AN EXPLORATION INTO THE IMPACT OF OUT-MIGRATION ON THE CHOICE’S WOMEN MAKE IN PREPARING FOR OR RESPONDING TO RAPID ONSET WEATHER HAZARDS IN THE INDIAN BENGAL DELTA

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This dissertation is submitted as part of an MSc degree in Sustainability at the University of Southampton
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Acknowledgements

This research was undertaken as part of the project ‘Climate Adaptation & Services Community (CASCO), contract no ICI+/2014/342-806 funded by the European Union, Delegation to India. It draws on work carried out under the Deltas, vulnerability and Climate Change: Migration and Adaptation (DECCMA) project (IDRC 107642) under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) programme.

First and foremost, I would like to thank Emma Tompkins for her supervision and support during the development of my dissertation, organisation of fieldwork in India and over the MSc year. I would also like to thank Craig Hutton for his support and guidance he has provided during the writing stages of my dissertation.

During fieldwork and data collection in India, I owe a huge thank you to the Jadavpur Team for their assistance. Firstly, I would like to thank both my translator, Snahar and my local guide, Subnakar, for without their help I would have not been able to undertake my fieldwork. Secondly, thankyou to Tuhin Ghosh, Sumana Banerjee and Souvik Das from DECCMA India and Jadavpur University for their support and organisation of fieldwork. Thirdly, I would like to thank Katherine Vincent for her knowledge on the gender dimensions of research. A further thanks to Victoria for her assistance with the survey data and unlimited supply of English snacks during fieldwork.

Furthermore, I would like to thank my fellow University of Southampton students, Rosyaln Lloyd-Haynes, Martin Watts and Alice Ainsworth, for their support during fieldwork and dissertation writing. Helen Twentyman from enabling services, has been invaluable at the final editing stages of my dissertation.

Finally, to my family and friends; thank you for the love and support you have provided throughout the last year.
Abstract

The vulnerability of deltaic environments is being increasingly recognised, with a multitude of stressors threatening the lives of communities and re-shaping livelihood decisions. Women, as a vulnerable and marginalised group, experience this the most acutely. The largest deltaic region is the Ganges-Bhramputra-Meghna (GBM) delta, the Eastern Indian region of the delta is referred to as the Indian Bengal Delta (IBD). Weather hazards are characteristics of these deltas, of these, cyclones, floods and storm surges are most dominant. Climate change and natural hazards research converges to identify adaptation as a key concept to reduce risk and vulnerability to natural hazards. Adaptive strategies are undertaken to prepare for and respond to these natural hazards. Migration is recognised, as one of the three sustainable livelihoods, alongside livelihood diversification and agricultural intensification. Primarily men migrate, therefore, women are left behind to look after the household and livelihoods. There is limited research exploring the impacts of out-migration and the adaptive strategies women undertake, particularly within the IBD. Therefore, the aim of this research is to explore the impact of out-migration on the choice’s women make in preparing for or responding to rapid onset weather hazards in the IBD. This research study will employ an explanatory sequential mixed methods approach, with secondary quantitative survey data and in-depth interviews to allow for an exploration of the complexities of adaptation and migration inclusive of gender. The findings of this study show that women are impacted by out-migration, with social aspects highlighted as the main mediating factors for how positively or negatively women experience out-migration and in turn the adaptive strategies they undertake. These findings have important implications for management and policy of rural, deltaic regions.
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Abbreviations

IBD  Indian Bengal Delta
DECCMA  DEltas, Vulnerability and Climate Change: Migration and Adaptation
GBM  Ganges Brahmaputra Meghna Delta
SHG  Self Help Groups
UNFCCC  United Nations Framework Convention on Climate Change
SPSS  Statistical Package for the Social Sciences
PIS  Participant Information Sheet
WRT  Wealth Rank Tool
IPCC  Inter-Governmental panel on Climate Change
WMO  World Meteorological Organisation
UNEP  United Nations Environment Programme
NGO  Non-Governmental Organisation
DRR  Disaster Risk Reduction

Word Count: 19,493 (excluding acknowledgements, references and appendices)
Chapter 1

Introduction

1.0 Background

Over 500 million people reside in deltaic, coastal regions, relying on these environments for their livelihoods (Cazcarro et al, 2018; Tessler et al, 2015). These regions are recognised for their economic and environmental importance, which sustain rural and urban populations (Ericson et al, 2006). Deltaic environments have been classified within the Sustainable Development Goals (SDG’s) as vulnerable regions, with focus on mitigating the impacts of environmental change and developing sustainable approaches for delta management to ensure food security and socio-economic development (United Nations Development Programme (UNDP), 2015). Deltas are classed as ‘dynamic coastal systems that are unique in their close links to both land-based fluvial and coastal ocean processes’ (Ericson et al, 2006). Ganges-Brahmaputra-Meghna (GBM) is the largest delta spanning Bangladesh and Eastern India. The Indian national boundary of the GMB delta is referred to as the Indian Bengal Delta (IBD) (DEltas, Vulnerability and Climate Change: Migration and Adaptation (DECCMA), 2018). A study assessing risk and sustainability of 48 coastal deltas globally, categorised the GBM Delta as being at high risk of natural hazards because of its socio-economic vulnerability, concluded from mapping deltaic risk, which involved measuring exposure to hazards, population density and socio-economic vulnerability (Tessler et al, 2015).

Deltaic regions are particularly at risk from multiple weather hazards, the low-lying environment leaves rural populations exposed and vulnerable to the impacts of these. Weather hazards are defined as both rapid onset, cyclones and floods, and slow onset, drought and salinity. Rapid onset are the dominant hazards which demonstrate significant implications for these rural communities, threatening both lives and livelihoods alike (O’Hare, 2001). Bio-physical characteristics combined with population growth and urbanisation are causing both rural and urban populations to be under increased risk and vulnerability (Tessler et al, 2015). Within climate change and natural hazards literature, lies adaptation and mitigation, two concepts which have grown to be critical aspects developed to reduce risk and vulnerability. This literature is inherently interdisciplinary, drawing on both bio-physical and socio-economic dimensions at all spatial and temporal scales. Within adaptation discourse, adaptive strategies are defined, by the Intergovernmental Panel on Climate
Change (IPCC) as ‘the process of adjustment to actual or expected climate and its effects’ (Klein et al, 2014). These adaptive strategies occur at a variety of scales, including governance, household and individual (Mallick, 2011; Mazumdar et al, 2014; Hajra, 2017). Household adaptation research within the IBD has been increasingly documented in recent years. The current literature suggests a wide range of adaptations across these scales. Household adaptations undertaken to cope with rapid onset weather hazards have been documented in the IBD, including taking out loans (Chowdhury, 2016), diversification of livelihoods (Bhattacharjee and Behera), preserving food and fuel (Hajra et al, 2017) and migration (DECCMA, 2018).

Within rural, deltaic environments, three sustainable livelihoods have been identified; migration, livelihood diversification and agricultural intensification (Kundu, 2013; McDowell and de Haan, 1997). Of these livelihoods, migration has played a crucial role in the recent history of West Bengal, contributing to reducing socio-economic vulnerability (Banu, 2016; Debnath and Nayak, 2018; Keshri and Bhagat, 2013). Whilst current research primarily explores migration networks and migrants at the place of destination, there is a growing amount of research exploring the impacts of out-migration in rural deltaic communities and the place of origin. Primarily, these studies have explored and documented the characteristics of out-migration, including migrant flows and remittance networks, with relation to national census data (Banu, 2016; Debnath and Nayak, 2018). Men are the household heads, primarily observed as the breadwinners, decision makers and migrants within households. When men out-migrate, women are left to adopt additional household roles, decision making powers, and are the de facto household head. Women can be defined as a vulnerable and marginalised group, with a lack of representation within deltaic environments, adaptation and migration literature. The impact of out-migration on women is often referred to as the ‘migration left-behind nexus’ within literature. On the one hand, this literature has identified that out-migration has been seen to increase women’s autonomy and agency from greater influence in household decision making (Desai and Banerji, 2008; Sabhlok, 2011; Sangeeth et al, 2013). On the other hand, out-migration has shown to significantly impact women’s wellbeing through social isolation and loss of household members (Ghosh et al, 2018).

The impact of out-migration on the adaptive strategies women undertake when preparing for and responding to weather hazards has been an area of research increasing within deltaic regions globally (Nelson et al, 2002; McLeman and Hunter, 2010; Chindarkar, 2012). After cyclone Alia hit the GBM delta in 2009 coupled by the recognition of increasing vulnerability of deltas, there has been an increase in research exploring adaptive strategies of women in the IBD. Before this
however, the IBD received very little research. Researchers continue to highlight the future changes in climate and the implications that they pose significant challenges for society (Adger, 2003). These challenges will be experienced differently at local, national and international scales but also, within different societal groups. Marginalised and vulnerable groups, including women, have been shown to experience the impacts of natural hazards the most acutely and with the least capacity to prepare for and respond to these impacts (Demetriades and Esplen, 2008). After outlining the background and rationale for the research and study area, the aim, research objectives and research questions will be presented.

1.1 Aim

To explore the impact of out-migration on the choice’s women make in preparing for or responding to rapid onset weather hazards in the IBD.

1.2 Research Objectives and Research Questions

To explore the aim, the following research objectives and subsequent research questions have been developed and are presented in Table 1.

**TABLE 1: RESEARCH OBJECTIVES AND RESEARCH QUESTIONS**

<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Research Questions</th>
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<tbody>
<tr>
<td>1. To document the characteristics of out-migration of the IBD</td>
<td>• What are the main characteristics of out-migration in the IBD?</td>
</tr>
</tbody>
</table>
| 2. To identify and categorise the main adaptive strategies that are undertaken by non-migrant households, migrant households and women in migrant households to prepare for and respond to rapid onset weather hazards | • How are rapid onset weather hazards perceived by households and what causes them to adopt strategies?  
• Which adaptive strategies have been undertaken by migrant and non-migrant households?  
• What adaptive strategies do women in migrant households undertake? |
| 3. To explore whether out-migration impacts migrant women’s wellbeing and the adaptive strategies they use to prepare for and respond to rapid onset weather hazards | • How does out-migration impact women in migrant households?  
• Do the impacts of out-migration impact the choices and adaptive strategies women undertake?  
• Are there any barriers to adaptation experienced by women in migrant households? |
1.3 Study Area: The Indian Bengal Delta and Case Study Area

The IBD refers to the India national area of the GBM delta (DECCMA, 2018). The IBD national area has an area of 14,054sq.km, this has been defined by DECCMA because the area is 5m of mean sea level. The IBD and the case study area are presented spatially within Figure 1.

FIGURE 1: MAP OF THE IBD AND CASE STUDY AREA (AUTHORS OWN)
It is populated with over 18 million people. Situated at the south of the IBD is a protected natural environment, home to the Royal Bengal Tiger, called the Sundarbans (DECCMA, 2018).

1.4 Summary

The IBD can be categorised within a unique social and cultural context, the implications of out-migration have been extensively researched, with a high mobility categorised in the delta. Migration is an important livelihood strategy, which is primarily undertaken by men. Women in these areas are left behind with additional household, child rearing and day-to-day livelihood activities. Whilst out-migration and its impact on women and how they adapt to weather hazards has been researched and documented in literature, it is not well explored within the context of the IBD, with existing literature inherently contradictory. This research study will address the gap in current literature by firstly, documenting the characteristics of out-migration within the IBD. The dynamic nature of migration warrants the need for documenting the contextual foundation to build on the impact of out-migration on the adaptive strategies women undertake. Secondly, it will identify and categorise the adaptive strategies undertaken by households (non-migrant, migrant and women in migrant households). Finally, it will gain insight and explore whether out-migration impacts women’s ability to undertake adaptive strategies. It will identify any factors that influence and impact women’s wellbeing and the adaptive strategies women undertaken in preparing for and responding to rapid onset weather hazards.

To explore this phenomenon, this research study will be presented in six chapters. Following Chapter 1, this research study will proceed with Chapter 2 consisting of a review of the current literature on the research objectives and questions. Chapter 3 will present the mixed methods explanatory sequential research design, inclusive of methodological issues and considerations. Chapter 4 will present and analyse the results from the quantitative and qualitative data. This will be presented according to the research objectives: Out-Migration, Observed Adaptation (migrant households, non-migrant households and women in migrant households) and Impacts of Out-migration. Chapter 5 will synthesise the results and analysis section in relation to current literature, focussing on the value of the study and the limitations. Chapter 6 will provide a conclusion to the research study, summarising the key insights, detailing the implications for policy and highlighting the areas of future research.
Chapter 2

Literature Review

2.0 Introduction

As outlined in Chapter 1, the focus of this dissertation is on the vulnerability of women in relation to the impacts of out-migration, adaptive strategies and weather hazards in deltaic environments. Denton highlights the vulnerability of women, stating that ‘70% of the 1.3 billion people in the developing world, living below the threshold of poverty, are women’ (2010). Women, as a marginalised group, are inherently under represented within literature and policy. Within the context of deltas, this has been increasingly recognised and is reflected in the growth in gender inclusive research within the developing world and deltaic regions. Deltaic environments are defined as inherently mobile communities, with men often out-migrating for economic reasons from these regions and leaving women within the rural areas. A growing amount of literature has been devoted to exploring women in the context of vulnerability within migration processes (Islam, 2011; Warner et al, 2010; Amuedo-Dorantes and Pozo, 2006; Taylor, 1999; Curran and Saguy, 2001).

To document and review the current literature in relation to this focus, this chapter will firstly provide context on deltaic environments. It will outline the rapid onset weather hazards and their prevalence and impacts on communities in the IBD, with reference to climate change. Adaptation, its definition and the key concepts, will be discussed in relation to observed adaptation within the IBD and barriers to adaptation. Out-migration will form the final section of the literature review, with an exploration of impacts on out-migration on women and its outcomes within rural communities. It will then summarise and highlight the gaps in the current literature.

In order to explore the current literature, a tiered search was applied to find relevant textual papers. The search engine SCOPUS was used to carry out the search by combining the terms from each tier systematically, shown within Table 2. The use of truncated words and interchangeable words for the IBD were also used to ensure breath of literature. The search aimed to include a large range of literature including systematic reviews, books and peer-reviewed journals, to ensure the full range of literature was filtered for review. Furthermore, a Google search was applied to explore additional relevant documents, including reports, policy and initiatives, related to the current literature.
### Table 2: Example Tiered Search Terms Applied to Find the Literature

<table>
<thead>
<tr>
<th>Tier 1: Location</th>
<th>Tier 2: The Hazard</th>
<th>Tier 3: Unit of Interest</th>
<th>Tier 4: The Action</th>
</tr>
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<tbody>
<tr>
<td>‘Indian Bengal Delta’</td>
<td>Hazar*</td>
<td>Wom*</td>
<td>Impact*</td>
</tr>
<tr>
<td>India*</td>
<td>Flood*</td>
<td>Hous*</td>
<td>Resilien*</td>
</tr>
<tr>
<td>Sundarban</td>
<td>Monsoon</td>
<td>Migra*</td>
<td>Vulner*</td>
</tr>
<tr>
<td>Delta*</td>
<td>Cyclone</td>
<td>Men</td>
<td>Cop*</td>
</tr>
<tr>
<td>Rural</td>
<td>Rapid-Onset</td>
<td>Rela*</td>
<td>Adapt*</td>
</tr>
<tr>
<td></td>
<td>Climat*</td>
<td></td>
<td>‘left behind’</td>
</tr>
<tr>
<td></td>
<td>‘Climate change’</td>
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#### 2.1 Rapid Onset Weather Hazards

Weather hazards are defined within literature as rapid and slow onset. Rapid onset weather hazards occur quickly often with little warning, with the ability to forecasting their effects, duration and frequency (Kovats and Akhtar, 2008). Slow onset weather hazards occur slowly and over many years (Kovats and Akhtar, 2008). Throughout Asia, there is evidence to show that there are increases in the intensity and frequency of extreme weather events, especially rapid onset hazards, tropical cyclones and flooding from intense rainfall (Klein at al, 2014; Cruz et al, 2007; Hazra et al, 2003). The impacts of these, amongst others, have been observed as loss of income and livelihoods, threats to life and wellbeing (Klein at al, 2014; Cruz et al, 2007). Furthermore, the predicted increases in rainfall and glacial melting, from anthropogenic impacts, could change the duration and intensity of the monsoon periods (Cruz et al, 2007). This could pose significant challenges for flood-prone areas within Asia, such as the IBD (Mallick and Vogt, 2014). The environmental and development problems have been observed to be exacerbated by climate change, leaving coastal communities increasingly vulnerable to multiple stressors (Klein at al, 2014; Cruz et al, 2007).

#### 2.1.1 Climate Change

Global climate change is the changes in the climate caused by anthropogenic impacts (United Nations Framework Convention on Climate Change (UNFCCC), 2007). Controversy surrounding this topic lies in extensive political, scientific and behavioural debate surrounding the ‘change’ in climate (Adams, 1990; Bianchi and Allison, 2009; McMichael et al, 2006). Early climate researchers, Landsberg and Machta, predicted in 1974 that climate change would become a major environmental
issue. They stated, with certainty, that anthropogenic impacts on the climate would be experienced locally, with global consequences.

Within the large body of global climate change research and debate, deltas have been established as particularly vulnerable regions to climatic change and sea level rise, with the social, economic and environmental implications unknown (Cazcarro et al, 2018). A UNFCCC report reviewing literature on regional impacts of climate change has documented, with certainty, that Asia will be implicated by climate change within ‘water resources, agriculture and food security, ecosystems and biodiversity, human health and coastal zones’ (2007). Coastal zones and deltaic environments are highlighted as a significant sector affected by climate change. Human impacts are increasingly degrading the environment attributing to a loss in environmental productivity and provision of natural resources (Klein et al, 2014). The UNFCCC states that the ‘environmental and development problems in Asia will be exacerbated by climate change’ (2007).

The importance for documenting climate change within this study is to present the facts and controversy surrounding the impact on rural communities and weather hazards. Global climate change is set to impact people and the environment significantly in the future, but these impacts are not well known or understood. Deltaic environments have been categorised as the most vulnerable regions globally, especially to the impacts of climate change (Wassman et al, 2009; Thomalla et al, 2006). The projected sea level rises have shown the impacts of salinity, increasing frequency of natural hazards, such as cyclones and monsoon patterns, which may leave populations living in these areas exposed to multiple and increased stressors (Adger, 1999; Kelly and Adger, 2000; Ericson et al 2006). It is fair to summarise that the impact of global climate change will, or is, going to impact deltaic regions. Global climate change, out-migration and natural hazards exist, but their association is unknown and complex.

2.1.2 Rapid Onset Weather Hazards in the IBD

As a low-lying, coastal and deltaic environment, the IBD is a region highly subject to natural hazards. Cyclones, flooding and storm surges are the dominant rapid-onset weather hazards in the IBD. Flooding is experienced on an annual cyclical basis, particularly, during monsoon season, with the risk of flooding limited and localised throughout the delta and the risk stratified over the wider delta
(DECCMA, 2018). Cyclones on the other hand, are less frequent, with cyclone Alia, which hit the IBD in 2009, one of the largest disasters experienced in the last 20 years.

