University of New England

THE ROLE OF GENDER AND SOCIO-POLITICAL POWER RELATIONS IN TRANSFORMING SMALLHOLDER LIVELIHOODS: A CASE STUDY FROM THE VIETNAMESE MEKONG DELTA

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Abstract

This thesis aims to enhance understanding about the interaction of gender and climate-induced hazards through its empirical and investigation into adaptation making-decision processes and livelihood strategies of small-scale farming households in the Vietnamese Mekong Delta (VMD). Rural communities in climate-affected regions, such as floodplains and coastal zones, are becoming increasingly vulnerable to the concurrent pressures of globalization and climate hazards. Women, disproportionately assigned agricultural and domestic responsibilities, encounter increased hazards due to restricted access to resources and persistent socio-cultural norms. This study underscores that the adaptation of livelihood transformation is a gendered process influenced by socio-political power dynamics and norms. It further demonstrates that the decisions made by men, women, and their households during the livelihood transformation process are influenced not only by their gender identities and socio-political standings but also by the household and community contexts from which they originate. The study uses an interdisciplinary framework that integrates feminist political ecology, and adaptive capacity theory to investigate how gender relations and social-ecological contexts shape perceptions of vulnerability, adaptation responses, and transformative livelihood strategies. Employing mixed-methods research in Soc Trang and An Giang provinces, data were collected via household surveys, field observations, and semi-structured interviews with farmers, local government officials, experts and NGOs.

Empirical findings reveal that gendered power dynamics and institutional settings substantially influence vulnerability and adaptation. Notwithstanding these limitations, adaptation strategies may drive the transformation by tackling social injustices and promoting gender equity. The study emphasizes how local adaptation initiatives can support broader social and political change, advancing gender justice and adaptation on a national and international level.

Agriculture-based livelihoods continue to be the primary income source for smallholders in the VMD, notwithstanding the vulnerability of crops to climatic risks and their restricted commercial viability. Small-scale producers are particularly vulnerable to the compounding effects of market volatility and climatic disturbances, the inflexibility of their production methods, and the restricting effects of existing gender norms and institutional frameworks. The institutional setting for industrialisation plays an important part in shaping intra-household adaptive capacity, indicating that spontaneous adaptation to climate change cannot be assumed. Furthermore, although seasonal climate forecasts disseminated via formal and informal channels are frequently advocated as decision-support instruments for agricultural adaptation, their effectiveness is constrained for farmers hindered by limited access to credit and insurance, increasing input costs, and challenges related to land insecure tenure.

This study indicates that effectively addressing gendered vulnerability and enabling transformative livelihood adaptation to climatic risks requires the implementation of adaptive policies that may evolve in response to the shifting goals and vulnerabilities of rural communities. These policies should seek to broaden livelihood opportunities and improve long-term adaptability. The findings further assist academics, professionals, and policymakers enhance sustainable and gender-responsive climate-affected community management in the VMD and other complex socio-ecological systems. This research links global policy frameworks to local experiences to develop equitable and contextual climate adaptation measures.

Declaration/Certification by Author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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Acknowledgement of Country

The University of New England respects and acknowledges that its people, courses and facilities are built on land, and surrounded by a sense of belonging, both ancient and contemporary, of the world's oldest living culture. In doing so, UNE values and respects Indigenous knowledge systems as a vital part of the knowledge capital of Australia.

We recognise the strength, resilience and capacity of the Aboriginal community and pay our respects to the Elders past, present and future.

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Upcoming publications

Contextualising the Mekong Delta's environmental challenges: Farmers' perceptions of water insecurity and adaptation.

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Chapter One: Introduction

1.1 Rationale of the study

In recent years, policymakers, international agencies, and academics have increasingly highlighted two interconnected yet distinct global processes: the growth of economic integration and the escalation of environmental change and variability. It is widely acknowledged that the local and national economies of all nations are intricately intertwined with global economic processes and supra-national political institutions that operate beyond national governing authority or responsibilities (Goodman & Watts, 1997). Eakin (2002) highlights that human production and consumption patterns have an enduring impact on the earth, and this might be connected to a perceived increase in the occurrence of extreme climate hazards. Roson and Van der Mensbrugghe (2012) indicate that economic and climate change interact in unforeseeable and complex ways in the setting of national economic and social policies, as well as in the decision-making processes of institutions, businesses, and individuals. O'brien and Leichenko (2000) argue that the concurrent processes of globalisation and climatic variability on various temporal and spatial scales result in communities that are doubly exposed and thus particularly vulnerable.

In developing nations, small-scale farmers must be recognised as a social category. As such nations open their markets to free trade, the lack of infrastructure, political, and institutional support for smallholders increases (Eakin, 2002). Insufficient funding for transportation expenses and reductions in governmental support for agricultural technology and research, for example, restrict these farmers' involvement in more competitive local and international markets (Mahul & Stutley, 2010). Although the nature of climatic variability in the tropics, including Vietnam can lead to severe and frequent extreme events, insurance enterprises and climate-related risk management organisations are either absent or inadequate. Such circumstances are abundantly obvious in rural Vietnam (Reynaud et al., 2017). To address rural poverty and agricultural growth, policymakers must understand how households concurrently respond to multiple sources of uncertainty and transform their livelihoods to adapt to continually changing environmental, political, and economic situations.

Adaptation to changing climate has been a focal area of research and policy concerning the social facets of global environmental crisis (Downing et al., 1999; IPCC, 2007). Such an emerging topic is also motivated in part by the expansion of the adaptation agenda of the United Nations Framework Convention on Climate Change (UNFCCC) (Huq & Reid, 2004; Schipper,

2006). The Intergovernmental Panel on Climate Change (IPCC) characterises adaptation as modifications in processes, procedures, and structures aimed at mitigating possible harms or capitalising on possibilities related to the effects of climate change (Smit & Pilifosova, 2003). Adger et al. (2005) reveal that adaptation can exist at several scales and that state, enterprises, and individuals can adopt adaptive measures. Costs and benefits might be coupled with adaptation (Smit & Pilifosova, 2003). Smit et al. (1999) suggest that knowledge of anticipated adaptations is crucial for both assessing the impacts of changing climate and formulating policy responses to changes in climate. In this sense, Vincent et al. (2010) writes that researchers are attempting to scientifically measure the adaptation process but due to its nature, this is challenging. Meanwhile, policymakers are eager to know how to use their budgets to enhance adaptive capacity and adaptability amid uncertain variations in the climate.

Climate change is an undeniable threat to society, but its effects will rely on the socially and spatially varied vulnerability of individuals (Adger, 2003b). It is crucial to understand which groups within societies are least capable to respond to changing climate and which are most vulnerable to its effects. This is especially the case for the least developed nations (IPCC, 2007). According to Thomas and Twyman (2005), communities whose primary source of livelihood is derived from natural resources are more susceptible to climate change. Agriculture, for instance, has dominated the preliminary research on climate adaptation due to the obvious susceptibility of agricultural systems to climate and concerns about the effects of changing climates on food security (Chen & Kates, 1994; Easterling, 1996; Smit et al., 1996). Prior research has investigated the physical characteristics of the environment and their effects on humans and biological diversity, leading to biophysical vulnerability (Liverman & O'Brien, 1991). However, vulnerability also incorporates the political, social, and economic dimensions of a society (Liverman & O'Brien, 1991). This thesis also examines a political economy perspective on vulnerability, which recognises that exposure to climate risks is shaped by broader socio-economic and institutional processes. In agreement with O'brien and Leichenko (2000), I argue that globalisation and political-economic change constitute the structural context within which climate impacts are experienced—not as isolated environmental shocks, but as factors interacting with existing patterns of inequality and transformation. In this sense, as described by Klein (2015), the transformative potential of environmental change may mobilise the resources and energy necessary to tackle both climate change and issues of poverty and social disparities. This is also congruent with what Beck (2015) refers to as ‘emancipatory catastrophism’ – a chance to address intersectional injustices, such as colonial history and other

structural inequalities. Climate change adaptation may be reconceived as a mechanism for larger societal transformation (Bee, 2014).

Much of the political ecology literature on injustices in the environment has investigated how social inequalities might lead to exposure to climate risks (Buckingham & Kulcur, 2009). Employing the concept of adaptive capacity (Preston & Stafford-Smith, 2009), the fundamental origins of climate vulnerabilities are often entrenched within cultural, economic and political systems. Vulnerability to environmental change arises from the convergence of exposure and sensitivity to changing circumstances, alongside socioeconomic groups and power dynamics that shape individuals' capability to respond. As a result, as per Black (2016), climate change has ethnic, socioeconomic, and gender implications.

Climate change and gender have progressively emerged as crucial, intersecting concerns in international development discourse and policy frameworks (Dankelman, 2010). The interplay between these two realms is intricate and fluid, rooted in the daily lived experiences, perceptions, and adaptive responses of individuals, especially with intersecting livelihood pressures and socio-economic disparities. Gender relations considerably influence the distinct ways in which men and women, positioned differently, face and respond to climate impacts, considering their varying livelihoods, responsibilities, and entitlements (Denton, 2004). Despite an increasing volume of research and development initiatives examining the relationship between gender and environmental change (Nielson & Reenberg, 2010; Carr, 2008; Terry, 2011), significant research gaps persist. There remains a persistent necessity for strategic and critical efforts that prioritise gender as a fundamental analytical framework in comprehending vulnerability and adaptability. Thus, analyses need to move beyond conventional gender inclusion to thorough examinations of the systemic power dynamics that influence varying vulnerability to climate risk and adaptive capability (Kaijser and Kronsell, 2014).

Much recent research on feminism and development has begun to examine women's vulnerability to climate risks (Demetriades & Esplen, 2010b; Sultana, 2014), analysing how gender dynamics, such as labour allocation, resource access and entitlements, as well as economic and political influence, affect interactions with environmental changes. For instance, climate hazards, such as floods and storms in rural Vietnam could lead to gender-specific temporary seasonal migration and permanent displacement (UN Women 2021a). Vietnamese women suffer increasing workloads as a result of taking on both agriculture work and domestic responsibilities (Dasgupta, 2019). In addition, a feminist political ecology paradigm is utilised

to comprehend how uneven gender relations influence environmental change experiences. This means that adaptation must address underlying social inequities to achieve emancipating and transformational power (Klein, 2015). The possibility of transformational livelihood adaptation to address the ecological and social aspects of vulnerability has, however, not received much attention in research.

The recognition of gender in environmental discourse has been increasingly essential in both policy and scientific domains (Fatma Denton, 2002), as academics have acknowledged that environmental change and its effects are profoundly influenced by gendered relationships. Adger et al. (2002) suggest that global discourses on climate change diverge substantially from local context. Initially, UNFCCC negotiations focused primarily on mitigation via the Kyoto Protocol and carbon market mechanisms (Vincent et al., 2010); however, adaptation has become increasingly significant since the Cancun Adaptation Framework (2010) and especially under the Paris Agreement (2015), which instituted a Global Goal on Adaptation (Art. 7). The Paris framework acknowledges adaptation as a universal, gender-sensitive, and participative process associated with adaptation and the mitigation of vulnerability (Paris Agreement 2015). Nonetheless, despite these advancements, gender integration under UNFCCC adaptation governance remains inconsistent, frequently confined to procedural obligations rather than substantial structural change (Skutsch, 2002). Although women are increasingly being incorporated into the process and structure of decision-making, climate policy does not appear to address their most pressing issues (Denton, 2004, 2010). Adger et al. (2002) argue that global ideologies on climate change have concentrated on technical mitigation solutions, whereas the local implications of climate change are linked to vulnerability and adaptation.

Gender has historically been a primary concern in development studies. While climate change and gender are increasingly acknowledged as interrelated issues, the systematic incorporation of gender analysis into climate adaptation research has progressed over time. Early feminist research often employed disaggregated analysis to highlight structural inequalities between men and women (Vincent et al., 2010). These disparities are frequently linked to gender-based differences in entitlements to resources (Goetz, 2007). Women have a higher poverty rate than men due to their lower entitlements, a concept known as the feminisation of poverty (Vincent et al., 2010). Furthermore, Dankelman (2002) and Skutsch (2002) demonstrate that women are particularly susceptible to environmental change because of their disproportionately high participation in the agricultural sector, limited land ownership, and the intersection of poverty.

This thesis draws on adaptive capacity theory and feminist political ecology to examine how gender and socio-political power relations shape vulnerability and adaptation in the rural geographies of the Vietnamese Mekong Delta, and to establish a theoretical framework for the enquiry (see Figure 1.1). This study is based on empirical findings collected from four selected farming communities in the VMD.

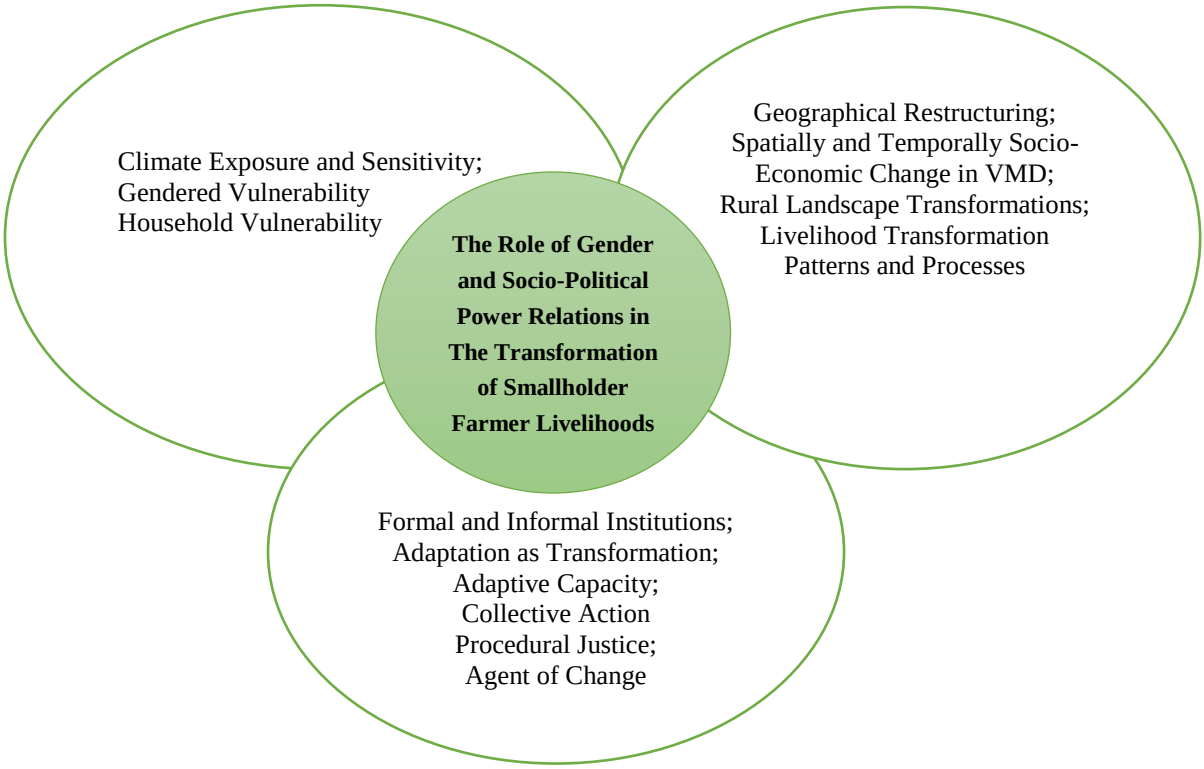


Figure 1.1 Core areas of the study situated in this thesis

Source: Author-own illustration (2024).

Gender differences in vulnerability and adaptation represent structural gender inequality on a broader scale (Cameron et al., 2021; Vincent et al., 2010). Carr (2008a) argues that adaptation efforts may continue if they are compatible with existing power structures, such as gendered power relations. According to Pelling (2011), transformation will be challenging to achieve since existing social connections are a fundamental root cause of vulnerability and, therefore, the focus of adaptation. Such systems may establish historically constrained path-dependencies, which can impede the achievement of new (transformation) initiatives (Wise et al., 2014). Gender inequality appears to be a significant driver. The social barriers to climate vulnerability have been the subject of much research (Adger et al., 2009) but the gendered role and nature of transformative adaptation has received very little attention. Hence, empirical research is required to understand the gendered nature of vulnerability at individual and

household scales, and what factors contribute to its existence. Furthermore, this study aims to investigate the social characteristics of adaptation, which could provide crucial insights for a variety of agents, such as communities, non-profit organisations, and governments promoting adaptation, and facilitate the recognition of new possibilities for collective action and transformation.

In this study, I intend to investigate the intersection of gender and socio-political power relations as well as climatic variability in the adaptation decisions and transformational livelihood strategies of small-scale farmers in the Vietnamese Mekong Delta. My research focuses on the decision-making process and the gendered dynamics of climatic and social implications of institutional change, which have been rarely discussed simultaneously in climate vulnerability and transformational adaptation of livelihoods studies. The objectives of the study are as follows:

1. To understand how the existing social-ecological context, and gender relations, shape VMD rural households' perceptions and experiences of climate-related hazards.

2. To explore the current situation regarding the livelihood strategies of VMD farming households, including the factors and forces (including gender) driving their transformation.

3. To examine how climate-related hazards adaptation discourses and policies address gender-specific vulnerability and livelihood transformative adaptation.

4. To develop practice and policy-relevant suggestions for the future sustainable and equitable management of natural hazards-prone farming communities in the VMD.

To investigate the potential, constraints, and mechanisms of adaptation to climate changes in complex social-ecological systems, such as the VMD, I address four research questions concentrating on the various components of gendered vulnerability and transformational adaptation of livelihoods that I have identified:

1. How does the existing social-ecological setting influence the perceptions and experiences of rural farming households in relation to climate hazards vulnerability?
2. How do gender and socio-political power relations shape the adaptation of rural individuals, households, and communities to natural hazards?

3. To what extent do gendered relations coupled with institutional context and actor participation influence the transformation of agricultural households' livelihoods in the VMD?
4. How can natural hazards adaptation discourses and strategies account for gender-specific vulnerability and transformational adaptation of livelihoods?

1.2 Contribution to the discipline

The thesis enhances knowledge of human society, particularly regarding socio-ecological challenges posed by climatological hazards and capability to adapt, hence advancing the disciplines of development geography and the social and behavioural sciences. This study investigates the influence of gendered power dynamics and socio-political institutions on vulnerability and adaptation strategies of small-scale farming households in the Vietnamese Mekong Delta (VMD), thereby bridging gaps in gender studies, political economy, and global environmental change.

The study of climate vulnerability in human geography highlights the interconnected nature of global processes and local experiences by placing it within the larger framework of globalization and socio-ecological systems. It deepens our understanding of how social and geographical disparities influence adaptation and change in vulnerable rural and regional geographies by looking at the gendered aspects of climate hazards risk. The study offers new insights into how gender relations and institutional contexts moderate the transformational potential of livelihood adaptation through its interdisciplinary approach, which integrates feminist political ecology and adaptive capacity theory.

Additionally, the thesis emphasizes the significance of social justice, power relations, and agency in climate adaptation in the social and behavioural sciences. It contests conventional, technocratic viewpoints by redefining adaptation as a means to tackle persistent inequities, including gendered labour divides and unequal access to resources. Empirical evidence from the VMD guides actionable policies that emphasize justice, adaptation, and sustainability, providing transferrable ideas for mitigating climate vulnerability in other developing regions.

The thesis also enhances comprehension of human-environment interactions by connecting theory and practice, emphasizing the transformative potential of inclusive, gender-sensitive strategies for climate adaptation.

1.3 Structure of the thesis

The thesis structure is organized into nine chapters as follows:

The first chapter introduces the research problems, research questions, and research aims. It examines the theoretical perspectives on global economy, climate change, gender, vulnerability, and transformative adaptation. The analytical framework (core areas of the thesis) is designed to investigate the complicated gender and social-political power dynamics that influence the transformative adaptation of farmers' livelihoods. The first chapter also describes the contributions of the thesis to the discipline.

The second chapter presents a comprehensive literature analysis on vulnerability, adaptation, livelihoods, gender relations, adaptation governance, and transformational adaptation. In addition, it explores historical overview of gender, environment, and development, the associations between gender and climate hazards; vulnerability and adaptation; and a transformational and gender-just strategy for adaptation. Employing a feminist political ecology in conjunction with an adaptive capacity framework to examine climate change offers possibilities for transforming both ecosystems and social institutions within a neoliberal context. The conceptual structure developed for the thesis is validated theoretically and empirically in this chapter.

The third chapter examines research methodology, which includes the use of a mixed-methods approach and a case-study-based approach to guide the research questions. The chapter encompasses specifics regarding research parameters, case study selection, data collection techniques, data analysis methodologies, and ethical considerations. This chapter discusses the rationale for the research design and methodologies employed.

The fourth chapter addresses the historical context of Vietnam by reviewing the literature on the political economy of agrarian society, especially in the evolution of land use and governance in the Vietnamese Mekong Delta. This discussion will focus on the rise and decline of agricultural collectivization in Vietnam, the macro transformation with local ecology and society in the context of the Doi Moi reform, the Green Revolution, as well as gendered land rights. This chapter aims to present a historical and broader historical context for concerns pertaining to climate and adaptation governance, social institutions, and persistent gender inequality challenges.

Chapters Five and Six present the findings from the case study analyses. Chapter five delineates the opinions and experiences of agricultural households regarding climate hazards and its

fundamental causes of vulnerability. Chapter Six examines how gendered vulnerabilities, resource accessibility, and institutional dynamics collectively impact climate adaptation options in the two chosen case studies. This chapter delineates the influence of gender and socio-political power relations on decision-making towards transformational livelihoods.

Chapter Seven discusses about the roles of local authorities and relevant actors and their influences on gendered relations and livelihood transformation. It specifically analyses how state-led interventions, particularly infrastructural projects and climate-related risk governance mechanisms interact with local practices, social norms, and gendered roles in farming communities.

Chapter Eight examines the gendered dimensions of adaptive capacity in the selected communities, situated within the broader context of the VMD's social-ecological systems. This chapter examines how poverty, gender disparity, and restricted entitlements have heightened the susceptibility of individuals, households, and entire communities to climate change, while constraining their ability to proactively and positively modify their livelihoods.

Chapter Nine concludes the thesis by synthesising the various elements of the study to examine the interplay between gender and socio-political power in shaping gendered agency, collective action, and climate adaptation within small-scale farming communities in the VMD, and how this understanding can enhance the adaptive capacity and long-term sustainability of rural communities.

Chapter Two: Literature Review

2.1 Introduction

This chapter examines essential literature that supports the analytical framework of this study, specifically addressing how climate vulnerability, adaptation, and livelihood shifts are influenced by gendered power dynamics and institutional contexts. This review is guided by two interrelated theoretical frameworks: Adaptive Capacity and Feminist Political Ecology. Collectively, they establish an essential basis for comprehending the dynamic interaction among environmental change, social inequality, and institutional response.

The chapter is structured into four primary theme divisions. The first section provides a historical review of gender-environment study, outlining core concepts that shape current discussions. The second section analyses vulnerability and adaptive capacity from a social-ecological viewpoint, emphasising the influence of environmental factors and relationships on adaptation. The third section presents Feminist Political Ecology and its relevance to climate change and adaptation, emphasising the impact of intersecting inequities on experiences and reactions. The fourth section examines institutions and governance, highlighting the political and multi-scalar aspects of adaptation and its consequences for equitable and just outcomes.

2.2 Historical perspectives on gender, environment and development

The first and well-known 'nature-culture divide" framework in the book "*Woman, culture, and society"* attempts to bridge the gap between asymmetrical traditions of feminism and anthropology. Rosaldo et al. (1974) point out women's inequality and their possible causes, and further suggests solutions for inequality in the post-industrial societies. This book also examines sociocultural models, in which economics and the relations of labour to the means of production are considered antecedent to inequalities between men and women (Oakley, 1979; Silverstein, 1975). The book contains a collection of sixteen articles that address anthropological concerns about cross-cultural differences in female status in domestic and public institutions (e.g., economic independence and political participation), which is further interpreted by Ortner (1972), who highlights that the actual treatment of women associated with their relative power and contribution varies enormously across cultures and history. Rosaldo et al. (1974) also questioned how women are viewed as closer to nature due to biological features such as lactation, menstruation, and gestation, and how men have been traditionally more highly esteemed, and symbolically regarded as closer to culture. This understanding is crucial because, from this pivotal research, Rosaldo et al. (1974) precisely reveal that there is an interlinkage between sexual dimorphism and labour allocation. However,

the book does not analyse the sexual dimorphism of size and strength, which is an obvious difference that pervades ideological and division of labour systems (Silverstein, 1975).

Environmentalism and feminism were two of the most significant political movements of the late twentieth century. In New Woman, New Earth: Sexist Ideologies and Human Liberation, Radford Ruether (1975) highlights the connection between the subordination of women and the degradation of the planet. Moreover, Ruether's main thesis is that the hierarchical dualisms in Western culture separates a feminised nature from masculine culture, as well as the obvious masculine need to exceed the human existence (Radford Ruether, 1975). Building on Ruether's scholarship, academics have contested whether the relationship between women and nature should be interpreted as physiological, psychological, or as an outcome of historical and social contexts. This discourse is positioned within critiques of patriarchal Western and neo-Western socio-economic systems that have shaped the representation of both women and nature under hierarchical power structures. Similar views are expressed by Plumwood (1993) and Hawkins (1998) who point out that Western culture's dualistic structures emphasise radical discontinuity between humans (cultures) and nonhumans (natures), but responsive attention to nonhumans reveals both continuity and difference between other forms of life. Such a viewpoint, according to Plumwood, would offer a philosophically informed explanation of the relationship between women and nature, demonstrating how relating male dominance to natural dominance is crucial and yet remains a dilemma for women.

In *The death of nature: Women, ecology, and the scientific revolution* (Merchant, 1980), a neo-Marxist perspective on the historic connection between the nature and women is proposed. Merchant (1980) argues for a grounding of the analysis of women and nature within historical and social systems. Bridenthal and Koonz (1977) critique the narrative of the historically termed "Western man" as the primary subject of history, arguing that women's perspectives have frequently been overlooked within conventional periodization frameworks. They also assert that institutional changes during the Renaissance and Reformation, especially in socio-economic, religious, educational, and legal spheres, contributed to the increasing constraint of women to private, domestic, and politically marginal roles (Kelly-Gadol, 1977). Merchant (1980) conceptualizes the nature-gender nexus as being under the influence of two questions: (i) How have people historically conceptualised nature? and (ii) How have they behaved in relationship to that construction? A question that needs to be asked, however, is whether examining the relationship between human society and nature takes into consideration

economic factors from an ecological perspective, and the gendered interactions of people and nature as well as moral concerns with participatory democracy.

Unlike a capitalist framework, ecofeminism is arguably the most influential and yet debatable body of theory in nature and gender research. The book *Staying Alive: Women, Ecology and Survival in India,* first published in 1988, defines the relationships between ecological crises, colonialism, and the oppression of women is viewed as one of the foundations of modern ecofeminism (Shiva, 1988). It is well-documented research that reveals how technology has impacted on women's lives. Prior to the so-called Green Revolution, rural and peasant women have been the direct agricultural producers and managers of natural resources for the production of sustenance. It is often argued that the idolatry of modern science and technology in the Green Revolution displaced women's traditional knowledge and skills while destroying the ecosystems that they have long nurtured and been nurtured by (Vance, 1990). The book's author brings up the idea of "the patriarchal concept of productivity" which was formed by the very specific historical and political phenomenon of colonialism (Shiva, 1988, p. 10). Shiva assumes that patriarchal categories demonstrate the destruction as "production" and reproduction as "passivity" in the globalizing patriarchal capitalism society. Nevertheless, Shiva's theory has faced criticism for characterising the patriarchal concept of productivity as predominantly a Western construct imposed by imperialism. Salleh (1991) argues that this approach may neglect the existence of hierarchical gender relations in Indian society before colonial involvement.

One of the monumental studies in gender and natural resources management is Agarwal's book *A field of one's own: Gender and Land Rights in South Asia* (Agarwal, 1994a). This book calls attention to the direct link between gender inequalities and effective property rights in land. Using an interdisciplinary approach with a vast array of evidence including economic, historical and legal sources, ethnographic studies, government survey data as well as the author's own fieldwork, Agarwal (1994a) argues that the household as the unit of analysis is an essentially cooperative institution in which one's interests are the interests of all individuals, the household's assets, such as productive resources, and income, owned by males will benefit female and children automatically. Illustrated by cross-cultural and cross-regional case studies in India, Pakistan, Bangladesh, Nepal, and Sri Lanka, this study reveals that property rights play a crucial role in structuring, maintaining and transforming gender relations within and beyond the household, the community, the market and the State. Employing development economics and environmental perspectives, Agarwal (1994a) makes the very valid point that

addressing issues of women's ownership and control over landed property improves gender inequalities and women's empowerment, particularly in South Asian agrarian societies.

A key contribution to gender and development approaches was the publication of the book *Feminist Political Ecology: Global Issues and Local Experiences* – one in the series of the "International Studies of Women and Place" edited by Rocheleau et al. (1996). Feminist political ecology brings together feminist and political ecology knowledges as one of the first theoretical frameworks to the study of resource use from gendered perspectives (Gezon, 1997; Raghuram, 1998). While political economy is concerned with political and economic structures as well as processes of disempowerment and marginalisation (Miller, 2003), feminist political ecology is primarily concerned with gendered power relations in the shaping and use of the environment (Bryant, 1997; Helen, 1997; Peet & Watts, 2004). Drawing on 11 case studies from Brazil, Austria, Spain, Poland, Kenya, India, Zimbabwe, the Philippines, the Dominican Republic and the United States, Helen (1997) shows that feminist political ecology is interpreted with four main points as a basis for theory: (i) acknowledging the interconnectedness of all life and the importance of power relations, including gender relations in decision-making about resource access and control; (ii) challenging the assumption of technological progress and dominance of nature; (iii) recognising that ideologies shape relationships between gender, knowledge, environment, and development that were particularly formulated in a patriarchal mode—and that these create gendered access to information, knowledge, and resources, and technologies for improving livelihoods; and (iv) addressing the differences in structural positions held by men and women, such as men's tendency to specialise and women's to take part in integrative roles in both economic activity and management of natural resources. This approach to gender and environment research has been influential in not only human geography and ecology, but also rural sociology, anthropology and social movements. In this milestone study, Rocheleau et al. (1996) found that the intersection of power and gender – particularly women and their organizations are embedded within socioeconomic, cultural and political structures that both facilitate and constrain their resource management strategies.

Amongst the most influential texts in the development of feminist geography includes the Women and Geography Study Group's (WGSG) approach in the book *Feminist geographies: explorations in diversity and difference* highlights the evolution of feminist geography both theoretically and empirically in the 1990s remarked by Linda McDowell with her article published in Progress in Human Geography volume 17. From feminist geographical

perspectives, Rose et al. (1997) introduce key concepts such as feminism, space, and place, as well as how these are interlinked with the environment. Longhurst (1999) claims that the authors draw attention to theoretical debates and pose the question "what is gender?" as well as "how do feminist geographers work with gender?". This was influential because it attempted to investigate multiple intersections of identities, knowledge, power, and agency in the context of climate change adaptation, gender justice and environmental governance. However, the WGSG's theory has been subject to considerable criticism as it neglects to examine perspectives and experiences of non-British-based feminist geographers with the rapidly (socially, economically and politically) changing context of Asia-Pacific region. Hence, building on Crenshaw (1989) work, this thesis argues that understanding gender relationally requires examining both the power differentials between men and women or the social and institutional mechanisms through which bodies become sexed and gendered. The term 'intersectionality' or 'intersectional approach' was introduced to conceptualize power and agency in such a manner that includes sexism, racism, class oppression, heterosexism, and other axes of oppression in their complex interconnections (Crenshaw, 1989, 1990). Taking Black women's studies as an example, Akasha et al. (1982) highlight that what need to be taken into account in the theoretical developments and political interventions is to employ an intersectional lens (Cho et al., 2013; Crenshaw, 1989). Other scholars who followed Crenshaw, also argued that the concept of intersectionality is viewed as a mainstreaming research paradigm of conceptualising the connection between oppressive systems that reflect our multiple identities and social locations in privilege hierarchies and power (Bailey et al., 2019; Carastathis, 2014; Collins & Bilge, 2020). Feminist geographers and social scientists who followed Crenshaw adopted this notion and used it in gender and climate change research because it undermines gender as the central analytical category, and considers gendered expertise to the specific locality and the significant role of social context, as well as emphasising how people experience multiple layers of oppression beyond those associated with gender (Gay-Antaki, 2017; Hopkins, 2018; Kaijser & Kronsell, 2013). Perhaps the most vivid example is that of Rodó-de-Zárate and Baylina (2018) and Sircar (2019), who point out that there has been a distinct turn towards intersections between class, race, ethnicity, sexuality, age, religion and gender and the intersections of diverse power structure within feminist geography. Consequently, such views would contribute to more complex and dynamic insights into social relations and power structures, and this has led many researchers to propose possible future developments in relation to feminist geographies and intersectional studies.

As summarised in Table 2.1, these various approaches offer new insights into the gender-society-environment nexus, as well as play a complementary role to the traditional ones. Key aspects of these approaches include the significance of an understanding of human and nature relationships, especially in women's traditional knowledge and experiences in resources use and management as situated within the existing structures and systems that create the political, social, economic and ecological context of the study. Building on structuration theory's emphasis on power and agency (Giddens, 1985), scholars in feminist political ecology and intersectional research argue that these approaches provide a comprehensive framework for analysing gender and climate change. They integrate macro-level structural forces with micro-level lived experiences, while also examining how institutional arrangements shape the interconnections between gender and environmental governance. This will be discussed in the following sections.

Table 2.1 Historical trends in the literature on Gender – Society – Environmental Relations

Socio-environmental and political movements

	Approaches	Proponents	Assumptions	Key concepts	Field of study
Pre-(20tC) 1900 ….. 1960	Sociocultural models	Rosaldo et al. (1974); Ortner (1972)	Women are viewed close to nature – are preoccupied with children, and the mother-child tie at some basic level is a "natural" one while men's positions are closer to culture.	Nature-culture divide	Anthropology
1970 1980	Structural approaches	Ruether (1975); Plumwood (1993); Hawkins (1998)	The male is identified with the original male human being, from whom the female is created and given to the male God as his wife-servant.	Ecofeminism and green thinking	(Ecofeminist) theology
1990	Marxist materialist approaches	Merchant (1980); Kelly-Gadol (1977); Bridenthal and Koonz (1977)	Women-nature connection is treated and situated within historical and social systems.	Deep ecology: 'Women-nature connection'	Environmental history and philosophy
2000 **21th C** 2001	Materialist ecofeminism approaches	Shiva (1988)	Emphasis on the patriarchal concept of productivity highlights that women and tribal and peasant societies situated in nature are similarly unproductive.	Concept of productivity and feminine principles	Environmental activism and ethics

Bargaining approaches	Agarwal (1994a)	The family is a homogeneous unit governed primarily by altruism, and therefore; the land owned by the male head will benefit the entire family.	Property (land reform) and gender relations	Development Economics and Environment
Feminist political ecology	Rocheleau et al. (1996); Bryant (1997); Helen (1997); Peet and Watts (2004)	Gender, along with class, race, and other relevant dimensions of political ecological life, is a critical variable in determining access to, control over, and knowledge of natural resources.	Environment and gendered power relations	Geography and political ecology
Feminist geographical theory	Rose et al. (1997)	Gender, space and place are interlinked with the environment.	Geography and Gender	(Feminist) geography
Intersectional theory; structuration approaches	Crenshaw (1989); Akasha et al. (1982)	Gendered social identities can overlap, creating compounding experiences of oppression.	Intersectionality and gender subordination	Intersectional feminism

The evolution of gender-environment discourse uncovers fundamental principles that support the Feminist Political Ecology (FPE) paradigm. Early feminist anthropological studies, such those by Rosaldo et al. (1974) and Ortner (1972), emphasise the symbolic and material aspects of women's subjugation, linking its origins to the nature-culture dichotomy that aligns women with biology and nature, while associating men with culture and public authority. Ecofeminists such as Ruether (1975) and Merchant (1980) further attack this dichotomy, contending that patriarchal and capitalist frameworks have historically diminished the worth of both women and nature. Shiva's (1988) analysis amplifies this critique by associating colonialism, the Green Revolution, and technical rationality with the marginalisation of women's ecological knowledge and innovative contributions, especially in the Global South.

The approaches conclude in the development of Feminist Political Ecology, as described by Rocheleau et al. (1996), which serves as a comprehensive framework examining the influence of gendered power dynamics on environmental access, control, and knowledge. FPE emphasises structural disparities and opposes technocratic development, while acknowledging the contextual experiences and agency of women in the management of natural resources. It contests prevailing narratives of productivity, investigates the impartiality of science and technology, and exposes the profound establishment of environmental governance systems inside patriarchal and socio-political institutions.

The incorporation of intersectionality, as articulated in Crenshaw's (1989) research, enhances Feminist Political Economy (FPE) by illustrating the interplay between gender and other identity dimensions, including race, class, and ethnicity. Feminist geographers (e.g., Rose et al., 1997; Rodó-de-Zárate & Baylina, 2018) enhance this perspective by analysing spatial and social dynamics, demonstrating how individuals encounter climate vulnerability and resource accessibility through various, intersecting systems of oppression. These insights provide a comprehensive theoretical framework for examining the gendered aspects of climate change, resource governance, and adaptation strategies, establishing Feminist Political Ecology (FPE) as an essential basis for analysing the lived experiences and agency of rural farming households in climate-vulnerable areas such as the VMD.

2.3 Climate vulnerability and adaptive capacity: A social-ecological perspective

2.3.1 Biophysical and social dimensions of vulnerability

Climate vulnerability has become a pivotal concept in comprehending the diverse risks encountered by both human and ecosystems amid environmental change. The notion was

originally based on studies of natural hazards and food security (Cutter, 1996b; Liverman, 1990). Vulnerability is commonly defined as the extent to which a system is prone to, or incapable of managing, the detrimental impacts of climate change, encompassing climate variability and extremes (Füssel, 2007b)

Vulnerability can be regarded as the susceptibility to harm from environmental and social change pressures together with a lack of coping and adaptive capacities towards these forces (Adger, 2006; IPCC, 2022). A meta-analysis of vulnerability definitions demonstrated that varied epistemological approaches have been applied to the field (Eakin & Luers, 2006). The positivistic natural hazards school emphasises the quantitative assessment of risks. Consequently, attention is placed on environmental stress and ecological vulnerability. In contrast, human ecology and political economy perspectives originated from interpretive social science paradigms grounded in relativist and constructivist ontologies (Vincent et al., 2010). From these standpoints, vulnerability is characterised as a system's susceptibility to harm, which includes both sensitivity to effects and deficiencies in coping and adaptive capabilities (Ara Begum et al., 2022).

The study of vulnerability has become central to climate change research (Adger, 2006; Füssel, 2007a; Liverman, 1990; Reid et al., 2006). Early approaches, emerging from natural hazards research in the 1970s, conceptualised vulnerability primarily in terms of exposure to hazards and the magnitude of potential losses (Romieu et al., 2010). Subsequent scholarship expanded the concept to incorporate both biophysical and social dimensions, recognising that vulnerability is shaped not only by environmental conditions but also by socio-economic and institutional factors (Liverman, 1999).

2.3.1.1 Biophysical vulnerability

Biophysical vulnerability refers to the degree to which a system is exposed and sensitive to climatic hazards, and it is commonly assessed through projections of potential climate impacts (O'Brien et al., 2004). Rising temperatures, altered rainfall patterns, and the increasing intensity of climate-related hazards, such as storms and droughts, are widely recognised consequences of climate change.

Different biophysical environments have differing levels of vulnerability to natural hazards, whether or not they are generated by climate change (Vincent et al., 2010). Different ecosystems and sectors in various locations have been investigated for the potential effects of a changing climate, including river resources (Mendoza et al., 1997), coastal regions

(Capobianco et al., 1999; de Lourdes Olivo, 1997; Klein & Maciver, 1999), wetlands (Kracauer Hartig et al., 1997), forests (Dixon et al., 1996), and agricultural productivity (Chipanshi et al., 2003; Karim et al., 1996; Lal et al., 1998; Magrin et al., 1997). In essence, such analyses assume a linear relationship between hazard and effect, and vulnerability refers to the biophysical sensitivity of natural habitats to climate change.

Changes in resource availability may affect human populations, especially those that are exposed to climate-related exposure. For instance, several studies have examined the implications of climate change on the prevalence of malaria (Martens et al., 1999; Van Lieshout et al., 2004), water availability (Arnell, 1999), coastal flooding (Nicholls, 2004), food security (Parry et al., 2004), and natural ecosystems and the carbon sink (Levy et al., 2004). The IPCC also evaluates consequences based on biophysical vulnerability to climate change (McMichael, 1994). However, the concept has been criticised for considering humans as passive in the face of global environmental change and fail to recognize their abilities to cope with such risks (Stonich, 2000). Hewitt (2014) stresses that climate change is considered as an issue for society, not of society. By overlooking social vulnerability, impact assessments have been limited by an exclusive emphasis on biophysical vulnerability (Cutter, 1996a).

2.3.1.2 Social vulnerability

Interactionist approaches have been used to analyse society-nature relationships (Vincent, 2004). This approach recognises that physical phenomena are situated within and mediated by their human context (social, political, economic, institutional). Physical events are required for a natural hazard, but their interpretation into climate hazards potential depends on human exposure and human inabilities to resist its harmful effects (Pelling, 2003). Therefore, this broader approach has highlighted the importance of assessing vulnerability when predicting future environmental change impacts; for instance, poor people can live in resilient biophysical environments and still be vulnerable, whereas wealthy people can live in fragile physical environments and be prosperous (Liverman, 1999). Understanding the effects of climate change on human society depends on an appreciation of human factors that determine social adaptation, resistance or vulnerability (Parry & Carter, 1998).

There has been an increase in theoretical and conceptual research on the nature of vulnerability to climate change (Vincent et al., 2010). Social vulnerability is viewed as a potential reality of human societies that can influence how they experience environmental hazards (Adger, 1999; Adger & Kelly, 1999). This shows how economic and social processes interact to affect how

individuals, groups, sectors, regions, and ecosystems respond to socioeconomic and biophysical shocks (Comfort et al., 1999; Leichenko & O'brien, 2002). Bohle et al. (1994) state that those who are most exposed to climate risks and have limited coping abilities and adaptation will be the most vulnerable. Therefore, economic, social, political, environmental, and technological assets determine vulnerability. This depends on the scale of the investigation. Large-scale macro factors will be most significant in influencing the allocation and production of entitlement.

2.3.2 Vulnerability and adaptive capacity: Integrating concepts

2.3.2.1 Conceptualizing vulnerability

In the climate, food security, and natural hazards literature (Eriksen & O'Brien, 2007), vulnerability has been extensively discussed with several theories focusing on external biophysical hazards, political and economic processes, internal social structures, and human-nature relationships (Füssel, 2007b; McLaughlin & Dietz, 2008). Füssel (2007b) points out that engineering and economic risk-hazard approaches focus on the link between the severity of a hazard, damage and biophysical responses. However, such approaches are less well-suited for individuals and communities, whose vulnerability originates in interactions between hazards and socioeconomic determinants (Füssel, 2007b). Within social science and geographical approaches to hazards, natural and social scientific approaches emphasise structural social factors of vulnerability to hazards (Adger, 1998). Hewitt (1983) identifies economic and social structure as a cause of vulnerability instead of being a contributor to hazard mitigation. Poverty and marginalisation translate into vulnerability through reduced coping behaviour and increased stress (Hewitt, 1983). McLaughlin and Dietz (2008) emphasize that examining the effects of class and entitlements has benefited from political economy methodologies. In addition, Kasperson et al. (1995) explore vulnerability as an introduction to assessing 'regions at risk'. Vulnerability is the most common term in studies of social groups and individuals' exposure to environmental change losses (Kasperson et al., 1995). Individuals and communities' environmental vulnerability might change over time depending on their institutions and economies. Existing policies and practises in agriculture, forestry, and marine resource management can increase vulnerability and be maladaptive (Burton, 1997). As a result, an integrated, feminist political ecology approach that considers the interactions within and between people (including both men and women) and environments, as well as broader political economies and key internal and place-based factors, such as agency, capabilities, and

capacity, is argued by some as needed to fill the knowledge gap in these conceptions (MacMahon, 2017).

