials are brought in from other areas due to the unavailability of locally produced materials. Therefore, if the communication infrastructures are not up-to-date, the reconstruction activities might be affected. Generally, disasters victims face challenges to get construction materials. Improved infrastructure can both reduce the losses resulting from natural disasters and facilitate post-disaster recovery and thus more investment in infrastructure reconstruction is needed (Amaratunga *et. al.*2014).

Table 5. 11 Resources for transportation and communication infrastructure

Transportation and communication infrastructure	Mean	Confidence Interval	Lower Bound	Upper Bound
Financial resources	1.39	95%	1.33	1.46
Bus	1.46	95%	1.38	1.54
Train	1.26	95%	1.21	1.32
Private car	1.23	95%	1.17	1.28
Electricity	1.42	95%	1.35	1.49
Mobile	1.61	95%	1.51	1.7
TV	1.32	95%	1.25	1.38
Internet	1.17	95%	1.12	1.22
Computer	1.3	95%	1.29	1.36

Table 5.11 shows that the mean score for access to buses is 1.46, level of access to train is 1.26 and access to TV is 1.32 which means affected respondents have very low level of access to good infrastructure.

Table 5. 12 Frequency distribution of resources for transportation and communication

Resources for transportation and communication	very low	low	moderate	high	very high
Financial resources	63.20%	32.30%	2.40%	0.70%	0%
Bus	63.50%	26.40%	9.00%	0%	0%
Train	74.70%	22.60%	1.00%	0.70%	0%
Private car	77.40%	19.10%	1.70%	0.70%	0%
Electricity	62.80%	31.90%	3.80%	0.40%	0%
Mobile	56.60%	26.70%	14.20%	1.00%	0%
TV	70.10%	25.30%	2.40%	0.30%	0%
Internet	82.60%	14.90%	1.40%	0%	0%
Computer	72.20%	23.60%	2.40%	0.70%	0%

Table 5.12 shows that on an average more than 69% of respondents have very low level of access to transportation and communication resources which indicate that majority of the respondents have very limited access to different resources in terms of communication and transportation networks.

5.6.8 Access to resources and water and sanitation infrastructure

Water and sanitation programmes play a pivotal role for the normal livelihood recovery of the people affected by disasters. The current infrastructure doesn't support even 50% of the total respondents regarding water and sanitation programmes (Vogt *et al*.2011).

Table 5. 13 Respondents' level of resources for water and sanitation infrastructure

Resources for water and sanitation infrastructure	Mean	Confidence interval	Lower bound	Upper bound
Financial resources	1.38	95%	1.31	1.44
Pure drinking water	1.32	95%	1.26	1.39
Toilet	1.41	95%	1.34	1.48
Pit latrine	1.31	95%	1.25	1.37
Sewerage facilities	1.26	95%	1.21	1.31

Table 5.13 shows that the mean score for access to toilets is 1.41, access to pure drinking water is 1.32, access to financial resources is 1.38, access to latrines is 1.31; and access to sewerage facilities is 1.26 which means the affected respondents have a very low level of access to water and sanitation programmes. Pure drinking water is a big problem for the study area 1 of Satkhira both Gabura and Padma Pukur. The result of this study is quite similar to the study of Vogt *et al. (*2011). They (Vogt *et al*.2011) found that the infrastructure of coastal Bangladesh especially in the cyclone Aila area of Gabura was not satisfactory at all and it could not support even 50% of the total respondents living in this area.

Table 5. 14 Frequency distributions

Access to resources and water and sanitation infrastructure	very low	low	moderate	high	very high
Financial resources	66%	29.20%	2.80%	0.40%	0%
Pure drinking water	69.80%	25.70%	2.40%	0.30%	0.30%
Toilet	60.80%	34.70%	3.10%	0.40%	0%
Pit latrine	69.80%	27.10%	2.10%	0%	0%
Sewerage facilities	72.60%	25%	0.70%	0%	0%

The frequency distribution table 5.14 shows that 66% of respondents have a very low level of access to financial resources, more than 29% have a low level of access to financial resources, and only 2.80% respondents have a moderate level of access to financial resources. Likewise, the level of access to pure drinking water is very poor as well. Table 5.14 shows that more than 69% of respondents have very low levels of access to pure drinking water, about 26% have access to low levels of access and 2.40% respondents have a moderate level of access. Table 5.14 also shows that more than 60% of respondents have a very low level of access to toilets and about 70% have very low level of access to pit latrines, a further 27% have a low level of access to pit latrines. So, the data shows that the total sanitation programme and its coverage are very poor and unattainable to the majority of the respondents. The result of this analysis is consistent with Russel (2014); Nahid (2016); and Paul and Rashid (2016) who found that disaster victims in Bangladesh have very poor levels of access to water and sanitation.

5.6.9 Access to resources and school and health care facilities

Disasters like cyclones create a serious threat to survivors. Due to the breakdown of health care facilities and the paucity of pure drinking water, people affected by cyclone disasters suffer from communicable diseases like diarrhoea, dysentery, pneumonia, respiratory related diseases and other diseases. A major outbreak of such diseases was largely avoided because of the proper distribution of food and safe drinking water as well as the timely implementation of health care intervention measures (Paul *et al*.2010). Resources like school and health care facilities play a major role preventing these communicable diseases.

Table 5. 15 Respondents' level of resources for school and health care facilities

Resources for school and health care facilities	Mean	Confidence interval	Lower bound	Upper bound
Available teacher	1.94	95%	1.83	2.05
Financial resources	1.60	95%	1.52	1.67
Human resources	1.54	95%	1.46	1.62
Hospitals	1.47	95%	1.36	1.57
Clinics	1.62	95%	1.53	1.72

Table 5.15 shows that the mean scores for the determinants of school and health care facilities are: teachers 1.94, clinics 1.62, financial resources 1.60, access to human resources 1.54; and hospitals 1.47 and these results are quite similar to the study of Vogt *et al.* (2011); Mallick *et al*. (2011a) and Paul *et al*. (2010). These results show that affected respondents have a very low level of access to school and health care facilities.

Table 5. 16 Respondents' level of resources for school and health care

Resources for school and health care facilities	very low	low	moderate	high	very high
Available teacher	42.70%	25.00%	28.80%	2.40%	0%
Financial resources	45.50%	48.60%	4.20%	0.30%	0.30%
Human resources	55.90%	33.00%	9.00%	0.30%	0%
Hospitals	60.10%	34.70%	3.10%	0.30%	0.30%

Clinics	58.30%	21.50%	18.80%	0.30%	0%

The frequency distribution table 5.16 shows that more than 42% of respondents have a very low level of access to available teachers, about 25% of respondents have a low level of access, almost 28% of respondents have a moderate level of access, and only 2.40% has a high level of access. Likewise, the level of access to financial resources is very poor as well. Table 5.16 also shows that about 46% of respondents have a very low level of access to financial resources, more than 48% have a low level of access and 4.2% of respondents have a moderate level of access to financial resources. Furthermore, more than 55% of respondents have a very low level of access to human resources and more than 60% have a very low level of access to hospitals, whereas more than 58% of respondents have a low level of access to clinics.

5.7 Factors determining effectiveness of resourcing in PDHR projects

This section addresses the central research question of ‘To what extent is resourcing effective in post-Sidr and Aila housing reconstruction in Bagerhat and Satkhira in Bangladesh. It is based on the results of questionnaire surveys from 285 respondents who have been affected by cyclone disasters. It consists of factors that can determine the effectiveness of resourcing in rebuilding houses after Cyclones Sidr 2007 and Aila in 2009. It evaluates the effectiveness of resourcing by employing six parameters of respondents’ rate of housing recovery, vulnerability reduction, poverty reduction, livelihood recovery, beneficiaries’ satisfaction on the reconstructed house, quality of the reconstructed house, and level of capacity to manage emergency.

5.7.1 Housing recovery and access to resources

From the frequency distribution results in table 5.17, we observe that only about 5% (13) of respondents have access to resources and rest of the respondents that represent more than 95% have no access to resources. It indicates their inability to rebuild their houses.

Table 5. 17 Frequency distribution of access to resources

Valid cases	Frequency	Percentage	Valid percent	Cumulative percent
Yes	13	4.60%	4.60%	4.60%
No	272	95.40%	95.40%	95.40%
Total	285	100	100	100

The relationship between access to resources and other socio-economic variables has been examined by using chi-square test along with cross tabulation. The socioeconomic variables of reconstruction, vulnerability reduction, poverty reduction, livelihood recovery, quality of reconstructed houses and beneficiaries' satisfaction are also cross tabulated with the variable of access to resources. The cross tabulation results are attached in appendix 4.

The Chi-square values are 3.109[a] for reconstructions, 84.346[a] for vulnerability reduction, 66.802[a] for poverty reduction, 53.609[a] for livelihood recovery, 150.785[a] for quality of reconstructed houses and 4.001[a] for beneficiaries' satisfaction.

Table 5. 18 Housing reconstruction and socio-economic factors: Chi-square tests

Pearson Chi-square	Value	DF	Sig.
Reconstruction	3.109[a]	1	.016
Vulnerability reduction	84.346 [a]	6	.000
Poverty reduction	66.802 [a]	4	.000
Livelihood recovery	4.001 [a]	1	.045
Quality of reconstructed houses	53.609[a]	2	.000
Beneficiary's satisfaction	150.785 [a]	3	.000

Table 5.18 shows that level of significance (2-sided) is .016 for reconstruction, .045 for livelihood recovery, .000 for vulnerability reduction, poverty reduction, quality of reconstructed houses, beneficiaries' satisfaction respectively which is statistically accepted and significant because its p-value is lower than 0.05. This result affirms the hypothesis of the study that disaster victims with access to resources are more likely to reconstruct their houses than those who have no access to resources. The implications of these results are explained in detail in the next section with the other socio-economic variables.

Table 5. 19 Regression analysis of resourcing for housing reconstruction

Variables	Std error	Beta Coefficient	T-value	P-value
Quality of reconstructed houses				
Age	0.003	-0.02	-0.02	0.657
Gender	0.097	0.038	0.038	0.457
Monthly income in BD Taka	0	-0.028	-0.028	0.690
Marital status of the respondents	0.147	-0.031	-0.031	0.449
Level of education	0.048	-0.076	-0.076	0.276
Level of access to land	0.064	-0.018	-0.018	0.418

Access to sufficient resources	0.221	0.313	0.313	0.001**
Income generating activities	0.044	-0.01	-0.01	0.005**
Level of access to the quality of building materials	0.07	0.174	0.174	0.113
Level of access to construction expertise	0.077	0.258	0.258	0.001**
Level of access to technological application	0.073	0.012	0.012	0.983
Housing reconstruction				
Age	0.002	0.018	0.299	0.760
Gender	0.068	-0.175	-2.93	0.004**
Monthly income in BD Taka	0	0.021	0.295	0.767
Marital status of the respondents	0.087	-0.02	-0.335	0.742
Level of education	0.04	0.012	0.17	0.860
Level of access to land	0.05	-0.066	-1.038	0.301
Access to sufficient resources	0.161	0.142	1.998	0.047**
Income generating activities	0.034	-0.004	-0.068	0.942
Level of access to the quality of building materials	0.055	-0.056	-0.807	0.446
Level of access to construction expertise	0.061	0.154	2.301	0.021**
Level of access to technological application	0.048	-0.197	-2.783	0.005**
Livelihood recovery				
Age	0.002	0.113	1.871	0.041**
Gender	0.076	0.008	0.127	0.857
Monthly income in BD Taka	0	0.008	0.102	0.889
Marital status of the respondents	0.097	-0.04	-0.652	0.572
Level of education	0.045	0.165	2.234	0.031**
Level of access to land	0.056	-0.054	-0.826	0.675
Access to sufficient resources	0.18	-0.186	-2.571	0.002**
Income generating activities	0.038	0.064	1.06	0.049**
Level of access to the quality of building materials	0.061	0.6	-0.839	0.663
Level of access to construction expertise	0.068	0.176	2.584	0.009**
Level of access to technological application	0.053	-0.051	-0.705	0.701
Vulnerability reduction				
Age	0.002	0.07	1.305	0.347
Gender	0.068	0.045	0.819	0.464
Monthly income in BD Taka	0	0.119	1.808	0.076*
Marital status of the respondents	0.086	-0.041	-0.749	0.335
Level of education	0.04	0.087	1.331	0.148
Level of access to land	0.05	-0.022	-0.388	0.272
Access to sufficient resources	0.161	0.25	3.872	0.001**
Income generating activities	0.034	-0.061	-1.132	.000**
Level of access to the quality of building materials	0.054	0.112	1.763	0.370
Level of access to construction expertise	0.06	0.065	1.075	0.344
Level of access to technological application	0.048	0.11	1.707	0.200
Beneficiary's satisfaction				

Age	0.001	-0.013	-0.266	0.454
Gender	0.046	-0.054	-1.12	0.203
Monthly income in BD Taka	0	0.066	1.117	0.287
Marital status of the respondents	0.059	0.013	0.263	0.984
Level of education	0.027	0.079	1.134	0.178
Level of access to land	0.034	0.038	0.743	0.816
Access to sufficient resources	0.11	0.411	7.14	.000**
Income generating activities	0.023	0.023	0.479	.000**
Level of access to the quality of building materials	0.037	0.053	0.929	0.870
Level of access to construction expertise	0.041	0.151	2.781	0.013**
Level of access to technological application	0.032	0.082	1.418	0.203
Poverty reduction				
Age	0.002	0.015	0.287	0.649
Gender	0.065	0.036	0.664	0.600
Monthly income in BD Taka	0	0.085	1.299	0.201
Marital status of the respondents	0.083	-0.038	-0.708	0.241
Level of education	0.039	-0.018	-0.274	0.834
Level of access to land	0.047	0.053	0.928	0.829
Access to sufficient resources	0.154	0.153	2.401	0.087
Income generating activities	0.032	-0.069	-1.297	.000**
Level of access to the quality of building materials	0.052	0.208	3.317	0.068
Level of access to construction expertise	0.058	0.196	3.271	0.001**
Level of access to technological application	0.046	0.087	1.371	0.464

Notes: ** indicates p-value is lower than 0.05 and * indicates p-value is between 0.051 and 0.100.

Table 5. 20 Model statistics

	Reconstruction	VR	QRH	LR	BS	PR
Sample size	285	285	285	285	285	285
Significance	.000	.000	.000	0.013	.000	.000
Adjusted R square	0.085	0.07	0.29	0.046	0.398	0.261

Notes: VR = Vulnerability Reduction, QRH = Quality of Reconstructed Houses, LR= Livelihood Recovery, B.S = Beneficiary's Satisfaction, PR= Poverty Reduction

For multiple regression analysis, age, gender, monthly income, marital status, level of education, access to land, access to resources, income generating activities, access to the quality of building materials, level of access to construction expertise and level of access to technological application have been used as independent variables and quality of reconstructed houses, housing reconstruction, livelihood recovery, vulnerability reduction, beneficiarys' satisfaction and poverty reduction have been employed as dependent variables. The multiple regression result (table 5.19) shows that access to resources, gender, level of access to construction expertise, and access to technological innovations are significant predictors of post-disaster housing reconstruction. Similarly, access to resources is a significant predictor of vulnerability reduction, but it is not a significant factor for poverty reduction, surprisingly. The beta Coefficient of access to resources is 0.142 for housing reconstruction, 0.250 for vulnerability reduction, .313 for quality of reconstructed houses, 0.411 for satisfaction with houses, 0.153 for poverty reduction, and -0.186 for livelihood recovery. The level of significance is .047 for housing reconstruction, .001 vulnerability reductions, .001 for quality of reconstructed houses, .000 for satisfaction with houses, .087 for poverty reduction, and .002 for livelihood recovery.

However, monthly income, access to technological innovation and construction expertise are significant for vulnerability reduction at the 0.05 level. People with a higher income are, for example, able to relocate to less vulnerable areas. Access to technological innovation also helps resident to mitigate some of the adverse effects of cyclones. For example, access to digital technology is known to have a major impact on information dissemination before, during and after disasters (Shklovski *et al.*, 2008). Furthermore, access to resources is the main predictor of quality of reconstructed houses, beneficiary's satisfaction, livelihood recovery, but access to resource is not a significant predictor to poverty reduction of disaster victims. Moreover, data on access to resources in table 5.17 shows that people who have access to resources have rebuilt their houses by themselves, but the percentage is low, only 4.6% of respondents have a sufficient amount of resources to rebuild their houses without external intervention. This result is consistent with findings of Wisner *et al*. (2004) and Bosher *et al*. (2007) that disaster victims have very limited access to resources and access to resources significantly influences the disaster victims' ability to rebuild their houses.

Table 5. 21Respondents' level of poverty, safety and condition of housing

Responses	Acute poverty	Cyclone resilient	Safety
Very dissatisfied	-	81.80%	70.20%
dissatisfied	-	13.30%	25.60%
Neither satisfied nor dissatisfied	-	3.90%	2.80%
satisfied	-	0.70%	0.70%
Very satisfied	-	0.40%	0.40%

Very low	3.90%		-
low	2.80%		-
Moderate	6.70%		
high	45.80%	-	-
Very high	40.80%	-	-

The result of the frequency distribution table 5.21shows that more than 86% of respondents live in poverty to some degree, so they do not have access to resources to rebuild their houses. Access to resources such as microfinance or insurance would help them to escape from the vicious cycle of poverty which hinders housing recovery.

The results of this investigation show that access to resources exerts a significant impact in post-Sidr and Aila housing recovery. Having access to the necessary resources increases the adaptive capacity of disaster victims to recover their livelihoods and helps them to rebuild their houses after. Most of the respondents in cyclone-affected areas in this study are in absolute poverty. Furthermore, the overall findings of this quantitative analysis support the main hypothesis that people with access to resources are more likely to rebuild houses by themselves than people without access to resources.

This result rejects the null hypothesis as most of the respondents have no access to resources; because of this, they cannot rebuild houses and the rate of housing recovery is very poor in terms of cyclone resilient houses. To measure whether the houses they received are cyclone resilient or cost efficient, respondents were asked to rank their satisfaction based on the five-point Likert scale from 1 to 5, where 1 = very dissatisfied; 2 = dissatisfied; 3 = neither satisfied nor dissatisfied; 4 = satisfied and 5 = very satisfied. The result in table 5.21shows that more than 81% of the respondents are very dissatisfied with their houses whether they are cyclone resilient or not, and only .70% respondents are satisfied with the resilient houses, and more than 70% of respondents think that they are not safe in their current houses. This indicates that they cannot rebuild cyclone resilient houses due to their lack of access to available resources.

5.7.2 Access to resources and vulnerability reduction

The 95% confidence interval results in table 5.22 show that disaster victims are very vulnerable in all the aspects of vulnerability reduction factors of resilience to cyclones, building capacity to resilience, reducing underlying risk factors and strengthening disaster preparedness for effective response to disasters.

Table 5. 22 Results of 95% confidence interval on factors determining respondents' vulnerability

Access to resources and vulnerability reduction	Mean	Confidence interval	Lower bound	Upper bound
Resilience to cyclone	1.31	95%	1.23	1.4
Building capacity to resilience	1.36	95%	1.28	1.45
Reducing underlying risk factors	1.30	95%	1.21	1.38
Strengthen disaster preparedness for effective response	1.29	95%	1.2	1.37

Table 5.22 shows that the mean score of the vulnerability reduction factors is 1.31 for resilience to cyclone, 1.36 for building capacity to resilience, 1.30 for reducing underlying risk factors and 1.29 for strengthening disaster preparedness for effective response. The average mean value of resilience to withstand disasters is below 1.40 which represents their vulnerable condition and inability to prepare, cope, and respond to disasters.

Table 5. 23 Frequency distribution of factors determining respondents' level of vulnerability

Access to resources and vulnerability reduction	very low	low	moderate	high	very high
Resilience to cyclone	78.50%	16.70%	3.80%	-	-
Building capacity to resilience	71.50%	22.60%	4.50%	-	0.30%
Reducing underlying risk factors	77.80%	17.40%	3.10%	0.70%	-
Strengthen disaster preparedness for effective response	77.80%	16.30%	3.50%	0.70%	-

Table 5.23 shows that more than 78% of respondents have very low level of resilience to cyclone, more than 71% have very low level to building capacity to resilience and about 78% to reducing risk factors and strengthen disaster preparedness for effective response.

A chi-square test along with cross tabulation were employed to examine the relationship between the two categorical variables of access to resources which has two categories 0 = yes and 1 = no and vulnerability reduction which has 4 categories. The cross tabulation results in table 5.24 show that more than 77% (220) of respondents have very low level of resilience to cyclone and more than 95% (272) of respondents have vulnerability between very low to moderate level. Table 5.24 also shows that about 71% (202) of respondents have very low level of vulnerability in response to building capacity to resilience, more than 76% (219) to very low level of vulnerability to risk reduction and about 8% (22) to disaster preparedness.

Table 5. 24 Vulnerability reduction and access to resources: chi-square tests

		Access to resources		
Vulnerability reduction factors		No	Yes	Total
Resilience to cyclone	Very low	220	6	226
	low	47	1	48
	Moderate	5	6	11
	Total	272	13	285
Building capacity to resilience	very low	202	4	206
	low	62	3	65
	moderate	7	6	13
	very high	1	0	1
	Total	272	13	285
Risk reduction	very low	219	5	224
	low	48	2	50
	moderate	4	5	9
	high	1	1	2
	Total	272	13	285
Disaster preparedness	very low	222	2	224
	low	43	4	47
	moderate	5	5	10
	high	1	1	2
	very high	1	0	1
	Total	272	12	284
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Resilience to cyclone	65.694a	2	.000	
Building capacity to resilience	54.955a	3	.000	
Risk reduction	66.073a	3	.000	
Disaster preparedness	70.456a	4	.000	

The Chi-square results in table 5.24 show that chi-square value is 65.694a for resilience to cyclone, 54.955a for building capacity to resilience, 66.073a for risk reduction and 70.456a for disaster preparedness and level of significance is .000 for all of the reduction factors. This result indicates access to resources has significant association with the vulnerability reduction factors in terms of disaster victims' ability to increase resilience, and withstand future disasters effectively to avoid vulnerability. This result is consistent with the findings of Bosher *et al*. (2007) which showed in a study of resource accessibility and vulnerability that most of the people are vulnerable due to low levels of education; poor housing and lack of involvement with other organisations and thus have a lesser capability to withstand the onslaught of disasters due to poverty. Other findings affirmed that disaster victims are vulnerable in terms of resilience to cyclones, building capacity and preparing for effective response due to their low level of access to resources, low literacy rate and acute poverty (Wisner *et al*. 2004; Paul, 2010; Islam, 2011 and Mallick *et al.* 2011).

5.7.3 Access to resources and poverty reduction

Several studies have confirmed that poverty is the root cause of all vulnerabilities (Twigg, 2001; Wisner *et al*.2004; Bosher *et al.* 2007). There is no vulnerability if there is no poverty (Schilderman, 2004; Wisner *et al*.2004; Charlesworth and Ahmed, 2015). Disaster victims are in a vicious cycle of poverty. They need to have access to necessary resources to build up capacity to cope with the adverse effects of disasters. To measure the level of quality of life, respondents were invited to participate in a structured questionnaire survey. The five-point Likert scale was introduced to explore the accurate level of their capacity to run their family depending on affordability, capability to meet regular needs, access to recreation, per capita income, bearing regular expenses and satisfaction over income. They were asked to rank the level of their capacity from 1 to 5, where 1= very low, and 5= very high. According to their responses, the level of their poverty reduction status is summarised in table 5.25.

Table 5. 25 Respondents' level of poverty

Access to resources and poverty reduction	very low	low	moderate	high	very high
Affordability	61.80%	31.90%	4.20%	0.40%	-
Capability to meet regular needs	57.60%	35.80%	4.50%	0.30%	0.70%
Access to recreation	69.10%	24.30%	4.50%	0.30%	0.70%
Percapita income	62.50%	32.30%	3.10%	0.70%	0.30%
Bearing regular expenses	58%	35.40%	4.50%	0.70%	0.40%
Satisfaction over income	66%	27.10%	4.90%	0.70%	0.30%

Table 5.25 shows that respondents have very low level of poverty. The percentage of a very low level of capacity in terms of affordability, capability to meet regular needs, access to recreation, per capita income, bearing regular expenses and satisfaction over income is 61.8%, 57.6%, 69.1%, 62.5%, 58% and 66% respectively. 95% confidence interval test was also performed to examine the level of their poverty and results of confidence interval summarised below in table 5.26:

Table 5. 26 Factors determining respondents' level of poverty reduction

Access to resources and poverty reduction	Mean	Confidence interval	Lower bound	Upper bound
Affordability	1.43	95%	1.34	1.53
Capability to meet regular needs	1.48	95%	1.39	1.56
Access to recreation	1.39	95%	1.3	1.48
Percapita income	1.45	95%	1.37	1.54
Bearing regular expenses	1.47	95%	1.38	1.56
Satisfaction over income	1.55	95%	1.4	1.71

Table 5.26 shows that the average mean value of poverty reduction determinants is below 1.5 which represents their inability to prepare, cope, respond to disasters and rebuild their houses. A chi-square test along with cross tabulation were administered to examine the relationship between the two categorical variables of access to resources which has two categories 0 = yes and 1 = no and poverty reduction which has six categories.

Table 5. 27 Poverty reduction and access to resources: chi-square tests

		Access to resources		
Poverty reduction factors		No	Yes	Total
Affordability	very low	175	4	179
	low	89	3	92
	moderate	7	6	13
	high	1	0	1
	Total	272	13	285
Capability to meet regular needs	very low	163	4	167
	low	101	2	103
	moderate	6	7	13
	high	1	0	1
	Total	1	0	1
Access to recreation	very low	197	3	200
	low	69	2	71
	moderate	5	8	13
	Total	271	13	284
Per capita income	very low	178	4	182
	low	90	4	94
	moderate	4	5	9
	Total	272	13	285
Bearing regular expenses	very low	165	4	169

	low	99	3	102
	moderate	7	6	13
	Total	271	13	284
Satisfaction over income	very low	186	4	190
	low	77	2	79
	moderate	7	7	14
	high	2	0	2
	Total	272	13	285
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Affordability	54.291[a]	3	.000	
Capability to meet regular needs	76.054[a]	4	.000	
Access to recreation	101.406[a]	2	.000	
Per capita income	56.116[a]	2	.000	
Bearing regular expenses	53.963[a]	2	.000	
Satisfaction over income	76.059[a]	4	.000	

The cross tabulation results in table 5.27 show that more than 62% (179) of respondents have very low level of affordability and more than 58% (167) of respondents have very low level of capacity to meet regular needs. Table 5.27 also shows that more than 63% (182) of respondents have very low level of poverty in terms of per capita income; about 60% (169) of respondents have very low level of capacity to bear regular expenses and more than 66% (190) have very low level of satisfaction over income. The Chi-square results show that the level of significance of all poverty reduction factors is .000 which is statistically significant and indicates that access to resources can influence the disasters victims' ability to build up their capacity to meet regular needs and bear regular expenses that in turn will augment their resilience. This leads to rejection of the null hypothesis, affirming the suggestion that people having poverty and vulnerability have very low levels of affordability, capacity and satisfaction. This result is similar with the findings of Bosher *et al*. (2007), and Amaratunga *et al*. (2014) that disaster victims are in acute poverty due to their incapacity in terms of bearing regular expenses, access to recreation and capability to meet regular needs.

5.7.4 Access to resources and livelihood recovery

Livelihood consists of capabilities, assets, and activities required as a means of living (Joakim and Wismer, 2015). It equips individuals in facing natural calamity and recovering from stress and shocks. Access to resources has a significant influence in recovering the livelihoods of disaster victims. The frequency distribution summarized in table 5.28 shows that more than 49% of respondents have recovered their livelihoods and more than 50% of respondents have not recovered their livelihoods.

Table 5. 28 Livelihood recovery rate

Cases	Frequency	Percent	Valid percent	Cumulative percent
Yes	142	49.3	49.8	49.8
No	143	49.7	50.2	100
Total	285	99	100	

As can be seen from the frequency distribution table 5.28 that approximately 50% of respondents have still not recovered their livelihoods years after the cyclone hit, which means the livelihood recovery rate of disasters victims is not satisfactory.

Table 5. 29 Factors contributing to livelihood recovery

Access to resources and livelihood recovery	very low	low	moderate	high	very high
Income generating activities	4.20%	3.50%	39.90%	47.60%	3.90%
Humanitarian assistance from international stakeholders	2.80%	38.50%	51.40%	4.90%	1.10%
loan from local business	11.10%	39.20%	40.30%	7.30%	0.30%
Relief fund	14.60%	39.90%	33.30%	10.80%	0.30%
Temporary employment	9.40%	19.40%	51.40%	17.70%	0.70%

Table 5.29 shows that there are factors that contribute to livelihoods recovery which are income generating activities, humanitarian assistance from international stakeholders, loan from local business, relief fund and temporary employment. The results of frequency distribution show that income generating activities and temporary employment plays important role in recovering their livelihoods in comparison to other factors.

Table 5. 30 Results of 95% confidence interval on factors contributing to livelihood recovery

Access to resources and livelihood recovery	Mean	Confidence interval	Lower bound	Upper bound
Income generating activities	3.44	95%	3.29	3.51
Humanitarian assistance from international stakeholders	2.65	95%	2.55	2.75
loan from local business	2.47	95%	2.36	2.58
Relief fund	2.41	95%	2.29	2.54

Temporary employment	2.81	95%	2.69	2.88

Table 5.30 shows that the factors that play important roles in recovering livelihoods are income generating activities and temporary employment. The mean value of income generating activities and temporary employment is 3.44 and 2.81 respectively. The average mean value of other factors that contribute to livelihoods is below 2.50, which indicates those factors can help disaster victims to recover livelihoods but their contribution is below the expected level. To examine to what extent can access to resources contribute to livelihood recovery, a chi-square test along with cross tabulation were employed. The results of chi-square and cross tabulation are given table below:

Table 5. 31 Livelihood recovery and access to resources: Chi-square test

	Access to resources		
Have you recovred your livelihood?	No	Yes	Total
Yes	132	10	142
No	140	3	143
Total	272	13	285
Chi-square value	*Value*	*df*	*Sig.*
	4.001a	1	0.045

Table 5.31 shows that more than 49% (142) respondents recovered their livelihoods and on the other hand, more than 95% (272) of respondents did not have access to resources. The chi-square value of access to resource is .045 for livelihood recovery and it indicates that access to resource has a significant association with livelihood recovery. This leads to rejection of the null hypothesis, affirming the suggestion that people having access to resources can recover their livelihoods.

5.7.5 Factors affecting livelihood recovery

There are some factors that affect livelihood recovery which are access to land, lack of cash money, acute poverty, lack of jobs, lack of assistance from international stakeholders, and lack of local facilities. To evaluate the factors that hinder livelihood recovery the most, a five-point Likert scale was introduced. Respondents were asked to rank the factors from 1 to 5, where 1= little or no hindrance, 2= some hindrance, 3= moderate hindrance, 4= great hindrance, and 5= very great hindrance. The responses that were given by respondents were summarised in table 5.32.

Table 5. 32 Frequency distribution of factors affecting livelihood recovery

Factors affecting livelihood recovery	LONH	SH	MH	GH	VGH
Access to land	4.50%	4.50%	19.10%	43.40%	27.40%
Lack of cash money	1.10%	6.90%	41.30%	42.70%	6.60%
Acute poverty	0.70%	4.90%	27.10%	34.00%	31.90%
Lack of jobs	2.80%	4.20%	52.40%	35.40%	4.20%
Lack of assistance from local and international stakeholders	4.50%	4.90%	49.00%	39.20%	1.40%
Lack of local facilities	4.90%	5.90%	48.30%	37.80%	1.70%

Notes: *LONH= little or no hindrance, SH= some hindrance, MH= moderately hindrance, and GH= great hindrance.*

The frequency distribution in table 5.32 shows that more than 43% of respondents attribute access to land; about 43% lack of cash money, 34.0 % acute poverty, 35.4% lack of jobs, more than 39% lack of assistance from international stakeholders, and about 38% lack of local facilities as factors that affect them in terms of recovering their livelihoods.