Ghosh et al (2018) explored the impacts of cyclone Alia attributing the event as a direct consequence of climate change. As previously discussed, deltaic regions are prone to weather hazards and disasters and this is a prime example of attribution of localised events to climate change. The instance of Landsbery and Matcha’s ‘certainty’ around the anthropogenic impacts and the ‘uncertainty’ surrounding the scale of impacts provides a perfect example of the controversial ‘attribution’ of this phenomenon to local natural hazards, changes in environment and climate. Whilst early researchers believed that climate change would significantly impact the local scale, the scientific evidence of today the impacts can be identified on a global scale. Many scholars suggest the impact on the local scales, often attributing migration and increasing frequency of natural hazards, to this phenomenon. The evidence to this affect is unproven. Whilst there are many correlations and causalities between events, other stressors within this phenomenon are present. A vast amount of research has been conducted to assess and understand the connections between socio-economic and bio-physical dimensions and the impact climate change is set to have on these coastal regions (Cazcarro et al, 2018). From this research, climate mitigation and adaptation have emerged, which contribute to developing sustainable development and management plans for deltaic environments.

2.2 Adaptation

The aforementioned recent developments in climate change and natural hazards research have led to an evolution of terms, concepts, frameworks and extensive research (Kelly and Adger, 2000; Smit and Pilifosova, 2003; Smit and Wandel, 2006). Mitigation and adaptation are the primary concepts. Mitigation was the original goal within the climate change field, with adaptation presently taking preference. Adaptation strategies aim to offset, moderate and mitigate the impacts of weather hazards and climate change scenarios. The term adaptation has been applied differently in a range of disciplines, with its origins lying in political ecology and evolutionary biology, it has become an emergent subject within climate research. Unlike climate change, sustainable development and migration, the term adaptation has no singular universal definition, but is used as frequently (Jones and Boyd, 2011; Kelly and Adger, 2000). Whilst the IPCC define adaptation simply, Smit and Pilifosova’s (2003) definition can adds dimension and depth to the concept of adaptation as a;
‘This term refers to changes in processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate.’

Moser and Ekstrom (2010) prefer to define adaptation in relation to specific temporal and spatial aspects;

‘strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities.’

The development of the adaptation definition is important; adaptation is a concept that is constantly evolving and its applicability within spatial and temporal scales important. Within the field of adaptation research, the key terms vulnerability and adaptive capacity are at the heart of conceptual frameworks and debate (Smit and Wandel, 2006). Adaptations, interchangeably used with adaptive strategies, are manifestations of adaptive capacity, whereby, changes within a system are undertaken to deal with vulnerability, exposure or sensitivity (Franhauser et al, 1999; Fussel, 2007; Smit, 2000).

![Figure 2: Nested Hierarchy Model of Vulnerability (Smit and Wandel, 2006)](image)

Figure 2 represents the nested hierarchy model of vulnerability, whereby the different factors are show to interplay within a variety of scales. Adaptations are at the centre of this diagram, which represents their importance for influencing vulnerability (exposure and sensitivity) and adaptive capacity. Adaptive capacity is inherently context specific, varying from and within country to country, amongst social groups and at household and individual levels (Smit and Wandel, 2006).
Temporal and spatial aspects also play critical roles within adaptive capacity, for example households and individuals are dependent on communities and regional processes, within unspecific and specific timeframes. Literature has aimed to label differences within short term and long-term capacity. ‘Coping ability’ and ‘adaptability’ (Watts and Bohle, 1993; Smit and Wondel, 2006) are often used in reference to short term capacity, whereby, normal climatic conditions and small deviations from the norm are easily adapted to. The majority of scholars predominantly employ ‘adaptive capacity’ for longer term adjustments whereby exposure to extreme events or a multitude of stressors may need more sustainable adjustments for a community to cope (Kelly and Adger, 2000; Smit and Skinner; 2002; Park et al, 2012). Moser and Ekstrom (2010) emphasise the importance of intentional and planned adaptation to ensure long term thought within adaptation, instead of short-term actions, with shallower goals.

Vulnerability by definition is a broad term, however, within the field of climate change sciences, it is related to ‘resilience, marginality, susceptibility, adaptability, fragility, and risk’ (Paul, 2013). It converges the fields of natural hazards, development and environment. Similarly to adaptation, the term has no singular universal definition or meaning but can be defined within these fields as:

‘an internal risk factor of the subject or a system that is exposed to a hazard and corresponds to its intrinsic tendency to be affected, or susceptible to damage.’ (Paul, 2013)

Theoretically and conceptually the key terms and broad models are fairly consistent throughout the literature, however, adaptive capacity is context-specific with no universal model or categorising system to assess communities, households or specific scales.

Adaptive strategies take many forms and levels of which scholars have aimed to use categories and typologies to document. Smit and Wandel (2006) outline four forms and levels of adaptive strategies; timing relative to stimulus, spatial scope, intent and form. The timing relative to a stimulus can be anticipatory, concurrent or reactive (Hoffmann and Sgro, 2011). The spatial scope of an adaptive strategy can be local, within a community or household, or more widespread (Grothman and Patt, 2005). The intent of adaptive strategy refers to autonomous or planned actions (Fussel, 2007; Park et al, 2012). The form can be a technological, behavioural, financial, informational or institutional (Smit and Skinner, 2002; Adger, 2003). However, complexity lies in the categorising of these adaptations within a multitude of scales and to multiple stressors. Smit et al (1999) presented an extensive set of categories to document adaptive strategies undertaken by households, which can
advances Smit and Wandel's four forms and levels (2006). The purposefulness, timing, temporal scope, spatial scope, function, form and performance are seven concepts and attributes of adaptive strategies. The use of the categories ‘Reactive and Proactive’ within timing allows an investigation into the adaptive strategies undertaken to both respond to and prepare for weather hazards, to document the coping strategies undertaken in relation to weather hazards, within the context of households and individuals (Grothmann and Patt, 2005; Füssel, 2007).

2.2.1 Adaptive Strategies undertaken in the IBD

A large proportion of natural hazards, environment and climate change research undertaken within the GBM Delta is focussed within Bangladesh (Rahman and Rahman, 2015; Abdullah et al, 2016; Shimi et al, 2010). Of the limited body of literature in the IBD, most has been conducted within the last 20 years (Kumar, 2010; Mazumdar, 2014). The increasing focus on deltaic regions and their importance and vulnerability have attributed to this rise and increased focus of literature. Perhaps the biggest demonstration of this, was the stark increase in literature after cyclone Alia in 2009 within the IBD (Mallick, 2011, DasGupta and Shaw, 2015; Mazumdar et al, 2014; Hajra, 2017).

The adaptive strategies undertaken in the IBD have been documented within many research studies, from households, agriculture, fisheries, water resource management and Disaster Risk Reduction (DRR). In relation to an exploration of rapid onset weather hazards; cyclones (Raha et al, 2013; Mondal, 2014), flooding (Mazumdar et al, 2014), and storm surges (Raha, 2014). These studies have identified the following, household adaptations within the IBD, including ‘borrowing money from friends/relatives, money lender, selling assets and livestock, diversification of livelihoods, migration, elevation of the height of houses, preserving food and fuel stocks (Raha et al, 2013; Mondal, 2014; Mazumdar et al, 2014).

Upon review of the current literature, primarily the documented adaptations are being undertaken due to exposure to prolonged environmental stress to natural hazards (DECCMA, 2018). A study by Chowdhury (2016) attempted to document the economic vulnerability of the IBD, with reference to livelihood adaptations. It was found that, through the use of the wealth rank tool (WRT), that 45% of the population were under economic stress (Chowdhury, 2016). Hajra et al (2017) surveyed 783 households in the IBD and documented their vulnerability to impacts of rapid onset weather hazards, with vulnerability predominantly being caused by loss of life and loss of assets which contribute to deteriorating livelihoods. The perceived and experienced impacts of rapid onset weather hazards, include loss of life, loss of seasonal income, loss of land, household stress and
livelihood implications. These are the major drivers for households to undertake adaptive strategies. There is very limited literature documenting household and vulnerable group adaptations in the IBD, despite previous studies presenting empirical evidence of the extent of vulnerability (Chowdhury, 2016; Hajra et al, 2017).

The current studies document adaptations undertaken at specific levels, such as community or specific spatial boundaries. Although vulnerable and minority groups are identified, studies rarely explore adaptations being undertaken within these groups. There is a significant amount of literature exploring the gendered dimensions of adaptations, within male and female household heads (Nabikolo et al, 2012). Of this literature, gendered differences have been rarely explored within the IBD. A study of 136 households in Uganda found that male and female headed household reacted and implemented adaptations differently, with women undertaking adaptations in relation to decreases in household assets primarily and men being influenced by vulnerability of land use (Nabikolo et al, 2012). Gendered differences are significantly recognised within previous studies, with perception of vulnerability, specific adaptations undertaken and impacts experienced differently by genders.

2.2.2 Barriers and Constraints to Adaptation

Within the body of literature in the climate change field, the concept of barriers and constraints to adaptation have emerged. Defined as;

‘factors that make it harder to plan and implement adaptation actions. They restrict the variety of options for actors to secure their objectives. E.g. lack of resources such as funding, technology or knowledge’ (Klein et al, 2014)

Evolving significantly throughout the IPCC’s reports, barriers and constraints to adaptation were extensively reported and explored in Annual Report 5 (AR) (Klein et al, 2014). Since, there has been a vast amount of research aiming to explore, categorise and document barriers and constraints. The IPCC’s AR5 outlines eight categories of constraints; physical, biological, economic, financial, human resources, social and cultural and governance and institutional (Klein et al, 2014). Whilst the IPCC aims to categorise and define these constraints, they highlight that it is not a ‘well researched’ area within literature. Scholars in recent years, have been increasingly exploring barriers and constraints (Le Dang et al, 2014; Jones and Boyd, 2011; Biesbroek et al, 2013; Moser and Ekstrom, 2010). With adaptation high on the international agenda, there has been an emerging discourse for barriers to
adaptation (Klein et al, 2014). This has been increasingly highlighted as important for developing, disaster prone and environmentally vulnerable areas to allow policy and decision makers to implement and assist these communities.

Upon review of frameworks to categorise adaptation, perhaps one of the most applicable analytical frameworks was presented by Jones and Boyd (2011) in Figure 3. Whilst simple and not completely exhaustive, this analytical framework grouped barriers and constraints into three inter related categories; Human and Informational, Natural and Social. Furthering the IPCC’s eight categories, Jones and Boyd (2011) aimed to identify and categorise barriers to adaptation and their interrelations, reviewing its success and applicability within a case study exploration of Western Nepal.

![Figure 3: Barriers of Adaptation (Jones and Boyd, 2011)](image-url)
2.3 Migration

Migration research has gained momentum in recent decades and has been defined in many contexts throughout academic literature. Migration is defined as ‘the movement of people from one place to another, within the country or geographical region’ (Debnath and Nayak, 2018). Out-migration is an aspect within this process, which can be further defined as proportion of total out-migrants from the given area to total population of that area during the specific period of time (Debnath and Nayak, 2018; Kundu, 2013). Migration is not a modern phenomenon, particularly in Asia, however, there is extensive debate about the reasons for migration in research.

2.3.1 Out-migration and the IBD

Migration has played a crucial role in the recent history of West Bengal, contributing to socio-economic transformation (Banu, 2016; Debnath and Nayak, 2018; Keshri and Bhagat, 2013). Banu (2016) statistically explored the trends in out migration and its links to socio-economic transformation within West Bengal, using census data over the recent 50 year period. This account of the study area provided an extensive cultural, social and economic context surrounding migration. A regional pattern and determinants study into male out-migration undertaken by Debnath and Nayak (2018), found that whilst male out-migration is experienced throughout West Bengal, certain regions such as southern regions and groups experience it differently. Both studies documented an increase in out-migration since the 1980’s. Seasonal migration was found to be a significant livelihood strategy within poorly developed agricultural areas and landless farmers (Kundu, 2013; McDowell and de Haan, 1997).

There are various types of migration, including rural-rural, rural-urban, circular, permanent, cyclical and seasonal. Reasons behind out-migration are broad by definition and often there is no singular reason (Kundu, 2013). Migration forms a two-way process whereby close links between destination and origin are maintained through communication and remittances (McDowell and de Haan, 1997). In a recent study undertaken by DECCMA (2018), three main reasons for migration in the IBD were noted. Firstly, the state of agricultural productivity combined with a lack of economic opportunities pushed people to seek employment outside of the delta. Secondly, aspirational pursuits for education also encouraged people to move. Thirdly, migrant households had a higher perception of environmental stressors which motivated household members to migrate. DECCMA undertook data collection for these findings after cyclone Alia devastated the region, therefore agricultural productivity and environmental stressors could have been exacerbated. These findings, however,
support the previous reports of migration within the delta. Recent studies have highlighted that environmental and climatic changes have forced people to adopt migration and leave their place of origin (Massey et al, 2010). A review of migration literature by De Haan (1999), documents the occurrence of displacement of a large number of people within the GBM delta in both India and Bangladesh from environmental stressors. Whilst wrongly attributing this migration to climate change, Banerjee et al (2012) notes that migration is an effective mode of adaptive strategy in response and to prepare for natural hazards.

After reviewing the chronology of the current literature and research studies, out-migration has been observed to be increasing in frequency, which is set to continue. The high mobility of the region, development, aspirational and educational pursuits and perception of environmental stressors are attributed to this increase. There is an apparent relationship between environmental stressors and migrants (Banerjee et al, 2012; Keshri and Bhagat, 2013; Bit and Banerjee, 2013). Out-migration however, is a complex phenomenon with many causal relationships of migrant rates.

2.3.2 Out-migration and Women

Considering the aforementioned establishment of vulnerability and underrepresentation of women in the current literature coupled by the frequency rates of out-migration, it is surprising to find a lack of studies exploring the impacts of out-migration on women in the IBD. Out-migration and its impact on women ‘left behind’, in rural settings, is becoming an increasingly researched area within literature, particularly in rural, developing countries (Wrigley-Asante and Agandin, 2015). It is important, for the purpose of this research study to firstly, discuss the documented impact of out-migration on women globally and within the context of India, and to secondly, highlight the gender differences and specific socially constructed roles of Indian women.

The impacts of out-migration on women has been extensively mentioned within literature, often being referred to as the ‘migration left-behind nexus’ (Islam, 2011; Warner et al, 2010; Amuedo-Dorantes and Pozo, 2006; Taylor, 1999; Curran and Saguy, 2001). Within the growing amount of migration literature, deltaic regions are being increasingly explored. The recent developments in literature highlight the increasing recognition of the migration and adaptation with aims focussed around adaptation to climate. DECCMA (2018) for example highlights, with aims focussed around adaptation to climate change, the importance of gender sensitive research, for applicability for policy makers. Migration lies at the centre of the research undertaken by DECCMA, highlighting further the current context of this phenomena and the mobility of deltaic communities.
Primarily, men migrate in India, which reflects traditional gender roles, the gendered division of labour and livelihood activities. Although, these roles are slowly being changed, with women observed to be migrating for education or factory work (Mistri, 2013). This has been reflected in research, with an increasing number of studies exploring women migrants (Mistri, 2013; Sen and Pattanaik, 2017). There have been noted differences between household livelihoods and the impact of out-migration on women. Women are still inherently in charge of the household, and childcare, whereas men are seen as the primary breadwinners (Bose et al, 2017). Women have always ‘helped’ men in the fields, but their primary position is in the household. Decision making for agricultural land lies with men. Changes have been seen within households where migrants are present, the responsibility for land, livestock and livelihoods often transfers from the men, when they migrate, to the women (Sarker and Islam, 2014). Despite the global trend and recognition of the gendered dimensions of migration, the literature surrounding women in deltas and the IBD, who aren’t migrating, is surprisingly lacking, considering their role in the migration process and the observed household changes when men migrate (Desai and Banerji, 2008).

2.3.3 Impacts and Outcomes of Out-migration

After review of the ‘migration-left behind nexus’ literature globally and in the IBD, several impacts and outcomes of out-migration on women, which can be grouped into the following six categories; women empowerment, feminisation of agriculture, labour force participation, women’s autonomy, decision making, self-help groups (SHG) and remittances. Bose et al (2017) explored the consequences of male out-migration on women’s empowerment within the IBD with several interesting findings. Firstly, it was concluded that the change in gender roles that women undertake during the absence of men has been gradual through the expansion of women’s roles within the household and livelihoods. Women’s autonomy, defined as the capacity and control women have to act independently, is identified as critical for empowerment of women (Osamor and Grady, 2016). It has been attributed and identified as a crucial aspect for women to undertake adaptive strategies.

A study exploring male migration specifically in relation to ‘left-behind’ wives in India found that the household structure formed the main factor of the impacts felt by women (Desai and Banerji, 2008). Whilst women in extended families were significantly more supported, their autonomy was less than women who were alone. They concluded stating that out-migration fuels women’s autonomy, allowing more freedom from a transfer of household decision making powers. They stated that women felt more empowered and more in control of decisions. Desai and Banerji’s (2008) study
employed a quantitative methodology, and it is evident that it lacks depth and exploration of feelings and real life accounts of women. Furthermore, there are many gender differences and relations across India. The employment of statistical analysis, ignores gender contexts between rural and urban areas, poor and vulnerable groups.

There has been a vast array of research into the role of SHG’s in rural communities, particularly in India. SHGs are microfinance programmes, formed of 10-20 women and are female only, which allows women to access savings when economical constrained (Tesorio, 2005). A large proportion of literature on SHG’s is focused within Southern India and the IBD with findings showing a vast improvement in decision making and the importance of these groups in the lives of women (Sabhlok, 2011; Sangeeth et al, 2013; Swain and Wallentin, 2009; Tesorio, 2006; Vijayanthi, 2002; Morgan and Olsen, 2012). Some researchers discuss that SHG’s are non-existent with only small groups able to access them (Swain and Wallentin, 2009). The existing literature portrays SHG’s as critical for gender empowerment and development, documenting the successfulness of these groups for supporting, empowering through accessing economic means (Tesorio, 2006; Vijayanthi, 2002; Morgan and Olsen, 2012). Whilst limited, research suggests that households with women involved with SHG’s that have a migrant in the household are significantly more supported. SHG’s allow for social and economic support of women. A study conducted by Ghosh et al (2018) found that SHG’s not only help women, but increase and support their autonomy. The literature suggests that SHG’s should contribute to a women’s ability to employ adaptive strategies, especially in the absence of remittances. Current studies have highlighted many impacts of out-migration on rural communities. A recent study by Ghosh et al (2018) explored the impact of out-migration after cyclone Alia, reporting that self-help groups were critical for helping women in the aftermath of the cyclone.