In the food security literature, famines are explained by entitlement theory (Sen, 1981). In this theory, the allocation and reproduction of entitlements depends on structural elements that induce entitlement failure (Bohle et al., 1994; Watts & Bohle, 1993). For instance, some communities can use their rights to adapt to climate change through awareness and planning, taking out insurance for losses, and diversification of livelihoods. Handmer et al. (1999) point out that communities with robust institutions may also be able to successfully manage a hazard and prevent its biophysical consequences from affecting humans. Locally, human agency significantly determines access to resources and the social standing of households. In this sense, it is vital to examine the procedures for claiming resources (Leach et al., 1999). Socially and spatially diversified entitlements are based on socio-cultural and demographic factors including gender, race, religion, socioeconomic status, and age (Cutter, 1995; F. Denton, 2002). In order to accurately estimate the future societal effects of climate change, it is vital to comprehend the complexities of vulnerability. Biophysical and social vulnerability are related and dynamic, but the relationship is not straightforward because the most vulnerable people may not be in the most exposed locations. The real nature of the potential situation is incorporated in the dynamics that define vulnerability, which can vary with time, place, and scale (Vincent et al., 2010).

Furthermore, Smit and Wandel (2006) indicate that if a system has greater capability, ability, or adaptation to cope with, adapt to, or recover from the effects of climatic variability and its exposure, it will be less vulnerable. This promotes a greater emphasis on building the capacity to adapt to climatic variability as opposed to the hazards themselves (Folke et al., 2002; Fuchs et al., 2011; Adger et al., 2005; Smit & Wandel, 2006).

This thesis is built on the risk assessment framework presented in the IPCC Fifth Assessment Report (AR5) and further developed in the Sixth Assessment Report (AR6), which defines climate risk as arising from the interplay of three analytically distinct components: hazards, exposure, and vulnerability (IPCC, 2014b, 2022). In AR6, risk is characterised as the likelihood of adverse outcomes impacting human or ecological systems, recognising the diversity of values and purposes inherent in those systems (see Table 2.2). These risks emerge from the dynamic interaction between climate-related hazards and the exposure and vulnerability of impacted systems (Ara Begum et al., 2022). This approach is characterised by an explicit division between hazard, exposure, and vulnerability, a distinction that has substantial

conceptual and methodological implications for climate adaptation research. In this composition, each component fulfils a distinct analytical role. Hazards are defined as climate-related physical events, trends, or processes that might cause damage. Exposure denotes the existence of individuals, livelihoods, ecosystems, infrastructure, and social, economic, or cultural assets in areas susceptible to detrimental impacts from hazards (Ara Begum et al., 2022). Vulnerability is characterised as a system's susceptibility to harm, which includes both sensitivity to effects and deficiencies in coping and adaptive capabilities (Ara Begum et al., 2022). Importantly, vulnerability within this approach does not encompass exposure. Rather, it comprises fundamental characteristics that determine the extent of a system's impact following exposure.

The analytical distinction is not merely a terminological issue but is a fundamental logical necessity of risk assessment. As per Preston and Stafford-Smith (2009) and Pelling (2011), vulnerability was characterised as Vulnerability = Exposure + Sensitivity + Adaptive Capacity, allowing for the theoretical possibility of a system demonstrating vulnerability without exposure to a specific hazard. This formulation suggests the contradictory notion that risk may exist even in the absence of individuals, assets, or ecosystems at risk (Ara Begum et al., 2022). In contrast, the IPCC paradigm ensures conceptual consistency by acknowledging that when exposure is zero, risk must also be zero, irrespective of a system's sensitivity or limitations in adaptive capacity (IPCC, 2022). This clarification maintains the internal consistency of risk analysis and aligns risk outcomes with the real world.

The distinction between exposure and vulnerability signifies an important milestone in IPCC conceptualisation. The AR6 report recognises that previous approaches for vulnerability assessment frequently depended on top-down, biophysical viewpoints that either included exposure as part of vulnerability or considered exposure as the principal focus for analysis (Ara Begum et al., 2022). In 2012, the IPCC Special Report on Managing the Risks of Extreme Events and Disasters initiated a significant conceptual evolution, transitioning to a risk-based framework and redefining vulnerability to integrate social and biophysical perspectives (Ara Begum et al., 2022; Cardona et al., 2012; Field, 2012; Lavell et al., 2012). This transition clearly separated exposure from vulnerability while maintaining focus on both contextual, grassroots social processes and climate-induced, top-down dynamics. The outcome structure was established in AR5 and then expanded upon in AR6.

The IPCC acknowledges the variety of approaches in vulnerability assessment and aims to evaluate and unify various viewpoints based on existing data (Ara Begum et al., 2022). For this

thesis, the AR5/AR6 framework is utilised because of its enhanced logical clarity and analytical precision. This framework distinguishes exposure from vulnerability, allowing for a clearer differentiation between adaptation strategies that mitigate exposure (e.g., spatial planning or relocation), those that diminish vulnerability (e.g., enhancing adaptive capacity or social protection), and those that address hazards through mitigation (Ara Begum et al., 2022). Consequently, it offers a more resilient and internally coherent basis for assessing climate change adaptation strategies and their effects on risk mitigation.

Table 2.2 Key concepts in the IPCC sixth assessment report (AR6) risk framework

Concepts	IPCC AR6 Definition	Key Characteristics
Risk	"The potential for adverse consequences for human or ecological systems, recognizing the diversity of values and objectives associated with such systems" (Ara Begum et al., 2022, p. 143).	• Outcomes derived from the dynamic interplay of hazard, exposure, and vulnerability. • May denote both the effects of climate change and the hazards associated with mitigation strategies. • Includes uncertainty, varied values, and disputed priorities. • Comprises high-consequence, low-probability events. • May cascade across sectors and regions.
Hazard	Climate-related physical events, trends, or impacts that may cause adverse effects (Ara Begum et al., 2022).	• May be classified as acute (extreme events) or chronic (slow-onset changes) • Defined by Global Warming Levels and emission scenarios • Physical climate events occurring without human involvement • Employs the term "Climatic Impact Driver"
Exposure	"The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected" (Ara Begum et al., 2022, p. 133).	• Distinct from vulnerability (crucial differentiation) • May be spatial or temporal • Dynamic rather than static • Can be delineated geographically or via interconnections • When exposure is zero, risk is also zero, irrespective of vulnerability.
Vulnerability	"The propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements,	• Excludes exposure

	including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (Ara Begum et al., 2022, p. 133).	• Consists of sensitivity, insufficient coping capacity, and inadequate adaptive capacity • Varies both within and among communities • Variations throughout time • Element of risk and independent analytical emphasis • Highlights varying effects influenced by gender, race, socioeconomic background, and social hierarchy.
Sensitivity	Susceptibility to harm (component of vulnerability; sensitivity without exposure does not create risk) (Ara Begum et al., 2022).	• Extent to which a system is influenced by climate-related events • Physical susceptibility to harm • Intrinsic attributes that determine the extent of impact • Applicable to individuals, ecosystems, infrastructure, and economic systems.
Adaptive Capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (implicit within vulnerability definition as "lack of capacity to adapt") (Ara Begum et al., 2022).	• Facilitates adaptation to real or anticipated climatic conditions and their impacts • Can mitigate harm or capitalise on advantageous opportunities •Encompasses resources, institutions, knowledge, and technology • Varies at different scales (individual, community, national) • Pertaining to development and governance • Lack of capacity to adapt constitutes a facet of vulnerability.
Coping Capacity	The ability to respond to and manage acute impacts (Ara Begum et al., 2022).	• Capacity for immediate response • Prompt administration of climate effects • Differentiated from prolonged adaptive capacity • Frequently reliant on resources • May be diminished by successive shocks.

The vulnerability of areas, nations, communities, and individuals to climate change varies. Due to its heightened vulnerability to global warming, the Arctic, for instance, is extremely susceptible to climate unpredictability (IPCC, 2007; R. Mearns & A. L. Norton, 2009). Due to its expanding population and placement in flood-prone areas, the Asian mega-delta is severely impacted (R. Mearns & A. L. Norton, 2009). Sub-Saharan African nations are extremely vulnerable to climate change (Brooks et al., 2005). In addition, developing nations are more

vulnerable to the impacts of climate change because they have fewer resources to respond (IPCC, 2007).

Vulnerability to climate change also differs within a country. The rural population, with generally limited access to resources and information relative to metropolitan areas, can be severely affected by climate risks (Steenwerth et al., 2014). Different households are also affected differently by climate variability. Heltberg et al. (2008) report that poor households are disproportionately affected by climate variability due to their insufficient resources and poor management skills. Children, women, the elderly, and those with disabilities are highly vulnerable to climate change due to their health or social status (Demetriades & Esplen, 2010b; Heltberg et al., 2008). Good adaptation strategies are required to reduce the vulnerability to climate change (Nong, 2020). I argue that good adaptation is equivalent to equitable adaptation (Pelling & Garschagen, 2019; van den Berg, 2021). Social vulnerability as a prioritising factor may not result in the most efficient utilisation of scarce resources (van den Berg, 2021). Pelling and Garschagen (2019) argue that equitable adaptation is not just a moral obligation, but also beneficial to economic productivity, social cohesion, health, and peace. The conceptualization of adaptation will be covered in the subsequent section.

2.3.2.2 Conceptualizing adaptation and adaptive capacity

Adaptation

It is increasingly recognised that anthropogenic climate change is stressing socio-ecological systems (Bardsley, 2014). A number of well-documented studies on the significance of societal reactions to climate change (Adger, H. Eakin, et al., 2009; Chornesky et al., 2015; IPCC, 2014b; Wilby & Dessai, 2010) have led scholars to discuss whether adaptation should be regarded as a unique field of study (Massey et al., 2014; Massey & Huitema, 2015; Patt, 2013; Swart et al., 2014). Hence, several definitions of adaptation exist. The AR6 IPCC defines adaptation as "In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate" (Ara Begum et al., 2022, p. 134). Smit et al. (2000, p. 225) define adaptation as "adjustments in ecological-social-economic systems in response to actual or expected climatic stimuli, their effects or impacts". Pielke Jr (1998, p. 159) defines adaptation as "adjustments in individual, group, and institutional behaviour in order to reduce society's vulnerabilities to climate".

Until recently, adaptation research has primarily been on the development of conceptual frameworks, processes, methods, and typologies (Füssel, 2007a; Simpson et al., 2008; Smit & Skinner, 2002; Wise et al., 2014). For instance, geography researchers have investigated how adaptation can be facilitated across scales (Juhola & Westerhoff, 2011; Adger et al., 2005; Urwin & Jordan, 2008), while others explore what different forms of adaptation, such as behavioural, technological, or governance measures can take to address climate change (Aldrich et al., 2015; Huitema et al., 2016; Klein et al., 2001; Termeer et al., 2012). In addition, some scholars (e.g. Adger et al. (2009); Hamin and Gurran (2009)) have discussed adaptation both as an outcome and as an ongoing process, while others (e.g. Clément and Rivera (2016); Smit et al. (2000); Armitage and Plummer (2010); Rickards and Howden (2012)) have examined the relative merits of proactive versus reactive adaptation approaches. These studies have served to shape how adaptation is understood and what it entails, providing insights on how to support it. The scale, scope and intensity of adaptation have been the focus of contemporary discussions (Kates et al., 2012; Termeer et al., 2016), highlighting that adaptation is categorised as either incremental or transformative change.

Transformative adaptation extends beyond incremental measures that aim to preserve system functioning under changing conditions. Rather than stabilising existing structures, it entails fundamental reorganisation of social, institutional, and ecological relationships. Despite growing recognition of its necessity, the majority of adaptation efforts remain incremental and constrained in scope (Park et al., 2012). Due to the profound interconnection between social and environmental systems, significant adaptation frequently necessitates structural transformation; however, such shifts are rarely realised in practice (Eakin & Patt, 2011).

Adaptive capacity

Several scholars write that adaptive capacity links to adaptation (Adger & Vincent, 2005; Pelling, 2011; Plummer, 2013; Smit & Pilifosova, 2003; Smit & Wandel, 2006). Adaptive capacity is “the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” (Ara Begum et al., 2022, p. 133). It represents the capacity of a system to use natural, financial, institutional or human resources to cope or adapt to climate variability and change, among other livelihood stresses through capabilities, resources and institutions (Brooks & Adger, 2004; Smit et al., 2000). Adaptive capacity depends on a society’s ability to act collectively and resolve conflicts among social actors (Adger et al., 2005; Brooks & Adger, 2004). This is consistent with the viewpoint of Lebel et al. (2010a: 135) who argue that building adaptive

capacity needs critical attention to "existing institutions, knowledge, and capacity within and outside government".

Adaptive capacity is referred to as 'social ingenuity' – the ability to respond to intersecting climate-related, environmental and socio-economic changes (Homer-Dixon, 2010). Key characteristics within adaptive capacity are broad, however a wide body of literature draws attention to the ways in which social, political and institutional categories intersect to influence people's capacities and entitlements. Adaptive capacities vary between individuals, households, communities, countries and regions (O'Brien et al., 2004). Adaptive capacity is often influenced by factors such as gender, culture and ethnicity (Ensor & Berger, 2009; Kelly & Adger, 2000; Nielsen & Reenberg, 2010). I argue in line with (Adger, 2001; Adger & Kelly, 1999; Nielsen & Reenberg, 2010; Rahman & Alam, 2016a) that focusing on issues of poverty, gender inequality, cultural pluralism, knowledge, and institutional settings would enhance adaptation research.

Poverty is a severe lack of well-being that encompasses multiple dimensions. It consists of poor incomes and the inability to obtain the essential commodities and services required for a decent existence (World Bank 2015). Foster (1998) notes that there is a distinction between absolute and relative poverty. Absolute poverty describes a state marked by a severe lack of fundamental human necessities, encompassing food, water for drinking, sanitation, healthcare, housing, education, and information. It is contingent not alone upon income but also on access to services (United Nation 1995). A relative poverty threshold starts with a concept of the population's level of living, including the mean, median, or another quantile (Foster, 1998). In this sense, relative poverty is a failure of distributive fairness, while absolute poverty is a failure to meet human rights (Eskelinen, 2011). From these standpoints, poverty can be conceptualised as insufficient resources, and lack of entitlements and capabilities (Adger & Kelly, 1999). Sen (1999) and Alexander (2016) established the concept of capacities and entitlements from the premise that development is about achieving agency and dignity. Sen (1999, p. 18) argues we should focus on free agency and the capacity of people to experience social, political, and economic freedoms. This encompasses political and material rights (Alexander, 2016). People's access, entitlements, and capabilities can be restricted by environmental changes and hazards, and are cross-cut by gender, income inequality, class, race and ethnicity (Sultana, 2011). Poverty makes people more vulnerable to climate change, and climate change may exacerbate poverty (Leichenko & Silva, 2014).

Regarding adaptive capacity, poverty hinders people's ability to invest in mitigating risks and exploiting opportunities, while also increasing their sensitivity. According to Leichenko and Silva (2014), the connection between poverty and adaptive capacity indicates that poor people have fewer resources to adapt. They emphasise the risks that poorly managed adaptation poses to poor communities and how neo-classical approaches to reducing poverty (such as the privatisation of agriculture) might exacerbate climatic changes (Leichenko & Silva, 2014). Many scholars (e.g. Hafiza and Neelormi (2015); Adger (2003b); Tompkins and Adger (2004)) argue that inequality impairs collective action. Collective action and social capital, referring to the interdependence of community members, institutions, and ecosystems, are essential for adaptation and natural resource management. As Tompkins and Adger (2004) argue, there is no uniform correlation between poverty and vulnerability, while poverty can cause vulnerability and climate change can exacerbate it. Lack of access and capabilities, restricted diversification alternatives, failed development policies, environmental degradation, and negative effects of capitalism and globalisation are to fault (Leichenko & Silva, 2014). Tschakert (2016, p. 18) notes that "the poor are not equally impoverished" and that underlying issues must be understood for just adaptation. Instead of focusing on poverty and impoverished people, Tschakert (2016) suggests that focusing on the mechanisms that render people vulnerable, including institutional relations and political settings.

Gender inequality shapes adaptive capacity and increases vulnerability for marginalised individuals and groups. Gender, as a category of socio-political power, influences people's entitlements and capacities in diverse contexts. Nussbaum (2002, p. 123) explains that "unequal social and political circumstances give women unequal human capabilities", and when poverty mixes with gender inequality, central human capabilities fail severely. For instance, women's entitlements in Bangladesh are entrenched in gender, class, and family relationships (Kabeer, 2011). Access to land, education, and paid employment can be unequal for poor women in rural areas. The risk of death for poor women can increase after natural hazards (Tschakert, 2016). Like women, men suffer distinct climate change-related hazards. Alston and Kent (2008) highlight the mental health consequences suffered by male farmers in drought-affected regions of Australia, illustrating how hegemonic masculinity shapes men's identity. In the next section, I use feminist political ecology to explain how gender associated with poverty, geography, and livelihoods can affect the vulnerability and adaptive capacity of individuals and communities.

Knowledge is as a crucial aspect of adaptive capacity. This covers both knowledge accessibility and the institutional contexts that value and share local knowledge. According to Akter and

Mallick (2013), hazard assessment is a crucial aspect of adaptive capacity. For instance, cyclone-affected populations in Khulna lack a comprehensive understanding of climate change, and their indigenous knowledge systems are incapable of forecasting the scale of the hazard (Alam et al., 2015). Brooks et al. (2005) assert that literacy is a crucial factor in establishing adaptive ability, emphasising that literate communities are better prepared to participate in political processes to pursue their rights and government responsibilities. This is further supported by Rahman and Alam (2016b), who argue that local knowledge must be incorporated into adaptation measures to improve the capacity of community for decision-making. Studies on gender, development, and climate change have also highlighted the importance of incorporating women's knowledge into adaptation processes, policy, and decision-making, emphasising the distinct knowledge and abilities formed in gendered roles and responsibilities and the significance of perceived fairness (Oakley & Momsen, 2007). As a result, knowledge is an essential aspect for adaptive capacity, both in terms of communities possessing knowledge and their knowledge being incorporated into broader systems.

In short, the concept of adaptive capacity provides a valuable perspective on individual and community responses to climate change, although it is insufficient without a critical examination of the power dynamics within social systems that create unequal vulnerabilities (McLaughlin, 2011). Feminist political ecology provides a vital expansion of climate adaptation scholarship by elucidating how socio-political disparities, particularly associated with gender, are ingrained in daily environmental governance and adaptation practices (Rocheleau et al., 1996). Therefore, integrating feminist political ecology with the concept of adaptive capacity enables a more nuanced, relational, and justice-oriented climate adaptation knowledge (Bee, 2013; Tschakert, 2012). It highlights how gendered power dynamics are a fundamental to, rather than merely resulting from, adaptation processes.

2.4 Feminist political ecology and gendered dimensions of vulnerability and adaptation

2.4.1 Feminist political ecology

This section develops a feminist political ecology framework for understanding climate hazards in order to elaborate on the connection between climate change, vulnerability, adaptation and gender. Environmental sociology, development, and political ecology have all pointed out environmental injustice and the growing vulnerability of politically and economically marginalised communities and emerging economies due to poverty, a lack of social safety nets, and a heavy reliance on natural resources (Buckingham & Kulcur, 2009; Thomas & Twyman, 2005). Political ecology studies examine how social power relations influence and interact with

natural resources (Truelove, 2011b), as well as the political-environmental interface (Forsyth, 2001).

In the 1970s, political ecology emerged as a branch of geography and environmental sociology, attempting to draw on structural Marxist perspectives that connect environmental damage to factors of production, capitalism, class structures, and marginalisation (Forsyth, 2008), at both local and global scales (Biersack, 2006), emphasising how marginality is formed through global material relations (Robbins, 2019). Watts (2015) claims that political ecology used accumulation regimes to explain how resources, ecosystems, and disturbances could be managed and governed. In reaction to the emergence of post-structuralism, political ecology has undergone a 're-materialisation' addressing embodiment, agency, and the ways in which social processes are rooted in ecosystems and socio-ecological relationships (Bakker & Bridge, 2006). Political ecology perspectives allow for the examination of social elements in vulnerability and adaptation (Stonich, 2000; Vincent, 2004). Because of differential resource entitlements, social vulnerability to climate change varies at the local level, despite the fact that biophysical vulnerability or exposure is the same (Vincent et al., 2010). Similarly, the capacity to cope with or adapt to climate change depends on multiple rights (Eriksen et al., 2005). These rights vary based on socioeconomic and demographic factors such as class, race and gender (Pelling & High, 2005b). This present study demonstrates that vulnerability is not a purely natural phenomenon; rather, biophysical risks and changes intersect with social, economic, cultural, and political power relations, including gender, to shape people's perceptions, experiences and responses to environmental changes (Adger, 2003b; Ribot, 2010).

Scholars in gender and development studies and feminist political ecology have emphasised the role of gender in shaping and intensifying vulnerability to environmental change (Cannon, 2002; Demetriades & Esplen, 2010b). Incorporating intersectional studies that address gender, class, and ethnicity, the discipline of political ecology has evolved, focusing primarily on class as a key indicator (Hanson & Buechler, 2015). Moreover, feminist political ecology attempts to interpret gendered differences by focusing on social configurations of labour, access to resources and spaces, decision making, and capabilities (Hanson & Buechler, 2015). Dankelman (2002) and MacGregor (2010) reveal that poverty, gendered divisions of labour, and varying access to resources may devalue women's employment and expose them to environmental hazards, hence increasing their vulnerability. One example that has gained a considerable amount of attention is access to land and security of tenure (Agarwal, 1994a). The gender gap in property ownership and control is a major contributor to economic well-being,

social standing, and empowerment (Agarwal, 1994b). Agarwal (2003) further explains that women gain access to land through the state, their families, or the marketplace. Each of these factors plays a different role in different places. In South Asia, for example, land is a private asset that is usually passed down through the male line. In this sense, the market also plays a role because a great deal of agricultural land is privately-owned. In Africa, the family plays a crucial important role because the land is held communally and permission to use it is provided by traditional leaders to the heads of households (Scholtz & Gomez, 2004). Community and kinship customs inhibit women from inheriting natal property in Asia, where the concept of the male head of family is deeply rooted (Rao, 2011). In South East Asia, land is a private asset that is passed down through customary inheritance systems (Rao, 2011). In communist or socialist countries, such as Vietnam, land belongs to the state, but local village committees offer households the right to use it (Rao, 2011).

Feminist political ecologists argue that "not all women are equally vulnerable" (Sultana, 2014, p. 6). Lahiri-Dutt (2012) notes that the human-environment relationship is not gender-neutral. For example, rural women in developing nations interact more with their local resources and are more impacted by the loss of these resources than men. Rather, vulnerability originates from power relations (Arora-Jonsson, 2011) and is associated with class, ethnicity, age, education, and religion (Harris, 2009; Nightingale, 2011; Sultana, 2014). Recently, these concepts have been employed to understand the role of gender in climate change processes (Dankelman, 2002). Gender, class and geography have become key drivers of these uneven impacts and outcomes of climate change (Sultana, 2014). MacGregor (2009) and Ribot (2010) emphasize that climate change consequences are not gender-neutral, but rather have gender-specific causes and effects.

In this thesis, gender refers to the socially formed notions of masculinity and femininity that characterize men and women (Momsen, 2009; Vincent et al., 2012). This is based on feminist political ecology and development theory. MacGregor (2010) asserts that gender is not a synonym for women, but rather dominant concepts of masculinity and femininity. Nightingale (2011) indicates that gendered bodies are a result of power in socio-natural connections, and bodies are linked to their material environments and spaces. This produces social differences and changes ecological systems. Once gender is recognised as a social construct, and is neither fixed nor binary, gender roles and relationships can be seen as dynamic and context-specific (Dankelman, 2010), fluctuating based on historical and political events (Momsen, 2009).

Historically, feminist political ecology mainly focused on analysing inequality and injustice (Chandra et al., 2017; Elmhirst, 2015; Massé et al., 2021). However, the discipline is progressively identifying alternatives to neoliberalism and the inequalities and unsustainable socio-natures that these pathways frequently produce (Harris, 2015). This research contributes to the feminist political ecology approach by not only examining the representations of gendered power relations, but also the extent and mechanisms of transformation and transformative adaptation. Hanson and Buechler (2015) write that environmental justice approaches have strengthened the connections between feminist political ecological studies and their economic and political implications. Gendered identities can be restructured as a result of changing environmental, social, and political contexts (Sultana, 2009). Sultana (2009) notes that everyday environmental practises, such as divisions of labour, norms and rights related water, land, and food, and access to gendered places, are crucial to the construction, production, and contestation of gendered subjectivities and identities. The empirical study of the transformation of socio-ecological systems under past and present forms of neoliberalisation, and how these shifts affect local and regional political ecologies as well as gender relations within agricultural households in the context of climate change, constitutes one of the central contributions of this thesis.

2.4.2 Gendered dimensions of vulnerability and adaptation

2.4.2.1 Gender, climate change and vulnerability: Global studies and its critiques

This section focuses on the growing amount of international research on how gender and climate change are intertwined and how this connection enables us to comprehend social (gendered) vulnerability, which is one of the most important variables for the future pathways of adaptive capacity and (transformative) adaptation (Patwardhan et al., 2007; Thomas et al., 2019). Social vulnerability is defined as the exposure to stress due to the influence of three dimensions: exposure, sensitivity and adaptive capacity. Several scholars argue that understanding human vulnerability facilitates the examination of adaptation decisions and actions (Atteridge & Remling, 2017; Bankoff, 2019; Cannon & Müller-Mahn, 2010; Curtis & Oven, 2012; Lei et al., 2013). From these standpoints, it is crucial to investigate how gender and (formal and informal) institutions and social structures influence climate change vulnerability (Dankelman, 2002; Enarson & Meyreles, 2004a; Enarson, 2012; MacGregor, 2010). A considerable amount of feminist and climate change literature now analyse the uneven effects of climate change, in which gender and class inequalities exacerbate vulnerability to climate-induced changes and disasters (Enarson & Meyreles, 2004b; Sultana, 2011). Inequality

influences adaptation to climate change; therefore, it should be addressed in the adaptation design, implementation, and evaluation; otherwise, interventions may be ineffective or worsen human vulnerability (Ireland & McKinnon, 2013; Schipper et al., 2020; Shackleton et al., 2015b).

According to Enarson and Meyreles (2004b), women are more vulnerable to climate change and natural catastrophes. Key discourses of women's challenges to climate change include (i) the challenges women face during the process of slow-onset changes; (ii) the issues that women face in the post-disaster period; (iii) the immediate danger to women's lives in times of natural hazards; and (iv) the challenges that women confront in their coping and adapting processes. Fisher (2010) and Egert (2014) reveal that women are more vulnerable because of persistent gendered power relations that existed prior to environmental shifts. In this sense, the literature identifies crucial characteristics that increase women's vulnerability. First, women's roles and responsibilities expose them to environmental changes; second, poverty inhibits women's ability to adapt; third, political and social exclusion limits women's voice in decision-making processes; and finally, gendered displays of masculinity place women at risk of violence and marginalisation (Egert, 2014; Enarson, 2012; Fisher, 2010).

In post-disaster events, women reportedly experience distinct and significant challenges, in terms of household and care responsibilities (Enarson, 2012). In such cases, Egert (2014) and WHO (2002) find that women's responsibilities and burdens rise when their husbands die, are injured, migrate, or flee. In the aftermath of natural hazards, women must exert more effort to secure natural resources, such as water, for household use, resulting in an increase in their workloads (Dankelman et al., 2008; Habiba et al., 2014). In addition, economic stress may expose women to insecure employment options, such as prostitution (Wiest et al., 1994). As a result of environmental changes resulting from natural hazards or slow-onset alterations, women also experience a variety of adverse health effects. Khan et al. (2011) conducted research on issues of saline intrusion into drinking water sources caused by climate change–induced sea-level rise in coastal regions of Bangladesh. Khan et al. (2011) discovered that women who drink or bathe in salt water during pregnancy are vulnerable to water-borne diseases, which have detrimental consequences for both mothers and children. Buechler (2009) discusses the challenges of men's migration, such as loss of livelihoods, restriction and loss of access to productive resources (e.g. land) to adapt to climate change. During extreme weather events, for instance, males in rural Vietnam tend to migrate to metropolitan regions, while women stay at home and assume responsibility for crop production and food security, as well

as caring for children and the elderly (UN Women 2021a). This demonstrates the fact that traditional norms and practises influence gendered experiences during and after disasters.

According to Egert (2014), women experience substantially higher mortality rates and risks of sexual assault and violence in regard to urgent threats to their lives and safety. By analysing 141 countries from 1981 to 2002, Neumayer and Plümper (2007) demonstrate that more women than men die in natural hazards. They further explain that natural catastrophes could narrow the gender difference in life expectancy since female life expectancy is higher than that of males (Neumayer & Plümper, 2007). Moreover, Habiba et al. (2014) indicate that women and children in some cases wait for their husbands' return before determining whether to flee during disasters. However, Arora-Jonsson (2011) emphasizes that these death rates must be studied in terms of class intersections, as they disproportionately affect rural poor women. Enarson (2000) discovered that low income, male violence, and the need for prenatal care make women more vulnerable and cause gender-specific crisis situations before, during, and after a natural hazard (Fordham, 2012; True, 2013). A case study of a fishing community (Long Lanh village) in central coastal Vietnam demonstrates that fishing as a source of income is associated with masculinity characteristics which not only inform daily life but also influence how various types of crises, including violence, emerge prior to, during, and after a storm (Rydström, 2019). Poverty and social dislocation set the stage for violence, which increases women's vulnerability to climate-related hazards (Fisher, 2010).

Carr and Thompson (2014) outline fundamental criticisms of several studies on gender, climate, and adaptation. First, a significant portion of the research explored gender as a binary concept, neglecting contemporary feminist theory and the interconnections of gender with other social characteristics. Second, these studies do not adequately address how gender relations will be transformed and renegotiated in response to changing environmental conditions (Carr & Thompson, 2014). Alston and Whittenbury (2012a) argue that environmental changes are driving a renegotiation of gender relations in agricultural settings, with women engaged in greater non-farm jobs. These findings are consistent with feminist ecological theories that view gender as a negotiating process between individuals, communities, and environments.

Furthermore, exploring how the interaction between gendered norms and changes in the environment affects both men and women enables a thorough understanding of the gendered implications of climate change (MacMahon, 2017). Using droughts as an example, Alston (2013) demonstrates that Australian male and female farmers are differently impacted by

drought, highlighting that men were vulnerable to mental illness and social isolation, whereas women were overloaded with on-farm, off-farm, and community responsibilities. Alston and Kent (2008) employ the concept of hegemonic masculinity to explain mental health issues among male Australian farmers facing drought. In this sense, both men and women experience larger burdens as a result of severe droughts, which challenges men's identities as farmers and increases to a sense of helplessness (Alston & Kent, 2008).

It is vital to challenge the presumption that being a woman makes one vulnerable, which requires a comprehensive review of how gender relations operate at the local level. Much of the research has documented unreflective images of women as vulnerable, based on uncritical claims regarding the relationships between women, poverty, and vulnerability (Arora-Jonsson, 2011). Arora-Jonsson further argues that there is a need to differentiate between being poor and being a woman, or the commonly accepted assumption that "all women are poor and the poor are always more vulnerable" (Arora-Jonsson, 2011, p. 746).

For a holistic understanding of gender relations, the intersections with other crucial social identities, such as class and intra-household, must also be considered. This viewpoint deconstructs static narratives and discourses of gender relations and concepts of women as a single category (Allen & Sachs, 2012a). Current theories of gender and identity in the broader social science literature view gender as a social categorisation whose significance is derived from its interaction with other identities, roles, and obligations including age, income and ethnicity (Carr & Thompson, 2014). Allen and Sachs (2012b, p. 4) elaborate on this by stating that "intersections of gender, race, ethnicity, and class define who accomplishes what in food systems and under what conditions". Furthermore, feminist political ecology approaches have emphasised that vulnerability must be examined in the context of other power relationships and the ways that gender intersects with class, age, race, caste, education, and religion (Arora-Jonsson, 2011; Nightingale, 2011; Sultana, 2014). In Vietnam, for instance, this viewpoint is congruent with the concept of the feminisation of agriculture, which has been adopted by poor women who remain in rural areas while men seek employment in the textiles industry (De Schutter, 2013; Sachs, 2019; Vinh, 1996). These intersections shed light on how gender appears and relates with other key social identities, geographies, and environments, as well as their influence on transformation processes.

A feminist political ecology viewpoint emphasises that gendered vulnerability to climate change is influenced by power dynamics, social systems, and institutional exclusions that overlap with class, ethnicity, age, and other social identities. The heightened vulnerability of

women stems from duties and responsibilities that subject them to environmental changes, poverty that obstructs adaptation, political and social exclusion from decision-making processes, and gendered norms that sustain violence and marginalisation. Feminist political ecology emphasises that vulnerability should be analysed via the intersections of power and identity, illustrating how livelihood activities and adaptation strategies reshape gender norms and inequities amid environmental change (Tschakert, 2016).

2.4.2.2 Gender and adaptation: Existing studies in Global, South and Southeast Asia

A significant portion of the literature on gender and climate change examines the role of gender in adaptation and the position of women in the context of environmental change. Alston (2014b) and UNEP (2011) argue that more emphasis should be placed on women as custodians of local knowledge and change agents. For instance, UNEP (2011) identified women as the frontline of climate change, crucial to adaptation due to their increased vulnerability, as well as their knowledge, experience, and agency regarding natural resources. This considers structural challenges, women's empowerment, and access to resources and opportunities, as well as the gender-specific effects of climate change, and attempts to assist women in achieving their fundamental rights.

However, this emphasis on women's responsibility for development processes has also been criticised. According to Leach (1992b), women's tasks are commonly assumed to be restricted to domestic caregiving, with little consideration for the diversity of their labour and the meanings encoded in specific positions. The position of women as natural resource managers assumes that they would be capable and willing to take on more environmental responsibilities (Leach, 1995). This viewpoint is related to critiques of ecofeminism and women and development discourses that describe women as intrinsically more linked to nature and ecologically sustainable (Arora-Jonsson, 2011; Bridenthal & Koonz, 1977; Merchant, 1980). Dineen and Le (2015), examining the feminist empowerment paradigm in which women participate in the microfinance programs in Vietnam, argue that women have been targeted for participation in microfinance on the premise that they are better prepared to assist their families and escape poverty. However, the empowerment of Vietnamese women outside the home results in decreased leisure time and increased social, economic, and family responsibilities (Dineen & Le, 2015). This signifies the need to investigate structural issues with regards to the gendered division of labour (Wilson, 2015). Moreover, women have been highlighted as the target for increased participation in environmental and climate change projects, which may have unexpected implications such as increasing women's burdens or prolonging existing

power relationships (Arora-Jonsson, 2011). Women's active participation remains constrained by gendered divisions of labour, public attitudes, and specific gender and class power dynamics (Agarwal, 2001; Sultana, 2009).

The issue of presenting women as 'vulnerable and virtuous' has been raised as a result of a further critique of the assumption that women are considered as agents of adaptation in mitigating climate change (Arora-Jonsson, 2011). Moreover, Arora-Jonsson (2011) and Resurrección (2013) have critiqued how fixed ideas of gender and vulnerability have portrayed women as victims of environmental change, while also positioning women as change agents. These approaches challenge the reasons why some people are vulnerable, how gender is produced and perpetuated, the power of organizations and institutions, as well as the intersection of gender, class, poverty, and environment (Arora-Jonsson, 2011). Resurrección (2013) argues that an investigation of the key factors of gendered vulnerability may be more beneficial than focusing solely on women's participation, with responses tailored to context-specific drivers and practises that contribute to the marginalisation of women and other marginalized communities. Agarwal (2001) suggests that tackling women's exclusion from climate adaptation measures requires an examination of women's participation as well as their interactivity and engagement in local processes. In response to these criticisms, the capacity of adaptation attempts to address these underlying issues must be considered. Much of the literature emphasises the gendered inequities in adaptation, development, and policy implementation processes (Sultana, 2014).

There is an increasing body of literature on the gendered nature of vulnerability to climate change in Vietnam, but very little study on the gendered nature of transformative adaptation in Vietnam, particularly in the Mekong Delta. Due to male migration in the North and Central areas of Vietnam, for example, women undertake hitherto traditionally male farm responsibilities as primary income earners (Pham et al., 2016; Ylipaa et al., 2019); and female household-heads face increased workloads as a result of taking on both farm work and domestic chores in the Southern Vietnam, particularly Mekong Delta (Dasgupta, 2019). Working in the Mekong Delta of Vietnam, Tran (2019) discovered evidence of migration and shifting livelihoods as a result of the extensive use of agricultural mechanisation. Another case study conducted by Ylipaa et al. (2019) in the Red River Delta of Northern Vietnam reveals forced migration as a result of climate hazards such as floods and storms. Eventually, climate hazards in Vietnam could lead to temporary seasonal migration and permanent displacement (UN Women 2021a). The literature has focused on male migration as a result of climate change,

resulting in the assumption that women are commonly left behind, implying that women experience increased workloads, debt, hunger, and sexual harassment due to the absence of their spouses (Etzold et al., 2013; Saha, 2014). Rashid (2013) discovered that women are likely to preserve traditional norms regarding the obligations placed upon them when their husbands move away, but others have claimed that female household heads may have higher mobility and more employment opportunities (Kabeer et al., 2011).

Furthermore, MacMahon (2017) claims that empirical study has investigated how existing cultural norms and practises determine adaptation efforts. Adger et al. (2009) investigate how perceptions of risk, knowledge, ethics, and culture restrict the adaptive capacity of communities. The study of Carr (2008a) in Ghana demonstrates that the link between adaptations and existing gender norms contributes to legitimise adaptations while reinforcing gendered roles. Carr (2008b) reported that diverse agricultural projects in Ghana, where women had less land despite being more productive farmers, were able to continue because they utilised existing gender norms. As a result, adaptation evolves as responses to climate risks that take shape under locally particular contexts of uncertainty (Carr, 2008a). Bee (2013) employs feminist standpoint theory to emphasise the role of women's agency in climate adaptation. Despite women's knowledge of agriculture, adaptation, and the environment in Mexico, Bee (2013) observed that gendered differential access to essential resources, such as land and decision-making, impeded their capacity to place this knowledge into practise. Similar views are expressed by Oxfam and UN Vietnam (2009), who point out that the National Target Programme to Respond to Climate Change in Vietnam does not account for the diverse roles, responsibilities, and decision-making capabilities of men and women in mitigating and adapting to climate change, stressing that sufficient knowledge of how climate change affects gender is required. Bhattarai et al. (2015) discovered evidence that NGOs in Nepal supported existing gender roles, such as assisting males with cash crops production. In Bangladesh's Northwest Wetlands, Choudhury et al. (2016) analysed the social and cultural factors that inhibit women's participation in natural resource management programmes. These findings conclude that women self-excluded themselves from community participatory platforms due to their social position, established societal structures, and perceptions concerning women's capability, knowledge, and desirability. As a result, it is not sufficient to simply create spaces where women can engage in. Instead, investigating gender roles and their relationships to environmental changes at the individual, household, and community levels promotes gender equality and women's empowerment (Choudhury et al., 2016; Oxfam & UN

Vietnam 2009). Djoudi and Brockhaus (2011) found that adaptation efforts had both beneficial and adverse impact on gender. For instance, more women in Mali are undertaking forest-related activities that were traditionally performed by men, yet this has not translated in more rights for women and has increased their burdens. The fact that more forest-related jobs are held by women, however, suggests that they have potential to diversify their livelihoods, making them less vulnerable to climate change (Djoudi & Brockhaus, 2011).

These studies indicate that adaptation is grounded in social, economic, political, and environmental contexts and developmental processes (Wise et al., 2014). Factors including social values, beliefs, and power institutions can impede adaptation and influence perceptions of risk (Adger et al., 2009), particularly when changes challenge existing power relations and resource distribution (Shackleton et al., 2015b). Pelling (2011) states that when existing social relationships constitute a significant cause of vulnerability and a goal of adaptation, it will be difficult to implement change. These settings are described as "historical determinism, path dependence, and lock-in" (Wise et al., 2014, p. 332), implying that the future is challenging to alter and relies excessively on the past. Nightingale (2011) states that inequalities are continually altering and can be reinterpreted, but also unexpectedly resistant to substantial restructuring. Her main thesis focuses on examining the term "resilient contestations", which describes how inequalities are perpetuated and how resistance might further establish subjectivities as opposed to eliminating them (Nightingale, 2011). In this sense, a case study of changing gendered roles and household relations in the Murray-Darling Basin area of Australia conducted by Alston and Whittenbury (2012a), indicates that adaptations are not simple revisions to changing material situations, but rather complex renegotiations of gender relations that must account for both changing agricultural society and existing gendered expectations.

From a feminist political ecology standpoint, the literature attempts simplistic narratives that depict women as either intrinsically vulnerable or fundamentally powerful agents of climate change. Although women are frequently shown as resource managers and guardians of local knowledge (UNEP, 2011; CARE, 2010), these perspectives may inadvertently perpetuate gender stereotypes and neglect persistent disparities (Leach, 1992a; Arora-Jonsson, 2011). The research challenges that environmental and adaptation programmes may disproportionately burden women by augmenting their obligations without rectifying fundamental power disparities (Dineen & Le, 2015; Sultana, 2009). Gendered vulnerability intersects with class, poverty, and institutions, whereas women's involvement in adaptation is hindered by labour

divides, societal norms, and restricted access to resources (Agarwal, 2001; Choudhury et al., 2016). In Vietnam, male migration associated with climate-induced changes has exacerbated women's households and agricultural responsibilities (Pham et al., 2016; Dasgupta, 2019), yet their agency is influenced and limited by established gender norms (Tran, 2019; UN Women 2021). Prior research indicates that adaptation strategies frequently perpetuate gender norms, hence reinforcing rather than altering existing disparities (Carr, 2008a; Bee, 2013). The literature advocates for a critical examination of the production, negotiation, and institutionalisation of gender in adaptation, rather than assuming that women's participation is intrinsically powerful (Resurrección, 2013; Nightingale, 2011). Adaptation processes must examine historically entrenched power structures and consider the complexity of social identity, labour, and governance that influence varied vulnerabilities and adaptive capacities.

2.4.2.3 Climate resilience and feminist approaches

The concept of resilience has been widely applied across multiple disciplines. In his seminal work, Holling (1973) distinguished between different understandings of system stability, noting that perspectives on stability depend on the properties of the system under consideration. He further argued that resilience reflects the tension between constancy and change, and between certainty and uncertainty. Holling (1973) defined resilience as the capacity of a system to absorb disturbances, including changes in state variables and driving forces, while maintaining its essential structure and function. Environmental scientists have contributed to our understanding of the concept of 'system' that may be a social group, a household, a community, a region, an economic sector, or an ecological system (Adger, 2000; Brooks, 2003). The common definition of resilience is also documented in the ecological system that exists to the equilibrium. In this context, resilience is described as a stable system only if all variables return to the equilibrium following a perturbation (O'Neill et al., 1986; Pimm, 1984). From ecological perspectives, Folke (2006, p. 259) defines resilience as "the opportunity that disturbance creates for the recombination of evolved structures and processes, the renewal of the system, and the formation of new paths". Disturbances within systems have the potential to create opportunities for change when control shifts from one variable to another, hence changing relationship dynamics and the capacity to influence or trigger transformation (Folke, 2006). Holling's (1973) definition, which has served as the cornerstone for the resilience perspective of social–ecological systems, is consistent with the dynamics of complex adaptive systems.