As can be seen from table 5.32, more than 27% of respondents, in terms of lack of access to land and 31.9% in terms of acute poverty, expressed their concerns that lack of access to land and acute poverty play a significant role in affecting the livelihood recovery of disaster victims, which means the livelihood recovery rate of disaster victims is unsatisfactory.

Table 5. 33 Factors affecting livelihood recovery

Factors affecting livelihood recovery	Mean	Confidence interval	Lower bound	Upper bound
Access to land	3.81	95%	3.71	3.88
Lack of cash money	3.79	95%	3.7	3.95
Acute poverty	3.81	95%	3.67	3.91
Lack of jobs	3.45	95%	3.34	3.88
Lack of assistance from local and international stakeholders	3.88	95%	3.75	3.95
Lack of local facilities	3.36	95%	3.25	3.55

Table 5.33 shows that the factors that present stumbling block to livelihood recovery are acute poverty, lack of access to land, lack of cash money and lack of available jobs. The mean value of acute poverty and lack of access to land is 3.81 and 3.81respectively. The average mean value of other factors that inhibit livelihood recovery is below 3.50, which indicates those factors are also responsible for hindering the livelihood recovery of disaster victims.

5.7.6 Access to resources and quality of reconstructed houses

Quality, cost and timescales are the three main elements of post-disaster housing reconstruction that need to be considered and maintained carefully in order to rebuild cyclone resilient houses for the victims (Silva, 2010, Burnell, 2010). The five-point Likert scale was introduced to identify the level of quality of reconstructed houses depending on factors that determine the level of the quality of the houses. They were asked to rank the level of the quality of the reconstructed houses and the level of their safety and security in case of strong storms or hurricanes from 1 to 5, where 1= very low, and 5= very high. According to their responses, the level of the quality of reconstructed houses and their level of safety and security in the houses during strong storms or hurricanes are summarized in table 5.34.

Table 5. 34 Results of 95% confidence interval on the quality of reconstructed houses

Access to resource and quality of reconstructed houses	Mean	Confidence interval	Lower bound	Upper bound
Durable	1.60	95%	1.48	1.72
Cultural acceptance	1.43	95%	1.33	1.52
maintaining building codes	1.34	95%	1.26	1.42
Community participation	1.40	95%	1.31	1.5
Technological use	1.28	95%	1.2	1.36

Table 5.34 shows that the quality of reconstructed houses is very poor. This is because the mean values of durability, cultural acceptance, maintaining building codes, community participation and technological use are only 1.60. 1.43, 1.34, 1.40, 1.28 respectively which means that reconstructed houses are not durable, not culturally accepted, are not maintained by building codes, exhibit a lack of community participation and use inadequate technology. The average mean value of other factors that determine the safety and security of the respondents during strong storms is below 1.20, which indicates that disaster victims are not safe at all during cyclones.

Table 5. 35 Frequency distribution results of level of quality of reconstructed houses

Access to resource and quality of reconstructed houses	very low	low	moderate	high	very high
Durable	41.70%	19.40%	7.30%	2.10%	0.30%
Cultural acceptance	45.50%	19.80%	5.20%	-	
maintaining building codes	49.70%	18.40%	2.40%	-	
Community participation	47.90%	17.70%	4.90%	-	0.30%
Technological use	54.20%	13.90%	2.80%	-	

As shown in table 5.35 that 41.70% of respondents in terms of durability, 45.50% in terms of cultural acceptance, 49.70% in terms of building code, 47.90% in terms of community participation, and 54.20%, in terms of technological use, have confirmed the very low quality of the reconstructed houses and the safety and security during strong cyclones. Similarly, based on an average of the determinants, only 4.52% of respondents assumed that the quality of their houses was moderate; no respondents thought they were high quality or were safe and secure.

The relationship between access to resources and quality of the reconstructed houses has been examined by using chi-square test along with cross tabulation. The socioeconomic variables of access to resources which has two categories 0 = yes and 1 = no and quality of the reconstructed houses which has five categories have been examined further to identify whether there is a significant association between the socioeconomic variables.

Table 5. 36 Quality of the reconstructed houses and access to resources: Chi-square tests

		Access to resources		
Factors determining quality of the houses		No	Yes	Total
Durability of the houses	very low	118	2	120
	low	55	1	56
	moderate	19	2	21
	high	1	5	6
	very high	0	1	1
	Total	193	11	204
Culturally acceptance	very low	129	2	131
	low	54	3	57
	moderate	9	6	15
	Total	192	11	203
Maintaining building code	very low	140	3	143
	low	49	4	53
	moderate	4	4	8
	Total	193	11	204
Community participation in decision making process	very low	137	1	138
	low	45	6	51
	moderate	11	3	14
	high	0	1	1
	Total	193	11	204
Use of technology	very low	154	2	156
	low	34	6	40

	moderate	5	3	8
	Total	193	11	204
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Durability of the houses	94.390[a]	4	.000	
Culturally acceptance	38.875[a]	2	.000	
Maintaining building code	34.729[a]	2	.000	
Community participation in decision making process	34.556[a]	3	.000	
Use of technology	28.571[a]	2	.000	

The cross tabulation results in table 5.36 show that more than 42% (120) of respondents opted for the very low quality of the durability of houses, more than 45% (131) for cultural acceptance, more than 50% (143) for building codes and about 49% opted for the very low level of community participation in terms of rebuilding their houses. The Chi-square results show that the level of significance of all the determining factors is .000 which is statistically significant and indicates that access to resources has significant association in terms of quality of the reconstructed houses. This leads to the rejection of null hypothesis and affirm the suggestion that people having access to resources can rebuild durable and cyclone resistant houses. This result is quite similar with the findings of Hakim, (2009); Alam (2010); Lyons (2008); Jones (2006); Jha *et al.* (2010); and Esther and Charlesworth (2015) in the sense that the reconstructed houses are very poor, not durable and not cyclone resilient.

5.7.7 Access to resources and beneficiaries' satisfaction on reconstructed houses

Beneficiaries' satisfaction with the houses that they received is one of the significant determinants that whether the housing reconstruction has been successful (Gunasekara, *et al*.2016). Generally, in a post-disaster period, people affected by disasters suffer from a lack of available houses as they live in multiple places such as embankments, polders and transitional shelters. Thus, permanent houses that can ensure the end user's satisfaction are the ideal solution for post-disaster housing reconstruction projects. To explore beneficiary satisfaction on reconstructed houses, the five-point Likert scale was introduced to identify the level of their satisfaction on reconstructed houses depending on the determinants of cyclone resilience, safety, cost-efficiency, use of technology, giving importance to culture, sustainability, community participation, coping and adapting capacity. They were asked to rank the level of their satisfaction on the scale ranges from 1 = very dissatisfied, 2 = dissatisfied, 3 = neither satisfied nor dissatisfied, 4 = satisfied and 5 = very satisfied. According to their responses, the level of their satisfaction on the quality of reconstructed houses is summarized in table 5.37.

The 95% confidence interval test results in table 5.37show that disaster victims are not at all satisfied in all the determinants of beneficiary satisfaction on reconstructed houses of cyclone resilience, safety, cost-efficiency, use of technology, giving importance to local culture, sustainability, community participation, and coping and adapting capacity.

Table 5. 37 Beneficiaries' satisfaction on the quality of reconstructed houses

Access to resources and beneficiary's satisfaction	Mean	Confidence interval	Lower bound	Upper bound
Cyclone resilient houses	1.29	95%	1.14	1.33
Safety	1.33	95%	1.23	1.43
Cost-efficiency	1.34	95%	1.26	1.42
Use of technology	1.3	95%	1.23	1.38
Giving importance to culture	1.25	95%	1.17	1.32
Community participation	1.23	95%	1.16	1.31
Coping and adaptive capacity	1.2	95%	1.12	1.28
Sustainability	1.26	95%	1.18	1.34

The average mean value of the factors that determine the satisfaction of beneficiaries on reconstructed houses is not more than 1.25, which indicates that disaster victims are not at all happy with their current houses.

Table 5. 38 Beneficiaries' satisfaction on reconstructed house.

Access to resources and beneficiaries' satisfaction	VD	D	NSND	S	VS
Cyclone resilient	80.90%	13.30%	3.80%	0.70%	0.30%
Safety	70.40%	25.30%	2.80%	0.70%	0.40%
Cost-efficiency	72.90%	22.60%	2.40%	-	-
Use of technology	76.00%	20.50%	2.10%	-	-
Giving importance to culture	82.00%	15.50%	2.50%	-	-
Sustainability	82.30%	12.80%	3.50%	0.30%	
Community participation	78.80%	15.60%	3.80%		
Coping and adapting capacity	77.80%	17.70%	2.40%	0.30%	-

Notes: *VD = very dissatisfied, D= dissatisfied, NSND= neither satisfied nor dissatisfied, S= satisfied, and VS= very satisfied*

As can be seen from Table 5.38, more than 80% of the respondents in terms of cyclone resilient houses, 70.40% in terms of safety, 72.90% in terms of cost-efficiency, 76.0% in technological use, 82.0% in giving importance to local culture, 77.8% in sustainability, 78.8 % in community participation, and 82.3% in coping and adapting capacity have confirmed that they are very dissatisfied with the quality of the reconstructed houses. Similarly, on an average of the determinants, only 2% of respondents answered that they are satisfied with the quality of the houses and only 0.7% of respondents were very satisfied, in terms of the quality of their current houses.

The researcher of this study has employed chi-square test along with cross tabulation in order to examine the relationship between socio-economic variables of access to resources which has two categories and beneficiaries' satisfaction which has eight categories in terms of their existing houses to identify whether there is a significant association between the socioeconomic variables. The summary of cross tabulation and chi-square results are given below:

Table 5. 39 Beneficiaries' satisfaction and access to resources: Chi-square tests

		Access to resources		
Beneficiaries' satisfactory factors		No	Yes	Total
Cyclone resilient houses	very dissatisfied	227	6	233
	dissatisfied	38	0	38
	neither satisfied nor dissatisfied	5	6	11
	satisfied	1	1	2
	very satisfied	1	0	1
	Total	272	13	285
Safety	very dissatisfied	195	5	200
	dissatisfied	72	1	73
	neither satisfied nor dissatisfied	2	6	8
	satisfied	1	1	2
	very satisfied	1	0	1
	Total	271	13	284
Cost-efficiency	very dissatisfied	206	4	210
	dissatisfied	63	2	65
	neither satisfied nor dissatisfied	1	6	7
	Total	270	12	282
Use of technology	very dissatisfied	213	6	219
	dissatisfied	57	2	59
	neither satisfied nor dissatisfied	1	5	6
	Total	271	13	284
Giving importance to culture	very dissatisfied	228	4	232
	dissatisfied	41	3	44
	neither satisfied nor dissatisfied	1	6	7
	Total	270	13	283

Sustainability	very dissatisfied	219	6	225
	dissatisfied	50	1	51
	neither satisfied nor dissatisfied	1	6	7
	Total	270	13	283
Community participation	very dissatisfied	223	4	227
	dissatisfied	43	2	45
	neither satisfied nor dissatisfied	4	7	11
	Total	270	13	283
Coping and adaptive capacity	very dissatisfied	233	4	237
	dissatisfied	35	2	37
	neither satisfied nor dissatisfied	4	6	10
	Satisfied	0	1	1
	Total	272	13	285
Summary of Chi-squares	*Value*	*DF*	*Sig*	
Cyclone resilient houses	76.591[a]	4	.000	
Safety	104.022[a]	4	.000	
Cost-efficiency	117.076[a]	2	.000	
Use of technology	70.456a	4	.000	
Giving importance to culture	109.961[a]	2	.000	
Sustainability	107.835[a]	3	.000	
Community participation	91.652[a]	2	.000	
Coping and adaptive capacity	96.079[a]	3	.000	

The cross tabulation results in table 5.39 show that more than 81% (233) of respondents were very dissatisfied about cyclone resilient houses, more than 70% (200) for safety, about 74% (210) for cost-efficiency, about 77% (219) for the use of technology, more than 81% (232) for giving importance to culture, about 79% (225) for sustainability, more than 79% (227) for community participation and about 84% (237) were very dissatisfied on coping and adaptive capacity. The Chi-square results show that the level of significance of all the determining factors is .000 which is statistically significant and indicates that access to resources has significant association in terms of beneficiarys' satisfaction in their existing houses. This result is quite similar with the findings of Lyons (2009); Jones (2006); Jha *et al*. (2010); Nadiruzzaman and Wrathall, (2014); Esther and Charlesworth (2015) and Gunasekara, *et al.* (2010) in the sense that most of the respondents have poor satisfaction level regarding the quality of the houses that they have received from either international agencies or local governments.

5.7.8 Access to resources and managing emergency

Disaster victims are in a vicious cycle of poverty that actually shapes their limited capacity to manage in an emergency. According to table 5.40, more than 68% of respondents are day labourers, 18.80% are farmers, 4.50% are fishermen, 0.70% are carpenters and 5.90% have other professions. The frequency distribution table shows that most of the disaster victims are day labourers and they live hand to mouth. Similarly, most of the respondents are unemployed for instance; more than 79% of respondents have no fixed and secure jobs. Therefore, they have no regular income. It also shows that only 8.70% of respondents are employed which indicates that most of the respondents live in acute poverty.

Table 5. 40 Occupation and employment status of the respondents

Occupation of the respondents	Frequency	Percentage
Day labourers	198	68.80%
Farmer	54	18.80%
Fisher man	13	4.50%
Carpenters	2	0.70%
Others	17	5.90%
Employment status of the respondents		
Unemployed	227	79.90%
Employed	25	8.70%
Self-employed	28	9.70%
House wife	2	0.70%
Pensioner	3	1.00%

To evaluate the level of capability of managing an emergency, respondents were invited to participate in a structured questionnaire survey regarding their occupation and employment status. The five-point Likert scale was introduced to explore the level of capability of managing in an emergency in respect of on savings, income from employment, available assets, selling lands, and loans from local Mahajan. They were asked to rank their level of capability in managing emergencies from 1 to 5, where 1= very low, and 5= very high. According to their responses, this level of capability of managing emergency is summarised in table 5.41.

Table 5. 41 Respondents' level of capability to manage emergency

Managing emergency	very low	low	moderate	high	very high
Cash saving	72.20%	-	22.20%	3.10%	0.30%
Income from employment	71.90%	23.30%	3.10%	-	-

Assets	70.50%	24.30%	3.80%	-	-
Selling lands	63.90%	30.60%	4.20%	-	-
Loan from local Mahajan	69.40%	26.00%	3.10%	1.00%	0.40%

As can be seen from Table 5.41, more than 72% respondents in terms of cash savings, 71.90%, in terms of income from employment, 70.50% in terms of available assets, 63.90% in terms of selling lands and 69.40% in terms of loans from local Mahajan have confirmed very low levels of capacity in managing emergency periods following a disaster. A 95% confidence interval test was also performed to examine the level of capability to manage emergency.

Table 5. 42 Respondents' level of capability to manage emergencies

Managing emergency	Mean	Confidence interval	Lower bound	Upper bound
Cash saving	1.31	95%	1.23	1.4
Income from employment	1.33	95%	1.24	1.41
Assets	1.37	95%	1.29	1.45
Selling lands	1.44	95%	1.36	1.53
Loan from local Mahajan	1.37	95%	1.29	1.45

Table 5.42 shows that disaster victims are in acute poverty and their capability managing emergency periods of disaster are very limited. According to the table 5.42, selling land has been ranked as their main option to manage in an emergency with the mean value of 1.44. The average mean value of the level of capability of managing emergency is below 1.35 which indicates that all the determinants such as cash savings, income from employment, available assets, selling land, and loans from local Mahajan cannot provide sufficient assistance.

To examine the relationship between access to resources and managing emergency, a chi-square test was employed to identify whether access to resources have significant association with respondents' managing emergencies.

Table 5. 43 Managing emergencies and access to resources: chi-square tests

		Access to resources		
Factors that manages emergency		No	Yes	Total
Cash saving	very low	203	5	208
	low	63	3	66
	moderate	4	5	9
	high	1	0	1

	Total	271	13	284
Income from employment	very low	203	4	207
	low	64	3	67
	moderate	3	6	9
	Total	270	13	283
Assets	very low	200	3	203
	low	66	4	70
	moderate	5	6	11
	Total	271	13	284
Selling lands	very low	180	4	184
	low	85	3	88
	moderate	6	6	12
	Total	271	13	284
Loan from local mahajan	very low	196	4	200
	low	72	3	75
	moderate	3	6	9
	Total	271	13	284
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Cash saving	55.845[a]	3	.000	
Income from employment	82.472[a]	2	.000	
Assets	67.551[a]	2	.000	
Selling lands	59.391[a]	2	.000	
Loan from local Mahajan	82.532[a]	2	.000	

The cross tabulation results in table 5.43 show that disaster victims have very low level of capacity to manage their emergencies. As shown in table 5.43 that about 73% (208) of respondents have very low cash saving capacity, more than 72% (207) have very low income from employment, and more than 71% (203) have very low level of assets to manage emergencies. The Chi-square results show that the level of significance of all the factors that determine the level of capacity to manage emergency is .000 which is statistically significant indicating that access to resources can influence the disaster victims' ability to increase their level of capacity in managing emergency. This leads to the rejection of null hypothesis and affirms the hypothesis number two that people in poverty and with vulnerability have very low levels of affordability, capacity, resilience, satisfaction and managing emergencies.

5.7.9 Disaster vulnerability, coping capacity and resilience

Disaster vulnerability, coping/adaptive capacity and resilience are very significant concepts in disaster management research. The severity of disaster losses and risks is largely determined by vulnerability. Coping and adaptive capacity is the individual's ability to respond to natural disasters and resilience embodies the ability to withstand, cope with and recover from the adverse impact of natural disasters in an effective manner. To explore respondent's level of vulnerability, coping capacity and resilience, a five point Likert scale was introduced. Respondents were asked to rank the level of their vulnerability on the scale ranges from 1 to 5, where 1= very low, and 5= very high. According to their responses, the level of their vulnerability is summarized in table 5.44.

Table 5. 44 Respondents level of vulnerability

Respondents' level of vulnerability	Mean	Confidence interval	Lower bound	Upper bound
Acute poverty	4.17	95%	4.07	4.29
No access to resources	3.5	95%	3.41	3.59
No permanent jobs	3.45	95%	3.36	3.53
Very susceptible to disasters	3.6	95%	3.54	3.76
Lack of assistance from local and international stakeholders	3.35	95%	3.25	3.44

Table 5.44 shows that the level of a disaster victim's vulnerability is very high in all the determinants of vulnerability. The average mean value of the factors that determine the level of their vulnerability is 3.61, which indicates that disaster victims are very vulnerable in their current houses. Poverty is the main barrier for them as its mean value is 4.17.

Table 5. 45 Respondents' level of vulnerability

Access to resources and level of vulnerability	Very low	Low	Moderate	High	Very high
Acute poverty	3.80%	2.80%	6.60%	45.10%	40.30%
No access to resources	3.50%	3.50%	38.20%	48.30%	5.20%
No permanent jobs	2.80%	5.20%	40.60%	46.20%	3.80%
Very susceptible to disasters	3.50%	4.90%	30.90%	42.40%	16.70%
Lack of assistance from local and international stakeholders	3.10%	7.60%	41.70%	43.80%	2.10%
Coping and adaptive capacity	82.30%	12.80%	3.50%	0.30%	-
Resilience to cyclone	78.50%	16.70%	3.80%		
Building capacity to resilience	71.50%	22.60%	4.50%	0.40%	

As shown in table 5.45 that more than 45% of the respondents have high level of poverty, 48.30% had no access to resources, 46.20% had no permanent jobs, and 42.40% have high level of vulnerability in terms of susceptibility to disaster. Table 5.45 also shows that the coping and adaptive capacity of disaster victims is very poor and 83% of respondents are very dissatisfied in terms of coping and adaptive capacity. Furthermore, table 5.45 shows that the level of respondents' resilience is very low. About 79% of respondents have a very low level of resilience in terms of cyclones and more than 71% in terms of building capacity to resilience. This finding is quite consistent with the result of Tobin (1999), Wisner *et al.* (2004) and Cutter *et al*. (2008) that the degree of disaster losses or potential losses is largely determined by the level of vulnerability and the level of resilience is determined by the adaptive measures undertaken to recover from the uncertainty.

5.8 Key success factors of resourcing for PDHR projects

This section is one of the significant parts of this study. It is based on the results of a questionnaire survey conducted with 285 respondents who have been affected by cyclone disasters in Bagerhat and Satkhira in Bangladesh. It consists of factors of resourcing that can contribute to durable post-disaster housing reconstruction after cyclones Sidr 2007 and Aila in 2009 in Bangladesh. It also explores the key challenges of PDHR projects, causes of limited access to power, respondents' level of vulnerability, level of income generating activities, level of their participation in terms of giving opinions on decisions, choosing the design of the houses, selection of construction materials, choosing technological use and permanent or temporary houses to be made.

5.8.1 Access to resources and challenges of PDHR projects

The challenges associated with post-disaster housing reconstruction projects from other researchers are discussed and presented in chapter two in the review of literature. The nine most cited challenges were included in the questionnaire survey. Respondents were given the questions in the Likert scale format and were invited to rank the barriers from 1 to five where 1 = not a barrier and 5 = extreme barrier. The barriers of post-disaster housing reconstruction projects are analysed with frequency distribution and 95% confidence interval test. The results from the questionnaire survey are presented in table 5.46.

Table 5. 46 Challenges of post-disaster housing reconstruction

Challenges of post-disaster housing reconstruction	NAB	SAB	MB	B	EB
Resource availability	0	0	33.30%	36.80%	28.10%
Lack of coordination among participant organisations	0	1.00%	23.60%	63.90%	11.50%
Unavailability of appropriate land		1.40%	30.60%	48.30%	19.80%
Poor quality of reconstructed houses	0	1.40%	34.40%	44.10%	20.10%
Delay in project implementation	0	0.70%	36.10%	54.90%	8.30%
Lack of community participation in decision making process	0	0.30%	31.90%	57.60%	10.00%

Corruption	0	1.00%	33.70%	58.70%	6.60%
Lack of funding	0	1.70%	39.90%	48.60%	9.70%
Cultural barrier	0	3.80%	48.30%	40.30%	6.60%

Notes: NAB= Nota a barrier, SAB= Somewhat of a barrier, MB= Moderate barrier, B= Barrier and EB= Extreme barrier.

The frequency distribution table shows that more than 28% of respondents rank availability of resources, 20.1% respondents poor quality of reconstructed houses, 19.8% lack of available land, 11.50% lack of coordination among the participant organisations and 10% lack of community participation as extreme barriers. This result is quite similar with Chang, (2012); Singh, 2007; Wilkinson *et al*., (2010); and Jha *et al*. (2010) that lack of resources is the most critical problem compared to other challenges in post-disaster reconstruction and they argued that the whole reconstruction project depends on the availability of resources.

Table 5. 47 Results of 95% confidence interval of challenges of post-disaster housing reconstruction

Challenges of post-disaster housing reconstruction	Mean	Confidence interval	Lower bound	Upper bound
Resource availability	3.90	95%	3.81	4
Lack of coordination among participant organisations	3.85	95%	3.78	3.92
Unavailability of appropriate land	3.85	95%	3.77	3.94
Poor quality of reconstructed houses	3.82	95%	3.73	3.91
Delay in project implementation	3.80	95%	3.59	4.01
Lack of community participation in decision making process	3.76	95%	3.69	3.83
Corruption	3.69	95%	3.63	3.76
Lack of funding	3.65	95%	3.57	3.73
Cultural barrier	3.50	95%	3.69	3.83

As can be seen in table 5.47, challenges associated with post-disaster housing reconstruction projects are ranked by the disaster victims range from 3.90 availability of resources to 3.50 cultural barriers which means availability of resources is the main barriers that affects the PDHR projects. None of the overall mean scores are above 4. Generally, barriers with a mean score above 3.90 are related to quality of reconstructed houses, poor coordination, delay in project implementation and avoiding corruption. By examining from the lower part of the table, it can be observed that the four lowest ranking barriers in PDHR projects are lack of community participation in DCM, which ranked 6th, followed by corruption 7th, lack of funding 8th, and cultural barriers which ranked nine.

5.8.2 Key success factors of resourcing for PDHR projects

This section is based on the analysis of quantitative data from questionnaire survey of 285 affected villagers. It analyses quantitative data and shed light on the key success factors of resourcing that can contribute to successful post-disaster housing reconstruction projects in Bangladesh and elsewhere. The results associated with the key success factors of resourcing for post-disaster housing reconstruction projects from the questionnaire survey are summarised in the table below:

Table 5. 48 Frequency distribution of success factors of resourcing for PDHR

Key success factors of resourcing for PDHR projects	NIA	SI	MI	I	VI
Effective monitoring and managing resources	0.00%	1.40%	25.30%	60.40%	11.80%
Supporting community self-reliance	0.00%	0.70%	35.10%	52.00%	10.40%
Community participation in decision making process	0.00%	0.70%	25.30%	55.00%	16.70%
Adequate funding	0.00%	0.70%	28.10%	49.00%	21.20%
Competency of resourcing managers	0.00%	1.40%	29.50%	55.00%	12.80%
Beneficiary's satisfaction	0.00%	0.70%	29.90%	50.00%	17.40%
Transparency and accountability of resourcing s	0.00%	0.30%	29.90%	58.00%	10.10%

Notes: Scale ranges from 1 = Not important at all to 5 = very important. NIA = Not Important at all, SI= Somewhat Important, MI= Moderately Important, I= Important, VI= Very Important.

Table 5.48 shows that more than 60% of respondents for effective monitoring and managing resources, 58.70% for transparency and accountability of resourcing managers, 55.00% for community participation for decision making process, 55.00% for competency of resourcing managers, 52.00% for supporting community self-reliance, about 50.00% for beneficiary’s satisfaction, and 49.00% for adequate funding think that key success factors are very important in reconstructing disaster victims’ houses.

Table 5. 49 95% confidence interval of success factors of resourcing for PDHR

Key success factors of resourcing for PDHR projects	Mean	Confidence interval	Lower bound	Upper bound
Effective monitoring and managing resources	3.84	95%	3.76	3.91
Supporting community self-reliance	3.74	95%	3.66	3.81
Community participation in decision making process	4.04	95%	3.75	4.32
Adequate funding	3.92	95%	3.83	4
Competency of resourcing managers	3.8	95%	3.73	3.88
Beneficiary's satisfaction	4.02	95%	3.69	4.36
Transparency and accountability of resourcing s	3.85	95%	3.74	3.95

Table 5.49 shows that the average mean value of key success factors is below 3.90 which indicate that key success factors can play a significant role in rebuilding the houses of coastal Bangladeshi people affected by cyclone disasters. As can be seen from table 5.49 that the most significant factor is community participation in the decision making process and beneficiary satisfaction with the mean values of 4.04 and 4.02 respectively. The results (in table 5.49) show that 21.20% of respondents have ranked adequate funding as a very important factor for PDHR projects and 17.40% ranked beneficiary satisfaction. This result is quite similar with the findings of Wilkinson *et al*. (2010) and Chang (2012) that availability of resources one of the main factors for post-disaster housing reconstruction.

5.8.3 Access to resources and level of vulnerability

Bangladesh has been ranked as the third most vulnerable country and ranks as the 'first and most at risk country in the world due to sea levels rising, cyclones, storm and tidal surges, floods, land erosion, water logging, drought and salinity (Shamsuddoha *et al*.2013; Paul and Rashid, 2016). Coastal people are very vulnerable in terms of withstanding cyclones, rebuilding their houses, income generating activities, livelihood recovery and building, and coping and adapting capacity. To explore the level of the respondent's vulnerability, five determinants have been employed such as acute poverty, no access to resources, no permanent jobs, very susceptibility to disasters, and lack of assistance from local and international stakeholders based on the five-point Likert scale. They were asked to rank the level of their vulnerability on the scale ranges from 1 = very low, 2 = low, 3 = moderate, 4 = high and 5 = very high. According to their responses, the level of their vulnerability is summarized in table 5.50.

Table 5. 50 Respondents' level of vulnerability

Access to resources and level of vulnerability	VD	D	NSND	S	VS
Acute poverty	3.80%	2.80%	6.60%	45.10%	40.30%
No access to resources	3.50%	3.50%	38.20%	48.30%	5.20%
No permanent jobs	2.80%	5.20%	40.60%	46.20%	3.80%
Very susceptible to disasters	3.50%	4.90%	30.90%	42.40%	16.70%
Lack of assistance from local and international stakeholders	3.10%	7.60%	41.70%	43.80%	2.10%
Coping and adaptive capacity	82.30%	12.80%	3.50%	0.30%	-

Notes: *VD = very dissatisfied, D= dissatisfied, NSND= neither satisfied nor dissatisfied, S= satisfied, and VS= very satisfied*

The frequency distribution table 5.50 shows that disaster victims are very vulnerable in all the determinants of acute poverty, no access to resources, no permanent jobs, very susceptible to disasters, and lack of assistance from local and international stakeholders. As can be seen from table 5.50, 45.10% of the respondents in terms of acute poverty, 48.30% in terms of no access to resources, 46.20% in terms of no permanent jobs, 42.40% in terms of susceptibility to disaster, and 43.80% in terms of lack of assistance from local and international stakeholders have confirmed that they are vulnerable and 40.30% of respondents in terms of poverty and 16.70% in terms of susceptibility to disaster have ranked that they are very vulnerable. Similarly, on an average of the determinants, more than 3% of respondents in terms of acute poverty and 3.50% in terms of susceptibility to disaster and vulnerability answered that they were low on the scale.

TTable 5. 51 Respondents level of vulnerability

Respondents' level of vulnerability	Mean	Confidence interval	Lower bound	Upper bound
Acute poverty	4.18	95%	4.07	4.29
No access to resources	3.5	95%	3.41	3.59
No permanent jobs	3.45	95%	3.36	3.53
Very susceptible to disasters	3.65	95%	3.54	3.76
Lack of assistance from local and international stakeholders	3.35	95%	3.25	3.44

Table 5.51 shows that the average mean value of the factors that determine the level of their vulnerability is below 3.60, which indicates that disaster victims are very vulnerable in their current houses. Poverty is the main barrier for them as its mean value is 4.18. This result is quite similar with the findings of Lyons (2009); Paul and Rashid (2016); Esther and Charlesworth (2015) and Gunasekara, *et al.* (2016) in the sense that the majority of the respondents are very vulnerable against all the determinants of level of vulnerability.

5.8.4 Access to resources and causes of limited access to power

Several studies have confirmed that poverty is the root causes of all vulnerabilities (Twigg, 2001; Wisner *et al*.2004; Bosher *et al*. 2007; Nadiruzzaman, 2012; Charlesworth and Ahmed, 2015; Paul and Rashid, 2016) and vulnerability is contributed to by lack of income, lack of education and training, lack of jobs and the clutch of natural disasters. There is no vulnerability if there is no poverty (Schilder man, 2004; Wisner *et al*.2004; Charlesworth and Ahmed, 2015). Disaster victims are in vicious cycle of poverty that shapes their limited access to power.