Many studies have documented the emotional impacts on women when household members migrate, with Wrigley-Asante and Agandin (2015) reinforcing the importance of economic empowerment programmes. Their study of 59 ‘left behind’ wives employed an investigation on economic, social, psychological and emotional impacts during out-migration. Despite undertaking the physical work of male roles, the women were predominantly affected by the emotional impacts of supporting their extended families and taking on the decision making. Their study, whilst based in Ghana, has important similarities to those noted in current studies in the rural areas of the IBD (Tesorio, 2005; Osamor and Grady, 2016). The remittances, distance and the impact of abandonment have shown both negative and positive impacts of out-migration on women, with inherently contradictory summaries noted within current studies.
2.3.4 Out-migration, Adaptive Strategies and Women

Whilst current literature establishes the impacts of out-migration on women and establishes the gendered differences in adaptive strategies, there is limited research in exploring how out-migration impacts the adaptive strategies undertaken by women. There is a vast array of migration literature about the IBD but there is a surprising lack of studies documenting the impact of out-migration on the places of origin and vulnerable and marginalised groups. A recent study by Ghosh et al (2018) stated that women were left alone to shoulder the burden the effects of cyclones. Out-migration literature suggests that women are not ‘left alone to shoulder the burden’, but the absence of men actually empowers women and increases their autonomy. With Bose et al states that there are four dimensions that empower women: ‘access to remittance and control over income, mobility, household and community decision-making and freedom from threat or fear of violence’ (2017). The extent to how out-migration impacts the adaptive strategies women undertaken to prepare for and respond to rapid onset weather hazards is unknown and undocumented within current literature situated in the IBD.

2.4 Summary and the ‘Gap’

On review of existing literature, the gap is three-fold. Firstly, out-migration is a phenomenon and characteristic of deltas globally, with mobility prevalent within rural communities. Whether climatically influenced, or not, migration has been increasing in recent decades. It is very uniquely experienced within a delta and is constantly evolving and dynamic. Migration in the IBD has been extensively documented, within the dominant body of literature exploring network flows, the characteristics of out-migration are less documented. Many studies researching out-migration focus solely on husbands or men, however, the lack of documentation of any of type out-migration in the IBD, leads this research study to explore all members of a household migrating. Secondly, the impacts of global climate change are set to increase the vulnerability of deltaic environments and the frequency and intensity of natural hazards. With the aforementioned nature of adaptation research and the relevance to current global issues, the stark limited research within the IBD highlights the gap in current literature, research and policy information. The documentation of household adaptation strategies is limited with very few research studies presenting empirical evidence of adaptation IBD. Thirdly, women are more often than not ‘left behind’ in rural areas, where primarily male members out-migrate. Within the large body of literature exploring adaptive
capacity and documenting observed adaptation within the IBD, women are underrepresented. Very few studies explore the impact of out-migration on the adaptive strategies undertaken by women. Therefore, to address the gap in the literature, the overarching aim of this research study is to explore the impact of out-migration on the choice’s women make in preparing for or responding to rapid onset weather hazards in the IBD. The research objectives and research questions of this study, presented in Chapter 1, have been developed to explore this aim.
Chapter 3

Methodology

3.0 Introduction

The Methodology Section will outline the mixed research methods approach used for data collection, data analysis and data presentation within the research study design. Following this, it will present both the quantitative data collection and analysis method. Thirdly, it will present the case study area and both the qualitative data collection and analysis methods. Throughout, it will highlight limitations, ethical considerations and the importance of the mixed research methods approach. To conclude, it will highlight the integration and relevance of the mixed research methods approach in relation to the aims and research questions.

3.1 Research Study Design

This research applies a mixed methods approach which involves the use of qualitative and quantitative methods to collect and analyse data to develop the research process (Leech and Onwuegbuzie, 2009). Doyle et al (2016) outlines the primary approaches to mixed methods research as triangulation, expansion, exploration, completeness, and illustration. Tashakkori and Teddlie (2003) identified over forty mixed-methods research designs, of which, six are predominantly used. One of these, the sequential explanatory design, is often employed within social sciences and particularly adaptation research (Fraizer et al, 2010). Whereby, the application of methods are used in a sequence or concurrent to one another. Within adaptation and migration research, sequence designs have proved important for gaining insight into the ‘big’ phenomena through statistical data from quantitative research and providing real life experiences through qualitative research to further explore and gain insight into context. The rationale for applying a mixed-methods approach to research is predominantly that neither method is appropriate for exploring adaptation, gender and out-migration independently (Ivankova et al, 2006; Kumar, 2007; Paul and Routray, 2011; Maharjan et al, 2012). Whilst Tanyaniwa and Kamyepi describe ‘definitional, paradigmatic and methodological issues with mixed methods’ (2015), it has been gaining rigour, validity and
recognition in recent years. Upon review of the mixed methods research designs, a sequential explanatory design will be employed in this research study.

Gioli et al (2014) implemented a competent and logical mixed methods approach to explore migration and its implications for women in Pakistan. The use of questionnaires and descriptive statistics, followed by Focus Group Discussions (FDG) and content analysis, allowed for completeness, insight and illustration to explore the perception of migration and the wellbeing of women, whilst situating the research into a larger context with the quantitative data. Similarly to Gioli et al’s (2014) approach to exploring the gendered implications of out-migration and upon review of the integration of mixed methods in previous studies, the quantitative data will employ the use of secondary data collected by DEltas, Vulnerability and Climate Change: Migration and Adaptation (DECCMA) in the IBD. Thereafter, the qualitative data will employ the use of primary data collected through a case study and in-depth interviews to add a deeper and more contextualised understanding of the impacts of out-migration on women.

As highlighted in a critical review of the sequential exploratory design, three potential limitations can arise through the implementation of both methods, the weighting and justification of the methods and the integration of the results (Ivankova et al, 2006). Ivankova et al (2006) emphasise the value of visual presentation of the study phases and procedures to overcome the key limitations. Upon drawing on mixed methods literature, Ivankova et al (2006) presents ‘10 rules’ to be adhered to for visual designs in relation to process, procedure and outcome. To outline and introduce the research study design, the mixed methods approach is presented visually in six stages (Figure 4). Firstly, variables relevant to the research objectives were identified from the quantitative data. Once chosen, these variables were explored through descriptive statistics, frequency distributions, cross tabulations and chi-squared tests. Patterns and findings were identified as the initial outcomes. Upon initial completion of the quantitative data analysis, the qualitative research method was developed. The qualitative method, including the case study, interview structure and participant sampling technique was then developed to further explore, understand and explain the quantitative data. The interview data was subsequently coded to illuminate the key themes. The qualitative and quantitative data was collected and analysed through an explanatory sequential to allow for effective integration of both methods.
3.2 Quantitative Research Method

The quantitative research method is presented first to reflect the chronological thought of the mixed methods design. The data collection process and the use of household questionnaires will be discussed. This will be followed by outlining the data analysis process. The limitations of the questionnaire data will be outlined thoroughly and throughout.
3.2.1 Household Survey

The household survey, formulating the quantitative secondary data for this research study, was implemented, designed and carried out as part of a 5 year study by DECCMA. The DECCMA project can be described as a ‘programme of applied research on the adaptation options, limits and potential in deltaic environments to current weather variability and extremes, as well as climate change’ (DECCMA, 2018). The project designed and implemented household surveys in 4 major deltas; GBM Delta in Bangladesh, Volta Delta in Ghana, Mahanadi Delta in India and the IBD. The DECCMA main aims are;

1. ‘To evaluate the effectiveness of adaptation options in deltas
2. To assess migration as an adaptation in deltaic environments under a changing climate
3. To deliver policy support to create the conditions for sustainable gender-sensitive adaptation’ (DECCMA, 2018)

These aims demonstrate the relevance of the DECCMA data and the applicability of the research to this research study. The data, which explores the impacts of migration with a gender-focus and the exploration into the impact of weather hazards, lends itself specifically for gaining insight into the research objectives of this study. The IBD household survey was conducted from December 2016 to February 2017, which included the in-house training for the enumerators, pilot studies, data collection and data checking. The survey was designed and integrated both a household survey and female only survey, to allow for the exploration of gender perceptions and positions. The DECCMA data was collected at a total of 50 locations within the districts of these are North Twenty Four Parganas and South Twenty Four Parganas.

A two-stage cluster design was implemented to source participants according to demographic and migration characteristics, as well as, hazard vulnerability. Firstly, a multi-hazard map was developed in relation to household vulnerability and exposure to natural hazards. This clustered households into five zones; very low, low, medium, high and very high. Thereafter, 10000 households were selected across these zones based on demographic and migration characteristics. After the two-stage cluster design, participant households were selected through proportionate random sampling, of which a total of 1500 households across 50 locations were selected. A total of 30 households were selected in each location; very low (13 locations), low (11 locations), medium (10 locations), high (9 locations) and very high (7 locations). Of the 1500 households, data was present from a total of 1315 households within the IBD, with 236 households recording migrants. A total of 185 households had missing data, which can be explained as the first limitation of the household survey, using equipment within the field and carrying out fieldwork.
3.2.2 Quantitative Data Analysis

The household head and female only questionnaires were explored for variables related to the research objectives. Once selected, the variables were then split into three sections: Out-migration, Observed Adaptations and Impacts of Out-migration. The variables used are presented in Appendix 1. Variables such as perception of the environment, migrant perspectives and documenting economic wellbeing were excluded from the analysis. The reasoning for excluding the economic wellbeing variables are that communities in the IBD often do not solely exchange money, but goods and services are used by way of payment and the unreliability of answers. Furthermore, the perception of the environment questions were noted by DECCMA (2018) during data collection as primarily answered by the household head and male household members. These variables above all did not contribute to the exploration of the research objectives, and were beyond the scope of this research study.

Many of the variables in the sections of migration characteristics and adaptation strategies were also answered predominantly by the household head and the male household members. However, they are useful for exploring how out-migration is experienced and documentation of adaptive household strategies which is crucial for providing a foundation of adaptive strategies within households to build on and identify adaptive strategies undertaken by women specifically. The statistical software, Statistical Package for the Social Sciences (SPSS), was selected to analyse the variables (George and Mallery, 2016). The data was cleaned to ensure all variables were present and data was categorised correctly.

Firstly, to explore the migration characteristics, frequency distributions were carried out to find document the characteristics of migrant households including age, gender and the member within the household of migrants. As well as exploring the main livelihoods of migrant households, household headship, type of migration and number of migrants in a household. It also explored the reasons of migration stated within the survey and the use of remittances within a household.

To document the adaptation strategies, frequency distributions were used to analyse the adaptations being undertaken by migrant and non-migrant households. The household survey reported fifteen variables related to household and livelihood adaptations. The percentage of migrant and non-migrant households were used to compare and explore the prevalence of adaptations. Whilst the household head was a potential variable, it was considered inappropriate
because there was a possibility of excluding migrant households where the household head was migrating. It was not possible to explore the adaptive strategies undertaken by women from the household survey, because men primarily answered the survey on behalf of the household. Therefore, the type of household (Migrant or Non-migrant) were chosen to observe differences and the gender differences to added from the qualitative data.

To explore impacts of out-migration, cross tabulations and frequency distributions were used to explore wellbeing variables of migrant households and women. A cross-tabulation was formulated to explore differences in decision making within migrant and non-migrant household between male and females. Frequency distributions were used to explore the survey responses to women’s wellbeing in migrant household’s statements because these were asked solely to women in migrant households.

### 3.2.3 Summary of the Quantitative Research Method

The initial quantitative data was explored within SPSS. This was used to identify aspects to be explored in the qualitative research methods. The case study design was developed in relation to the three categories identified in the exploring Out-migration, Observed Adaptations and Impacts of Out-migration aspects will be explored within the in-depth interviews.

### 3.3 Qualitative Research Method

On presentation of the quantitative research method, the Case Study will be presented, including the data collection process, participant sampling and the data analysis used to code the data. The limitations of the research method, positionality and interpretation will be discussed in relation to the implementation of the qualitative method.

### 3.3.1 Case Study Area: Dulki and Sonagar

The case study villages of Dulki and Sonagar are situated in the centre of the IBD and border the Sundarbans National Park (Figure 5). Fieldwork was carried out on an Island where both villages are situated.
3.2 In-depth Interviews

A case study was employed as the qualitative research method and to collect the data in-depth interviews were employed. In-depth, face-to-face, semi-structured interviews are a popular research method which seek to explore individual experiences and perspectives within a phenomenon (DiCicco-Bloom and Crabtree, 2006). The primary data was collected through in-depth interviews which were conducted during fieldwork in June 2018. A total of 17 interviews of approximately 45 to 60 minutes were conducted through the use of translators. Data collection took place over seven days, which included a training day for the translators, orientation in the field and pilot interviews. The duration of data collection was limited due to time restrictions of the university timetable and the timing of the monsoons. However, this was predominantly overcome with the use of purposive

**FIGURE 5: CASE STUDY AREA: DULKI AND SONAGAR (AUTHORS OWN)**
sampling to maximise the interviewing time in the field. A researcher from the Jadavpur team conducted a survey to explore the access and suitability of different locations and presence of desired participants for relevance to my study aims, prior to my arrival in the study area. The survey documented the number of migrants in the household, the location of the household on the island, the status of the migrant (return or current) and number of members in the household.

The interviews were semi-structured, containing six initial open-ended questions allowing for follow up questions. The interviews were designed upon reflection of the initial quantitative analysis and review of the literature (Appendix 2). Several limitations related to language were experienced, including word meanings and cross-languages. Whilst the translators had a firm understanding of English, words in Bengali often significantly differed in meaning from the English translation. Whilst there were many notable challenges in using translators, noted in previous field work studies (Winchester, 1999; Gjersing et al, 2010), the primary challenges with using translators led to me gaining some of the most in-depth insight into the women’s lives. The researcher prevented asking sensitive questions that may have implicated the women or made them feel uncomfortable (Wrigley-Asante and Agandin, 2015). Predominantly, women were interviewed alone and within their houses to ensure that males did not influence answers.

The training day, orientation and pilot interviews were used to overcome and attempt to mitigate any potential limitations. For example, the translator initially misunderstood the meaning of several questions. After discussion and rewording, the meaning of the questions were understood and the questions changed to be presented more simply. The interviewee profiles documented in Appendix 3, show the characteristics of each participant interviewed. To ensure anonymity, all interviewees were given a participant number and code for reference within the text.

3.3.3 Qualitative Data Analysis

The content and thematic analysis pursued as the qualitative data analysis. Coding is defined as a ‘dynamic, intuitive and creative process of inductive reasoning, thinking and theorizing’ (Basit, 2003). Coding involves assigning words and sentences labels of descriptive meanings to text (Basit, 2003). These codes are often an inductive, data driven, and deductive, theory-driven, but can also be a hybrid approach of the two. Fereday and Muir-Cochrane (2006) argues that a hybrid approach allows for continuity of exploration of quantitative data and allows for a further exploratory approach to investigate the situation further. The use of both inductive and deductive coding is a useful for theme development and will be used to code the in-depth interviews. An initial set of
codes are produced from theory and then additional codes are then generated from the data itself (Thomas, 2006). Initial emergent themes, defined as clusters, are then grouped. Thereafter, primary themes are created from these clusters. Inter-rater reliability, a process of independent coding and where coding is compared for agreements, is argued amongst qualitative researchers as an important stage for ensuring rigour and transparency within the research was used (Armstrong et al, 1997). The codes were evaluated by an MSc student and discussed. Finally, selective themes are created in relation to the study research objectives. The use of a systematic procedure in analysing qualitative data ensure reliability and validity within findings (Thomas, 2006).

After review of coding methods, the coding of the interview data pursued in 6 titled stages; initial coding, cluster analysis, initial clusters, secondary coding, inter-rater reliability and selective coding (Figure 6). These stages were undertaken in NVIVO to ensure a manual but methodological approach to qualitative data analysis through a reliable data management programme (Feredy and Muir-Cochrane, 2006; Zamawe, 2015). During the coding process, primary themes and final themes were identified to ensure a rigorous approach to exploring the overarching themes.

<table>
<thead>
<tr>
<th>Codes from Code Book</th>
<th>Initial Coding</th>
<th>Cluster Analysis</th>
<th>Initial Clusters</th>
<th>Primary Themes</th>
<th>Inter-Rater Reliability</th>
<th>Final Themes</th>
<th>Selective Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation</td>
<td>Bamboo fences</td>
<td>Adaptation</td>
<td>Protect</td>
<td>Reactive (Respond)</td>
<td>Response</td>
<td>Adaptations</td>
<td>Observed Adaptation</td>
</tr>
<tr>
<td></td>
<td>Money sent to</td>
<td>undertaken by</td>
<td></td>
<td></td>
<td></td>
<td>Undertaken</td>
<td></td>
</tr>
<tr>
<td></td>
<td>market</td>
<td>women</td>
<td></td>
<td></td>
<td></td>
<td>by Women</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 6: Example of the Coding Method**
3.3.4 Summary of the Qualitative Research Method

Overall, the approach allowed for a thorough and exhaustive identification of overarching themes relating to and exploring the quantitative data. There were eight final themes identified: Reasons, Remittances, Adaptation Strategies, Characteristics of Out-migration, Decision Making, Family Structure, Wellbeing and Barriers. Upon identification of final themes, selective coding was used to assign each theme to the quantitative data categories of Out-migration, Observed Adaptations and Impacts of Out-migration. This allowed for the themes to be used for further insight into the quantitative findings.

3.4 Ethical Considerations

The vulnerability and cross-cultural nature of the study highlights the importance of ethical consideration and regulations. The study was submitted for ethical approval to the University of Southampton’s, Ethics and Research Governance Online (ERGO) (See Appendix 7 and 8). It received ethical approval before data collection was undertaken (ERGO ID. 41112). The study employed a Participant Information Sheet (PIS), consent form and de-brief form to inform all participants of the nature of the study and to ensure consent was obtained to confirm their willingness to participate (See Appendix 4, 5 and 6). Anonymity and data protection was fully outlined within the PIS, assuring participants that they or identifying features would not be published within the study.

3.5 Summary: Integration and Relevance

The mixed methods approach to this study has been invaluable for shaping the study design and gaining insight into the aims and objectives of this study. It is often argued that a mixed methods approach allows ‘for the limitations of each method to be reduced because of the strength of the other’ (Doyle, 2016). This is inherently evident within the design of this research study. Firstly, this research study and DECCMA’s aims and objectives were inherently similar in their relevance to migration and integration of gender, a vital aspect which allowed me to gain a significant amount of detail from the quantitative data.

The gender dimensions however, were best explored from a qualitative approach. For example, several studies have employed a similar survey to explore gender aspects of out-migration within
India, but through a solely quantitative method. The attribution, assumptions and generalisations of the gender roles, cultural values and social norms are assumed within these studies, ignoring inter and intra-regional differences within India (Desai and Banerji, 2008). This emphasises the importance of the qualitative research method for ensuring a gendered perspective. The mixed methods approach is inherently grounded within current literature and builds on this by providing a deeper understanding of the context behind adaptive strategies undertaken by women in households in the IBD. Furthermore, it allows the added dimension of exploring women in these households by adding ‘voice’ through qualitative methods within a complex phenomenon (Doyle et al, 2016).