There has been a broader definition of resilience in the context of natural hazards. Scientists that study natural hazards and resilience define resilience as a system's capacity to prevent and recover from floods (de Bruijn, 2004). Furthermore, resilience towards natural hazards including floods, droughts, landslides, storms and cyclones, earthquakes, tsunamis, as interpreted by Gaillard (2007), is the capacity of a system encompassing humans and ecosystems to face and respond to the impacts caused by natural hazards. Consequently, a system is able to endure and persist within the original regime, manage same functions, structures and feedbacks towards the change from both endogenous and exogenous drivers determine its resilience (Appiah, 2021). Carpenter et al. (2001) further argue that the ability of the system to self-organize and the extent to which it is the enhancement of adaptive capacity and the evolution of novelty or learning, are central to the analysis of resilience.

The IPCC defines resilience as "the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation" (IPCC, 2014b, p. 5). Hence, resilience refers to how much a regime or system may expand and contract in response to shocks and pressures while continuing to execute its original duties before a new regime must be imposed (Lin & Petersen, 2013). As summarized by Folke (2006), the resilience perspective emerged from the ecological field, in which human actions become the early agents of system changes, in particular ecosystem dynamics. However, the inclusion of humans as external to the system undermines the main stream of ecology, which subsequently ignores the interdependencies between ecosystem evolution and social dynamics as well as their cross-scale interactions (Folke, 2006). This resulted in the generation of a new research agenda for social scientists on exploring the dynamics of social-ecological systems as well as their resilience, allowing for management of ecosystem changes.

From sociological perspectives, resilience is understood as "a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance" (Norris et al., 2008, p. 130). Colding et al. (2002) suppose that disturbance can be expressed in two attributes: abiotic and biotic. Abiotic disturbances are those in which non-biotic sources such as droughts or flooding are the direct cause of the disturbance while insect and pest attacks or exotic species invasion for example are all examples of biotic disturbances. Norris et al. (2008) write that adaptive capacity can be described by four key drivers, such as economic

development, information and communication, social capital and community competence which provide a strategy for building resilience that communities face natural hazards.

However, the link between resilience and vulnerability is equally controversial. While some recognise the complementarity of resilience and vulnerability (Miller et al., 2010) or view them as opposites (Holling & Gunderson, 2002a, 2002b), others caution against framing resilience as the counterpart of vulnerability (Klein et al., 2003; Matyas & Pelling, 2015). It is widely assumed that adaptation and vulnerability are intertwined due to their origins in natural hazards and geography domains (Janssen, 2007). I employed the concept of 'adaptation' rather than 'resilience' in this thesis.

The concept of resilience has been described as a dividing concept between the natural and social sciences (Brand & Jax, 2007). However, its application within social science has generated debate (Olsson et al., 2015). Critics argue that resilience frameworks often overlook central social science concerns such as agency, power, and conflict. In the context of poverty alleviation, scholars further contend that resilience is not inherently a pro-poor concept (Béné et al., 2012; Matyas & Pelling, 2015; Olsson et al., 2015). They caution that resilience-building initiatives cannot replace structural poverty reduction efforts, as resilience alone does not address the underlying drivers of inequality. Additional conceptual constraints of the resilience, which is "viewed as an insistence on simply responding to the new reality of vulnerability — a shift away from a focus on development out of poverty and the development of adaptive capacity" (Schlosberg & Collins, 2014, p. 368). Many grassroots environmental justice organisations and activists have criticised the resilience idea on the grounds that it avoids tackling the causes of climate change and the need to adapt (Shi, 2020, 2021) and instead accepts the intensification of stresses and shocks on vulnerable communities.

Given the aforementioned insights, without gender equity and transformational aims, climate change adaptation strategies may entrench societal inequities that cause vulnerability. A growing body of literature on adaptation overlooks the larger political context in which individuals adapt and how regional and national policy settings (macro levels) influence micro level outcomes. Moreover, much of adaptation initiatives require a defined justice framework that can guide and evaluate the outcomes of adaptation programmes.

Adaptation as transformation paradigm can be valuable and is consistent with the emerging literature and the present thesis, which positions climate change and climate change adaptation as social issues, with gender as a primary component, beyond the technical and management

ideologies (Tschakert and Machado, 2012). In response to climate change, adaptive capacity theory calls attention to social characteristics that must be addressed coupled with social and biophysical sensitivity and exposure. Pelling (2011) observes that climate change poses a unique challenge to traditional beliefs and organisational structures that represent power relationships. Such perspectives reflect both concepts of 'emancipatory catastrophism' (Beck 2014), and the 'revolutionary power of climate change' (Klein, 2015). When adaptation must address fundamental societal inequalities as its primary focus, this could start a process of profound social transformation. Adaptation as transformation framework facilitates the emergence of new social, ecological interconnections, and policy options (Pelling et al., 2015). This thesis is founded on Enarson (2012) and Sultana (2014)'s premise that existing gendered roles, responsibilities, and power relations associated with livelihood transformation in the context of climate hazards are capable of being examined, reshaped, and expanded, both positively and negatively. Adaptation could result in the formation of new social-political and environmental contexts, which could enable for the emergence of new subjectivity, such as new ways of expressing masculinity and femininity, gendered roles and relationships related with established structures, and governance and social-ecological relationships.

Hafiza and Neelormi (2015) refer to the concept of resilience as an outcome of adaptation, while Pelling and Manuel-Navarrete (2011) have developed a new term for adaptation, that can be viewed as a process of change from resilience through transition to transformation (see Table 2.3). Resilience seeks to increase a system's functionality in a changing environment, without challenging its core assumptions and structures. Transition refers to the adjustments that enable organisations' access to established regimes but unclaimed entitlements. Transformation refers to the process of tackling the obvious root causes of vulnerability by examining priorities, constraints, and assumptions (Pelling, 2011). Pelling's (2011) core thesis distinguishes between adaptation strategies that seek to preserve the status quo and those that regard adaptation as an opportunity for deeper structural change. This latter approach is crucial if we recognize the interrelationships between grounded social structures and vulnerability, as well as the role of social systems in vulnerability. According to Pelling (2011), the root of vulnerability caused by these social and political structures is frequently deemed beyond the domain of adaptation or is not recognised. By not challenging underlying structures and maintaining existing systems, a resilience approach has its own limitations, as apparent risk reductions indicate that the broader system may still collapse (Pelling, 2011).

Table 2.3 Attributes of adaptation for resilience, transition and transformation

	Resilience	**Transition**	**Transformation**
Goal	Functional persistence in a changing environment	Realise full potential through the exercise of rights within the established regime	Reconfigure the structures of development
Scope	Change in technology, management practice and organisation	Change in practices of governance to secure procedural justice; this can in turn lead to incremental change in the governance system	Change overarching political-economy regime
Policy focus	Resilience building practice Use of new seed varieties	Implementation of legal responsibilities by private and public sector actors and exercise of legal rights by citizens	New political discourses redefine the basis for distributing security and opportunity in society and social-ecological relationships
Dominant analytical perspectives	Social-ecological systems and adaptive management	Governance and regime analysis	Governance and regime analysis

Source: Adapted by Pelling (2011, p. 51).

A growing collection of research on climate change and development has documented socially equitable adaptation theory (Benzie, 2014; Shackleton et al., 2015a), adaptation as transformation (O'Connell et al., 2015; Pelling et al., 2015), and gender justice (Terry, 2009a, 2009b; Tschakert and Machado, 2012) as significant conceptual frameworks for approaching adaptation from a transformational standpoint. These approaches shed light on how adaptation could be implemented as an instrument for social-political change (Quay, 2010), guiding and being directed by existing social conventions, roles, and structures.

Socially just and sustainable adaptation approaches emerge to fill gaps in the existing adaptation literature by investigating the connections between environmental changes, and distributional and procedural justice. The paradigm for sustainable adaptation presented by Eriksen et al. (2011) needs a sense of social responsibility and environmental stewardship. Eriksen et al. (2011) provide four ethical principles that will guide responses to climate change by highlighting the significance of the sustainable adaptation approach using case studies from various contexts in Nigeria, South Africa, Chile, and Norway. First, adaptation initiatives must acknowledge that various socioeconomic, political and ecological variables contribute to

vulnerability (Eriksen et al., 2011). Second, vulnerable individuals, groups and communities must be engaged and embodied throughout the entire process. This demonstrates a dedication to procedural justice and acknowledgment of its importance (Eriksen et al., 2011; Thomas & Twyman, 2005). A crucial requirement would be to prioritise the needs and viewpoints of women in decision-making processes. Beck (2015) indicates that fostering adjustments in social and political norms and reconfigured power relations between communities who have triggered climate change and those affected by it necessitates an analysis of the needs of those affected. Thirdly, affected people's local knowledge and priorities must be incorporated into adaptation options (Eriksen et al., 2011). Community-Based Adaptation projects utilising participatory approaches, for example, attempt to promote local initiatives and empowerment by drawing on the knowledge and decisions of impacted individuals (Rashid & Khan, 2013). Warner et al. (2012) note the significance of recognising how adaptation programmes would affect the environment positively and negatively, developing initiatives from a global and local perspective, and highlighting that adaptation efforts have physical and social constraints.

Drawing on the work of Lahiri-Dutt (2012), gender justice approaches strive to place gender roles, relations and equality issues at the centre of climate change mitigation and adaptation mechanisms and policies. Further, Seguino (2013) adds that promoting gender equality with regard to capabilities, livelihoods, and empowerment/agency in larger adaptation initiatives provides not just equality of opportunity, but also equitable outcomes. Sen (1999)'s definition of 'development as freedom' is employed by Seguino (2013) to explore the representation of gender justice, which must concentrate on realising women's socioeconomic and political capabilities, which in turn promote women's agents of change (Roy & Venema, 2002). As argued above, if gender injustice and inequality influence vulnerability to climate change, then gender justice must be at the core of adaptation. Hemmati and Röhr (2009) differentiate between gender justice and gender equality, emphasising that the latter term refers to equality within the established power systems that have led to climate change. Instead, Tschakert and Machado (2012) indicate that gender justice is considered not only as rights, but also as a commitment to create change. Thus, gender justice manifests as an emphasis on transforming existing systems and institutions that have caused social and ecological vulnerabilities, implying that this approach extends beyond integrating women into these established systems (Hemmati & Röhr, 2009; Lahiri-Dutt, 2012).

Following Moser (1989) and Molyneux (1985), Allen and Sachs (2012b) present a conceptual framework for gender justice. These findings represent both practical and strategic gender

needs and interests, which constitute a range of responses to unequal gender relations. Practical needs refer to survival strategies within established gendered and power inequalities, such as gaining access to water and food. The reality of women's position in the division of labour as a result of their gender (Molyneux, 1985) places them in charge for water and food, health, and child and elderly care (Moser, 1989). Despite the fact that these practical needs originate from power structures at the interface of class and gender, efforts to address these underlying systems frequently fail (Molyneux, 1985). In contrast, strategic needs emphasise the need to deconstruct the existing systems that contribute to women's oppression. Such initiatives, which are grounded in gender and power analyses, include increasing access to women's property ownership and access to financial resources, lessening the women's burdens of childcare and domestic work, bodily and reproductive rights and liberties and agency, and wellbeing from gender-based violence (Molyneux, 1985). All of which aim to create alternatives to existing structural arrangements (Molyneux, 1985). Molyneux (1985) and Allen and Sachs (2012b) conclude that these demands originate from social beliefs, gendered roles and relationships, as well as class and race.

Furthermore, CARE International (2010) distinguishes between 'gender-sensitive' and 'gender-transformative' approaches to climate adaptation policies and programs that aim to establish a gender justice framework. Gender-sensitive frameworks recognise gendered roles, resources, and power and aim to work with them. In contrast, the key components of gender-transformative approaches include challenging these social norms and systems and fostering women's and men's critical awareness. According to CARE International (2010), the concept of women's empowerment has become the focal point of gender-transformative approaches. This considers not just women's own agency, but also economic, social-political and environmental settings, and micro-level processes such as mobility, home relationships, and decision-making on alternative livelihoods strategies. Similarly, Sen (1999) distinguishes between women's well-being and their agency in the globalisation and development processes, suggesting that analysing key aspects including women's agency, capabilities, and entitlements could lead to an improvement in women's well-being. These findings are in line with Tschakert and Machado (2012)'s research on climate-related adaptive social protection programs, which employs both human security and gender justice lenses as the foundation for transformational adaptation.

Existing research on adaptation and development leads to questions about how theoretical insights might be utilised to explore transformative and strategic gender approaches. According

to Tschakert and Machado (2012), a transformative approach to climate change adaptation is characterised through community-based adaptation with proactive risk reduction and social protection, with the aim of empowering communities to realise their rights, mitigate risks, and promote livelihood transformations (Arnall et al., 2010). In Vietnam, for instance, Farnworth et al. (2017) suggests that the involvement of farmer associations and women's organisations in reducing glasshouse gas emissions from agriculture could result in distributional and procedural justice improvements for women. Case studies in Hung Yen province of Northern Vietnam conducted by Thao (2013) reveals that mobility is a crucial factor in women's economic empowerment and the diversification of household livelihoods. Kabeer et al. (2011) found that women who are supported by other family members, particularly men, have a better chance of converting their resources into enhanced voice and agency, such as public mobility and political participation. Further, they add that promoting sustainable and transformative change in women's lives requires changes in women's awareness and knowledge, economic stability and well-being, and their capability to restructure established relationships. The greatest transformative potential is in women's regular and relatively independent sources of income (Kabeer et al., 2011).

Collective action is developing as a means of achieving gender justice not only in developing nations but also in the industrialised World (Sweetman, 2013). Women in African agricultural markets, for instance, may employ collective action to resolve market deficiencies by providing small-scale farmers with a shared marketing plan (Sweetman, 2013). Pandolfelli et al. (2008) state that collective action refers to a more equitable allocation of resources to enhance the livelihoods of marginalized communities, as well as the assistance of communities in reducing risks and long-term planning. Similarly, Htun and Weldon (2012) argue that feminist movements play a critical role in advancing progressive social policy reforms related to human rights. In Northern Vietnam, Godden et al. (2020) applied Feminist Participatory Action Research with Tay ethnic minority women farmers, illustrating how collective empowerment and strategic activism can contribute to policy change. They also claim that the Feminist Participatory Action Research is a valuable approach for feminist climate justice activists at the grassroots level to capture collectively the lived realities of climate change, as well as women's movements and advocacy for rights-based policy change. This reflects the attempts to improve the political representation of women. Makita (2008) emphasises that men and women must collaborate to ensure that women's viewpoints are considered while examining gendered procedural justice at the household level. In this sense, the family unit must be

recognised. Makita (2008) discusses how women's labour might be valued inside households, noting that this is frequently contingent on the involvement of spouses.

Additionally, agency becomes the paradigm for achieving gender justice (Björkdahl & Selimovic, 2015). As argued by Sen (1999), agency as a major aim in the development process enables individuals to exercise their personal rights and attain economic, social-political freedom and well-being. The concept 'agency' appears to be both a means and an end. In the context of climate change adaptation, Roy and Venema (2002) observe that agency is a component of adaptive capacity, implying that individuals can pursue adaptation as active agents of change. Coulthard (2012) states that people are never merely passive victims in the face of environmental change; rather, they are active actors whose agency is constrained by social, political, economic, and cultural factors. According to Mahmood (2005), within the field of development studies, agency represents the resistance to oppression conducted by rational, self-interested actors pursuing progressive political aims. Moreover, Rashid (2013), Mahmood (2005), and Wilson (2013) attempt to construct agency without assuming western notions of autonomy, opposition, and independence. Mahmood (2005) believes that agency should not be associated with resistance, but rather as an individual's capacity for action that contextually specific forms of oppression facilitate and produce. Working in the area of gender and migration, Rashid (2013) reveals that women's experiences of their men's movement in Bangladesh are nuanced and heavily reliant on their interactions with family members, with women striving to maintain cultural norms and values against autonomy and freedom. Therefore, it may be said that women's power and agency are exercised in these contexts of identity construction. Coulthard (2012)'s research on the relationship between agency and adaptation in fisheries communities reveals that women ensure the adaptation of their communities by compromising their personal well-being for the benefit of their family. Coulthard (2012) emphasises how agency occurs within existing social systems, and the alternatives individuals make between short and long-term goals, as well as individual and community desired outcomes. Working in gender identity and migration decision-making in rural Northern Vietnam, Hoang (2011a) demonstrates that the agency of migrants and the decisions they make during the migration process are influenced by their gendered identities as men and women. Her research also demonstrates that women's agency in relation to their own migration was partially restricted by the necessity to negotiate for their personal ambitions while striving to maintain family stability. Kabeer (2011) interprets similar findings, revealing that family and kinship in rural Bangladesh constituted a primary source of security,

emphasising mutual obligations between women and men and increased freedoms and rights within households, as opposed to independence. Kabeer (2011) indicates that affiliation may be a crucial factor motivating women's movements in Bangladesh, and it is opposed to autonomy, suggesting that the attribute of affiliation is a result of particular settings, but the characteristic of autonomy should be valued in other contexts. Moreover, Kandiyoti (1988, p. 285) presents the concept of 'patriarchal bargain', describing women's role as rational agents who "resist, accommodate, adapt, and conflict" through paradoxical forms of passive resistance. However, Kandiyoti (1988) argues that bargaining mechanisms are utilised to disguise means of expressing oppression that have been relabelled as a choice in order to make empowerment and agency acceptable within neoliberalism (Wilson, 2015). To promote gender and social justice, these reflections highlight the importance of structural settings that facilitate full capacities and procedural justices. Practically, transformative adaptation should include agency through such a dedication to procedural justices, placing the viewpoints, interests, and identities of women at the core of both climate adaptation research and practise.

The literature criticises conventional resilience models from a feminist political ecology (FPE) standpoint for neglecting agency, power, and structural inequalities (Cote & Nightingale, 2012; Cretney, 2014). Instead, feminist political ecology scholars advocate a shift toward adaptation as transformation, which addresses the root causes of vulnerability, including gendered power relations and socio-political inequalities (Pelling, 2011; Enarson, 2012; Sultana, 2014). The examination of practical and strategic gender demands (Molyneux, 1985; Allen & Sachs, 2012b), alongside the focus on women's agency within societal restrictions (Sen, 1999; Mahmood, 2005; Hoang, 2011), corresponds with FPE's preoccupation with justice and inherent power dynamics. Gender-transformative strategies (CARE International, 2010) and participatory methods (Godden et al., 2020) underscore the necessity of prioritising local perspectives and reforming inequitable processes. The literature indicates that FPE's primary objective is to politicise adaptation and advance social and gender equity in climate responses.

2.4.2.4 Gendered livelihoods and adaptive capacity: A feminist political ecology perspective

It is well accepted that rural households are subject to a wide variety of risks to their livelihoods. Agricultural-based livelihoods are prone to climatic fluctuations such as drought (Kinsey et al., 1998), as well as pest infestation and crop diseases, which can affect their productivity and thereby influence market conditions. Food security is thus a major risk. With the characteristic labour-intensive nature of employment in agrarian regions, whether in agriculture or otherwise, households are vulnerable to health risks and disease. Illness and hunger can have the double

effect of reducing the capacity to work and also increasing household outgoings for healthcare and medicines. Political turmoil and civil conflict can also impede the ability to make a living (Schafer, 2002). Although this is arguably less the case now for South Africa, a turbulent recent political history has seen dramatic changes to the institutional and policy environment, and although some of these have been positive there have also been a number of risks to rural households and their livelihoods. The concept of sustainable livelihoods arose to take account of the various risks affecting livelihoods, and marks a new paradigm within approaches to rural development (Ellis & Biggs, 2001).

The livelihoods approach, frequently used in development studies, also applies to climate adaptation (Ziervogel & Calder, 2003). The livelihoods approach focuses on humans' ability to meet their requirements on a family scale (Leach et al., 1999; Wisner et al., 1994) or on a society scale (Turner et al., 2003).

The livelihoods approach has both academic and policy institution foundations (Chambers & Conway, 1992). Ellis and Freeman (2004) point out that the livelihoods approach identifies the strengths in the livelihoods of the most vulnerable individuals in society so that their accessible assets can be used to eliminate poverty. Ellis (2000) offers the following definition of a livelihood, which differs from Chambers and Conway (1992):

> "A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household".

Figure 2.1 shows a framework for implementing the livelihoods approach that relates the different parts of the preceding definition of a livelihood. The concept applies to the extended household, which includes family members who reside away from home but send remittances to the household (Allison & Ellis, 2001). Social relationships and institutions (Box B in Figure 2.1) affect a household's access to five types of capital assets. These five forms of capital assets are listed in column A: natural capital such as water, land, trees, and fish stocks; physical capital such as buildings, roads, and tools; human capital such as people, education, skills, and health; financial capital such as savings and access to credit; and social capital such as reciprocity, social ties between people and organizations. Access to these assets is affected by trends and shocks (Box C) and leads to strategies for making a living (Box D) that include a variety of activities (Box E) that may or may not be directly related to natural resource use (e.g., farming, fishing, and raising livestock) or trading, services, remittances. The household's livelihood

strategies, or combinations of activities, define its security and the environmental sustainability of its surroundings (Box F). Trends and shocks (Box C) contain exogenous elements that can affect livelihood activities. Shocks include floods, droughts, and disease outbreaks. Trends include growing population or economic and technological progress (Allison & Ellis, 2001; Ellis, 2000).

The livelihood approach is commonly used to analyse rural livelihoods in developing countries, where people participate in various activities across multiple industries. Ellis and Bahiigwa (2003) focus on analysing poverty and policies for poverty reduction, while others use it for examining challenges related to natural resource management (Allison & Ellis, 2001; Ellis-Jones, 1999; McDonald & Brown, 2000). Within the livelihood framework, the vulnerability context (Box C in Figure 2.1) is crucial for climate adaptation research. It includes both continuous pressures (trends) like changing seasons or increasing yearly temperatures and unexpected events (shocks) like droughts, floods, or storms. Thus, the livelihoods approach has been recommended for various climate change adaptation initiatives or projects (Sharma et al., 2014).

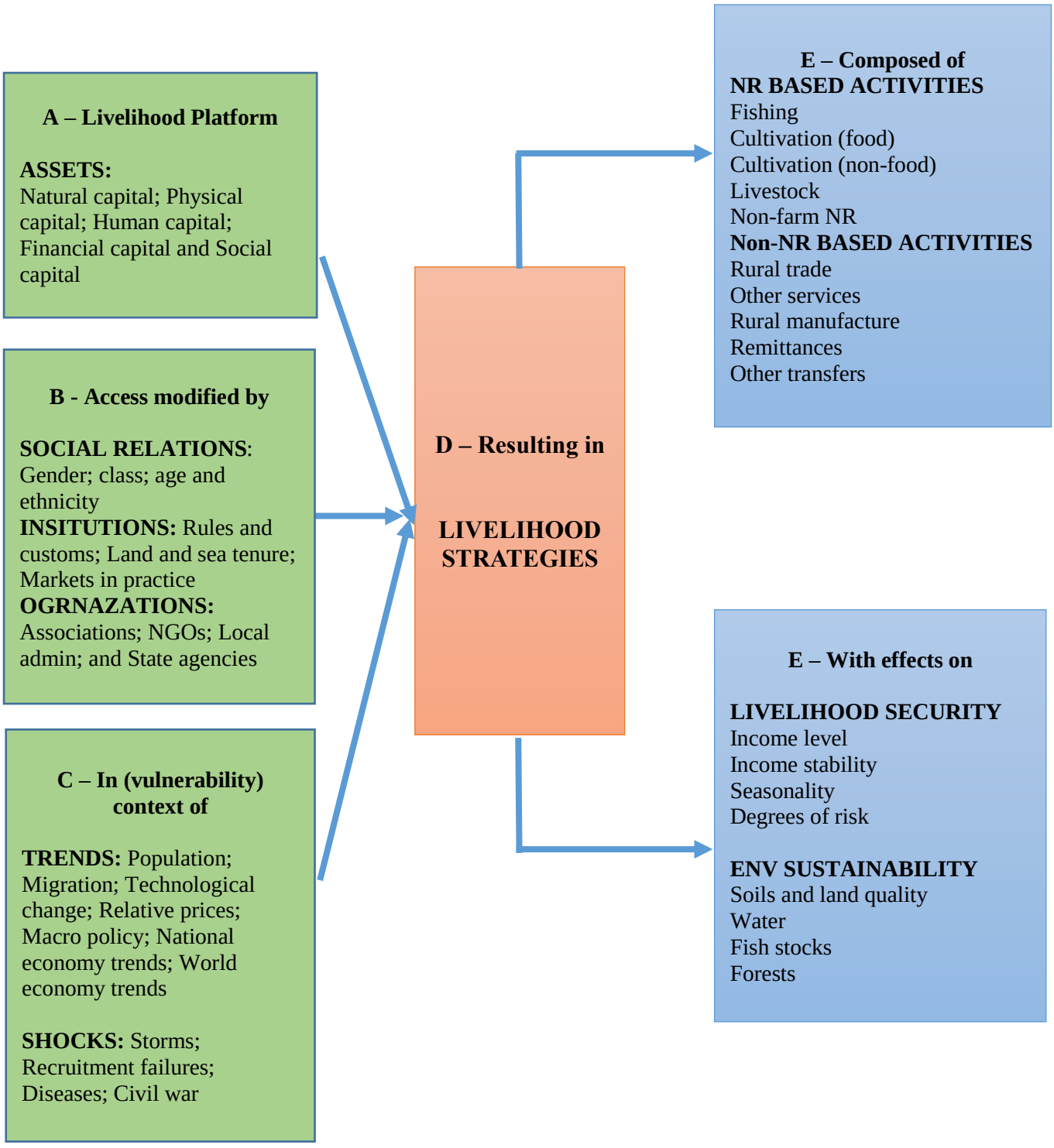


Figure 2.1 The Livelihoods Framework

Source: Adapted by Allison and Ellis (2001).

Prior research in rural Vietnam has employed the livelihoods approach to households coping with or adapting to the effects of climatic variability or change (Brown et al., 2018b; Huynh & Stringer, 2018; Manh et al., 2016; Nguyen et al., 2021; D. D. Tran et al., 2020). In addition, several studies investigate the link between rural livelihoods and climate change without expressly using the livelihoods framework, although they do consider its components (Block & Webb, 2001; Cavendish, 2000; Davies, 2016; Eriksen et al., 2005; Little, Smith, et al., 2001; Mortimore & Adams, 2001; Quinn et al., 2003; Roncoli et al., 2001).

Climate is just one stressor or threat to livelihoods (Quinn et al., 2003; Ziervogel & Calder, 2003). As shown in Box C (Figure 2.1), the vulnerability context of the livelihood framework lists numerous more shocks and trends. In terms of the availability of natural resources, water insecurity including salt intrusion, floods, and droughts was the greatest risk in rural Vietnam (Manh et al., 2016); however, residents also identified a variety of risks associated with the five capitals outlined in the livelihoods framework. Goulden (2006) writes that women were more likely than men to recognise risks linked with human and social capitals (e.g., diseases and medical availability). Adger (1999) indicates that institutional and economic factors are also a source of vulnerability during periods of climate change in coastal provinces of Vietnam.

Households employ their own resources (assets as shown Box A) and activities to cope with climate and other challenges (Burton et al., 2003). Sarch and Birkett (2000) and Mortimore and Adams (2001) argue that poor households are less able to adapt climate variability than the wealthy (Roncoli et al., 2001). Cavendish (2000), Burton et al. (2003), and Quinn et al. (2003) state that access to natural resource assets (e.g., land, water, trees and fish stocks) is vital for successful adaptation, but other types of assets are equally crucial for adaptation. For instance, social networks are used to share risk information (Little, Mahmoud, et al., 2001) and might be tapped for aid during food shortages (Roncoli et al., 2001). Households with enhanced access to financial, social, and informational resources are better at interpreting and responding to seasonal climate projections, while resource-limited households frequently lack the ability to adapt their livelihood strategies accordingly (Ziervogel & Calder, 2003).

Several studies reveal that diversification and mobility are important to household adaptations and recovery from climatic stressors (Block & Webb, 2001; Little, Smith, et al., 2001; Mortimore & Adams, 2001; Sarch & Birkett, 2000). Ellis (1998) found that diversifying rural livelihoods in developing nations enhances livelihood security. His main thesis also examines the causes and effects of livelihood diversification, highlighting that five primary determinants or motivations could be used to measure livelihood diversification: (i) seasonality includes

income instability owing to the cropping production calendar or seasonal fluctuations in resources; (ii) risks may result in the failure of household activities due to shocks namely a drought or fluctuating market conditions; (iii) coping mechanisms include actions to respond to a crisis); (iv) credit market failure (e.g., lack of credit) and (v) accumulation of assets. These factors are demonstrated to be location- and pressure-specific, therefore it is not possible to generalise about their impacts across all cases (Ellis, 1998).

Households with diversified livelihoods have less exposure to seasonality risks, lower the chance of income failure, provide coping strategies, increase access to financing, and promote accumulation (Ellis, 2000). Ellis (2000) states that in order for the diversifying livelihood activities to benefit risk management, the activities must have low shock covariance. For instance, livelihood diversity only increases livelihood security in a drought-prone area if other diverse activities of the household members are not affected by the drought (Ellis, 2000).

Several studies have examined how diversifying household livelihoods might improve livelihood security. For instance, local farmers in Northern Vietnam's mountainous regions adapt to seasonality by growing cinnamon trees and labouring on other farms (A. T. Nguyen et al., 2019). In rural areas of Vietnamese Mekong Delta, Ho et al. (2021) found that diversifying farmers' income sources from traditional rice varieties to improved varieties, high-value crops, livestock products, and non-farm economic activities increased their adaptation to risks. Renaud et al. (2011) reveal that when people are affected by an environmental stressor, their ability to maintain a livelihood becomes a crucial factor in driving migration. Barnett and Adger (2007) examine migration as a potential response for those whose livelihoods are impacted by environmental issues such as climate change. Migration is reliant on the household's human capital assets. Migration can lessen the risk and impact of seasonality by offering spatially distributed and distinct risk behaviours (Ellis & Freeman, 2004). Equally, constraints on livelihood diversity and migration could make social groups more susceptible to climatic or non-climatic forces. Poverty, a lack of education, a lack of credit, gender barriers for women, and a lack of social connections for recent immigrants are among the challenges (Barrett et al., 2001; Block & Webb, 2001; Eriksen et al., 2005; Roncoli et al., 2001).

Diversity in rural livelihoods seems to counter conventional economic theory, which claims that a nation's economic success is connected to the division of labour (Ellis, 1998). A family or broader social group can diversify by placing individuals in single occupations, promoting specialisation and skill development. More interestingly, Ellis (2000) indicates that the scale at which diversity occurs has indeed been linked to prosperity, highlighting that rich households

diversify at the household level, allowing individuals to specialise in their professions, whereas poor households diversify at the individual level, meaning that individuals engage in a variety of occupations. Case studies conducted in Kenya and Tanzania revealed that local households with both diversification at the household scale and specialisation at the individual level have been less susceptible to climatic changes and other kinds of stress than other households (Eriksen et al., 2005).

Diverse livelihoods are crucial for adapting to climatic variability, particularly extreme occurrences (Block & Webb, 2001; Eriksen et al., 2005), and seasonal changes (Mortimore & Adams, 2001; Sarch & Allison, 2001; Sarch & Birkett, 2000). Diversification of livelihood is associated with both demographic characteristics, such as gender and age, and socio-economic factors, including educational attainment and employment status (Alobo Loison, 2019). Previous research has examined how diversifying livelihoods affects gendered climate vulnerability (Adzawla & Baumüller, 2020; Ibrahim et al., 2019; Maja et al., 2022; Ogra & Badola, 2015). I argue that examining the nature of gender and political power relations and how they construct gender- and climate-related vulnerability determines the factors and forces that drive the diversification and transformative adaptation of livelihoods at both the household and individual scales.

The livelihoods framework evolved to support a multidimensional knowledge of the nature and dynamics of livelihood vulnerability and adaptation (Vincent et al., 2010). In this framework, five capital assets including financial, human, social, physical, and natural are viewed as the assets of the household (Chambers & Conway, 1992), and include income, social institutions, gender relations, and property rights (Ellis, 1998). By focusing on assets and how people access them to make a living, the livelihoods framework gives a more dynamic reflection of local reality, providing depth to concerns about why people are poor (Bebbington, 1999). Furthermore, the livelihoods approach could be used to investigate contextual and multidimensional nature of vulnerability (Francis, 2002; Reid & Vogel, 2006; Waite, 2000; Ziervogel & Calder, 2003), and adaptation (Hoque et al., 2017; Kelso & Vogel, 2015; Vincent & Cundill, 2021).

In the literature on gender and livelihood, food appears as an important site of interaction between individuals and their environments (Nightingale, 2011). In addition, activities such as cultivating, processing, consuming, and sharing food are crucial points at which gendered subjectivities are constructed. Allen and Sachs (2012a) investigate the configurations of food-related gender interactions, providing valuable insights into power dynamics within and around

farming communities. They describe how men and women interact with food in three ways: (i) gendered responsibility for food-related work in the home (sociocultural), (ii) the links between gendered food work and the labour market (material), and (iii) gendered relationship with eating (bodily). The socio-cultural domain encompasses the labour that people apply at home in order to produce food (Allen & Sachs, 2012a). Moreover, Allen and Sachs argue that women's roles in food production create possibilities for their agency and identity, as well as means for articulating identity, culture, and class, and for interacting with family and friends. However, these roles require women to undertake unpaid mental and physical work, which can lead to uneven power relationships between women and other family members within the household (Allen & Sachs, 2012a). In the material domain, gender relations are examined in terms of material production, compensation for labour, and the political economy of food and agriculture. This offers women access and rights to tangible and natural resources, such as land, knowledge, and decent compensation, with an emphasis on the feminisation of agriculture. Due to economic trends such as urbanisation and industrialisation, male out-migration has implications for the livelihood of farming households in many nations in Africa, Latin America, and Asia, as well as on the women left behind (Sachs, 2019). De Schutter (2013) and Sachs (2019) state that the gendered nature of agrarian transformation has increased women's involvement in agriculture. This trend is prominent in the Vietnamese Mekong Delta, where 67% of women reported agriculture-based livelihoods as their primary work and 26% as their secondary occupation (Vinh, 1996). Due to male migration, rural women are increasingly engaged in food production, subsistence, and income generation (Sachs, 1996). This means that the processes of economic development have also radically transformed gender roles. For instance, the introduction of modern agriculture has transformed gendered divisions of labour and frequently hindered women from land ownership (Momsen, 2009). In terms of gendered health, bodies, and identities, the corporeal domain shows how women connect to food. Alston and Akhter (2016) argue that analysing the implications of climate change on food security is best accomplished at the micro and household level, as there are likely to be differences in how food is distributed within households.

The literature, examined using a feminist political ecology lens, emphasises how gendered power dynamics and inequitable resource access influence the adaptive capacity of rural households. The expansion of women's responsibilities in agriculture, attributed to male migration (Sachs, 2019; Vinh, 1996), sometimes occurs without land rights or compensation (Momsen, 2009), hence exacerbating unpaid labour obligations (Allen & Sachs, 2012a). FPE

highlights that women are disproportionately vulnerable to health and social responsibility-related hazards (Goulden, 2006) and encounter structural impediments, such as poverty and restricted mobility, that hinder adaptation (Eriksen et al., 2005; Roncoli et al., 2001). Consequently, adaptation is profoundly influenced by gender and determined by interconnected political, ecological, and institutional factors.

2.4.3 Gender, Intersectionality, and Climate Adaptation

2.4.3.1 Theoretical evolution and core principles

Intersectionality originated in the United States, influenced by the historical intertwining of feminist activism and racial politics, as well as intellectual traditions including poststructuralism, critical legal scholarship, and Black feminist theory (Lépinard, 2014; Okolosie, 2014). The term was originally formulated as a critique of prevailing feminist narratives that regarded "woman" as an isolated and universal category—an approach predominantly representing the experiences of white, middle-class women. Conversely, intersectionality aimed to address the complex and interconnected nature of social identities and power dynamics (Smooth, 2013). Scholars like Kimberlé Crenshaw and subsequently Patricia Hill Collins posited that identity axes such as gender, race, and class function in conjunction rather than in isolation, collectively influencing lived experiences and structural disparities (Collins, 2015; Lépinard, 2014; Okolosie, 2014). Consequently, intersectionality has been extensively utilised as an analytical framework for scrutinising the production of social positions and forms of marginalisation through intersecting systems of domination (Byerly, 2017; DeBlaere et al., 2018). This initial theoretical foundation has sparked persistent discussions over the scope, definition, and application of intersectionality—discussions that persist as the framework undergoes heightened conceptual refinement and critical scrutiny (Collins, 2015; Salem, 2018).

The evolution of intersectionality from a conceptual metaphor in feminist structural analysis into a comprehensive analytical framework has greatly influenced various academic fields, including communication studies, criminology, psychology, medical education, and refugee research. Intersectional analysis in communications elucidates how media narratives both reinforce and challenge gender and racial hierarchies, hence broadening the analytical framework of feminist theory (Byerly, 2017). In psychology, intersectionality is utilised as a vital methodological framework that compels researchers to contextualise marginalised identities within extensive historical, political, economic, and social frameworks, rather than

considering them as distinct variables (Grzanka et al., 2020; McKinzie & Richards, 2019). Similar methodologies have arisen in research on refugee entrepreneurship and medical education, wherein scholars utilise context-specific and narrative-based techniques to elucidate how intersecting identities influence lived experiences and outcomes in these fields (Khademi et al., 2024; Rehman et al., 2023).

Beyond its practical implications, intersectionality has also promoted methodological reflection and critique within the social sciences. Academics have expressed concern that blind application of intersectionality may reinforce social categories instead of examining the historical and political mechanisms that create them (May, 2014; McKinzie & Richards, 2019). This issue has led to demands for reflexive research methodologies that perpetually scrutinise their analytical assumptions and conceptual boundaries (Haenfler, 2021; May, 2014). In criminological study, for example, intersectionality has been crucial in illustrating the concurrent operation of many systems of oppression, influencing daily experiences and motivating collective resistance and activist initiatives (Henne & Troshynski, 2013).

Intersectionality has been extensively recognised as a vital analytical framework for elucidating the complex and interrelated mechanisms through which social identities, including gender, race, class, and other distinguishing characteristics, are constructed through power dynamics (Collins, 2015; Lépinard, 2014). This framework is particularly crucial in the realm of climate change, where effects are disproportionately allocated and tend to exacerbate pre-existing social and economic disparities rather than affect populations equitably (May, 2014; McKinzie & Richards, 2019). Consequently, researchers argue that climate adaptation policies must explicitly tackle overlapping vulnerabilities to be just and effective (Bilge, 2013; Thomas, 2020). This strategy prioritises gender as fundamental to tackling deep-rooted structural disparities. The literature review also indicates that adaptation projects that integrate gender and broader social participation are more likely to provide equitable, enduring, and sustainable resilience outcomes (Badolo, 2024; Thwe, 2022).

Recent advancements in climate adaptation research have produced new analytical frameworks that explicitly incorporate gender and social inclusion into resilience-focused policy design. Badolo's ClimResilience framework is one such example, emphasising the systematic identification of socially vulnerable groups and the expression of climate impacts and actions through a gendered and intersectional lens (Badolo, 2024). This approach underscores the necessity for effective resilience planning to extend beyond narrowly focused biophysical indicators, incorporating participatory and socially informed analyses that consider local

knowledge, norms, and power dynamics (Badolo, 2024). Integrative frameworks are especially relevant in regions such as the Vietnamese Mekong Delta, where hazards from climate change like sea-level rise and land subsidence intersect with established gendered and social hierarchies, exacerbating vulnerability patterns (Schmitt et al., 2021).

2.4.3.2 Gendered and intersectional vulnerabilities to climate change

The integration of intersectionality into climate change analysis is grounded on prior environmental justice studies that have shown how vulnerability to environmental hazards is substantially influenced by race, class, and geographic location (Bullard, 2018; Pulido, 1996). Climate justice scholarship has broadened its analytical scope to the global level, examining how historical accountability for emissions, disparate development patterns, and colonial legacies create considerably unequal climate vulnerabilities (Ciplet et al., 2015; Roberts & Parks, 2006). An intersectional climate justice viewpoint reveals that the individuals least responsible for greenhouse gas emissions frequently endure the most severe climate consequences (Sultana, 2022). Empirical research demonstrates this trend across various contexts, encompassing indigenous women in Arctic regions, women smallholders in sub-Saharan Africa, low-income women of colour in urban settings, and older women residing in flood-prone areas, all of whom encounter compounded vulnerabilities at the intersections of multiple forms of marginalisation (Collins et al., 2018; Djoudi & Brockhaus, 2011; Jerneck, 2018; Perez et al., 2015). This collection of work challenges climate policies that entirely disregard gender and approaches that categorise women as a homogeneous social group.

Building upon these ideas, Kaijser and Kronsell (2014) propose the notion of "feminist climate justice" as a comprehensive framework that synthesises intersectionality, postcolonial critique, and environmental justice. From this viewpoint, climate change is perceived as functioning through interconnected power dynamics that encompass local, national, and global levels. The framework facilitates a critical analysis of how climate governance, mitigation, and adaptation efforts may perpetuate current inequities or generate new injustices if power imbalances are not addressed (Bee, 2016; Tschakert, 2012).

Agriculture serves as a crucial domain where gender dynamics, intersectional disparities, and climate adaptation strategies meet, especially in the Global South, where women represent a significant portion of the agricultural labour force (FAO, 2011). Climatic changes, characterised by altered rainfall patterns, rising temperatures, heightened occurrence of extreme events, and modified cropping schedules, present substantial threats to agricultural systems, with effects that are inequitably distributed across gender and socioeconomic classes

(Dasgupta, Laplante, Meisner, et al., 2009; Demetriades & Esplen, 2010a). Evidence from South Asia illustrates how climate-induced vulnerabilities in agriculture arise from the interplay of caste, class, and gender. In India, Dalit women face multiple obstacles to adaptation, such as insecure land tenure, deep-rooted social marginalisation, restricted educational access, and exclusion from government-led development and climate initiatives (Ravera, Iniesta-Arandia, et al., 2016; Sugden et al., 2014).

Water security is another important area where intersectional and gendered forms of vulnerability are produced and exacerbated. In various settings, women bear the principal duty for obtaining home water supplies, although they are predominantly marginalised from formal decision-making processes concerning water governance (Cleaver & Hamada, 2010; Harris et al., 2013). Climate change exacerbates these inequities by modifying hydrological conditions via changing precipitation patterns, extended droughts, and groundwater depletion. These modifications increase the duration, exertion, and physical strain involved in water collection, concurrently intensifying competition for scarce water resources (Alston, 2013; Resurrección et al., 2019). Empirical research in sub-Saharan Africa indicates that during droughts, women and girls allocate considerably more time to water collection, frequently compromising their education, income-generating pursuits, and rest (Graham et al., 2016; Stevenson et al., 2012). An intersectional perspective, however, uncovers substantial gaps in the experience of these responsibilities both within and across communities. Households with improved economic resources may frequently alleviate water insecurity by investing in storage facilities or procuring water, while impoverished households depend on more remote and unreliable sources. Older women may encounter physical limitations that hinder their capacity to collect water, but younger girls are often removed from educational institutions to fulfil domestic water requirements. Indigenous and ethnic minority women may face heightened obstacles due to prejudice or exclusion from communal water access locations (Truelove, 2011a; Wutich et al., 2012). The findings align with evidence gathered from case studies in the VMD, indicating that women from ethnic minority groups, especially Khmer women, encounter increased challenges regarding freshwater availability in salinity-affected regions like An My commune. In the dry season, when saltwater intrusion exacerbates water shortages, these women indicate that they spend considerable effort in obtaining freshwater, a duty strongly associated with their primary role in domestic water supply. This scenario exemplifies the intersection of gendered domestic labour, environmental exposure, and ethnic marginalisation in shaping disparate

experiences of water insecurity, particularly during periods of seasonal climatic stress. Chapter eight provides a further analysis of these findings.