Table 5. 52 Socioeconomic status of the respondents

Socioeconomic status of the respondents	Frequency	Percentage
Level of education		
No formal education	230	79.90%
Primary education	36	12.50%
Secondary education	10	3.50%
Further education	4	1.40%
University degree	2	0.70%
Postgraduate	3	1.00%
Monthly income of the respondents		
500-1000	9	3.30%
1001-2000	33	11.50%
2001-3000	54	18.80%
3001-5000	104	36.10%
5001-9000	63	21.70%
9001-20,000	22	7.50%

According to table 5.52, more than 79% of respondents have no formal education, 12.50% have a primary education and only 3.50% have a secondary education. Similarly, most of the respondents have a low monthly income; for instance, more than 69% of respondents have an income between 500-5000 BD taka and 7.50% of respondents earn between 9001-20000 which indicates that most of the respondents are in acute poverty. To evaluate the causes of limited access to power, respondents were invited to participate in structured questionnaire survey. According to their responses, the causes of their limited access to power is summarised in table 5.53.

Table 5. 53 95% confidence interval of causes of limited access to power

Causes of limited access to power	Mean	Confidence interval	Lower bound	Upper bound
Poverty	4.21	95%	3.61	3.84
Oppressed by political leaders	3.81	95%	3.70	3.85
lack of jobs	4.14	95%	4.02	4.26
lack of income	3.45	95%	3.21	3.69
Lack of training and skills	3.39	95%	3.27	3.50

Table 5.53 shows that poverty has been ranked the number one reason for their limited access to power with the mean value of 4.21. The average mean value of causes of limited access to power is below 3.60 which indicate that all the determinants such as poverty rate, oppressed by political leaders, lack of jobs, lack of income, and lack of training and skills play an important role regarding

their low access to power. The percentage of a very low level of capacity, in terms of accessing to power dynamics is explored by using the result of frequency distribution.

Table 5. 54 Frequency distribution of causes of limited access to power

Causes of limited access to power	very low	low	moderate	high	very high
Poverty	0.70%	2.10%	13.90%	41.70%	40.60%
Oppressed by political leaders	10.40%	50.34%	33.70%	3.80%	0.30%
lack of jobs	0.30%	8.00%	47.90%	35.10%	7.30%
lack of income	0.30%	7.60%	46.20%	37.80%	6.60%
Lack of training and skills	1.00%	5.90%	62.50%	25.00%	4.50%

As can be seen from Table 5.54, the rankings were 41.70% poverty, 35.10% lack of jobs, 37.80% lack of income, and 25.00% lack of training and skills and more than 40% of respondents thought that poverty is the very high reason for their limited access to power. This result is quite similar to the findings of Bosher *et al*. (2007), and Nadiruzzaman (2012) that disasters victims are in acute poverty and they are neglected from power dynamics due to their poverty, vulnerability, low education and low income.

5.8.5 Access to resources and level of income generating activities

The coastal people of Bangladesh suffer from extreme poverty, vulnerability, inequality, and marginalization in income compared to other areas (Paul and Rashid, 2016). Their life and properties are destroyed by disasters. Disaster victims use income generating activities such as fishing, homestead vegetable cultivation, crop production, and poultry rearing as option to recover livelihoods. To identify the level of their income generating activities, respondents were invited to participate in a structured questionnaire survey. The five-point Likert scale was introduced to explore the level of their income generating activities. They were asked to rank the level of income generating activities from 1 to 5, where 1= very low, and 5= very high. According to their responses, the level of income generating activities is summarised in table 5.55.

Table 5. 55 Respondents level of income generating activities

Level of income generating activities	Mean	Confidence interval	Lower bound	Upper bound
Small enterprises	1.45	95%	1.1	1.81
Sewing	1.38	95%	1.3	1.46
Homestead vegetables cultivation	1.51	95%	1.32	1.52

Crop production	1.45	95%	1.35	1.54
Poultry rearing	1.33	95%	1.25	1.41
Fisheries	1.38	95%	1.29	1.46

According to table 5.55, homestead vegetable cultivation has been ranked the number one factor contributing to their income generating activities with the mean value of 1.51. The average mean value of the level of their income generating activities is below 1.50 which indicates that all the determinants do not contribute to their income generating activities much. The percentage of very low levels of capacity in terms of involving them in income generating activities is explored by the result of frequency distribution.

Table 5. 56 Frequency distribution of level of income generating activities

Level of income generating activities	very low	low	moderate	high	very high
Small enterprises	75.30%	14.60%	8.30%	0.30%	0.30%
Sewing	65.30%	30.20%	3.50%	-	-
Homestead vegetables cultivation	61.80%	24.30%	12.50%	0.30%	-
Crop production	59.70%	29.90%	8.30%	1.00%	-
Poultry rearing	69.10%	26.00%	3.80%	-	-
Fisheries	62.80%	30.60%	4.90%	0.30%	-

As can be seen from Table 5.56, more than 75% of the respondents in terms of small enterprise, 65.30% in terms of sewing, 61.80% in terms of homestead vegetable cultivation, 59.70% in terms of crop production, 69.10% in terms of poultry rearing and 62.80% in terms of fisheries have a low level of income generating activities. A chi-square test along with a cross tabulation were employed to examine whether access to resources has significant association with income generating activities of disaster victims.

Table 5. 57 Level of income generating activities and access to resources: chi-square tests

		Access to resources		
Income generating factors		No	Yes	Total
Small enterprises	very low	213	4	217
	low	39	3	42
	moderate	20	5	25
	high	0	1	1
	Total	272	13	285
Sewing	very low	183	5	188
	low	81	6	87

	moderate	8	2	10
	Total	272	13	285
Homestead vegetables cultivation	very low	173	5	178
	low	68	2	70
	moderate	30	6	36
	high	1	0	1
	Total	272	13	285
Crop production	very low	168	4	172
	low	82	4	86
	moderate	20	4	24
	high	2	1	3
	Total	272	13	285
Poultry rearing	very low	193	6	199
	low	72	3	75
	moderate	7	4	11
	Total	272	13	285
Fisheries	very low	172	9	181
	low	85	3	88
	moderate	13	1	14
	high	1	0	1
	Total	271	13	284
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Small enterprises	38.936[a]	3	.000	
Sewing	8.127[a]	2	.017	
Homestead vegetables cultivation	13.888[a]	3	.003	
Crop production	15.760[a]	3	.001	
Poultry rearing	26.703[a]	2	.000	
Fisheries	.599[a]	3	0.897	

The cross tabulation results in table 5.57 show that disaster victims have very low level of income generating activities. As shown in table 5.57 that more than 76% (217) of respondents have very low level of access to small enterprises, about 66% (188) have very low level of sewing facilities, more than 62% have very low level of access to homestead vegetable cultivation and more than 63% (181) have very low level of facilities to fisheries. The Chi-square results show that the level of significance of all the factors that determine the level of capacity to income generating activities except fisheries is .000 which is statistically significant indicating that access to resources can influence the disaster victims' ability to increase their level of income generating activities. This leads to the rejection of null hypothesis and affirms the hypothesis number six of this study that people with access to income generating activities have higher chance to maintain the quality of reconstructed houses. This result is quite similar with the findings of Bosher *et al.* (2007) and Wisner *et al*. (2004) that disaster victims can avoid vulnerability and disasters if they have access to resources.

5.8.6 Access to resource and community participation

Community participation in PDHR projects has been found to play a pivotal role in empowering beneficiaries or community members in terms of decision making roles, promoting community control over the project and their needs and wants (Davidson *et al.*2007). In contrast, Choguill (1996) and Arnstein (1969) argued that end users or beneficiaries will have little or no control over decision making roles in specific projects. However, this study seeks to explore the level of respondents' participation in post-Sidr and Aila housing reconstruction in Satkhira and Bagerhat in Bangladesh. To identify the level of their capacity to participate in rebuilding houses in post-disaster reconstruction after cyclone Sidr and Aila, respondents affected by cyclones were invited to participate in a structured questionnaire survey. The five-point Likert scale was introduced to explore the level of their participation dependant on their opinions on making decisions on housing reconstruction, design of houses, selection of construction materials, use of technology, temporary or permanent houses. They were asked to rank the level of their participation in post-Sidr and Aila housing reconstruction from 1 to 5, where 1= very low, and 5= very high. According to their responses, the level of their participation is summarised in table 5.58.

The frequency distribution test result, 95% confidence interval test and Chi-square results show that disaster victims have very low levels of participation in post-cyclone Sidr and Aila housing reconstruction.

Table 5. 58 Respondents level of community participation in PDHR

Community participation in PDHR	Mean	Confidence interval	Lower bound	Upper bound
Opinion of affected people on housing reconstruction	1.44	95%	1.38	1.66
Design of houses	1.48	95%	1.33	1.66
Selection of construction materials	1.47	95%	1.35	1.51
Use of technology	1.41	95%	1.25	1.7
Temporary or permanent houses	1.32	95%	1.3	1.45

Table 5.58 shows that design of the houses has been ranked one of their main options among other determinants with the mean value of 1.48. The average mean value of the level of their participation is below 1.50 which indicates that the affected population has a very low level of participation in

terms of giving opinions on decisions, choosing the design of the houses, selection of construction materials, choosing technological use and whether permanent or temporary houses should be made. The percentage of a very low level of their capacity to participate in terms of PDHR projects is also assessed by the result of the frequency distribution.

Table 5. 59 Frequency distribution of community participation PDHR projects

Community participation in PDHR	very low	low	moderate	high	very high
Opinion of affected people on housing reconstruction	62.80%	31.90%	3.80%	0.30%	0.40%
Design of houses	66.30%	30.20%	1.40%	0.70%	0.30%
Selection of construction materials	60.40%	35.40%	1.70%	0.30%	0.40%
Use of technology	66.00%	30.90%	1.00%	0.3	%
Temporary or permanent houses	67.40%	31.30%	0.30%	0.30%	0.70%

As shown in Table 5.59, more than 62% of respondents in terms of opinion on decisions, 66.30% in terms of choosing the design of the houses, 60.40% in terms of selection of construction materials, 66.00% in terms of choosing technological use and 67.40% in terms of permanent or temporary houses to be made have confirmed very low levels of their capacity to participate in rebuilding houses in post- Sidr and Aila reconstruction.

5.8.7 Stakeholders and their involvement in PDHR projects

Stakeholders' involvement in post-disaster housing reconstruction projects has become very significant due to its humanitarian assistance to rebuild houses for the disaster victims. A stakeholder is a person, group of people, organisation or systems that has a stake in the reconstruction and is likely to be affected by the reconstruction; whose support is needed or who identifies and analyses their relative power, influences priorities, resources, and is significant in the entire reconstruction process (Freeman, 2010). Stakeholders in this study refer to an international donor agency, local government, disaster victims and the beneficiaries. A post-disaster housing reconstruction project is very challenging and it requires funding, materials, labour and the involvement of people from all walks of life. Stakeholders in this situation generally play a pivotal role in terms of starting and finishing disaster reconstruction projects, providing temporary shelters, relief and rehabilitation of the disaster victims.

In post-disaster housing reconstruction projects, especially in Satkhira and Bagerhat in Bangladesh, different national and international stakeholders undertake an initiative to reconstruct houses for the disaster victims. To identify the level of their roles, respondents were invited to participate in a questionnaire survey. They were asked questions about the different stakeholders' involvement in rebuilding their houses. The responses from the disaster victims are summarised in the table below:

Table 5. 60 Humanitarian assistance and actors involved in reconstruction

Materials used for reconstruction	Frequency	Percentage
Permanent tin roof	146	50.70%
Temporary thatch	40	13.90%
Reinforced concrete	11	3.80%
Brick	2	0.70%
Plinth	4	1.40%
Amount of assistance received		
5000-10,000	95	33.00%
10001-15000	3	1.00%
15001-20,000	95	33.00%
20001-0ver	54	18.80%
Did you receive housing assistance?		
Yes	244	84.70%
No	35	12.20%
How did you receive assistance?		
Via local government	106	36.80%
Via local and national NGOs	7	2.40%
Via international NGOs	35	12.20%
Via international stakeholders	97	33.70%
Don't receive	3	1.00%
Others	0	0%
Who provided assistance for reconstruction?		
Local Government	109	37.80%
IFRC	29	10.10%
UNDP	87	30.20%
World Bank	1	0.30%
Local and international NGOs	17	5.90%
I don't know	2	0.70%
Who actually rebuilt your houses?		
IFRC	7	2.40%
UNDP	79	32.10%
Local Government	84	34.10%
Self-reconstruction	45	17.80%
Local and international NGOs	32	13.00%
Are resources sufficient for reconstruction?		

Yes	9	3.10%
No	240	83.30%
Why are the resources insufficient?		
Misallocation of resources	134	46.50%
Delay in implementation	16	5.60%
Corruption	77	26.70%
Spent fund for other purposes	19	6.60%

The frequency distribution results in table 5.60 show that more than 37% of respondents think they received humanitarian assistance via local government, 2.40% received assistance via local and international NGOs, 12.50% received assistance via international NGOs, 8.30% received assistance from international stakeholders and 1% stated that they did not receive any type of humanitarian assistance. Similarly, in terms of providing humanitarian assistance, the frequency distribution table also shows that local governments play an important role, as 44.50% of respondents received assistance from local governments, 35.50% respondents from UNDP, and 6.90% respondents received assistance from local and international NGOs. As can be seen from the above table, more than 83% of respondents answered that they did not receive sufficient resources for reconstructing their houses and only 3.10% of respondents owned that they received sufficient resources for rebuilding. In terms of rebuilding, 33.37% of respondents explained that their houses were built by local government and 32.50% of respondents stated that their houses were built by UNDP; the self-reconstruction rate is 15.62% and 15.40% of respondents think their houses were built by local and international NGOs. In addition, respondents were asked about the amount of assistance they received. In response to this question, 33% of respondents answered that they received between 5000-10,000 BD takas, and 15001-20,000 respectively; 18.80% of respondents mentioned that they received over 20000. Respondents were also asked if their resources were insufficient. In response to this question, 46.50% of respondents think that resources are misallocated, 26.70% mentioned there is corruption in implementing PDHR projects, 5.60% think that there are delays in project implementation and 6.60% of respondents mentioned that resources are spent for other purposes.

5.9 Conclusion on the impact of access to resources on PDHR projects

Socio-economic factors play a significant role in rebuilding houses for the population affected by disasters. The socio-economic variables that play a major role in post-disaster housing reconstruction in Satkhira and Bagerhat in Bangladesh are access to resources, level of education, access to land, income generating activities, gender, quality of building materials, construction expertise, and technological application. The results of this investigation show that access to resources exerts a significant impact in post-Sidr and Aila housing reconstruction. Having access to the required resources increases the adaptive capacity of disaster victims to recover their livelihoods, which in turn helps them to rebuild houses after livelihood recovery. Most of the respondents in cyclone affected areas in this investigation are in absolute poverty. The results of frequency distribution of this study show that more than 86% of respondents are between high and very high levels of poverty. As they are in acute poverty, they do not have access to resources to rebuild their houses. Access to resources such as microfinance or insurance can make them capable of escaping the vicious cycle of poverty that would result in housing recovery.

Table 5. 61 Poverty level of respondents

Poverty level of respondents	Frequency	Percent	Valid percent
Very low	11	3.90%	3.90%
Low	8	2.80%	2.80%
Moderate	19	6.70%	6.70%
High	130	45.60%	45.80%
Very high	116	40.70%	40.80%

The multiple regression result in table 5.19 shows that access to resources, gender, level of access to construction expertise, and access to technological innovations are significant predictors of post-disaster housing reconstruction. The beta Coefficient of access to resources is 0.42, the t-value is 1.998 and the p-value is 0.047, which is statistically accepted and significant and it indicates that access to resources can play a crucial role in rebuilding houses for the affected population. Data on access to resources shows people who have access to resources have rebuilt their houses by themselves but the percentage is very low as only 4.6% of respondents have a sufficient amount of resources to do so.

Among the other socio-economic factors, level of education and income generating activities can also play significant roles in post-disaster housing reconstruction. There is an association between level of education and housing reconstruction because level of education is generally associated with increased income. Similarly, level of income generating activities can increase their income level and it can help them to reduce poverty which can lead to rebuilding houses. Construction expertise and quality of building materials are also significant in terms of disaster victims' rebuilding houses. The regression analysis, Chi-square, and 95% confidence interval test results show that access to resources and construction expertise give momentum to PDHR and this result is quite similar with the study of Freeman (2004) and Chang (2012). As can be seen from the result of this study, building materials are required for reconstruction and without them, housing reconstruction is impossible. The regression result supports the importance of construction expertise due to its level of significance of 0.021. The role of construction expertise is significant because a cyclone resilient house requires a step by step guideline and the right combination of materials to expedite successful housing reconstruction.

The overall findings of this quantitative analysis support the main hypothesis of ‘people having access to resources are more likely to rebuild houses by themselves than people having no access to resources. This result rejects the null hypothesis because most of the respondents have no access to resources, because of this, they cannot rebuild houses and thus, the rate of housing recovery is very poor in terms of cyclone resilient houses.

Furthermore, 95% confidence interval test and frequency distribution results show that disaster victims were very dissatisfied in terms of the quality of reconstructed houses. The frequency distribution results show that about 81% in terms of cyclone resilient houses, 70.40% in terms of safety of the houses, 72.90% in terms of cost-efficiency, 76% in terms of using technology, 82% in terms of giving importance to culture, 77% in terms of sustainability, 78% in terms of community participation and more than 82% in terms of coping and adapting capacity are very dissatisfied on the quality of reconstructed houses. Therefore, it appears from the results that beneficiaries are not satisfied at all with the quality of the reconstructed houses and they even feel unsafe for upcoming cyclones.

Following the quantitative data analyses on the impact of access to resources in post-disaster housing reconstruction in Bangladesh in this chapter, the next chapter presents challenges associated with post-disaster housing reconstruction projects by analysing both quantitative and qualitative data.

CHAPTER 6 CHALLENGES ASSOCIATED WITH POST-DISASTER HOUSING RECONSTRUCTION PROJECTS

The preceding chapter has mainly focused on the impact of access to resources to post-Sidr and Aila housing reconstruction in Bagerhat and Satkhira in Bangladesh. The socio-economic factors such as gender, age, monthly income, education, access to land and access to resources can significantly influence the capacity of disaster victims to rebuild their houses in post-disaster period. The quantitative data explored in chapter five started with a socio-economic profile of the respondents and examined their level of access to different types of resources, humanitarian assistance and actors involved in reconstruction, factors affecting housing reconstruction, livelihood recovery and key success factors of resourcing. It also explored the central aim of this research, that of effectiveness of resourcing by employing specific parameters. Furthermore, it identified the importance of stakeholders' involvement and community participation in PDHR projects.

This chapter has focused mainly on the key challenges of post-Sidr and Aila housing reconstruction in Bagerhat and Satkhira in Bangladesh. It is based on both quantitative and qualitative data analysis from questionnaire surveys of 285 affected villagers and semi-structured interviews from respondents who were actively involved in post-Sidr and Aila housing reconstruction. The quantitative and qualitative data show that post-Sidr and Aila housing reconstruction faced many challenges and those challenges tremendously affected the coverage as well as the quality of reconstruction. The key challenges which were stumbling blocks in rebuilding their houses were lack of available resources, lack of coordination among participating organisations, lack of availability of appropriate land, poor quality of reconstructed houses, delays in project implementation, lack of community participation, corruption, lack of funding, and cultural barriers.

It discusses key challenges faced by stakeholders, construction practitioners and local government in terms of post-disaster housing reconstruction projects in the Sidr and Aila affected areas of Bagerhat and Satkhira in Bangladesh. As well as drawing from descriptive statistics from the survey data, this chapter is based on the results of semi-structured interviews with 20 stakeholders from national and international organisations and the results from the questionnaire surveys. Finally, this chapter seeks to address research question number three regarding the challenges of post-disaster housing reconstruction that affects villagers in rebuilding their houses.

6.1 Key challenges of post-disaster housing reconstruction projects

Post-disaster housing reconstruction is one of the most challenging tasks that international stakeholders including the World Bank, IFRC, UNDP, Housing Reconstruction Practitioners (HRP), and local governments face. Unlike most normal construction projects, PDHR projects are diverse in nature, having unique socio-cultural and economical requirements and are extremely dynamic and thus require a meaningful and dynamic response (Davidson *et al*. 2010). PDHR projects generally lack a strategy compatible with the severity of disasters, community culture and socio-economic requirements, environmental conditions, and government legislation. In addition, technical and technological solution frequently fails to operate and respond effectively to the needs of the people affected by disasters (Amaratunga *et al.* 2011). Despite being identified as a critical and colossal problem, post-disaster housing reconstruction projects do not draw much attention and remain poorly researched (Wilkinson *et al.* 2010; Ophiyandri, 2013; Nirooja, 2013; Ismail *et al*.2014). Factors that frequently pose real threats to the eventual success of reconstruction projects are rarely given appropriate consideration at the designing stage (Sadiki *et al*. 2012). Previous research conducted on challenges of post-disaster housing reconstruction shows that bypassing those factors which contribute to the poor quality of houses can have an adverse effect on entire PDHR project. This study seeks to explore the key challenges of post-disaster housing reconstruction projects by employing questionnaire surveys and exploratory interviews with villagers and stakeholders respectively.

6.1.1 Identification of challenges for PDHR projects from questionnaire survey

To identify the challenges that most the affected the villagers, questionnaire surveys were administered. Altogether, nine most cited challenges are included in the questionnaire survey. Respondents were given the questions in the Likert scale format and were invited to rank the barriers from 1 to five where 1 = not a barrier and 5 = extreme barrier. The barriers to post-disaster housing reconstruction projects are analysed with frequency distribution, and 95% confidence interval test.

Table 6. 1 Results of frequency distribution of the factors that affect PDHR projects

	NAB	SOAB	MB	Barrier	EB
Resource availability	0%		33.30%	36.80%	28.1
Lack of coordination among participant organisations	0%	1.00%	23.60%	63.90%	11.50%
Unavailability of appropriate land	0%	1.40%	30.60%	48.30%	19.80%
Poor quality of reconstructed houses	0%	1.40%	34.40%	44.10%	20.10%
Delay in project implementation	0%	0.70%	36.10%	54.90%	8.30%
Lack of community participation in decision making process	0%	0.30%	31.90%	57.60%	10.00%
Corruption	0%	1.00%	33.70%	58.70%	6.60%
Lack of funding	0%	1.70%	39.90%	48.60%	9.70%
Cultural barrier	0%	3.80%	48.30%	40.30%	6.60%

Notes: Scale ranges from 1 = not a barrier to 5 = extreme Barrier. NAB= Not a Barrier, SOAB = Somewhat of a Barrier, MB = Moderate Barrier, EB = Extreme Barrier.

The frequency distribution in table 6.1 shows that more than 28% of respondents mentioned availability of resources, 20.10% respondents poor quality of reconstructed houses, about 20% lack of available land, 11.50% lack of coordination among the participant organisations and 10% respondents lack of community participation as extreme barriers.

This result is quite similar with Chang, (2012); Singh, (2007); Wilkinson and Chang, (2010) and Jha *et al*. (2010) that lack of resources is the most critical challenges faced in post-disaster reconstruction and that the success of the whole project depends on the availability of resources.

Table 6. 2 Results of 95% confidence interval of the factors that affect PDHR projects

Factors affecting PDHR Projects	Mean	Confidence Interval	Lower bound	Upper bound
Resource availability	3.9	95%	3.81	4
Lack of coordination among participant organisations	3.85	95%	3.78	3.92
Unavailability of appropriate land	3.85	95%	3.77	3.94
Poor quality of reconstructed houses	3.82	95%	3.73	3.91
Delay in project implementation	3.8	95%	3.59	4.01

Lack of community participation in decision making process	3.76	95%	3.69	3.83
Corruption	3.69	95%	3.63	3.76
Lack of funding	3.65	95%	3.57	3.73
Cultural barrier	3.5	95%	3.42	3.58

As shown in table 6.2 that challenges associated with post-disaster housing reconstruction projects are ranked by the disaster victims and their responses are analysed by using 95% confidence interval. Table 6.2 shows mean values ranging from 3.90 availability of resources to 3.50 cultural barriers which mean availability of resources is the main barrier that affects PDHR projects. None of the overall mean scores are above 4. Barriers with a mean score above 3.90 are related to poor quality of reconstructed houses, poor coordination, delay in project implementation and avoiding corruption. By examining the lower part of the table, it can be observed that the four lowest ranking barriers in PDHR projects are lack of community participation in DCM, which ranked 6th, followed by corruption 7th, lack of funding 8th, and cultural barriers which ranked lowest.

6.1.2 Identification of challenges for PDHR projects from exploratory interview

This section is based on the results of semi-structured interviews with different stakeholders such as UNDP, OXFAM and other national and international non-governmental organisations relating to challenges associated with post-disaster housing reconstruction projects. The results associated with the challenges of post-disaster housing reconstruction projects from the interviews are summarised in the table below:

Table 6. 3 NVivo matrix coding of challenges of PDHR projects

Sl No	Themes on challenges of PDHR	Frequency
1	Lack of resources	15
2	Poverty	11
3	Lack of local materials	14
4	Salinity	4
5	Poor communication and transportation networks	8
6	Corruption	5
7	Lack of accountability and transparency	3
8	Delay in implementation	3
9	Lack of coordination among participant organisations	1
10	Ignoring local culture	2
11	Financial barriers	8

12	Lack of fund	6
13	Wrong beneficiary selection	1
14	Lack of construction expertise	2
15	Poor construction materials	2
16	Prioritising basic needs	1
17	Lack of community participation	8
18	Poor quality of reconstructed houses	8

There are many challenges, which impeded post-disaster housing reconstruction was highlighted in the interviews. These were related to the availability of required resources, construction materials, poor quality of reconstructed houses and corruption.

The NVivo matrix coding also shed light on different thoughts and views from stakeholders working in many organizations. As can be seen from the table 6.3, the lack of available resources has highest the nodes of 15, which means most of the respondents think lack of available resources is the top challenge present in PDHR projects. Lack of local materials has been ranked as the second highest nodes in the NVivo matrix analysis. The reference of NVivo matrix is 11 for poverty, 4 for salinity, 8 for poor communication and transportation networks, 5 for corruption, 3 for lack of accountability and transparency, 3 for delay in implementation, 1 for lack of coordination, among participant organisations, 2 for ignoring local culture, 8 for financial barriers, 6 for lack of funds, 1 for wrong beneficiary selection, 2 for lack of construction expertise, 2 for poor construction materials, 1 for prioritising basic needs and 8 for poor quality of reconstructed houses. This result of the NVivo matrix analysis is consistent with the findings of Klinken and Aspinall (2011); Chang (2012); and Hidayat (2013) that availability of resources is the most significant challenge for post-disaster housing reconstruction projects and they are also subject to corruption and low quality.

6.1.3 Critical discussion about challenges of PDHR projects

Housing reconstruction is probably the most significant activity in post-disaster reconstruction projects (Ophiyandri, 2013; Hidayat, 2013; Nirooja, 2013). After the relief period, housing is needed by the end users, as they bear the brunt of housing problems. But housing reconstruction projects are beset with problems that impede the total progression of reconstruction activities. As a result, providing quality houses to the population affected by disasters can become very cumbersome. This section discusses and sheds light on the key impediments associated with post-disaster housing reconstruction projects.

The data from the questionnaire surveys and semi-structured interviews were analysed using SPSS version 21 and NVivo version 10 respectively. The quantitative and qualitative data analysis revealed that PDHR projects face several challenges. The key challenges are related to availability of required resources, lack of local materials, lack of funds and poor quality of reconstructed houses.

Look for: Search In Nodes Find Now

Nodes

Name	Sources	References
Corruption	5	5
Delay in implementation	3	3
financial barriers	8	8
Ignoring cultural asoepcts	2	2
Lack of access to land	6	6
lack of accountability and transparency	3	3
lack of community participation	8	8
Lack of construction expertise	2	2
Lack of coordination among participant organiz	1	1
Lack of fund	6	6
lack of local materials	16	22
lack of resources	15	15
lack of access to land	4	4
poor communication and transportation network	8	8
Poor construction materials	2	2
porr quality of reconstructed houses.	8	8
Poverty	11	11
Prioritising basic needs	1	1
Salinity	4	4
ways to rebuild houses	1	1
Wrong beneficiary selection	1	2

Figure 6. 1 Overview of themes emerging from the qualitative data

The key challenges which are culled from the questionnaire survey and interviews are outlined below:

i) Lack of resources

The success of any post-disaster housing reconstruction project largely depends on the availability of required resources (Singh and Wilkinson, 2008). A lack of required resources (Steinberg, 2007); price escalation (Nazara and Resosudarmo, 2007); disruption of access to available resources (Green *et al*.2006); resource pressure (Chang *et al*.2010); and lack of available construction materials (Hidayat, 2013) could significantly exacerbate the resource availability leading to project failure and withdrawals, poor beneficiary satisfaction, cost overruns and delays in project delivery to the end.

The quantitative data analysis in chapter five table 5.47 shows that resource availability is the main challenge that disaster practitioners, international stakeholders and local governments face. Likewise, the qualitative data analysed by NVivo shows that lack of resource availability has the highest reference of 15 nodes which indicates that resource availability is the key factor that can play a pivotal role in completing the PDHR projects. One of the respondents stated:

Lack of resources is the main barrier that tremendously affects post-disaster housing reconstruction projects in Bangladesh because most of the coastal people affected by cyclone disasters are very poor and after the cyclones, they have no resources left to rebuild their houses. He also added that after disasters occurred, they feel difficulty in fulfilling basic needs let alone thinking of rebuilding their houses (Respondent 10, Cristian Aid Official, April 2016).

This result is quite consistent with the study of Steinberg (2007); Singh, (2007) and Chang (2012) that post-disaster housing reconstruction projects are affected severely due to the lack of available resources. The researcher of this study is in agreement with the above respondent's statement that lack of resources is one of the main barriers that can affect post-disaster housing reconstruction.

ii) Lack of construction materials

Disasters disrupt the functioning of the affected society as a whole. After the disaster, production, service, and factories are damaged and people working in different places become disaster victims. Demands for the construction materials become higher but the supply of those materials becomes scarce because many organisations need to run similar types of projects to rebuild houses for the affected communities.