The development of the quantitative and qualitative methods, including data analysis of the secondary data and data collection of the in-depth interviews, has been developed in a sequential approach. The final stage of the research design, the integration of the data, will be further informed by the research objectives. In order to explore the aim ‘explore the impact of out-migration on the choices women make in preparing for or responding to rapid onset weather hazards in the IBD’, the results have been categorised in relation to the three research objectives and to answer the research questions. The qualitative and quantitative data will be integrated within Out-migration, Observed Adaptation (household and women in migrant households) and Impacts of Out-migration on women, which will further inform how the data will be presented in the Results and Analysis Section.
Chapter 4

Survey and Case Study: Results and Analysis

4.0 Introduction

The Results and Analysis Section will be categorised in accordance to the main objectives of this study: Out-migration in the IBD, Adaptive Strategies (migrant, non-migrant households and women in migrant households) and Impacts of Out-Migration. It will describe and analyse the quantitative and qualitative data in an integrated presentation within each category. Firstly, the characteristics of out-migration in the IBD will be identified. Secondly, it will document the main adaptive strategies undertaken by households and address the differences between non-migrant, migrant households and women in migrant households. Thirdly, the impacts of how out-migration affects the adaptive strategies women undertake. It will also categorise the barriers to adaptation women experience and present the interrelations and interactions of the impacts of out-migration and the adaptive strategies women undertake. Finally, the section will be summarised.

4.1 Out-migration in the IBD

This section will present the results to address the following research objective: to document the characteristics of out-migration and how it is experienced in the IBD. It will present the main characteristics of out-migration, which will be presented from the survey data, with further insight provided from the qualitative themes: Reasons and Remittances.

4.1.1 Characteristics of Out-migration

The characteristics of out-migration are outlined within Table 3.
<table>
<thead>
<tr>
<th></th>
<th>Out-migration Characteristics</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender of Migrants</strong></td>
<td>Female Migrants</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Male Migrants</td>
<td>181</td>
</tr>
<tr>
<td><strong>Age of Migrants</strong></td>
<td>&gt;19 years old</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>20-29 years old</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>30-39 years old</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>40-49 years old</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>50&lt; years old</td>
<td>7</td>
</tr>
<tr>
<td><strong>Household Member Status</strong></td>
<td>Household Head</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Partner of Household Head</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Married Child</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Partner of Married Child</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Unmarried Child</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Brother or Sister of Household Head</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Brother in Law or Sister in Law of Household Head</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Niece or Nephews of Household Head</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Parent</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Grandchild</td>
<td>22</td>
</tr>
<tr>
<td><strong>Type of Migration</strong></td>
<td>Permanent Migration</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Seasonal Migration (Migrates once or twice a year)</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Circular Migration (Migrates often for short periods)</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Other (International etc.)</td>
<td>87</td>
</tr>
<tr>
<td><strong>Type of Migrant Household Head</strong></td>
<td>Male Household Head</td>
<td>182</td>
</tr>
<tr>
<td></td>
<td>Female Household Head</td>
<td>54</td>
</tr>
<tr>
<td><strong>Main Livelihoods of Migrant Households</strong></td>
<td>Crop Farmer</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Unpaid home carer</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Construction worker</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Factory worker</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Trader/Dressmaker</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Fish/Shrimp Farmer</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Domestic worker</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Regular Salaried Employ</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Transport worker</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Hawker</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Livestock farmer</td>
<td>0</td>
</tr>
<tr>
<td><strong>Number of Migrants per Household</strong></td>
<td>1 migrant</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>2 migrants</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>3 migrants</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>4 migrants</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>5 migrants</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>6 migrants</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>7 migrants</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>8 migrants</td>
<td>1</td>
</tr>
</tbody>
</table>
There is a significantly higher proportion of male migrants. All ages are observed to be migrating however, typically migrants are younger, aged between 20-40 years old. The survey showed that out-migration in the IBD is inherently seasonal, with migrants travelling for work within India. Permeant and circular migration is also experienced. There is a higher prevalence of female household heads within migrant households, which can be attributed to primarily male migrants. Within interview responses, women were often referred to as a household head when the household head migrates. Whilst household heads and partners do migrate, there is a higher prevalence of migration by household children. Furthermore, it can be attributed that unmarried migrants are more likely to migrate than married migrants. Whilst all livelihoods experience migration, the main livelihoods of migrant households are crop farmers and construction workers. Unpaid home carers are also classified as a migrant household livelihood, within the survey data. This could be attributed to a female member of a household, whereby migrants have left and send remittances home.

The qualitative sample consists of 17 responses from women in migrant households within the case study villages (See Appendix 3). Women between the ages of 25 – 65 years old were interviewed. Migrant characteristics in these households varied, for example, remittances received, number of migrants in the household, role of the migrating member and reasons for migrating.

4.1.2 Reasons for Out-Migration

Figure 8 shows the reasons for out-migration from the household survey data. Seeking employment, family obligations and seeking education were the three primary reasons for out-migration reported (See Appendix 11). Seeking employment was also the primary reason for out-migration stated in the interviews. However, one significant difference between the datasets, upon follow up questioning, was the multitude of different reasons for migrating. Whilst, many people migrated to find employment, the need for this was differently reported within interviews. The main reasons for migration were; loans, environmental reasons, perceptions of wildlife, cyclone Alia and the unavailability of work.
Migrant households reported the reason for the migrant seeking employment and work outside their village was due to the burden of taking out a loan. Interviewees discussed several environmental reasons for migration. Agricultural productivity was stated to have declined within agricultural households, with many saying that the produce could not support the family and the prospect of higher wages from migration destinations was more attractive. Several interviewees perceived the wildlife within the IBD negatively. There was uncertainty and worry from fishing activities and hunting in the Sundarbans forest of family members. The perceived negativity arose from stories and first-hand accounts from encounters with tigers, sharks and crocodiles. One prominent reason for out-migration was related to cyclone Alia. The destruction of households and assets, the availability of work and inability to conduct agricultural or fishing activities, because of
flooded land and salinization, forced household members to migrate. All interviewees reported that the government had provided them with 10,000 rupees and some received Non-Governmental Organisation (NGO) assistance following the cyclone. The financial support did not cover the assets, household reconstruction and long term impacts on livelihood activities, therefore, loans were taken out by households to meet financial needs. Another reason for out-migration mentioned by interviewees in reference specifically to younger migrants was the availability of work. Many noted that migrants can earn over double the amount at migrant destinations, the work opportunities were more attractive than jobs within the village, where most of the work is laborious and agricultural. Out-migration was rarely caused by one reason, being exposed to a multitude of stressors was seen throughout the interviews.

4.1.3 Remittances

Remittances were usually sent from the migrant to the household monthly or every 2-3 months as reported by the household survey. Whilst this was consistent throughout the interviews, interviewees noted that a remittance network was not established immediately. Sometimes it would take between two and six months for households to begin to receive remittances, which was not highlighted within the household survey. Once received the remittances were used primarily for daily consumption, healthcare and education of children. Figure 9 shows the use of remittances within migrant households from the household survey responses.

![Figure 8: Migrant Household Remittance Use (See Appendix 11)](image-url)
Interviewees reported the use and significance that remittances had on household and livelihood activities. Many reported the remittances were significant in modification of household roofs from thatch to tin and a shift from mud to concrete houses. Household use of remittances from interviewees reflected the household survey data. It was highlighted that the most important use of the remittances was to repay household loans and allow children to continue with educational pursuits.
4.2 Observed Adaptation in Households in the IBD

This section will present the results to address the following research objective: to identify and categorise the main adaptive strategies that are undertaken by non-migrant households, migrant households and women in migrant households to prepare for and respond to rapid onset weather hazards. To do this it will explore how rapid onset weather hazards are perceived by households and what drives them to adopt strategies. Secondly, it will identify adaptive strategies that have been undertaken by migrant and non-migrant households. Thirdly, it will identify and categorise the adaptive strategies women in migrant households undertake. The observed adaptations of non-migrant and migrant households will be explored through the use of survey data, to understand the differences. It will further present the interviewee responses from the theme: Adaptive strategies.

4.2.1 Perception of Rapid Onset Weather Hazards

The survey data showed that migrant and non-migrant households were affected by rapid-onset weather hazards differently with the frequencies presented in Figure 9.

![Figure 9: Frequency of Households Affected by Rapid-Onset Weather Hazards](See Appendix 12)
Predominantly both non-migrant and migrant households were affected by rapid onset weather hazards ‘Once per Decade’. Overall, flooding has the highest impact on households across all time scales. Conversely, cyclones impacted households predominantly on a once per decade basis. Overall, migrant households have been affected by rapid-onset weather hazards more than non-migrant households. The survey data represented households from 50 locations within the IBD, whereas the interviews were undertaken solely in one location in the south of the IBD, which is at closer proximity to the fluvial and coastal processes seen in deltas.

The interviewee responses can add depth to how households are affected by rapid-onset weather hazards. It was reported from the responses that cyclone Alia was a significant turning point in the perception of cyclones in the IBD, which could explain the uptake of adaptations by migrant households. Several adaptive strategies undertaken by women were as a direct consequence of the impact cyclone Alia had on them, in which they chose to undertake certain adaptations to prepare for a similar. In relation to the monsoon season, households reported the that it was starting earlier and ending later, describing the season as having ‘no set period’ anymore (Participant 6). Flooding was perceived as increasing in duration and frequency. An interesting and unexpected finding, which was reported across all interviews, was the increased prevalence of thunder and lightning storms. Women reported that they are:

‘more common now’ (Participant 8)

‘Thunderstorms are a very recent event. In the next village, livestock has been killed by them’

( Participant 6)

The women discussed that the creation and development of electric lines within and around the village, causes lightening to strike during the thunderstorms. It was perceived that people and animals were increasingly in danger, with many stating that livestock have been killed during storms. They stated this was a recent event.

4.2.2 Observed Adaptation in Non-Migrant and Migrant Households

The quantitative survey identified fifteen specific adaptations in relation to the IBD. These adaptations and their frequency within non-migrant and migrant households are presented in Figure 10. It was observed that adaptations are being undertaken, primarily at the household level. Although still prevalent, agricultural and other livelihood adaptations were less reported. The survey
Between 2011 and 2016, over 63% of migrant households took out a loan, in comparison to 47% of non-migrant households. Interviewees reported the reason for migration was the need to repay loans, which may correlate to the reasons for out-migration, which is employed to repay loans. Modifying the household was also undertaken, with 53% of migrant households and 40% of non-migrant households undertaking these adaptation. Interviewees stated that they needed to shift from mud and thatch houses to concrete and tin to ensure safety during weather hazards. Whilst, mud and thatch houses are easily replaced, households were making significant and constant
Changes to these households when they were damaged by hazards. This was in response of the damage caused by cyclone Alia and to prepare for and accommodate the impacts of future cyclones. Furthermore, over half of migrant households have undertaken house modifications compared to 40% of non-migrant households. Migrant households reported that they could make house modifications because they received higher incomes from migrant remittances, than previous livelihoods incomes.

After the occurrence of cyclone Alia, it is expected that the NGO/government assistance variable is high because assistance was present and there was intervention following the cyclone. Within the agricultural livelihoods variables, there are little differences in uptake of adaptations and generally a lower prevalence of undertaking adaptations than household variables. However, there is a higher prevalence of using hired labour amongst migrant household than non-migrant households. This was noted as being undertaken by interviewees because of the lack of a household member. It was shown that there is a higher prevalence of women working outside the home in migrant households.

There are interesting outcomes related to taking out insurance. 8% of non-migrant household took out a loan, compared to 4% of migrant households take out insurance. One interviewee discussed that migration in itself provides an insurance of the household and members. The remittances sent each month allow the household to prepare for and anticipate costs of the household. When the migrant is away from the household and a hazard hits the area, there will still be an income. If the migrant is at the household, then they may not be able to work because of the environmental conditions restricting livelihood activities or the death of livestock.

4.2.3 Observed Adaptation of Women in Migrant Households

The adaptive strategies undertaken by women have been documented and categorised, into Smit et al (1999) ‘Proactive and Reactive’ in Figure 11. The interactions between adaptations undertaken in migrant and non-migrant households will be discussed further in relation to the adaptive strategies women undertake.
<table>
<thead>
<tr>
<th>Adaptive Strategies undertaken by Women in Migrant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proactive/Anticipatory</strong></td>
</tr>
<tr>
<td>Saving money</td>
</tr>
<tr>
<td>Sending money to the bank</td>
</tr>
<tr>
<td>House modification</td>
</tr>
<tr>
<td>Local emergency contact in place when migrant is away</td>
</tr>
<tr>
<td>Accessing female only SHG</td>
</tr>
<tr>
<td>Cutting trees down to protect house</td>
</tr>
<tr>
<td>Increasing social interaction</td>
</tr>
<tr>
<td>Increasing social activities</td>
</tr>
<tr>
<td>Planting trees for land stability</td>
</tr>
<tr>
<td>Increased awareness for forecasting weather patterns</td>
</tr>
<tr>
<td>Start working outside the home</td>
</tr>
<tr>
<td>Using hired labour</td>
</tr>
<tr>
<td>Use or diversification of climate tolerant crops</td>
</tr>
<tr>
<td>Mixed Methods Farming</td>
</tr>
</tbody>
</table>

**FIGURE 11: OBSERVED ADAPTATION OF WOMEN IN MIGRANT HOUSEHOLDS**

The proactive and anticipatory measures noted as the primary differences in adaptations undertaken by women in migrant households were mainly social actions and decision making differences. There were significant differences and gender specific adaptations undertaken by women, in addition to the observed adaptations within households. The women stated that they undertook adaptive strategies differently during out-migration.
Proactive: To prepare for rapid onset weather hazards

One adaptation undertaken was the use of mixed farming methods; during the monsoon season women undertook additional livelihoods and income activities, often fishing. This was noted to support the household if a migrant was not at home and to continue the household livelihoods. A woman with three migrating members of the household stated;

‘I have two bighar land, but during the rainy season I have to sell fish because I do not receive remittances’ (Participant 17)

Women stated that they were more socially active during periods of out-migration of family members. They increased social interaction and activities to improve their emotional wellbeing and asked support if they needed physical help within household and livelihood activities. Women entered and joined SHG’s both to pursue and continue individual and household livelihoods and activities, particularly if migrating members did not send remittances.

The remittances received by women, were reported as being saved for emergencies and sent to the bank. One interviewee stated that she does this to ensure that;

‘When a cyclone or flooding hits, I have money to support the house and repair damage.’ (Participant 15)

Reactive: To respond to rapid onset weather hazards

Women noted that they have an increased awareness of household and farming activities for decision making purposes. When a migrant leaves, the women taken on extra roles in the household. Women took on the decision making powers for the household and livelihood activities. Interviewees stated that there are problems when a migrant is not around and a cyclone or flooding hits. They reported:

‘If my husband is here, he will go to the market, he will tend the agricultural land. When he is not here, I struggle to maintain everything’

[The migrant] would help me collect water during the monsoon season, when he is absent, I have to do it alone’ (Participant 14)
This leads directly on to additional adaptations, including re-organisation of the day, placing bricks on the ground, collecting rations from the market, collecting water, covering houses and animal houses in plastic, making bamboo fences and covering themselves in plastic to continue farming. The roles that women have to fill during out-migration, caused them to undertake additional adaptive strategies and take on strategies the migrating members would usually do. This is particularly evident during out-migration of a husband, leaving just the woman and children in the household.

Furthermore, women increased their social interaction and activities when the household member migrated so that they were better supported in decision making. Women often mentioned that they forecasted the weather more frequently when a member migrated, both within the village and the migrant destination. To ensure they could prepare for weather hazards and to ensure their family member was safe. Women noted that they had a local emergency contact in place whilst a household member was migrating. This was noted as a neighbour, extended family member or a household friend with a market shop. This acted by way of insurance, which women could called on for physical help and economic support.

The adaptive strategies have been outlined and will be further discussed within the Impacts of Out-migration on Women in the IBD section.

4.3 Impacts of Out-migration on Women in the IBD

This section will present the results to address the following research objective: to explore whether out-migration impacts migrant women’s wellbeing and the adaptive strategies they use to prepare for and respond to rapid onset weather hazards. It will firstly identify how out-migration impacts women in migrant households. It will then explore whether the impacts of out-migration affect the choices and adaptive strategies women undertake in response to rapid onset weather hazards. It will also identify any barriers to adaptation experienced by women in migrant households. The impacts of out-migration on women will be explored through decision making and wellbeing variables from the survey data. It will then present further insight into the impacts of out-migration on women from the qualitative themes; Characteristics of Out-migration, Decision Making, Family Structure, Wellbeing and Barriers.
Impacts of Out-migration on Women

Figure 12: Impacts, Barriers and Adaptive Strategies
4.3.1 Impacts of Out-migration

There were several impacts of out-migration, identified within the data that implicate, cause and affect the adaptive strategies women undertake. The impacts of out-migration are complex and open-ended, with many potential implications, both positive and negative. There were also barriers to adaptation identified within the data. The impacts of out-migration on women, their potential outcomes, the barriers to adaptation and the adaptive strategies women undertake to prepare for (Proactive) and respond to (Reactive) weather hazards have been presented within Figure 12. The adaptive strategies highlighted in bolder writing are identified as primarily being affected by the impacts out-migration. The impacts of out-migration identified by the survey data and interviewee responses will be discussed in six categories.

4.3.2 Characteristics of Out-Migration

The type of out-migration (seasonal, cyclical or permanent) was reported to have different implications for women. Seasonal and cyclical migration was preferred because the migrant often lived closer to the area. They could return home, or the migration duration meant that they would be at home, to prepare the household for and provide support during rapid onset weather hazards. This is particularly in reference to monsoon flooding because it can be more easily forecasted and it is expected annually, therefore, migrants can return home, in anticipation. Cyclones however, were observed to impact women significantly more, because migrants could not help women in the time of response to these. Women expressed their concern for the migrating family members, especially children, and preferred them to be at a closer location. One interviewee’s husband migrated for a year at a time, returning home once a year for a month. Whilst potentially an exceptional case, this woman was very emotional about her situation and said;

‘During heavy rain and monsoon seasons, I have to do everything in the home. I need to go out to collect drinking water, go to the market so I have to lock my young children in the house. I do not speak to my or my husband’s family, I am all alone.’ (Participant 13)

This was reported differently by women and was primarily overcome by social factors. When women were living in supported extended families, or increased their social interaction and activities, they did not report these problems.
The reason for migration often reflected the impacts experienced and subsequent adaptive strategies the women undertook. When loan repayment and severe economic conditions were experienced by the household, the women often had to continue working in the village and had more responsibility of livelihood activities, such as looking after the livestock, farming or fishing. One woman had two migrating family members, her son and husband. She reported that she had to take on their previous household roles because their remittance is solely used to repay a loan. Therefore she covered herself in plastic to continue with livelihood activities. Other women also reported that they had to undertake all aspects to protect the household from weather hazards, including collecting water, making bamboo fences, placing bricks on the ground, covering houses in plastic and collecting rations from the market. In all circumstances, the women would have been helped by the migrating member of the household during a weather hazard.