An intersectional standpoint, emphasising the interplay of various social identities, is crucial for evaluating climate adaptation processes in the VMD. While Van Thanh et al. (2022) focus their study predominantly on gender, their findings implicitly highlight how gendered vulnerabilities are exacerbated by intersecting factors such as socioeconomic standing and geographical location. Thuy and Thanh (2022) illustrate that vulnerability among Khmer households in the VMD arises from a complex interplay of factors, including gender and educational attainment, access to land and labour, livelihood and income diversification, availability of information and social networks, access to credit, and the security and quality of housing conditions. This understanding is reinforced by scholarship on ethnicity and cultural identity. Empirical evidence from the VMD case studies in chapter eight underscores that ageing and gendered labour expectations constitute important determinants affecting women's economic agency, mobility, and livelihood transformation. Hanh and Ha (2025) illustrate that ethnic identity and cultural heritage greatly impact adaptation strategies and agricultural transformation. Their research demonstrates that cultural identity shapes community responses to climatic stressors and affects collective adaptation against environmental risks. Collectively, these studies emphasise that adaptation is not a homogeneous process; instead, perceptions of vulnerability and manifestations of agency differ based on individuals' positions within gendered, ethnic, and socio-cultural hierarchies (Johnson et al., 2022; Ranjitkar & Haukanes, 2022). Moreover, studies on community-based adaptation emphasise the importance of grassroots learning mechanisms in facilitating transformative change. Quang and De Wit (2020) demonstrate that localised adaptation projects can empower community members by integrating gendered experiences into wider collective learning frameworks. These approaches frequently highlight collective responsibility among social groups, therefore fostering more inclusive and sustainable adaptation outcomes (Quang & De Wit, 2020). These findings highlight the importance of intersectional approaches that go beyond a singular emphasis on gender to encompass the intricate dynamics of vulnerability and agency that exist in local adaptation contexts (Ahmed & Eklund, 2024).

The processes of livelihood transformation present an important lens for examining the gendered and intersectional aspects of climate adaptation in the VMD (H. Q. Nguyen et al., 2019). Strategies that respond to climate change, including crop diversification, transitioning from rice farming to shrimp aquaculture, and seeking off-farm jobs for income, are frequently

proposed as remedies for saline intrusion and broader environmental challenges (Lan, 2011; Tri et al., 2019). Nonetheless, current research demonstrates that these changes in livelihood often exacerbate, rather than mitigate, pre-existing social inequities (Renaud et al., 2016). Households possessing higher financial assets, robust institutional connections, and enhanced access to credit are better positioned to leverage these transformations, whereas economically disadvantaged households frequently face increased indebtedness and livelihood instability (Rockenbauch et al., 2019). Women continue to play a crucial role in preserving the economic stability and well-being of households during these changes. However, adaptation initiatives that neglect gendered power dynamics consistently fail to recognise women's increasing labour responsibilities or to enhance their participation in decision-making (Call & Sellers, 2019; Edvardsson Björnberg & Hansson, 2013). Consequently, these interventions may improve overall output without dramatically tackling underlying gender disparities (Alston & Akhter, 2016).

From a governance standpoint, feminist political ecology and critical adaptation research emphasise that climate adaptation in the Mekong Delta is predominantly influenced by technocratic planning, market-oriented development principles, and externally imposed project objectives (Thomas, 2023; Ylipaa et al., 2019). Despite Vietnam's official policy commitments to gender equality and social inclusion, empirical research consistently reveals a disparity between claimed aims and actual implementation, especially at sub-national and local levels (Song et al., 2023; UN Women 2021b). In practice, adaptation interventions often prioritise infrastructure-intensive and production-oriented measures that correspond with donor priorities and planning frameworks, neglecting less apparent yet equally vital aspects such as social reproduction, caregiving responsibilities, and intra-community power dynamics (Thomas, 2023). When examined through an intersectional perspective, these tendencies may perpetuate existing hierarchies by disproportionately recognising individuals with greater political power, financial assets, and institutional access, consequently marginalising those with limited opportunities to influence adaptation outcomes (Ahmed & Eklund, 2024; Garcia et al., 2020).

This literature emphasises that climate adaptation cannot be effectively analysed through a sole focus on gender; rather, it necessitates an intersectional approach that contextualises gender alongside ethnicity, socio-economic status, age, spatial location, and institutional positioning. In areas like agricultural livelihoods, water availability, and adaptation governance, women's capacity to address climate stress and their vulnerability to risk are influenced by established power dynamics that dictate resource access, affect decision-making involvement, and limit

livelihood opportunities. In the VMD, these overlapping dynamics are evident for women, particularly in the Khmer women whose experiences with climate-related challenges are exacerbated by enduring marginalisation, inadequate institutional representation, and gendered norms pertaining to employment and caregiving (Marschke & Berkes, 2006; Tuy, 2019). An intersectional standpoint illustrates that adaptation strategies often reinforce existing disparities when technocratic and market-driven methods neglect social differentiation and lived experiences. To rectify these deficiencies, it is essential to implement adaptive governance that encompasses consistent solutions, recognising various vulnerabilities, validating diverse knowledge systems, and promoting collective, gender-sensitive, and socially inclusive approaches for transformative change.

2.5 Institutions, governance, and the politics of adaptation

Local entitlements, capacities, and inequalities are mediated by institutional and governance frameworks. Institutional contexts determine the formation, distribution, and contestation of entitlements (Adger, 2001; Adger & Kelly, 1999), and political decisions and processes can lead to environmental changes that disproportionately affect disadvantaged groups (Sultana, 2009). Schlosberg (2012) writes that injustice originates from a lack of acknowledgement and unequal social and political power provided to diverse communities. To ensure procedural justice, Eriksen et al. (2011) and Thomas and Twyman (2005) suggest that affected groups must be involved and represented throughout decision-making processes. Brisley et al. (2012) describe procedural justice as enabling community participation in decision-making by addressing a lack of social capital and institutional constraints. Lebel et al. (2006) studied governance structures in industrialised and developing countries, highlighting that repressive social structures and power disparities cause injustices, and governments must pursue social justice and mediate distributions of ‘goods’ and ‘bads’. Diverse engagement, deliberation, flexible governance frameworks, and accountability enhanced ecological adaptation and livelihoods (Lebel et al., 2006). For example, Engle and Lemos (2010) analysed Brazilian governance characteristics that contributed to adaptive capacity in the case of droughts and water management. Their main thesis emphasises that increased levels of representation and engagement led to more capable of adaptive governance. Adaptive capacity depends on the efficiency and stability of governance institutions and the capability of communities to influence political processes (Brooks et al., 2005).

Formal and informal institutions are also a key part of the analytical framework development in this thesis. Institutions are regulations that influence social behaviour (North, 1990). They

vary from organisations, which are collectives with agency (Pelling et al., 2008). Institutions can limit organisational behaviour (Pelling et al., 2008). Formal institutions refer to the visible and tangible bureaucratic procedures and responsibilities, such as laws and land tenure agreements by which public sector organisations carry out climate hazards management, while informal institutions are intangible social features (Abeling, 2015). These include values, conventions, trust relationships, and informal networks. According to Stacey (1996), these two forms of institutions contrast a 'shadow system' of rules, values, and behaviours. Trust is prevalent in informal relationships and networks. They can bring flexibility to climate hazards management, such as when conventional behaviour offers alternatives to formal bureaucratic standards of action. For the establishment of institutions, social capital and its networks are essential (Dasgupta, 2003).

2.5.1 Adaptation through (national and global) formal politics

Several governments throughout the world have attempted to build climate change adaptation policy frameworks. Some of these policies were formed in a reactive manner, while others are proactive (Vincent et al., 2010). Frequent hurricanes in the Caribbean have motivated emergency and disaster planning (Tompkins, 2005). Prior to the destruction caused by a hurricane, proactive adaptation strategies are thought to mitigate the negative effects of climate change, and these are typically planned and frequently executed by public actors. Many governments have begun to integrate an appreciation of climate change into their risk management policies (Antón et al., 2013; Kunreuther et al., 2012).

Research on political processes surrounding environmental change requires a wide spectrum of contemporary social theory (Adger, 1998), including insights from international relations. Jordan and O'Riordan (1995) argue that institutions such as national policy styles are also included in this list. Their study, however, focused on sub-national formal political institutions, informal connections, and cultural norms, as well as local exogenous environmental change related with global processes like existing climate extremes and projected future changes. Global environmental change can be both cumulative and systemic. Meyer and Turner (1995) indicate that both categories are mediated by individual and collective (institutional) acts. In the sections below, institutions facilitate power relationships, and local adaptation.

According to Vincent et al. (2010), the shifting institutional regime and policy framework has implications for climate change vulnerability because local decisions are now integrated in a new institutional framework that can influence local adaptations. Political ecologists have long

acknowledged the interconnectedness of local and global processes. The political ecology approach originated with the discussion regarding land deterioration, desertification, and soil erosion but rapidly spread to other areas (Blaikie, 2016). First research on embeddedness of livelihood strategies in 1975 and 1989 in Ghana indicated that household decisions are rational given the institutional framework. In that context, climate change and government economic policy cause restricted and unpredictable employment situations (Whitehead, 2010). In a study conducted in Mexico, production patterns were more closely connected to agricultural policy than climate variability (Eakin, 2000). In fact, it is crucial to acknowledge that nations are already faced with a number of complex economic, social, and demographic transformations. This is further interpreted by Bloom (2004), who argues that those nations that are currently facing challenges in this area are likely to have the most problems managing climate change risks.

2.5.2 Adaptation through local informal institutions

According to Vincent et al. (2010), informal institutions also contribute to adaptive capacity and climate change adaptation. Locally, climate poses a covariate risk, meaning whole communities are at danger. Biophysical vulnerability is often the same, but the social vulnerability of households varies. Facing livelihood threats often promotes collective action or communities of practice (Agrawal & Perrin, 2008). Collective action depends on social capital and the informal structures that evolve when social capital is robust (Adger, 2003b).

According to Wenger (2000), a community of practice shows how learning agent interactions can facilitate collective action. A community of practice is a group of individuals with shared interests who engage in collective learning (Wenger, 2001). Communities of practice emphasise interaction and participation. Individual experiences are exchanged and shared information, stories, and resources are developed through interaction (Wenger, 2001). Individual group members' contribution to the shared competence of the group leads to collective action (social learning). Wenger (2001) differentiates between the group's collective knowledge and skills, and individual experience. When there is a mismatch between two things, such as when a new person enters a group, learning will occur (Wenger, 2001).

Collective action (communities of practise) are building blocks of social learning systems and, hence influence the capacity of social entities, including organisations, to learn and adapt (Abeling, 2015). Communities are social settings that hold specialised knowledge, such as conventional wisdom and practice (Abeling, 2015). Wenger (2000) writes that competence is

defined by three components: shared work, mutuality, and shared communal resources (e.g. shared stories and language), highlighting that social competence is the collective knowledge of a community. Collectively, these skills constitute the social learning system. This focuses on the ability of various communities of practise to link with one another and build a network of learning spaces in the analysis of organisational and institutional change (Wenger, 2001).

Furthermore, collective action refers to voluntary group action for common goals (Meinzen-Dick & Gregorio, 2004). As people realise the benefits of collaboration, several local institutions have evolved. Once these ideas were first offered in the context of resource management, concerns emerged that individuals would pursue short-term benefits, compromising long-term collective benefits (Hardin, 1998). However, Vincent et al. (2010) indicates that local institutions have a lengthy history and are geographically dispersed. For instance, about 500,000 organisations have been established for collective action in the sectors of watershed, forest, irrigation, pest, wildlife, fisheries, and microfinance management since the early 1990s (Pretty, 2003). Local (informal) groups' networks and collaborative activities are now recognised as a resource, namely social capital.

Social capital is associated with collective action because it not only strengthens individuals' capacity to address collective action challenges (Ostrom & Ahn, 2003), but also enhances trust. Social capital has the advantage of being applied at numerous scales, from the individual to the national scale (Goulden, 2006). The roots of social capital theory can be traced back to sociology. (Bourdieu, 1986, pp. 248-249) defines social capital as:

> The aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition - or in other words, to membership in a group - which provides each of its members with the backing of the collectivity-owned capital, a 'credential' which entitles them to credit, in the various senses of the word.

Bourdieu (1986) defines social capital as actual or potential resources including symbolic or material for group members. This means that those who become involved in groups can gain access to both symbolic and material resources. Social capital is developed through formal or informal interactions that are nurtured through the exchange of symbolic or material goods. Bourdieu (1986) also emphasizes that social relationships are crucial to obtaining social capital.

Martin (2000) notes that social capital is a measure of the trust that each member of a group has in each other. In addition to trust, reciprocity, common rules, norms, and sanctions, and connection,

networks, and groups are other prevalent concepts in social capital definitions (Adger, 2003b; Coleman, 1988; Pretty & Ward, 2001). Bonding and networking social capital significantly differs. Bonding social capital is associated with social and family bonds based on commitment and reciprocity, while networking social capital refers to trust-based ties with persons outside the kinship or friendship group (Adger, 2003b). Kin networks are generated organically, whereas the majority of other social connections need investment. Bourdieu (1986) argues that social capital is a communal asset that is produced by and distributed among group members. A person's social capital depends on the extent of his or her networks or involvement in groups, or the economic, cultural, or symbolic assets of each organisation to which he or she belongs (Bourdieu, 1986).

Social capital refers to interpersonal interactions that facilitate productive activity, whereas human capital and physical capital refer to individuals' skills and capacities and the materials employed in production, respectively (Coleman, 1988). Omolo and Mafongoya (2019) indicate that different social groups require social capital at different periods, and it is essential for economic development, particularly in the context of climate change. Employing the tracking adaptation and measuring development paradigm, Omolo and Mafongoya (2019) also point out the key connections between gender, social capital, and climate change. Pastoralists in Kenya's Turkana region, for instance, apply both technologies and traditional adaptation strategies based on social capital in order to adapt to droughts (Omolo & Mafongoya, 2019). Fine (1999) argues that social capital is not as visible as human or physical capital, and that a reductionist economic approach to social science is problematic. This is the notion I use in my research for social capital (collective action) analysis associated with gender differences and livelihood transformation in response to climate hazards.

However, social capital is challenging to define and quantify due to some of its more intangible characteristics (Woolcock, 2000). Lack of proper approach for analysing social capital has led to allegations that it is a useless term (Adam & Rončević, 2003). Nonetheless, membership in groups may act as an indicator of social capital (Bourdieu, 1986; Narayan & Pritchett, 1999), while the World Bank employs an integrated questionnaire focusing on broader ideas of trust and collaboration (Grootaert, 2004). Knack and Keefer (1997) found that social capital has economic value. In Tanzania, for instance, stronger associational activities led to lower transactional costs and broader diffusion, which increased household income levels (Narayan & Pritchett, 1999). In Madagascar, more connected enterprises achieved better sales, profits and values (Fafchamps & Minten, 1998). In addition, social capital has economic and political benefits through association, civil society, and democracy (Fukuyama, 2010). In hazardous events, social capital

also helps households cope with shocks (Woolcock, 2000). Moreover, Carter and Maluccio (2003) point out that individuals with stronger social capital appear more resilient to shocks.

According to Adger (2003b), social capital develops in the absence of governmental provision, when local institutions replace formal governing mechanisms. Promoting social capital for development has been criticised as a neo-liberal effort to reduce state power (Bebbington, 2004; Fine, 1999), and there are some concerns whether or not policy initiatives can or should foster social capital on the ground (Pelling & High, 2005b). A case study conducted in Tanzania revealed that social networks and collective efforts can fundamentally exclude the poor, illustrating how developing social capital does not necessarily promote equitable development (Cleaver, 2005). In this sense, Emmett (2000) writes that the responsibilities of government and social capital are complementary. Both complementarity and embeddedness, or socially-based synergy between the government and civil society, exist (Evans, 1996). Questions have been raised regarding the impact on social capital of the reappearance of such state provision. In South Africa, for instance, governance institutions are experiencing a comparable transition as a result of the political shift.

The distinction between formal and informal institutions pertains to social geographical concepts about organisational space and how it shapes social interactions (Abeling, 2015). Regarding adaptive capacity, "shadow spaces" or "shadow learning environments" is interpreted by Pelling et al. (2008) and Pelling and High (2005a) as informal organisational spaces spanning conventional organisational structures. Adaptive behaviour is capable of interacting with more formal systems of learning, as represented in organisational structure (Pelling et al., 2008). Such an understanding recognises implicit processes as learning within informal partnerships. Behavioural approaches to learning that focus solely on observable, output-oriented organisational behaviours are thus broadened by Pelling et al. (2008). This means that social context affects individual learning and that social collectives have a unique capacity to learn.

Adaptive capacity and feminist political ecology collectively offer a multifaceted perspective on how institutions and governance influence climate adaptation. The capacity of communities to adapt is determined by resource availability, institutional efficacy, and the distribution of power, acknowledgement, and involvement in decision-making processes (Brooks et al., 2005; Schlosberg, 2012). Formal structures, including laws and policies, in conjunction with informal institutions such as trust networks and social norms, substantially influence the adaptive capacity accessible to households and communities (North, 1990; Abeling, 2015). Social

capital and collective action can bolster adaptive capacity through mutual support and knowledge dissemination; yet, they may also perpetuate exclusion and inequality if marginalised groups are deprived of access or representation. Feminist political ecology emphasises that adaptation is fundamentally political, as intersecting social identities, such as gender, class, and ethnicity interact with institutional dynamics to determine who reaps the benefits or incurs the costs of adaptation. Therefore, adaptive capacity should be perceived not merely as a technical reaction to climatic hazards, but as a socially ingrained process influenced by power dynamics, institutional frameworks, and the ability for collective action.

2.5.3 Understanding adaptation under neoliberalism and its governance structures

Neoliberalism is generally characterised by its emphasis on market mechanisms, coupled with a comprehensive commitment to deregulation, privatisation, and the fragmentation or decentralisation of governmental authority and institutional control (Patomäki, 2021; Sadian, 2022). Sadian (2022) argues that neoliberalism cultivates a consumerist ideology that serves a twin purpose: it depoliticizes governance and promotes the privatisation of social and governmental spheres. This observation corresponds with broader academic viewpoints that regard depoliticization as a fundamental result of neoliberal reforms, wherein the dominance of market rationality erodes opportunities for political opposition and collective mobilisation (Patomäki, 2021; Quinn & Bates, 2017). These tendencies highlight a substantial conflict between the normative power of neoliberal ideas and the specifics of local historical-political settings

Neoliberalisation is regarded as a dynamic process rather than a fixed state (i.e. neoliberalism), and entails the alteration of established institutional structures and ideological frameworks so that they better embody neoliberal principles (Springer, 2010). This process-oriented viewpoint defines neoliberalism as a hybrid and contextually negotiated integration of practices, developed through the interaction of global market rationalities and locally entrenched political frameworks, consequently influencing governmental processes, cultural values, and policy trajectories. (Knio, 2022; Mössner & Freytag, 2014). Mössner and Freytag (2014) underscore the crucial influence of local political elites in enabling urban restructuring to conform to global capital interests, wherein neoliberal initiatives are both resisted and legitimised through localised political involvement. Khan et al. (2022) illustrate that the seemingly dominant imposition of neoliberal logic in Cape Town's urban policy is frequently characterised by intricate discussions influenced by community responses and local discursive frameworks. Likewise, Knio (2022) defines neoliberalisation as a dynamic reconfiguration of global

institutional frameworks, profoundly affecting multilateral governance and international collaboration.

Neoliberalism is recognised as the prevailing global political economic paradigm since the 1990s, influencing the contemporary world (Steger & Roy, 2021). Peck and Tickell (2017) contend that the political and economic influence of neoliberalism has been significantly overestimated, citing its continuous flexibility and transformative potential as proof of its persistent power. Neoliberalism is commonly defined as the proliferation of market-oriented government, characterised by the infiltration of market principles into areas formerly governed by the state (MacLeavy, 2019; Venugopal, 2015). This foundational interpretation is further elaborated by Harvey (2007), who characterises neoliberal theory as a framework of political-economic practices asserting that human welfare is optimally promoted by empowering individual entrepreneurial freedoms and capabilities within an institutional structure defined by robust private property rights, free markets, and free trade. The state's duty is to provide and maintain an institutional structure suitable for these behaviours. Neoliberalism, defined as the prevalence of market-oriented governance (McMichael & Lawrence, 2001), has drastically altered the organisation of commodity production, resulting in decreased labour costs and alterations in pricing structures. Consequently, neoliberal restructuring has far-reaching implications for family dynamics and the continual reconfiguration of gender hierarchies (Connell, 2014).

Contemporary research on climate adaptation increasingly recognises that the risks associated with climate change are exacerbated by the worldwide neoliberal reconfiguration of political and economic institutions initiated in the mid-1970s (O'brien & Leichenko, 2000; Wisner, 2001). O'brien and Leichenko (2000) established the concept of "double exposure" to illustrate the interaction between the demands of anthropogenic climate change and vulnerabilities generated by globalisation processes. This idea is crucial in examining the intersection of societal vulnerabilities, influenced by neoliberal reforms, and environmental risks (O'brien & Leichenko, 2000; Wisner, 2001). Eriksen and O'Brien (2007) assert that this intersection emphasises that adaptation is not merely an environmental or technological issue but ultimately a matter of social evolution. From this perspective, neoliberalism is associated not only with the emergence of vulnerability but also with the establishment of institutional, economic, and political obstacles that restrict adaptive solutions (Adger, 2003b; Pouliotte et al., 2009). These remarks highlight that dominant neoliberal norms and frameworks, including market-driven governance, deregulation, and decentralisation, frequently hinder collective action and equity

in adaptation processes. Collectively, this body of scholarship advocates for an adaptation paradigm that transcends technological solutions to confront the political-economic institutions that sustain social and environmental inequities.

Early political ecology research, notably Watts' examination of famine in West Africa, contested environmentally deterministic interpretations by illustrating that susceptibility to drought and food poverty is socially and politically constructed (Watts, 2013). Despite its development in the 1980s, this perspective created an analytical framework that emphasises structural disparities in resource access, the disproportionate distribution of environmental advantages and disadvantages, and the impact of institutional and structural factors, such as markets, land tenure systems, governmental bodies, legal frameworks, scientific narratives, and coercive state actions on the behaviours of local land users (Watts, 2013). Building on this foundation, contemporary political ecology has increasingly analysed how neoliberal restructuring alters environmental governance, encompassing the proliferation of market-based instruments, the commodification of natural resources, and the dispersal of regulatory authority via decentralised frameworks. These advancements broaden political ecology's enduring focus on power by examining how market-driven changes affect resource access, collective action, and adaptive capacity. These investigations emphasised that such dynamics surpass spatial limits, functioning concurrently at local, national, and global levels. With the ascendance of neoliberalism, political ecology expanded to encompass critiques of market-oriented environmental solutions, the commodification and financialization of ecological governance, and the development of regulatory frameworks based on the concept of ‘environmentality’ (Watts, 2013). These developments stimulated a further investigation into the opportunities and limitations presented by these governance structures. At the core of political ecology is its dedication to examining the frequently obscured power dynamics that influence land-use decisions and, increasingly, consumer behaviour, while also investigating how communities resist or adapt to structural changes impacting their daily lives.

The domain of climate adaptation is characterised by uncertainty, encompassing abrupt disruptions, pivotal thresholds, and strategic hazards (Collier, 2008). Framed through the perspective of self-regulating social systems, modern concepts of adaptation and resilience function as measurable instruments for managing the instability of global capitalism. In this setting, the Global South has effectively transformed into a testing ground where the most vulnerable populations endure experimental adaptation strategies as climatic consequences manifest (IPCC, 2014a). Ngcamu (2023) affirm that climate change in the Global South has

catastrophic impacts on vulnerable communities exacerbated by socio-economic disparities. Thomas (2023) notably emphasises that in the Vietnamese Mekong Delta, capital-intensive adaptation approaches enhance economic competitiveness rather than genuinely reducing vulnerability, effectively regarding millions of individuals as subjects of experimental adaptation strategies. According to Watts (2015), constructing resilient systems relies primarily on the adaptive and self-organizing capabilities of the market. From this viewpoint, Watts (2015, p. 40) writes that "resilience dissolves directly into neoliberalism as a life". These findings conclude that addressing radical power asymmetries and re-engaging with the core concepts of political ecology, such as power, agency, struggles over access and control of property, labour and the disposition of surpluses require a thoroughly re-conceptualisation of adaptation as transformation (Watts, 2015).

According to De La Fabián (2020), the current application of concepts like adaptive capacity and resilience must be contextualised within the larger framework of contemporary biopolitical governance. These terms correspond with a particular theoretical interpretation of life that is progressively utilised as a means of governance. In this context, adaptation entails an active interaction with risk, wherein the management of uncertainty is intrinsically linked to facilitating new possibilities for value extraction and legitimising emerging practices and decisions (Amoore, 2013). In this framework, adaptation, security, risk governance, and resilience arise as prevailing paradigms governing life under neoliberalism.

In the Vietnamese Mekong Delta, adaptation governance is influenced by neoliberal decentralisation and enduring centralised authority (Gilfillan et al., 2017; T. A. Tran, J. Pittock, et al., 2020). Minkman et al. (2022) also emphasise that the shift towards sustainable agriculture is hindered by inadequate leadership, coordination, and finance, despite the existence of national initiatives for climate adaptation. The findings collectively suggest that decentralisation alone does not enhance adaptive capacity; instead, it necessitates well-integrated institutions and sufficient financial resources to facilitate cohesive adaptation initiatives across various political and geographical boundaries (Gilfillan et al., 2017; Minkman et al., 2022; Tri et al., 2023).

Additional constraints of neoliberal approaches are apparent in the domain of environmental governance. An increasing amount of literature suggests that development initiatives guided by neoliberal principles often promote frameworks like Integrated Coastal Zone Management and other market-driven environmental tools (Fletcher, 2012; McFadden, 2007; Zinzani, 2018). Nevertheless, these programmes frequently inadequately address localised socio-

environmental contexts and tend to minimise the importance of ongoing collaboration among governmental entities (Zhao et al., 2022; Zinzani, 2018). The conflict between distributed autonomy and the necessity for centralised oversight is particularly evident in the VMD. In this context, effective adaptation necessitates coordinated responses to extensive, state-driven challenges, such as salinity intrusion and altered flood regimes (Eslami et al., 2021; Van et al., 2012) while concurrently addressing localised issues, including the erosion of indigenous knowledge systems and diminishing community resilience (Mishra & Pede, 2017; Van Chat, 2024).

This thesis presents empirical evidence from the VMD demonstrating that farmers have implemented diverse self-initiated adaptive strategies to address climate stressors, including salinity intrusion, extreme heat, and insufficient irrigation, through the construction of dikes, modification of irrigation schedules, cultivation of salt-tolerant crops, and transition to perennial crops aligned with market demand. Neoliberalism's emphasis on market mechanisms frequently neglects community-based coordination, undermining social equity and long-term adaptation strategies (Fieldman, 2011).

Deregulation, a fundamental aspect of neoliberal philosophy, aims to diminish government intervention and promote private sector involvement. In the VMD, the loosening of government influence over water and agricultural systems has resulted in fragmented and inadequately coordinated adaptation strategies (Jaisridhar et al., 2025). This study provides a clear example of farmers constructing individual dike systems to regulate local water flows. As per Janmaat and Ruijs (2007), without a cohesive regulatory framework, these autonomous solutions frequently disrupt overarching hydrological processes, heightening downstream vulnerability and reducing the collective action to manage floods. Lovell (2019) provides relevant comparisons, illustrating how deregulation in various contexts yields fragmented results that inadequately address regional and ecological goals in a comprehensive manner. Deregulation may facilitate rapid, localised responses, but it often undermines the essential cooperation required for equitable and sustainable adaptation solutions across various areas (K. Brown, 2011).

Furthermore, decentralisation, frequently promoted as an approach to delegate decision-making power to local governments and communities, theoretically offers the potential to customise adaptation initiatives to the local context (Agarwal et al., 2012). However, the distribution of authority under neoliberal decentralisation frequently undermines cohesive governance and diminishes coordinated collective responses (Feiock, 2013). Evidence from

the VMD case studies indicates that, while decentralised adaptation responsibilities have promoted locally driven solutions, such as farmers constructing their own dike systems or adopting salt-tolerant crops, this autonomy may result in a lack of planning coordination. These individual initiatives, while decentralisation seeks to empower local institutions, may lead to inconsistent implementation and reduced central monitoring, obstructing collective climate actions and increasing existing inequities (Ahmad & Ali, 2011; Barrett, 2015). Consequently, while neoliberal approaches may promote swift, localised initiatives, they inadequately facilitate the integrated, equity-oriented adaptation options essential for addressing climate change in an equitable and sustainable manner (Fieldman, 2011).

2.6 Summary and identification of research questions

The review of the literature has established two primary theoretical frameworks for evaluating climate-induced vulnerability and adaptation in the VMD: adaptive capacity and feminist political ecology. These frameworks facilitate an understanding of the interplay between climate change, power, gender identity, and institutional dynamics.

The adaptive capacity theory emphasises the factors that facilitate or hinder individuals and communities in effectively responding to environmental hazards. It considers both the availability of material resources and the institutional frameworks, governance structures, and social capital that influence adaptation pathways. This elucidates why certain households are greater at adaptation than others, even within comparable environmental circumstances. Feminist political ecology enhances this analysis by contextualising adaptation within wider social power dynamics. It highlights the impact of gender, class, ethnicity, and geographical location on resource access, decision-making participation, and the acknowledgement of varied forms of knowledge. FPE analyses how intersecting disparities, rather than viewing gender as a singular component, produce distinct vulnerabilities and influence the lived experiences of climate change. The two frameworks collectively offer the theoretical foundation to examine the primary research question of this study:

> *How does the existing social-ecological setting influence the perceptions and experiences of rural farming households to climate hazards vulnerability?*

The literature identifies gender as a critical point of climate inequality. Feminist political ecology approaches conceptualise gender as a negotiation between people, spaces, and ecological systems (Sultana, 2009), which enables the investigation of how gender is constituted through every day environmental practices, resulting in vulnerabilities in times of

environmental challenges as well as possibilities for renegotiation. A substantial body of research in gender and climate hazard studies has documented the linkages between gender and natural hazards in terms of women's mortality and workloads during and after climate hazards. The literature indicates that gender inequities associated with established political structures are a major component of climate change vulnerability; hence, adaptation efforts must address this component. A fundamental critique of the existing literature on gender and climate change is that such an approach must be guided by feminist political ecology perspectives that understand gender relations as dynamic and changeable. The thesis seeks to answer the following question:

> *How do gender and socio-political power relations shape the adaptation of rural individuals, households, and communities to natural hazards?*

In order to address the underlying determinants of decreased adaptive capacity in the context of climate hazards, adaptation must encompass both environmental responses and social transformations in order to visualize vulnerability as a social process. Consequently, adaptation measures must address gender inequality as a crucial element of vulnerability. The concept of 'adaptation as transformation' is also useful for developing an analytical framework for adaptation that incorporates gender roles and larger societal processes as drivers to vulnerability. This approach also allows for the investigation of the underlying mechanisms that contribute to exposure, sensitivity, and restricted adaptive capacity. Furthermore, collective action (social capital or public participation), mobility, and agency are considered as essential instruments for achieving gender justice in the literature on feminist and development studies. This is the following research question the thesis attempts to address.

> *To what extent do gendered relations coupled with institutional context and actor participation influence the transformation of agricultural households' livelihoods in the VMD?*

However, vulnerability and adaptation are situated in Vietnam's broader institutional structure, which has experienced significant transformation since the 'Doi moi' policy. Political upheaval has had an influence on local institutions based on collective action in a number of rural communities that evolved under a traditional system of governance. These governance changes have effects for the institutional and environmental context in which vulnerability at the household level, including gendered divisions of labour, norms, and rights in connection to their everyday lives, is constructed. To investigate the impact of current political and

institutional change on the gendered vulnerability of households to climate change and their decisions to transform their livelihoods, the thesis seeks to answer the last question:

> *How can natural hazards adaptation discourses and strategies account for gender-specific vulnerability and transformational adaptation of livelihoods?*

From the aforementioned perspectives, there has been insufficient research investigating feminist political ecology and adaptive capacity to address the social and political factors causing gendered vulnerability to climate change associated with households' livelihood transformation, particularly in the complex social-ecological systems of the VMD, such as the floodplain and coastal regions. Previous research demonstrate that adaptation initiatives could contribute to reproduce gendered boundaries and power dynamics. Figure 2.2 outlines the conceptual framework for the thesis and provides an overview of the key vulnerability factors and transformative adaptation of households' livelihoods, which are aimed at addressing gender-specific vulnerability and shape the adaptation of VMD's farming communities to climate-related natural hazards.

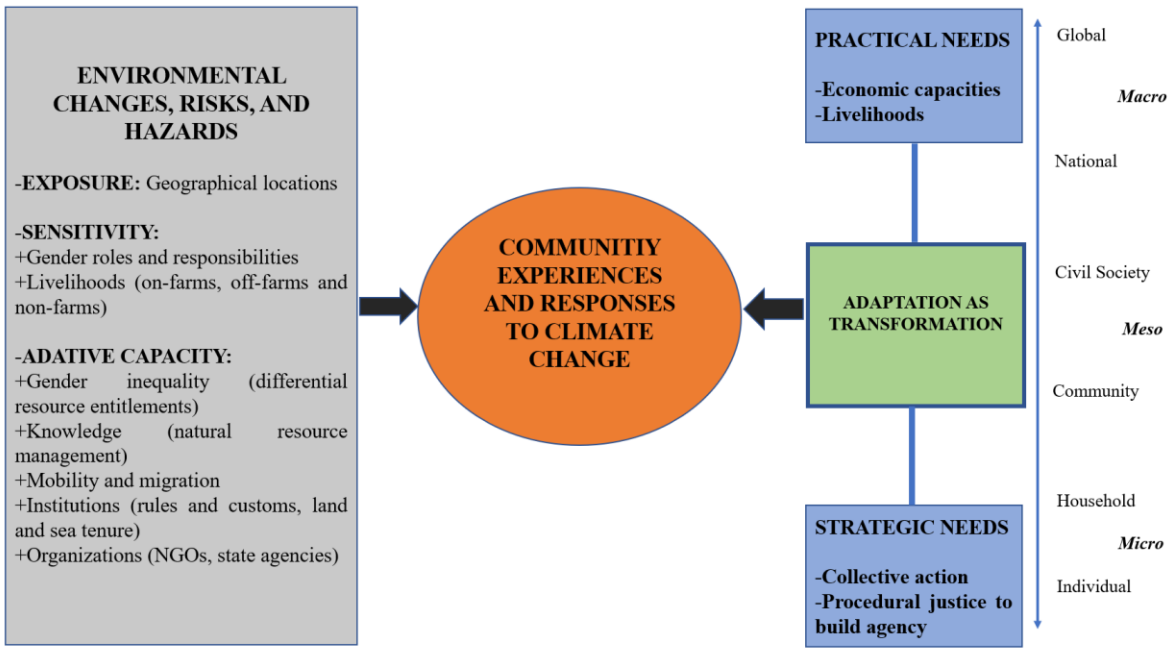


Figure 2.2 Conceptual framework for this thesis

Source: Author-own illustration (2024).

Chapter Three: Research Design, Methodology and Methods

3.1 Research design

3.1.1 Designing case study

This study uses a qualitative case study methodology to address the four research questions (Byrne & Ragin, 2009; Creswell, 2007, 2009; Stake, 2005; Yin, 2014). Some scholars view a case study as a methodology, a style of design for qualitative research, or both an object of study and a research output (Creswell, 2007), "a choice of what to be studied" (Stake, 2005, p. 443), and a research method (Yin, 2014). Along with four other significant approaches – narrative studies, phenomenology, grounded theory, and ethnography –Creswell (2007) classifies case studies as part of qualitative enquiry. His definition of this methodology is "the study of an issue explored through one or more cases within a bounded system" (i.e., a setting, a context) (Creswell, 2007, p. 73). According to Yin (2014), a real-world context is a way to conceptualise case study research that focuses on the primary issue of hazards and gendered vulnerability in smallholder farming communities of the VMD.

This research is characterized by a qualitative approach, complemented by the use of quantitative data obtained from household surveys to support the overarching thesis. According to Braun and Clarke (2019), qualitative research focuses on the interpretation and construction of meaning, recognising that this process is constantly influenced by the specific context, position, and situation. Additionally, qualitative data analysis is also considered the way to tell “stories”. This qualitative case study research enables the exploration of the significance and narratives underlying gender roles within farming households, as well as the perspectives of significant stakeholders in the agricultural sector across different temporal and spatial contexts. Quantitative data are not used to generalise to a larger population; rather, they are utilised to produce simple statistics like frequency and crosstabs. The quantitative research data might also be subject to qualitative interpretation.

As identified by Yin (2014), this study uses both exploration and explanation approaches to comprehend complex phenomena including climate-related hazards, gendered vulnerability, and livelihood transformation in the VMD. This study provided an opportunity to examine farmers' perception of risk, as well as the emergence and development of vulnerability and climate adaptation that stem from underlying social structures associated with agency and collective actions. The adoption of a case study research design facilitated the collection of

data from various techniques, hence allowing for the analysis and illustration of the phenomenon under investigation. The research methods included household surveys, in-depth interviews with farmers and other key stakeholders, field observations, and archival records.

3.1.2 Rationale for multiple-case embedded design

This study employs a multiple-case embedded approach, as proposed by Yin (2014). A multiple or collective case study will enable the researcher to compare and contrast various contexts, as well as analyse within and between them (Baxter & Jack, 2008). Multiple case studies can be used to either forecast findings that are similar (a literal replication) or results that are different but for understandable reasons (a theoretical replication) (Yin, 2003). According to Tellis (1997), the case study method not only covers the three pillars of the qualitative method: describing, analysing, and interpreting, but it also presents a nuanced perspective of reality through an in-depth investigation of the research issue. For examining and analysing the complex socio-ecological systems that are driven by the climate-related hazards in VMD, such a type of research is regarded as strong and reliable (Baxter & Jack, 2008; Yin, 2014).

This design is concentrated on numerous cases of interest. The utilisation of a multiple case embedded design enables a more comprehensive exploration of the case under investigation, including its sub-units. The aim of this study is to better understand how and why the role of gender influences how small-scale farmers' livelihoods change in the face of climate-related hazards, such as floods in upstream regions and droughts and salt intrusion in downstream regions of the VMD. An My commune in Ke Sach district, Soc Trang province, which is in the coastal area of the Vietnamese Mekong Delta (VMD), and Phu Huu commune in An Phu district, An Giang province, which symbolizes the flooded plain region, are the two key case study region chosen to research this topic.

Farming households from two unique villages were used as the sub-units to demonstrate how the farming systems and social structures of villages impacted by climate-related events have changed over time. As shown in Figure 3.1, the village-level case studies will combine qualitative and quantitative methods, including interviews with local government, agricultural officials, women unions, farmer unions and academics to gain insights into policy, broader environmental changes, and global and national level interpretations of gender and poverty. These insights will assist synthesising results from case study villages and establish cross-case perspectives on gender in farming activities and transformational adaptation, especially in VMD’s complex social-ecological systems.

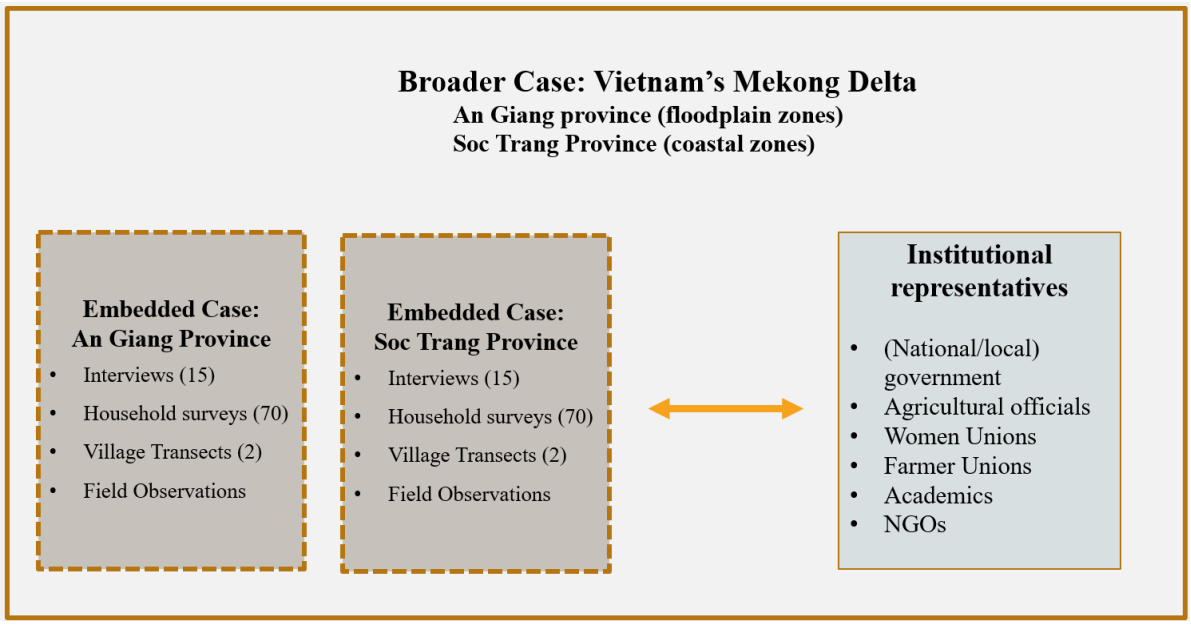


Figure 3.1 Embedded case study design

Source: Author's own-illustration, based on Yin (2014).

In line with Harvey (2009)'s case selection criteria, two cases at the village level will be included. Harvey (2009, p. 24) characterizes villages as 'meaningful analytic closure' at the local level and as a social structure that is incorporated within itself. Villages are comprised of groupings of houses, which are frequently inhabited by a large number of extended families (Rashid, 2013), enabling the investigation of various household responses to shared environmental factors. Furthermore, a case study conducted from a feminist viewpoint facilitates recording of gendered differences, particularly women's daily lives and accomplishments in the specific context of VMD, presenting both description and examination of women's lives, livelihood practices and transformation towards climate change, which other methods tend to neglect (Reinharz & Davidman, 1992).

3.1.3 Locating the cases

As the "rice bowl" of the nation, the VMD is essential to enabling Vietnam achieve its development goals (Ninh, 2007). The natural resource base is being put under further stress as a result of growing populations and rapid socioeconomic development. For instance, land resources are also becoming increasingly scarce, and environmental degradation in the low-lying VMD is intensifying (Stewart & Coclanis, 2011). Risks from climate change pose newly formed reasons for comprehending the processes of floods, droughts and salinity intrusion in the VMD, particularly the effects they have on local livelihoods of the communities. This is considered a matter of concern at both the local and national levels.

The delta region serves as an illustrative case of a society reliant on natural resources, which is subject to the impacts of both anthropogenic and natural catastrophes. The topography of the region experiences significant alterations due to the seasonal variability of water levels. Human habitation in the delta is typified by attempts to adapt to and benefit from these extreme seasonal water variations because the upper delta is exposed to extensive floods while the coastline area is marked by fresh water scarcity and saline intrusion (Miller, 2003). According to climate change predictions made by Dasgupta et al. (2007) and Carew-Reid (2007), the VMD will be the most severely affected region in terms of the proportion of the population that will be impacted, as well as the second most affected region globally in terms of the percentage of land that would be submerged by rising sea levels. Annual slow-onset floods have several flood-related advantages (MRC, 2003), while high floods seriously harm infrastructure, crops, and human lives (CCFSC, 1991–2000). As a result, human habitation in the rural delta must both adapt to and attempt to take advantage of these seasonal water variations (Miller, 2003).

The VMD was selected as the broad case study region for this thesis based on a number of crucial factors. Firstly, abundant research indicates that the VMD, the low-lying delta, is the most vulnerable to the negative effects of climate change. In the past decade, the region was impacted by a series of storms and floods, as well as droughts, land subsidence, and saltwater intrusion (see the literature section). Secondly, emerging issues over gendered vulnerability and inequality have been observed in the region, enabling for an analysis of the linkages between gendered norms, climate variability, and adaptation. Thirdly, my previous work experience and childhood in the VMD, as well as my (field and academic) networks and relationships in the provinces of VMD, provide me with the vital background knowledge for this study's design and ethical approach.

Figure 3.2 Map of VMD with two study locations - floodplain areas, and coastal areas

Source: Käkönen (2008).