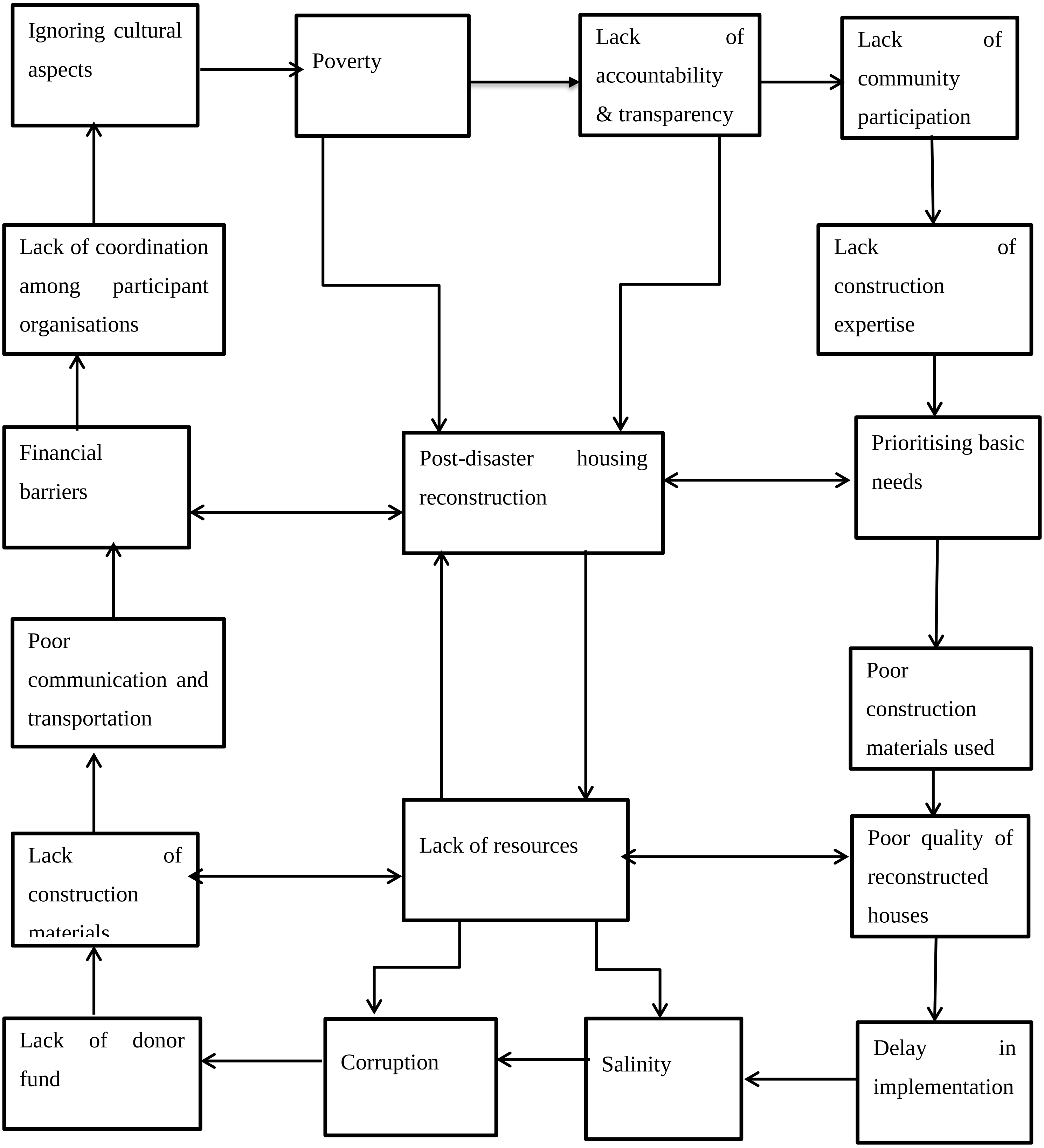


Figure 6. 2 Challenges of post-disaster housing reconstruction

Construction materials consists of timber, tree trunks, CGI sheets, RCC pillars, brick, cements, sand and iron rod. Housing reconstruction cannot be started due to the lack of these materials. According to the qualitative analysis by NVivo, 14 respondents mentioned their concerns that many affected people cannot start their rebuilding process due to the lack of vital construction materials which are highly needed by the beneficiaries. One of the interviewees explained:

Affected people face severe problems due to the unavailability of building materials like corrugated tins, timber, CGI sheets, brick, cements, sands and iron rod as they are very poor and having no money left to manage construction materials for their housing reconstruction (Respondent 4, UNDP Official, April, 2016).

This result is quite consistent with the findings of Chang (2012); Hidayat (2013); and Ophyandri (2013) that construction materials become significant factors that hamper PDHR projects. Construction materials affect housing reconstruction severely due to their lack of availability and due to poor communication networks in the cyclone Sidr and Aila affected areas.

iii) Poverty

Over the past two decades, the world has made major strides in human development and today, people are living longer, more children are going to school and more people have access to clean water and basic sanitation (Human Development Report, 2015). But the scenario is totally different in the cyclone affected coastal area of Bangladesh. People in Cyclone Sidr and Aila affected areas are very poor and the poverty rate is lower than national poverty. The national poverty rate of Bangladesh is 24.80% whereas the poverty rate of cyclone Sidr and Aila affected areas are 70-75% (Kabir, 2014). It is the root cause of all their problems. The average monthly income of cyclone Sidr and Aila affected areas is below 5000 BD taka which indicates that people affected by cyclones live in extreme poverty.

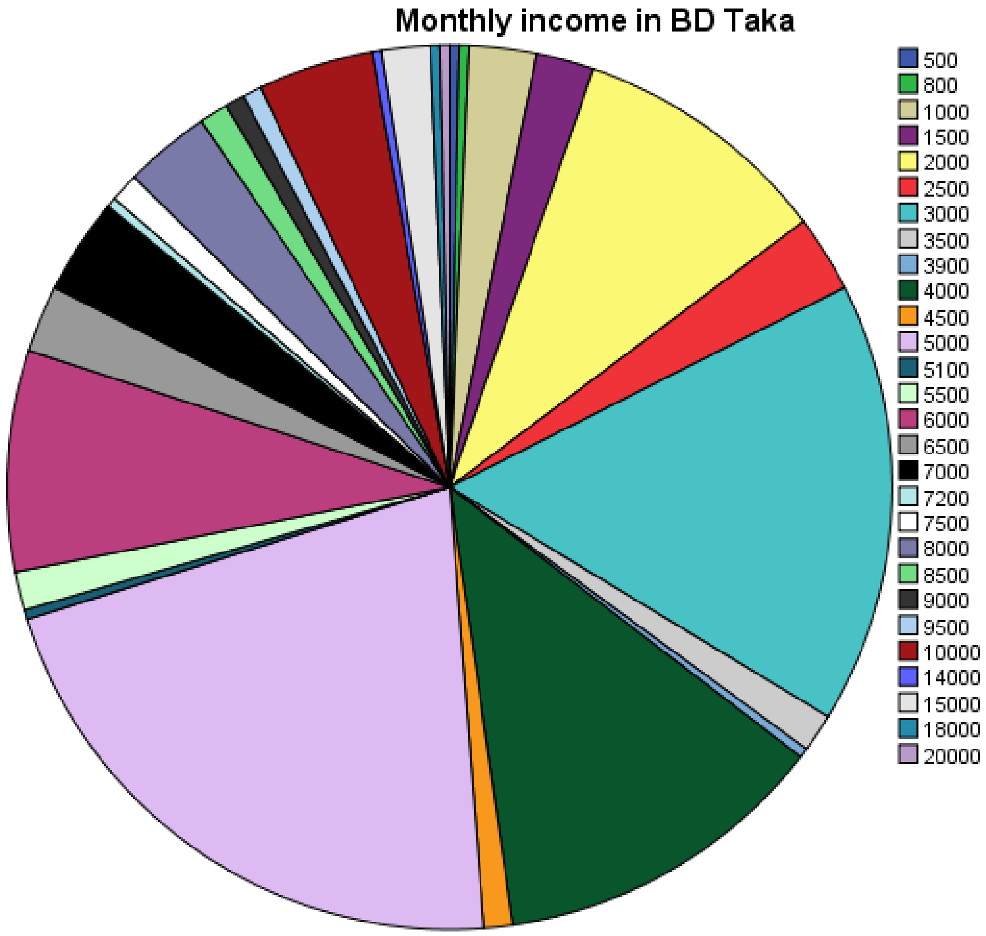


Figure 6. 3 Monthly incomes of Cyclone Sidr and Aila affected areas of Bangladesh

Source: Results of data analysis from this study.

The results of quantitative data analysis in chapter five (table 5.25 & 5.26) show that disasters victims are in acute poverty in all aspects of the poverty reduction determinants of affordability, capability to meet regular needs, access to recreation, per capita income, bearing regular expenses and satisfaction over income. The average mean value of poverty reduction determinants is below 1.5 which represents their poverty to prepare, cope, respond to disasters and rebuild their houses. The percentages of very low levels of capacity in terms of affordability, capability to meet regular needs, access to recreation, per capita income, bearing regular expenses and satisfaction over income is 61.8%, 57.6%, 69.1%, 62.5%, 58% and 66% respectively.

The qualitative analysis by NVivo in figure 6.1 shows that at least 11 respondents mention that poverty is a big barrier for post-disaster housing reconstruction because they are caught in a vicious cycle and subsequently are unable to rebuild their houses by themselves. Poverty has 11 nodes and 11 references in NVivo analysis. One of the interviewees highlighted that poverty is a major factor:

Poverty is a major concern and challenges for cyclone affected people to rebuild their houses as they are very poor, they struggle every day to buy their foods let alone spending money for housing reconstruction (Respondent 1, BRAC Official, April 2016).

This result is consistent with several studies that cite poverty as the root cause of all vulnerabilities (Twigg, 2001; Wisner *et al*.2004; Bosher *et al.* 2007) and that there is no vulnerability where there is no poverty (Schilder man, 2004; Balike *et al*.2004). The above statement of the respondent is quite supportive and similar to the findings of this study as about 93% of respondents are very vulnerable, in terms of withstanding future disasters and the percentage of poverty determining criteria of capacity in terms of affordability, capability to meet regular needs, access to recreation, per capita income, bearing regular expenses and satisfaction over income are 61.8%, 57.6%, 69.1%, 62.5%, 58% and 66% respectively.

iv) Lack of coordination

Coordination and communication can play a major role in successful post-disaster housing reconstruction projects as seen in the 2004 tsunami reconstruction, where it was a great challenge to coordinate hundreds of NGOs and agencies involved in reconstruction together with their experiences (Hidayat and Egbu, 2010). However, lack of coordination among the participant organisations is the most cited challenge to PDHR projects (Hidayat, 2013, Sadiki, *et al.* 2016). PDHR projects generally become unsuccessful and of poor quality due to lack of coordination among the participant organisations and local government. Coordination problems generally create gaps, inefficiencies, duplications and uncertainty (Hales, 2010; IKA *et al*. 2011; Ophiyandri, 2013).

The results of quantitative analysis in table 5.46 (chapter five) show that 63.9% of respondents mark a lack of coordination a barrier and 11.50% think lack of coordination is an extreme barrier for PDHR projects. The qualitative analysis shows that lack of coordination has 6 nodes with 6 references which indicate that at least six respondents mention lack of coordination among participant organisations as a significant challenge for PDHR projects. As one of the interviewees observed:

Lack of coordination is a big challenge for housing reconstruction after disasters. He added that agencies working in coastal belt did not communicate with each other for covering a specific area for building houses. As a result, some people are receiving housing assistance from different organisations but some people are missing receiving assistances. For example, many organisations including Islamic Relief, Muslim AID and Bangladesh government has built houses in deferent parts but in section 6 of Gabura Union in Satkhira districts, nobody receives either houses or assistance as cash but section 6 of that area is severely damaged by Cyclone Aila. (Respondent 191, affected villager at Gabura, April 2016).

v) Poor quality of reconstructed houses

Poor quality is one of the significant barriers for PDHR projects. Several studies have revealed that reconstruction projects often fail to satisfy the beneficiaries (Lyons *et al*.2010; Barenstein, *et al*. 2013; Kennedy *et al.* 2008; Boen and Jigyasu 2005; Silva, 2010; Steinberg, 2007; Nadiruzzaman, 2013). A study conducted by Paul and Nadiruzzaman (2013) reported that post-disaster housing reconstruction in Bangladesh after Cyclone Sidr 2007 did not maintain minimum quality and standards which ultimately fails to satisfy the end-users.

The results of quantitative data analysis show that the reconstructed houses for the beneficiaries of Cyclone Sidr and Aila affected areas in Bangladesh were very deplorable. The mean values (in table 5.34, chapter five) of durability, cultural acceptance, maintaining building codes, community participation and technological use are 1.60. 1.43, 1.34, 1.40, 1.28 respectively which means that reconstructed houses are not durable, not culturally accepted, not maintained by building codes, exhibit a lack of community participation and use insufficient technology. The average mean value of other factors that determine the safety and security of the respondents during strong storms is below 1.20 which indicates that disaster victims are not safe at all during cyclones. The results (in table 6.1, chapter six) also show that 44.1% of respondents mark poor quality of reconstructed houses as a barrier and 20.1% think it is an extreme barrier for PDHR projects. The qualitative analysis shows that poor quality of reconstructed houses has 8 nodes with 8 references which indicates that at least 8 respondents out of twenty mention that lack of coordination among participant organisations is a significant challenge for PDHR projects. One of the respondents stated:

Poor quality of reconstructed houses is a big challenge for housing reconstruction after disasters. He added that most of the built houses are very fragile and cannot sustain even in category 1 cyclone and those houses are made of CGI sheets, tents, corrugated tin and mud. As a result, affected people are not safe in the upcoming cyclones. He also explained that houses are built with very poor and cheap materials and even some houses have already been blown away for instance, tin from the roof of Islamic Relief house has been blown away already at Gabura in Satkhira districts of Bangladesh (Respondent 249, affected villager at Paddupukur, April 2016).

vi) Cultural barriers

Cultural barriers are one of the significant barriers that pose a real challenge to PDHR projects. Ignoring the importance of local culture can reduce the quality of the reconstruction projects and this is particularly true when reconstruction works are executed in collaboration with international organisations that have limited understanding about local culture (Coffee *et al*. 2014). Several studies have confirmed that reconstruction works are not culturally pertinent with the choice and opinion of local people (Johnson, 2007; Barenstein, 2013; Nadiruzzaman, and Paul, 2013). Boen and Jigaysu (2005) argued reconstruction projects that did not take social and cultural aspects into consideration face difficulties in completing the projects. For example, the Bangladesh government have undertaken projects that consist of building concrete houses to protect disaster victims from category 4 cyclones. The building looks resilient as it is made of brick, cement, sand and iron. However, the whole design of the building is flawed as the houses are limited to only one room with no doors and veranda. During interviews, people highlighted the fact that the Bangladesh government funded houses are made without any thought given to engineering design and there is no protection if there is a tidal surge, for instance, as they do not have a 1st floor. One of the interviewees explained that government funded houses in Gabura in Satkhira are only a one room buildings and are not useful at all.

The results of quantitative analysis (in table 6.1, chapter six) show that 40.30% respondents mark ignoring local culture as a barrier and 6.60% think it is an extreme barrier for PDHR projects. The qualitative analysis shows that cultural barriers have 2 nodes with 2 references which indicate that at least two respondents out of twenty mention ignoring local culture is a significant challenge for PDHR projects.

vii) Delay in project implementation

Delay in project implementation is another challenge that international stakeholders and local governments face. Several studies have confirmed that post-disaster housing reconstruction projects suffer from untimely starts due to delays (Jones, 2006; Ophyandri, 2013; Nissanka *et al.*2008; Kabir, 2009; Paul and Nadiruzzaman, 2013). Jones (2006) revealed in his study that PDHR projects were tremendously affected due to delays in implementation.

The results of quantitative analysis (in table 6.1, chapter six) show that about 55% of respondents mark delays in project implementation as a barrier and 8.3% think it is an extreme barrier. 95% confidence interval test results (in table 6.2) show that delay in project implementation has been ranked number five out of nine challenges. The qualitative analysis shows that delay in project implementation has 3 nodes with 3 references which indicate that delay in project implementation is a big challenge for PDHR projects. As one of the respondents observed:

Most of the projects are started late and the suffering of the people know no bounds and the completion of the PDHR projects and Cyclones Sidr and Aila area take ages (Respondent 11, NCCB Official, April 2016).

viii) Lack of access to land

Landlessness is a major problem in terms of post-disaster housing reconstruction for the people affected by cyclones in the coastal areas of Bangladesh. The number of landless people has increased by 22% over the last 35 years. For example, only 28% of people of Bangladesh were landless in 1972 (Hossain *et al.*2010) but the latest statistics show that about 4.5 million of the total population of Bangladesh is completely landless (BBS, 2010). The disaster victims generally lost almost everything including their land. Therefore, they cannot rebuild their houses after the disasters due to the lack of access to land. According to 95% confidence interval test results (in table 6.2), lack of access to land has been ranked number two out of nine challenges. The qualitative analysis shows that lack of access to land has 6 nodes with 6 references. One of the interviewees explained:

Most of the affected people are very poor and they have lack of access to land and it works as stumbling blocks for them to rebuild their houses because without land they cannot rebuild their houses (Respondent 19, KARITAS Official, April 2016).

ix) Lack of community participation

Disaster researchers, policy makers and disaster housing reconstruction practitioners have emphasized the community participation in PDHR projects. However, the term community participation is still not clearly defined (Davidson *et al*. 2007). Community refers to a group of people, residents or locally based organisations that have a similar environment, shared responsibility or have incurred similar types of problems. In terms of post-disaster housing reconstruction, community participation means people affected or not affected by disasters will engage in different activities such as sharing cultural aspects, choosing their own housing design, material selection and preparation, and providing assistance to the affected people to recover them from the sudden shock. Davidson *et al.* (2007) revealed that community participation plays an important role in empowering beneficiaries or community members to become part of the political process and to have a voice in decisions that shape the community. In contrast, Choguill (1996) and Arnstein (1969) argued that beneficiaries with low access to resources cannot play a part in the decision-making process because they have little or no control over the overall projects.

The quantitative data analysed by frequency distribution and 95% confidence interval show that disaster victims have a very low level of participation in post-cyclone Sidr and Aila housing reconstruction. According to the results of 95% confidence interval test (in table 5.58, chapter five), design of the houses has been ranked their main option among other determinants with the mean value of 1.48. The average mean value of the level of their participation is below 1.50 which indicates that the affected population has a very low level of participation in terms of giving opinions on the design of the houses, selection of construction materials, choosing technological use and whether permanent or temporary houses to should be made.

The results of quantitative analysis (in table 6.1) also show that 57.60% of respondents mark lack of community participation as a barrier and 10% think it is an extreme barrier for PDHR projects. The mean values displayed in table 5.58 shows that giving opinions on making houses, choosing the design of the houses, selection of construction materials, choosing technological use and permanent or temporary houses are 1.44. 1.48, 1.47, 1.41, 1.32 respectively, which means that affected people have very low levels of participation in terms of all the determinants of community participation.

The qualitative analysis shows that lack of community participation has 8 nodes with 8 references which indicate that at least 8 respondents out of 20 mention that lack of community participation is a big challenge for PDHR projects. One of the interviewees explained:

Community participation is very significant in terms of PDHR projects but people affected by cyclones are not given opportunities to take part in decision-making process about the choice of design and materials required for the projects. He added that this is the agencies who are actively involved in the whole projects from start to completion (Respondent 20, OXFAM Official, April 2016).

x) Corruption

Corruption is a major obstacle associated with post-disaster housing reconstruction that affects the overall progress of the entire projects. Lack of accountability and transparency leads to corruption in PDHR projects. Generally, the success rate of PDHR projects decreases due to the recurring corruption. There is also evidence that 91% of individuals in disaster management and relief sectors are involved in corruption (Mahmud and Prowse, 2012). A study conducted by Paul and Nadiruzzaman (2014) revealed that government officials in Bangladesh especially in cyclone Sidr affected coastal areas, are found to take bribes, while listing the disaster victims’ names to obtain government assistance for their housing reconstruction. They added that respondents made complaints to them (researchers), that if they do not give bribes to the government officials, then they won’t register their names on the list. Likewise, Benson and Clay (2002) found in their study that PDHR projects are found to have issues like governance deficits, undisclosed policy, unavailability of clarity, non-availability of project information, and serious allegation of political interference in project selection, lack of transparency and accountability in project implementation.

The results of the quantitative analysis (in table 5.46, chapter five) show that more than 58% of respondents mark corruption as a barrier and 6.60% think it is an extreme barrier for PDHR projects. The qualitative analysis shows that corruption has five nodes with five references, which indicates that five respondents out of twenty mention corruption among participant organisations is a significant challenge for PDHR projects. One of the interviewees mentioned:

Corruption is a big barrier for PDHR projects in Bangladesh. He added that due to the corruption, people from most severely affected areas are overlooked and they are not given any government assistance in rebuilding their houses. For example, in the case of Cyclone Sidr, the vastly affected areas near Boleswar river was overlooked even government donated or international organisation funded houses are not seen but so many houses are seen by Muslim Aid where the severity of Sidr is less (Respondent 269, affected villager at South Khali, April 2016).

6.2 Summary and link

This chapter discusses the challenges associated with post-disaster housing reconstruction projects in the post-cyclone Sidr and Aila area of Bangladesh. It starts with the challenges of PDHR projects from the questionnaire survey as well as challenges were culled from the exploratory interviews with experts involved in post-cyclone housing reconstruction in coastal Bangladesh. Finally, it discusses the challenges and sheds light on the most significant challenges that affect the post-disaster housing reconstruction projects.

After having discussed the key challenges associated with post-disaster housing reconstruction projects in this chapter, the next chapter analyses the perception of disaster victims and key stakeholders on post-Sidr and Aila housing reconstruction in Bangladesh.

CHAPTER 7 PERCEPTION OF DISASTER VICTIMS AND KEY STAKEHOLDERS ON POST-SIDR AND AILA HOUSING RECONSTRUCTION

This chapter places emphasis on information obtained from semi-structured interviews of affected villagers and key stakeholders from national and international organisations to contribute to new insights into theoretical and practical issues. It is based on the results of qualitative data gathered from semi-structured interviews of 20 stakeholders from national and international organisations. Data were analysed by using a six-phase thematic data analysis techniques introduced by Braun and Clark, (2006). It evaluates and presents respondents views on this research by employing a rigorous thematic approach. More specifically, it discusses respondents' level of access to resources, materials used for housing reconstruction, key challenges of PDHR projects in Sidr and Aila affected areas of Bagerhat and Satkhira in Bangladesh, conditions of existing houses, key success factors of resourcing, factors contributing to livelihood recovery and stakeholders' involvement in post-disaster housing reconstruction. Finally, this chapter seeks to address the questions of how the affected villagers can rebuild dynamic cyclone resilient houses despite having low levels of access to resources.

7.1 Administering interview

Semi-structured interviews were used to collect qualitative data for this study. This section discusses the modus operandi used to administer the interviews, key questions used in interviews, process of data transcription and analysis. A total of twenty key stakeholders who have experience and knowledge regarding post-Sidr and Aila housing reconstruction have been interviewed. Respondents from UNDP, OXFAM and other national and international NGOs were chosen for semi-structured interview.

The semi-structured interviews were conducted with prior written consent from the interviewees. The respondents were sent interview details, including the purpose of the interview, questions, consent forms, location and duration of the interview, via email prior to the interview date. After receiving responses from the respondents, interviews were at the participants' convenience.

7.1.1 The interview questions

A semi-structured interview format was used to conduct interviews as a strategy for gathering qualitative data. The data used in this research was the extracts from 20 semi-structured interviews lasting about 35 minutes on an average. Discussions with respondents during interview were based on the central research questions of this study. Respondents were asked general questions about their personal details, position and working experience in their sectors and discussion then went ahead about their ideas and thoughts on respondents level of access to resources, ways to rebuild houses, factors that affect their housing reconstruction, whether houses are cyclone resilient or not, roles and strategies of the organisation involved in rebuilding houses, materials used for reconstruction, key factors of resourcing, ways to recover livelihoods, and ways to build dynamic cyclone resilient houses and the importance of community participation in post-disaster housing reconstruction. However, interview questions were summarised in the table below:

Table 7. 1 Interview questions (Summarised)

Stages	Summarised questions
Availability of resources	Whether disaster victims have sufficient resources to rebuild their houses?
Housing reconstruction	How do they rebuild their houses?
Barriers of reconstruction	What are the factors that affect post-disaster housing reconstruction?
Existing houses	Whether built houses are cyclone resilient?
Types of houses	Houses that can withstand future cyclone?
Organisations responsibility	What are the roles that organisation played in rebuilding houses?
Strategies	What are the strategies that organisation applied in reconstructing houses?
Success factors	What are the key success factors of resourcing?
Dynamic resilient houses	How can disaster victims build dynamic resilient houses?
Materials used	What are the materials used for housing reconstruction?
Livelihood recovery	Ways affected people recover livelihoods?
Vulnerability	Whether their vulnerabilities have been reduced?
Community participation	Is community participation important in building cyclone resilient houses?

7.1.2 Demographic profile of the interviewees

Respondents were chosen based on their experiences of international humanitarian assistance to disaster victims as well involvement in reconstruction projects especially after cyclone Sidr and Aila.

Table 7. 2 Profile of the respondents for semi-structured interview

SL No	Designation	Name of organisation	Experience level
Interviewee 1	Programme manager	BRAC, Bangladesh	5 Years
Interviewee 2	Project Manager	Habitat for the Humanity	10 Years over
Interviewee 3	Project Coordinator	Habitat for the Humanity	8 Years
Interviewee 4	Programme Manager	UNDP	10 Years +
Interviewee 5	Project Adviser	UNDP	5 Years
Interviewee 6	Project Manager	IFRC	10 Years+
Interviewee 7	Project Coordinator	IFRC	9 Years+
Interviewee 8	Director	Ahsania Mission	15 Years+
Interviewee 9	Project officer	Ahsania Mission	10 Years
Interviewee 10	Disaster Adviser	Christian Aid	11 Years+
Interviewee 11	Director	NCCB	15 Years+
Interviewee 12	Project Manager	Islamic Aid	12 Years+
Interviewee 13	Project Coordinator	Islamic Aid	7 Years
Interviewee 14	Programme Manager	Action Aid	10 Years
Interviewee 15	Lecturer	BRAC University, BD	9 Years+
Interviewee 16	Assistant Manager	Catholic Relief	13 Years
Interviewee 17	Programme Manager	Tear Fund	11 Years+
Interviewee 18	Deputy Secretary	Ministry of Disaster Management	8 Years
Interviewee 19	Programme Manager	KARITAS	9 Years+
Interviewee 20	Project Coordinator	OXFAM	6 Years

The researcher of this study has interviewed 20 respondents from fifteen different national and international organisations. Two respondents were chosen from Habitat for the Humanity, UNDP, IFRC, Ahsania Mission, and Islamic Aid and one respondent from the rest of the organisations.

7.2 Thematic analyses of interview data

The interview data of this study was analysed by using qualitative approach of thematic analysis. Thematic analysis is the most widely used qualitative approach to analysing interview data (Jugder, 2016). The goal of thematic analysis is to identify, analyse and report pattern (themes) within the data which are importantly interesting and use these themes to address research questions (Cathan & Thomas, 2004; Jugder, 2016). It is more than just summarising data and it makes sense of analysed data. This study employed a six-phase qualitative data analysing technique of thematic analysis introduced by Braun and Clark (2006). The reason for choosing this method was rigorous thematic data analysis techniques can provide an insightful analysis that can answer specific research questions (Braun and Clark, 2006; Jugder, 2016). The six phases of data analysis techniques are given below:

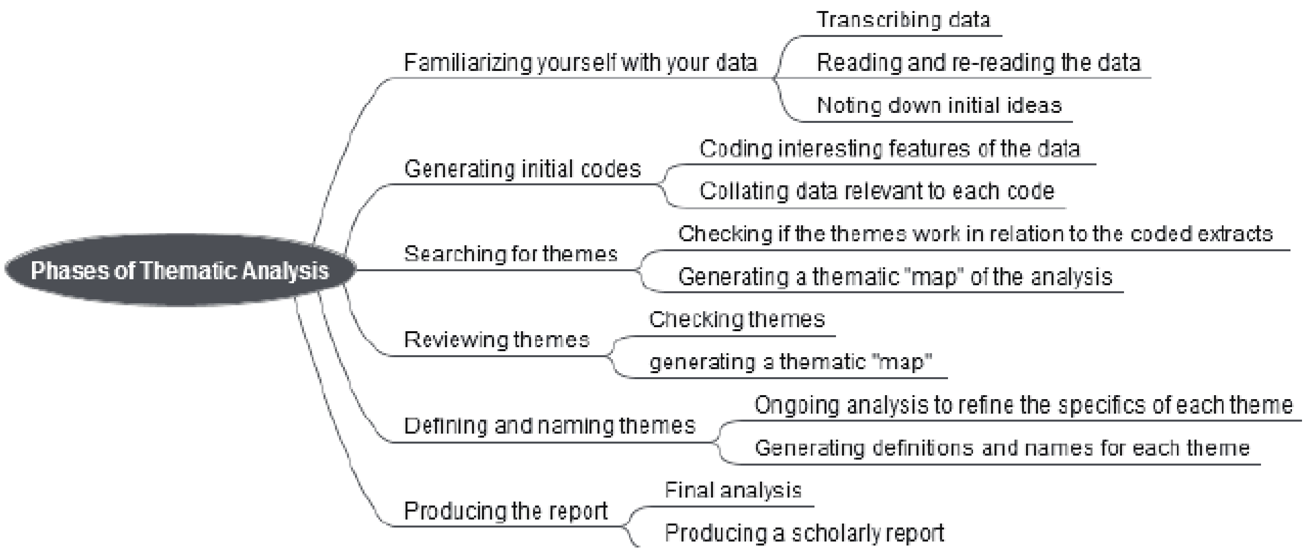


Figure 7. 1 Process of thematic analysis of interview data

Adapted from Braun and Clark, 2006.

Step 1: Become familiar with the data

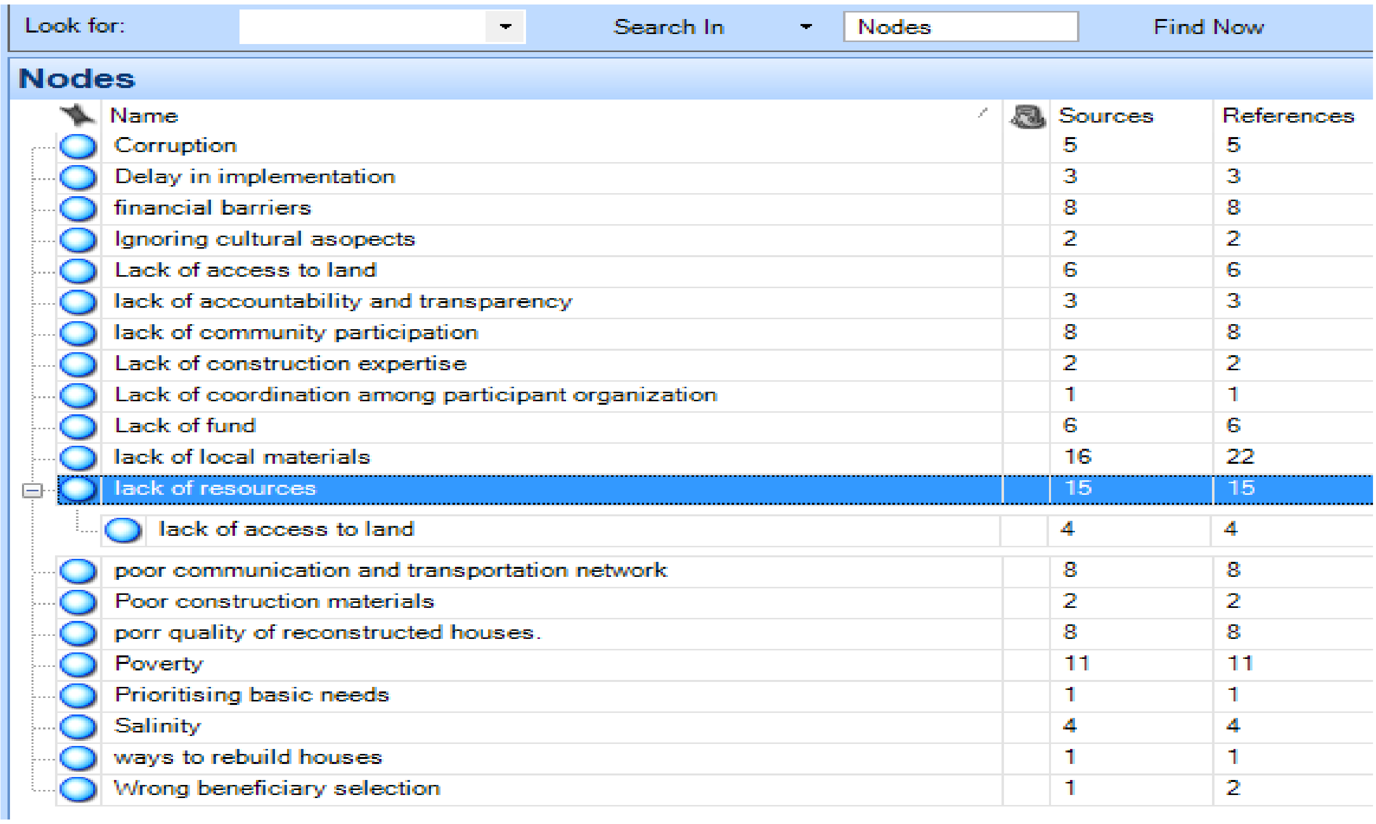
To become familiar with the interview data is the first step in qualitative data analysis technique. This involves reading and re-reading the interview data after transcribing of it. The researcher of this study became familiar with the interview data by playing and replaying recorded interview data and transcribed verbatim in Microsoft Office Word. The transcribed data was read through to gain primary ideas and thoughts against each question that respondents were asked in semi-structured interview. For instance, information regarding respondents' level of access to resources, ways to rebuild houses and the factors that affect their housing reconstruction was tried to retrieve from the transcribed data.