The primary uses of remittances, previously discussed in the Characteristics of Out-Migration section, had significant impacts on women’s daily life. Interviewees reported that the remittances would go to education or healthcare costs of the children, repaying loans, house modifications and lastly, it would go to supporting the women directly. For example, one interviewee reported that she would put her children and house first, instead of hired labour costs or buying food at the market, which would drastically help her, despite the fact she was physically struggling with these tasks. Remittances did however, have a positive impact on women’s responsibility to undertake both household and livelihood activities. In some cases, it was reported that remittances allowed women to focus solely on the household, without additionally having to support livelihood activities. Other women reported that they only undertook extra livelihood and income activities if time allowed. One woman stated that:

“Our whole family and our life is supported by my husband’s migration and the money he sends”

(Participant 16)

Additionally, migrant incomes were reported to be significantly more than the income they earnt in previous livelihood activities. This allowed women to save a little extra money and was described by several interviewees as a type of insurance. One woman stated this in detail;

“When my husband worked in the village, income is equal to expenditure, if there are any health problems or money needed for emergencies, there is no money left to support us. When my husband migrates, we can save money, we know that we will receive money each month.’ (Participant 15)

When migrant households do not receive remittances it was noted by interviewees that they significantly affected both emotional and physical wellbeing. Amongst others, primarily women
could not undertake the adaptations saving money or sending money to the bank, which impacted the household to prepare for weather hazards. The missing household member added more pressure onto the women. An elderly wife discussed her and her husband’s struggles upon the migration of their three children. Whilst potentially an exceptional case, none of the children sent remittances home and the couple lacked physical help and financial support.

A stark finding and aspect of remittances discussed by the interviewees was the difficulties in obtaining the sent remittances. Primary forms of receiving remittances were when migrants returned home, paid into bank accounts and sent to family members to give to the women. Some women could not collect remittances because the household was in debt and could not open a bank account, there were time constraints placed on the women from added household responsibilities. This was noted as a lack of access. To overcome these barriers, women undertook the adaptations social interaction and activities, as well as, re-organising their day. They often travelled in small groups to the bank, during school hours or members of the family would look after the children. Some migrants left provisions in place for neighbours to receive remittances for women to collect more easily.

4.3.3 Decision Making

Out-migration of a household member had surprising impacts on women’s household decision making powers. Overall, the survey data showed that both male and female adults and female adults decision making was higher in migrant households than non-migrant households, shown in Figure 13. The decision to treat sick children was undertaken by female adults in 24% of migrant households. The characteristics of out-migration reflected mainly male migrants and it can be anticipated that women become de facto household heads and in turn the responsibility of the decision making
Figure 13: Decision Making in Non-Migrant and Migrant Households (See Appendix 15)
Many women reported the worry they experienced when their family member migrated. Often discussing this as the most negative impact of out-migration. Considering the description of added physical activities from missing household members, this was a surprising finding throughout the interviews. Several women said that they worry about the migrant when the weather is bad in the village. With little ability to communicate, the women say they often cry themselves to sleep and do not eat. When communication between migrant and household is upkept, women felt better equipped and less alone to deal with natural hazards. The decision making powers in migrant and non-migrant households show that it is often shared between

![Figure 14: Protecting agricultural crops (Authors own photo)](image14)

![Figure 15: Livestock at a household (Authors own photo)](image15)
Whilst women help in the field and within livelihoods, women in migrant households whereby the migrant is primarily in control of livelihood decision making were seen to struggle to undertake both household and additional livelihood decision making and added roles. Inexperience in these livelihoods often added pressure to the lives of women. Figure 14 and Figure 15 shows a farming technique used to protect the crops and also livestock at a household, as well as others, women are often struggle with these types of added livelihood responsibilities. However, women often mentioned that they forecasted the weather more frequently when a member migrated, both within the village and the migrant destination. This was observed to be firstly, an outcome of added livelihood responsibility and also, allow for communication with migrants or friends to gain advice. Furthermore, women often heavily invested and supported migrants, whilst it was a household decision usually, women gave as much as they could to support the migrants. Parents and women gave children a large amount of money to help them get set up in the destination area, which was a huge investment for the households. Some interviewees say they sacrificed this so that they could eventually receive remittances.

4.3.4 Household Structure

The household structure, including extended family, was a significantly influences how a woman experienced and was impacted by out-migration. Some interviewees lived within, what was described as ‘nuclear’ and ‘fragmented’ families whereby women were not in contact or supported by their extended family members. Women who were supported had a network of security and safety that they could call on when the migrant was away. The women described their family members as:

‘uncle as very helpful and supportive’ (Participant 8)

‘mother-in-law and father-in-law were very supportive’ (Participant 4)

Family members lent them money when they were struggling, when they needed assistance with their children during flooding or when their homes were seriously damaged from natural hazards. Neighbours and friends were discussed as significant supporting members of a woman’s social network. Interviewees discussed the role of their neighbours and friends during times of natural hazards, amongst responses were the following:

‘I have a huge bond with my neighbours, yes we are poor but they provide huge mental and emotional support when my husband is migrating’ (Participant 6)
Neighbours and friends acted in place of, or extensions of family, greatly supporting women during out-migration of household members.

The presence of certain household members during out-migration and the role of the migrating member within the household have significant impacts on women. Where there are children in a household, the primary aim for them is to pursue education. There was a significant shift from children’s responsibilities to educational pursuits within the interviews. This often led women to have higher pressures at home, with many attempting to do more jobs throughout the day whilst the children were at school. They also prioritise their children’s educational costs above those within the household. The role the migrant had in the household, i.e. a husband, son or grandchild, had significant impacts on women. Despite the women taking on similar extra roles, when any member migrated, the presence of a husband directly impacted women. This was because of the emotional and mental support husbands provided, as well as the roles the women undertook. Amongst interviewee responses, women often described their husband as:

‘when problems arise, my husband and I sit together and find a solution’ (Participant 15)

‘my husband helps me physically, in the house and with the livestock’ (Participant 7)

‘he is so caring, I speak to him each and every day’ (Participant 4)

The physical burden of the loss of household members was mentioned as an impact, but was often counteracted from remittences and social support whilst the member of the household migrated.

4.3.5 Wellbeing

The survey asked women in migrant households to agree of disagree to several wellbeing statements, as shown in Figure 14.
There are interesting aspects to discuss with relation to the wellbeing statement; ‘overall I feel more stressed and unhappy’ in relation to out-migration, which can be explored within the other wellbeing statements. Whilst, 35% of women agreed with this statement, 38% of women disagreed with it. There seemed to be influencing factors that affect the responses.

One significant finding from the interviewee responses was the worry women had for the migrating member and its impact on women’s wellbeing. They were significantly affected by emotional worry about where and how the migrant was. It was observed from the survey data that 50% of women felt that migrants do not feel like they belong in their new destination and 74% of women felt that migrants are more likely to get sick or be in danger. Emotional worry, combined with social isolation, affected the adaptive strategies women undertook. The little support they received from family or friends led them to be more vulnerable, with some experiencing emotional stress. The increasing social interaction and social activities led women to undertake adaptive strategies and improve their wellbeing. Women stated that they felt more empowered and supported to undertake livelihood and household decisions. Furthermore, it is interesting that 90% of women agreed that

![Figure 17: Women’s Wellbeing Statements (see Appendix 14)](chart.png)
migration improved a migrants education and work opportunities. Within all interviwee responses, women wanted their children to gain a good education and wanted migrants to have good work opportunities. Primarily, migration is presented as a positive livelihood decision by women. Additionally, the survey data illustrates that 48% of women agreed that migration gave them more opportunities in life and 75% of women believed that they had greater influence in household decision making. These statements demonstrate that migration can have positive outcomes on womens lives. Women had the choice to undertake livelihoods, such as tailoring (Figure 19) and growing chillies (Figure 18). The interviwee responses can provide examples of this with women attributing more freedom during out-migration:

‘I have my own fishing net now and I support the income from fishing occasionaly’ (Partcipant 11)

Adaptive strategies are further implicated by these opportunities and greater influence in decision making, with women observed to be re-organising their time, diversifying livelihood choices and accessing SHG’s. SHG were praised by interviwees for the economic support and security they
provided during out-migration of family members. This was seen to increase women's access to economic resources and allowed women to make decisions over their livelihoods and households. To prepare for rapid-onset weather hazards, accessing SHG positively contributed to the adaptive strategies they could undertake. For example, it allowed them to stop working outside the home or to undertake a different livelihood during times of vulnerability or stress. It also allowed women to save money and preserve rations. This was especially evident when remittances were not sent by the migrant.

Within the wellbeing statements 85% of women agreed that their childhood responsibilities had increased and 85% of women agreed their work responsibilities had increased. These were noted by interviewees as potential negative during out-migration, during flooding, cyclones and storm surges. The added pressures often led women to struggle with life and the ability to implement adaptive strategies.

4.3.6 Observed Barriers to Adaptations

There were several barriers to adaptation, which emerged from the data, experienced by women in migrant households, shown in Figure 15. These have been categorised and documented within three categories; Human and Informational, Natural and Social (Jones and Boyd, 2011).

<table>
<thead>
<tr>
<th>Human and Informational</th>
<th>Natural</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inexperience in decision making</td>
<td>Lack of resources</td>
<td>Isolation</td>
</tr>
<tr>
<td>Livelihood pressures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in household roles and activities</td>
<td></td>
<td>Lack of access to SHG</td>
</tr>
<tr>
<td>Access to remittances</td>
<td></td>
<td></td>
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<tr>
<td>Ability to forecast weather</td>
<td></td>
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<tr>
<td>Time constraints</td>
<td></td>
<td>Lack of family members</td>
</tr>
</tbody>
</table>

**Figure 20: Barriers to Adaptation experienced by Women in Migrant Households**

Higher responsibilities in decision making powers often led women unable to implement adaptations. Socially isolated women with increased household roles and livelihood activities often
struggled to prepare for and respond to weather hazards, with time and economic constraints reported. Women with supportive family and friends would help the women to forecast weather, provide emotional and economic support, which leads into the Social and Natural barriers to adaptation.

A lack of resources was associated with a lack of access to remittances, SHG’s and social isolation. Access to additional livelihoods and assets to allow women to prepare for and respond to hazards was particularly observed, for example, women could not obtain resources from the market, cover their houses in plastic and build bamboo fences. Social barriers were noted to have the highest impact on the ability of women to undertake adaptive strategies. Isolation and a lack of family members to support women were significant allowing women to respond to weather hazards. They placed huge strain and stress on women, both mentally and physically. Furthermore, SHG’s were extremely important for women’s agency and to support livelihood activities when migrants were away or remittances were not sent regularly. Access to these SHG was vital for women in rural areas. A lack of access to these SHG’s, from age and means of finance, was identified as a primary social barrier experienced by women.

4.4 Summary of Results and Analysis

The Results and Analysis section presented the qualitative and quantitative data to address the main research objectives. The summary will further be informed by the research objectives and will address the related research questions.

Primarily men are observed as the migrating members of the household, with unmarried children, married children and partner of the household head the main migrants. The primary livelihoods of migrant families are crop farmers, which can reflect the prevalence of seasonal and cyclical migrants.

The perception of the impacts of rapid-onset weather hazards on households found that migrant households appear to be impacted by cyclones, storm surges and flooding more than non-migrant households. Whilst affecting households within all time frames, hazards primarily affect households once every decade. Adaptive strategies were undertaken by migrant and non-migrant households differently, as shown within the fifteen adaptation responses from the survey data. Primarily, household adaptations in the forms of taking out a loan, modifying the house, planting trees and using hired labour are being undertaken in the IBD. The adaptive strategies migrant households undertake, is reflected within the adaptive strategies undertaken by women in migrant households.
There are many adaptive strategies employed by women. Adaptive strategies categorised as Proactive adaptations, including increasing social interaction and activities, accessing female-only SHG’s and storing rations, were undertaken to prepare for rapid-onset weather hazards. Whereas, the adaptive strategies categorised as Reactive adaptations, including increased awareness of household and livelihood activities for decision making purposes and re-organisation of day, were undertaken to respond to rapid-onset weather hazards.

The impacts of out-migration documented within this research study were primarily identified as reason and type of out-migration, remittances, household structure, physical and emotional impacts and decision making. The impacts of out-migration are by affect linked to the adaptive strategies women undertake. Out-migration has shown to positively impact a woman’s wellbeing and their ability to prepare for and respond to weather hazards, though remittances and greater influence on household and livelihood decision making. These impacts are linked to the following adaptive strategies: stopping working outside the home and increasing social interaction. The role of remittances, social factors, including social interaction and the support provided by family were discussed as the primary influencing factors of how women experience out-migration.

On the other hand, out-migration has shown to negatively impact a woman’s wellbeing and their ability to prepare and respond to weather hazards, from loss of household members, not receiving remittances and physical impacts. The negative impacts of out-migration causes women to undertake the following adaptive strategies: covering themselves in plastic to continue farming and accessing female-only SHG’s. There were several barriers to adaptation, including social isolation, lack of access to SHG’s and time constraints, which have shown to be experienced by women in migrant households. The impacts of out-migration, their inter-relations and the interactions between adaptive strategies are open-ended and do not have a definite correlation.
Chapter 5

Discussion

5.0 Introduction

Chapter 6 will provide a discussion on the results and analysis in relation to the current literature. It will synthesise the impacts of out-migration on the adaptive strategies women undertaken to respond to and prepare for rapid-onset weather hazards specifically. It will reflect on the research study limitations and positionality in data interpretation.

5.1 Synthesis: Out-migration, Women and Adaptive Strategies

The adaptive strategies identified and categorised within this research contributes to the current literature in relation to rapid-onset weather hazards, adding to adaptive strategies identified by Raha et al, 2013, Mondal, 2014 and Mazumdar et al, 2014. The documentation of gender dimensions of these adaptive strategies is further important for representation of women within research. The way migrant households perceive and experience rapid onset weather hazards and the reasons for out-migration within migrant households have significant implications for the adaptive strategies women undertake. This is an important aspect to highlight and has rarely been documented within the current literature.

Several studies exploring out-migration often question or attempt to conclude the reasons for why some women experience out-migration positively and others inherently negatively (Gulati, 1993). Desai and Banerji’s (2008), upon reflection of studies who document women’s perception of out-migration, raise the interesting question of ‘Why do some women find freedom and responsibility in their husband’s absence while others do not?’ This research study can offer several inferences, upon presentation of the results and conclusions of this research study, in relation to impacts of out-migration and can further be discussed within women’s choices of adaptive strategies. The findings to this research study have identified several impacts of out-migration that constrain women and in contrast, find women’s agency and autonomy significantly enhanced.
The role of loans have been identified as a reason for out-migration, an adaptive strategy to cope with natural hazards and in turn, has demonstrated several impacts on women. When a household takes out a loan a woman often has to manage both the household and livelihood activities alone, when the migrant leaves the household, because the remittances are used to repay the loan and do not contribute a household livelihood. Whilst within the same deltaic region, but not within India, Paul and Routray (2011) identified that households took out loans to cope with the impacts of cyclones and induced surges in coastal Bangladesh. It was identified that households often entered a vicious cycle of taking out loans after a natural disaster as a way of coping. Borrowing money, whether formal or informal, was seen by a high number of households in the IBD. The pressure on women from this act can have an extremely detrimental impact, with impacts affecting women’s physical and emotional wellbeing.

With the characteristics of out-migration reflecting mainly male migrants, it was shown in this study and anticipated that women become de facto household head and in turn the responsibility of the household head decision making (Nabikolo et al, 2012). Findings of this study show that decision making powers often transferred to the women when men migrate, which can have implications for the adaptive strategies they undertake. Whilst limited literature documenting this in the IBD, similarities can be drawn from Nabikolo et al’s (2012) study in the context of rural communities in Uganda, which explored differences in adaptive strategies undertaken by men and women. This study found that men and women were observed undertaking adaptive strategies differently, with men prioritising adaptations with land use and women prioritising assets and house modifications. The increase in decision making powers often had positive impacts on women, but social isolation and inexperience in decision making led women to be affected and not undertake adaptive strategies, especially within livelihood activities and outside of the household.

Desai and Banerji (2008) stated the household structure forms the key mediating factor through which a husband’s absence affects women. This has been inherently reflected in the findings, and can be highlighted particularly in relation to weather hazards and the main influencing factor in the adaptive strategies undertaken by women. Women’s autonomy is critical for empowerment and it has been attributed and identified as a crucial aspect, both within literature and the findings of this study, to allow them the freedom to undertake adaptive strategies (Osamor and Grady, 2016). Whilst further drawing on the conclusion presented by Desai and Banerji (2008), the findings of this research study found that the key mediating factor the household structure, but can redefined this
to incorporate the stark implications of social aspects discussed, redefining this mediating factor to include ‘family’ and ‘community.’ A woman’s social network, of extended family, neighbours and friends, is often increased and strengthened during out-migration.

Within the migration left-behind nexus literature, Toyota et al highlights the multidimensional nature of out-migration, arguing that there is not a sole outcome or conclusion, but instead it is more productive to identify ‘lines of influence and their relations’ (2007). Toyota et al’s (2007) interpretation of the impacts of out-migration can be used to conclude the research studies findings. There are many lines of influence that affect the choices women make in preparing for or responding to rapid onset weather hazards in the IBD outlined in this study. The open-ended nature of out-migration and their influence on the adaptive strategies women undertake are broad and identifying the lines of influence that highlight the issues impacting women, households and communities, represented in Figure 12. Documentation of these lines of influence are inherently important for policy and decision makers.

5.2 Limitations and Interpretation

Whilst the household survey provided huge insight, its implementation and execution however, was costly, time consuming and far beyond a masters student’s realistic study design. The use of the data was invaluable and added significant depth and insight into the wider context of out-migration in the IBD specifically. It should be noted that the qualitative research was undertaken in significantly planned circumstances. The climatic conditions, safety aspects and travel in the IBD are near impossible without help from locals and understanding of the local area. A research team from Jadavpur University, as well as visiting researchers, provided help and assistance during fieldwork, from safety aspects to undertaking the purposive sampling. Risk assessments were carried out to ensure we knew what to do in an emergency and consider all potential risks involved in fieldwork (Appendix 9).

The limitations of the survey design appear to lie within language and the meanings of words cross-culturally. These limitations were experienced but overcome and mitigated during the in-depth interviews. The meanings of words, the structure of the sentences and the delivery by the translator all impacted how the question was answered. For example, the question: ‘What was the reason the migrant left the household?’ was asked within the in-depth interviews to obtain context to the migration within a household. Most respondents reported the migrant left to ‘find employment’ but
the need for this employment was identified as the actual reasons for migration. Whist in the household survey, researcher training was put in place to overcome these language issues, it appears evident that this is one limitation which comes with the implementation of surveys. It allowed for further insight and provided a holistic view for the reasons of out-migration, whilst the survey showed that the primary reason was to seek employment, there was rarely one motivating factor for out-migration.