Specifically, the provinces of An Giang and Soc Trang of the VMD are chosen as the two case study areas for two key reasons. First, the geographical features indicate distinct social and agro-ecological systems in VMD, such as the provinces of An Giang (floodplain zones) and Soc Trang (coastal zones). This enables researchers to comprehend environmental changes caused by climate hazards across the Mekong Delta at various spatial and temporal scales. Secondly, this thesis uses spatial data examined by the Global Disaster Database, the Emergency Events Database (EM-DAT) to categorize main categories of natural hazards, such as floods, storms, droughts, landslides, and wildfires that have occurred in Vietnam's Mekong Delta over a 100-year period. As depicted in Figure 3.3, An Giang is the most hazard-prone region in the floodplain zone, whereas Soc Trang is one of the most susceptible regions

impacted by extreme droughts and salinity (EM-DAT, 2022) and ranks among the poorest provinces in Vietnam (Prime Minister 2022).

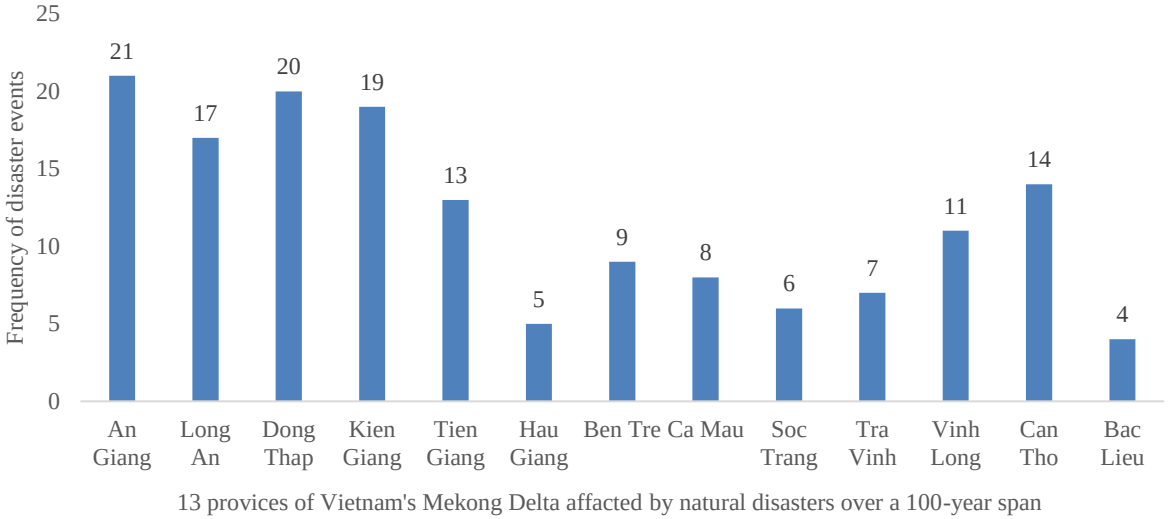


Figure 3.3 100 years of disaster occurrence frequency in the VMD

Source: Author's own-illustration, based on EM-DAT (2022).

3.1.3.1 An Giang province, An Phu district, Phu Huu commune

An Giang is the northernmost province among the 13 provinces and cities in the Vietnamese Mekong Delta. With an area of 3537 km, the province ranks fourth in the VMD region by land area and makes up 1.07% of the country's total land area (Van, Thuy, Viet, Van Anh, et al., 2024). An Giang province is situated in one of the two primary floodplains of the VMD, the Long Xuyen Quadrangle (Tran et al., 2018a). With floodwater depths ranging from roughly 1.5 to 4 metres, the province is completely inundated during seasonal flood seasons. This converts the terrain into an expansive, temporary aquatic area that holds floodwaters for several months (Tran et al., 2018a). This region's floodplain serves as an essential hydrological reservoir, possessing a natural potential to retain around 16 billion cubic metres of water (Duc Tran et al., 2018). This region, adjacent to the eastern Plain of Reeds, functions as a crucial water retention and flood regulation zone for the Vietnamese Mekong Delta, creating an interconnected system with Cambodia's upstream floodplain.

Flooding is a persistent natural occurrence in the VMD. Although frequently linked to devastation, seasonal floods from July to November also provide essential common pool resources, such as nutrient-dense alluvial sediment and wild aquatic species (Howie, 2011; Käkönen, 2008). The floodwaters, originating from upstream flows beyond the Cambodian

border (see Figure 3.4), reach the Mekong River's two primary distributaries, namely the Tiền and Hậu Rivers—submerging extensive regions of the delta. The waterways inundate the vast canal networks, creating depths that range from 0.5 to 5.5 metres above mean sea level.

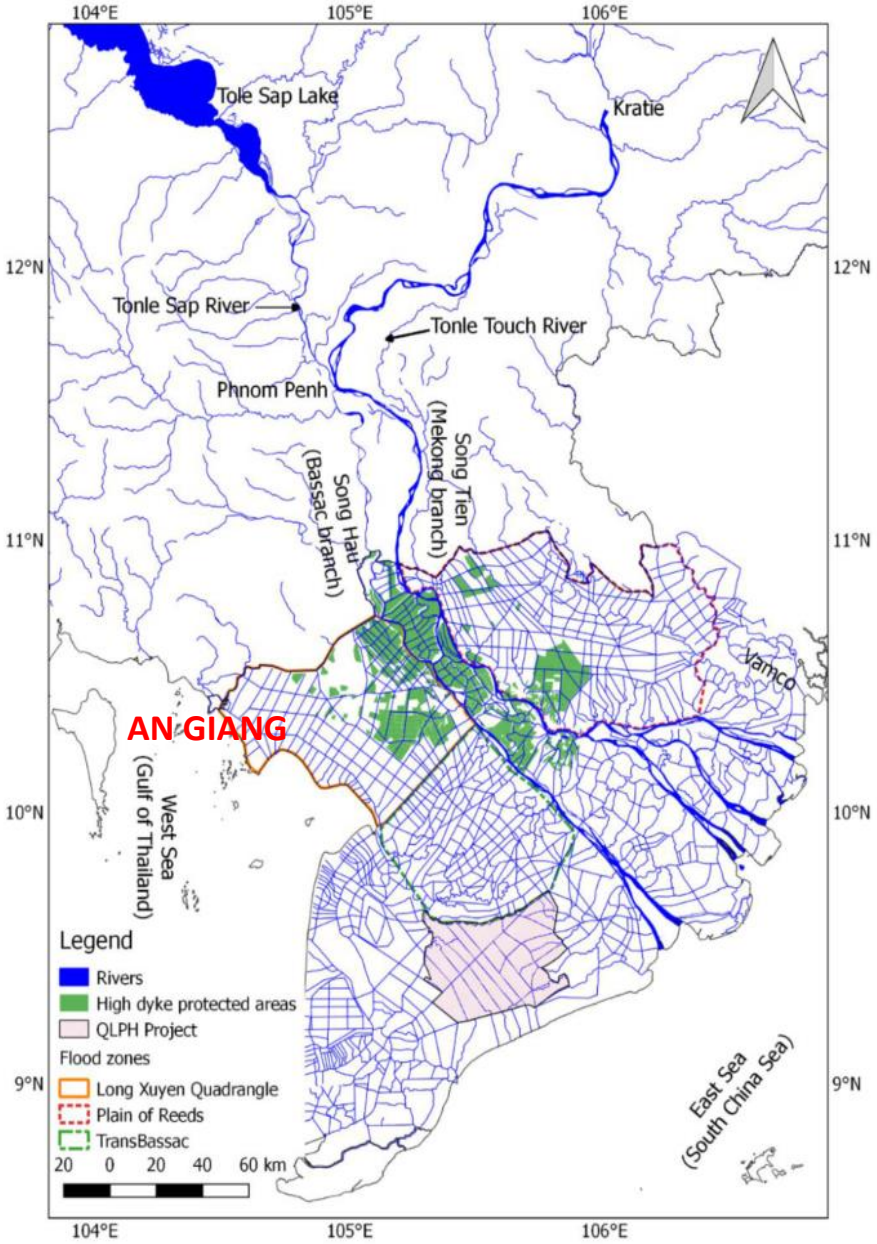


Figure 3.4 Map of An Giang province and its border with Cambodia

Source: Adapted by Thanh et al. (2020).

Historically, communities locally adapted their farming practices to capitalise on these seasonal floods. Initially characterised by monoculture floating rice systems, agriculture in the region had a substantial transformation post-1980s and early 1990s (see Figure 3.5), highlighted by the adoption of high-yield rice varieties and the shift into intensive rice farming systems for

the country's food security (Käkönen, 2008). The construction of dikes divided the terrain into many divisions, protecting agricultural areas from seasonal inundation and promoting the intensification of rice output via double and triple cropping each year (Xuân & Matsui, 1998). Subsequent to the catastrophic flooding in 2000, extensive high-dike systems have been built throughout the upper floodplains, especially in An Giang Province, to protect rice fields from submersion and to enable the annual production of three rice crops. This shift to triple-cropping and intensified agricultural methods has resulted in a significant rise in the application of chemical inputs, such as fertilisers and insecticides (Nguyen, 2014).

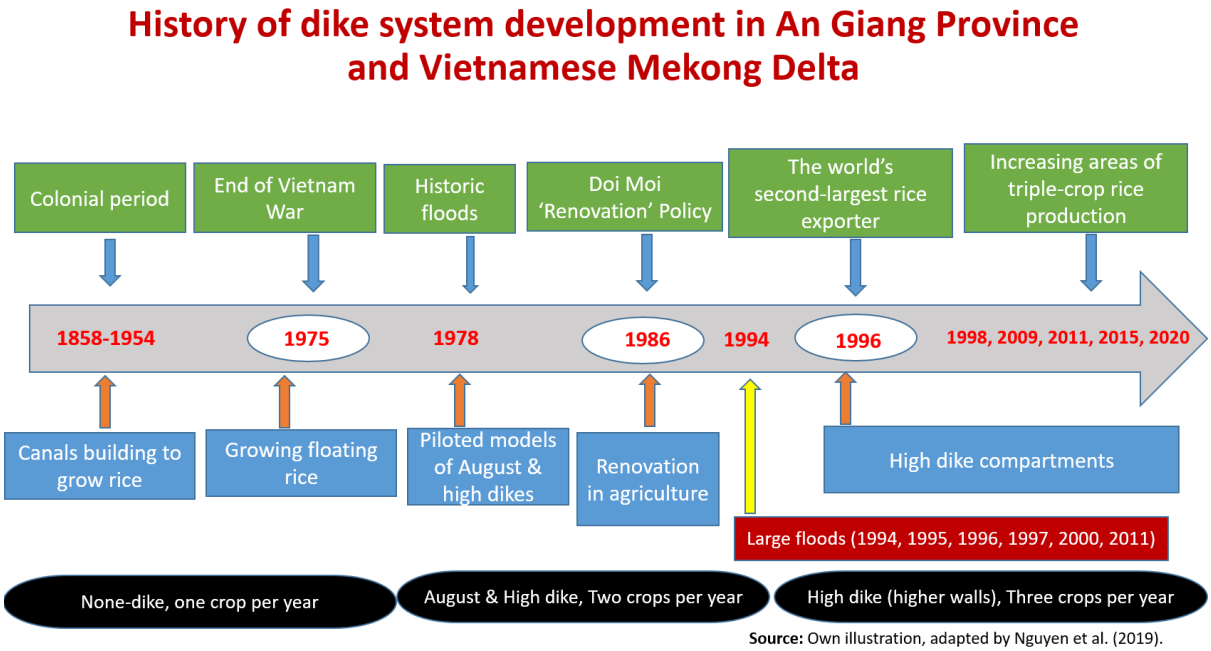


Figure 3.5 An Overview of the historical development of the dike system in An Giang Province and the VMD

Since the late 1980s, rice production in the Vietnamese Mekong Delta has markedly intensified, mainly due to national food security goals and the economic liberalisation initiated by the Đổi Mới reforms. In this setting, An Giang province became a pivotal area for agricultural growth, ranking as the second-largest rice-producing province in the VMD from 2000 to 2015. In this period of time, the province achieved an average annual rice production of over 3.2 million tonnes, ranking second to Kien Giang at 3.3 million tonnes, and surpassing Dong Thap, which yielded nearly 2.7 million tonnes annually (GSOVN, 2015).

However, such a transformation from a naturally flooded floodplain to a region of increased rice production has mostly been driven by the establishment of extensive flood-control infrastructure. The expansion of triple-rice cultivation, facilitated by high dikes, has drastically

altered the Delta's hydrological system. These structures have modified natural flood dynamics, resulting in elevated peak river discharge levels, irregular floodwater distribution, reduced flood retention capacity, and increased flood risks in neighbouring and downstream areas (Le et al., 2007; Tri et al., 2012). The extensive use of high-dike systems has drastically reduced the floodplain's natural water storage capacity, compromising its effectiveness in mitigating saltwater intrusion in downstream regions during the dry season (Tran et al., 2018b).

An Phu district, Phu Huu commune

Located in the upper reaches of the VMD, An Giang frequently experiences the worst effects of flooding (Tran et al., 2022; Van, Thuy, Viet, Van Anh, et al., 2024). Additionally, the province has experienced considerable damage due to the synergistic impacts of climate change, upstream hydropower dams, and extensive investments in local water infrastructure, including dike and drainage canal systems, negatively impacting the lives of numerous residents (Tran et al., 2024) and leading to harm on the environment (Van, Thuy, Viet, Van Anh, et al., 2024). For example, An Phu District, where the Mekong River enters Vietnam from Cambodia, has a disproportionately large concentration of people living in high-risk areas (the flood risk indexes are up to 0.094) (Van, Thuy, Viet, Van Anh, et al., 2024). This region, which is characterised by primarily agricultural landscapes and comparatively low living standards, is vulnerable to regular flooding during the monsoon season (Cosslett & Cosslett, 2018; Delgado et al., 2012).

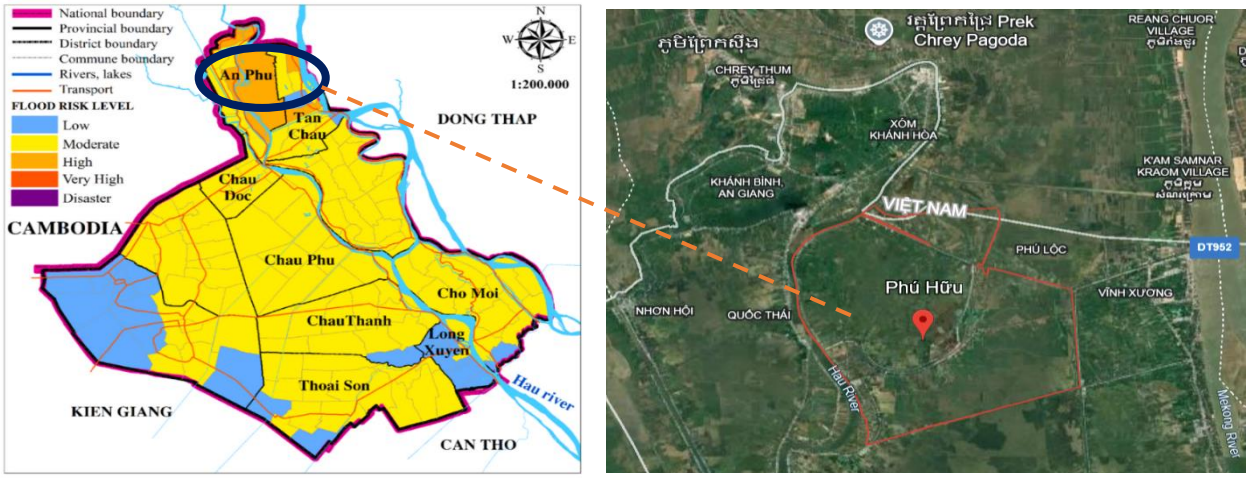


Figure 3.6 Map of An Phu district and Phu Huu commune - a study site in the floodplain zone

Source: Adapted by Van, Thuy, Viet, Anh, et al. (2024).

An Phu is situated in the north-west of An Giang province, bordering Cambodia for 42.5 kilometres, adjacent to Takeo and Kandal provinces (see Figure 3.6). The district is enriched with substantial water resources, predominantly sourced from the Mekong River through the Bassac River (also known as Hau River or Hậu Giang) (Pham et al., 2024). As of 2021, the local population is 148,731 individuals, with a density of 657 inhabitants per square kilometre, comprising 13 communes and one town (An Phu's GSO 2021). The local economy mostly depends on agriculture (see Figure 3.7), facilitated by the district's level topography and rich floodwaters during the yearly inundation season, which have traditionally rendered the area conducive to rice production. Nevertheless, the agriculture sector is presently encountering substantial challenges. The inconsistency in the timing and intensity of seasonal floods, along with extended durations of intensive agriculture, has resulted in diminished soil fertility, adversely impacting agricultural output, particularly rice harvests.

The natural conditions of An Phu can be classified into two distinct sub-regions. The western region is safeguarded by an elevated dike system, facilitating the annual cultivation of three rice crops. Conversely, the eastern portion produces two rice crops year and is protected solely by an August dike. This construction offers adequate height to protect the summer-autumn crop from August floods, yet renders the land susceptible to natural flooding for the rest of the year (Pham et al., 2024).

In 2021, the land use distribution in An Phu and Phu Huu reveals a major reliance on agricultural operations in the area. Agricultural land constitutes the primary section, encompassing 18,722.91 hectares in An Phu district and 346,199 hectares in Phu Huu commune, underscoring the region's dependence on agriculture as its main economic activity. Subsequently, special-use property comprises 1,257.15 hectares, indicating allocated areas for infrastructure, public amenities, or possible irrigation projects that improve agricultural productivity. The aquaculture area, encompassing only 216.03 hectares, remains minimal despite the region's suitability for integrated aquatic farming. This constrained use may signify issues like as infrastructure, or market accessibility in regional practices.

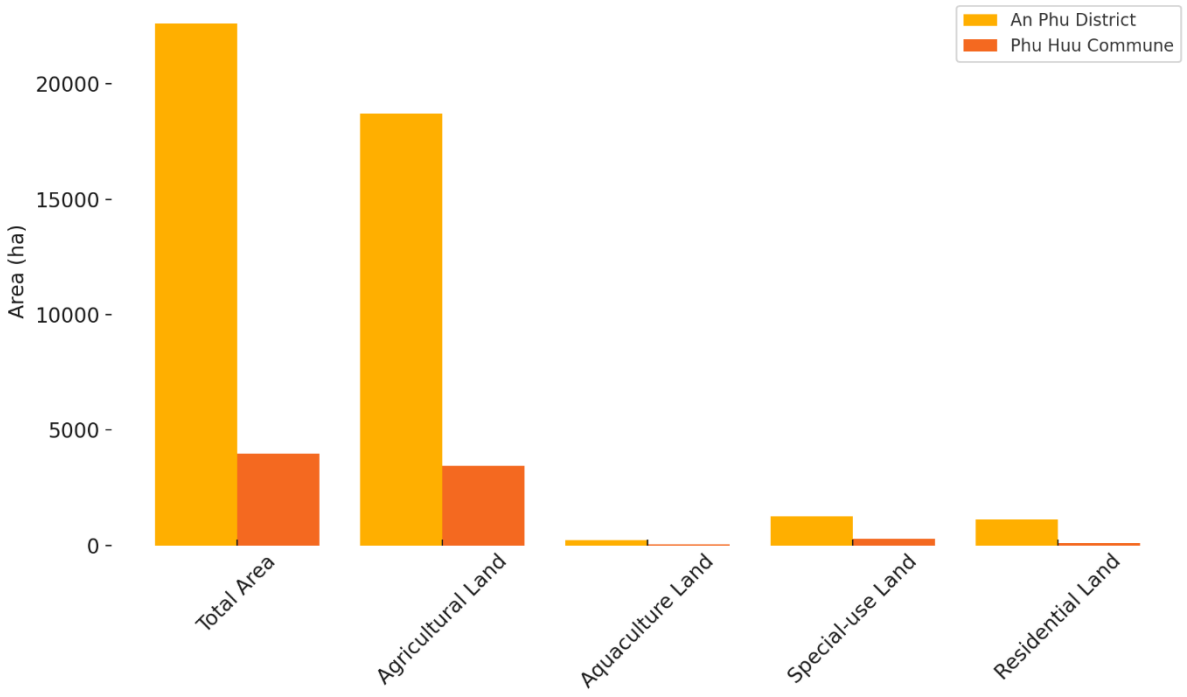


Figure 3.7 Land use distribution in An Phu district and Phu Huu commune

Source: GSO (2021).

The figure 3.7 reveals a land use pattern characterised by substantial agricultural influence, alongside a measured integration of residential and infrastructural zones. The little investment in aquaculture may indicate a prospective avenue for future advancement, especially with climate-adaptive land use planning.

Phu Huu commune is designated as an early-flooding area, with seasonal inundations often occurring from early July to October. Phu Huu is a substantial community of approximately 4,670 households (18.531 individuals), with a density of 377 inhabitants per square kilometre (Phu Huu PPC, 2021). The community covers an area of approximately 39,717 km², with 3,461.99 hectares allocated for agricultural use (An Phu's GSO 2021). The primary land uses consist of rice agriculture, along with the cultivation of groundnuts and beans. The community is abundant in natural resources, especially freshwater fish that are accessible during the flood season. In recent years, the timing of floods has become increasingly erratic, causing significant damage to both commercial and non-economic sectors (Pham et al., 2024).

Climate hazard events in Phu Huu in the year 2020–2021

Regarding natural hazards and climate change risks, the local authorities base their assessments on the disaster risk levels outlined in Decision No. 44/2014/QĐ-TTg, dated August 15, 2014,

issued by the Prime Minister. Furthermore, considering natural conditions, geographical location, and statistical data on recent natural catastrophes, the disaster risk levels in the commune are assessed as follows:

- The risk level for tropical depressions and storms is 3, with a maximum of 4.
- For thunderstorms, winds, lightning, and heavy rainfall: risk level 1, with a maximum of level 2.
- For landslides and land subsidence resulting from floods or water flow: risk level 1, with the maximum being level 2.
- Flood and inundation risk levels are categorised as 1, 2, 3, with level 4 being the highest risk.

The natural hazards that commonly impact the region encompass storms, winds, lightning, localised flooding from extended heavy rainfall, landslides, early floods, and elevated flood peaks resulting in extensive inundation; unusual floods and diminished water levels (see Table 3.1). This results in inadequate flushing and cleaning of fields, thereby inflicting significant damage to local property and agricultural output.

According to the assessment criteria for disaster risk levels issued by Phu Huu People's Committee, storms with high rainfall and whirlwinds caused considerable damage on local dwellings, crops, and infrastructure.

Table 3.1 Climate hazard events in Phu Huu in the year 2020–2021

Types of Disasters	Properties or Crops Impacted	Descriptions
Storms, heavy rain, whirlwinds	Housing	15 houses affected: 1 collapsed, 14 had roofs blown off
Flooding	Rice and crops	75.37 hectares inundated, affecting 91 households
Riverbank and canal erosion	Households along rivers/canals	70-metre landslide in Phu Thanh hamlet, impacting 12 households
Road subsidence and landslide	Public transportation infrastructure	Approximately 30-metre section of road collapsed due to landslide
Dike erosion	Flood protection infrastructure	35-metre section of dike eroded in the southern sub-region of Co Lau

Source: Phu Huu PPC (2022).

The disaster events in 2020-2021 in Phu Huu underscore the significant susceptibility of rural populations in the Mekong Delta to climate-induced risks. Damage to dwellings, affecting 15 homes, indicates inadequate structural adaptation, while the inundation of almost 75 hectares of crops demonstrates the vulnerability of local agricultural systems to extreme weather conditions. Infrastructure deficiencies, such as public road and dike erosion, further reveal vulnerabilities in vital services and protective systems.

3.1.3.2 Soc Trang, Ke Sach district and An My commune

Soc Trang Province is situated south of the Hau River, the southernmost tributary of the Mekong. The tidal regime of the South China Sea (as known as East Sea in Vietnam), the flow regime of the Mekong River and its sediment load, and coastal long-shore currents propelled by the dominant monsoon winds all contribute to the dynamic processes of accretion and erosion that define the coastline of Soc Trang Province (Schmitt et al., 2013; Tamura et al., 2018). Due to the combination of the monsoon climate, upstream flooding, and the influence of the East and West Sea tides, the province is considered to be among the most vulnerable regions in terms of coastal disasters (Tamura et al., 2018) with a population of 1,206,819 people (Soc Trang Statistics Office 2022). The saline intrusion zone comprises roughly 47 percent of the entire land area in the Mekong Delta. This area encompasses the Cà Mau Peninsula (Cà Mau province), Bạc Liêu, and Trà Vinh provinces, together with portions of Kiên Giang, Sóc Trăng, Hậu Giang, Bến Tre, Tiền Giang, and Long An province, collectively designated as the East Sea Coastal Region (Prime Minister of Vietnam, 2018). The flooded area has two principal sub-regions, namely the Plain of Reeds (Đồng Tháp Mười), covering Long An, Tiền Giang, and Đồng Tháp provinces; and the Long Xuyên Quadrangle (Tứ Giác Long Xuyên), which includes Kiên Giang, An Giang, and Cần Thơ city. The freshwater zone, predominantly unimpacted by saline intrusion, encompasses regions of An Giang province, Cần Thơ city, and Vĩnh Long province.

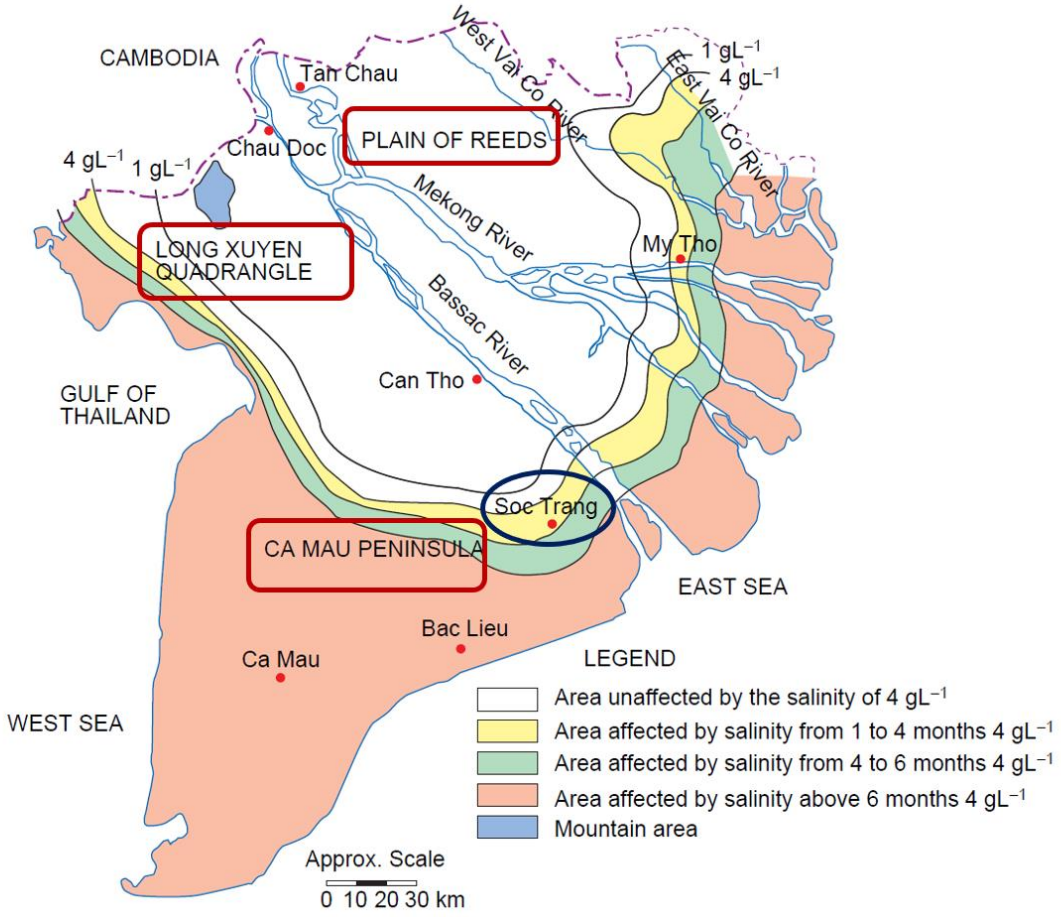


Figure 3.8 Key zones of the water regime in the VMD

Source: Adapted by Preston and Clayton (2003).

Furthermore, Schmitt et al. (2013) claimed that the coastal zone's development and irresponsible use of natural resources pose a risk to the mangrove forest belt's ability to preserve itself. This scenario is intensified by the effects of climate change, including the heightened intensity and frequency of storms, floods, and rising sea levels (Schmitt et al., 2013). In certain regions of Soc Trang, erosion-induced land loss has been documented at up to 30 m annually, whereas accretion-induced land creation can reach up to 64 m annually in other regions (Joffre, 2010; Thinh et al., 2009). As per the study of Tamura et al. (2018), over the previous ten years, there has been an increase in storms, flooding, landslides, and river erosion in Ke Sach district of Soc Trang province. Tamura et al. (2018) concluded that the majority of participants in Soc Trang province had adapted to climate conditions to some degree, however they acknowledged and expressed concern regarding the shifting climate patterns.

Soc Trang is a pivotal province in the expansion of the rice industry in the Mekong Delta. Soc Trang, with a cultivated area of roughly 328,000 hectares and an annual rice production of around 2 million tonnes, represents 8.5% of the region's total rice area and output, ranking fifth

in the Delta, behind Kiên Giang, Đồng Tháp, Long An, and An Giang (Nguyen et al., 2025). The province's rice cultivation is predominantly located in two sub-regions: 88% in the estuary zone and 12% in the coastal zone, both of which are progressively impacted by drought and salinity intrusion. Historically, Soc Trang experienced natural hazards, such as extreme salinity and drought between December 2015 and May 2016 during the dry season. A significant amount of rice (31,761 hectares) was severely affected by salt intrusion (Department of Agricultural and Rural Develpment of Soc Trang 2016). Presently, 4,976 ha of crop production land (estimated till March 2020) has been devastated by drought and salinity in 2019-2020 (Department of Agricultural and Rural Develpment of Soc Trang 2020). In response to these issues, Soc Trang has implemented a strategy of adaptable agricultural production, intending to adjust to drought and saline conditions by 2030, with a long-term perspective stretching to 2050 (Nguyen et al., 2025). This approach focuses on advancing the speciality rice sector, aiming to use the seasonal brackish water ecology through ecologically sustainable practices, with the objective of enhancing production value per unit area and elevating the livelihoods of rice farmers (Nguyen et al., 2025).

Soc Trang province encompasses a total area of 331.2 thousand hectares, with agricultural land constituting 64.2 percent, or 212.6 thousand hectares (see Figure 3.9). In 2018, the province recorded 495 farms in total, of which crop-based farms constituted the largest proportion (51.3%). Aquaculture farms accounted for 30.1%, livestock farms 16.2%, and other types 2.4%, indicating the continued dominance of crop production within the provincial agricultural structure. The percentage of cultivation farms increased markedly from 42.9 percent in 2015. In the province, farmers plant two primary cereal crops, such as paddy and maize across a total area of 355.9 hectares, with paddy comprising 98.8 percent of the overall cereal crop area. Alongside cereals, local farmers cultivate 8,537 hectares of annual industrial crops, including sugarcane, peanuts, and soybeans; 24,035 hectares of primary perennial crops, such as oranges, lemons, mangoes, longan, bananas, and pomelos; and 2,246 hectares of tuber crops, comprising sweet potatoes and cassava. In recent years, a transformation in cropping patterns has been seen, with the cultivated areas of cereal crops, tuber crops, and industrial crops declining by 11 hectares, 575 hectares, and 2,611 hectares, respectively, relative to 2015. In contrast, the area dedicated to perennial crops expanded by 1,729 hectares during the same year.

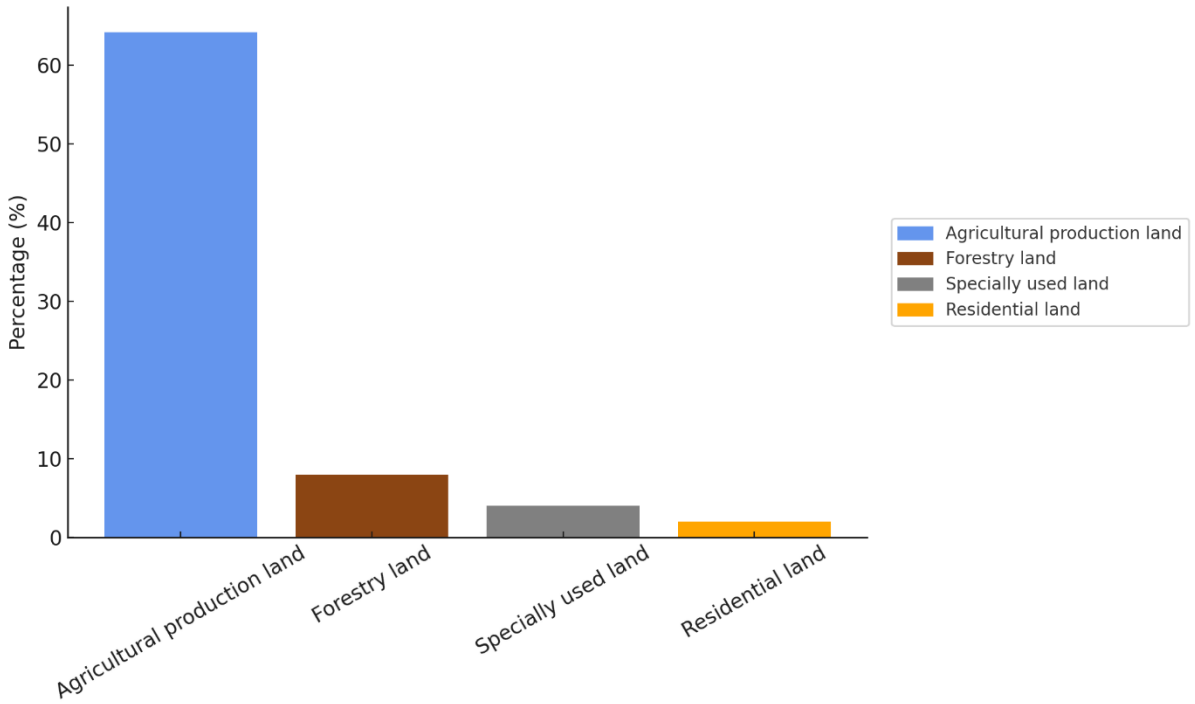


Figure 3.9 Land usage in Soc Trang categorised by type (percentage)

Source: GSO (2020).

Between 2015 and 2018, the number of aquaculture farms decreased by 20, while overall fisheries production increased by 19.3 percent, amounting to an additional 42.2 thousand tonnes. Aquaculture, especially shrimp and fish farming, has become predominant in the industry, representing 73 percent of overall fisheries production in 2018—an increase of 1.7 percentage points since 2015. Pig farming is the most significant segment of the livestock sector, with 261.1 thousand pigs recorded in 2018. Conversely, the populations of cattle and buffalo are rather low, with 30.6 thousand and 2.7 thousand heads, respectively. Poultry farming is prevalent, with 6.327 million birds grown in 2018, reflecting a rise of around 1.3 million birds from 2015 (GSO, 2020).

Ke Sach and An My commune

The Ke Sach district, located upstream and affected by the Hau River, has a consistent supply of freshwater that primarily facilitates the production of fruit trees (see Figure 3.10). The district spans 353 square kilometres and has a population of over 147,000 inhabitants, constituting 11 percent of the total land area and 12 percent of the population of Sóc Trăng province (Linh et al., 2025). Ke Sach accounts for 54 percent of the province's total fruit tree cultivation (Linh et al., 2025). Notwithstanding these benefits, the district has recently faced increasing difficulties stemming from saline intrusion from the Hậu River during the dry season.

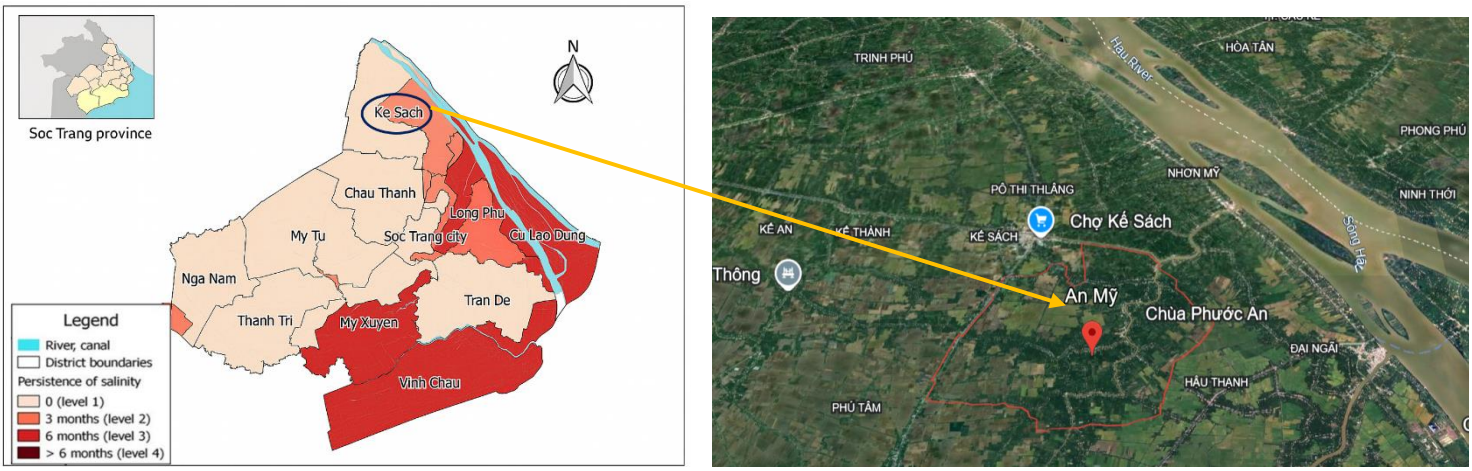


Figure 3.10 Map of Ke Sach district and An My commune – a study site in the coastal zone

Source: Adapted by Truong et al. (2024). Source: Adapted by Google Earth (2024).

An My Commune is located in Ke Sach District, roughly 10 km from the Bassac River, also referred to as the Hau River locally. The area's proximity to the river enhances its fertile alluvial soil, rendering it ideal for agriculture, especially rice cultivation and fruit farming. The commune is situated approximately 27 kilometres north-east of Soc Trang City. The route from An My to Soc Trang City is predominantly straightforward, mainly utilising provincial routes that link the commune to the urban centre. The roads are regularly utilised by inhabitants for commuting and moving agricultural goods, as the area is renowned for its fertile farmlands and plentiful fruit orchards.

According to An My PPC (2023), the 2019 Population and Housing Census, executed under the directives of the Central Steering Committee and the provincial and district-level Steering Committees, the commune comprised 3,241 households with a resident population of 10,935 individuals. In 2022, the cultivated area for the three rice crops: Winter-Spring, Spring-Summer, and Summer-Autumn was 3,489 hectares. The mean yield attained 58.25–61.67 kilograms per hectare, fulfilling 92.83% of the commune's annual production target. Total production attained 20,324 tonnes out of 20,740 tonnes, representing 97.99% of the objective, indicates a high degree of productivity despite climatic uncertainties increasingly affecting the region. The area designated for speciality rice attained 2,816 hectares, surpassing the commune's target of 2,700 hectares. This overachievement indicates a strategic shift towards premium rice types, potentially aligned with broader provincial or national initiatives, such as the "One Million Hectares of High-Quality Rice" program to improve export competitiveness and revenue diversification.

The An My commune cultivated 125.4 hectares of short-term industrial and vegetable crops, surpassing the aim of 110 hectares by 14%, illustrating a proactive diversification strategy in local agriculture (An My PPC, 2023). This overachievement underscores the initiative of farmers and the adaptability of local planning in addressing economic or ecological circumstances. The variety of crops, such as corn, watermelon, papaya, bitter melon, legumes, and vegetables indicates a focus on short-cycle, high-turnover products that can generate additional money for the commune's residents.

The allocation of 1,232 hectares for fruit tree agriculture in An My commune signifies a strategic focus on sustainable, perennial crop systems, which is considered an important issue for the local household economy. The diverse variety of species, such as grapefruit, longan, mango, star apple, coconut, areca, jackfruit, lime, and others, signifies a robust agro-biodiversity foundation that may mitigate market fluctuations and climatic instability.

Regarding irrigation, in collaboration with the District Project Management Board, four canal sections in An Nghiep and Truong Tho hamlets were excavated, along with four sluice gates in Phu Tay and Truong Phu. Furthermore, donations from local donors financed the construction of five concrete bridges in Phung An, Truong Tho, and Truong Loc, facilitating improved travel and commodities transportation for people.

The entire commune comprises approximately 500 impoverished and 400 near-impoverished homes (Tran, official). An My commune is impoverished, with An Nghiep hamlet comprising approximately 500 homes, 400 of which are inhabited by Khmer individuals. Truong Tho hamlet comprises 77 households, Truong Loc has 2, Phung An has 2, and Hamlet 3 contains 1 or 2 households. Truong Tho comprises 78 Khmer houses (Tran, official).

3.1.3.3 Village transect walks

At the commencement of the data collecting phase, I consulted with the leaders of the two communities to present the study and delineate its objectives. This first engagement enabled discussions with essential stakeholders and gained community support for involvement in the PhD project. Local leaders facilitated village transect walks (see Figure 3.11 & 3.12; Table 3.2 & 3.3) across the communities to examine the physical landscape and social dynamics of the region. These excursions yielded insights into the environmental conditions and socio-economic attributes of the research locations. Furthermore, the site visits facilitated my oversight of activities, including the home survey and in-depth interviews with key stakeholders.