Step 2: Generate initial codes

In this second phase of thematic analysis, data were organised in a meaningful and systematic way. Data coding reduces lots of data into small chunks of meaning (Maguire & Delahunt, 2017). Data coding can be conducted in different ways and the method of coding data was based on research aims and research questions of this study. In this phase of analysis, the transcribed audio files were imported into the NVivo. NVivo is the most notable developments in qualitative data analysis in recent years that facilitates the analysis of qualitative data (Bryman and Bell, 2015). In NVivo data analysis, data are coded for analysis and coding data is one of the key phases in the whole process of qualitative data analysis (Ibid). NVivo is a fairly simple tool to use and has the flexibility of allowing documents to be imported directly from a word processing package and while coding data, coding stripes can be made visible in the margins of documents so that the researcher can see at a glance which codes have been assigned to what portion of the transcripts (Samwinga, 2009). While analysing qualitative data, the researcher can create nodes and memos for analysis.

Process of coding interview data

The data coding process involves isolating segments of text and coding them for future retrieval and linking with other segments of the text. In NVivo, coding is the process of marking passages of text in a project's documents with nodes (Bryman and Bell; 2015, Sarantakos, 2005). Nodes are the route by which coding is undertaken and is defined as a collection of references about a specific theme, place, concepts and other areas of interest (Bryman and Bell, 2015). Thus, coding is a modus operandi of storing and recording all ideas, concepts, categories, thoughts, image data and field work notes, so that the researcher can retrieve the coded data for further analysis. Before coding qualitative data, themes were extracted by using the six-phase thematic analysis techniques of qualitative data in figure 7.1 in this chapter. Codes were indexed by selecting a segment of texts in Microsoft Word document which was transcribed after playing and replaying recorded audio files from each interview. A created node is said to code those highlighted texts in the project document. Besides these, the researcher of this study has selected a particular segment of the text under a particular node and highlighted it and dragged it into the expected nodes. The highlighted texts which were coded to a particular node were also highlighted in colour. The coding process of creating nodes is listed below:



Look for: Search In Nodes Find Now

Nodes

Name	Sources	References
Corruption	5	5
Delay in implementation	3	3
financial barriers	8	8
Ignoring cultural asopects	2	2
Lack of access to land	6	6
lack of accountability and transparency	3	3
lack of community participation	8	8
Lack of construction expertise	2	2
Lack of coordination among participant organization	1	1
Lack of fund	6	6
lack of local materials	16	22
lack of resources	15	15
lack of access to land	4	4
poor communication and transportation network	8	8
Poor construction materials	2	2
porr quality of reconstructed houses.	8	8
Poverty	11	11
Prioritising basic needs	1	1
Salinity	4	4
ways to rebuild houses	1	1
Wrong beneficiary selection	1	2

Figure 7. 2 Process of Creating Nodes in NVivo

Step 3: Search for themes

As stated earlier, a theme is a shape or pattern that captures the key ideas about the data in relation to the research question. But there are no hard and first rules about what makes a theme and a theme is characterized by its significance (Braun and Clark, 2006; Boyatzis, 1998). After data was prepared and organised, the information regarding access to resources, vulnerability reduction, barriers of post-disaster housing reconstruction and key success factors of resourcing was read through in details. The reason for doing this was to identify general ideas of the respondents, overall depth, credibility and reliability and use of the information extracted (Creswell, 2014). In this stage, coded data were examined and were searching for themes.

Table 7. 3 Data extracted from interviews and coded with theme

Extracted data from interview	Coded for	Theme
After cyclone occurred, they lost their houses. They basically lost everything	Impact of cyclone on houses	Disaster victims can not rebuild houses
Local government and other agencies build up houses for them	Assistance for reconstruction	Strategies to rebuild houses

Lack of financial resources, lack of accountability, transparency,	Factors affecting reconstruction	Barriers to housing reconstruction
90% organisations use corrugated tin and GI sheets as a routine	Poor materials for reconstruction	Houses are not cyclone resilient
They need to make houses with concrete buildings that is made of	Reinforced houses	Features of cyclone resilient houses
We have helped 480 families in cyclone Sidr and Aila affected areas	Stakeholder's involvement in reconstruction	Strategies of stakeholder in reconstruction
Community participation, effective monitoring and evaluation,	Factors contributing to successful reconstruction	Key success factors of resourcing
Houses are normally made with bamboo fence, woods, mud,	Materials used for reconstruction	Ways to reconstruct houses
Access to resources as microfinance, cheap rate loans and income generating activities	Ways to recover livelihoods	The impact of access to resources to livelihood recovery

As soon as the data were refined by finding its depth, credibility and reliability, it was coded using NVivo version 10. After finishing the coding stage, all endeavours were taken to generate a description or themes for analysis. Description involves a detailed rendering of information about people, places or events in a setting and theme involves exploring what the main ideas of the respondents are regarding specific subjects. Interconnecting themes from the description is the next stage. It involves advancing the themes from the description towards interrelating themes. This involves a discussion that covers the chronology of events, the detailed discussion of several themes or a discussion with interconnecting themes.

Step 4: Review and refine themes

In this stage of thematic analysis, the researcher of this study modified and reviewed the preliminary themes which were identified in step three. Considerations were given whether those themes make sense, does the theme correspondent research questions and are themes fitting within the data? For instances, disaster victims' inability to rebuild houses was the preliminary theme for the impact of cyclone on houses and it was reviewed and modified into respondents' level of access to resources because it did not work well.

Table 7. 4 Refined and modified themes from exploratory interview

Extracted data from interview	Coded for	Theme
After cyclone occurred, they lost their houses. They basically lost everything	Impact of cyclone on houses	Respondents' level of access to resources

Local government and other agencies build up houses for them	Assistance for reconstruction	Stakeholders' involvement in reconstruction
Lack of financial resources, lack of accountability and transparency	Factors affecting reconstruction	Barriers to housing reconstruction
90% organisations use corrugated tin and GI sheets as a routine	Poor materials for reconstruction	Materials used for reconstruction
They need to make houses with concrete buildings that is made of brick, cement, sands	Reinforced houses	Features of cyclone resilient houses
We have helped 480 families in cyclone Sidr and Aila affected areas	Stakeholder's involvement in reconstruction	Strategies of stakeholder in reconstruction
Community participation, effective monitoring and evaluation,	Factors contributing to successful reconstruction	Key success factors of resourcing
Houses are normally made with bamboo fence, woods, mud	Materials used for reconstruction	Condition of existing houses
Access to resources as microfinance, cheap rate loans and income generating activities	Ways to recover livelihoods	The impact of access to resources to livelihood recovery

Likewise, houses are not cyclone resilient were the initial themes for poor materials used for reconstruction and it was reviewed and modified into materials used for reconstruction. Similarly, ways to reconstruct houses were the initial theme for materials used for reconstruction and it was refined and modified into condition of existing houses. Strategies to rebuild houses were the initial themes for assistance for reconstruction which were reviewed and modified into stakeholders' involvement in housing reconstruction. Furthermore, data associated with each theme were read and considered whether gathered data support each theme.

Step 5: Define themes

The final phase in qualitative data analysis is the interpretation of data or seeking results from the data. This is the essence of the analysis and it involves a meaning derived from a comparison of the findings, with information gleaned from the literature or theories (Creswell, 2014). In this phase, the researcher of this study refined each specific theme and generated definition of it. A thematic map was also developed by reviewing and refining carefully each theme which emerged from the semi-structured interviews. The researcher of this study also examined all the data extracted from the interview for each theme and ensured that extracted data were appropriate against each theme. Information that did not fit into any theme was excluded. The thematic map which was developed after examining each theme was defined below:

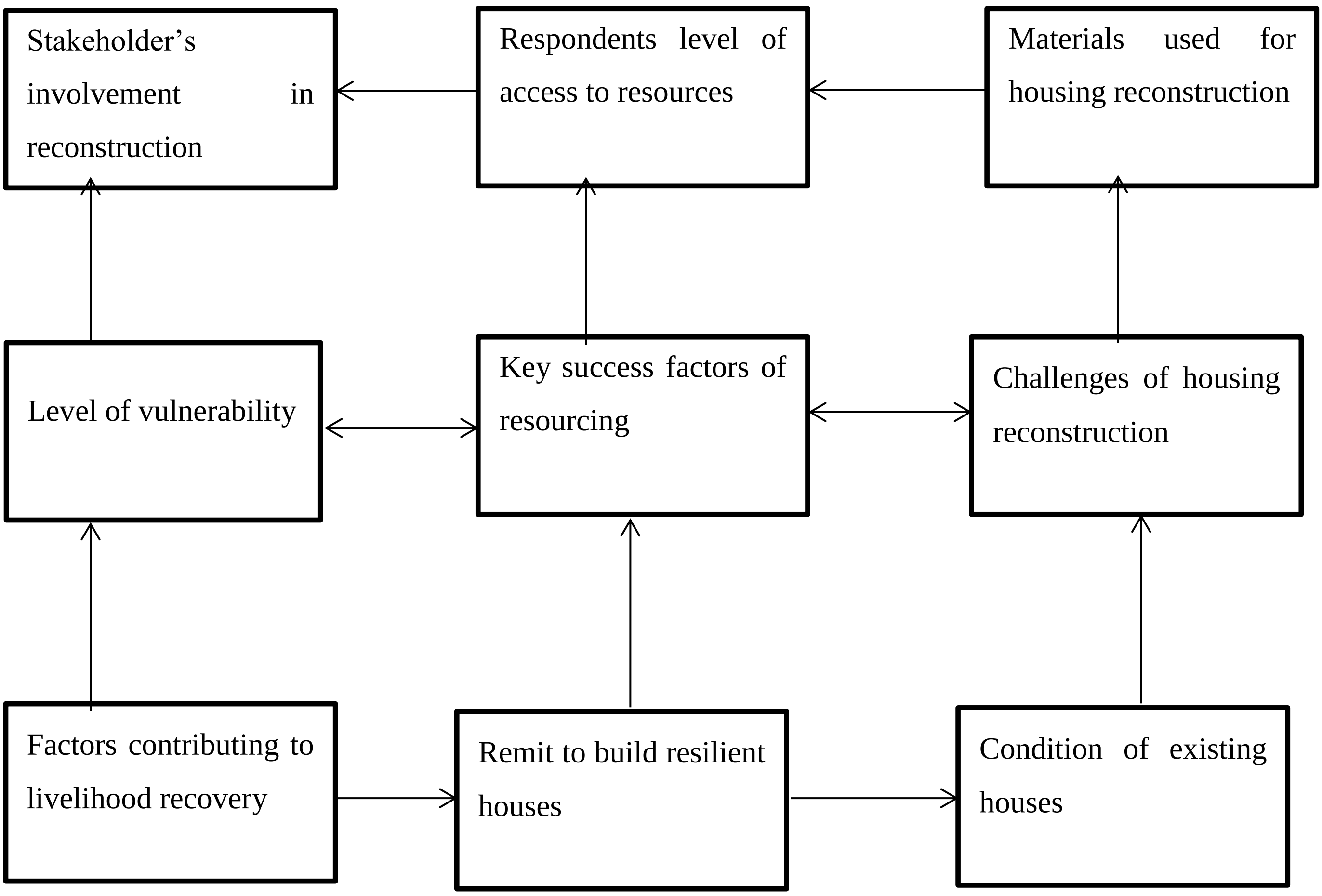


Figure 7. 3 Thematic map of qualitative data analysis

Step 6: Producing the report

This is the last stage of thematic analysis introduced by Braun and Clark (2006). In this phase, a final analysis is conducted following producing a scholarly report on respondent's views which are significant for this research project. This is because most of the respondents who took part in semi-structured interview were experienced on post-disaster housing reconstruction projects as they were directly involved with such project from early recovery to end the housing reconstruction project and they were also involved in initial needs assessment as soon as the cyclone strikes the coastal people of Satkhira and Bagerhat in Bangladesh. However, the key themes that emerged from the six-phase thematic analysis were delineated below:

7.3 Key themes emerges from exploratory interview

The thematic analysis of qualitative data from semi-structured interviews revealed some significant issues that can determine the disaster victim’s level of access to resources; factors that generally affect housing reconstruction and remit to rebuild dynamic cyclone resilient houses for cyclone Sird and Aila affected people. The findings from the interview have been derived as a theme after analysing and transcribing the audio files by following six-phase thematic data analysis technique introduced by Braun and Clark (2006). The themes that emerged from the analysis are: respondents’ level of access to resources, materials used for housing reconstruction, techniques and strategies to rebuild disaster victims’ houses, factors affecting post-disaster housing reconstruction, ways to build dynamic cyclone resilient houses, roles and strategies of stakeholders in rebuilding the houses of disaster victims, key success factors of resourcing, factors contributing to livelihood recovery and community participation in post-disaster housing reconstruction.

7.3.1 Respondents’ level of access to resources for PDHR

Access to required resources is a pre-requisite for disaster victims to rebuild their houses. They cannot rebuild houses without a sufficient amount of resources. They need resources as well as construction materials to reconstruct houses. The results of the quantitative analysis in chapter five show that people affected by cyclones Sidr and Aila are very poor. They cannot rebuild houses due to insufficient amount of resources. Most of the time, they depend on external humanitarian assistance for reconstruction. Likewise, chapter five confirmed that they do not receive a sufficient amount of resources to rebuild houses.

Nodes

Name	Sources	References
Wrong beneficiary selection	1	2
Sufficient amount of resources to rebuild houses	0	0
Poor construction materials	2	2
Prioritising basic needs	1	1
lack of community participation	8	8
ways to rebuild houses	1	1
they don't have any resources to rebuild their houses.	14	16
inadequate resources	7	7

Figure 7. 4 Coding structure of level of access to resources

However, the qualitative data analysis from semi-structured interviews also shows that people affected by both cyclones Sidr and Aila has very low levels of access to resources. The data analysis by NVivo shows that at least 14 respondents mentioned that disaster victims have a very low level of access to resources to rebuild their houses and no respondents mentioned disaster victims having sufficient resources to rebuild. One of the interviewees commented:

> In terms of cyclone Sidr and Aila, the scenery was totally different. It was category 4 cyclone. So during that time people were affected severely and it was well reported nationally and internationally. Donors were aware about the situation what is going on there. Due to timely communication, resources were there but may be not adequate because damage was massive. Each shelter needs lots of money. For this, donors were not interested in housing reconstruction rather they were interested in coverage. Therefore resources were but not adequate (Respondent 3, Habitat for the Humanity Official, April 2016).

> In response to your question, I personally believe they don't have any resources to rebuild their houses in terms of availability of resources, in terms of managing and spending resources for reconstruction, they have no access to resources to rebuild their houses (Respondent 2, Habitat for the Humanity Official, April 2016).

> I am a day labourer. I earn 80 taka per day. I struggle every day to buy food. I have no money left to build my house. Agency makes my house with tin and mud wall. I cannot improve the condition of my house due to lack of money (Respondent 250, affected villager at Sharankhola, April 2016).

The results from quantitative data analysis, qualitative data analysis and opinions from respondents working in post-Sidr and Aila reconstruction show that people affected by Sidr and Aila have a very low level of access to resources to rebuild their houses. As a result, they rely on local government and national and international organisations to rebuild their houses.

7.3.2 Materials used for rebuilding houses

Disaster victims suffer from lack of resources; they cannot rebuild houses by themselves. In most cases, local government, national and international NGOs, and international stakeholders, for example UNDP, OXFAM and IFRC rebuild their houses. But in some cases, houses are built by themselves or relatives. However, the percentage of self-reconstruction is very poor. The results of quantitative analysis in chapter five show that self-reconstruction rate is only 17.80%. In terms of housing reconstruction, in most cases materials such as bamboo, CGI sheet, wood, mud and RCC pillars are used for building.

Nodes

Name	Sources	References
Assistance by government	6	6
Bamboo	9	9
Built by relatives	1	1
Built houses by golpata	1	1
CGI sheets	6	6
Corrugated tin	7	7
Damage part of the house	1	1
inadequate resources	7	7
International stakeholder	4	4
Mud	3	3
National and international NGOs	3	4
Poor construction materials	2	2
Prioritising basic needs	1	1
RCC Pillar	4	4
Scrap materials	1	1
Self-reconstruction	2	2
ways to rebuild houses	1	1

Figure 7. 5 NVivo matrix coding of materials used for reconstruction

The data analysis by NVivo in the above figure shows that bamboo, mud, CGI sheets, corrugated tin, RCC pillars and scrap materials were generally used in post-Sidr and Aila housing reconstruction. At least 9 respondents mentioned bamboo as the main material that disaster victims use for reconstruction. Likewise, corrugated tin, CGI sheets and RCC pillars have got nodes of 7, 6, and 4 respectively. According to one of the respondents working in an international organisation:

> In our country, houses after the cyclone are built by local government and national and international NGOs. Some are built by relatives of the affected people, UNDP get involved for reconstruction. Till now after Sidr and Aila, recovery was not done fully. Some houses are built by UNDP through the partner organisation such as Karitas, and Muslim Aid. UNDP has responded to the housing problems. Some houses are built by BRAC under the direct supervision of UNDP (Respondent 11, NCCB Official, and April 2016).

> My house is a Saudi model house. It is built with tin on roof and bamboo fence as a wall. We are worried while cyclones. Our house looks like very weak during cyclones (Respondent 65, affected villager at Gabura, April 2016)

> In terms of materials, we found that they build their houses with basic and primary materials which are very fragile, cheap and not cyclone resilient. The materials are bamboo, corrugated tin, and muds etc (Respondent 18, Government Official, April 2016).

> Access to resources is the main determinants to rebuild houses for them. They try to construct first according to the available resources they have. They normally rebuild their houses with very poor materials which are CGI sheet, mud, RCC pillars ((Respondent 20, OXFAM Official, April 2016).

> I got a brick built house from Bangladesh government. The house is a brick built house. But it is a one room building; it has no veranda and no separate door. There is no proper planning and design in my house (Respondent 151, affected villager at South Khali, April 2016)

Experiences like this are recounted by many disaster affected coastal people of Bangladesh, undermining the effectiveness of resourcing in terms of their post-Sidr and Aila housing reconstruction. This is because their houses are generally built by either local government or national or international organisations and cheap materials such as CGI sheets, corrugated tin and tents are used for reconstruction, making their houses deplorable. As a result, those houses cannot provide safety and security during strong cyclones such as a category 4 cyclone.

7.3.3 Condition of existing houses

The condition of existing houses is very fragile and deplorable. It has been seen that some of the houses built by different organisation, including Islam Relief, have already been blown away in the study area of Gabura Union, Satkhira. The quantitative data analysis (in chapter five) confirmed that more than 50% houses are built using permanent tin roofs and only 3.80% of houses use reinforce concrete, which means most of the houses are built out of corrugated tin, which can be blown away by strong winds. There are some houses which have been built by local government and UNDP concrete and cyclone resistance materials but those houses are very few and far between. A few local people, who have political connections, have been selected to receive those houses.

Nodes

Name	Sources	References
Assistance by government	6	6
Damage part of the house	1	1
Deplorable	1	1
Fragile	2	2
inadequate resources	7	7
International stakeholder	4	4
no building quality	1	1
Not cyclone resilient	10	10
Resilient	1	1
Tidal surge resilient	2	2

Figure 7. 6 Themes emerges from qualitative data on the condition of existing houses

The analysis shows that most of the houses are not cyclone resilient and it is confirmed by the quantitative analysis in chapter five. As can be seen from figure 7.6, non-cyclone resilient house has got 10 nodes out of 20 respondents. On the other hand, tidal surge resilient and fragile houses have got 2 nodes respectively. In contrast, only one respondent mentioned that existing houses are cyclone resilient. One of the respondents stated:

> I think most of the houses in coastal area of southern part of Bangladesh after cyclone Sidr and Aila are not cyclone resilient or tidal surge resilient, they are very fragile and deplorable because those houses are built with bamboo, muds and CGI sheets, it cannot protect them in tidal surge as well (Respondent 1, BRAC Official, April 2016).

> I do not receive any assistance from government or organisations. The local government officials told me to give him bribe to put my name on the list. As I have no money to give him, they do not put my name on the list (Respondent 101, Gabura, April, 2016).

This is very special and crucial question if you consider cyclone Sidr, media coverage and all the donor attractions were there. Therefore, thousands of families got support but the issue is when construct or rebuild the houses for them, 90% organisations use corrugated tin and GI sheets as a routine materials and side walls but corrugated tin and CGI sheets are not cyclone resilient. Therefore, we cannot say that those houses are cyclone resilient (Respondent 2, Habitat for the Humanity Official, April 2016).

> I receive 10,000 taka (£100) for housing reconstruction. But this money is not sufficient for building my house. I spent this money for emergency food, clothing and drinking water. I have no money left to build my houses. I live in tents (Respondent 86, affected villager at Gabura, April 2016).

> In general, they try to rebuild some resilient houses but it is not always the case, there are no standard guidelines for cyclone resilient houses in Bangladesh. No, they are not cyclone resilient because they have lack of resources and donor fund amount was not enough to rebuild resilient houses (Respondent 7, IFRC Official, April 2016)

Cyclones Sidr and Aila affected coastal people of Bangladesh bear the brunt of the effect of cyclones due to their deplorable and fragile houses which cannot protect them during strong cyclones and tidal surges. The condition of existing houses is deplorable and the structure is weak as very cheap materials were used for reconstruction.

7.3.4 Analysis of key success factors of resourcing from interview

Post-disaster housing reconstruction is one of the most challenging tasks that international stakeholders including World Bank, IFRC, and UNDP, Housing Reconstruction Practitioners (HRP), and local government face. Unlike most normal construction projects, PDHR projects are diverse in nature, having unique socio-cultural and economic requirements and are extremely dynamic and thus require a meaningful and dynamic response (Davidson *et al*. 2010). PDHR projects generally lack a strategy compatible with the severity of disasters, community culture and socioeconomic requirements, environmental conditions, government legislation and technical and technological solutions frequently fail to operate and respond effectively to the needs of the people affected by disasters (Amaratunga *et al*. 2011). Despite being identified as a critical problem, post-disaster housing reconstruction projects do not draw much attention and remain poorly researched (Wilkinson *et al.* 2010; Ophiyandri, 2013; Nirooja, 2013; Ismail *et al*.2014). Factors that frequently pose real threats to the eventual success of reconstruction projects are rarely given appropriate consideration while designing such projects (Sadiki *et al*. 2012).

Nodes

Name	Sources	References
Active local government	1	1
Common consensus on priciple of housing reconstruction	2	2
Coordination among participant organisations	6	6
Use of cyclone resistance materails	2	2
Microfinance	3	3
Managing resources properly	8	8
Construction materials	2	2
Government and stakeholder involvement	1	1
Supporting community self-reliance	1	1
Beneficiary's satisfaction	5	5
Effective monitoring and evaluation	3	3
Mobility of community resources	1	1
Quality of reconstructed houses	1	1
Adequate funding	5	5
Access to resources	12	12
Community participation	10	10
Considering local culture	2	2
Accountablity and transparency	9	9
Competency of resourcing managers	1	1
Cultural aspects	3	3
Access to land	3	3
Proper budgeting	3	3

Figure 7. 7 Extracted themes on key success factors of resourcing for PDHR

i) Effective monitoring and managing of resources

Effective monitoring is significant in terms of project success. It aims at achieving improved performance and demonstrable results. It is the routine collection and analysis of information to track progress against set plans and check compliance to established standards (IFRC, 2011). Thus, effective monitoring of resources means to check whether the required or sufficient amount of resources is being spent and to track the progress of a project. However, effective monitoring of resources in terms of PDHR projects means to assess what work has been completed and to assess costs, issues and risks against the success of the disaster reconstruction projects and to oversee progress of products, outputs, and outcomes (DFC, 2015). In PDHR projects, the resourcing manager is responsible for tracking the progress of the projects and he or she assesses whether given outputs lead to the achievement of the outcomes, projects activities lead to the expected outputs and activities are being implemented on schedule and within budget.

The qualitative data analysis shows in figure 7.7 that effective monitoring and managing resources are very important success factors of resourcing. At least three respondents out of twenty mentioned effective monitoring and eight respondents mentioned the significance of managing resources properly in terms of successful post-Sidr and Aila housing reconstruction. One of the respondents described:

> There are numbers of key success factors of resourcing such as are sufficient funding, access to land, and proper coordination among the participant organisation but effective monitoring and managing resources properly are very significant in terms of successful completion of post-disaster housing reconstruction projects (Respondent 12, Islamic Relief Official, April 2016).

ii) Supporting community self-reliance

What we often see is missing, however, are the voices of the affected people and their involvement in reconstruction. Supporting community self-reliance generally ensures the success of the disaster projects. A research conducted by Barenstein and Leeman (2012) reported that 94.50% of the households who opted for self-reconstruction were fully satisfied with all major features of their new houses. The qualitative data analysis in figure 7.7 also shows that supporting community self-reliance is important in terms of successful reconstruction.

> Supporting community self-reliance increases completion of housing reconstruction and motivates the disaster victims to be self-reliant and help them feel the sense of ownership of the completion of their houses (Respondent 13, Islamic Relief Official, April 2016).

iii) Community participation in DMP (Decision Making Process)

Community participation in housing reconstruction is widely recognised as the key to achieving any satisfactory level of recovery (Barakat, 2003; Davidson *et al*.2007). Previous case studies of PDHR projects show that projects without active local community participation pose a real threat of failing down and destroying community cohesion. For example, after the Indian Ocean Tsunami 2004 in Aceh Indonesia, many NGOs did not pay adequate attention to the needs of affected beneficiaries and local people were excluded from the decision making process . The houses built by these NGOs were found to be structurally defective and culturally ineffective, and failed to meet the required budgetary requirements which built further tensions and anger within the Acehnese communities (Sadik *et al*. 2012). Thus, active community participation is one of the key success factors of resourcing which can lead to successful PDHR projects.

The thematic analysis in figure 7.7 shows that 10 respondents out of twenty mentioned the significance of community participation in post-disaster housing reconstruction. One of the respondents said:

Community participation in terms of decision making about the material selection, design of the house and cultural appropriateness of the houses are very significant. It ensures the quality of the houses and it increases the beneficiary’s satisfaction (Respondent 1, BRAC Official, April 2016).

iv) Adequate funding

The availability of funds is very significant in PDHR projects because without sufficient funds the PDHR projects won’t progress and will take too long. Several scholars namely Okada (2002) and Sullivan (2003) agreed that successful post-disaster housing reconstruction could only be possible by systematic planning and focusing on making the required resources available. Chang (2013) reported that the repeated failure of many projects can be attributed to the shortage of available resources. Research by Hoai *et al.* (2008) reports that owner’s financial hardship was one of the important causes of project delays in Vietnam. Likewise Frim Pong *et al.* (2003) showed that owners hardship in monthly payments lead to project overrun in Ghana.

The results of qualitative data analysis are also consistent with studies of previous researchers. The thematic analysis in figure 7.7 shows that adequate funding is very significant in terms of completion of disaster reconstruction projects. Five interviewees have delineated the importance of adequate funding in rebuilding houses for the affected people.

Adequate funding is the most important factors of housing reconstruction. Housing reconstruction cannot be completed without sufficient fund. As disaster victims are in vicious cycle of poverty, they need to have access to adequate funding to reconstruct their houses (Respondent 16, Catholic Relief Official, April 2016).

v) Competence of resourcing managers

Generally resourcing managers can play a major role achieving the project's success and the success, and failure of the project largely depends on their competence of resourcing managers. Patanakul (2011) argued that the success or failure of a project, to a large degree, depends on who manages it. Competence combined with skills and knowledge is attributes which should be possessed by the project manager. Fotwe and McCaffer (2000) proposed that a competent project manager needs to have technical, managerial, financial, legal communication and general skills. The quality of the project manager is critical to achieve project success. The thematic analysis in figure 7.7 also indicates that the competence of resourcing managers can be conducive to successful housing reconstruction. It has got one node and one reference in terms of rebuilding houses. One of the respondents stated:

The factors that contribute to successful post-disaster housing reconstruction are accountability and transparency, considering local cultural aspects and the competency of the resourcing managers which can play an important role in terms of post-disaster reconstruction (Respondent 1, BRAC Official, April 2016).

vi) Beneficiaries' satisfaction

Satisfaction of the beneficiaries is one of the most significant success factors of resourcing. The qualitative data analysis in figure 7.7 shows that the beneficiary's satisfaction is an important factor in successful reconstruction. It has got five nodes which mean five interviewees have mentioned that beneficiaries' satisfaction can play a pivotal role in terms of project success. If the stakeholders considered the satisfaction of the end users, they would not rebuild fragile houses. This result is quite consistent with Takim (2005). He reported that client's satisfaction with service, products, project effective services, projects functionality and free from defect are the success factors of a project.

We are not happy with the quality of the houses which are built by the agency. My house is built with bamboo fence, wall and tin on top and there is no veranda and separate room for us. The total structure of the houses seems very weak. There is no safety for us during strong cyclones in the future (Respondent 177, affected villager at Sharankhola, April 2016)

vii) Transparency and accountability

It is one of the most significant factors that can play a major role in making the PDHR projects successful. Beard and Dasgupta (2007) and Labadie (2008) highlighted the importance of these factors in community based projects. In addition, Labadie (2008) argued that there is an increased chance of success in post-disaster housing reconstruction if transparency and accountability are maintained. Transparency and accountability are required not only in terms of funding but in all aspects of the housing reconstruction projects (Ophiyandri, 2013). Ophiyandri (2013) also argued that transparency in terms of information, programme details, objectives of the project, the decision making process availability of funding and its disbursement and project time scales are very important for the success of the project. In PDHR projects, resourcing managers are required to maintain all aspects of the process from implementation to completion.

The qualitative data analysis in figure 7.7 also shows that transparency and accountability can play an important role in terms of successful post-disaster construction projects. Nine interviewees have mentioned the significance of transparency and accountability. One of them said:

Transparency and accountability ensure the project success by removing corruption from the projects. Project managers can make sure transparency and accountability in the disaster reconstruction projects which can finally increase the success rate of the projects (Respondent 2, Habitat for the Humanity Bangladesh, April 2016).

7.3.5 Factors contributing to livelihood recovery

Livelihood recovery is very difficult for disaster victims because they have lost almost everything. Recovering livelihoods is inter-related with vulnerability, coping capacity and resilience. As soon as livelihoods are recovered, the vulnerability of disaster victims reduced, their coping capacity increases and this results in increased resilience. Disaster victims bounce back prior to disasters after they attain livelihood recovery. The qualitative data analysis shows that there are several factors contributing to recovering livelihoods that that can thus enable disaster victims to bounce back to their pre-disaster state.