In recent years, researchers have acknowledged the importance of not just ethical practice within research but have put a greater emphasis and attention on reflexivity, positionality and power relations, to contribute to the ethical considerations (Canagarajah and Stanley, 2015; Vanner, 2015; Nathan et al, 2016). This was noted as particularly important by Sultana (2007) in relation to conducting international research. During transcription and after conducting interviews, many topics were discussed with the translator, to situate the findings within the social and cultural context. This was which was invaluable for highlighting the researcher positionality within interpretation of the data. As a British woman and the researcher, the way I interpret the data will be from my current understanding of social and cultural contexts. A field diary was kept to understand the phenomena and prevent bias within data interpretation.

The need for in-depth interviews can be further justified in relation to the exploration into differences undertaken by women in migrant households, primarily to ensure that they were represented. Whilst the household survey was undertaken by women, this was only if they were the household head, and the adaptation specific-questions were reportedly undertaken by very few women. Therefore, to explore the aim, the findings were solely drawn from the interview data. Whilst this mitigates the limitations highlighted from the survey implementation, limitations can still be reflected on in relation to case study. The generalisation and applicability of case studies are very limited, however, the contextual relevance and broader understanding was provided by quantitative research (Flyvbjerg, 2006). Real life context is an important addition, however, there is a possibility that the quantitative and qualitative research does not correlate. The quantitative variables may not represent what is interpreted and there may been cross-cultural misunderstanding. Every effort was made during the survey implementation by the DECCMA team and during the qualitative research to ensure simple and unambiguous questions.
Chapter 6

Conclusion

The main aim of this research was to advance an understanding and to explore the impact of out-migration on the choices women make in preparing for or responding to rapid onset weather hazards in the IBD. The aim and research objectives were explored in the six previous Chapters. Chapter 1 presented introduced the research topic and study area and outlined the importance and significance of the research. Chapter 2, this synthesised, explored and reviewed the current literature surrounding deltas, adaptation and out-migration, with reference to women in the IBD. Chapter 3 outlined the justification and implementation of the mixed methods research study design. Chapter 4 presented the results and analysis of the qualitative and quantitative findings in relation to the research objectives. Chapter 5 synthesised the current literature with the results and analysis of this research. This research study can be concluded within regards to the specific research objectives to address the main aim.

The documentation of the characteristics of the IBD provided a foundation and context, contributing to a deeper understanding of how out-migration impacts the adaptive strategies women undertake to prepare for and respond to rapid-onset weather hazards. The findings conclude, with support from current literature, that rapid onset weather hazards and their impacts are perceived and experienced differently by non-migrant and migrant household and in turn, adaptive strategies are undertaken. These differences in adaptive strategies, combined with characteristics of out-migration such as reasons and remittances, impact the choices women make in preparing for or responding to rapid onset weather hazards.

Out-migration poses significant impacts on women in the IBD, with an interplay of aspects affecting how women experience this phenomena. These implications have been shown to influence the choices women make in preparing for and responding to rapid onset weather hazards. It has been documented on an IBD scale that migrant households perceive and are affected by rapid onset weather hazards. Within the parameters of the case study data, the gendered dimensions within the adaptive strategies documented are implicated by the way migrant and non-migration households perceive and undertake adaptations. This study reinforces the open-ended and multi-dimensional nature of relations between out-migration and adaptive strategies undertaken by women. There are
many ‘lines of influence’ which can contribute and be attributed to the adaptive strategies women undertake. It is evident that migration will continue to be a viable and increasingly undertaken sustainable livelihood within the IBD and it has been observed that it has great positive impacts on women. The greater influence on decision making, gifted from out-migration by men, is a significant factor that affect the choices women make in preparing for rapid onset weather hazards.

Remittances and SHG are additional significant impacts of out-migration which empower women to make choices over their own lives and in turn the adaptive strategies they undertake. Whilst the negative impacts of out-migration are inherently evident, social factors, such as strengthening social networks, can reduce these impacts. Literature discusses that out-migration has re-defined the social and cultural roles and dimensions within the IBD, which positively attributes decision making through empowerment, this has been demonstrated within this research study and has important implications for policy and to highlight areas of future research.

6.0 Implications for policy

The Indian government has been slow to recognise the importance of adaptation implementation in policy, particularly within gender development. Women are still unrepresented within both policy and research. The Delta Alliance, which publishes reports to inform policy, may find the conclusions of this research study important for assisting in the development of policy (Delta Alliance, 2018).

Social support is often lacking in policy, but has been concluded as the primary reason for undertaking adaptive strategies, as well as the primary barrier. Therefore, policy makers should develop these into policy for supporting women in rural communities.

SHG’s have been shown to have positive implications for women in rural communities which this research study reinforces. Therefore, the support of these groups should be important additions into policy. The findings of this study would contribute significantly to Disaster Risk Reduction policy for reducing vulnerability and impacts of weather hazards.

The findings could be valuable for NGO’s which often play an important role in assisting and supporting these rural communities after natural hazards. One NGO, the Sundarban Social Development Centre (SSDC), with a mission to support society and improve equality in relation to natural disasters, would be informed by the study’s findings in the best uses of their funds and support for women in the IBD (SSDC, 2018).
6.1 Future Research

The focus of this research study was solely the impact of out-migration on women’s adaptive strategies in relation to rapid-onset weather hazards, it would be valuable to replicate the study in relation to slow-onset weather hazards to explore the potential implications of these. Furthermore, whilst this study documented adaptive strategies in the context of out-migration the IBD, migration is inherently dynamic. It would be academically important to repeat the study in to further document how women experience out-migration over time. The study provided and contributed to the literature on adaptive strategies undertaken within the IBD but future studies should attempt to build on this further. It has been important to document the impact of out-migration on women and the adaptive strategies they undertake, however, the study found several barriers to adaptation. A study exploring barriers to adaptation further would be an important area to be explored in the future. Finally, future research should aim to develop a framework for identifying the impacts of out-migration on adaptive strategies women undertake in relation to weather hazards. Whilst many studies have attempted to do this within the ‘migration left-behind nexus’ literature, they do not have applicability universally.
References


Appendix

Appendix 1 DECCMA Variables Selected for Quantitative Analysis

Out-Migration

Characteristics of Out-migration
Q1.2.2. What relationship does [migrant] have with the household head?
Q1.2.3. What is the sex of [migrant]?
Q1.2.4. How old is [migrant]?
Q1.2.9. What is the main livelihood activity of [migrant]?
Q4.2.2. Earlier you mentioned that [migrant] migrated away and has now returned to the village. How would you describe their migration?

Reasons
Q4.2.6. What were the main reasons [migrant] migrated?

Remittances
Q4.3.4. What does your household use the remittances on?

Observed Adaptation

Perception
Q6.1.1. How frequently is your household affected by Flood?
Q6.1.1. How frequently is your household affected by Storm surges?
Q6.1.1. How frequently is your household affected by Cyclone

Adaptation
Q5.1.1 In the last 5 years, have you taken out a loan to purchase things for the household, or to improve livelihood?
Q5.2.1 In the last 5 years have you taken out, or cancelled insurance for your main livelihood?
Q5.3.1 In the last 5 years have you joined, or left a cooperative in relation to your main livelihood?
Q5.4.1 In the last 5 years have you modified, or improved your house (walls, roof, floor)?
Q5.5.1 In the last 5 years have you started to cut down trees around your home, or stopped cutting down trees around your home?
Q5.6.1 In the last 5 years have you planted trees around your home, or stopped planting trees around your home?
Q5.7.1 In the last 5 years have you started or stopped using hired labour to support you in generating income?
Q5.8.1 In the 5 years have women in your household started, or stopped working outside of the house?
Q5.12.1 In the last 5 years have you diversified crops or reduced the variety of crops grown?
Q5.14.1 In the last 5 years have you increased or reduced the use of fertiliser?
Q5.16.1 In the last 5 years have you changed land use to mixed farming/fishing production
Q5.20.1 In the last 5 years have you received government or NGO assistance to help with your home, family or livelihood, or stopped receiving assistance?
Q5.21.1 In the last 5 years have you organised your own protection or used a community shelter during a storm or flood, or stopped using a community shelter?

Impacts of Out-Migration on Women

Decision Making

Q2.5.1. Who in the household makes the following decisions in the household? Making changes to livelihood practices? (ie changing agricultural inputs)
Q2.5.1. Who in the household makes the following decisions in the household? Spending family savings?
Q2.5.1. Who in the household makes the following decisions in the household? Taking out a loan?
Q2.5.1. Who in the household makes the following decisions in the household? Treatment of sick children?
Q2.5.1. Who in the household makes the following decisions in the household? Taking up work outside the home?
Q2.5.1. Who in the household makes the following decisions in the household? Someone from the household migrating?
Q2.5.1. Who in the household makes the following decisions in the household? Education of children?

Wellbeing

Q4.5.4. I have greater influence in household decisions
Q4.5.4. My work responsibilities have increased
Q4.5.4. My child care responsibilities have increased
Q4.5.4. I have more control over reproductive choices
Q4.5.4. Overall I feel more stressed and unhappy
Q4.5.4. I feel less safe in my village
Q4.5.4. I have more opportunities in life
Q4.5.3. Migration helps the household to be financially secure (HH)
Q4.5.3. Migration makes it difficult to maintain household livelihoods and responsibilities (ie fewer people to help out) (HH)
Q4.5.3. Migration brings new ideas and practices to the village when migrants return (V)
Q4.5.3. Migration means there are not enough young people in the village (V)
Appendix 2 Interview Schedule

**Question 1 - Interviewee, Migrant and Household background** (Repeat for each migrant)
- Which member has moved away from the household?
- How many times and how long do they leave for?
- What activity did the migrant do in the household?
- What job activity does each migrant do when they leave?
- (Repeat for each migrant)

**Question 2**
What was the reason that the migrant/s left the household?

**Question 3**
How is your life and household different when the migrant leaves?

**Question 4**
During monsoon seasons, heavy rain or storms, how do you cope without the migrant at the home?

**Question 5**
Which ways does migration contribute to your community?

**Question 6**
Would you or other household members like to migrate in the future? If not, why not? If yes, why?

**Question 7**
What is the perception of the migration?
## Appendix 3 Interviewee Profiles

<table>
<thead>
<tr>
<th>Interviewee Number</th>
<th>Interviewee Code</th>
<th>Age</th>
<th>No. of Members in Household</th>
<th>No. of Migrants in Household</th>
<th>Migrant Positions in Household</th>
<th>Return or Current Migrant</th>
<th>Remittances</th>
<th>Length of Migration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01BHDULK I05/06</td>
<td>59 years</td>
<td>4</td>
<td>1</td>
<td>Son</td>
<td>Current</td>
<td>Yes</td>
<td>6 years</td>
</tr>
<tr>
<td>2</td>
<td>02BBDULKI 05/06</td>
<td>45 years</td>
<td>7</td>
<td>2</td>
<td>Son, Son</td>
<td>Current, Current</td>
<td>Yes, Yes</td>
<td>3 years, 2 years</td>
</tr>
<tr>
<td>3</td>
<td>03JBDULKI 06/06</td>
<td>50 years</td>
<td>4</td>
<td>1</td>
<td>Son</td>
<td>Current</td>
<td>Yes</td>
<td>1.5 years</td>
</tr>
<tr>
<td>4</td>
<td>04SJDULKI 06/06</td>
<td>26 years</td>
<td>4</td>
<td>1</td>
<td>Husband</td>
<td>Current</td>
<td>Yes</td>
<td>15 years</td>
</tr>
<tr>
<td>5</td>
<td>05MMDULKI06/06</td>
<td>56 years</td>
<td>8</td>
<td>1</td>
<td>Daughter</td>
<td>Current</td>
<td>Yes</td>
<td>28 years</td>
</tr>
<tr>
<td>6</td>
<td>06MMDULKI06/06</td>
<td>42 years</td>
<td>3</td>
<td>1</td>
<td>Son</td>
<td>Current</td>
<td>Yes</td>
<td>2 years</td>
</tr>
<tr>
<td>7</td>
<td>07MMDULKI06/06</td>
<td>36 years</td>
<td>5</td>
<td>1</td>
<td>Son</td>
<td>Current</td>
<td>Yes</td>
<td>8 years</td>
</tr>
<tr>
<td>8</td>
<td>08PMDULKI07/06</td>
<td>30 years</td>
<td>6</td>
<td>2</td>
<td>Son, Daughter</td>
<td>Current, Return</td>
<td>Yes, No</td>
<td>6 months</td>
</tr>
<tr>
<td>9</td>
<td>09BMDULKI07/06</td>
<td>45 years</td>
<td>5</td>
<td>1</td>
<td>Son</td>
<td>Current</td>
<td>Yes</td>
<td>2 years</td>
</tr>
<tr>
<td>10</td>
<td>10PPDULKI07/06</td>
<td>65 years</td>
<td>6</td>
<td>2</td>
<td>Son, Daughter-Law</td>
<td>Current, Current</td>
<td>Yes, Yes</td>
<td>6 years, 6 years</td>
</tr>
<tr>
<td>11</td>
<td>11BDDULKI07/06</td>
<td>38 years</td>
<td>5</td>
<td>3</td>
<td>Son, Son, Son</td>
<td>Current, Current, Current</td>
<td>Yes, Yes</td>
<td>2 years, 3 years, 1 year</td>
</tr>
<tr>
<td>12</td>
<td>12KADULKI08/06</td>
<td>64 years</td>
<td>3</td>
<td>2</td>
<td>Son, Son, Husband</td>
<td>Current, Current, Return</td>
<td>No, No</td>
<td>20 years, 10 years</td>
</tr>
<tr>
<td>13</td>
<td>13DGDULKI07/06</td>
<td>27 years</td>
<td>4</td>
<td>1</td>
<td>Husband</td>
<td>Current</td>
<td>Yes</td>
<td>18 years</td>
</tr>
<tr>
<td>14</td>
<td>14MDULKI08/06</td>
<td>38 years</td>
<td>4</td>
<td>2</td>
<td>Husband, Son</td>
<td>Current, Current, Return</td>
<td>Yes, No</td>
<td>25 years, 14 years</td>
</tr>
<tr>
<td>15</td>
<td>15PRDULKI08/06</td>
<td>38 years</td>
<td>6</td>
<td>1</td>
<td>Husband</td>
<td>Current</td>
<td>Yes</td>
<td>15 years</td>
</tr>
<tr>
<td>16</td>
<td>16RTDULKI08/06</td>
<td>47 years</td>
<td>3</td>
<td>1</td>
<td>Husband</td>
<td>Current</td>
<td>Yes</td>
<td>8 years</td>
</tr>
<tr>
<td>17</td>
<td>17GMDULKI08/06</td>
<td>65 years</td>
<td>2</td>
<td>3</td>
<td>Son, Son, Daughter</td>
<td>Current, Current, Current</td>
<td>No, No, No</td>
<td>15 years, 16 years, 8 years</td>
</tr>
</tbody>
</table>
Appendix 4 Participant Information Sheet

Participant Information Sheet

**Study Title:** To assess the impact of labour migration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD)

**Researcher:** Lindsay Roberts
**ERGO number:** 41112

*Please read this information carefully before deciding to take part in this research. It is up to you to decide whether or not to take part. If you are happy to participate you will be asked to sign a consent form.*

**What is the research about?**
I am an MSc student from the University of Southampton undertaking a research project. This research project aim is to assess the impact of labour migration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD). This project is funded by Deltas, Vulnerability and Climate Change: Migration as an Adaptation (DECCMA), which previously carried out a household survey surrounding adaptation and

**Why have I been asked to participate?**
You have been asked to participate because you have a migrant in your household and you are a woman. These are important characteristics for participants because the research is specifically looking at women. These characteristics were identified within the household survey by Jadavpur University.

**What will happen to me if I take part?**
If you agree to participate, you will be interviewed about migration which will take approximately 30 minutes. A translator will be used to ask 4 questions and allow for us to communicate. This will only take part on one visit. If you agree and consent, the interview will be audio recorded, but this is not compulsory.

**Are there any benefits in my taking part?**
There are unlikely to be any direct benefits for you taking part. I would be very grateful for your time. The interview will provide valuable insight into the lives of women in the Indian Bengal Delta and contribute significantly towards my research project.

**Are there any risks involved?**
There are no risks of involvement in the study, beyond those encountered in everyday life. This project has been approved by an ethics board and will comply with ethical considerations so that overly-sensitive questions will not be asked. If you feel uncomfortable at any point of the interview, even if you have consented at the beginning of the study, it will stop immediately.

**Will my participation be confidential?**
Should you participate, privacy, anonymity and confidentiality of data identifying participants will be strictly maintained. The research will be in compliance with the UK Data Protection Act and University of Southampton policy. These aim to protect participants to ensure information is used respectfully and is confidential. The translators have agreed to this code of conduct as well. I will only have access to the data collected. All field notes and audio recordings will be deleted and destroyed after the interviews are transcribed, approximately 1 week after the interview. They will not be uploaded to personal or public computers. When discussing the data and in transcription, pseudonym names will be used within my project. I will not use your name or any identifying characteristics to ensure anonymity. I will not retain or give out any contact details.
What should I do if I want to take part?
If you wish to take part, please inform the translator. You will be given a consent form, please read over and sign this.

What happens if I change my mind?
You have the right to withdraw at any time without any legal or other consequence. If you wish to withdraw, data collected up to the point of withdrawal will be deleted and destroyed if you wish. I will be respectful of any decision you make.

What will happen to the results of the research?
The results of this research will unlikely be published and will solely be used for my research project. If you wish to see the final project, it will be held with Tuhin Gosh at Jadavpur University. You should explain what will happen to the results. Will the project be written up or published?

Where can I get more information?
If you would like more information about this study, please contact Professor Emma Tompkins on e.l.tompkins@soton.ac.uk.

What happens if something goes wrong?
If you are concerned or have a complaint, please contact the Research Integrity and Governance Manager on 023 8059 5058 or rgoinfo@soton.ac.uk.

Thank you for taking the time to read this information sheet and considering taking part in the research.
Appendix 5 Consent Form

Consent Form

Study title: To assess the impact of labour migration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD)

Researcher name: Lindsay Roberts
ERGO number: 41112

Please initial or fingerprint the box(es) if you agree with the statement(s):

<table>
<thead>
<tr>
<th>I have read and understood the information sheet (v2, 16/06/2018) and have had the opportunity to ask questions about the study.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I agree to take part in this research project and agree for my data to be used for the purpose of this study.</td>
</tr>
<tr>
<td>I understand my participation is voluntary and I may withdraw at any time and for any reason without my rights being affected.</td>
</tr>
<tr>
<td>I understand my responses will be anonymised in reports of the research.</td>
</tr>
<tr>
<td>I understand that I have the choice to be audio-recorded and can opt out at any point.</td>
</tr>
<tr>
<td>I understand that information collected about me during my participation in this study will be stored on a password protected computer and that this information will only be used for the purpose of ethically approved research studies.</td>
</tr>
</tbody>
</table>

Name of participant (print name)..................................................................................................................
Signature/Left Thumb impression of participant..........................................................................................
Date.................................................................................................................................................................