Figure 3.11 Village transect walk in An My commune

Table 3.2 Land use types and field observations in An My commune

Land use	Road	Home-garden	Crop field	Pond
Soil	–	Sandy soil, alluvial soil	Sandy soil, alluvial soil, saline soil	–
Trees & Veg	–	Bean, cucumber, fresh chili, lemons, guava, leafy vegetables…	–	–
Crop	–	Star apple, longan, lemon, jackfruit, mango, coconut, grapefruit...	Integrated fruit farms (e.g., star apple, longan, lemon, jackfruit, mango, coconut, grapefruit...), and paddy fields	–
Wild (native) products	Coconut water, mangrove tree	–	–	Snakehead, snails…
Livestock	–	Cow, duck, chicken	–	–
Fish (commercial)	–	–	–	Native fish (e.g. perch, snakehead fish), snails…
Problems	Most of the roads are paved, but there are many sections that are seriously eroded.	–	Saltwater intrusion, droughts, crop disease, lack of irrigation, high price of agricultural input, and market variability	Lack of aquaculture techniques and market communication

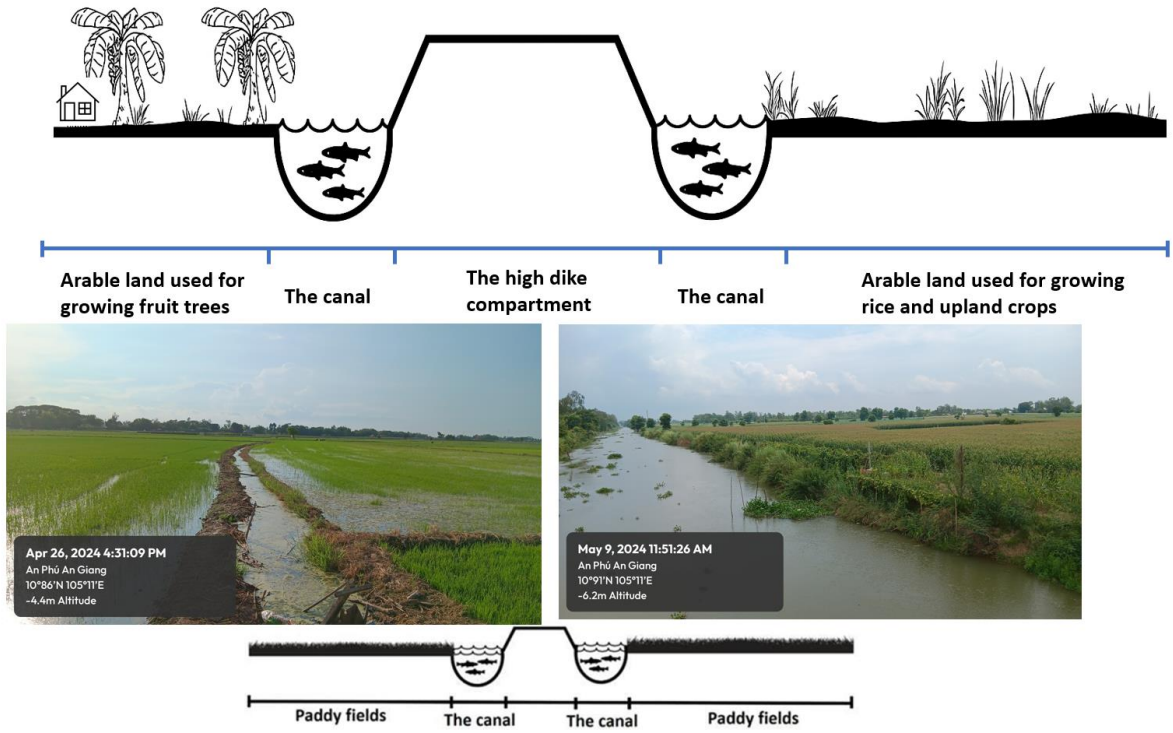


Figure 3.12 Village transect walk in Phu Huu commune

Table 3.3 Land use types and field observations in Phu Huu commune

Land use	Road	Home-garden	Crop field	Ponds or rivers
Soil	–	Alluvial soil, acid sulphate soil	Alluvial soil, acid sulphate soil, and sandy soil.	–
Trees & Veg	–	Pumpkin, fresh chili, lemon grass, mango, banana, leafy vegetables…	–	–
Crop	–	Longan, jackfruit, mango	Mango, jackfruit, guava, rice	–
Wild (native) products	Eucalyptus tree, saman tree	–	Sesbania sesban, water lily	Henicorhynchus, Kissing gourami, striped catfish, perch…
Livestock	–	Duck, chicken	–	–
Fish (commercial)	–	–	–	Baitfish, snakehead fish
Problems	Most of the roads are paved, but the roads are very small	–	Excessive heat, crop disease, lack of irrigation, high price of agricultural input, and market variability	Lack of marketing skills

Source: Author-own illustration (2024).

Field investigations from An My and Phu Huu communes reveal that both regions display intricate, resource-dependent livelihood systems influenced by unique agroecological variables and comparable environmental constraints. In both communes, agricultural areas constitute the foundation of household economies. The agricultural fields in An My and Phu Huu communes underpin local livelihoods, albeit they exhibit distinct emphases and adaptation levels. In An My, fruit cultivation practices constitute the primary element of agricultural fields, underpinned by sandy soil, and alluvial soil that enable the production of high-value perennial species such star apple, longan, jackfruit, mango, coconut, and grapefruit. The integrated fruit systems have become a defining feature of An My's agricultural landscape, illustrating farmers' adaptation to evolving environmental and economic situations. This region continues to encounter substantial obstacles, such as saltwater intrusion, drought, and agricultural diseases, which jeopardise long-term productivity. Conversely, rice farming constitutes the primary agricultural endeavour in Phu Huu, where rich alluvial soils facilitate the growth of staple grains and additional fruit crops like as mango, jackfruit, and guava. Despite the efficacy of these rice-based systems, farmers in Phu Huu encounter increasing stress due to extreme heat, irrigation deficiencies, and plant diseases. In both communes, elevated input costs and volatile markets further impede agricultural initiatives, rendering livelihood sustainability extremely challenging amid prevailing climatic and economic challenges.

3.1.4 Unit of analysis – the case: Conceptualizing households

This thesis examines how vulnerability and adaptive capacity are gendered, and how gendered representations could contribute to effectively responding to climate hazards or risk exposure. According to Vincent (2007), the indicators required to appropriately reflect variance in vulnerability and adaptive capacity across social groups and spatial scales depend on the level of analysis. In this sense, vulnerability and adaptive capacity can be evaluated at various levels, with the local level perhaps being the most significant because higher units of resolution, for example the national level, may conceal variance (Vincent, 2007). The household unit has been adopted in economics because it is more appropriate than focusing on individuals when considering access to vital means of subsistence (Wheelock & Oughton, 1996). Geisler (1993) argues that the household is a powerful instrument for concealing gender inequality in terms of access to land, production, and income. Yet, analysing the household unit through the use of a gendered lens can unlock the closed box of intra-household performance, highlighting gendered differences from a post-structural standpoint (Ellis, 1998).

However, the household is an ambiguous term, particularly in the context of Vietnam. Kabeer (2002) traditionally defines the household as an entity composed of members of the same family who are related by blood or marriage, care for one another, and work on common tasks. In modern society including Vietnam, however, household members are not always linked by blood or marriage. According to Hirschman and Loi (1996), a household consists of one or more individuals, whether related or unrelated, who share certain common living expenses and frequently eat meals together. It is in line with the concept employed by the Vietnam General Statistics Office for the 1989 Census, which defines a household as a group of individuals who share a budget and reside together on a long-term basis, whether they are unrelated or connected by blood or marriage (Hoang, 2008). These definitions are also problematic. According to Chant (1998), the concept of the household as a spatial unit is no longer applicable in many countries in the developing world. Case studies undertaken in Bangladesh, Ghana, Kenya, the Philippines, and Brazil by Chant (1998) indicate that contributions to household reproduction may be larger from individuals who reside beyond the household's physical boundaries than from household members. In addition, the case of Thang Loi commune in Vietnam demonstrates that migrants in many agricultural households may not dwell together for extended periods of time, but that many of them identify as residents in their country of origin and pool resources with other household members (Hoang, 2011a, 2011b). In this sense, the thesis applies a larger definition of the household that includes not only individuals who typically consume food and sleep together but also other members who could reside apart for portions of the year but contribute to the household's work and financial assistance.

Findings from the Vietnam Living Standards Survey conducted 1992-1993 indicated that Vietnamese households are small in size, and nuclear family households represent the most prevalent living arrangement (Bélanger, 2000). Northern Vietnam has a greater share of nuclear families, whereas the South has more extended and multiple family households (Bélanger, 2000). According to the Vietnam General Statistics Office's 1989 Census, the average household size ranged between 4.5 and 6.3 members (Bryant, 1996). More recent data from the 2019 Vietnam Population and Housing Census reveal a continued decline in household size, with the national average falling to approximately 3.6 persons per household. Urban households averaged around 3.4 persons, while rural households were slightly larger at 3.6 persons (GSO, 2019). In many instances, two or more nuclear families may share a house and resources. This is especially prevalent in rural areas, where grandparents sometimes reside with the family of their sons but register as a distinct household (Ánh et al., 1997; Hirschman & Loi,

1996). They may or may not consume food together, although they frequently assist with productive and reproductive activities (Cuc et al., 1993).

The significance of family relationships in Vietnamese culture further complicates the concept of household. 'Family' refers to a group of individuals linked by blood or marriage, whereas 'household' is primarily an administrative term that may or may not comprise related individuals (Hoang, 2008). Hirschman and Loi (1996) state that the extended family is a crucial source of social, emotional, and even financial support. Much of the social life of rural Vietnamese households occurs within the setting of the extended family. Family members, particularly parents, may play a crucial role in the decision-making process of the household (Hoang, 2008). Due to the importance of the extended family in Vietnamese social life, the notions of 'household' and 'family' are frequently confused in Vietnamese. The Vietnamese word 'nhà' or 'hộ gia đình' refers to a house, home, family, or even a spouse. In the study of rural livelihoods and poverty reduction initiatives, the term 'household' is also utilised as a conceptual framework (Ellis & Freeman, 2004).

Furthermore, the notion of household head is prevalent in Vietnam. Nonetheless, my prior experience working with local communities of the VMD enables me to grasp the term 'household heads' and its nature. By custom, when the youngest son marries, his bride moves in with him and they continue to dwell within his parents' houses; thus, multi-generational households are common. The point at which headship goes from the parent to the son may be indeterminate and patriarchal, meaning that if an elderly head of household dies, his son is frequently more likely than his wife to assume the responsibilities regardless of their age differences. Several studies suggest a correlation between different types of headship and concerns of poverty and vulnerability (Katapa, 2006; Klasen et al., 2015; White & Masset, 2003). For instance, the experiences of female-headed households in Vietnam are related with

Male-headed: The household is headed by male.
De jure female: The household is headed by a female, with no discernible male contribution to either income or decision-making. Primary causes include death and divorce.
De facto female-headed: The household is headed by a woman, but the husband does not reside in the VMD. Migration of laborers to the city is a major contributor to this circumstance.
Child-headed: The head of the household is a child (under 18 years of age). The primary causes of this condition are migration to the city for work and the loss of a parent within the household.

Source: Adapted by Vincent et al. (2010).

disparities in livelihood vulnerability and land-use rights (Scott, 2017). It is essential to provide context-appropriate working definitions to differentiate between families with different heads of household.

Due to the specific-context definition, it is difficult to determine earlier which households belong to which headship categories. Within the broader gender framework of this study, household headship is examined as one dimension through which environmental change and its impacts are perceived and responded to. The thesis proposes using a purposively random sampling approach for the household survey, with each household in the community having an equal chance of being selected. This may be restricted to some extent by the availability of the household head.

3.1.5 Timeline of fieldwork

I developed my research plan at Armidale, New South Wales, Australia, covering the period from January 2023 to January 2024. During this stage, I formulated the research proposal, which entailed reading pertinent literature, articulating research objectives, and establishing the case study framework. This framework included the study design, comprising critical elements such as the project outline, ethical approval documents (e.g., consent forms), participant selection procedures, and customized interview protocols for various participant groups. Fieldwork occurred in Soc Trang and An Giang provinces, Vietnam, from early February to late June 2024. The concluding phases, encompassing data analysis and report structure, occurred from July 2024 to January 2025.

The data collection process was divided into three distinct phases. These comprise the initial exploratory fieldwork; and the fieldwork in the two locations of the case study. I conducted an exploratory field visit, including key informant interviews with community leaders, and field observations in the VMD, which allowed me to collaborate with local leaders and stakeholders and discuss ongoing plans for conducting household surveys and semi-structured interviews in the two selected research sites. I built a conceptual framework for the research and worked on the research design after this initial visit.

Table 3.4 delineated the distinct periods of data collection during the major fieldwork period. This comprised four components. I conducted interviews with key informants at the province level, the highest tier of local governance, and performed field visits to identify case study sites throughout the preparation phase. I subsequently undertook a three-week exploratory phase in each case study community. This phase aimed to familiarize my research assistants and me

with the research site, engage with the community, and examine the critical issues relevant to the research questions. I utilized diverse methodologies, encompassing interviews with key informants, field observations, and village transects. Furthermore, I executed trial semi-structured interviews. The collected data was utilized to facilitate the design of the subsequent phase of data collection, the household sample survey, necessitating the creation of a sample frame and a questionnaire. Prior to initiating the third phase, which involved semi-structured interviews, I conducted a brief assessment of the data collected from the questionnaire.

Table 3.4 Data collection stages for the field trip

Timing	Main activities	Detailed work	Outcomes achieved
Week 1, 2, 3	Preparatory phase (case study selection)	Conducted key informant interviews with provincial/district officials as well as visited and selected a case study village.	• Comprehended key issues of local government regarding present environmental changes and associated adaptation measures; • Gained an understanding of the vulnerabilities of farming households and their adaptation to climate change (including gender); • Obtained important documentation on climate adaptation policy and its implementation mechanisms.
Week 4, 5 & 6	Exploratory field visits	Collected exploratory data in the case study village through group discussions (in two villages) using village transects, conducted key informant interviews with village leaders, conducted field observations, and piloted semi-structured interviews.	• Grasped the big picture of the case study villages; • Obtained vital data on the primary livelihoods of residents, the variables and processes influencing the transformation of their livelihoods in the context of climate hazards; • Conducted a trial semi-structured interview.
Week 7, 8 & 9	Questionnaire design (Piloted and Revised)	Revised the designed questionnaire, as well as piloted and modified the questionnaire.	• Revised the household survey using questionnaire; • Piloted the questionnaire.
Week 10, 11, 12, 13, & 14	Household survey	70 households at each research site (70 households × 2) were surveyed using a questionnaire.	Completed 140 household surveys at two research sites within the prescribed timeframe.
Week 15 & 16	Semi-structured interviews (Revised)	The theme checklists and question guidelines for semi-structured interviews were amended based on the initial data entry and analysis of questionnaire data.	• Revised semi-structured interviews for next steps; • Collected contact details for key informants for semi-structured interviews.
Week 17, 18, 19, 20 & 21	Semi-structured interviews	15 semi-structured interviews in each village were conducted with key informants such as senior farmers, Women Unions, Farmers Unions, NGOs, and academics.	Completed semi-structured interviews at two research sites within the prescribed timeframe.

3.2 Mixed methods of data collection

In the 1950s, Campbell and Fiske's study on the validity of psychological qualities marked the beginning of the use of mixed methods in research (Creswell, 2009). Concerns with the mixing

of paradigms and methodologies, as well as the application of multiple models, approaches, or triangulation, emerged as controversies regarding the efficient use of social science research (Bazeley, 2004; Tashakkori & Teddlie, 2010). Hall (2013) states, however, that a multi-method approach should be viewed as a mixed method involving multiple techniques within the same research paradigm. In addition, Tashakkori and Teddlie (2010) suggest that the combining of research methods can develop at any point of the research process.

In this thesis, the mixed-methods strategy gives a more comprehensive means of addressing the research question by incorporating multiple stakeholders. Greene et al. (1989) listed several purposes for mixed method approaches, including triangulation, complementarity, development, initiation, and expansion (see Table 3.5).

Table 3.5 Purposes for mixed-method research designs

Purpose	Description	Rationale
Triangulation	Seeks convergence, confirmation, and congruence between the results of several methodologies.	To strengthen the validity of concepts and enquiry findings by counteracting or increasing the diversity of irrelevant sources of variance related mostly to inherent method bias, but also to inquirer bias, bias of substantive theory, and context-related bias.
Complementarity	Compares and contrasts the findings of one method with those of another.	To enhance the interpretability, relevance, and validity of concepts and research results by focusing on inherent methodological strengths and accounting for inherent biases in methods and external sources.
Development	Attempts to use the data of one approach to develop or guide the other approach, where development is widely interpreted to include sampling, implementation, and measurement decisions.	Utilizing intrinsic technique strengths to enhance the validity of literature review and theoretical findings.
Initiation	Seeks out paradox and contradiction, fresh paradigm viewpoints, and the reshaping of questions or conclusions from one approach with that of another approach.	To broaden and deepen the breadth and depth of enquiry findings and interpretations by examining them from the perspectives of various approaches and paradigms.
Expansion	Attempts to expand the breadth and scope of enquiry by employing distinct methodologies for distinct components of enquiry.	To expand the scope of the investigation by identifying the best suited procedures for numerous components of the research.

Source: Adapted by Greene et al. (1989).

Validity has been identified as one of the primary concerns in the mixed-methods study. Despite the fact that mixed methods study combines complementary qualities, assessing the

validity of research findings is somewhat challenging (Winter, 2000). Onwuegbuzie and Johnson (2006) addressed the question of research validity with the word 'legitimation'. Onwuegbuzie and Johnson (2006) identified a typology of nine mixed methods legitimation forms, including sample integration legitimation, inside-outside legitimation, weakness minimisation legitimation, sequential legitimation, conversion legitimation, paradigmatic mixing legitimation, commensurability legitimation, multiple validities legitimation, and political legitimation, which may have validity implications for the research findings. Based on the philosophical foundations of mixed methods research typologies, this study employs an exploratory sequential design as the primary research strategy to examine how gendered relations influence farming households' perceptions, experiences of environmental changes, and how gendered practical and strategic needs shape the transformative adaptation of their livelihoods in the VMD. Examining the causal relationship between climate vulnerability, gendered relations and justices, and women's empowerment in the social-ecological and cultural context of the VMD involves the grounded theory research approach and long-term interactions with local communities through interviews (Charmaz, 2006; Kabeer, 2012). De Vaus (2013) note that recruitment of study participants also requires the deliberate adoption of a sampling technique, as the population must be explicitly defined prior to sampling procedure. Such procedures attempt to ensure that the data gathered via qualitative and quantitative methods represent real empirical understanding, something that neither qualitative nor quantitative methods alone are sufficient to achieve (Doyle et al., 2016; Fielding, 2010).

This study comprises two principal phases of data collecting (refer to Figure 3.13). The initial phase encompasses pre-fieldwork, semi-structured interviews, and field observations in two communities located in An Giang and Soc Trang. These exploratory techniques are of utmost importance as they furnish me with comprehensive knowledge regarding the study issue and empirical data necessary for developing structured questionnaires for a household survey. After completing the qualitative data collection and analysis in the first phase, I conducted the household survey in the following phase.

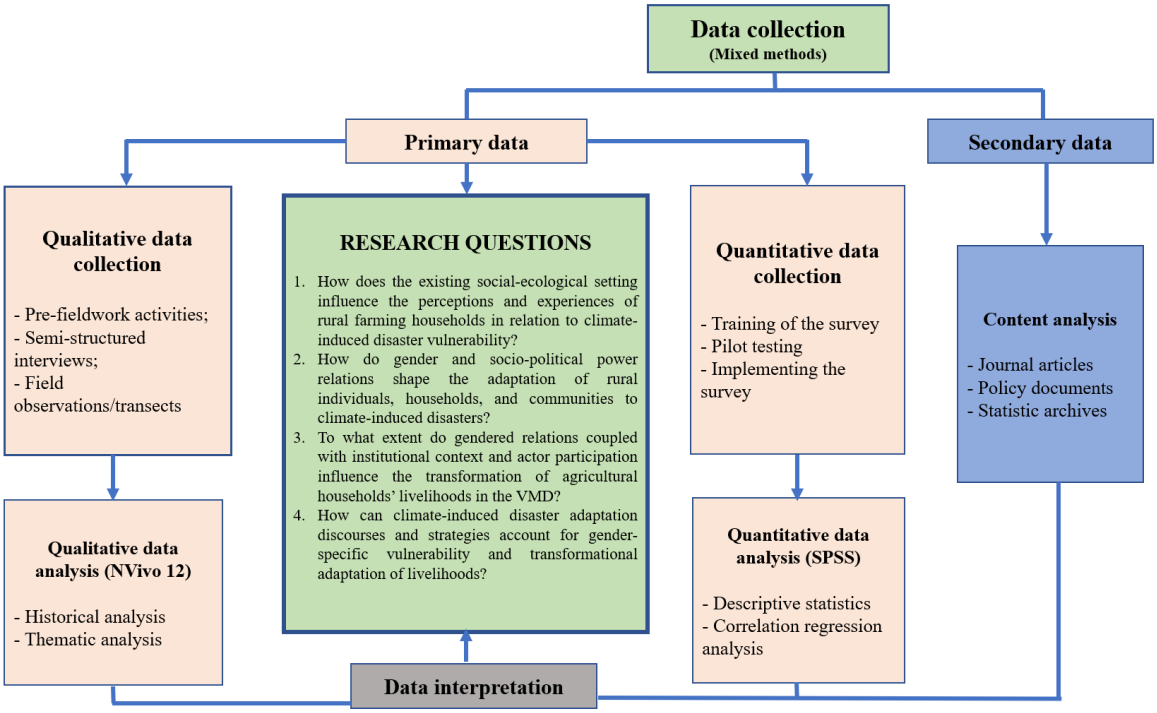


Figure 3.13 The protocols for the sequential exploratory design of the research

3.2.1 Qualitative research methods

There are several reasons to conduct qualitative data study (Glaser & Strauss, 1999). First, the essential components of sociological theory are frequently discovered most effectively through qualitative methods, for example, data on structural factors, outcomes, deviations, norms, processes, patterns, and systems. Second, qualitative research is believed to be an effective strategy to obtain the necessary information and deal with the challenges of an empirical context. It is a useful approach to understand the responses and sense the emotions, which can reflect the true viewpoints of the individuals and the circumstances. Despite the fact that the question is not difficult to comprehend, it is indeed essential to concentrate on a group of experts and experienced people who can provide logical and informed opinions and facts (Flowerdew & Martin, 2005). In this thesis, the qualitative method will be used for data collection techniques such as interviews, and case studies, aiming to obtain purposeful qualitative data with an observation of participants' emotions and feelings. In addition, such an approach enables participants to provide detailed information.

Qualitative research is a method for comprehending the relevance that individuals or groups of people connect to a social or human issue (Creswell, 2009). The 'revealed' reality is rather the result of the interacting process and its historical, cultural, and structural circumstances (Mills et al., 2006). Furthermore, Creswell (2009) indicates that qualitative techniques allow for

innovation and work more within frameworks designed by researchers. Therefore, it enables researchers to flexibly build a suitable research framework. In this study, qualitative research was used to collect primary data through interviews with relevant research participants and key informants involved in disaster management and adaptation initiatives in the VMD. In this stance, qualitative interview inquiries, which are open-ended questions (Creswell, 2009), were employed.

The semi-structured interview may be the most suited since it allows for the examination of new ideas supplied by interviewees and also allows the researcher to ask new questions based on participants' responses and explanations (Adams, 2015). In contrast to questionnaires, interviews are often unstructured or semi-structured. In other words, interviews are interactive and fluid, as they can change based on the interests, experiences, and viewpoints of the participants (Flowerdew & Martin, 2005).

In qualitative research, if information is revealed, the researcher looks for evidence by asking participants more semi-structured questions or approaching different participants particularly about the issue. This procedure enables the researcher to eliminate bias from the collected data and ensure the neutrality of the findings by identifying the participants' real motives and elucidating their ambiguous responses (Sofaer, 1999). Due to the use of snowball sampling procedures in this study, the researcher may establish the appropriate data collection methods (Atkinson & Flint, 2001).

Furthermore, qualitative research has the potential to explore a specific subject, such as national and local risk reduction measures policies (Almarzouqi, 2017). The researcher can utilise a variety of research methods to obtain people's opinions and views regarding the policy. Sofaer (1999) emphasises that the researcher could enquire with policy stakeholders about their view of the policy and whether or not changes are made in the context of risk management and environmental science. This procedure will assure the appropriateness and vitality of policies.

3.2.1.1 Semi-structured interviews with key informants

In flexible research designs, semi-structured interviews are commonly utilised and frequently supplemented with other methods (Robson & McCartan, 2016). Corbetta (2003) defines a semi-structured interview as a discussion between an interviewer and a participant in which the interviewer has the outlined themes but considerable flexibility to conduct the discussion in his or her own manner. In the majority of interviews, the researcher will adhere to a prepared overview of themes of interest or suggested questions. However, the conversations regularly

stray from the planned themes based on the participant's interests or potential new areas of inquest that the researcher may not have anticipated (Goulden, 2006). There are numerous benefits to the flexibility of adopting semi-structured interviews (Goulden, 2006). The researcher might be sensitive to the participants' interests and the length of time they are willing to speak with them. They also could increase or limit the list of topics to be discussed based on people's readiness to speak, experience with the particular topic, and level of interest. A conversational approach to interviewing allowed me to build rapport and establish trust with participants. Moreover, researchers have the opportunity to ask further questions to clarify any responses they do not comprehend. In addition to what participants actually say, their body language and tone of voice could assist the researcher in determining their beliefs and opinions regarding the problems they are discussing, as well as their level of honesty (Goulden, 2006).

Semi-structured interviews are often employed in feminist and political ecology research (Bee, 2013; Sultana, 2006) because they allow participants to describe facts while considering underlying assumptions (Galletta, 2013). With questions on the environment, agriculture, political engagement, and gender relations, data are gathered through interviews to provide insight into larger and more fundamental social variables (Hughes & Sharrock, 2007 cited by MacMahon, 2017). To investigate four research questions, interviews were used to build on findings acquired through field observations and ethnographic fieldnotes, allowing for deeper detail into farming households and individuals in the selected communities. In all phases of my research, semi-structured interviews provided me with a substantial amount of social data. Using open-ended questions, the semi-structured interviews enabled me to capture a comprehensive understanding of the issues by eliciting narratives from a diverse range of stakeholders, including policymakers, programme implementers, and village residents. This method was particularly valuable at this stage of the research, as it allowed for the exploration of context-specific perceptions and experiences that may not have been accessible through structured surveys alone. Accordingly, I conducted 15 interviews in each of the two case study villages, resulting in a total of 30 interviews. Each participant's informed consent was confirmed, and interviews were either audio recorded or transcribed. I also photographed homes, and farms. Interviews took place in people's houses, shared yards, and occasionally in the fields. The interviews were conducted in An Giang and Soc Trang, with questions translated into Vietnamese, and lasted approximately one and a half hours.

Potential participants were identified beginning with semi-structured interviews and continuing with snowball sampling and purposive sampling based on established criteria. Women, farming

families, and people involved with adaptation efforts and interested in participating were the target of sampling approaches. In addition, we conducted interviews with community leaders, Farmer Unions, NGOs, and academics. Within a semi-structured design, interviews commenced with a collection of questions concerning environmental changes, vulnerability, and adaptation; farm-based livelihood practices within households; gendered roles and responsibilities; and adaptation options toward climate hazards. The nature of semi-structured interviews allowed for flexibility depending on participant ideas and perspectives as well as observational findings. At the conclusion of conversations, interviewees were asked again if I could use their views in my thesis and other papers and were then asked if they had any questions.

3.2.1.2 Field observation and reflection

Field observation is crucial to all qualitative research (Maxwell, 2008). Case studies, for instance, are normally linked with qualitative research since they rely on the examination and interpretation of texts (Gerring, 2007). Furthermore, Gillham (2000) suggests that the standard procedure for case study research is to begin by gathering data with an open mindset. Observations provide a comprehensive depiction of the study's subject that is illustrative of the daily experiences that people face (Fraenkel et al., 2018). Such an approach consists of listening and observing skills, in addition to visual and verbal behaviour in regular physical interactions (Baker, 2006; Gold, 2017). Maxwell (2008) suggested that field observation should be exploited at the outset of qualitative research.

In this study, field observations and reflections assisted the researcher in understanding, among other things, the lives and behaviours of village residents. Throughout the pre-fieldwork and exploratory phases, my research assistants and I employed observation as a complementary approach. We made observations on a variety of subjects relating to gender differences and involvement in farm-based livelihoods, household assets and adaptation decisions, and hazard-related responses. For instance, we observed who was performing which tasks, the crops grown, house structures, the living situations, and the interactions between residents at village meetings. In addition, we were able to observe the surrounding environment, including the canals, floating plants, fishing, rice-fruit farming and harvesting, soil, and weather. Such an observational method involved observing and taking field notes; guided walks with a village resident; observing residents' facial expressions and tones of gendered voices; creating sketch maps and taking photographs; enjoying food with locals and attending local village meetings;

and engaging in village life, such as purchasing items at the local store and using public transportation.

All members of the research team, including myself and the research assistants, made observations, which we shared by discussing and exchanging reflective notes. We made and documented observations in an opportunistic and descriptive manner rather than in a systematic manner (Robson & McCartan, 2016). Observations were useful for strengthening the overall comprehension of the research setting and assessing the validity of the information provided by participants in response to interview questions (Goulden, 2006). In addition, they provided a set of possible interview questions and assisted me in formulating more pertinent inquiries (Goulden, 2006). The value of observations was contingent on the attention with which they were recorded and the time available for analysis. Instead of making daily trips, we spent five to ten days in each of the case study villages.

3.2.1.3 Sampling process for collecting qualitative data

This study recruited semi-structured interview participants such as key informants using two primary sampling procedures: purposive sampling and snowball sampling. Purposive sampling referred to the intentional selection of particular individuals, events, or contexts because they could supply vital information that could not be accessed via other methods (Mack, 2005). Local government agencies, NGOs, research organisations, and farmers were designated as key informants in this study based on their specific duties and empirical information pertinent to the research area. For example, the directors of local government agencies (provincial/district/village leaders) were targeted to obtain policy documentation regarding climate-related hazard events, impacts, and governance responses, as well as local perceptions of past and current hazards, their daily livelihoods, and adaptation in the delta. In the meantime, male and female farmers provided the researcher with data from their considerable experience coping with environmental changes and the effects of risk management policies gained from their daily activities.

Furthermore, various studies need the identification of a number of hidden populations, because they may supply the researcher with useful information (Almarzouqi, 2017). In qualitative research, such information can fundamentally explain the actual situation and experience, as it depends on a variety of perspectives, perceptions, opinions, and other important factors. As a result, many methodologies, theories, and approaches, such as snowball

sampling, have been developed to collect such sample for research purposes (Almarzouqi, 2017).

Snowball sampling is a method for locating study participants. One subject supplies the researcher with the name of another subject, who in turn provides the researcher with the name of a third subject, and so on (Atkinson & Flint, 2001). This strategy pertains to populations that are unknown or rare. Individuals of these populations have not all been identified and are more challenging to locate or contact than members of known groups (Biernacki & Waldorf, 1981; Goodman, 1961; Noy, 2008; Spreen, 1992). In this context, the targeted study sample was not easily identified, particularly when conducting research on gendered relations and household vulnerability to climate change; hence, snowball sampling was adopted as an ideal approach for reaching the relevant participants. For instance, the study examined gender inequality, vulnerability, and the transformation of livelihoods in the VMD in response to climate hazards and local governance responses. Given the challenges in identifying suitable participants, participants were asked to recommend other individuals who met the research criteria, thereby facilitating access to otherwise hard-to-reach individuals (Atkinson & Flint, 2001).

3.2.2 Quantitative research

Quantitative data were gathered for this study through a household survey utilising a semi-structured questionnaire. However, the questionnaire also contained a section for collecting qualitative data. This approach was used to evaluate how small-scale farmers perceived their gendered differences, their vulnerability to natural hazards, how they prioritised their risks in hazard-prone locations, and what they were doing to adapt to hazards. In conjunction with participant observation and key informant interviews, the household survey was also utilised to investigate transformational livelihood options and community behaviour that required in-depth comprehension.

3.2.2.1 Household survey

The primary approach for collecting quantitative data is a household questionnaire comprising a survey of livelihood activities with consideration of gender (see Table 3.6). Typically, livelihoods are analysed at the household level, and this has been the main focus of several feminist studies. Murray (2010) notes that livelihoods research contains two primary techniques, such as the circumspective, which allows for the examination of particular issues surrounding a single point in time, and the retrospective, which provides for the reconstruction of change across time. The livelihood framework enables the researcher to comprehend

microscale realities, especially how they derive from the macroscale structural, institutional, and historical framework. Thus, it is necessary to enquire about the condition of their assets and their ability to use those assets to sustain their everyday livelihood. Hence, both procedures should preferably be done concurrently. To avoid excluding the illiterate, the survey was administered verbally as an interview schedule questionnaire, with my research assistants and translators, in the case of conducting interviews with ethnic minority communities, asking the questions and recording the responses.

The questionnaire was developed in accordance with semi-structured interviews and the elements of the livelihood framework, with the addition of questions investigating the viewpoints and experiences of climate variability, the nature of gender relations, and other stresses on livelihoods. The initial version was tested with 10 households in each of the case study villages. This task assisted the researcher in achieving three crucial objectives. First, it provided me with an indication of the appropriateness of the questions, such as where misunderstandings could occur or where the responses indicated that a question did not pertain to the current issue. Second, it allowed for a test of the time required to complete the survey, which was necessary to minimise fatigue and erroneous or incomplete answers due to lack of attention. Third, it allowed research assistants to familiarise themselves with the survey instrument.

In this study, my research assistants and I conducted the survey with 140 households, 70 in each of the case study villages. The survey included quantitative data, along with some qualitative data using open-ended questions, on a variety of topics focusing on gender, livelihoods, household assets, institutions, climate event impacts, and transformational adaptations. The length of time required to conduct a survey varied between 60 and 90 minutes.

Table 3.6 Structure of the household survey

Section	Key indicators	Styles of questions
I – Household structure and composition	Demographic information (age, gender, ethnicity, religion, marital status, occupation, and level of education) on the primary participants and each household member.	Closed and open-ended
II – Livelihood profiles: assets and income sources	Patterns of livelihood (e.g., rice, livestock, and shrimp farming), land ownership, usage of agricultural equipment, non-farm income sources, household expense categories, and budget and savings types.	Closed and open-ended

III – Perceptions of the nature of climate hazards	Perceptions of the natural features of catastrophes; positive and negative effects of various hazards and their levels on the livelihood activities and assets of individuals, households, and communities.	Closed and open-ended
IV - Changes in securing a livelihood over time	Changes in everyday livelihood activities, impacts of unexpected and covariable shocks on livelihoods, families' immediate and long-term responses to climate hazards (e.g., droughts, floods, cyclones), and the illness and death of a household member.	Closed, open-ended and ranking
V – Gendered differences and engagement in transformational livelihood decisions	Households' assets, gendered resources entitlements, households' decisions in terms of living expenses, agricultural inputs and outputs, and transformative patterns of livelihoods caused by climate change.	Closed and open-ended
VI – Social capital and institutions	(Formal and informal) social capital of households and each household members; features of social groups (e.g., memberships in community organisations) in which household members participate and to whom households turn in times of crisis.	Closed and open-ended
VII – Future livelihood strategies	Predictions of potential hazards; households' short- and long-term future livelihood expectations	Closed and open-ended

3.2.2.2 Sampling process for collecting quantitative data

As indicated previously, the household is the unit of analysis for the survey in accordance with the livelihoods approach (Allison & Ellis, 2001; Ellis, 2000). The household adequately characterises a cluster of agents and behaviours, and its unit of analysis improves the comprehension of the economy as a whole as well as individuals (Wheelock & Oughton, 1996). Due to the substantial social and economic interaction between the group of individuals that form a household, Ellis (2000) notes that the household is regarded an appropriate unit of analysis for the study of livelihoods (including gender). As stated in the literature section, the livelihood approach considers the extended household, which includes individuals who live away yet contribute remittances home (Allison & Ellis, 2001). In this study, we encouraged participants to answer survey questions for all household members, including those who were temporarily or frequently absent but contributed to family income.

Moreover, in the sociocultural setting of VMD, household headships play a crucial role in the conduct of social interactions within the community. Generally, they are viewed as the primary breadwinners who are mostly responsible for feeding their families. Such obligations render them significant; hence, they typically possess decision-making authority within the family. In this sense, household heads are considered the primary survey participants. This facilitates survey administration tasks. For example, a researcher has a greater chance of gaining access to information by contacting household heads than by approaching other household members. Clark and Steel (2007) argue that surveying one person per household is more statistically efficient than surveying every member of the household. The information provided by the household head in the household survey can be representative of the entire family because his responses are substantially connected with the home and safety variables (Bookwalter et al., 2006).

In order to engage with local authorities on my field data collection activities, I made a pre-fieldwork trip to my research locations in the provinces of An Giang and Soc Trang. Firstly, I presented them with the introduction letter from my research institute based in Vietnam, as well as the goals, objectives, and planned activities for my PhD study. Secondly, I discussed with them the sampling approach for my study. This study employed a probability sampling technique in which each unit in the population had an equal probability of being chosen for the sample. The selection of the quantitative research sample was conducted using a simple random sampling technique. Bhattacherjee (2012) defined simple random sampling as randomly choosing participants from a sample frame; however, with large sampling frames, a table or sheet of random numbers was typically employed. As a result, sample statistics provided unweighted estimates of population parameters.

In terms of my research sites, each village had 5–8 hamlets on average. As per Bhattacherjee (2012), I requested that local officials provide a list of farming households across all hamlets in the selected village. In particular, I began by selecting a sampling fraction (e.g., 10%), applying it to the total number of farming households in the village, and then selecting the required number of potential participants using a random number sheet. This technique allowed me to assign a unique ID number to each household in the sampling period initially. According to Bhattacherjee (2012), when employing the simple random sampling strategy, the sampling frame was not divided or partitioned, the sample was unbiased, and the findings were the most generalizable of all probability sampling approaches. The sampled households reflect a wide range of livelihood types, income groups, and ethnic backgrounds, including those of wealthy,

middle-class, and poor households, as well as diverse cultures including ethnic minority groups. Such an approach enables the researcher to understand how resources access, entitlements, and capabilities of farming households could be influenced by environmental changes and hazards, and how these factors intersect with gender, income inequality, class, race, and ethnicity.

Regarding the survey implementation, local officials accompanied me to the sampled farming households for the survey. When approaching a farming household at random, I displayed the ISP and ensured that all potential households had received and read it in advance. Moreover, the provided list of sampled farming households allowed me to identify household head farmers for my research. When participants informed me that they had already read through the information sheet participant, I then enquired about their readiness to participate in my research. If they agreed to participate in the survey, I began asking questions from the designed survey.

3.2.2.3 Training sessions for field research assistants

Postgraduates, undergraduate students, and my colleagues at An Giang University in the VMD were recruited as research assistants. The social science backgrounds of these research assistants included two students of Integrated Rural Development from An Giang University and two postgraduates of Rural Development from Can Tho University. These individuals had gained experience conducting interviews with locals. In addition, the recruited field assistants had conducted sociological research with university lecturers in the past.

This study also examined gender as a criterion for selecting research assistants. Therefore, they consisted of both females and males. Before the survey training week, I, as the lead researcher, distributed the survey to each research assistant so they could comprehend the surveys. By participating in training sessions, the research assistants acquired knowledge about the survey content, language usage, and interviewing techniques for each question. The training was conducted twice to ensure that all questionnaire sections were mastered by the assistants.

The field assistants were solely recruited to assist with the household survey aspect of the research, under the direct supervision of the lead researcher. The principal investigator and the field assistants performed household visits together, with coordination and assistance from local authorities. At the commencement of each visit, the principal investigator explained the research team and the study objectives, and provided the necessary research documents. After obtaining informed consent from the household, the principal investigator administered the

survey questions, while the field assistants documented the responses. When field assistants required clarification about the survey questions, the lead researcher promptly offered guidance to ensure participants understood the questions and could respond accurately.

3.2.3 Sampling framework for quantitative and qualitative components

This study utilised distinct sampling strategies for the quantitative and qualitative elements, in accordance with the principles of mixed-methods research design. The sample methodologies are detailed below.

Quantitative Component:

The quantitative component involved a household survey utilizing a probability-based simple random sampling method to choose participants from the designated research sites. Every participant in the sample frame possessed an equivalent likelihood of being selected. No purposeful or snowball sampling strategies were utilised for the survey sample.

Qualitative Component:

The qualitative component involved semi-structured interviews utilising a non-probability sampling approach. Initial participants were deliberately chosen according to established criteria for key informants. Subsequent participants were identified by snowball sampling to reach persons possessing specialised knowledge or marginalised perspectives on climate vulnerability and adaptation, livelihood shifts, and local governance.

In summary, random sampling was solely employed for the quantitative household survey, whilst purposive and snowball sampling were exclusively utilised for qualitative interviews.

3.2.4 Secondary data collection

Secondary data is defined as data that has previously been gathered and is available for use by the researcher (Flowerdew & Martin, 2005). This information may be useful for qualitative or quantitative data, or potentially both. In the initial stage of the research, secondary data were used to assist the researcher in gaining a better understanding of the issues related to the research topic. For example, these data served as the foundation for selecting specific study sites. This procedure prevented the researcher from duplicating the same questionnaire questions or research. In addition, the researcher was able to build the research on previously conducted projects. Additionally, gathering readily accessible secondary data may save time and effort for the researcher (Flowerdew & Martin, 2005; McNeill, 2006).

Secondary data contained a variety of components, which were identified based on the type of research data. Newspapers, interviews, diaries, and photographs were useful secondary sources of qualitative data (Flowerdew & Martin, 2005; McNeill, 2006). Therefore, these data were valuable for this thesis on hazardous events and household vulnerability in the VMD, as they contained real situations that had been investigated and evaluated and illustrated the findings and problems of earlier research. I also collected policy documents and research reports from several government departments. These sources assisted me in comprehending the historical, political, and geographical setting of the case studies, supporting the semi-structured interviews with government officials. Along with the documents, I collected topographic and land use maps, digital map data, and precipitation and river flow data. Such physical and documentary data allowed me to supplement interview data in order to develop a description of the social-ecological systems of the VMD.

3.3 Analytical data approaches

3.3.1 Qualitative data analysis

In this study, qualitative data were analysed using thematic analysis. Thematic analysis is defined by Braun and Clarke (2006, p. 79) as the process of "identifying, analysing, and reporting patterns within data". Themes, as defined by (Guest et al., 2012; Vaismoradi et al., 2016; Vaismoradi et al., 2013), are recurrent and unique characteristics of participant stories that represent their individual perceptions or experiences. Thematic analysis is suggested by Braun and Clarke (2006) as the core method for qualitative analysis. Later, Braun and Clarke (2019) refer to thematic analysis as 'reflexive thematic analysis' to highlight the investigator's key involvement in knowledge production. Themes were produced from the researcher's analytical preconceptions, analytic materials and skills, and the data itself (Braun & Clarke, 2019). This indicates that themes are not pre-existing objects awaiting exploration, but rather reflexive decisions of the researcher based on provided data (Braun & Clarke, 2016).

My qualitative data analysis of semi-structured interviews, and field observations demonstrates the six components of data analysis established by Braun and Clarke (2006). As shown in Figure 3.14, six steps involve (1) getting familiar with the data, (2) developing coding categories, (3) exploring for key themes, (4) reviewing themes, (5) identifying and labelling themes, and (6) generating the report. To analyse the qualitative data in this study, I adopted Braun and Clarke's coding approach using NVivo software (version 12).

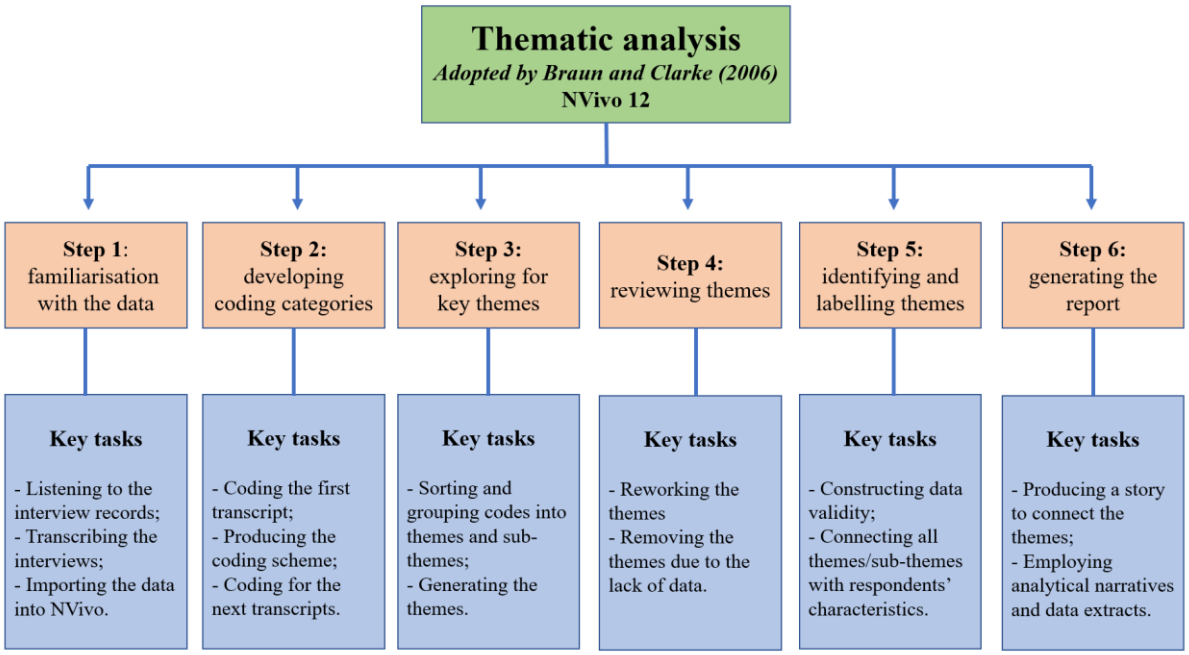


Figure 3.14 Thematic analysis approach

Source: Author's own-illustration based on Braun and Clarke (2006).