Nodes

Name	Sources	References
VGF programme	1	1
Relief fund	1	1
Microfinance	1	1
Involving them with IGA	1	1
Increasing coping capacity	2	2
government and NGOs support,	2	3
Cheap rate loan	2	2
Cash transfer	5	5
Cash grant	3	3
Assistance for income generating activities	17	17
Agricultural activities	2	2
Access to resources	2	2

Figure 7. 8 NVivo matrix coding of factors contributes to livelihood recovery

The factors that influence disaster victims to recover livelihoods are providing assistance for income generating activities such as cash transfer, cash grants, relief, microfinance, vulnerable group feeding programmes, involving disaster victims in IGA (Income Generating Activities), government and stakeholders support, agricultural activities such as crop cultivation, homestead vegetable cultivation; and providing them with opportunities to access resources. Providing them assistance for IGA is the most cited factor that can contribute to livelihood recovery which results in reducing their vulnerability and increasing their coping and adaptive capacities. It has 17 nodes which mean at least seventeen respondents have mentioned the significance of assistance for income generating activities. This result is consistent with Tobin (1999) that resource distribution, government and NGOs support, relief and social capital play an indispensable role in reducing disaster victims' vulnerability, increasing coping capacity and increasing resilience in terms of withstanding future disasters. One of the respondents highlighted:

> Most of the people are very poor in coastal belt area and they lost their crops, they need some loans, or microfinance loan to help them in recovering their livelihoods. The factors that help them to recover their livelihoods are access to resources as microfinance, cheap rate loan and income generating activities. The factors that hinder to recover livelihoods are lack of access to resources, vulnerability, and poverty mainly (Respondent 2, Habitat for the Humanity Bangladesh, April 2016).

7.3.6 Vulnerability, coping capacity and resilience

The thematic analysis as well as quantitative data shows that most of the respondents are very vulnerable because they lost almost everything due to disasters. The 95% confidence interval results (in table 5.44, chapter five) show that disaster affected people are highly vulnerable in terms of acute poverty, no access to resources, no permanent jobs, very susceptibility to disasters, and receiving assistance from international stakeholders. The result shows that the mean value of acute poverty and susceptibility to disaster is 4.17 and 3.60 respectively which indicates they are very vulnerable. Furthermore, the results also show in table 5.45 (chapter five) that the coping and adaptive capacity of disaster victims is very low as well as about 83% of respondents are very dissatisfied in terms of their coping and adaptive capacity. Moreover, the quantitative result in table 5.22 shows the factors that determine respondents' levels of resilience are very low. The mean value of resilience to cyclone is 1.31 and building capacity to resilience is 1.36 which indicates very low levels of resilience. The frequency distribution results (in table 5.23) show that the level of respondents' resilience is very low. About 79% of respondents have a very low level of resilience in terms of cyclones, and 71% in terms of building capacity to resilience.

Nodes

Name	Sources	References
Increased awareness	9	9
Vulnerability in awareness is reduced	1	1
Respondnets vulnerability is reduced	4	4
Respondents still in vulnerable condition	9	9

Figure 7. 9 NVivo matrix coding of level of vulnerability of respondents

The qualitative data analysis also confirms the vulnerability of disaster victims. Most of the respondents elucidated that both cyclone Sidr and Aila affected area, people are very vulnerable in terms of acute poverty, withstanding future cyclones and safety and security. One of the respondents stated:

> People are still vulnerable but they are aware of the fatality of the cyclone, they cannot protect their food security and livelihood, they can survive for the time being but they cannot withstand future cyclone (Respondent 3, Habitat for the Humanity Bangladesh, April 2016).

7.3.7 Stakeholders' involvement in post-Sidr and Aila housing reconstruction

This section is based on both qualitative and quantitative data. It describes the involvement of stakeholders and their roles in post-Sidr and Aila housing reconstruction in Satkhira and Bagerhat in Bangladesh. This section is categorised into two parts: the first part provides a brief description about stakeholders' roles and the second part describes the main stakeholders and their involvement in post-Sidr and Aila housing reconstruction.

a) Role of stakeholders in PDHR projects

Post-disaster reconstruction is very complex, challenging and fraught with potential pitfalls (Jha *et al.*2010). Recovery and reconstruction after disasters requires the active participation of different stakeholders. The success of PDHR projects largely depends on the participation of different stakeholders, such as local government, UN organisations and national and international non-governmental organisations. In recent years, stakeholders and their participation in disaster management projects, especially in the reconstruction phase, is considered integral part because it not only helps to smooth and streamline the reconstruction process but also creates resilience among the disaster victims for future disasters (Zafari *et al*.2011; Chandrasekhar, 2012).

Stakeholders whether they are individuals, groups, organisations, communities or disaster victims have a common interest in seeing successful projects come to fruition and they can play a significant role from relief to reconstruction. The roles of stakeholders are associated with the initial assessment of loss and damage, planning, project development, funding for the project, project implementation and monitoring and evaluation of the projects Jha, *et al*. (2010). Haigh and Siriwardena (2011) mentioned in their study that the contributions of stakeholders in PDHR projects are supply of resources or funding which can expedite the progress of the projects. Davidson *et al*. (2007) have categorised the roles of stakeholders as programme initiation, project initiation, project financing, design, construction and post-project modification. Likewise, Jha *et al* (2010) identified the affected population, local government, humanitarian communities and bilateral and multilateral organisations as important stakeholders for PDHR projects and also mentioned their roles in terms of rebuilding houses for the disaster victims. Their roles are as follows:

Table 7. 5 Stakeholders and their roles in rebuilding houses

Affected population	Local government	The humanitarian community
First responders and most critical partners during an emergency	Managing and allocating resources	Organise coordination mechanism among participant organisation
Undertaking the majority of work on their own recovery	Managing disaster response	Support NGOs for project implementation of response and reconstruction programme
	Establishing policy to guide reconstruction	Develop early recovery framework

The stakeholders who are involved in post-Sidr and Aila housing reconstruction are UNDP, OXFAM, IFRC, Govt of Bangladesh, Habitat for the Humanity Bangladesh, BRAC, Islamic Aid, Tear Fund, Christian Aid, Ahsania Mission, NCCB, Action Aid, Catholic Relief, and CARITAS Bangladesh. This study underpins the activities of the organisations that have a major role in post-cyclone Sidr and Aila recovery and reconstruction. The roles of stakeholders in post-Sidr and Aila housing reconstruction are as follows:

i) United Nations Development Programme (UNDP)

United Nation Development Programmes (UNDP) has been playing a significant role in the overall development of Bangladesh since 1972. The purpose of UNDP programmes is to reduce poverty; activities related to restoring national economy, undertaking post-disaster housing reconstruction programmes through partner organisations, strengthening the resilience of disaster affected populations in response to combatting future disasters, providing humanitarian assistance to build up capacity and to livelihood recovery activities. It undertakes various programmes from relief to reconstruction in a post-disaster chaotic environment. It covers most of the coastal belt of Bangladesh including cyclone Sidr and Aila affected areas.

Table 7. 6 UNDP profile of interviewees

Cases	Position	Experience in current position
Interviewee 1	Information and Management Officer	10-12 years
Interviewee 2	Programme Development officer	9-10 years

The context

Cyclone Sidr and Aila hit coastal Bangladesh in 2007 and 2009 respectively. Cyclone Sidr was more severe than Aila in terms of destruction. Sidr was category 4, however, was also devastating resulting in 243,191 houses being fully destroyed and 370,587 houses being partially damaged (GOB, 2008; IFRC, 2010; Paul and Rashid, 2016). Approximately 30 out of 64 districts of Bangladesh were severely affected by Cyclones Sidr and Aila which resulted in 3406 deaths caused by Sidr and 325 by Aila. Tens of thousands of people were left homeless and people affected by both cyclones live in embankments and polders. In many districts, more than half of thatched-roof houses were destroyed and a high proportion of wood-framed houses with corrugated iron roofs have been destroyed or severely damaged in coastal areas. Initial estimates showed that there were around 86,000 families needing support from humanitarian organizations to rebuild fully damaged houses and around 141,000 families needing help to rehabilitate partially damaged houses (IFRC, 2010).

Response

UNDP has emerged as a dependable partner of the government of Bangladesh in rendering humanitarian assistance by supporting and contributing to post-disaster recovery and reconstruction. It generally mobilizes donor funds for recovery and supports wide-ranging interventions for the provision of food and non-food items to shelters (GOB, 2008). It undertook several programmes relating to humanitarian assistance to disaster victims such as relief and rehabilitation, proving food aid, nutrition, water and sanitation programme, and shelter reconstruction programmes. UNDP built over 9000 disaster resilient houses with 6600 houses still under construction and it supported and focused on providing shelter for the most vulnerable families in the hardest hit disasters with a budget of $US3.8 million. The basic characteristics of UNDP built houses are accordance with the environment, are culturally adapted and their structures allow for future extensions, giving families the option of investing their own resources into expanding their homes. Houses built by UNDP have special features of cyclone resilience and can withstand category 4 cyclones. BDT 72000-100,000 were allocated for reconstructing each house for disaster victims. The structure consists of 150sq ft and 225 sq ft concrete pillar with brick built walls and a tin-shed roof and it has a space on the 1st floor if there is a tidal surge. This strategy seems to be useful in terms of tidal surge because houses having features of cyclone resilience can not give them safety if there is tidal surge with cyclones.

ii) Habitat for Humanity Bangladesh

Habitat for the Humanity Bangladesh (HFHB) is a branch of Habitat for Humanity international (HFHI). It was founded in 1999 in Bangladesh. It has 10 branches in different locations across the whole country. HFHB has been working since its inception with low-income and poor families affected by disasters to build strength, stability and self-reliance through building transitional and permanent houses. The purpose of their programmes is to assist families in reducing poverty and vulnerability by improving conditions for those who live in fragile and deplorable shelter. It provides relief in emergency, clean water and safe sanitation, microfinance, training in appropriate construction technology and disaster response and mitigation. HFHB is committed to a participatory approach where house holders take a strong role in their own effort to move out of poverty and this has tangible community, environmental and health related benefits (Meding, 2014).

Table 7. 7 HFHB profile of interviewees

Cases	Position	Experience in current position
Interviewee 1	Monitoring and evaluation officer	15 years
Interviewee 2	Humanitarian officer	8-10 years

The activities and strategies of HFHB are related to establishing production centres, building shelters for disaster victims, providing transitional shelters, liaising with local government and national and international NGOs, initiating reconstruction programmes, providing technical assistance, training and skills, providing construction materials, rendering income generating activities to recover livelihoods and undertaking post-disaster reconstruction projects. The primary focus of HFHB projects is to work with partner organisations to provide safe secure shelter, either transitional or permanent to the people affected by disasters. As a strategy, its aim is to provide transitional shelter due to the poverty of affected people because people with limited access to resources cannot build resilient houses due to expensive construction materials. HFHB’s argument is that as soon as affected people recover their livelihoods, they will rebuild permanent houses.

In response to cyclone Sidr in 2007, HFHB established a production centre before starting any formal construction. It worked jointly with a need assessment team deployed by the World Bank. The needs assessment team analysed the situation and it started its actions from relief to reconstruction. In the initial phase, it emphasised the need to build up capacity by providing either cash grants or relief. For this, they ensured the participation of the affected people. It undertook a rehabilitation project with assistance from Christian Aid. In this project, HFHB built 480 transitional shelters and provided construction materials, such as CGI sheets, corrugated tins and tents for the disaster affected people of cyclone Sidr.

iii) Islamic Relief

Islamic Relief (IR) is an independent humanitarian and development organisation with a presence in more than 40 countries around the world. It was established in Bangladesh in 1991. It has become one of the major humanitarian organisations in Bangladesh for uplifting vulnerable people affected by natural disasters, through providing humanitarian relief, emergency assistance and undertaking development projects focusing on disaster risk reduction and reconstruction. The main aim of their programmes is to work with vulnerable communities to strengthen their resilience to natural disasters and promote risk reduction across the country. It also runs islamic microfinance and sustainable livelihood projects that provide poor people with skills and resources to lift them out of the vicious cycle of poverty.

IR plays an effective role in disaster relief, recovery and reconstruction in Bangladesh. In the immediate aftermath of a hazard event, it focuses on the supply of emergency relief packages, such as pure drinking water, clothes, foods, and temporary shelter and it provides assistance towards the community’s disaster mitigation preparation and evacuation. Cyclones Sidr and Aila were devastating in nature as category 4 cyclones and it submerged 31 districts out of 64 in Bangladesh. IRBD (Islamic Relief Bangladesh) has since then accelerated the process of working with local communities under risk from natural hazards to reduce their vulnerability and build their capacity to recover quickly (Meding, 2014).

Table 7. 8 IRB profile of interviewees

Cases	Position	Experience in current position
Interviewee 1	Programme manager	10+
Interviewee 2	Programme Analyst	6-8 years

According to the analysis of the semi-structured interviews, it is pertinent that the activities conducted by IRBD are related to providing temporary and permanent shelter, relief, rehabilitation programmes, encouraging communities to participate in reconstruction, restoring livelihoods, and income generating activities that reduce their poverty and vulnerability.

Cyclone Sidr struck the south-west coastal districts of Bangladesh in November 2007. This was one of the worst disasters in the history of Bangladesh. It was a category four cyclone. It killed 3406 people, injured 40,000 and destroyed 1.5 million houses. In response to cyclone Sidr, IRBD provided food and emergency relief to over 46,000 people in Bagerhat and Patuakhali and it built around 30,000 temporary shelters for the affected families.

In response to Cyclone Aila in 2009, Islamic relief responded to the disaster victims through the Cyclone Aila Response and Early Recovery Programme (REP) which was funded by European Community Humanitarian Aid Department (ECHO) and it benefitted more than 70,000 people. The aim of the project was to provide support to help the cyclone-affected communities of southwest Bangladesh recover from disaster and provide shelter for those made homeless, providing cash for work opportunities to those who lost their livelihoods and ensuring their access to clean water and sanitation to help prevent the spread of waterborne diseases. With Islamic Relief's support, those given new shelters or who were helped to repair their damaged accommodation could move from the makeshift roadside camps to homes that were safer and more comfortable. IRBD worked in the affected districts of Satkhira, Bagerhat and Khulna and it provided food to 27,000 people, water and sanitation facilities to 22,000, emergency and transitional shelters for 13,500 and cash for work opportunities for more than 7500 people.

The houses made by Islamic relief at Gabura in Satkhira were not cyclone resilient at all and were very fragile. They are built with tin-shed rooves and mud and fence-walls. It can be seen that some houses have already been blown away by wind; houses like this cannot survive strong cyclones like Aila.

Photos of houses built by NGOs working in Gabura, Satkhira, Bangladesh

iv) Government of Bangladesh

The government of Bangladesh plays an indispensable role in post-disaster recovery and reconstruction in Bangladesh. Over the past several years, the government of Bangladesh has been quite successful in reducing the impact of disasters though community involvement particularly in Cyclone Preparedness Programmes and shelter reconstruction programmes that reduce casualties from natural disasters (World Bank, 2008). Both Cyclones Sidr and Aila destroyed the life, property and economy of Bangladesh but the severity was higher than usual in the housing sectors. Due to these two cyclones, almost 243,191 houses were fully destroyed and 370,587 houses were partially damaged (GOB, 2008; IFRC, 2010; Paul and Rashid, 2016). Following cyclone Sidr, the Bangladesh government employed Joint Damage, Loss and Needs Assessment (JDLNA). According to the JDLNA assessment, the total estimated damages from cyclone Sidr amounted to US$ 1.158 billion, concentrated primarily in the housing sector (US$ 839 million). The government of Bangladesh estimated costs for recovery and reconstruction which are given below:

Table 7. 9 Government estimated costs for reconstruction

Actions/Interventions	Total cots (US$)	Responsible organisation
Building Core shelter	179,509,200	UNDP,IFRC, NGO,GOVT
Cyclone shelter repair assistance programme	52,000,000	Dir of Relief and rehabilitation
Construction of community appropriate cyclone shelter	11,000,000	Dir of Relief and rehabilitation
Special external monitoring of priority shelter	15,000	UNDP,IFRC, NGO,GOVT
Development of resilient communities for landless	243,274,200	UNDP,IFRC, NGO,GOVT

The Bangladesh government applied for international humanitarian assistance and drew the attention of international donor agencies. In response to the government application for humanitarian assistance, international donor agencies contributed to emergency relief and the post-Sidr recovery and reconstruction. A total of US$426 million was committed by donor agencies and countries.

Table 7. 10 Donor contributions to cyclone Sidr

Countries/Organisations	Amount (US$)
European Commission	12,300,500
United Kingdom	19,808,566
Australia	9,837,293
Netherlands	8,158,626
Kuwait	10,020,760
Japan	34,638,487
Sweden	7,542,617
Islamic Relief	5,643,705
Canada	4,897,997
USA	20,188,823
UN Agencies	28,381,904
Saudi Arabia	130,000,000
Saudi individual	130,000,000
Italy	4,472,908
Norway	4,370,069
Switzerland	3,355,104
Denmark	2,963,000
Germany	2,644,291
Belgium	2,181,389
China	2,050,000
Iran	1,380,757
Spain	1,247,121
India	1,001,697
Libya	1,000,000
Turkey	1,000,000

(Source, GOB, 2008)

The early recovery action plan for Cyclone Sidr was to build on immediate humanitarian interventions and prepare for long-term rehabilitation and reconstruction. The strategy and intervention for early recovery was;

- Best practises should be mainstreamed
- All materials should be durable and reusable
- Shelter planning Integrated with WASH
- Building core shelter
- Identification of safe land for landless
- Integration of CBOs and Union Parishad in monitoring

The Ministry of Food and Disaster Management of Bangladesh estimates that over 563,877 houses were destroyed and 955,065 were partially damaged. The GOB and international donor countries arranged emergency shelter solutions in the form of distributing plastic and CGI sheets, corrugated tins and tents for more than 100,000 families. Besides this, GOB has provided small amounts of grants ranging from BDT 5000 to 100,000 per family to support self-recovery and housing repair and reconstruction.

Table 7. 11 Government of Bangladesh profile of interviewees

Cases	Position	Experience in current position
Interviewee 1	Secretary , Ministry of Disaster	15-20 years

In response to the Sidr and Aila recovery and reconstruction, the Bangladesh government focussed on building core shelters as strong cyclone and flood resistant permanent housing for the affected population combined with loan programmes to provide the impetus to spur on the rebuilding of housing. The strategy of a core shelter policy to build a small house made of cyclone resistant materials that can later be added onto by the beneficiary to include storage spaces, verandas and extra rooms.

Photos of houses built by Climate fund of GOB in Gabura, Satkhira

However, the response and reality was totally different from the action plans. The response of the Bangladesh government relating to post-disaster recovery and reconstruction was limited to providing relief rather than undertaking projects and programmes to reduce the poverty and vulnerability of the people affected by natural disasters like cyclones. Despite taking the principle of core shelter policy, the undertaken projects were not sufficient and the quality of the reconstruction is not up to the mark.

Furthermore, the quantity of both transitional and core shelters covered by various agencies is around 78,519, with some shelter programmes remaining incomplete due to lack of funds. After visiting the study areas of both Bagerhat and Satkhira, it can be seen that the Bangladesh government built concrete core houses. An inspection of the building indicates that strong and cyclone resistant materials such as brick, sand, iron and cement were used to build these houses. However, the number of that type of houses is very limited in relation to the vast number of affected people. Through the semi-structured interviews with the villagers affected by cyclones, it was found government support was significantly influenced by political patronage. Some villagers who were not actually affected by cyclone Aila in Gabura got cyclone resilient houses and the vast majority of those who were affected did not receive those houses. One of the affected villagers' laments:

The people who have strong link with political parties got selected primarily to receive brick built houses. He also stated that even we had to give bribe to put our name on the lists to receive government one time housing grants and there are some areas where the velocity of cyclone was severe, people of those areas were deprived of receiving government donations for their housing reconstruction (Respondent 199, affected villager at Sharankhola, April 2016).

v) IFRC/BDRC

The Bangladesh Red Cross Society (BDRCS) was founded on 31 March 1973. The Society was recognised by ICRC on 20th September 1973 and was incorporated into the International Federation of Red Cross and Red Crescent Societies on 2nd November 1973. The name and emblem were changed from Red Cross to Red Crescent on 4th April 1988. There are 68 units in BDRCS which are constituted in 64 districts in Bangladesh and it has branches in the metropolitan cities of Dhaka, Chittagong, Rajshahi and Khulna. The National Headquarters of BDRCS are situated at Boro Maghbazar in Dhaka, Bangladesh. The mission statement of BDRCS is to reduce and prevent human suffering and to improve the situation of vulnerable people through undertaking mitigating measures to reduce their vulnerability by mobilizing the power of humanity.

Table 7. 12 IFRC profile of interviewees

Cases	Position	Experience in current position
Interviewee 1	Programme manager	15 years
Interviewee 2	Programme Coordinator	8-10 years

The respondents from the semi-structured interviews of IFRC stated that the main strategies of IFRC humanitarian response are related to providing core shelters to disaster victims, with the emphasis on rehousing rather than building new houses, making a list of the people who were most affected by a cyclone, providing training to the beneficiaries, running projects though regional offices, reducing vulnerability of the affected people, providing immediate relief and use an owner driven approach. One of the respondents stated that the main aims of any IFRC project is to reduce the vulnerability of the people of disaster affected areas and to provide core shelters for them which can offer during strong cyclones.

The IFRC undertook post-cyclone Sidr and Aila recovery and reconstruction projects immediately after they hit to reduce the vulnerability of affected people. The recovery and reconstruction projects start on 25th November 2007 and were completed by the end of March 2008. This was the biggest Red Cross and Red Crescent humanitarian response operation in Bangladesh since the 1991 flood (IFRC, 2010). The main focus of the IFRC recovery and reconstruction project was to provide for immediate needs such as food, drinking water, clothing and temporary shelter. The amount that IFRC spent for the Cyclone Sidr project was CHF 250,000 and it was allocated through the Federation's Disaster Relief Emergency Fund (DREF). The IFRC project was effective in terms of coverage and fulfilling the basic needs of affected people. More than 84,000 people affected by Sidr benefitted from the relief items (food and non- foods) in 13 districts including Bagerhat.

Photos: Design of transitional core shelter by IFRC

It built 1,250 new core shelters in addition a total of 5,093 families were assisted to repair their damaged houses or extend their new core shelters with the assistance of IFRC. However, the materials that were used in the core shelters constructed by the IFRC were not cyclone resilient because they were made with tin rooves and bamboo fence walls, which are cheap and not durable because as they can be blown away during category four cyclones like Sidr or Aila.

Cyclone Aila was devastating. It hit eleven southwestern coastal districts of Bangladesh on 25th May 2009. It killed 190 people and affected more than 3.9 million people, disrupting their livelihoods and destroying infrastructures. An estimated 243,000 houses were fully damaged and over 373,000 were partially damaged. In response to cyclone Aila, IFRC immediately sent emergency relief such as food and non-food items consisting of plastic sheets, drinking water and hygiene parcels. In Satkhira, a total of 770 households were assisted with cash grants into categories to recover their livelihoods. The IFRC allocated 253,00CHF for relief and recovery activities. Besides these, it also provided shelter kits to 80,000 families who were severely affected by cyclone Aila.

7.3.8 Remit to rebuild dynamic cyclone resilient houses

The People in Cyclone Sidr and Aila affected areas are very vulnerable. Lack of available resources, lack of education, and lack of training and skills exacerbate their vulnerability. They are in a vicious cyclone of poverty that results in them being unable to rebuild their houses. The vulnerability of their settlement to a cyclone is determined by its siting, probability that a cyclone will occur, and the degree to which its structures can be damaged by it (UNDP, 2007). Houses are considered vulnerable if they are built with poor, cheap construction materials such as mud, CGI sheets and corrugated tin, if a lack of engineering skills and design used, and if they cannot withstand strong cyclones. Generally the houses most vulnerable to cyclones are lightweight; structures with wood frames, older buildings where wood has deteriorated and weakened the walls are at risk (UNDP, 2007).

Building cyclone resilient houses is critical as houses built with non-cyclone resistant materials are blown away and those houses cannot offer safety and security in category 4 cyclones like Sidr. Cyclone resilient houses are houses that have been built using cyclone resistant materials. Disaster victims feel safer and more secure when living in this type of house.

However, building cyclone resilient houses is very difficult due to the acute poverty and lack of available resources for disaster victims. They cannot buy materials such as sand, iron rod, brick, and cement as they are expensive. Moreover, the availability of engineers locally is very limited which exacerbates the problem. Most of the respondents mentioned in the semi-structured interview stated that it is very difficult to build cyclone resilient houses. Some respondents also mentioned that disaster victims first need to recover their livelihoods to reduce poverty.

The poor coastal people affected by cyclones suffer from lack of resources, poverty, construction materials, and construction engineers. They are unable to build concrete building that can resist cyclone. But they can consult with construction agency about maintaining the core shelter policy. They need to build houses with concrete building and need to have consideration for tidal surge and strong cyclone like category4 cyclone (Respondent 9, Dhaka Ahsania Mission Official, April 2016). This study explores ways to rebuild cyclone resilient houses after analysing all the data from semi-structured interviews and the opinions and suggestions from the expert interviewees.

Nodes

Name	Sources	References
Concrete roofing	2	2
Anchoring roofing	1	1
Mintain core shelter policy	1	1
Consideration of tidal surge and strong cyclones	8	8
Owner driven approaches	1	1
Enigineering skills and training	6	6
Running need assessment	1	1
Access to resources	9	9
Community participation	1	1
Government and stakeholder involvement	2	2
Consider cultural aspects	4	4
Microfinance	2	2
Cyclone resilient materials for reconstruction	5	5
Access to land	4	4
Access to education	2	2
Use of technology	3	3

Figure 7. 10 NVivo matrix coding of remit to rebuild dynamic cyclone resilient houses

The qualitative data analysis conducted by NVivo shows that dynamic cyclone resilient houses can be built based on the determinants such as access to resources, considering tidal surges and strong cyclones, applying engineering skills and training in reconstruction, using cyclone resilient materials for reconstruction, access to land, considering cultural aspects, technological use in reconstruction, concrete roofing, access to education, microfinance, and government and stakeholder involvement in reconstruction. Access to resources is the determinant that has the highest nodes. Nine respondents out of twenty mentioned that access to resources is the main requirements necessary to rebuild cyclone resilient houses. Likewise, consideration of tidal surge in reconstruction is significant and several respondents highlighted the need to have a room in the first floor of the house so that at the time of tidal surge, they can take shelter in the room upstairs.

> It is really difficult to rebuild houses for them because they do not have sufficient amount of resources. However, you have to consider two things to rebuild houses. One is tidal surge and another one is wind speed.

> Then cyclone resistant construction materials need to be applied while rebuilding the houses (Respondent 20, OXFAM Official, April 2016).

> First, they have to have access to resources, then there should be specific design to combat tidal surge and velocity of cyclone, and they also need to access to land, education, and use of technology for dynamic cyclone resilient houses (Respondent 6, IFRC Official, April 2016).

> Disaster affected people did not have sufficient amount of resources to build resilient houses. But before building houses for the affected people, they need to consider two things: one is tidal surge and another one is wind speed. Cyclone resistant construction materials need to be applied while rebuilding the houses and they need to have access to resources in which they can invest money for reconstruction. He added that government and local can give them credit with cheap rate which can enhance their opportunities to rebuilt resilient houses (Respondent 19, KARITAS official, April 2016).

> We live hand to mouth. Our income is very low. I got 100 taka (£1) per day as a day labourer. I have no permanent house; I live in tin-shed house which is very deplorable. I need assistance from government and NGOs for building permanent house (Respondent 5, affected villager at Gabura, April 2016).

> I live in section 6 of Gabura union of Satkhira. This section is the most affected areas of cyclone Aila. I receive no assistance from government and NGOs. I have no house to live. I live in embankments and I suffered a lot while raining and tidal surge as my house is made of golpata ((Respondent 129, affected villager at Gabura, April 2016).

Considering engineering skills and training is also very important in terms of rebuilding resilient houses. Engineers generally play a pivotal role in delivering a safe design, designs for construction and maintenance of the infrastructure of buildings, bridges, power generation, a safe drinking water, supply waste management, and ensuring a good communication and transportation and network system. At least six respondents emphasized the application of engineering skills and techniques in reconstructing houses. The application of effective engineering design and techniques can augment the capacity of house to withstand strong cyclones. One of the affected villagers stated:

> Most of the houses built by different organizations are very fragile and deplorable. Those houses cannot give us safety and security while strong cyclones. To build cyclone resilient houses, agency to use construction materials such as brick, sands, iron rod, and cement and besides these, engineering skills and techniques need to be applied while reconstructing house for the disaster affected population so that structures and foundation of the building can be very strong (Respondent 179, affected villager at Sharankhola, April 2016).

Cultural aspects need to be considered while reconstructing houses for the disaster affected people. Cultural appropriateness generally indicates the proper use of housing styles, shapes and size of buildings, building materials; spatial lay outs, construction techniques and housing related infrastructures (Ahmed and Charles worth, 2015; Paul and Rashid, 2016). Traditional styles of houses are neglected while reconstructing houses for disaster victims. It can be seen in both Sidr and Aila affected areas that some houses have been built without veranda, some have no toilet, some did not have separate rooms and some houses consists of just four walls and a roof; lacking any design compatible with local culture.

Besides this, disaster victims should have access to land, technological use in reconstruction, concrete roofing, access to education, microfinance, government and stakeholder involvement in reconstruction, and cyclone resilient materials for housing reconstruction.

After analysing data from both questionnaire surveys and semi-structured interviews from the expert interviewees, the researcher has developed a model of dynamic cyclone resilient houses in the next section.

i) Dynamic theoretical framework for Cyclone resilient houses

Post-disaster housing reconstruction is a very complex and challenging task. The current literature relating to effective post-disaster housing reconstruction is limited. For example, existing post-disaster housing reconstruction theories lack strong focus on the need to build more cyclone resilient houses for the people affected by cyclone disasters. Therefore, this research attempts to provide a dynamic theoretical framework which draws on existing post-disaster housing reconstruction theories, the building back better approach, balance scorecard and dynamic competency theory. This framework is based on the significant aspects which have not been given emphasis by other researchers in terms of building cyclone resilient houses. The proposed dynamic model for cyclone resilient houses depicted below is based on the information from quantitative analysis, thematic analysis from the expert interviews and the synthesis of different post-disaster housing reconstruction theories. The suggested model states how durable and resilient houses can be obtained through different critical stages.