Name of researcher (print name).......................................................................................................................
Signature of researcher ....................................................................................................................................... Date..........................................................................................................................................................
Appendix 6 De-Brief Form

To assess the impact of out-migration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD)

Debriefing Statement (V2, 16/05/2018)

The aim of this research was to explore the impact of migration on the choices women make to weather hazards. Your data will help our understanding of the lives of women and the choices they take to cope with weather hazards in the Indian Bengal Delta. Once again results of this study will not include your name or any other identifying characteristics. The research did not use deception. You may have a copy of this summary if you wish and the final research project will be made available, with Tuhin Gosh, at Jadavpur University.

If you have any further questions please contact me Lindsay Roberts at ljsr1e17@soton.ac.uk and/or Professor Emma Tompkins at e.l.tompkins@soton.ac.uk.

Thank you for your participation in this research.

Signature/Left Thumb Impression __________________________         Date _____________

If you have questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact the Chair of the Ethics Committee, Psychology, University of Southampton, Southampton, SO17 1BJ. Phone: +44 (0)23 8059 3856, email fshs-rso@soton.ac.uk
Appendix 7 Ethics Form for Qualitative Research

Ssegm Ethics Sub-Committee Application Form

Please note:

- You must not begin data collection for your study until ethical approval has been obtained.
- It is your responsibility to follow the University of Southampton’s Ethics Policy and any relevant academic or professional guidelines in the conduct of your study. This includes providing appropriate information sheets and consent forms, and ensuring confidentiality in the storage and use of data.
- It is also your responsibility to provide full and accurate information in completing this form.

1. Name(s): Lindsay Roberts
2. Current Position: MSc Sustainability Student
3. Contact Details:
   Division/School: Geography and the Environment
   Email: ljsr1e17@soton.ac.uk
   Phone: 07802526594
4. Is your study being conducted as part of an education qualification? Yes ☒ No ☐
5. If Yes, please give the name of your supervisor
   Professor Emma Tompkins
6. Title of your project:

   The impact of migration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta.
7. Briefly describe the rationale, study aims and the relevant research questions of your study

   Rural, deltaic environments experience weather hazards which force households to take adaptive strategies to respond to, prepare for and cope. Labour outmigration is an increasingly important livelihood strategy for rural areas (IFAD, 2010). Households are become increasingly under pressure from stressors causing household members, predominately men, to migrate. Migrants often send remittances and support families in the rural areas. There are many types of migration, including seasonal, cyclical and permanent, which all benefit and impact households differently. The cultural and social values experienced by women in the IBD often cause them to be affected by labour
There is very limited research on labour outmigration and its impact on women in Deltas and rural areas. A previous 5 year study conducted by DECCMA aimed to explore adaptation in deltas globally. This research project would add insight into gender differences specifically. The DECCMA study was funded by CASCO, which shows the importance of research in Deltas and the uncertainty of future vulnerability. Migration studies often solely discuss and explore migration from a purely economic perspective, but the impact migrants have on households is an important area of research. Paris et al conducted a study on outmigration in South East Asia and the findings revealed firstly, that women often do not migrate and secondly, identified many constraints and pressures they experience when men migrate (2010). Studies in the IBD solely focus on migrants, with limited research on the impact of migration on women. Therefore, the aim of this research study is to assess the impact of labour outmigration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD). To explore this aim, the following research questions will be answered:

1. How are weather hazards experienced in the IBD
2. To categorise the main adaptive strategies that are undertaken in households?
3. Does the presence of a migrant affect the adaptive strategies women use?
4. Does the type of migrant (e.g. cyclical, permanent, internal, international etc.) affect the adaptive strategies that women use?

8. Describe the design of your study

A mixed methods approach will be used to conduct research. The qualitative methods will involve interviews. I will be conducting interviews in the Indian Bengal Delta. I will be visiting 2 villages, these are Mathurakhanda and Dulki situated in Gosaba, South 24 Parganas district. Data collection will occur over the course of a week between the 4th June and 12th June. Interviews will be conducted using a translator. The interviews will be audio recorded alongside verbatim translation. Interviews will be between 20-50 minutes long per participant of 6 semi-structured questions.

The quantitative research method will involve statistical data analysis. This data was collected through the use of a household questionnaire conducted by a 5 year study by DECCMA.

9. Who are the research participants?

Participants will be women from migrant households in the Indian Bengal Delta. Participants will be over the age of 18 years old, be of stable mind and mental capacity. No socially vulnerable individuals will be selected. Participants will only be selected if they are able to give full informed consent.

10. If you are going to analyse secondary data, from where are you obtaining it?

I will be using secondary data from a household questionnaire conducted by DECCMA. Statistical analysis of the anonymised questionnaire data will be used to explore the research aim and questions in relation to the IBD.
11. If you are collecting primary data, how will you identify and approach the participants to recruit them to your study?

*Please upload a copy of the information sheet if you are using one – or if you are not using one please explain why.*

I will be selecting participants using purposive sampling technique. This will allow me to identify participants with specific characteristics to explore my research title. This characteristic will be a household member who has migrated. Participants will be selected by a team from Jadavpur University who conducted the initial questionnaire. I will be using also be using a Participant Information Sheet to ensure they understand the purpose and details of the study. (See Participant Information Sheet attached in supporting documents)

12. Will participants be taking part in your study without their knowledge and consent at the time (e.g. covert observation of people)? If yes, please explain why this is necessary.

No. This study will not use deception or covert observation.

13. If you answered ‘no’ to question 12, how will you obtain the consent of participants?

*Please upload a copy of the consent form if you are using one – or if you are not using one please explain why.*

Participants will be full aware of study through the use of a Participant Information Sheet. I will be using a consent form to ensure fully informed consent. Participants will have the right to withdraw at any time.

14. Is there any reason to believe participants may not be able to give full informed consent? If yes, what steps do you propose to take to safeguard their interests?

No. There will be an interpreter. They will be able to fully communicate their consent. They will read the Participant Information sheet and Consent Form to ensure that participants can give fully informed consent. If the participants cannot write their signature, an ink pad will be available, and a left thumb impression will be used to show their consent.

15. If participants are under the responsibility or care of others (such as parents/carers, teachers or medical staff) what plans do you have to obtain permission to approach the participants to take part in the study?

I will not be involving participants who are under the care of others and who cannot give fully informed consent.

16. Describe what participation in your study will involve for study participants. Please attach copies of any questionnaires and/or interview schedules and/or observation topic list to be used.
Participation will involve an interview (Interview Schedule attached), through the use of an interpreter to translate questions. The Interview Schedule outlines the 6 open-ended, semi-structured questions used. The interview will be conducted in a single visit and will take approximately 30-50 minutes.

17. **How will you make it clear to participants that they may withdraw consent to participate at any point during the research without penalty?**

This will be made clear in the Participant Information sheet and in the Consent Form. They will be allowed to withdraw at any time, without judgement. Participants have the right to withdraw at any time without any legal or other consequence. If they wish to withdraw, data collected up to the point of withdrawal will be deleted and destroyed if you wish.

18. **Detail any possible distress, discomfort, inconvenience or other adverse effects the participants may experience, including after the study, and you will deal with this.**

There is a low risk that participants will experience stress, upset and anxiety from questions related to relatives migrating away or home life. Despite the low risk the study will take the following precautions:

- Full ethical approval will be sought for the study before the study begins.
- I will ensure participants understand that participation is voluntary.
- If participants do experience distress or discomfort, I will stop the interview and ensure they are happy to continue before proceeding.
- I will use the debriefing form to ensure they can contact me after the study and research.
- I will be fully aware and understand the cultural considerations of interviewing women. I will be informed of these considerations by researchers and the translator so that I can be respectful.

19. **How will you maintain participant anonymity and confidentiality in collecting, analysing and writing up your data?**

The privacy, anonymity and confidentiality of data identifying participants will be strictly maintained. The research will be in compliance with the UK Data Protection Act and University of Southampton policy. These aim to protect participants to ensure information is used respectfully and is confidential. The translators will fully understand and consent to this code of conduct as well. I will only have access to the data collected. All transcribed interviews will be fully anonymised, with only a participant code showing on the electronic copies. When discussing the data and in transcription, pseudonym names will be used within my project. I will not use your name or any identifying characteristics to ensure anonymity. I will not retain or give out any contact details. All field notes and audio recordings will be permanently deleted and destroyed after the interviews are transcribed,
approximately 1 week after the interview. They will not be uploaded to personal or public computers.

20. **How will you store your data securely during and after the study?**

   *The University of Southampton has a Research Data Management Policy, including for data retention. The Policy can be consulted at [http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html](http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html)*

   During the data collection period, paper field notes and interview transcripts, stored on a USB or computer, will be stored in a locked suitcase whilst in the field. After data collection, all field notes and transcripts will be permanently deleted and destroyed. Processed data and the study findings will be stored on a password encrypted laptop.

21. **Describe any plans you have for feeding back the findings of the study to participants.**

   I do not have plans to feedback findings of the study, but mine and my supervisors contact information and my supervisors will be provided on the Debrief form if they wish to obtain the findings of the study. A copy of the study findings will be kept with Tuhin Gosh at Jadavpur University.

22. **What are the main ethical issues raised by your research and how do you intend to manage these?**

   - Minimising the risk of harm
   - Obtaining informed consent- Misinterpretation of translation
   - Protecting anonymity and confidentiality
   - Avoiding deception
   - The right to withdraw

23. **Please outline any other information you feel may be relevant to this submission**

   All forms mentioned above are attached in supporting documents.
Appendix 8 Ethics Form for Quantitative Research

Ethics Application Form for SECONDARY DATA ANALYSIS

Please consult the guidance at the end of this form before completing and submitting your application.

1. Name(s): Lindsay Roberts
2. Current Position: MSc Sustainability Student
3. Contact Details:
   Division: Geography and the Environment
   Email: ljsr1e17@soton.ac.uk
   Phone: 07802526594
4. Is your research being conducted as part of an education qualification?
   Yes ☒ No ☐
5. If Yes, please give the name of your supervisor:
   Professor Emma Tompkins
6. Title of your research project / study:
   To assess the impact of labour outmigration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD).

7. Briefly describe the rationale, aims, design and research questions of your research
   Please indicate clearly whether you are applying for ethics approval for a specific piece of research, or for overarching ethics approval to use certain datasets for a range of research activities. Approval for the latter will only cover the datasets specified here, for a maximum of 3 years and then subject to renewal.

Rural, deltaic environments experience weather hazards which force households to take adaptive strategies to respond to, prepare for and cope. Labour outmigration is an increasingly important livelihood strategy for rural areas (IFAD, 2010). Households are become increasingly under pressure from stressors causing household members, predominately men, to migrate. Migrants often send remittances and support families in the rural areas. There are many types of migration, including seasonal, cyclical and permanent, which all benefit and impact households differently. The cultural and social values experienced by women in the IBD often cause them to be affected by labour outmigration. There is very limited research on labour outmigration and its impact on women in Deltas and rural areas. A previous 5 year study conducted by DECCMA aimed to explore adaptation in deltas globally. This research project would add insight into gender differences specifically. The DECCMA study was funded by CASCO, which shows the importance of research in Deltas and the uncertainty of future vulnerability. Migration studies often solely discuss and explore migration from a purely economic perspective, but the impact migrants have on households is an important area of research. Paris et al conducted a study on outmigration in South East Asia and the findings revealed firstly, that women often do not migrate and secondly, identified many constraints and pressures they experience when men migrate (2010). Studies in the IBD solely focus on migrants, with limited research on the impact of migration on women. Therefore, the aim of this research
study is to assess the impact of labour outmigration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD). To explore this aim, the following research questions will be answered;

5. How are weather hazards experienced in the IBD
6. To categorise the main adaptive strategies that are undertaken in households?
7. Does the presence of a migrant affect the adaptive strategies women use?
8. Does the type of migrant (e.g. cyclical, permanent, internal, international etc.) affect the adaptive strategies that women use?

A mixed methods approach will be used to conduct research. The qualitative methods will involve interviews. I will be conducting interviews in the Indian Bengal Delta. I will be visiting 2 villages, these are Mathurakhanda and Dulki situated in Gosaba, South 24 Parganas district. Data collection will occur over the course of a week between the 4th June and 12th June. Interviews will be conducted using a translator. The interviews will be audio recorded alongside verbatim translation. Interviews will be between 20-50 minutes long per participant of 6 semi-structured questions.

The quantitative research method will involve statistical data analysis. This data was collected through the use of a household questionnaire conducted by a 5 year study by DECCMA. I am applying for Secondary Data Analysis Ethics approval for the use of this DECCMA data.

8. Describe the data you wish to analyse

Please give details of the title of the dataset, nature of data subjects (e.g. individuals or organisations), thematic focus and country/countries covered. Indicate whether the data are qualitative or quantitative, survey data, administrative data or other types of data. Identify the source from where you will be obtaining the data (including a web address where appropriate).

The research methods will involve the use of mixed methods. The quantitative research method will involve statistical analysis of data collected in a household questionnaire dataset collected by DECCMA. A study that was conducted over 5 years. My research project is looking at migration, therefore I will be solely be looking at the migration questions within the data set.

9. What are the terms and conditions around the use of the data? Did data subjects give consent for their data to be re-used? If not, on what basis is re-use of the data justified?

Please state what (if any) conditions the data archive imposes (e.g. registration, signing of confidentiality agreement, specific training etc.). In many cases the data controller will have given explicit permission for data re-use. Please explain how you justify the use of data if approval and consents for the original data collection and re-use are not in place. This may be the case where, for example, the original data collection predated requirements for ethics review or occurred in a jurisdiction where explicit consent and approval are not required.
The DECCMA project had a separate ethics application (no. 18173) which outlined and gained consent for the data to be used in future research studies. This was ensured through informing participants with the use of a participant information sheet and consent form.


   Yes  ☐  No  ☒

   If YES, please specify what personal data will be included and why.

11. **Do you intend to link two or more datasets?**

    Data linkage refers to merging of information from two or more sources of data to consolidate facts concerning an individual or an event that are not available in any separate record. Please note that for the purposes of research ethics we are not interested in the merging of different waves of a particular survey, or the merging of data from different countries for the same survey.

   Yes  ☐  No  ☒

   If YES, please give details of which datasets will be linked and for what purposes.

12. **How will you store and manage the data before and during the analysis? What will happen with the data at the end of the project?**

    Please consult the University of Southampton’s Research Data Management Policy ([http://library.soton.ac.uk/researchdata/storage](http://library.soton.ac.uk/researchdata/storage) and [http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html](http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html)), and indicate how you will abide by it.

    I will keep the data set stored in a password controlled file that only you have access to, and kept on only one personal electronic USB that is password protected. The computer with the dataset and USB will be stored in a locked cabinet whilst in the field, in India. I will permanently delete the dataset from your laptop once you have completed your analysis.

13. **How will you minimise the risk that data subjects (individuals or organisations) could be identified in your presentation of results?**

    Please consider whether disclosive ID codes have been used (e.g. date of birth) and whether it is theoretically possible to identify individuals by combining characteristics (e.g. widow in Hampshire with 14 children) or by combining datasets. How will you protect individuals’ anonymity in your analysis and dissemination?

    The data will be ammonised through the use of a code system and the data will not discuss identifying characteristics of participants. The data will solely be used to look for patterns from across the IBD, not at individuals.

14. **What other ethical risks are raised by your research, and how do you intend to manage these?**
Issues may arise due to the nature of the research you intend to undertake and/or the subject matter of the data. Examples include: data or analysis that are culturally or socially sensitive; data relating to criminal activity, including terrorism, and security sensitive issues.

The data will not identify any culturally or socially sensitive aspects from participant responses. All data will be anonymised, so responses cannot identify individuals or households. Terrorism, security and criminal activity will not be discussed, nor has the data identified these issues.

15. Please outline any other information that you feel may be relevant to this submission.
   For example, will you be using the services or facilities of ONS, ADRN, or HSCIC and/or are you obtaining ethical review from NRES (through IRAS) or other? Please confirm whether the data being used are already in the public domain.

The SSEGM Ethics Application Form will be used to obtain ethical approval for the qualitative research.

16. Please indicate if you, your supervisor or a member of the study team/research group are a data controller and/or data processor in relation to the data you intend to use as defined by the Data Protection Act, and confirm that you/they understand your/their respective responsibilities

I am not a data controller nor a data processor. The data processing has already been done by the DECCMA project team, within the remit of the DECCMA ethics application (no. 18173). The data is controlled by the DECCMA project team and I have been granted permission from the team to use the data, from the following conditions;

- I must ensure that anonymity is guaranteed, and that no identifying characteristics (such as names, locations, phone contacts) can be used in any research
- I will use pseudonyms
- I will keep the data set stored in a password-controlled file that only you have access to, and kept on only one personal electronic USB that is password protected
- I will permanently delete the dataset from your laptop once you have completed your analysis

Note: This Ethics Application Form is currently being piloted. If you have comments on any of the questions, it would be helpful if you could email them to rgoinfo@soton.ac.uk with “Secondary Data Analysis Form” in the subject line.
Appendix 9 Risk Assessment Form

Risk Assessment Form for Assessing Ethical and Research Risks

- Please see Guidance Notes at the end of this document.
- *Students*: Please make sure you have discussed this form with your supervisor!

<table>
<thead>
<tr>
<th>Researcher's name:</th>
<th>Lindsay Roberts</th>
</tr>
</thead>
<tbody>
<tr>
<td>In case of students:</td>
<td></td>
</tr>
<tr>
<td>Supervisor's name:</td>
<td>Professor Emma Tompkins</td>
</tr>
<tr>
<td>Degree course:</td>
<td>MSc Sustainability</td>
</tr>
</tbody>
</table>

**Part 1 – Research activities**

What do you intend to do? *(Please provide a brief description of your study and details of your proposed methods.)*

This research study aim is to explore the aim of this research study is to assess the impact of labour outmigration on the choices women make in preparing for or responding to weather hazards in the Indian Bengal Delta (IBD). The study will use a mixed research method approach. The first stage of research will be quantitative analysis of the DECCMA household questionnaire data conducted in the Indian Bengal Delta. This will comprise statistical data analysis using descriptive statistics and regression models using SPSS. To support the quantitative data, qualitative research will encompass a trip to the Indian Bengal Delta to conduct interviews with women. The participants will comprise of women in migrant households identified through the DECCMA questionnaire. The aim is to collect approximately 30 interviews between the 4th to the 12th of June because of the monsoon season. All participants will be of sound mental capacity and will not be socially vulnerable, to ensue fully informed consent can be obtained.

Will your research involve collection of information from other people? *(If yes, please provide a description of your proposed sample.)*

Yes, the research conducted will collect data from women. The participants have been selected from their household characteristics related to migration. This is to allow for elaboration and exploration of responses in the questionnaire, allowing for quantitative and qualitative relationships to emerge. The sample size will be approximately 30 women, sampled from 2 villages in the Indian Bengal Delta, these are Mathurakhand and Dulki.

If relevant, what locations are involved? *(Please specify which country/region/place you will be working in, and details of where data collection activities will take place (e.g. public or private space).)*

Alongside visiting and staying in Kolkata, I will be staying in the Sundarban Region of the delta. In the delta, I will be visiting 2 villages, these are Mathurakhand and Dulki situated in Gosaba, South 24 Parganas district. I will be conducting the interviews in the participants houses.