3.3.2 Quantitative data analysis

This study utilised the Statistical Package for the Social Sciences (SPSS) for data entry and simple analysis, including frequencies, mean, mode, and simple correlations. Together with research assistants, I, as the principal researcher, developed the data entry format and input all quantitative data acquired during the household survey. I then conducted exploratory analysis (Robson & McCartan, 2016) by generating summary statistics of a number of variables displayed in tables or graphs, such as pie charts, and line graphs. This exploratory study enabled me to become acquainted with the collected data and detect any unexpected or intriguing correlations.

Furthermore, I utilised a variety of groups from the 140 households to compare the means of various variables. I categorised data not just by case study, but also by socioeconomic status, gender, ethnicity features, livelihood transformation options, and adaptation decisions. To simplify the comparison of variables between distinct groups of households, the mean or median values and standard deviations were displayed in tables. Such analysis allowed me to address four questions of the research.

Analysis of the correlation between gendered relations, collective action, and adaptive capacity necessitated the use of multivariate statistical methods such as factor analysis. The study

included the age and gender of the household's head as demographic data. Other variables, including household income, livelihood diversification/transformation indices, and the social capital index, already existed as continuous variables (see Table 3.7).

Table 3.7 Definition of quantitative data analysis variables

Variables	Definition	Coding	Data analysis
Demographic characteristics	Household size Number of household members		Min Max Mean
	Relation with the participant	1=Wife/ husband 2=Father/ Mother 3=Son/ Daughter 4=Grandchildren 5=Grandfather/ grandmother 6=Others	Mean Standard deviation
	Gender of the participant	1 = male 0=female	Mean Standard deviation
	Age of the participant Age in years	1=18-29 years old 2=30-39 years old 3=40-49 years old 4=Over 50 years old	Min Max Mean
	Ethnicity of the participant	1=Kinh (Vietnamese) 2=Khmer 3=Islamic 4=Chinese 5=Other	Mean Standard deviation
Educational factors	Participant with no school (Participants who never went to school)	1=yes 0=no	Mean Standard deviation
	Participant with primary school (years 1-5) (Participants who have completed primary school)	1=yes 0=no	Mean Standard deviation
	Participant with secondary School (years 6-9) (Participants who have completed secondary school)	1=yes 0=no	Mean Standard deviation
	Participant with high school (years 10-12) (Participants who have completed high school)	1=yes 0=no	Mean Standard deviation
	Participant with undergraduate (Participants who have completed undergraduate levels)	1=yes 0=no	Mean Standard deviation
	Participant above graduate	1=yes 0=no	Mean Standard deviation

Social and institutional capital	**Social memberships** Farmers' Association Women's Union Youth Union Veterans' Association Credit Group Agricultural Extension Association Red Cross Society Others	1=yes 0=no	Mean Standard deviation
Livelihood diversification and Transformational adaptation	On-farm activities Non-farm activities Off-farm activities Other activities	1=yes 0=no	Mean Standard deviation

One-Sample t-test

The implementation of the t-test necessitates several assumptions: (1) the dependent variable is continuous, (2) observations are independent, (3) the data are approximately normally distributed, and (4) there are no extreme outliers. Normality was evaluated through descriptive statistics and distributional assessments before analysis (Field, 2013). In this study, a one-sample t-test was utilised to determine if the observed mean number of years impacted by climatic extremes substantially varied from a predetermined benchmark. The one-sample t-test is a parametric statistical technique used to determine whether the mean of a sample is statistically different from a known or hypothesised population value (Field, 2013). This study evaluated whether the reported duration of experiencing climatic impacts significantly deviated from zero.

One-Way Analysis of Variance (ANOVA)

This study employed ANOVA to ascertain whether mean scores related to new livelihood conditions significantly varied among households indicating economic improvement, deterioration, or stability. ANOVA assumptions comprise the independence of observations, an approximate normal distribution within groups, and homogeneity of variances. A one-way Analysis of Variance (ANOVA) was conducted to assess whether statistically significant differences were present in the changes of households' economic conditions over the past decade among various livelihood outcome groups (improving, worsening, and unchanged). One-way ANOVA is a parametric statistical method employed to compare the mean values of a continuous dependent variable among three or more independent groups within a single analytical framework (Pallant, 2020).

Likert Scale

Likert-scale data were regarded as ordinal variables; yet, in alignment with standard practices in social science research, the responses were evaluated using descriptive statistics (frequencies, percentages, and mean scores) to discern overarching trends and patterns (Harpe, 2015; Likert, 1932). Inferential statistical tests were performed where necessary to analyse differences among groups.

This study utilised a six-point Likert scale to assess participants' impressions of institutional performance, management efficacy, and adherence to guidelines. The Likert scale is a commonly employed statistical instrument intended to assess attitudes, perceptions, and subjective assessments using structured response categories (Harpe, 2015; Likert, 1932). This research utilised a response scale from 0 (no response or don't know) to 5 (extremely high), enabling participants to express differing levels of agreement or perceived efficacy.

3.4 Reflection on the research process

3.4.1 Fieldtrip self-reflection

This research and the resulting thesis emerge from my academic inquiry, shaped by my background as a social scientist and my practical experience working on rural development initiatives in the Vietnamese Mekong Delta and across Southeast Asia. During my professional career and academic pursuits, I established a robust foundation in social science theories and methodology. The interdisciplinary aspect of this research compelled me to be flexible and to develop a diverse array of new skills. I was especially attracted to the creative and reflective aspects of open-minded approaches, notably semi-structured and in-depth interviews, along with household survey techniques.

During the fieldwork, I encountered a wide spectrum of perspectives on environmental change. Only a small number of participants understood climate change as a global phenomenon. Key stakeholders, including provincial and district-level officials, tended to frame it as a locally specific environmental concern. In contrast, some community members interpreted extreme weather events, natural hazards, or environmental shifts through religious or spiritual explanations. Others observed noticeable changes in weather patterns but were unable to identify their underlying causes, while some expressed the view that climatic variability is a natural and ongoing process. Rather than directly questioning villagers about climate change, I adopted an indirect approach by asking broader questions about factors influencing their

livelihoods, changes in canals and rivers, and their experiences of floods, droughts, and storms that they themselves had described.

In social science research, gaining legitimate access to local communities, especially to particular field sites, is an essential need. Based on my professional experience, such access necessitates thorough consideration of local institutions, social organisation systems, and established administrative protocols. Neglecting to recognise and effectively engage with these structures may lead to distrust, diminished engagement, or, in severe instances, an outright incapacity to perform research (Mandel, 2003). Access to communities is frequently facilitated by various layers of "gatekeepers", whose consent must be effectively secured to interact meaningfully with the studied community (Mandel, 2003).

Although several pathways were available for gaining formal entry to the case study villages, I chose to be introduced through the Institute of Climate Change at An Giang University, my official institutional affiliation within An Giang Province. Initially, I submitted all required documentation, including participant recruitment materials, consent forms, and a research project summary to the Institute for review. Following approval, the Institute issued a formal letter of introduction. This letter enabled me to engage with provincial-level authorities, such as representatives from the Department of Agriculture and Rural Development. Once approval was granted at the provincial level, additional recommendation letters were provided, along with guidance on key contacts at the district and commune levels.

While affiliation with government authorities can sometimes pose challenges, particularly in contexts where government institutions may be viewed with scepticism, this did not seem to impede my fieldwork. Equipped with formally approved letters and supporting documentation, I met and worked closely with leaders from the People's Committees of Phu Huu and An My communes. During my initial meetings with local officials, I clearly outlined the aims and methods of my research and sought their support in facilitating access to villagers throughout the fieldwork period. Visits to both research sites were conducted in the company of local leaders and other officials. Although endorsement from commune leaders was essential for gaining entry to the study areas, ongoing access to village residents ultimately depended on the cooperation and support of hamlet-level officials.

Managing community expectations emerged as one of the most demanding aspects of the fieldwork. Many villagers either anticipated some form of assistance from me or were concerned that my presence might result in a loss to them. In a sense, both perceptions

contained an element of truth, as I was seeking their time and experiential knowledge. This created a strong sense of obligation on my part, compounded by the emotional difficulty of observing those enduring poverty.

Throughout the research process, a range of ethical considerations required careful attention. Foremost among these was my commitment to treating all participants with respect, sensitivity, and fairness. I made every effort to clearly and comprehensively explain the objectives of the research so that participants could provide informed consent. Where individuals chose not to participate, their decision was fully respected without question. I also honoured my commitment to share the findings of the fieldwork with the community and consistently acknowledged the time and contributions of participants. To protect participants' privacy, all identifying information was removed from research outputs, and anonymity has been maintained in both published materials and this thesis.

3.4.2 Positionality of researcher and research assistants

Temple (2002) and Twyman et al. (1999) suggest establishing the research's objectives and positionality to foster an environment where researchers can understand from research participants in their circumstances, as opposed to being perceived as dominant and knowing everything better than the participants. According to Corbridge and Mawdsley (2003), it is crucial to deconstruct the role of positionality in the research process and outcomes in the post-structural social science research approach. Gender and ethnicity are two of the most significant dimensions of identity (Cupples, 2002). Indeed, one of my key considerations before visiting the VMD pertained to the conceptions of gender and ethnicity, as well as the implications this had for my ability to conduct research as a Vietnamese (*Người Kinh)* male in rural, remote areas inhabited by ethnic minority communities (e.g., the Khmer). When evaluating the production of knowledge in such a cross-cultural context, deconstructing the researcher's positionality and perspectives was therefore potentially just as crucial (Tembo, 2003). Also, interactions with members of ethnic minority communities allowed for increasing my awareness of this issue.

To minimize the negative consequences of cultural differences between the Vietnamese and Khmer people, I took an active role in living in the two case study villages. I spent several days per week in the villages, gaining knowledge of the culture of the target community through exploration within it. This provided me with the unique chance to observe people outside of questionnaires and interviews designed for research purposes.

In this study, positionality extended beyond the relational approach between researcher and research participants due to the necessity of working through translators. Despite the arguments in favour of acquiring the local language for cross-cultural studies (Watson, 2004), the additional time investment prevented me from pursuing this option. I took steps to learn and use basic Khmer language in an attempt to bridge the gap between myself and the villagers. Recruiting and depending on translators (research assistants) for the interviews, particularly in the Khmer village, was essential to my research.

3.4.3 Ethical considerations: Informed consent and confidentiality

The informed consent is an integral aspect of the research process and of developing relationships with research participants. Prior to beginning my field study, ethical approval (Approval Number: HE23-186) was obtained through the University of New England Research Committee and the Human Research Ethics Committee (HREC). Initial fieldwork required in-depth discussions with my research assistants about the importance of informed consent to enable the collection of informed written consent and to ensure that participants understood the entirety of the project. At the beginning of each interview and household survey, I introduced the academic nature of the research, presented myself as a student, and committed to maintaining confidentiality. Participants were referred to throughout the thesis by a surname or job position, their place, and the interview number to protect their confidentiality. Furthermore, the research team informed the participants that their information would not be publicly disclosed without their agreement and that they would remain anonymous throughout the research and report-writing process.

Upon elucidating the project's goal and scope, I obtained informed consent from participants to engage in the study. Whenever possible, this was acquired via signed consent forms. Nonetheless, in the majority of interviews and household surveys, consent was obtained either in writing or verbally, especially when participants were unable or chose not to provide their names in writing. In these instances, participants' names were documented during the consent procedure. From an ethical perspective, some persons inquired about the practical utility of this research for their benefit. I specified that, while it may not produce immediate or direct advantages, I plan to share the findings with local NGOs, pertinent government bodies, and other key stakeholders. A multitude of participants articulated a need for their perspectives to be acknowledged by relevant authorities and for heightened understanding of their lived experiences. I have endeavoured to maintain ties with key stakeholders and government officials, to whom I intend to deliver my results upon the completion of my thesis.

To maintain confidentiality, participants are identified in the thesis by pseudonyms or positional titles, accompanied by their location. A participant called Nguyen Van Tan from Phu Huu is designated as [Tan, PH], omitting full names. An institutional representative, Tran Van Quoc, questioned in An My, is identified as a government official [Quoc, official].

3.5 Conclusion

This chapter outlines a thorough and methodologically sound research design that strategically integrates a qualitative case study methodology with a quantitative approach to investigate gendered vulnerability, adaptive capacity, and livelihood transformation in the climate-impacted Mekong Delta. Rooted in significant academic literature (Yin, 2014; Creswell, 2007; Braun & Clarke, 2006), the study employs an embedded multiple-case study design to examine two distinct ecological and socio-economic regions: Phu Huu commune in the floodplain province of An Giang and An My commune in the coastal province of Soc Trang. The sites were deliberately selected to represent different hazard patterns (flood/water-related issues versus salinity and drought), enabling the research to document localised differences in vulnerability, adaptation, and gendered experiences across temporal and spatial dimensions.

The study's framing of the household as the analytical unit, while critically examining its complexities within the VMD context, enhances the comprehension of intra-household dynamics, gender roles, and social reproduction. Expanding the term to encompass migrant members enhances the research's ability to elucidate the complex nature of household adaptation and decision-making.

The incorporation of semi-structured interviews, household surveys, field observations, and historical records illustrates a purposeful and comprehensive mixed-methods approach. This triangulation strengthens the validity of findings and incorporates the dynamic and contextual knowledge of local actors. The research recognises its positionality, especially in cross-cultural and ethnic situations, and adheres to ethical norms with diligence and cultural sensitivity.

The research approach demonstrates a purposeful and contextually informed framework for examining climate change adaptation in the rural VMD. By adopting multiple methodologies and reflexivity, it provides both empirical depth and analytical consistency, rendering it appropriate for investigating the convergence of gender, hazard governance, and livelihood transformation within the dynamic social-ecological systems of the Vietnamese Mekong Delta.

3.6 Limitations of the study

While this study offers important insights into gendered livelihood strategies and institutional influences at the household level, several methodological limitations should be acknowledged. Across the two research sites, a total of 140 semi-structured household interviews were conducted, comprising 103 men and 37 women. This gender-disaggregated sample facilitates the examination of distinct roles and experiences; yet, the dependence on a single participant, typically the household head, constrains the study's ability to comprehensively elucidate intra-household decision-making processes This method limits the investigation of how decisions are discussed, contested, or shared among household members, potentially underrepresenting the viewpoints of women and other less visible participants whose influence is frequently exerted through informal or non-verbal ways. In actuality, it was frequently challenging to assemble all household members concurrently due to their involvement in agricultural and economic pursuits. For instance, husbands may labour in the fields while wives stay at home to prepare daily meals, or both partners may be employed off-site. In certain instances, sons and daughters had relocated to urban regions for employment and had been absent from the household for prolonged durations. Cultural norms about gender, power, and privacy also constrained the opportunity to interview multiple family members, thereby strengthening the potential for reported decisions that reflect dominant or socially accepted narratives rather than internal household dynamics.

Consequently, data concerning gender relations and livelihood transformation should be seen as indicative of reported household-level outcomes rather than comprehensive descriptions of power dynamics and decision-making processes within households. Subsequent investigations utilising multiple participants' interviews, or ethnographic methodologies might be more adept at exploring these intra-household dynamics in greater detail.

Chapter Four: The Evolution of Land Use and Governance in the Vietnamese Mekong Delta

4.1 Introduction

This chapter examines major shifts in land use and institutional development in Vietnam, influenced by historical, political, and ecological factors. The advancement of agricultural processes, water management systems, and government frameworks has significantly influenced rural livelihoods, especially in rice production and lowland agriculture. Political instability, colonial governance, and climatic extremes have historically prompted alterations in land ownership and institutional structures, shaping Vietnam's rural landscape.

The introduction and implementation of the Doi Moi reforms in the 1980s marked a significant turning point in Vietnam's economic and agricultural development. These reforms signified a transition from collectivised agricultural to market-oriented farming, promoting economic liberalisation, private sector acknowledgement, and international investment. Consequently, Vietnam became a prominent agricultural exporter, especially in rice, with the Vietnamese Mekong Delta being essential in this evolution.

The Vietnamese Mekong Delta is recognised as the most productive agricultural region in Vietnam, where the dynamic interplay of land use, water management, and climate-induced issues has intensified. The region's low-lying topography renders it particularly vulnerable to natural hazards, including floods, droughts, and saltwater intrusion, compromising both livelihoods and food security. Climate change, rising sea levels, and intensified hydropower development upstream intensify these vulnerabilities, necessitating sustainable adaptation alternatives.

This chapter analyses the historical development of land use and institutional changes in Vietnam, specifically concentrating on the Mekong Delta. This chapter examines the socio-political and environmental factors influencing transformation, emphasising the essential contributions of governmental reforms, technical innovations, and local adaptation techniques in transforming the region's agricultural and economic structure. Additionally, it positions the research within the framework of two case study provinces: An Giang and Soc Trang – each exemplifying unique agro-ecological and socio-economic environments. These case studies offer profound insights into the interplay of historical legacies, institutional frameworks, and climate hazards that shape the experiences and adaptation strategies of rural farming communities.

4.2 History and evolution of land use and institutions in Vietnam

This chapter explores the historical evolution of land use, technologies, and institutions in Vietnam and illustrates how land use and institutions have influenced agricultural development patterns throughout the 19th century. In addition, it illustrates how rural livelihoods related to rice cultivation and lowland agriculture have evolved in response to stress and shocks. Political instability and civil strife were frequent causes of these stressors and shocks, as were climate extremes. The topography of lowland Vietnam and the hierarchical social institutions of the relatively homogeneous Vietnamese enabled a complex system of water resource management and intensive agriculture to reduce the hazards associated with climate variability (Adger, 1998). Periodic upheavals associated with invasion and colonialism were designated as the primary influences on the evolution of this system over the centuries. During the 19th century, a combination of climatic extremes and property-rights issues led to significant social and political upheavals.

Vietnam's political history has been marked by revolution and upheaval for approximately a millennium, throughout their colonial, communist, and post-economic liberalisation periods. The historical periods of Vietnam can be categorised as follows: the pre-European colonisation era, during which Vietnam established itself as a nation; the period of French colonial rule, which lasted from around 1859 to 1954; the communist era, which involved anti-colonial wars of independence and the American war; and the subsequent phase of economic liberalisation known as the Doi Moi period, which commenced in the mid-1980s. This study focuses on the post-Doi Moi period, which is pertinent due to its substantial agricultural reforms, technical innovations, and institutional changes that have transformed Vietnam's socio-economic landscape.

4.2.1 Doi Moi reforms: Macro-economic and agricultural restructuring

The formal institutional changes in Vietnam must be situated within the broader framework of "Doi Moi" and the ensuing economic transition. The term "Doi moi", which may be translated as "renovation", is predominantly employed to characterise the economic and social transformation that has taken place in Vietnam during the 1980s. The economy grew by less than two percent per year between 1976 and 1980 (see Table 4.1), and no state goals were met. In 1980, there were pervasive food shortages due to the drastic decrease in rice production in 1978, which necessitated the importation of 1.4 million tonnes of grain (J.Watts, 1998). Two regulations that had a significant impact were Order No. 100-CP of 1981 issued by the Party Secretariat, which pertained to agriculture, and Government Decree No. 40-CP of 1980, which

pertained to foreign trade (Beresford & Phong, 2000). During the mid-1980s, Vietnam experienced an economic crisis that led to the implementation of new reforms. These laws were officially proclaimed during the 8th Plenum in June 1985 and served as a forerunner to the subsequent "Doi Moi" reforms that were enacted in 1986 (J.Watts, 1998). The *Doi Moi* policy encompassed a strategy centred on promoting agricultural-led growth and economic liberalisation. This approach required enacting financial reforms, reducing subsidies, acknowledging the role of the private sector, and easing regulatory constraints on foreign investment (J.Watts, 1998).

Table 4.1 Vietnam's significant political events, land laws and reform since 1975

Timeline	Vietnam's political events
1975-1979	Expansion of collectivised agriculture in south of Vietnam.
1978	Vietnamese occupation of Cambodia in 1978
1979	Chinese invasion of northern Vietnam.
1979	Introduction of home contracts in agriculture on a limited scale.
1981	National application of household contract system under Directive 100; cooperatives and work points remain.
1986	Renovation policy 'Doi moi' was introduced after the Party Congress.
1988	Agricultural reforms under Decree 10. Collective ownership of farmland in Mekong Delta. Land allocation on lease system. Cooperatives to act as service operations to household agriculture.
1988-1993	State ownership of land remains in effect. Illegal farmland rentals emerge.
1993	The Land Law mandates agricultural land leases of 15 years or longer.
1996	Government claimed land as property of the state

Source: Adapted by Fforde and De Vylder (1996).

Institutional change in relation to land use and hydrological infrastructure has influenced the VMD's agricultural geography and landscapes (V. K. Nguyen et al., 2019; Stewart & Coclanis, 2011). After reunification in 1975, Vietnam began to evolve its communist practise by implementing collectivization and state-owned business in the both north and south (Adger, 1998). Post-1979, the Mekong Delta played a crucial role in the economic recovery and nation-building of the Socialist Republic of Vietnam. In this phase, a liberal and capitalist-oriented

economy replaced socialist collectivization and state control of commodities production, processing, and trade (Beresford, 1989; Fforde & De Vylder, 1996).

In the lowlands of northern Vietnam, agriculture was collectivised until 1981, with village cooperatives allocating labour and distributing inputs and outputs (Lee, 2015). This period was short-lived due to diminishing food staple output in the late 1970s, which led to the introduction of contracts between cooperatives and households, beginning the decline of collectivisation in 1981 (Pham, 2012). In this stage, the agricultural legal and institutional framework began to change. In 1986, the Sixth Party Congress enacted the Doi Moi reforms, renouncing industrialisation for agricultural expansion (Lee, 2015; Pham, 2012; Rato, 2003).

The rapidly changing situation of land tenure and control was influenced by a 1988 National Assembly resolution (Resolution No. 10-NQ/TW on 'Reforming the Management of the Agricultural Sector') that formalised a full contract system of household responsibilities in agriculture and addressed a serious food shortage (Lee, 2015). Households that had worked for the cooperatives received a share of all of their shared assets, including land. The cooperatives were transformed into service providers aiding farm households, while households were given complete control over production and sales decisions (Wiens, 1998). Despite the fact that land is still considered to be state property, households and individuals have the 20-year renewable right to use land or to exchange, transfer, inherit, and mortgage land use rights. Price limits on agricultural goods were gradually lifted in 1987 and 1988, allowing farm households to sell any surplus goods for whatever price the market would bear (Adger, 1998; Glewwe, 2004). This strategy gave rural households significant incentives to boost productivity, together with the elimination of the state procurement system.

Vietnam's economy experienced one of the fastest growth rates in the world in the 1990s as a result of these significant reforms in the agricultural industry and the entire economy (Boothroyd et al., 2000; Dollar et al., 1998; Fforde & De Vylder, 1996; Forbes, 1991; Tria Kerkvliet, 2017). With a per capita GNP towards the bottom of the list of the world's 40 poorest and least developed nations, Vietnam has improved to become the world's second-largest exporter of rice between 1991 and 2000, with an average annual growth rate of about 7.6 percent (APEC, 2002), reflecting the success of the "Doi Moi" reforms in fostering economic recovery and global trade integration. The Mekong Delta played a crucial role in this shift. According to UNDP Vietnam (2017), the poverty rate decreased from 58.1% in 1993 to 13.5% in 2014, and there was a significant decrease in the number of people who were hungry on a daily basis.

The Vietnamese economy experienced a decline since 1997, partly due to the impact of natural hazards (Luttrell, 2001). This has necessitated the development of adaptation strategies by agrarian societies (farmers and co-operatives), such as irrigation-based water availability control, to mitigate the uncertainty driven by climatic change. In an effort to boost productivity under both the collectivised and decollectivized systems, the percentage of arable land in Vietnam that was irrigated rose from 19 to 31% between 1973 and 1988 (Brookfield, 1993 cited by Adger, 1998). During that time, both pesticide and fertiliser applications increased, with the addition of nutrients increasing from roughly 55 to 60 kg per hectare between 1969 and 1988. Within the agrarian sector, the liberalisation also had significant social, ecological, and political repercussions that are covered in the section below for the VMD.

4.2.2 'Green Revolution': Irrigation and technological development

Due to national food shortages during the nineteenth century, 90% of Vietnam's agricultural land was used for grain cultivation, especially rice, for the first 14-15 years after reunification (Boothroyd et al., 2000). To enhance Vietnam's agriculture-led economic strategies, several efforts have been taken to extend and strengthen the irrigation system, improve water supply and drainage infrastructure, and implement flood prevention measures in the rainy season (e.g. dike compartment systems), and measures for drought and saltwater intrusion during the dry season (Boothroyd et al., 2000; Le Coq et al., 2004). Under the open-market economy, agricultural production has been oriented towards intensive and multiple crops, as well as increased diversification of plants, such as vegetables, beans, fruits, and short- and long-term industrial crops, resulting in an increasing food supply for domestic and export demands (Boothroyd et al., 2000).

In 1967, Vietnam introduced high yield rice varieties (HYVs) as part of the Green Revolution, and the Mekong Delta's intensive irrigated rice system expanded greatly in 1981 after liberalisation (Le Coq et al., 2004). Transition from extensive to intensive agricultural production commenced. This was the result of the introduction of new technology, including high-yielding varieties, chemical fertilisers, mechanised land preparation, low-lift mechanical pumps, and pumping stations (Miller, 2003). In the VMD, the HYV-growing area increased significantly from 9.7% of the total area in 1980 to 99.5% in 2002, while irrigation for HYVs production increased from 41% to 91% of the total area devoted to rice farming during the same time period (see Figure 4.1). As a result, the adoption of double cropping spread over the mid- to upper-delta, causing a decline in traditional agricultural practices and a reduction in local rice variety diversity from more than 1,000 varieties (Chiem, 1994).

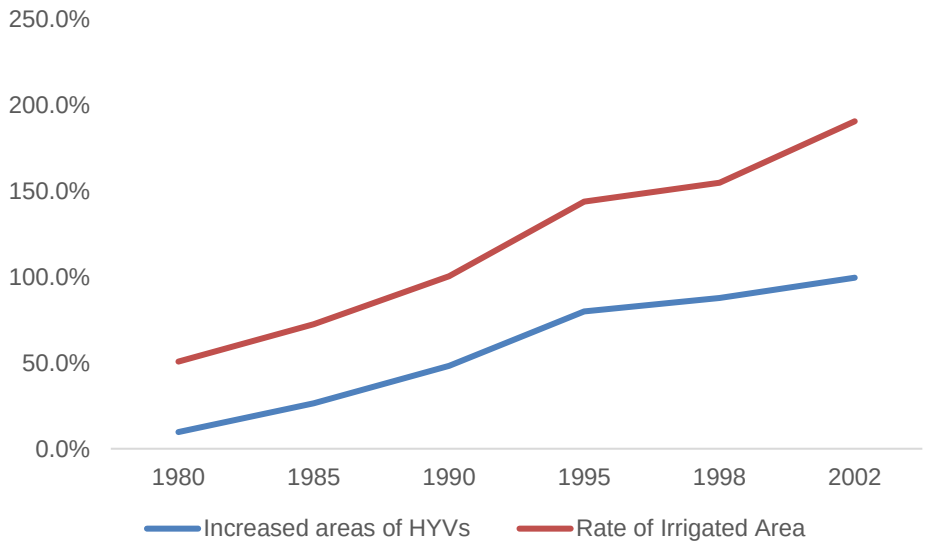


Figure 4.1 Adoption of HYVs and rate of irrigated area in the VMD (1980-2002)

Source: Adapted by Thi Ut and Kajisa (2006).

Figure 4.1 depicts the percentage increase in land allocated to the HYVs and irrigated areas from 1980 to 2002, with 1980 serving as the baseline year. Both indicators exhibit a steady rising trajectory throughout the study period. The area under the HYVs cultivation rose consistently from roughly 10% over the 1980 level in 1980 to nearly 100% by 2002. The most significant increase transpired between 1990 and 1995, during when growth intensified markedly.

The irrigated area increased rapidly and at a greater overall rate than the area designated for the HYVs. Irrigated land, beginning at approximately 50% above the 1980 baseline, had continued growth, attaining over 190% by 2002. The increasing trajectory of irrigation seems to exceed that of high-yielding varieties, especially post-1990. Both variables indicate continuous growth, with irrigation consistently surpassing the expansion of HYV cultivation since 1980.

Figure 4.2 Chemical fertilizer application per hectare in Vietnam (1980-2002).

Source: Thi Ut and Kajisa (2006).

In many regions, the cultivation of high-yield and high-quality crops has become prevalent alongside irrigation. However, the extensive development of new HYVs has led to excessive usage of chemical fertilisers and insecticides, resulting in detrimental effects on land and water resources (Boothroyd et al., 2000). Chemical fertilisers for rice production increased from an average of 60 kg/ha in 1980 to 180 kg/ha in 2000 (see Figure 4.2). Intensive use of chemical fertilisers can drastically boost rice yields in the short and medium term, but it has negative impacts on local water resources and ecologies (e.g. eutrophication). Toan et al. (2013) claim that organophosphorus pesticides are widely utilised in Viet Nam and leave toxic residues with negative effects on the ecology and drinking water resources. This results in killing of natural predators, fish, and shrimp in paddy fields, and affecting the locals who inhale the chemicals or consume the contaminated farm-based products (Cagauan, 1995; Toan et al., 2013). Such intense farming practices impede the achievement of sustainable agricultural development goals (Boothroyd et al., 2000).

Extreme weather or pests and diseases on farming systems might increase the risk of becoming dependent on nature-based resources (Adger, 1998). Since the 'Green Revolution', which reduced the genetic variety of the world's most cultivated crop – rice – global rice production has become more dependent on a single variety. Over the long term, this situation has resulted in greater yield variance (Hazell, 1985). In addition, the poor are disproportionately affected by this increased yield variability (Adger, 1998). This is further supported by Hart (1986) and Adamse Jr (1995) who convincingly argue that the Green Revolution, at least in South East

Asia, has had negative social effects in the form of a decline in employment opportunities and living standards among the poor.

4.3 Gendered Land Rights in Vietnam

This section examines the relationship between gender, land tenure systems, and household welfare in Vietnam, framed by the institutional setting of the 1993 Land Law and its subsequent reforms. The legal structure officially acknowledges land-use rights and has progressively advocated for joint land titling; yet, gender disparities exist within the underlying political economy governing land interactions (Rodgers & Menon, 2010). Empirical research demonstrates that households where women hold land-use certificates, either individually or jointly, exhibit enhanced welfare indicators, such as high overall expenditure, increased female self-employment rates, and reduced poverty exposure (Menon et al., 2017; Menon et al., 2014). Furthermore, women's land ownership correlates with favourable intergenerational outcomes, including improved child health, increased school attendance, and boosted household expenditure on necessary items, indicating broader advancements in human capital development (Menon et al., 2017; Menon et al., 2014).

Nonetheless, gender disparities continue to exist in the management and use of land-based resources (Croppenstedt et al., 2013). Men often possess enhanced access to formal credit and exercise greater authority over decisions concerning land transfers, reallocation, and asset management, illustrating enduring disparities in intra-household bargaining power and systemic biases within land and credit markets (Menon et al., 2017; Menon et al., 2014; Nguyen & Le, 2023). Thus, the official distribution of land titles at the household level does not inherently ensure equitable results. The developmental advantages linked to land rights are influenced by existing social norms, institutional frameworks, and market accessibility, which persistently affect gender-specific access to economic opportunities (Menon et al., 2017; Menon et al., 2014; Nguyen & Le, 2023).

Women's access to land is influenced by kinship structures, inheritance systems, and traditional societal norms (Agarwal, 1988). Research indicates that the implementation of land reforms under patrilineal and patrilocal systems may increase the risks of removal or limited entitlements for women, especially in settings where inheritance patterns favour male descendants (Bélanger & Li, 2009). In Vietnam, although women’s land-use rights are legally acknowledged, entrenched cultural norms persistently hinder women’s actual access to and security over landholdings (Bélanger & Li, 2009; Scott, 2003).

The recognition of ethnic minorities represents a further dimension of inequality in land relations, especially in central Vietnam (Baulch et al., 2007). Empirical research indicates that gender discrepancies in the acquisition and exercise of land-use rights are substantial in ethnic minority communities, where women are particularly vulnerable to exclusion from formal land administration processes (Pham Thi et al., 2023). Evidence reveals a robust positive correlation between gender equality and the effective implementation of land-use rights, with land access acting as a crucial mediating variable (Pham Thi et al., 2023). These findings possess important implications for policy. They emphasise the importance of registering land-use certificates in the names of both spouses, especially in ethnic minority households, as a means to improve women's tenure security and reduce the risks of dispossession due to marital dissolution, widowhood, or intra-household conflicts (Pham Thi et al., 2023). This approach aligns with extensive research indicating that joint titling can enhance women's negotiating power in households and strengthen the durability of their land rights (Menon et al., 2014; Pham Thi et al., 2023)

Land-use governance in the Mekong Delta is increasingly challenged by climate change, particularly due to saltwater intrusion and rising sea levels, which hinder spatial planning and agricultural sustainability (Cao et al., 2022; Truong et al., 2024). Analytical models emphasising optimising and spatial allocation demonstrate the impact of climate-sensitive land-use decisions on crop production, labour distribution, and vulnerability to environmental risks (Tran et al., 2015; Truong et al., 2024). While this research is mainly presented in economic and ecological contexts, they deliberately underscore the pivotal importance of land control and tenure security in influencing adaptive capacity. In situations where women's land rights are unstable or inadequately integrated into formal governance frameworks, gender-specific vulnerabilities to climate stress are likely to persist or intensify (Tran et al., 2015; Truong et al., 2024). Moreover, rapid shifts in land use and land cover, influenced by population growth, urbanisation, and ongoing policy reforms, intersect with current tenure systems in ways that may disproportionately assign women to less secure, lower-value, or environmentally marginal property. These activities not only diminish women's land security but also reduce their adaptation to climatic shocks and market fluctuations (Poortinga et al., 2019; Tran et al., 2015).

The relationships among land titling, access to credit, and motivations for productive investment are profoundly influenced by gender (Savath et al., 2014). Research demonstrates that when women possess land titles, households are more inclined to invest resources in child

health, education, and overall human capital development (Menon et al., 2017; Menon et al., 2014). Nonetheless, systemic discrimination in land markets and financial institutions frequently limits women's ability to convert formal land ownership into practical access to credit or productive capital (Menon et al., 2014; Nguyen & Le, 2023). This constrains the transformative capacity of land titling for women's economic emancipation.

In conclusion, gendered land relations in Vietnam and the Mekong Delta are influenced by the interplay of legal reforms, kinship norms, ethnic hierarchies, and governance capacity. Secure land rights, especially joint or female-held titles, are consistently associated with enhanced household welfare, child human capital, and women's empowerment; nevertheless, these benefits are contingent upon the dismantling of underlying barriers within land markets, financial systems, and decision-making institutions. Incorporating gender-responsive reforms into land administration, and land-use planning is crucial for maximising the developmental potential of land reforms, mitigating climatic hazards, and maintaining agricultural output in the Mekong Delta.

4.4 Geographical characteristics of the Vietnamese Mekong Delta (VMD)

4.4.1 Topography

The Mekong River, which has its source on the Tibetan Plateau, flows through China, Myanmar, Laos, Thailand, Cambodia, and Vietnam before emptying into the East Sea in Vietnam. The Mekong River is the tenth-largest river in the world with a mainline length of almost 4100 km, a drainage area of about 795 000 km2, and an annual mean discharge of 475 km3 (Liu et al., 2009; Mekong River Commission 2010). The Mekong Delta, which spans 5 million hectares and runs from Kratie in Cambodia through the VMD to the Gulf of Thailand and the East Sea, is located in south-east Asia (see Figure 4.3). The Tonlé Sap River, which in the rainy and dry seasons, respectively, contributes and extracts water to and from the more northern Tonlé Sap Lake, reaches the Mekong, the country's principal river, at Chaktomuk. Under Phnom Penh, the Mekong again divides, entering Vietnam via three main routes, i.e. the mainstream flow through the Mekong River (named Tien River in Vietnam) and Hau River (named Hau River in Vietnam), and transboundary overland flow to the Plain of Reeds east of the Mekong River and to Long Xuyen Quadrangle west of the Hau River (Manh et al., 2014; Triet et al., 2017).

The Mekong River provides essential upstream sediments and soils to the Delta environment, which is located at an altitude of between 0.5 and 3 metres above sea level, as well as serving

as an important fish breeding habitat (White, 2002). Because it produces more than half of the nation's staple food as well as nearly three-quarters of its fish and shrimp production, Vietnam's enriched flood plain—which makes up close to 50% of the country's cultivated land—is referred to as the "rice bowl" of the nation (GSO, 2015). The Vietnamese Mekong Delta, which has a population density of 426 people/km2, has great potential for agricultural and aquaculture. According to GSO (2022), the Delta is home to about 17,432.1 million people, or 20% of the Vietnamese population, with the majority of them living in rural areas.

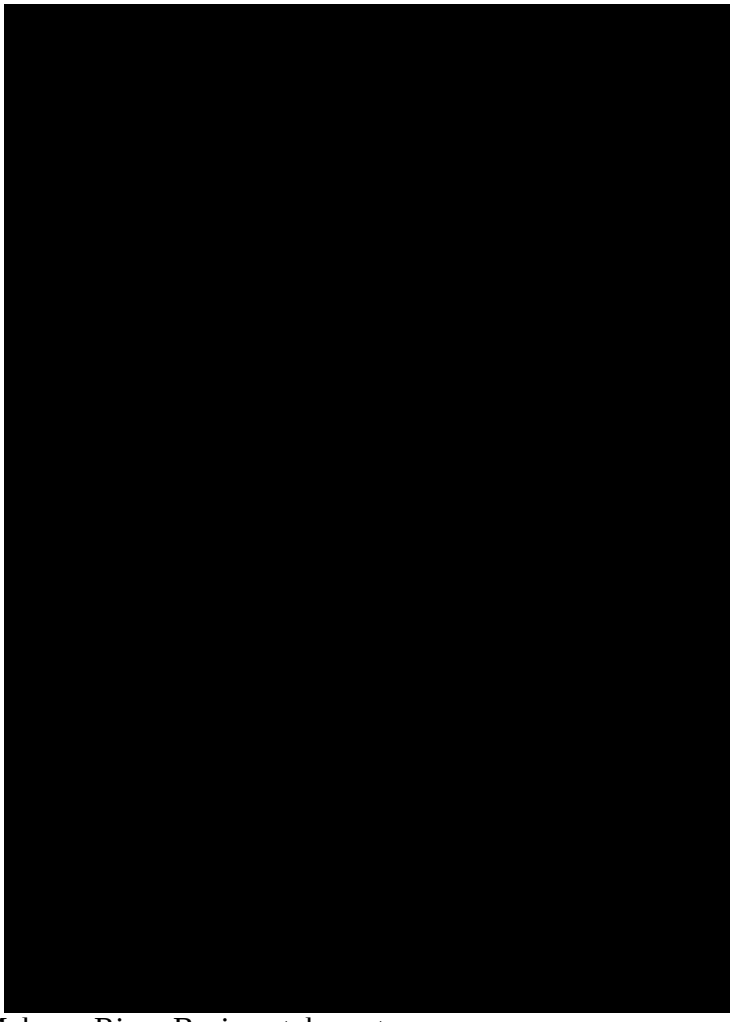


Figure 4.3 The Mekong River Basin catchment area

Source: Mekong River Commission (2020).

The VMD exhibits a topography that is primarily composed of alluvial flat and low-lying plains, with small mountainous sections in the north-west of An Giang and Kien Giang provinces. The elevation ranges from roughly 0.5 to 4 metres above sea level (Sanh et al., 1998 cited by Tuan, 2014). The VMD's level terrain and low topography have led to broad areas that become inundated during the rainy season and have affected hydrological strategies to prevent floods by using zone-protected embankments rather than river-parallel dike systems. The delta

is also subject to some natural restraints due to its flat and low-lying geography. For instance, during the wet season, floods are more prevalent in the Long Xuyen Quadrangle and the Plain of Reeds, while during the dry season, salinity increases and water scarcity have an impact on coastal zones. The VMD is extremely vulnerable to sea level rises in the context of climate change, especially in the coastal region, which are expected to have a considerable impact on agriculture and farm-based livelihoods. Coastal areas are affected negatively by small floods due to saline intrusion, whereas the upper VMD is severely affected by excessive excess floodwater. In this sense, the implementation of hydrological measures in the upper Mekong Basin and inside the VMD has the potential to have diverse consequences on water patterns, thereby influencing rural livelihoods.

The Vietnamese Mekong Delta (VMD) is a region with significant agricultural potential but is also vulnerable to natural hazards, especially considering the yearly slow-onset floods in its higher areas (Miller, 2003). In its ecological zones, fruit trees, vegetables, and aquaculture are also grown, with high-yielding rice varieties making up the majority of the planted grain crop area (around 99%). The VMD's agricultural sector plays a significant role in the country's economy, with rice production accounting for 90 percent of its total exported rice and aquatic exports contributing to 70 percent of its overall aquatic exports (IUCN & VAWR, 2016). Every year, from late June through December, floods affect the upper half of the delta, reaching their height in late September or mid-October. At the Vietnamese-Cambodian border, the Delta's flood depth varies from zero to roughly four metres above sea level (Dun, 2014). The Delta's flooded area produces 76% of the GDP, 75% of the GDP from agro-fisheries, 79% of the GDP from industry and construction, and 80% of the GDP from services (Tuan, 2014). In conclusion, the VMD, particularly the area that is prone to flooding, is crucial to Vietnam's agricultural exports as well as its national food security.

4.4.2. Socio-ecological systems: Climate variability and natural hazards in Vietnam

Some parts of Vietnam’s coast are flat, but the mountains are in the central highlands, north east, and north west. The monsoon winds, which come from the north-east and carry much moisture, have a dominant influence on its climate. Vietnamese meteorologists divide the country into seven climatic regions: Red River Delta, Northern Uplands, North Central Coast, South Central Coast, Central Highlands, South East, and Mekong River Delta. Vietnam is prone to natural hazards since it is situated in the East Sea, one of the world’s five typhoon hubs (Shaw, 2006). The World Bank recently declared that Vietnam is the world’s most climate-vulnerable country (Dasgupta, Laplante, Murray, et al., 2009). Vietnam was ranked

the sixth highest country in the Global Climate Risk Index 2020 for climate variability and extreme weather from 1999 to 2018 (Eckstein et al., 2020). Vietnam ranks third after Indonesia and China for the impacts of sea level rise and storm surge (Trung, 2015). Storms are the most common natural hazard in Vietnam, accounting for 48.51 percent of all natural hazards experienced in Vietnam from 1980 to 2020 (see Fig. 4.3) (World Bank Group 2021). Based on data from the Central Committee for Flood and Storm Control (CCFSC) database, Table 4.2 shows that tropical storms in Vietnam killed more than 5,700 people and injured an additional 7,000 between 1990 and 2010 (Trung, 2015). For instance, the Typhoon Damrey caused 68 deaths, damaged 118,000 homes, and ruined 244,000 hectares of rice over the period 1996 to 2005. It suggests that the intensity of storms between 1995 and 1999 must have been significant. In 1997, residents of the Mekong River Delta in southern Vietnam were severely affected by a storm known as Linda, which killed thousands of people and destroyed property (Trung, 2015). The Linda storm was the deadliest natural hazard in Southern Vietnam, with 3,111 fatalities and $385 million USD in damages (Anh et al., 2017). With the Mekong Delta's topology, storm surges, such as those produced by the Linda typhoon, are the major risk to low-lying coastal areas, whereas fluvial and pluvial flood events predominantly occur in the upper part of the delta, close to the Cambodia border (Takagi et al., 2015).

Table 4.2 Impacts of typhoons in Vietnam, 1990 – 2009

Source: Trung (2015).