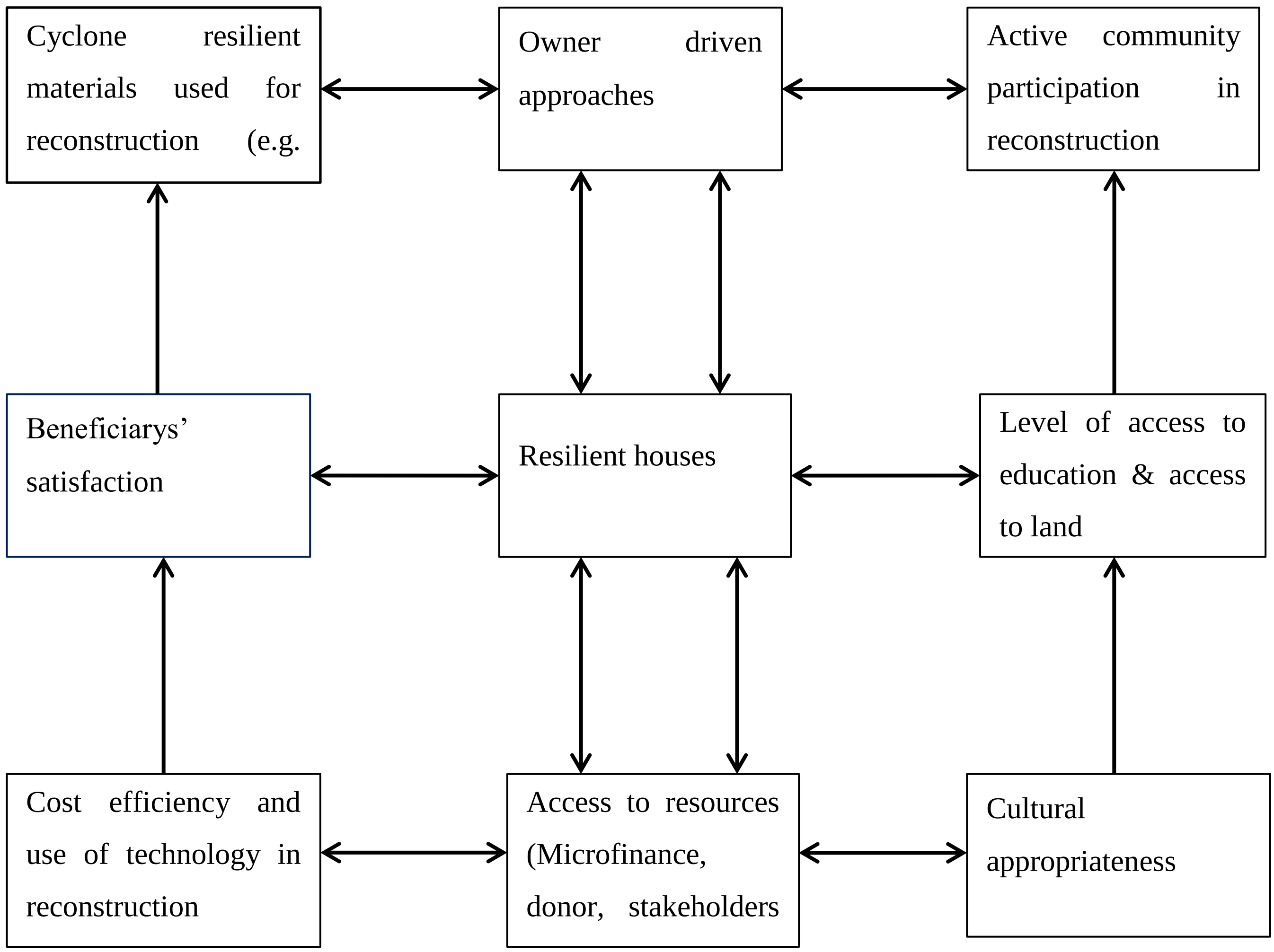


Figure 7. 11 Dynamic theoretical models for Cyclone resilient houses

There are eight critical elements that play a pivotal role in reconstructing durable and resilient houses. First, the researcher has evaluated existing housing reconstruction theories and underpinned the weaknesses of existing theories and suggests the application of those critical elements in terms of making durable and resilient houses. Secondly, active community participation is prerequisite to resilient houses this is because community participation in PDHR can empower the beneficiaries in important decision making processes which results in promoting community control over the project. Similarly, the involvement of the government can increase the accountability of the PDHR projects whereby cultural appropriateness can increase the acceptance of the delivered projects to the beneficiary. However, one of the most important elements, in which PDHR projects can be accomplished, is the effective implementation of available resources. The resourcing managers need to apply all available resources necessary to finish the specific project on time. Government and stakeholders' involvement is a significant element in delivering durable and resilient houses because they provide necessary resources for the PDHR projects. Likewise, materials that are cyclone resilient should be used for housing reconstruction. Finally, all the elements mentioned in the framework if maintained properly can drive the PDHR projects towards successful completion which will result in overall beneficiaries' satisfaction.

7.3.9 Conclusion on the perception of disaster victims and stakeholders on PDHR

This chapter was based mainly on the results of semi-structured interviews with twenty key stakeholders from national and international organisations who had worked in both Cyclone Sidr and Aila affected areas. It has explored the central theme of this research; respondents' level of access to resources, key success factors of resourcing and factors affecting post-Sidr and Aila housing reconstruction. It is underpinned by alternative ways to rebuild dynamic cyclone resilient houses for Cyclone Sidr and Aila affected people in Bagerhat and Satkhira in Bangladesh.

The discussions were based on qualitative data analysis of the opinions of key stakeholders as well as villagers affected by both Sidr and Aila on the level of access to resources, materials used for reconstruction, key challenges of PDHR projects in Sidr and Aila affected areas of Bagerhat and Satkhira in Bangladesh, condition of existing houses, key success factors of resourcing, factors contributing to livelihood recovery and stakeholders' involvement in post-disaster reconstruction. Finally, this chapter sought to address the question of how the affected villagers can rebuild dynamic, cyclone resilient houses despite having low levels of access to resources.

The analysis suggests that a new, dynamic model containing eight stages should be applied as an integrated and innovative approach that aims to provide a clear and complete guide, enhance the rebuilding of dynamic cyclone resilient houses and which can make a useful contribution towards the long term solution of housing reconstruction problems.

CHAPTER 8 SYNTHESIS AND CONCLUSIONS

This chapter presents the overall summary of findings as well as the conclusion of the study. The study aimed at investigating the effectiveness of resourcing in terms of post-cyclone Sidr and Aila housing reconstruction. It started with a critical review of literature and theories and approaches relating to resourcing and its implications in PDHR projects and disaster management to explore possible ways to rebuild dynamic cyclone resilient houses for the people affected by cyclones Sidr and Aila in Satkhira and Bagerhat in Bangladesh. Furthermore, the research methodology chapter explained how the selected theories, tools and methods fulfil the research aims and objectives, and research questions presented in chapter one. It also describes procedures of data collection and analysis by using computer-aided software of SPSS version 21, NVivo version 10 and a six-phase thematic analysis employed for qualitative data.

This chapter is divided into four sections. The first section provides a summary reviewing the major findings of this research. These findings are synthesized into addressing the central research question presented in chapter one. The second section describes how these research findings contribute to theories and practices; it also evaluates the outcome of the research by explaining how the findings in this study addressed the research gaps described in the introduction chapter. The third section presents a comparative discussion between post-cyclone Sidr and Aila housing reconstruction. Finally, the fourth section describes the practical implications of this research followed by recommendations for future research.

8.1 Summary of findings

The central research question of this study was to identify the effectiveness of resourcing in PDHR projects in Satkhira and Bagerhat in Bangladesh. Likewise, the main hypothesis of this research was that, people with access to resources have a higher chance of reconstructing houses and recovering livelihoods than people with limited access to resources. To achieve the results of the central research question and to test the main hypothesis, this study has examined the impact of access to resources and other socioeconomic variables to post-disaster housing reconstructions. Apart from the main independent variable of access to resources, the other socio-economic variables such as respondent's age, gender, monthly income, level of education, access to land and level of income generating activities and other socio-economic variables relating to this study have been analysed using SPSS, NVivo and thematic analysis of qualitative data. It has explored if and how access to resources, level of income generating activities and level of education can contribute to successful post-disaster housing reconstruction in Bangladesh. However, the main summary of the research findings is outlined below:

8.1.1 Access to resources for housing reconstruction

The level of respondents' access to resources for housing reconstruction is very low as they live in acute poverty. According to table 5.21 (in chapter five**)** more than 93% of respondents live in between moderate and very high poverty. Likewise, according to table 5.6, more than 95% of people affected by cyclone disasters have no access to resources to rebuild their houses. However, respondents' access to other resources is low as well. According to quantitative data analysis (in chapter five, table 5.8), the average mean value of their access to other resources for housing reconstruction is lower than 1.44 which indicates a low level of access.

Access to resources is one of the main contributors to successful post-disaster housing reconstruction projects. It rejects the null hypothesis and affirms hypothesis 1, and in response to hypothesis 3, the results of this study accept null hypothesis and it shows that access to education is not a significant predictor for successful post-disaster housing reconstruction.

Furthermore, according to the qualitative data analysis by using NVivo in chapter seven, the level of respondents' access to resources is very low as well. The results of qualitative data analysis from semi-structured interviews (in figure 7.4, chapter seven) show that people affected by cyclones Sidr and Aila have very low levels of access to resources. The data analysis by NVivo shows that at least 14 respondents mentioned that disaster victims have very low levels of access to resources to rebuild their houses and no respondent mentioned disaster victims having sufficient resources to rebuild their houses.

8.1.2 Factors determining the effectiveness of resourcing for PDHR projects

This section presents the effectiveness of resourcing by evaluating six parameters of respondents' rate of housing recovery, vulnerability reduction, poverty reduction, livelihood recovery, beneficiaries' satisfaction with the reconstructed houses and quality of the reconstructed houses.

As stated earlier in the methodology chapter, this study has employed parameters to determine the effectiveness of resourcing in post-disaster housing reconstruction projects. The parameters which are employed to measure the effectiveness of resourcing in PDHR projects are summarised below:

i) Respondents' rate of housing recovery

The results of frequency distribution (in chapter five, table 5.5) show that about 94% of respondents think their houses are not cyclone resilient and approximately 6% think they are cyclone resilient. In response to the question of why is your house not cyclone resilient, more than 79% of respondents think their houses have been built poorly, more than 25% of respondents received kutcha (built with mud) houses, about 12% received pucca (built with brick) houses, more than 23% received tin-shed houses and about 7% of respondents were provided with temporary fragile houses. The analysis also shows that more than 42% of respondents received their houses within 4 years, 28% respondents received houses 5 years after the cyclone, and more than 30% of respondents did not receive houses at all.

The chi-square results in table 5.7 (chapter five) shows that access to resources has a significant association with post-disaster housing recovery as its p-value is .016 which is statistically significant. Furthermore, the regression results in table 5.19 shows that access to resource can play significant role in post-disaster housing recovery as its p value is lower than 0.05 which is statistically significant. This result affirms the main hypothesis of this study that people with access to resources are more likely to recover houses than people having no access.

Thus, as can be seen from the results, the housing recovery rate is quite high among the respondents but the question remains of whether those houses are cyclone resilient or not and can provide safety for the coastal people. Questions also remain regarding materials used for reconstruction, time taken to rebuild houses and kutcha or pucca houses. This result rejects the null hypothesis and affirms hypothesis number 1 of this study that people with access to resources are more likely to rebuild durable and cyclone resilient houses than people having no access to resources.

ii) Vulnerability reduction

The results of quantitative and qualitative analysis show that people affected by both Sidr and Aila are very vulnerable. As a result, they cannot rebuild their houses after disasters. The results of quantitative analysis in table 5.22 (Chapter five) show that the average mean value of all the determinants of vulnerability reduction is below 1.35 which is very low and table 5.23 shows that on average more than 76% of respondents have very high level of vulnerability in terms of withstanding disasters like cyclones. The results of qualitative data in figure 7.9 (Chapter seven) also show that at least nine respondents reported that both Sidr and Aila affected people are very vulnerable. This indicates that resources have not become effective in terms of reducing vulnerability of the affected population because respondents, in terms of resilience to cyclones, building capacity to resilience, reducing risk factors and strengthening preparedness for effective response are very vulnerable. The regression results in table 5.19 shows that access to resource is a significant predictor for respondents'' vulnerability reduction.

iii) Poverty reduction

The quantitative results in table 5.26 (in chapter five) show that disaster victims are in acute poverty in all the aspects of poverty reduction determinants of affordability, capability to meet regular needs, access to recreation, per capita income, bearing regular expenses and satisfaction over income. The average mean value of poverty reduction determinants is below 1.50 which represents their inability to prepare, cope, respond to disasters and rebuild their houses. The average percentage of very low levels of capacity in terms of the determinants of poverty reduction (in table 5.25) is 62.50%. This result affirms hypothesis number 2 of this study, that people with poverty and vulnerability have very low levels of affordability and capacity to rebuild their houses.

iv) Quality of reconstructed houses

Quality issues are associated with materials used for reconstruction, durability, cultural acceptance, maintaining building codes, community participation and technological use in reconstruction. The quantitative data analysis in chapter five (table 5.34) shows that the average mean values for the determinants of maintaining quality houses is 1.40 which indicates very poor quality of reconstructed houses and disaster victims are not safe at all during cyclones. The chi-square results (in table 5.36, chapter five) shows that the level of significance of all the determining factors is .000 which is statistically significant and it indicates that access to resource has a significant association with the quality of reconstructed houses. Furthermore, regression result in table 5.19 (chapter five) shows that level of income generating activities is a significant predictor for the quality of reconstructed houses, livelihood recovery, poverty reduction, vulnerability reduction and beneficiaries' satisfaction but it is not a significant predictor for post-disaster housing recovery surprisingly. This result rejects the null hypothesis and affirms the suggestions that access to resource can contribute to beneficiaries' satisfaction and disaster victims with access to income generating activities can maintain the quality of the reconstructed houses.

v) Livelihood recovery

Livelihood opportunities are drastically disrupted by the destruction or loss of vulnerable assets such as houses, business and employment. As a result, people of the coastal area of Bangladesh become unable to engage themselves in income generating activities and they become demoralised and dependent on humanitarian assistance. However, the frequency distribution summarized in table 5.28 (chapter five) shows that the livelihood recovery rate of affected people is not satisfactory, even seven years after the cyclones. The results show that more than 50% of respondents do not recover their livelihoods. Furthermore, the chi-square results in table 5.31 (chapter five) shows that chi-square value of access to resources is .045 for livelihood recovery which indicates that access to resource has a significant association with livelihood recovery. Moreover, the multiple regression results in table 5.19 shows that access to resources is significant predictor for respondents' livelihood recovery. This result leads into the rejection of null hypothesis and affirms the suggestion that people with access to resources can recover their livelihoods.

vi) Beneficiaries' satisfaction

The quantitative data analysis in chapter five (table 5.37) shows that disaster victims are not satisfied in all the determinants of beneficiary satisfaction with reconstructed houses, i.e. cyclone resilience, safety, cost-efficiency, use of technology, giving importance to local culture, sustainability, community participation, and coping and adapting capacity. The average mean value of the factors that determine the satisfaction of beneficiaries with reconstructed houses is no more than 1.25; the frequency distribution results (in table 5.38) also show that on an average more than 77% of respondents were very dissatisfied on all the parameters of beneficiary satisfaction on the reconstructed houses. Furthermore, the chi-square results in table 5.39 shows that access to resource has a significant association with beneficiaries' satisfaction. Similarly, the multiple regression result in table 5.19 shows that access to resource is a significant predictor for beneficiaries' satisfaction with p value of .000. This affirms hypothesis number two of this study that people in poverty and vulnerability have very low levels of capacity and satisfaction.

The success and effectiveness of any post-disaster housing reconstruction project largely depends on the targeted goals in accordance with the pre-employed parameters of rate of housing recovery, vulnerability reduction, and poverty reduction, quality of reconstructed houses, beneficiaries' satisfaction, and respondents' level of income generating activities. The results of this study show that the beneficiaries' expectation of the housing reconstruction projects undertaken by different organisations are not fulfilled and their conditions remain vulnerable years after the cyclones. The rate of housing recovery, vulnerability reduction, poverty reduction, beneficiary satisfaction and level of income generating activities are not at a satisfactory level. Moreover, the quality of reconstructed houses is not good.

Housing recovery or reconstruction in this study is measured according to its durability, quality, safety of the affected population, and time taken to deliver the projects to the end users. The quantitative data analysis in table 5.38 shows that more than 82% of respondents are very dissatisfied with the sustainability of the houses, 70.40% are very dissatisfied with the safety of their houses, and more than 80% of respondents are very dissatisfied about cyclone resilient houses. Moreover, the quantitative results (in table 5.5) show that more than 70% of respondents did not recover their houses until five years after the cyclones.

Thus, from the quantitative and qualitative results, it can be summarised, in response to the central research question that resourcing has not been effective in rebuilding houses for the coastal people of Bagerhat and Satkhira affected by cyclones Sidr and Aila despite financial and the provision of other resources.

8.1.3 Key success factors of resourcing

This study has explored factors that can contribute to successful post-disaster housing reconstruction projects through questionnaire surveys as well semi-structured interviews with experts who have experience and knowledge in PDHR projects. The quantitative results in chapter five (table 5.49) show that the average mean value of key success factors of resourcing is below 3.90 which indicates that key success factors can play a significant role in rebuilding the houses of the coastal, disaster affected Bangladeshi people. As can be seen from table 5.49, the most significant factor is community participation in the decision making process and beneficiaries' satisfaction with the mean value of 4.04 and 4.02 respectively. The frequency distribution results (in table 5.48) show that more than 60% of respondents support effective monitoring and managing resources, 58% transparency and accountability of resourcing managers, 55% community participation for the decision making process, 55% competency of resourcing managers, 52% supporting community self-reliance, 50% beneficiaries' satisfaction, and 49.00% adequate funding.

Furthermore, the qualitative data analysed by NVivo shows that access to resources, community participation, accountability and transparency of resourcing managers, coordination among participant organisations, managing resources properly, adequate funding, beneficiaries' satisfaction and cultural consideration are the main success factors which can play important roles in successful post-disaster housing reconstruction.

8.1.4 Challenges of post-disaster housing reconstruction

The results of quantitative data analysis in chapter five (table 5.46) show that more than 28% of respondents rank availability of resources, 20.1% of respondents poor quality of reconstructed houses, 19.8% lack of available land, 11.50% lack of coordination among the participant organisations and 10% of respondents rank lack of community participation as the extreme barriers. This result indicates that lack of resources is the most critical problem in comparison to other challenges in post-disaster reconstruction and they argued that the whole reconstruction project depends on the availability of resources.

Moreover, as can be seen from table 5.47 (in chapter five) challenges associated with post-disaster housing reconstruction projects are ranked by the disaster victims and they range from 3.90 for availability of resources to 3.50 for cultural barriers, which means availability of resources is the main barrier affecting PDHR projects. None of the overall mean scores are above 4. Generally, barriers with a mean score above 3.90 are related to poor quality of reconstructed houses, poor coordination, delay in project implementation and avoiding corruption. By examining from the lower part of table 5.47 in chapter five, it can be observed that the four barriers to PDHR projects which ranked lowest were lack of community participation in DCM 6^{th}, followed by corruption 7^{th}, lack of funding 8^{th}, and cultural barriers which ranked lowest.

8.1.5 Factors contributing to livelihood recovery

This study underpins the factors that play a major role in recovering the livelihoods of disasters victims. The quantitative data analysed by 95% confidence interval, frequency distribution and Chi-square test shows that the factors that play important roles in recovering livelihoods are income generating activities and temporary employment. The mean values (in table 5.30) of income generating activities and temporary employment are 3.44 and 2.81 respectively. The average mean value of other contributory factors is below 2.50, which indicates that those factors can contribute to recovering livelihoods but their contribution is below the expected level.

Furthermore, the qualitative data shows that lack of available resources, lack of local construction materials, poverty, financial barriers, poor quality of reconstructed houses, poor communication and transportation networks, lack of community participation, lack of access to land, and salinity affect the disaster victims ability to recover their livelihoods.

8.1.6 Level of vulnerability, coping capacity and resilience of disaster victims

The quantitative as well as the thematic analysis show that the level of vulnerability, coping capacity and resilience of people affected by cyclones Sidr and Aila in Bagerhat and Satkhira in Bangladesh are very low. The quantitative result in chapter five (table 5.44) shows that the mean values of acute poverty and susceptibility to disaster are 4.17 and 3.60 respectively, which indicates that they are very vulnerable. Furthermore, the 95% confidence interval result shows that the mean value of coping and adaptive capacity is only 1.21 and the result of frequency distribution in table 5.45 (chapter five) shows that about 82% of respondents are very dissatisfied in terms of coping and adaptive capacity. Moreover, the quantitative result in table 5.22 (chapter five) shows the factors that determine respondents' level of resilience is very low. The mean value of resilience to cyclone is 1.31; building capacity to resilience is 1.36 and 1.29 for strengthening disaster preparedness for effective response which indicates very low levels of resilience. The frequency distribution results in table 5.23 (chapter five) show that about 79% of respondents have a very low level of resilience in terms of cyclones, more than 71% in terms of building capacity to resilience and more than 77% have a low level of resilience in terms of disaster preparedness for effective response.

8.2 Post-cyclone Sidr and Aila housing reconstruction: A synthesis

Post-disaster housing reconstruction is a key element of post-disaster recovery initiatives in developing countries (Ahmed, 2011); and it is often the most valuable asset for many people; in disasters it is usually the most visible component that is damaged or lost (Ahmed and Charlesworth, 2015; Rashid and Paul, 2016). But post-disaster housing reconstruction in Bangladesh is not satisfactory; rather the coastal population affected by disasters suffers from a lack of habitable houses following cyclone Disasters (Mallick *et al*. 2009; Kabir, 2010; Alam, 2010; Rashid and Paul, 2016).

Post-disaster housing reconstruction programmes in Bangladesh can be categorised into three different types; transitional shelters, permanent housing and multipurpose cyclone shelters. The Bangladesh government undertook an initiative to run an early recovery programme to provide transitional shelters for those in need, including a shelter repair assistance programme after cyclones Sidr and Aila. Many people affected by Sidr and Aila needed temporary shelters until the permanent houses were built. Considering this issue, the Bangladesh government provided a one off housing assistance payment of 5000 BD taka to some 100,000 families with fully destroyed houses, along with 13000 bundles of corrugated iron sheets, 13,406 tents, and 15,000 plastic sheets intended to provide transitional shelters in cyclone Sidr and Aila areas (GOB, 2008). But literature suggests that assistance provided by the government was insufficient when measured against the damage and loss due to cyclones Sidr and Aila.

Bangladesh was the 24th largest humanitarian aid recipient in 2012 with US$87 million, and from the year 2000 to March of 2013, Bangladesh received $678m in humanitarian aid for flood and cyclone related disasters. The total amount of humanitarian aid for the most recent disaster including the 2012 floods in the north and south of Bangladesh was $5,848,778.9 (Global Humanitarian Assistance, 2014).

Despite the humanitarian assistance provided by the international community, post-disaster housing reconstruction in Bangladesh is not at a satisfactory level with disaster survivors still living in embankments and polders. To improve the quality and standard of current PDHR projects, the Bangladesh government introduced build back better approach to rebuild safer homes for the people affected by cyclones. The key component of this approach was to improve the construction quality of destroyed and damaged houses in Cyclone Sidr and Aila affected areas, incorporating the wind resistant houses developed after the 1997 cyclone in the Chittagong area (UNHABITAT and IFRC, 2010).

However, the reality is different from the theoretical explanation in the literature relating to the condition of existing houses built in the Sidr and Aila affected areas. After visiting the cyclone Sidr and Aila affected areas of Satkhira and Bagerhat in Bangladesh while doing fieldwork, it seems most of the houses look quite deplorable and cannot provide safety and security to the people during strong cyclones. It can be seen that corrugated tin from some of the houses has been blown away already. The overall housing condition in the Sidr area is comparatively better than in the cyclone Aila area. The reason behind this is that Sidr occurred in 2007 and Aila hit in 2009, so the affected people have had time to settle down recovering their livelihoods. There are three types of houses in Southkhali and Sharonkhola. The first category is wind resistant but the number is very limited. These houses are bricks built but despite having wind resistant materials, they lacked engineering design and are one room buildings without verandas. The affected people are not happy with the location, size of the houses or the number of rooms. The second type of house is built entirely from corrugated tin; the local people call it Saudi model. These houses are not cyclone resilient. The third type is made of golpata (roof) and mud (both walls and floors). These houses are very deplorable and fragile.

Similarly, the overall housing condition in the cyclone Aila affected area especially in Padma Pukur and Gabura in Satkhira are no better. Like Sidr affected areas, there are three types of houses available. The only difference is that the first type of house is made of concrete. Some of the brick dwellings have first floors, which can save the affected people from strong cyclones with tidal surges. These houses were built by BRAC with the funding from UNDP. This type of house looks strong and has a solid foundation which can resist strong cyclones but they are very limited considering the large number of affected people. The rest of the houses are made of golpata (roof) and the walls and floors are made of mud which is very fragile.

Based on the questionnaire surveys from 285 affected villagers and the results of the quantitative data analysis (in chapter five, table 5.3), it was found in the Sidr affected areas that only 11.80% of houses are pucca, 25.30% are kutcha, 4.50% are detached, 23.30% are tin-shed, and 6.60% are temporary and fragile. On the other hand, in cyclone Aila areas, more than 29% of houses are kutcha, 16.29% are pucca, 11.11% are detached, 35.55% are tin-shed and more than 7% are temporary and fragile houses. The quantitative results in chapter five (table 5.4) also show that different materials were used for post-Sidr and Aila housing reconstruction. About 50.70% of disaster victims said that they used permanent tin roof in their housing reconstruction, approximately 14% mentioned temporary thatch, only 3.80% opined for reinforced concrete and 0.70% respondents used brick.

Furthermore, the results of the qualitative data analysis show that in terms of housing reconstruction, in most cases materials such as bamboo, CGI sheet, wood, mud and RCC pillars are used for rebuilding. The qualitative data analysed by NVivo shows that bamboo, mud, CGI sheets, corrugated tin, RCC pillars and scrap materials are generally used in post-Sidr and Aila housing reconstruction. At least 9 respondents mentioned bamboo is the main material that disaster victims use for reconstruction. Likewise, corrugated tin, CGI sheets and RCC pillars have got nodes of 7, 6, and 4 respectively.

Finally, the beneficiaries are not happy based on the size, location, quality, durability, safety, technological use, and cultural acceptance, coping and adaptive capacity and cost-efficiency of the houses.

8.3 Contribution to knowledge

Little is known about resourcing and its implications in post-disaster housing reconstruction projects in Bangladesh and elsewhere. The existing literature hardly contains any empirical evidence on the key stages and key success factors of resourcing for post-disaster housing reconstruction projects. Furthermore, no researchers provide findings of the effectiveness of resourcing in PDHR projects. This study attempts to identify the effectiveness of resourcing by employing specific parameters. Therefore, this additional data will help bring fresh insights to underlying theoretical issues related to resourcing and its effectiveness in PDHR in cyclone affected coastal areas in Bangladesh. However, the main contributions of this study to knowledge are summarized below:

i) Proper management and utilization of resources are the key considerations in post-disaster housing reconstruction projects, but literature on resourcing and its implications in PDHR projects is very limited (Chang, 2012). The current literature has mainly emphasized the factors that affect resourcing availability (Wilkinson *et al*. 2010), resource availability and its approaches (Chang, 2012) and allocation of resources (Freeman, 2004) for post-disaster housing reconstruction. Most of the existing studies lack key stages and key success factors of resourcing for post-disaster housing reconstruction. This study contributes to knowledge by exploring the key stages and key success factors of resourcing for post-disaster housing reconstruction projects.

ii) The existing literature contains hardly any empirical evidence on the relevant method of measuring the effectiveness of resourcing for post-disaster housing reconstruction. Hence, this study attempts to identify the effectiveness of resourcing for post-disaster reconstruction through applying parameters of rate of housing recovery, vulnerability reduction, poverty reduction, livelihood recovery, beneficiaries' satisfaction and quality of reconstructed houses by which effectiveness of resourcing can be measured. Therefore, this research adds greater knowledge into the existing literature by exploring the process of measuring effectiveness of resourcing in terms of post-disaster housing reconstruction.

iii) This study develops a theoretical framework by the synthesizing of literature review, approaches and theories relating to disaster management and resourcing and its implications in post-disaster housing reconstruction. This theoretical framework shows how affected people can increase their coping and adapting capacity to recover livelihoods that leads to successful post-disaster housing reconstruction through undergoing six critical stages.

iv) This study also contributes to the body of knowledge by developing a dynamic theoretical model that shows how people affected by cyclone disasters can rebuild dynamic cyclone resilient houses. The dynamic theoretical model is based on eight stages which are not identified by other researchers in terms of rebuilding cyclone resilient houses.

v) This study makes a significant contribution to the literature of resourcing for post-disaster housing reconstruction by introducing access to resources, land, and level of education and level of income generating activities as new variables. The study shows how the impact of access to resources, land, level of education and income generating activities play significant roles in reconstructing houses for the people affected by disasters by employing multiple regression analysis.

vi) The current literature contains hardly any empirical evidences that measure the rate of housing reconstruction. However, this study employs parameters of durability and quality of the houses, safety to the affected population during cyclones, time boundary and the percentage of recovery of the houses. Thus, this study contributes to existing literature by measuring reconstruction as new variable.

vii) Resourcing for post-disaster housing reconstruction is a new area for post-disaster housing reconstruction researchers. Measuring the effectiveness of resourcing in reconstructing houses is very complex and multifactorial. Information and resources regarding resourcing for PDHR projects are not sufficient as no similar type of research has been done before in Bangladesh. There are some articles and literature relating to post-disaster housing reconstruction. However, there is no evidence-based research on resourcing for post-disaster housing reconstruction in Bangladesh. This study fills this gap in the body of knowledge in this area.

8.4 Policy implications

The findings of this study have several important implications for resourcing managers, governments, disaster management practitioners, disaster researchers, NGOs and INGOs, and national and international organisations who are actively involved in post-disaster housing reconstruction. The main implications are summarized below:

i) This study explores the reasons for poor post-disaster housing reconstructions and identifies challenges associated with housing reconstruction projects. Government and international organisations working in the field can run successful post-disaster housing reconstruction by addressing those challenges which have been identified in this study.

ii) One of the main implications of this research is for policy and intervention programmes to apply key success factors of resourcing in terms of successful post-disaster housing reconstruction.

iii) Recovering livelihoods is very significant for disaster victims. The findings of this study show the factors that contribute to livelihoods recovery. Therefore, disaster management practitioners can put into practice those factors which contribute to livelihood recovery.

iv) The results of this study show that disaster affected people have a very low level of access to resources to rebuild their houses. Local government and national and international organisations should provide more access to resources to the disaster victims by providing cheap rate loans or microfinance.

v) The findings of this show that there is corruption in selecting the beneficiaries and in many cases the entire amount of the project money is not spent on the goals of the projects. Therefore, government and national and international stakeholders need to set up system to minimize such practice and to promote integrity in the whole project from start to finish.

vi) The quantitative analysis of this study shows that access to land is one of the main barriers for disaster victims to rebuild their houses. Governments should provide khas land free of charge to the disaster affected people so that they can rebuild their houses.

vii) This study explores experiences and knowledge from the expert interviews about how to rebuild cyclone resilient houses. Taking experts' suggestions and experiences from the villagers of Satkhira and Bagerhat into account, this study proposes a dynamic theoretical framework that shows how to build cyclone resilient houses for the affected people despite limited resources. Therefore, government and international organisations working in the field of post-disaster reconstruction can implement those guidelines to build cyclone resilient houses for the disaster affected people.

viii) This study underscores root causes of limited access to power of the vulnerable affected people. It shows in chapter five that poverty, lack of income, lack of training and lack of education exacerbate vulnerability. Therefore, international organisations such as UNDP, IFRC, OXFAM and the Bangladesh government can undertake vocational training for income generating activities and can arrange programmes to improve literacy.

8.5 Recommendations for future research

Bangladesh is one of the most disaster-prone countries in the world. Coastal Bangladesh is highly susceptible to natural disasters like cyclones. The study area of this research was severely affected by Cyclone Sidr in 2007 and Aila in 2009. While doing fieldwork, I came across the people from the affected communities in Bagerhat and Satkhira in Bangladesh. Through in-depth discussions with the cyclone victims, this study reveals how and why the residents still struggle to cope with the adverse effects of the cyclones that hit them in 2007 and 2009 consecutively. They are in vicious cycles of poverty. Their coping and adaptive capacities are very low. Most of them are day labourers. They live from hand to mouth. They do not have the capacity and capability to withstand future cyclones. As coastal Bangladesh is very prone to cyclones, their capacity development in terms of facing future cyclones is very important. Therefore, future research focus is on critical analysis of their capacity development in terms of withstanding future cyclones.

Furthermore, after reviewing literature relating to disaster management, resourcing and its implications in post-disaster housing reconstruction and stakeholders' involvement in reconstruction, it was observed that there is a dearth of literature on humanitarian assistance and development of disaster affected people and stakeholders' involvement in post-Sidr and Aila housing reconstruction in Bangladesh. Thus, it will be beneficial to conduct further studies on humanitarian assistance and the overall development of disaster victims.

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APPENDICES

Appendix 1: Questionnaire

Resourcing for post-disaster housing reconstruction: the case of Cyclone Sidr and Aila in Bangladesh

Please use your best judgement and answer the questions as fully and accurately as you can. Your prompt response will be highly appreciated. Participation is voluntary, and all the specific information provided in this questionnaire will remain absolutely confidential.

Thank you for your cooperation in answering the questions.

Definition

This study uses the following definition as a concept.