Will you be working alone or with others in the data collection process?
I will be working alongside and travelling with three other MSc students from the University of Southampton. Once in country, we will be meeting a team from Jadavpur University. This team will comprise of PhD students, lecturers and administrators who will assist with research and ensure everyone’s safety.

**Part 2 – Potential risks to YOU as the researcher**

Please specify potential safety issues arising from your proposed research activity. (Give consideration to aspects such as lone working, risky locations, risks associated with travel; please assess the likelihood and severity of risks.) If you have already completed a departmental H&S risk assessment, this may be attached to cover these aspects.

1. Drinking water- There is a potential risk of contracting water-bourne diseases from water through consumption, brushing teeth and swimming in freshwater. **Likelihood: Medium Risk**
2. Health- There is a potential risk of contracting malaria, cholera, rabies, Japanese encephalitis or zika virus. Upon discussing these risks of the area at a travel clinic, it can be assessed as a low risk. **Likelihood: Low Risk**
3. Food- Indian food is considerably different to English food, with low level hygiene standards. There is a risk of food poisoning and adjustment to food illness, such as diahorea. I suffer from IBS and changes to my diet can cause stomach upset. **Likelihood: Low Risk**
4. Terrorist/Civil unrest- The risk of terrorism and civil unrest has been identified from the Governmental Foreign Travel Advice for India website ([https://www.gov.uk/foreign-travel-advice/india](https://www.gov.uk/foreign-travel-advice/india)). This governmental website outlines that there is low level crime and fighting between religious groups but only in specific areas of the delta and region of West Bengal.
5. Lone working- As a westerner, with no previous experience of life in India, working and travelling alone could cause a risk of getting lost, being a vulnerable target of crime and potentially scams. **Likelihood: Low Risk**
6. Extreme weather- The study will be conducted in June which is the start of the Monsoon season in India. This can be characterised by heavy precipitation and flooding within the Delta, especially the low-lying areas. The other risk of this time of year is the temperature. It will be approximately 30-45C, which causes risks of dehydration, heat stroke and sunburn, and related illnesses. As well as this the time of year is also Cyclone Season and there is a risk of the area being hit. **Likelihood: Medium Risk**
7. Animals and Insects- Wild and domestic animals could potentially be prevalent in both the city of Kolkata and in the rural villages, such as dogs. These could carry diseases or be aggressive, causing harm to myself or other students. Insects such as mosquitos or snakes are prevalent in India, especially in the rural areas and pose a potential risk for spreading disease or biting, especially between sunset and dawn. **Likelihood: Low Risk**
8. Transport- Travelling in India is often unsafe due to the nature of busy traffic routes and the characteristics of a low-income country lack of road safety. Inexperienced and unlicensed drivers and unsafe cars could be prevalent. **Likelihood: Medium Risk**

**What precautions will you take to minimise these risks?**

1. Water- To avoid water-Bourne diseases, I will only drink treated, bottle water in both rural and urban areas. I will not swim in any freshwater when in India. I will only brush my teeth using bottle water. I will also wipe clean any bottles or cans of drinks I use.
2. Health- I have assess my risks of contracting a disease with a travel clinic and have received all vaccinations need for the area. Malaria tablets were not suggested because we are not in or in close proximity to the malaria areas. I will also take precautions during the day and extra care at night to avoid being bitten my mosquitos, to further reduce my risk of diseases. I will carry anti-bacterial hand gel with me at all times and will take extra precautions to ensure person hygiene is kept to a very high standard.
3. Food- I will be staying at a university guest house in Kolkata and a respected tourist resort during my stay in India. The accommodation will provide safe and hygienic food reducing my risk of food poisoning or stomach upset. I will avoid extremely spicy food to ensure my IBS is not inflamed.
4. Terrorist/Civil Unrest- I have checked travel advice for the area from the Foreign and Commonwealth office to firstly ensure it is safe for travel to the area and the risk of violence is low, and to secondly ensure I know the contact details for the nearest embassy.
5. Lone Working- The risk of lone working will be significantly low because I will be travelling, researching and staying with at least 3 MSc students at all times. During the riskier travel in the rural part of the delta, I will be...
with a team of Indian researchers who know the areas very well and are fully aware of risks. We will always stay in small groups.

6. Extreme weather - I will be aware of the weather forecast before and during my stay to ensure I know the temperature risk each day, weather forecast and the potential risk of hurricanes. I will stay hydrated, will wear a high factor UVA and UVB sun cream and will take rehydration tablets when needed to ensure I prevent the risk of sun related conditions.

7. Animals and Insects - I will not touch, approach animals or situate myself near animals. I will wear suitable footwear and cover myself up to ensure I reduce the risk of getting stung or bitten.

8. Transport - I will only travelling in safe, secure transport to/from the airports, within Kolkata and the delta, recommended and arranged by the team from Jadavpur University. I will be using a bicycles transport and boats within the delta. The risk of bicycle harm is low and boats will only be selected from known and safe companies. The use of life jackets will also lower risks.

9. Emergency: I will carry a card which contains the follow contact details at all times;
   o The address and phone number of the British consulate in Calcutta – British Deputy High Commission Kolkatta, 1A Ho Chi Minh Sarani, Kolkatta 700071, India. Email web.newdelhi@fco.gov.uk Phone +91 (33) 2288 5172/2288 5173-76. Fax +91 (33) 2288 3435
   o India Emergency service numbers are: 100 Police 102 Ambulance 101 Fire 108 Disaster Management
   o Insurance number and details

Please specify potential distress or harm to YOU arising from your proposed research activity. (Give consideration to the possibility that you may be adversely affected by something your participants share with you. This may include information of a distressing, sensitive or illegal nature.)

1. Culture Shock - The culture in India a lot different to England. It may be over-whelming, causing stress or shock to the researcher. Medium Risk
2. Findings - The potential topics and findings whilst conducting interviews may upset, distress or shock the researcher, who was not expecting this outcome. Medium Risk
3. Distress - Potentially research findings may provide little insight or depth on the research aim. This may stress and upset the researcher, who may feel disappointment with findings. Low Risk

What precautions will you take to minimise these risks?

1. Discussing the cultural and social differences with supervisors who have previously been to the area and exploring, through a google search, the area to help prepare for culture shock.
2. Taking the time to discuss and process the findings with other researchers and the team. I will read up the possible stressors that people face when living in the delta.

Part 3 – Potential risks to YOUR RESEARCH PARTICIPANTS

Please consider potential safety risks to participants from taking part in your proposed research activity? (Give consideration to aspects such as location of the research, risks associated with travel, strain from participation, and assess the likelihood and severity of risks.) If you have already completed a departmental H&S risk assessment, this may be attached to cover these aspects.

1. Location of interviews - Although the interview will take part in the participants home, there may be risk from everyday hazards of living in the delta. Likelihood - Medium Risk
2. Interview length - The length of the interview may cause the risk of stress. The women I am interviewing have difficult lives and may have worked for many hours before the interview. They may feel pressure because the interview is too time consuming. Likelihood - Medium Risk

What precautions will you take and/or suggest to your participants to minimise these risks?

1. Location of interviews - There is not a risk beyond that of everyday life. We will not be moving during the interview or travelling. I will ensure the participant feels safe to participate in the interview with the use of the information sheet and consent form.
2. Interview length- The participant will be able informed of what the interview involves before consenting to take part and will know that they can stop the interview when they wish at any point. This will be ensured by using the information sheet and consent form.

Please specify **potential harm or distress** that might affect your participants as a result of taking part in your research. (Give consideration to aspects such as emotional distress, anxiety, unmet expectations, unintentional disclosure of participants’ identity, and assess the likelihood and severity of risks.)

1. Distress- The research topic may breach on certain sensitive topics, which may upset and distress the participant. Possibly surrounding the migration of a relative.
2. Gender- Women often run the household in rural parts of India. The interview may take up time and women may have not completed all the activities they needed too. There could be gender pressure from men for women to have completed these activities. Men may not like the women being interviewed about the household.

What precautions will you take and/or suggest to your participants to minimise these risks?

1. Distress- The study will get full ethical approval. The questions will not specifically ask about sensitive issues. If a participant does get distressed or upset, I will stop the interview and ensure they are okay to carry on.
2. Gender- The interview will be kept to a maximum of 30-50 minutes to ensure that it does not interfere with their lives too much. All conversations and interviews will be kept strictly confidential.

### Part 4 – Potential wider risks

Does your planned research pose any additional risks as a result of the sensitivity of the research and/or the nature of the population(s) or location(s) being studied? (Give considerations to aspects such as impact on the reputation of your discipline or institution; impact on relations between researchers and participants, or between population sub-groups; social, religious, ethnic, political or other sensitivities; potential misuse of findings for illegal, discriminatory or harmful purposes; potential harm to the environment; impacts on culture or cultural heritage.)

1. Economic incentive- participants or other members of the community may feel the need to ask for money. A cultural dependency may occur if researchers give out money.
2. Cultural norms- If researchers dressed in flashy clothes, or with limited clothes reducing their modesty, it will offend and upset the communities we are interviewing.

What precautions will you take to minimise these risks?

1. Economic incentive- No economic incentive will be given to participants or members. To ensure cultural dependency does not occur or bias in research findings.
2. Cultural norms- Dressing appropriately and respectfully to ensure researchers fit in with cultural norms, modesty and to uphold respect.

CONTINUED BELOW ...
Part 5 – International Travel

If your activity involves international travel you must meet the Faculty’s requirements for Business Travel which are intended to:

1. Inform managers/supervisors of the travel plans of staff and students and identify whether risk assessment is required.
2. Provide contact information to staff and students whilst travelling (insurance contact details, University contact in case of emergency etc.)

Full details are provided in the Faculty H&S Handbook in the Business Travel section. Selecting Business Travel from the Contents list will take you straight to the relevant section.

<table>
<thead>
<tr>
<th>Departmental H&amp;S risk assessment attached (for Part 2/3)</th>
<th>YES</th>
<th>(Delete as applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Travel and Risk Filter Form attached (Part 5)</td>
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<td>(Delete as applicable)</td>
</tr>
</tbody>
</table>
### Appendix 10: Chi-Square Statistical Analysis of Observed Adaptations

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Migrant Households</th>
<th>Non-Migrant Households</th>
<th>Total</th>
<th>p-value</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used Fertiliser</td>
<td>Count N (%)</td>
<td>34 (22.5%)</td>
<td>117 (77.5%)</td>
<td>151 (100%)</td>
<td>.109</td>
</tr>
<tr>
<td>Put in Irrigation</td>
<td>Count N (%)</td>
<td>23 (20.5%)</td>
<td>89 (79.5%)</td>
<td>112 (100%)</td>
<td>.752</td>
</tr>
<tr>
<td>Climate Tolerant Crops</td>
<td>Count N (%)</td>
<td>10 (16.4%)</td>
<td>51 (83.6%)</td>
<td>61 (100%)</td>
<td>.440</td>
</tr>
<tr>
<td>Diversified Crops</td>
<td>Count N (%)</td>
<td>16 (25%)</td>
<td>48 (75%)</td>
<td>64 (100%)</td>
<td>.204</td>
</tr>
<tr>
<td>Planted Trees</td>
<td>Count N (%)</td>
<td>97 (21.9%)</td>
<td>345 (78.1%)</td>
<td>442 (100%)</td>
<td>.007</td>
</tr>
<tr>
<td>Cut Trees</td>
<td>Count N (%)</td>
<td>27 (26.7%)</td>
<td>74 (73.3%)</td>
<td>101 (100%)</td>
<td>.017</td>
</tr>
<tr>
<td>Joined a Cooperative</td>
<td>Count N (%)</td>
<td>22 (22.2%)</td>
<td>77 (77.8%)</td>
<td>99 (100%)</td>
<td>.249</td>
</tr>
<tr>
<td>Government/NGO Assistance</td>
<td>Count N (%)</td>
<td>79 (23.6%)</td>
<td>256 (76.4%)</td>
<td>335 (100%)</td>
<td>.002</td>
</tr>
<tr>
<td>Using Hired Labour</td>
<td>Count N (%)</td>
<td>49 (24.9%)</td>
<td>148 (75.1%)</td>
<td>97 (100%)</td>
<td>.006</td>
</tr>
<tr>
<td>Seek Protection</td>
<td>Count N (%)</td>
<td>13 (27.7%)</td>
<td>34 (72.3%)</td>
<td>47 (100%)</td>
<td>.077</td>
</tr>
<tr>
<td>Women working outside the home</td>
<td>Count N (%)</td>
<td>14 (25.9%)</td>
<td>40 (74.1%)</td>
<td>54 (100%)</td>
<td>.119</td>
</tr>
<tr>
<td>Taking out Insurance</td>
<td>Count N (%)</td>
<td>8 (9%)</td>
<td>81 (91%)</td>
<td>89 (100%)</td>
<td>.023</td>
</tr>
<tr>
<td>Modifying the House</td>
<td>Count N (%)</td>
<td>122 (22.1%)</td>
<td>431 (77.9%)</td>
<td>553 (100%)</td>
<td>.001</td>
</tr>
<tr>
<td>Taking out a Loan</td>
<td>Count N (%)</td>
<td>150 (22.8%)</td>
<td>509 (77.2%)</td>
<td>659 (100%)</td>
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### Reasons for Out-migration

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<th>Reasons for Out-Migration</th>
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<td>Seeking Employment</td>
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<td>Seeking Education</td>
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<td>To join spouse/marriage</td>
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<tr>
<td>Family obligations/problems</td>
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<tr>
<td>Health care</td>
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<tr>
<td>Housing problems</td>
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</tr>
<tr>
<td>Debt</td>
<td>7</td>
</tr>
<tr>
<td>Loss of income one season</td>
<td>2</td>
</tr>
<tr>
<td>Loss of income multiple seasons</td>
<td>7</td>
</tr>
<tr>
<td>Environmental degradation</td>
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</tr>
<tr>
<td>Extreme event</td>
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</tr>
<tr>
<td>Social/Political problems</td>
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</tr>
<tr>
<td>Other</td>
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</table>

### Remittances

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<th></th>
<th>Money</th>
<th>Goods</th>
<th>Money and Goods</th>
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</thead>
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<tr>
<td>Travel</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Buying Land</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Livestock</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Setting up a New Business</td>
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</tr>
<tr>
<td>Saving Money</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Marriage, Funerals and other Ceremonies</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Equipment for Livelihoods</td>
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<td>0</td>
</tr>
<tr>
<td>Loan Repayments</td>
<td>14</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>House Construction or Repair</td>
<td>15</td>
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<td>1</td>
</tr>
<tr>
<td>Household Furniture</td>
<td>17</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Education</td>
<td>35</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Healthcare</td>
<td>61</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Daily Consumption (Food, Bills, etc.)</td>
<td>88</td>
<td>1</td>
<td>9</td>
</tr>
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</table>
### Appendix 12 Perception: SPSS Output Table

<table>
<thead>
<tr>
<th></th>
<th>Cyclone</th>
<th>Storm Surge</th>
<th>Flooding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Season ally</td>
<td>Annually</td>
<td>Once per decade</td>
</tr>
<tr>
<td>Migrant Household</td>
<td>3</td>
<td>34</td>
<td>16</td>
</tr>
<tr>
<td>Non-Migrant Household</td>
<td>19</td>
<td>88</td>
<td>54</td>
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</table>
Appendix 13 Observed Adaptation: SPSS Output Table

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Migrant Households</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Mixed Farming</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Climate Tolerant Crops</td>
<td>10</td>
<td>51</td>
</tr>
<tr>
<td>Taking out Insurance*</td>
<td>8</td>
<td>81</td>
</tr>
<tr>
<td>Seek Protection</td>
<td>13</td>
<td>34</td>
</tr>
<tr>
<td>Women working outside the home</td>
<td>14</td>
<td>40</td>
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<tr>
<td>Diversified Crops</td>
<td>16</td>
<td>48</td>
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<tr>
<td>Joined a Cooperative</td>
<td>22</td>
<td>77</td>
</tr>
<tr>
<td>Put in Irrigation</td>
<td>23</td>
<td>89</td>
</tr>
<tr>
<td>Cut Trees*</td>
<td>27</td>
<td>74</td>
</tr>
<tr>
<td>Used Fertiliser</td>
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<td>Using Hired Labour</td>
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<tr>
<td>Government/NGO Assistance*</td>
<td>79</td>
<td>256</td>
</tr>
<tr>
<td>Planted Trees*</td>
<td>97</td>
<td>345</td>
</tr>
<tr>
<td>Modifying the House*</td>
<td>122</td>
<td>431</td>
</tr>
<tr>
<td>Taking out a Loan*</td>
<td>150</td>
<td>509</td>
</tr>
</tbody>
</table>
## Appendix 14 Wellbeing: SPSS Output Tables

<table>
<thead>
<tr>
<th></th>
<th>Agree</th>
<th>Neither agree/disagree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migration improves migrants education and work opportunities</td>
<td>208</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Migrants are more likely to get sick or be in danger</td>
<td>171</td>
<td>33</td>
<td>32</td>
</tr>
<tr>
<td>Migrants often don’t feel like they belong in their new destination</td>
<td>120</td>
<td>47</td>
<td>69</td>
</tr>
<tr>
<td>Migration helps the household to be financially secure</td>
<td>190</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>Migration makes it difficult to maintain household livelihoods and responsibilities</td>
<td>182</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>Migration brings new ideas and practices to the village</td>
<td>181</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>I have greater influence in household decisions</td>
<td>122</td>
<td>29</td>
<td>19</td>
</tr>
<tr>
<td>My work responsibilities have increased</td>
<td>144</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>My child care responsibilities have increased</td>
<td>128</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Overall I feel more stressed and unhappy</td>
<td>59</td>
<td>48</td>
<td>63</td>
</tr>
<tr>
<td>I feel less safe in my village</td>
<td>24</td>
<td>18</td>
<td>128</td>
</tr>
<tr>
<td>I have more opportunities in life</td>
<td>81</td>
<td>47</td>
<td>42</td>
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</tbody>
</table>
### Appendix 15 Decision Making: SPSS Output Table

<table>
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<tr>
<th>Activity</th>
<th>Migrant Households</th>
<th>Non-Migrant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult male only</td>
<td>Both male and female</td>
</tr>
<tr>
<td>Making changes to livelihood practices</td>
<td>80</td>
<td>121</td>
</tr>
<tr>
<td>Spending family savings</td>
<td>52</td>
<td>140</td>
</tr>
<tr>
<td>Taking out a loan</td>
<td>73</td>
<td>126</td>
</tr>
<tr>
<td>Treatment of sick children</td>
<td>21</td>
<td>139</td>
</tr>
<tr>
<td>Taking up work outside the home</td>
<td>105</td>
<td>106</td>
</tr>
<tr>
<td>Someone from the household migrating</td>
<td>59</td>
<td>139</td>
</tr>
<tr>
<td>Education of the children</td>
<td>14</td>
<td>132</td>
</tr>
</tbody>
</table>