Resourcing is the activity or process to manage construction materials, funding or humanitarian assistance which are required for post-disaster reconstruction in the built environment.

Reconstruction is a process of activities that involve building shelter or houses for the affected population in post disaster emergency period to get them back to a pre-disaster state.

Resilience is the ability of a system, community or society exposed to hazards to resist and recover from the effects of a hazard in a timely and efficient manner.

Please tick in the relevant boxes below whether you would like to proceed at this point.

Yes ☐

No ☐

Section A: Personal Profile		
Q.1 Name of the respondent:		
Q.2 Gender		
Male	☐	
Female	☐	
Q.3 Marital status		
Married	☐	
Unmarried	☐	
Widow/Widower	☐	
Separated	☐	
Q.4 Age :		
Q. 5 Religion		
Muslim	☐	
Hindu	☐	
Cristian	☐	
Others	☐	
Q. 6 Occupation		
Day labourers	☐	
Farmer	☐	
Fishing	☐	
Carpenter	☐	
Others	☐	
Q.7 Are you the sole bread-earner of the household?		
Yes	☐	
No	☐	
Q.8 What is your monthly income in BD Taka?		
Q.9 Level of education		
No formal education	☐	
Primary education	☐	
Secondary education	☐	

Further education	☐	
University degree	☐	
Postgraduate	☐	
Q.10 How would you describe your current employment situation?		
Unemployed	☐	
Employed	☐	
Self Employed	☐	
Housewife	☐	
Pensioner	☐	

Section B: Access to resources

Q.11 .Do you have access to the sufficient amount of resources to rebuild your houses		
Yes	☐	
No	☐	
Q.12 If you have access to resources, what type of resources do you have access to your houses?		
Humanitarian assistance from stakeholders'	☐	
Resources related to reconstruction materials	☐	
Cash grant	☐	
Assistance from Local government	☐	

Resources for post-disaster housing reconstruction

Q.13 Can you please rank the level of your access to the resources for housing reconstruction on a five-point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?

	1	2	3	4	5
Land	☐	☐	☐	☐	☐

Human resources (skilled & unskilled labour)	☐	☐	☐	☐	☐
Institutional resources (Govt., NGOs, etc)	☐	☐	☐	☐	☐
Community resources	☐	☐	☐	☐	☐
Quality of building materials	☐	☐	☐	☐	☐
Technology	☐	☐	☐	☐	☐
Financial resources	☐	☐	☐	☐	☐
Construction specialists input	☐	☐	☐	☐	☐
Information	☐	☐	☐	☐	☐
Resources for transportation and communication infrastructure					
Q.14 Can you please rank the level of your access to the resources for transportation and communication on a five-point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?					
	1	2	3	4	5
Financial resources	☐	☐	☐	☐	☐
Bus	☐	☐	☐	☐	☐
Train	☐	☐	☐	☐	☐
Private car	☐	☐	☐	☐	☐
Electricity	☐	☐	☐	☐	☐
Mobile	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐
Computer	☐	☐	☐	☐	☐
Resources for energy infrastructure					
Q.15 Can you please rank the level of your access to the resources for energy infrastructure on a five-point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?					
	1	2	3	4	5

Gas	☐	☐	☐	☐	☐
Electricity	☐	☐	☐	☐	☐
Solar farms	☐	☐	☐	☐	☐
Kerosin	☐	☐	☐	☐	☐
Firewood	☐	☐	☐	☐	☐
Coal	☐	☐	☐	☐	☐
Resources for water and sanitation infrastructure					
Q.16 Can you please rank the level of your access to the resources for water and sanitation infrastructure on a five-point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?					
	1	2	3	4	5
Financial resources	☐	☐	☐	☐	☐
Pure drinking water	☐	☐	☐	☐	☐
Toilet (WC)	☐	☐	☐	☐	☐
Pit Latrine	☐	☐	☐	☐	☐
Sewerage facilities	☐	☐	☐	☐	☐
Resources for school and health care facilities					
Q.17 Can you please rank the level of your access to the resources for school and health care facilities on a five-point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?					
	1	2	3	4	5
Available teachers	☐	☐	☐	☐	☐
Financial resources	☐	☐	☐	☐	☐
Human resources	☐	☐	☐	☐	☐
Hospitals	☐	☐	☐	☐	☐
Clinics	☐	☐	☐	☐	☐

Section C: Factors affecting housing reconstruction					
Impediment to Post-disaster housing reconstruction					
Q.18 Can you please rank the following factors as barriers to successful post-disaster housing reconstruction on the basis of five-point Likert scale from 1 to 5, where 1= not a barrier; 2 = somewhat of a barrier; 3 = moderate barrier; 4 = Barrier and 5 = extreme barrier?					
	1	2	3	4	5
Lack of coordination among participant organisations	☐	☐	☐	☐	☐
Resources availability	☐	☐	☐	☐	☐
Cultural barriers	☐	☐	☐	☐	☐
Lack of funding	☐	☐	☐	☐	☐
Corruption	☐	☐	☐	☐	☐
Poor quality of reconstructed houses	☐	☐	☐	☐	☐
Lack of community participation in decision making process	☐	☐	☐	☐	☐
Delay in project implementation	☐	☐	☐	☐	☐
Unavailability of appropriate land	☐	☐	☐	☐	☐

Section D: Importance of key factors for resourcing
Key success factors of resourcing
Q.19 Can you please rank the importance of the factors that can contribute to durable post-disaster housing reconstruction on a five-point Likert scale from 1 to 5, where 1= not important at all; 2 = somewhat important; 3 = moderately important; 4 = important and 5 =

very important?					
	1	2	3	4	5
Effective monitoring and managing resources	☐	☐	☐	☐	☐
Supporting community self-reliance	☐	☐	☐	☐	☐
Community participation in decision making process	☐	☐	☐	☐	☐
Adequate funding	☐	☐	☐	☐	☐
Competence of resourcing managers	☐	☐	☐	☐	☐
Beneficiary's satisfaction	☐	☐	☐	☐	☐
Transparency and accountability	☐	☐	☐	☐	☐

Section E: Cyclone resilient houses

Beneficiary's Satisfaction on reconstructed houses

Q.20 If you have access to resources and recover houses, can you please rank your satisfaction on the houses as a cyclone resilient on the basis of five-point Likert scale from 1 to 5, where 1= very dissatisfied; 2 = dissatisfied ; 3 = neither satisfied nor dissatisfied 4 = satisfied and 5 = very satisfied?

	1	2	3	4	5
Cyclone resilient	☐	☐	☐	☐	☐
Safety	☐	☐	☐	☐	☐
Cost efficiency	☐	☐	☐	☐	☐
Use of technology	☐	☐	☐	☐	☐
Giving importance to local culture	☐	☐	☐	☐	☐
Sustainability	☐	☐	☐	☐	☐
Community participation	☐	☐	☐	☐	☐
Coping and adapting capacity	☐	☐	☐	☐	☐

Q.21 Is your current house cyclone resilient?

Yes	☐

No	☐
Q.22 If your current houses are not cyclone resilient, what are the reasons of it?	
Poorly made	☐
Lack of maintaining building code	☐
Corruption	☐
Beneficiary's opinion is not considered	☐
Local culture is ignored	☐
Q.23 If you receive any humanitarian assistance from local government and international agency, how did you receive the assistance?	
Via Local Government	☐
Via Local and National NGOs	☐
Via International NGOs	☐
Via International Stakeholders (IFRC, UNDP, World Bank,)	☐
Don't receive	☐

Causes of limited access to power

Q.24 Can you please rank the most possible causes of your limited access to power on the basis of five-point Likert scale from 1 to 5, where 1= very low; 2 = low ; 3 = neither low nor high; 4 = high and 5 = very high?

	1	2	3	4	5
Poverty	☐	☐	☐	☐	☐
Oppressed by political leaders	☐	☐	☐	☐	☐
having no jobs	☐	☐	☐	☐	☐
lack of income	☐	☐	☐	☐	☐
Lack of training and skills	☐	☐	☐	☐	☐

Section F: Housing Recovery

Q.25 Have you recovered your houses to live?		
Yes	☐	
NO	☐	
If no, please go to section G		
Q.26 What type of houses have you recovered?		
Kutcha house (Built with mud)	☐	
Pucca House (Built with brick)	☐	
Detached	☐	
Tin shade house	☐	
Temporary fragile house	☐	
Q.27 When do you recover your houses to live?		
After 1 year of Cyclones	☐	
After 3 year of Cyclones	☐	
After 5 year of Cyclones	☐	
After 7year of Cyclones	☐	
Did not recover at all	☐	
Q.28 What materials were used to build your houses?		
Permanent tin roof	☐	
Temporary thatch	☐	
Reinforced concrete	☐	
Brick	☐	
plinth	☐	
Quality of reconstructed houses		
Q.29 Can you please rank the level of the quality of the reconstructed houses on a five-point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate = 4 = high; 5 = very high?		

	1	2	3	4	5

Durable	☐	☐	☐	☐	☐
Culturally acceptance	☐	☐	☐	☐	☐
Maintaining building code	☐	☐	☐	☐	☐
Community participation in decision making process	☐	☐	☐	☐	☐
Use of technology	☐	☐	☐	☐	☐
Safety and security					
Q.30 Can you please rank your safety in your house in case of strong storm or hurricane or Tsunami on the basis of 5 point Likert scale where 1 = very low; 2 = low; 3 = neither high nor low; 4 = high ; 5 = very high?					
	1	2	3	4	5
High modern design	☐	☐	☐	☐	☐
Use of technology	☐	☐	☐	☐	☐
hazard-resistant structures and retrofitting	☐	☐	☐	☐	☐
Resilience to hazard	☐	☐	☐	☐	☐
Section G: Livelihood recovery					
Factors contributing to livelihood recovery					
31. Have you recovered your livelihoods?					
Yes			☐		
No			☐		
Q.32 Can you please rank form the following factors that contribute most to your livelihood recovery on the basis of 5 point Likert scale from 1 to 5, where 1= very low; 2 = low; 3 = moderate; 4 = high; and 5 = very high?					
	1	2	3	4	5
Income generating activities including sewing, fishing, etc;	☐	☐	☐	☐	☐
humanitarian assistance from international stakeholders	☐	☐	☐	☐	☐

loan from local business man	☐	☐	☐	☐	☐
relief fund	☐	☐	☐	☐	☐
temporary employment	☐	☐	☐	☐	☐
Factors hindering livelihood recovery					
Q.33 Can you please rank the factors that most possibly hinder restoring your livelihoods on the basis of 5 point Likert scale from 1 to 5, where 1 = little or no hindrance; 2 = some hindrance; 3 = moderately hindrance; 4 = great hindrance; and 5 = very great hindrance ?					
	1	2	3	4	5
Access to lands	☐	☐	☐	☐	☐
lack of cash money	☐	☐	☐	☐	☐
acute poverty	☐	☐	☐	☐	☐
lack of jobs	☐	☐	☐	☐	☐
lack of assistance from international stakeholders	☐	☐	☐	☐	☐
lack of local facilities	☐	☐	☐	☐	☐
Section H: Vulnerability reduction					
Adapting capacity to withstand disasters					
Q.34 If you have the capacity to withstand future disasters, can you please rank the level of your adapting capacity of withstanding future disasters on the basis of five-point Likert from 1 to 5, where 1 = very low; 2 = low; 3 = moderate; 4 = high; and 5 = very high ?					
	1	2	3	4	5
Resilience to cyclone (Capacity to prevent, mitigate, prepare and recover from impacts of disasters)	☐	☐	☐	☐	☐
Building capacity to resilience	☐	☐	☐	☐	☐
Reducing the underlying risk factors	☐	☐	☐	☐	☐
Strengthen disaster preparedness for effective response	☐	☐	☐	☐	☐

Q.35 Are you still vulnerable in terms of withstanding future disasters like Cyclones?

Yes	☐	
No	☐	

Level of vulnerability

Q.36 Can you please rank the level of your vulnerability on the basis of 5 point Likert scale where 1 = very low; 2 = low; 3 = moderate; 4 = high; and 5 = very high?

	1	2	3	4	5
Acute poverty	☐	☐	☐	☐	☐
Having no access to resources	☐	☐	☐	☐	☐
Having no permanent jobs	☐	☐	☐	☐	☐
very susceptible to disasters	☐	☐	☐	☐	☐
lack of assistance from local and international stakeholders	☐	☐	☐	☐	☐

Section I: Stakeholder and government involvement in rebuilding houses

Q.37 Did you receive any humanitarian assistance for rebuilding your houses from either international stakeholder or local government?

Yes	☐
No	☐
If no, please go to section J.	

Q.38 If you receive any humanitarian assistance from local government and international agency, how did you receive the assistance?

Via Local Government	☐
Via Local and National NGOs	☐
Via International NGOs	☐

Via International Stakeholders (IFRC, UNDP, World Bank,)	☐
Don’t receive	☐
Q.39 Who provided your resources for housing reconstruction?	
Local government	☐
IFRC	☐
World Bank	☐
UNDP	☐
Local and international NGOs	☐
I don’t know	☐
Q.40 Can you please mention the amount of assistance that you receive for rebuilding your houses in BD Taka?	
5000-10,000	☐
10001-15,000	☐
15,001-20,000	☐
20,001 over	☐
Q.41 Are the provided resources sufficient for rebuilding your houses?	
Yes	☐
No	☐
Q.42 If the resources are not sufficient, why are they insufficient?	
Misallocation of resources	☐
Delay in implementation	☐
Corruption	☐
Spent fund for other sectors	☐
Q.43 Who actually rebuilt your houses?	
Nobody	☐
IFRC	☐
World Bank	☐
UNDP	☐

Local Government	☐
Self- reconstruction	☐
Local and international NGOs	☐

Section J: Social capital

Bonding social capital

Q.44 How would you rate your experience of the followings on the basis of five- point Likert scale where 1 = very low; 2 = low; 3 = moderate; 4 = high, and 5 = very high?

	1	2	3	4	5
Neighbourhood cohesion	☐	☐	☐	☐	☐
Neighbourhood trust	☐	☐	☐	☐	☐
Neighbourhood belonging	☐	☐	☐	☐	☐
Civic participation	☐	☐	☐	☐	☐

Bridging social capital

Q. 45 Can you please rank the level of your access to bonding social capital on the basis of 5 point Likert scale where 1 = very low; 2 = low; 3 = moderate; 4 = high, and 5 = very high?

	1	2	3	4	5
Social cohesion	☐	☐	☐	☐	☐
Mutual respect	☐	☐	☐	☐	☐
Socio-economic status	☐	☐	☐	☐	☐
Ethnicity	☐	☐	☐	☐	☐

Linking Social capital

Q. 46 Can you please rank the level of your access to linking social capital on the basis of 5 point Likert scale where 1 = very low; 2 = low; 3 = moderate; 4 = high, and 5 = very high?					
	1	2	3	4	5
Political participation	☐	☐	☐	☐	☐
Political activism	☐	☐	☐	☐	☐
Political efficacy	☐	☐	☐	☐	☐
Political trust	☐	☐	☐	☐	☐
Section K: Income generating activities					
Level of income generating activities					
Q.47 Can you please rank the level of your access to income generating activities on the basis of 5 point Likert scale where 1 = very low; 2 = low; 3 = moderate; 4 = high; and 5 = very high?					
	1	2	3	4	5
Small enterprise	☐	☐	☐	☐	☐
Sewing	☐	☐	☐	☐	☐
Homestead vegetables cultivation	☐	☐	☐	☐	☐
Crop production	☐	☐	☐	☐	☐
Poultry rearing	☐	☐	☐	☐	☐
fisheries,	☐	☐	☐	☐	☐
Section L: Poverty reduction					
Quality of life					

Q. 48 Can you please rank the level of your capacity to run your family by your income on the basis of five-point Likert scale from 1 to 5, where 1 = very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?					
	1	2	3	4	5
Affordability	☐	☐	☐	☐	☐
Capability to meet regular needs	☐	☐	☐	☐	☐
Access to recreation	☐	☐	☐	☐	☐
Per capita income	☐	☐	☐	☐	☐
Bearing regular expenses	☐	☐	☐	☐	☐
Satisfaction over income	☐	☐	☐	☐	☐
Q.49 Can you please choose from the following as a means of your main regular recreation?					
TVS	☐				
Radio	☐				
No access to recreation	☐				
Watching movies in cinema hall	☐				
Watching movies in home	☐				
Managing emergency					
Q.50 If you can depend on yourself in an emergency period to recover to prior to disaster, can you please rank the following option on the basis of 5 point Likert scale where 1 = very low; 2 = low; 3 = moderate; 4 = high; 5 = very high?					
	1	2	3	4	5
Cash saving	☐	☐	☐	☐	☐
Income from employment	☐	☐	☐	☐	☐
Assets	☐	☐	☐	☐	☐
Selling lands	☐	☐	☐	☐	☐

Loan from local mahajan	☐	☐	☐	☐	☐
Section M: Community participation in rebuilding houses					
Level of community participation in post-disaster housing reconstruction					
Q.51 Can you please rank the level of your participation in rebuilding houses in post-disaster reconstruction environment on the basis of five-point Likert scale from 1 to 5, where 1 = very low; 2 = low; 3 = moderate; 4 = high and 5 = very high?					
	1	2	3	4	5
Decision making about houses	☐	☐	☐	☐	☐
Design of houses	☐	☐	☐	☐	☐
Selection of Construction materials	☐	☐	☐	☐	☐
Use of technology	☐	☐	☐	☐	☐
Temporary or permanent houses	☐	☐	☐	☐	☐

Semi-structured interview

1. Do you think that people affected by cyclone have access to sufficient amount of resources to rebuild their houses?

2. How do normally people affected by Cyclones rebuild their houses?

3. What are the factors which can hinder affected people to rebuild their houses?

4. Do you think current built houses after Cyclone Sidr and Aila are cyclone resilient? Please state the reasons-------------------

5. How can affected people rebuild their houses which can withstand future cyclone?

6. What are the roles that you played in rebuilding the houses for the beneficiaries after Sidr and Aila?

7. What are the strategies that you employ to rebuild houses for them?

8. What are the key success factors of resourcing that can contribute to successful post-disaster housing reconstruction?

9. How can the affected people make dynamic cyclone resilient houses that can withstand future disaster like Cyclone?

10. What are the materials generally used to rebuild their houses?

11. How did the affected people recover their livelihoods? What are the factors that hinder or contribute to their livelihoods recovery?

12. Has the vulnerability of affected people been reduced after their livelihoods recovery? Are they able to withstand future disasters?

13. Do you think community participation is important in rebuilding cyclone resilient houses?

Appendix 2- Participant information sheet – script to be read out to Sidr and Aila affected people of Bagerhat and Satkhira.

2a: Participant information sheet for cyclone Sidr and Aila affected people.

Study title: Resourcing for post-disaster housing reconstruction: the case of Cyclones Sidr and Aila in Bangladesh

Invitation: You are being invited to take part in a research study as a part of PhD programme exploring the effectiveness of resourcing in reconstructing houses for the cyclone Sidr and Aila affected people of Bangladesh. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss with others if you wish. If anything is not clear or you need further information, please do not hesitate to ask me. Thank you for reading this.

What is the purpose of this study?

The purpose of this study is to examine the effectiveness of resourcing in rebuilding houses for the cyclone affected people. To achieve the above, this study has set the following objectives:

1. To review critically the literature of related theories on resourcing for post-disaster housing reconstruction

2. To evaluate the current post disaster housing reconstruction in Bangladesh

3. To develop a dynamic theoretical framework for cyclone resilient houses

4. To explore the key success factors of resourcing for post-disaster housing reconstruction

5. To identify the factors that affect post-disaster housing reconstruction

Here are some of the criteria that we would like to ask you about

- How did you recover your houses and livelihood after Cyclone Sidr and Aila?.
- Can your current houses protect you in severe Cyclone?

- What are that factors that affect you to recover livelihoods?

Why have we contacted you?

We think that your opinion will be very useful for this research. However, changing your mind will not be a problem after agreeing to participate in the interview.

Why have I been chosen?

I am to administer interview people affected by cyclone Sidr and Aila in Bagerhat and Satkhira in Bangladesh to explore their experiences in terms of housing recovery, livelihood hoods recovery and vulnerability as your opinion and experiences will be valuable for this research.

Do I have to take part?

No, we would be grateful if you could take part but this is purely a matter for you to decide upon.

What will happen to me if I take part?

You will be given a guarantee of confidentiality. It will be impossible for anybody to connect you with the information that you have given.

What are the potential benefits or advantages of taking part?

Your personal experience will be used to inform governments and aid agencies about how procedures can be improved when dealing with disaster reconstruction.

Are there any risks or disadvantages of taking part?

There are no risks or disadvantages. This study would not take place without the consent of London South Bank University's Ethics Committee.

Can I withdraw from the study and what will happen to my data if I withdraw?

Yes, you can withdraw from the study at any time, and we will still guarantee your anonymity.

Payment for participation and terms and conditions of payment

People answering the questionnaire will be paid £5 for taking part.

Will the information I give be kept confidential?

Yes, all information will be treated with the greatest of confidentiality. Any information about you which is shared with others (e.g. in reports and publications or is shared with a supervisor) will have your name and address removed so that you cannot be recognised from it. Your information will be kept by the main investigator and the London South Bank University solely for the entire duration of this research solely for the purpose of analysing, discussing and reviewing the data

When will the data be destroyed?

All data will be destroyed exactly one year after a doctorate has been awarded.

Contact information

Main investigator:

Md. Zahidul Islam, Contact:02078157356

Mobile: +447885816537

School of Law and Social Sciences, London South Bank University, UK

2b: Participant information sheet for stakeholders.

Study title: Resourcing for post-disaster housing reconstruction: the case of Cyclone Sidr and Aila in Bangladesh

Invitation: You are being invited to take part in a research study as a part of PhD programme exploring the effectiveness of resourcing in reconstructing houses for the cyclone Sidr and Aila affected people of Bangladesh. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss with others if you wish. If anything is not clear or you need further information, please do not hesitate to ask me. Thank you for reading this.

What is the purpose of this study?

The purpose of this study is to examine the effectiveness of resourcing in rebuilding houses for the cyclone affected people. To achieve the above, this study has set the following objectives:

1. To review critically the literature of related theories on resourcing for post-disaster housing reconstruction

2. To evaluate the current post disaster housing reconstruction in Bangladesh

3. To develop a dynamic theoretical framework for cyclone resilient houses

4. To explore the key success factors of resourcing for post-disaster housing reconstruction

5. To identify the factors that affect post-disaster housing reconstruction

Why have we contacted you?

We think that your opinion will be very useful for this research. However, changing your mind will not be a problem after agreeing to participate in the interview.

Why have I been chosen?

I am to administer interview stakeholders from national and international organisations who are involve in post-cyclone Sidr and Aila housing reconstruction in Bagerhat and Satkhira in Bangladesh in order to explore your experiences in terms of conditions of existing houses, materials used for reconstruction and the challenges you face as your opinion and experiences will be valuable for this research.

Do I have to take part?

No, we would be grateful if you could take part but this is purely a matter for you to decide upon.

What will happen to me if I take part?

You will be given a guarantee of confidentiality. It will be impossible for anybody to connect you with the information that you have given.

What are the potential benefits or advantages of taking part?

Your personal experience will be used to inform governments and aid agencies about how procedures can be improved when dealing with disaster reconstruction.

Are there any risks or disadvantages of taking part?

There are no risks or disadvantages. This study would not take place without the consent of London South Bank University's Ethics Committee.

Can I withdraw from the study and what will happen to my data if I withdraw?

Yes, you can withdraw from the study at any time, and we will still guarantee your anonymity.

Will the information I give be kept confidential?

Yes, all information will be treated with the greatest of confidentiality. Any information about you which is shared with others (e.g. in reports and publications or is shared with a supervisor) will have your name and address removed so that you cannot be recognised from it. Your information will be kept by the main investigator and the London South Bank University solely for the entire duration of this research solely for the purpose of analysing, discussing and reviewing the data.

What will happen to the audio-recording of the interview?

If you are chosen to take part in interview, the audio recording will be kept in a safe place, and then deleted after the data has been written up. Your name will only be given if we have received your permission to do so.

Contact information

Main investigator:

Md. Zahidul Islam, Contact: 02078157356

Mobile: +447885816537

School of Law and Social Sciences,

London South Bank University, UK.

Appendices 3: Results of Cronbach's Alpha

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.871	.865	18

Item Statistics

	Mean	Std. Deviation	N
Level of access to land	1.57	.591	272
Level of access to human resources	1.53	.723	272
Level of access to institutional resources	1.49	.703	272
Level of access to community resources	1.44	.623	272
Level of access to building materials	1.37	.581	272

Level of access of technologgical applicatuion in housing	1.42	.687	272
Level of access to financial resources	1.31	.538	272
Level of access to construction specialists	1.27	.506	272
Level of access to computer	1.29	.508	272
Level of access to information on housing reconstruction	1.55	.781	272
Level of access to financial resources for transportaion and communication	1.39	.573	272
Level of access to bus	1.46	.664	272
Level of access to train	1.26	.463	272
Level of access to private car	1.23	.462	272
Level of access to electricity	1.40	.568	272
Level of access to mobile phone	1.60	.781	272
Level of access to TV	1.32	.542	272
Level of access to Internet	1.17	.413	272

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Level of access to land	23.50	33.454	.482	.294	.865
Level of access to human resources	23.54	31.304	.651	.591	.857
Level of access to institutional resources	23.58	31.750	.613	.545	.859
Level of access to community resources	23.63	32.426	.604	.479	.860
Level of access to building materials	23.70	32.403	.659	.509	.858
Level of access of technologgical applicatuion in housing	23.65	31.600	.650	.497	.857
Level of access to financial resources	23.76	33.255	.573	.455	.862
Level of access to construction specialists	23.80	34.167	.452	.383	.866
Level of access to computer	23.78	35.508	.220	.256	.874
Level of access to information on housing reconstruction	23.52	31.549	.563	.432	.862

Level of access to financial resources for transportaion and communication	23.68	32.810	.604	.433	.860
Level of access to bus	23.61	32.896	.494	.408	.864
Level of access to train	23.81	36.072	.146	.159	.875
Level of access to private car	23.84	35.713	.212	.138	.873
Level of access to electricity	23.67	32.969	.583	.415	.861
Level of access to mobile phone	23.47	31.711	.543	.429	.863
Level of access to TV	23.75	35.216	.247	.177	.873
Level of access to Internet	23.90	35.344	.322	.205	.870

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
25.07	37.098	6.091	18

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Appendices 4: Results of cross tabulation of access to resources to socio-economic variables.

Table 1.

Vulnerability reduction and access to resources: chi-square tests

		Access to resources		
Vulnerability reduction factors		No	Yes	Total
Resilience to cyclone	Very low	220	6	226
	low	47	1	48
	Moderate	5	6	11
	Total	272	13	285
Building capacity to resilience	very low	202	4	206
	low	62	3	65
	moderate	7	6	13
	very high	1	0	1
	Total	272	13	285
Risk reduction	very low	219	5	224
	low	48	2	50
	moderate	4	5	9
	high	1	1	2
	Total	272	13	285
Disaster preparedness	very low	222	2	224
	low	43	4	47
	moderate	5	5	10
	high	1	1	2
	very high	1	0	1
	Total	272	12	284
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Resilience to cyclone	65.694a	2	0	
Resilience capacity	54.955a	3	0	
Risk reduction	66.073a	3	0	
Disaster preparedness	70.456a	4	0	

Table 2.

Poverty reduction and access to resources: chi-square tests

		Access to resources		
Poverty reduction factors		No	Yes	Total
Affordability	very low	175	4	179
	low	89	3	92
	moderate	7	6	13
	high	1	0	1
	Total	272	13	285
Capability to meet regular needs	very low	163	4	167
	low	101	2	103
	moderate	6	7	13
	high	1	0	1
	Total	1	0	1
Access to recreation	very low	197	3	200
	low	69	2	71
	moderate	5	8	13
	Total	271	13	284
Per capita income	very low	178	4	182
	low	90	4	94
	moderate	4	5	9
	Total	272	13	285
Bearing regular expenses	very low	165	4	169
	low	99	3	102
	moderate	7	6	13
	Total	271	13	284
Satisfaction over income	very low	186	4	190
	low	77	2	79
	moderate	7	7	14
	high	2	0	2
	Total	272	13	285
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Affordbility	54.291[a]	3	.000	
Capability to meet regular needs	76.054[a]	4	.000	
Access to recreation	101.406[a]	2	.000	
Per capita income	56.116[a]	2	.000	
Bearing regular expenses	53.963[a]	2	.000	
Satisfaction over income	76.059[a]	4	.000	

Table 3.

Quality of the reconstructed houses and access to resources: Chi-square tests

Factors determining quality of the houses		Access to resources No	Yes	Total
Durability of the houses	very low	118	2	120
	low	55	1	56
	moderate	19	2	21
	high	1	5	6
	very high	0	1	1
	Total	193	11	204
Culturally acceptance	very low	129	2	131
	low	54	3	57
	moderate	9	6	15
	Total	192	11	203
Maintaining building code	very low	140	3	143
	low	49	4	53
	moderate	4	4	8
	Total	193	11	204
Community participation in decision making process	very low	137	1	138
	low	45	6	51
	moderate	11	3	14
	high	0	1	1
	Total	193	11	204
Use of technology	very low	154	2	156
	low	34	6	40
	moderate	5	3	8
	Total	193	11	204
Summary of Chi-squares	*Value*	*df*	*Sig.*	
Durability of the houses	94.390[a]	4	.000	
Culturally acceptance	38.875[a]	2	.000	
Maintaining building code	34.729[a]	2	.000	
Community participation in decision making process	34.556[a]	3	.000	
Use of technology	28.571[a]	2	.000	

Table4

Beneficiaries' satisfaction and access to resources : Chi-square tests

		Access to resources		
Beneficiarys' satisfactory factors		No	Yes	Total
Cyclone resilient houses	very dissatisfied	227	6	233
	dissatisfied	38	0	38
	neither satisfied nor dissatisfied	5	6	11
	satisfied	1	1	2
	very satisfied	1	0	1
	Total	272	13	285
Safety	very dissatisfied	195	5	200
	dissatisfied	72	1	73
	neither satisfied nor dissatisfied	2	6	8
	satisfied	1	1	2
	very satisfied	1	0	1
	Total	271	13	284
Cost-efficiency	very dissatisfied	206	4	210
	dissatisfied	63	2	65
	neither satisfied nor dissatisfied	1	6	7
	Total	270	12	282
Use of technology	very dissatisfied	213	6	219
	dissatisfied	57	2	59
	neither satisfied nor dissatisfied	1	5	6
	Dissatisfied	271	13	284
	neither satisfied nor dissatisfied	7	6	13
	Total	271	13	284
Giving importance to culture	very dissatisfied	228	4	232
	dissatisfied	41	3	44
	neither satisfied nor dissatisfied	1	6	7
	Total	270	13	283
Sustainability	very dissatisfied	219	6	225
	dissatisfied	50	1	51
	neither satisfied nor dissatisfied	1	6	7
	Total	270	13	283
Community participation	very dissatisfied	223	4	227

	dissatisfied	43	2	45
	neither satisfied nor dissatisfied	4	7	11
	Total	270	13	283
Coping and adaptive capacity	very dissatisfied	233	4	237
	dissatisfied	35	2	37
	neither satisfied nor dissatisfied	4	6	10
	Satisfied	0	1	1
	Total	272	13	285
Summary of Chi-squares	*Value*	*DF*	*Sig*	
Cyclone resilient houses	76.591[a]	4	.000	
Safety	104.022[a]	4	.000	
Cost-efficiency	117.076[a]	2	.000	
Use of technology	70.456a	4	0	
Giving importance to culture	109.961[a]	2	.000	
Sustainability	107.835[a]	3	.000	
Community participation	91.652[a]	2	.000	
Coping and adaptive capacity	96.079[a]	3	.000	