Vietnam is also susceptible to floods and other natural hazards. Storms and floods usually have catastrophic consequences. Floods in Vietnam rank second only to storms and typhoons as the most damaging natural hazard (Trung, 2015). Between 1980 and 2020, floods accounted for 37.87 percent of the average yearly occurrence of natural hazards in Vietnam (see Fig. 4.4).

According to Trung (2015), Vietnam experienced 74 historic floods between 1990 and 2010. Floods killed 5,024 individuals, damaged or destroyed almost 220,000 homes and left 1,641 missing throughout the same period (1990-2010). As of 2010, assuming protection for a 1-in-25-year event, flooding in Vietnam affects 930,000 people annually and costs $2.6 billion annually (World Bank Group 2021).

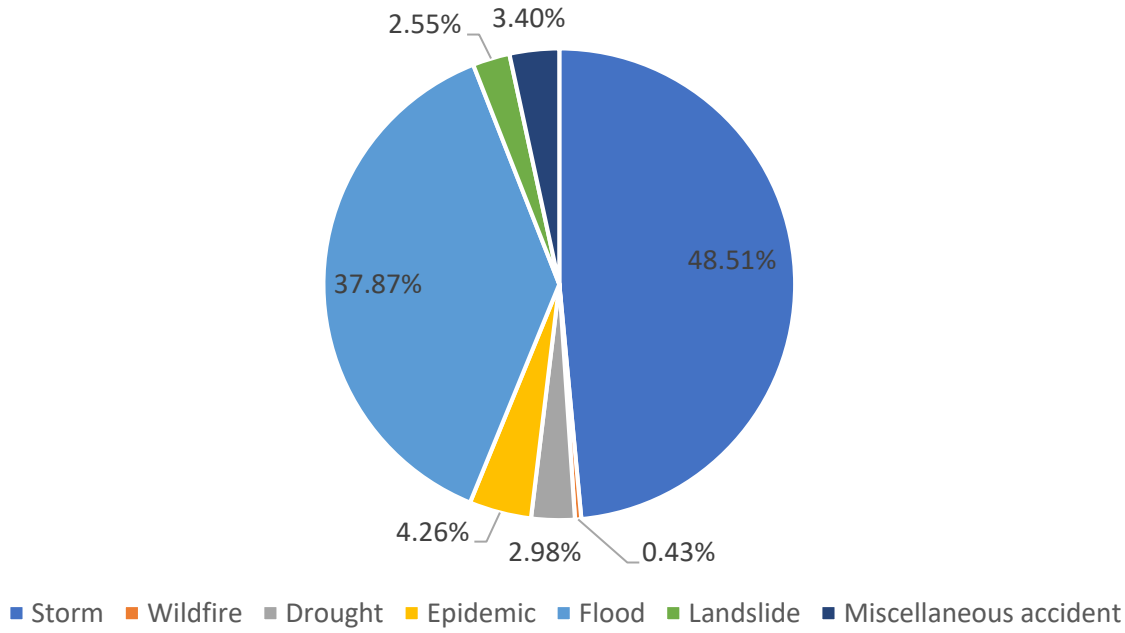


Figure 4.4 Average annual natural hazards occurrence in Vietnam (1980-2020)

Source: World Bank Group (2021).

Furthermore, Vietnam is also very vulnerable to riverine and coastal floods since its coastline is 3200 kilometres long and 70 percent of its people live in low-lying deltas (GFDRR, 2015). Floods have already caused significant issues, with some populations being more susceptible than others (Adger, 1999; World Bank 2010). Large floods occurred in the Mekong Delta of Vietnam in 1850, 1937, 1961, 1966, 1978, 1984, 1994, 1995, 1996, 2000, 2001, and 2002 (Socialist Republic of Vietnam 2004). The worst flood in 2000, in which flood levels exceeded 3 metres (Nguyen et al., 2003), affected 11 million people residing in 610 flooded villages, flooded 159,260 ha of rice, and destroyed 55,123 ha of rice crop (Tinh & Hang, 2003), resulting in USD 289.8 million (1$VND ~ 13,800 in 2000) in damages. Ten years later, in 2011, Vietnam was severely damaged by floods, despite the fact that reinforced high dike systems had been constructed to protect residences and farms after the flood of 2000 (Chinh et al., 2016). For instance, there were 265 fatalities, 248,768 hectares of drowned rice fields, and 101,599 hectares of damaged farms (Mekong River Commission 2015). Can Tho city was the

most devastated area in the Mekong Delta, with 27,800 flooded homes and an estimated loss of USD 11.3 million in buildings, infrastructure, aquaculture, and agriculture (Can Tho CFSC 2011 cited by Chinh, Bubeck, Dung, & Kreibich, 2016).

Prior research indicates that farmers and the poor are more susceptible to natural hazards than the rest of the population since they rely on nature-based livelihoods, such as rice production, fishing, and aquaculture (Hallegatte, 2016). For example, the livelihoods of the poor rely largely on the collection of fish and aquatic resources, as well as farm-based wage work during the flood season. Due to a lack of access to savings, credit, and social security, the poor have less ability to cope with and adjust to shocks, a situation which is likely to be exacerbated by the effects of climate change (Hallegatte, 2016).

With Vietnam's topography and socioeconomic state, rising sea levels and the frequency and intensity of floods globally, and in Southeast Asia particularly, could make the country especially vulnerable to natural hazards (IPCC, 2014b; World Bank 2013). Vietnam is projected to be one of the five nations most impacted by climate change: a 1 m rise in sea level would harm 11% of the population and 7% of agricultural area (GFDRR, 2015). Flooding caused by a 100 cm rise in sea level could inundate 16.8% of the population of the Red River Delta, 1.5% of the Central coastal provinces, 17.8% of Ho Chi Minh City, and 38.9% of the Mekong Delta (MONRE, 2016). Rising sea level has made the VMD one of the world's largest and lowest delta plains (Syvitski et al., 2009). In the recent study of Minderhoud et al. (2019), present and future land surface elevation above sea level determines how much time remains before the delta is submerged. Importantly, the Mekong delta's lower elevation implies there is less time than previously thought to develop climate change mitigation or adaptation strategies. Due to upstream dam development and decreased cyclone activity in the Mekong basin, the amount of Mekong sediment that may be deposited on the delta plain to counterbalance relative sea level rise is diminishing (Kondolf et al., 2014; Manh et al., 2015; Tessler et al., 2015).

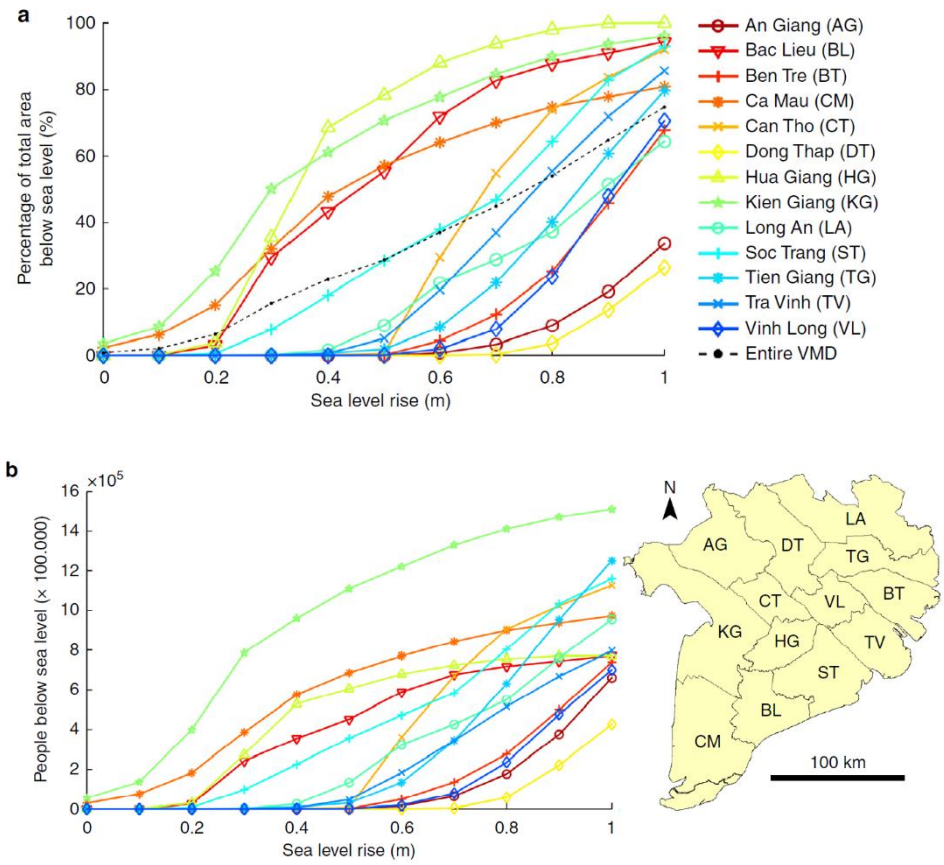


Figure 4.5 Locations and estimated number of residents impacted by sea level rise. Mekong Delta locations (a) and estimated number of Mekong residents (b) below sea level following sea level rise up to 1 metre designed by the Topo Digital Elevation Model.

Source: Adapted by Minderhoud et al. (2019).

The Mekong River Delta consists of the provinces of Soc Trang, Bac Lieu, Ca Mau, Kien Giang, and Hau Giang, which have all been recognised as the lowest and most susceptible regions of the delta (see Fig. 4.5) (Minderhoud et al., 2019). Using the Topo Digital Elevation Model, more than 70 percent of the Mekong Delta's population (12 million people) lives in areas that will fall below sea level following a 1 metre SLR (Minderhoud et al., 2019), which doubles the number of previous analyses by the International Centre for Environmental Management in 2008 (29 percent of the total) and the Vietnamese Ministry of Natural Resources and Environment in 2016 (38.9 percent of the total). In addition, natural hazard researchers internationally (e.g. Sherif and Singh (1999); Rice et al. (2012); Yuan et al. (2015); Bhuiyan and Dutta (2012)) and in the Mekong Delta have recently paid great attention to the influence of sea level rise on saltwater intrusion by applying numerous current sea level rise models (IPCC, 2007; MONRE, 2009, 2016; Nguyen, 2008; Trieu & Phong, 2015). The

coastlines of the East Sea, particularly Vinh Long (formerly Tra Vinh, Ben Tre) province, and Tien Giang are where the combined effects of sea level rise and reduced Mekong River flow during the dry season are most apparent (Khang, 2008). For example, the first significant drought and saltwater intrusion in 2005 caused an estimated loss of 45 million USD in the VMD (Vu et al., 2018). The second drought event in 2015 – 2016 affected 52.7% of the Mekong Delta, which included 10 out of 13 provinces and cities (Mai et al., 2018), and caused the VMD a total economic loss of US$360 million, as well as 244,000 ha of rice crop losses (89.6% of the country's rice crop losses) (Mai et al., 2018; UNDP Viet Nam 2016). As depicted in Figure 4.6, the sea level rise is expected to continue at a rapid rate of 5–7 cm per decade until the end of the century; the rate of sea level rise from 2005 to 2100 will be much higher than the rate from 1978 to 2005 (Vu et al., 2018). The sea level is expected to rise 25 to 30 cm by 2050 and 60 to 78 cm by 2100. The finding is consistent with the VMD's sea level rise scenarios, which is estimated by MONRE (2016).

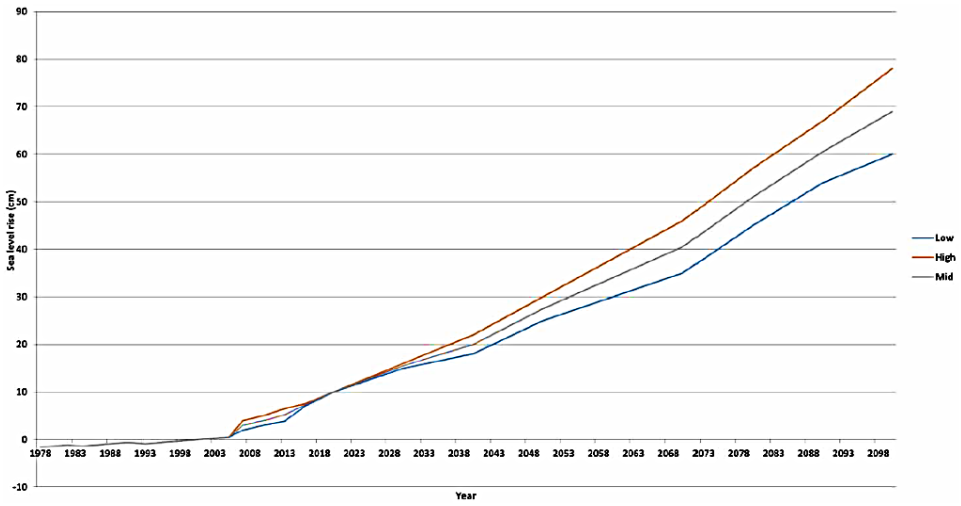


Figure 4.6 Projection of sea level rise for Mekong Delta, Vietnam under RCP 6.0 scenario for the period 2020–2100.

Source: Vu et al. (2018).

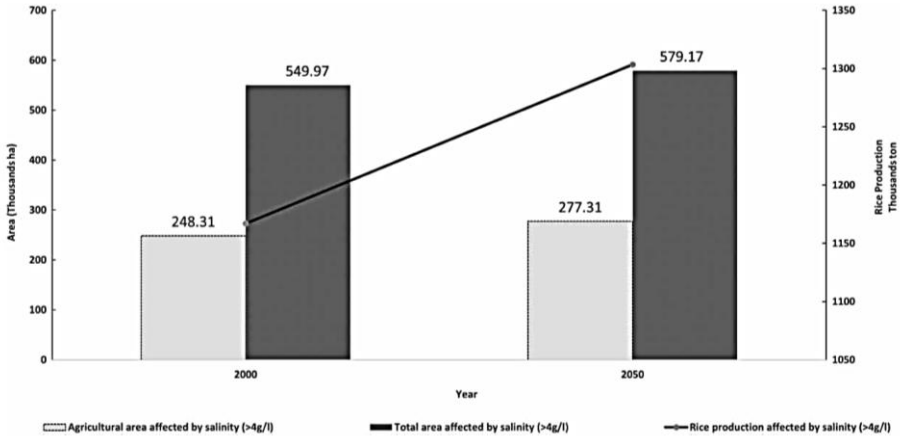


Figure 4.7 The VMD's locations affected by salinity of irrigation water in 2000 and 2050.

Source: Vu et al. (2018).

By 2050, the agricultural area of the VMD is projected to increase by 30,000 hectares, including the coastal provinces of Tien Giang, Ben Tre, Tra Vinh, and Soc Trang that are affected by medium salinity (more than 4 g/l) (see Fig. 4.6 and 4.7) (Vu et al., 2018). These hazards resulted in a substantial decline in agricultural productivity, especially in the third crop of rice production, which negatively impacted the local households' means of subsistence (Kien, 2021). Consequently, loss of agricultural food sources left many rural households' food insecure. In a quest for jobs, many residents relocated to large cities such as Ho Chi Minh City (FAO, 2016; Van et al., 2012). Gay-Antaki (2017) claims that climate change including typhoons, sea level rise, saltwater intrusion, floods and droughts will disproportionately affect women and those who are geographically or economically disadvantaged, and that climate risk measures must consider the vulnerable and marginalised. This is further supported by Cannon (2002) and Goldsworthy (2010) who argue that the vulnerability of women, particularly in rural areas, could be increased by climate change. For example, women collect water, food, and forest products for everyday household use and spend more time finding alternate food, water, and fuel sources during environmental degradation and natural hazards. In addition, the potential consequences of climate variability in the VMD may cause women with dual roles to do household chores and farming (Pistor et al., 2012).

Furthermore, land subsidence in the VMD has been associated with extensive groundwater extraction. Studies demonstrate that the mean subsidence rates throughout the delta surpass 10 mm yearly, with certain regions suffering rates as high as 60 mm per year (Ingebritsen & Galloway, 2014; Minderhoud et al., 2018). The ongoing extraction of groundwater diminishes

hydraulic pressure in aquifers, leading to the compaction of underground sediments. This mechanism accelerates ground subsidence and exacerbates the relative impacts of sea-level rise on susceptible coastal communities (Erban et al., 2014; Minderhoud et al., 2018). Hak et al. (2016) contend that in areas that have substantial extraction of groundwater and other subsurface fluids, human-induced subsidence may exceed the effects of climate-driven sea-level rise (Ingebritsen & Galloway, 2014).

Land subsidence exacerbates the effects of sea-level rise by speeding the loss of relative elevation, hence increasing flood vulnerability and saltwater intrusion across the delta (Erban et al., 2014). In low-lying regions, many located less than one metre above mean sea level, this process considerably exacerbates flood vulnerability (Erban et al., 2014). Empirical evidence indicates that decreasing groundwater levels and related subsidence rates are occurring simultaneously with anticipated sea-level rise, creating a compounded and exacerbating risk for at-risk communities (Takagi et al., 2016; Tran, 2018).

The Vietnamese Mekong Delta exemplifies one of the most pronounced instances of land subsidence (Minderhoud et al., 2018). The region, with a population estimated at 18 to 20 million and responsible for approximately half of the nation's food production, is facing land subsidence that surpasses the effects of climate-induced sea-level rise (Erban et al., 2014; Minderhoud et al., 2017). Empirical evidence indicates that subsidence accounts for roughly 70–85% of the recorded relative sea-level rise in the delta (Takagi et al., 2016). These dynamic influences shape the temporal framework of climate risk, converting a potential slow, long-term process into an urgent catastrophe that requires rapid and coordinated governance interventions.

The interplay between land subsidence and global sea-level rise produces compounded rates of relative sea-level rise, posing a substantial danger to the long-term sustainability of the VMD. In a case study of Can Tho, the major urban hub in the region, Takagi et al. (2016) discovered that relative water levels — defined as the combined effect of ocean-level increase and vertical land subsidence, which was occurring at an annual pace of 22.3 mm. The study ascribed approximately 17.1 mm per year to land subsidence by subtracting the anticipated worldwide sea-level rise of 5.2 mm annually from the observed maximum annual water level increase. This analysis indicates that subsidence constitutes almost 77% of the overall relative sea-level rise impacting metropolitan regions inside the delta, highlighting the substantial impact of human-induced land sinking on increasing coastal hazards (Takagi et al., 2016).

Recent advancements in modelling have yielded more refined projections by including both regional variability and temporal dynamics in the factors contributing to sinking. Dunn and Minderhoud (2022) integrated scenarios of groundwater extraction-induced compaction, natural sediment consolidation, and anticipated global sea-level rise to model relative sea-level trajectories up to 2050. Their findings suggest that the Mekong Delta has surpassed a crucial geomorphological threshold, transitioning from a net positive change in surface elevation to a continuous net subsidence across the whole delta. In a business-as-usual scenario, the average land surface elevation may decrease by around 0.5 metres relative to local mean sea level by mid-century, primarily due to anthropogenic subsidence (Dunn & Minderhoud, 2022).

4.5 Conclusion

The VMD has experienced significant changes in land use, governance, and socio-ecological dynamics during the last century, influenced by colonial legacies, political reforms, and environmental constraints. The Doi Moi reforms of the 1980s were essential in shifting from collectivised agriculture to a market-oriented system, enhancing agricultural output and economic growth. Technological developments, especially associated with the Green Revolution, drastically boosted the production of rice but also resulted in enduring ecological trade-offs due to excessive chemical application and diminished crop diversification.

The region's flat topography and exposure to floods, droughts, saltwater intrusion, and land subsidence render it particularly vulnerable to climate change. These natural risks, intensified by upstream hydropower development and increasing sea levels, persist in jeopardising rural livelihoods and food security. The provinces of An Giang and Soc Trang serve as case studies illustrating unique vulnerabilities: An Giang encounters flood-related issues in its higher floodplain regions, whilst Soc Trang grapples with salinity and drought in its coastal zones. Notwithstanding disparities, both provinces demonstrate how climatic stressors intersect with socio-economic inequalities.

In circumstances in which women's land rights are insecure, inadequately enforced, or absent from land-use planning, their adaptive capacity to respond to climate hazards may be severely restricted. Gendered disparities in land tenure can exacerbate vulnerability, restrict access to financial assistance or adaptation resources, and perpetuate structural disadvantages among the rural marginalised, especially women and ethnic minorities.

In summary, land-use patterns and governance in the VMD have been shaped by the interconnected dynamics of historical reform, socio-political power relations, and accelerated

changes in the environment. Promoting sustainable development and climate adaptation in this setting necessitates governing structures that are ecologically responsive and socially inclusive. Addressing structural inequities in land tenure, especially through gender-responsive reforms including joint titling, equitable credit access, and the incorporation of gender in land-use planning and climate adaptation strategies, is essential for enhancing adaptation, promoting social justice, and ensuring the long-term sustainability of the delta.

Chapter Five: Climate Change Vulnerability: Perceptions and Experiences of Farming Households

5.1 Introduction

This chapter seeks to address research question 1 of the study: *How does the existing social-ecological setting influence the perceptions and experiences of rural farming households in relation to climate hazards vulnerability?* This chapter's subsequent sections encapsulate the findings of the investigation into farmers' perceptions and experiences concerning climate change and climate hazards as socio-economic and environmental determinants influencing their decision-making in An Giang and Soc Trang provinces of the Vietnamese Mekong Delta. Rural farming communities are often deeply intertwined with their local ecosystems, relying heavily on natural resources for their survival. The chapter's introductory section explores the vulnerability of farmers to climate hazards within a social and ecological context and analyses their perception of these occurrences as both historical and contemporary phenomena that may spatially and temporally affect farming communities. The chapter subsequently explores farmers' perspectives of the causes of climate change and the changes they observe in their local climate. This corresponds with previous studies of Adger et al. (2003); Ribot (2010), who argue how biophysical hazards, economic factors, social-ecological dynamics, and political power structures, including gender, influence the experiences, perceptions, and responses of at-risk individuals, households, and communities to environmental changes.

Recent studies have emphasised the intricate connection between socio-economic determinants and vulnerability to climate change. Studies conducted in Australia, India, Tanzania, and several Indian cities indicate that age, gender, and geographic location are frequently linked to vulnerability (Smith et al., 2015). Reducing vulnerability requires a focus on infrastructure, economic growth, and resource accessibility (Tripathi, 2017). Climate impacts are more pronounced among populations with poor educational attainment, limited information availability, and reliance on climate-sensitive sectors such as agriculture (Kiplimo & Makame, 2020). Vulnerability is further increased by poor income, marginalisation in decision-making, and a lack of tangible assets (Kiplimo & Makame, 2020). It is crucial to comprehend the socio-economic influences on climate vulnerability. This section provides an overview of the socio-economic background of the farm households involved in this study. The participants' varied livelihoods, production, consumption, and demographic characteristics are highlighted in this instance.

5.2 Farm household characteristics of the selected participants

The demographic characteristics of 140 households selected in the two research locations are shown in Table 5.1. Descriptive statistics were used to display the comparative distribution of factors such as household size, age, gender, marital status, educational attainment, primary occupations, religion, and period of residency. The average household size was comparable across the two study sites, at 4.13 persons in An My and 4.27 persons in Phu Huu. 21.4% to 24.3% of household heads among participants were aged between 40 and 49 years. For both research sites, more than 60% of participants were over 50 years old. Male participants made up a larger percentage of the sample than female participants (67.1 percent of all participants were male in An My and 80 percent of all participants in Phu Huu, respectively). The sample largely consists of male participants, reflecting a higher proportion of male-headed households in the research locations and social norms that favour male household heads as representatives in formal interviews. However, this distribution should not be interpreted as evidence of women's diminished economic role, as their contributions to both productive and reproductive labour are substantial but frequently underacknowledged.

Participants generally have low levels of schooling. The predominant portion of participants had attained only primary school levels of education (30% in An My and 58.6% in Phu Huu), whilst 35.7% in An My and 25.7% in Phu Huu had achieved secondary education. The percentage of illiterate participants was quite high (7.1% in both An My and Phu Huu), and a minimal number of participants had completed vocational school or attended college or university. Approximately 4.3 percent of the participants had attained graduate or higher education levels in An My, but only 2.9 percent were documented in Phu Huu.

The primary source of income for rural households in the research areas is agricultural production. This is in accordance with the relatively high percentage of the participants' occupations, specifically 54.3% of fruit growers in An My commune and 58.6% of rice growers in Phu Huu commune. Additionally, off-farm activities, such as fishing and daily off-farm work, as well as non-farm activities, such as businesses, grocery stores, and vendors, have been identified as additional livelihood activities across the study sites. With regard to ethnicity, the finding shows that the majority of participants were Kinh people (Vietnamese), with 81.4% in An My commune and 100% in Phu Huu commune, though in An My commune the Khmer population accounted for 18.6% of the local population. The research revealed a significant prevalence of long-term migration among family members in the surveyed households. Specifically, 24.3% of households in An My and 28.6% in Phu Huu reported experiencing such

long-term migration. These findings underscore the increased movement tendencies in those regions and offer significant insights into the mobility patterns within the surveyed populations. The interviews reveal that the transition from rice cultivation to fruit production, together with subsequent agricultural mechanisation, is viewed as a primary cause undermining the livelihood opportunities of numerous rural households.

Table 5.1 Socio-economic and demographic characteristics of the participants (n=140)

Variables	Research sites	
	An My (n=70)	**Phu Huu (n=70)**
Household size		
Mean	4.13	4.27
Maximum	8	10
Minimum	2	1
Median	4	4
Standard deviation	2	2
Participants' age (%)		
18-29	0	2.9
30-39	2.9	5.7
40-49	21.4	24.3
>=50	75.7	67.1
Participants' gender (%)		
Male	67.1	80
Female	32.9	20
Participants' highest educational attainment (%)		
None	7.1	7.1
Not yet started school	1.4	0
Primary school	30	58.6
Secondary school	35.7	25.7
High school	20	4.3
University graduate	4.3	2.9
Postgraduate qualification	1.4	1.4
Participants' primary occupations (%)		
Rice grower	18.6	58.6
Fishermen	4.3	18.6

Government-based employee	1.4	0
Private sector employee	0	2.9
Self-employment (non-farm)	2.9	0
Workers from private firms	1.4	0
Self-employment (off-farm)	5.7	5.7
Fruit grower	54.3	11.4
Housewife	11.4	2.9
Participants' migration status (%)		
Yes	24.3	28.6
No	75.7	71.4
Participants' ethnicity (%)		
Kinh (Vietnamese)	81.4	100
Khmer	18.6	0

Source: Household survey (2024).

As shown in Figure 5.1, the distribution of educational attainment among participants across two study sites reveals that the majority of responses are concentrated at the primary and secondary education levels. Primary education constitutes 44.3% of the overall sample, while secondary education represents 30.7%. Completion of high school accounts for 12.1% of participants, whilst merely 3.6% possess a graduate qualification and 1.4% hold postgraduate degrees. A minor percentage of participants indicate having no formal education (7.1%) or not yet commencing school (0.7%). The data indicates that educational attainment among the studied population is predominantly at the basic and lower-secondary levels, with minimal advancement to university education.

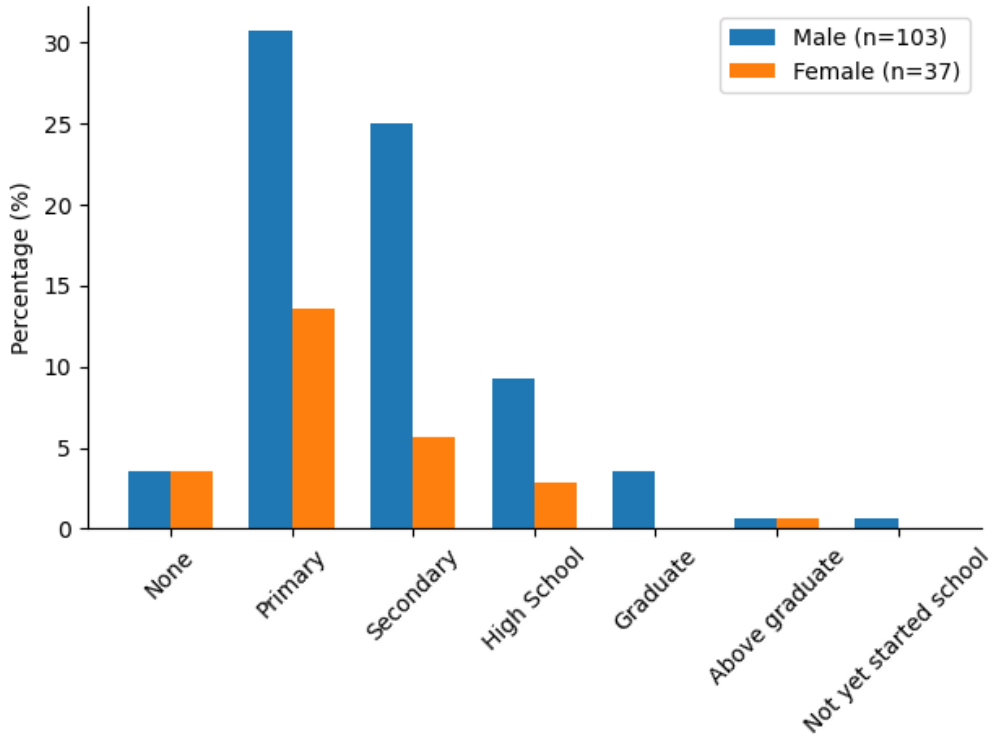


Figure 5.1 Education level by gender (n=140)

Source: Household survey (2024).

Gender disparities can be observed in the distribution. Males constitute 73.6% of the overall sample, and females comprise 26.4%. At the primary level, males constitute 30.7% of the overall sample, and females account for 13.6%. Likewise, secondary schooling comprises 25.0% males and 5.7% females. At the high school level, males constitute 9.3% of the entire sample, while girls comprise 2.9%. Significantly, 3.6% of the overall sample comprises males with graduate-level education, but no female participants are represented in this category. At the postgraduate level, both males and females represent 0.7% each.

The observed disparity may be attributed to the higher percentage of male participants in the sample, but it may also indicate underlying structural or socio-cultural factors affecting educational achievement. The inadequate female representation in higher education, especially the lack of women in graduate category, may indicate gender-based barriers to accessing advanced education. These discrepancies are crucial to incorporate in subsequent analyses, as educational attainment may profoundly influence access to resources, involvement in decision-making, and overall socioeconomic standing within the research setting.

Furthermore, Figure 5.2 depicts the occupational distribution, highlighting gender-specific patterns of livelihood contribution. A greater percentage of male participants indicated participation in rice farming (56.3%) and fruit farming (34.0%), signifying a focus on primary

crop production activities. Female participants engaged in rice farming (32.4%) and fruit cultivation (29.7%), however their occupation profile is more varied, with 27.0% mainly identifying as housewives.

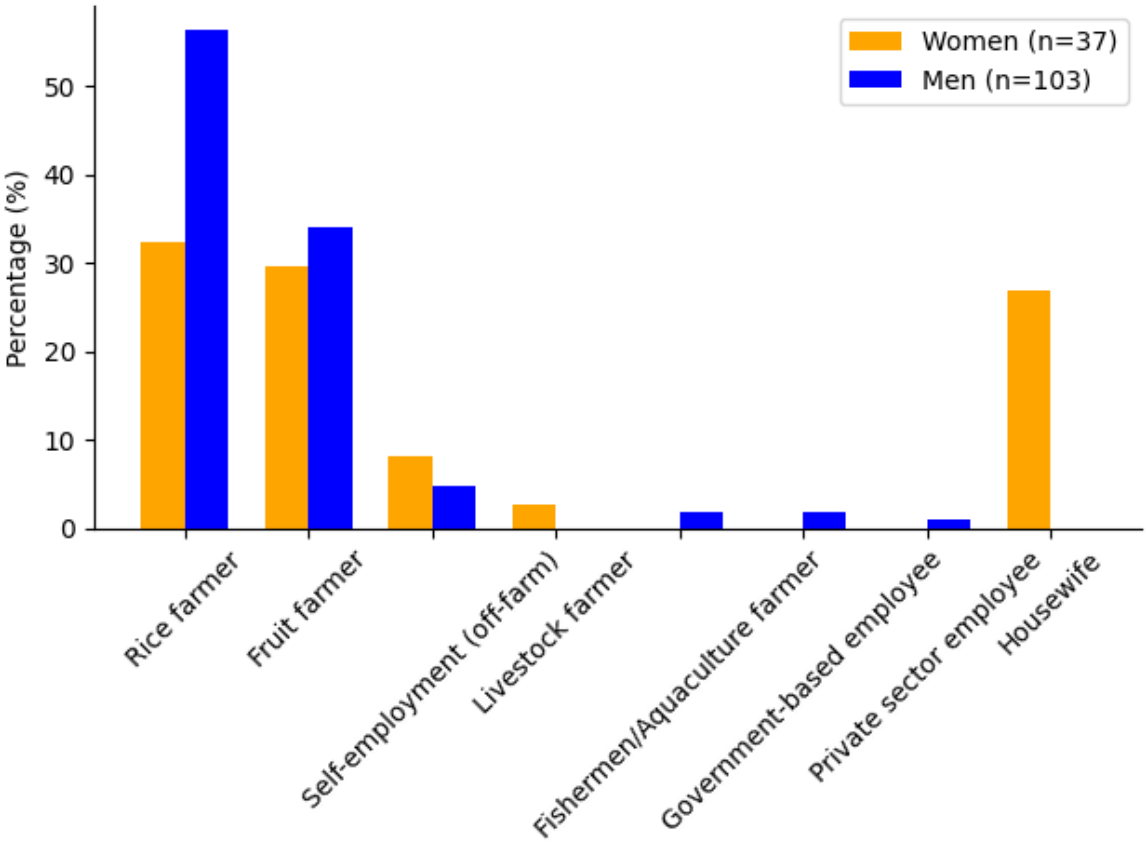


Figure 5.2 Gendered main occupation across two study locations (n=140)

Source: Household survey (2024).

Although both genders participate in agricultural output, men are more commonly represented in rice farming within this sample. The occupational roles of women encompass both productive agricultural activities and household duties, underscoring the dual aspects of their contributions to household subsistence.

In this sample, only male participants reported formal employment categories (government and private sector positions), while a limited number of female participants reported livestock farming. These patterns indicate that the daily livelihoods of the two study locations are characterised by a differentiated allocation of roles, rather than strictly dividing labour systems, with both genders contributing in separate although overlapping manners.

As illustrated in Table 5.2, the mean land size of participants varied slightly, from 1.3 hectares in An My to 1.5 hectares in Phu Huu. Within the sample, the maximum land size was 7.6

hectares in An My and 6.5 hectares in Phu Huu, while the minimum size was zero. Based on the in-depth interview with the local government representative, it was discovered that a significant portion of the agricultural land in An My has been converted from rice to fruit crops over the past decade. Regarding household incomes, the average household income in An My was VND 126 million (~ AUD 7,975) annually, whereas in Phu Huu it was VND 243 million (~ AUD 15,386) annually. The monthly per capita income was VND 4.89 million (~ AUD 311) in An My and VND 6.74 million (~ AUD 428) in Phu Huu. The level of well-being was determined using daily income, as stated in the Decision on Approval of the List of Poverty Districts and Villages of Coastal and Inland Areas for the Period of 2021 – 2025 (Prime Minister 2022) . Specifically, poor and near-poor households are defined as those in rural areas with an average monthly per capita income of VND 1.5 million (~ AUD 95) or less. Middle-income households are those in rural areas with an average monthly income per capita between VND 1.5 million (~ AUD 95) and VND 2.250 million (~ AUD 143). By using these parameters, the study discovered that the sample's poor households made up 24.3% of the sample in An My and 11.4 percent in Phu Huu, with medium-sized households making up 8.6% of the sample in An My and 12.9% in Phu Huu. The better-off households represent the largest percentage of the sample, comprising 67.1% in An My and 75.7% in Phu Huu.

Table 5.2 Distribution of households' agricultural land ownership and incomes by research sites (n=140)

Variables	Research sites	
	An My	**Phu Huu**
Agricultural land holdings (ha)		
Mean	1.3341	1.5108
Maximum	7.6	6.5
Minimum	0.0	0.0
Median	1.045	1.2
Household income in 2023, measured in VND million (VND million/year) (1 AUD ~ 15.591 VND)		
Mean	126	243
Maximum	885	2400
Minimum	0	12
Median	66	145

Per capita income in the year 2023 (VND million/month) (1 AUD ~ 15.591 VND)		
Mean	4.89	6.74
Maximum	25.47	43.35
Minimum	0.25	0.0
Median	3.32	4.58
Household classification by the 2023 income levels (%) (1 AUD ~ 15.591 VND)		
Poor households	24.3	11.4
Medium households	8.6	12.9
Better-off households	67.1	75.7

Source: Household survey (2024).

The assessment of socio-economic status was based on a primary income source, housing quality, encompassing simple, semi-permanent, and permanent structures—income levels, and access to natural resources, particularly agricultural land ownership, as examined through a combination of household survey and in-depth interviews with key informants at the two study sites. For instance, the following attributes were used to define a poor household: owning a simple house, selling food, off-farm fishing, having little land or none at all; having an average monthly income per adult member of the household of less than VND 1.5 million (~ AUD 95). Simple houses are frequently constructed using native wood, like eucalyptus or bamboo (Nguyen, 2011). Medium-sized households typically have semi-permanent homes, own agricultural land between 0 and less than 1.5 hectares, and earn a living through a combination of labouring on and off the farm and contracting for businesses. Better-off households are more likely to have a high-quality residence, own an increased amount of agricultural land (6.5–7.6 ha), earn money from specialising in rice and fruit farming, and have fewer members who work for wages off the farm. The economic prosperity of rural households in the two research sites, however, may not necessarily be reflected in the ownership of agricultural land. For example, some better-off households may focus on non-agricultural enterprises, such as operating a coffee shop, or grocery store, hence reducing the likelihood of possessing extensive agricultural land for crop cultivation.

5.3 Farm-household production characteristics of the selected participants

In the study locations, farm-household production typically integrates subsistence and commercial objectives, with households storing a portion of crops for their own consumption and selling excess products in local or regional markets. The study's findings indicate that varied farming systems, influenced by biophysical elements like as geography and climate conditions, affect farming system choices (Silva et al., 2020) in An My and Phu Huu, revealing significant discrepancies in agricultural practices and crop specialisation between the two locations. Particularly, An Giang encompasses the majority of the Long Xuyen Quadrangle, which forms the western floodplain of the Mekong Delta (see Figure 5.3). During natural flood events, the province undergoes flooding depths of 1.5 to 4 metres, transforming the region into an extensive water retention area for several months (Tran et al., 2018b). These floodplains are essential for flood management and water retention, containing roughly 16.10 billion cubic metres of water (Duc Tran et al., 2018). The area gains from sediment displacement during inundations, resulting in fertile alluvial soils conducive to high-yield rice farming (Nguyen, 2014). Soc Trang is situated south of the Hau River, the southernmost tributary of the Mekong River, and is adjacent to the East Sea to the south-east (Tamura et al., 2018). The province's 72 kilometre coastline is formed by dynamic processes of accretion and erosion, influenced by the sediment load of the Mekong River, the tide patterns of the East Sea, and longshore currents propelled by monsoonal winds (Schmitt et al., 2013). These differences reflect how geographical, environmental, and possibly socio-economic factors influence farming decisions and crop distribution.

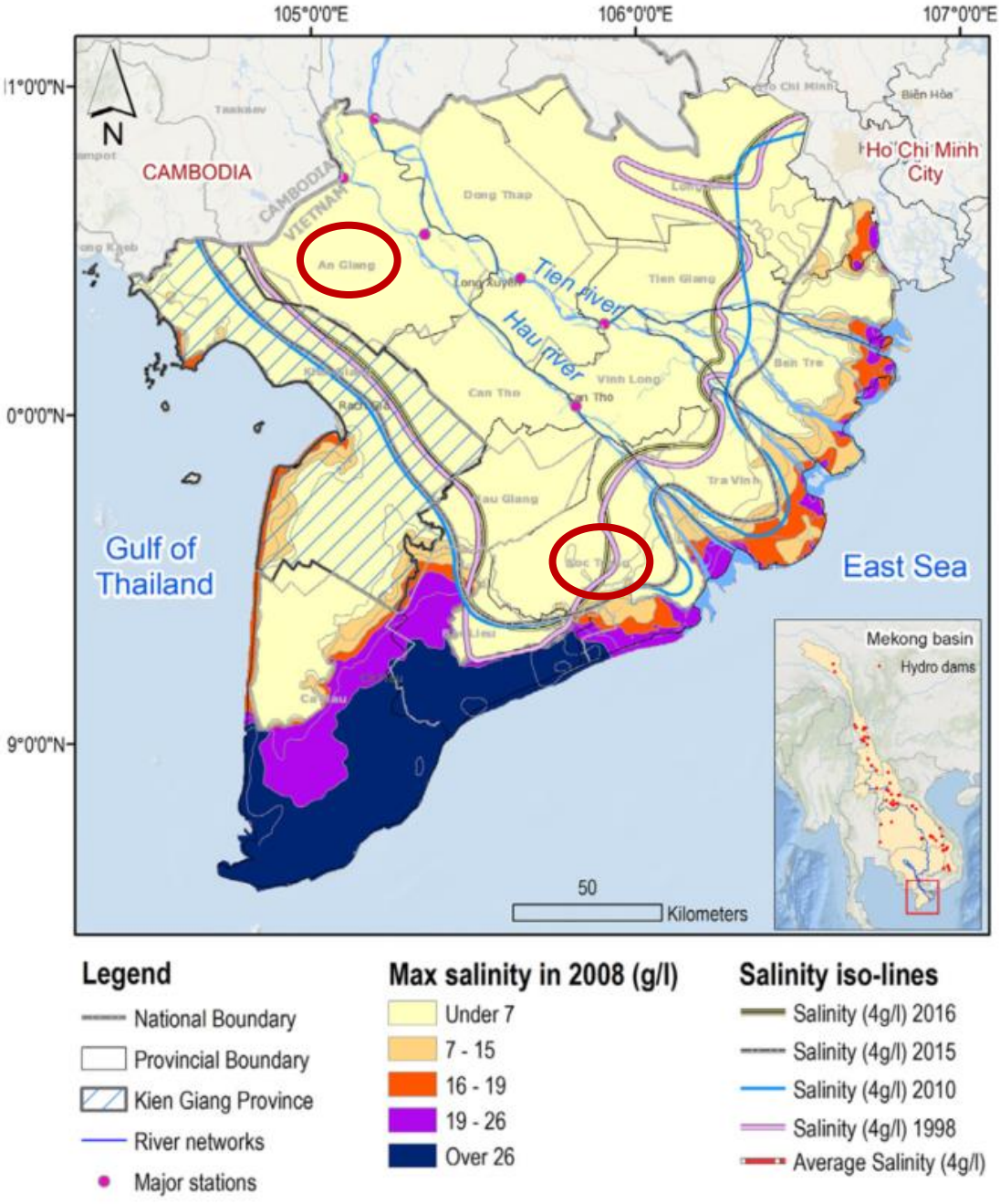


Figure 5.3 The map of selected case studies in the VMD

Source: Adapted by Loc et al. (2021).

As shown in Table 5.1, rice cultivation is significant in both regions, particularly in Phu Huu where it constitutes 59.4% of its farming systems. The upstream water supply from the Hau and Tien rivers, which share a border with Cambodia, is close to Phu Huu, making it a dependable source of water necessary for rice farming. In An My, rice cultivation constitutes 33.3% of agricultural activities, underlining its significance, however not to the same degree as in Phu Huu. Conversely, fruit cultivation is more dominant in An My, accounting for 60.9% of agricultural initiatives. According to the Ke Sach's Head of Agriculture and Rural

Development, the economic viability of agriculture in a number of communes of Ke Sach district, including An My is further challenged by the shift in farming practices. He emphasized that there has been a significant transition from traditional rice farming to more lucrative fruit tree cultivation, stating, “More and more, farmers are switching from rice to fruit trees on rice fields” (Nguyen, official). One female farmer state, “Rice farming here isn’t stable. But compared to before, when the price was only 4,000 VND per kilogram, we still made a profit because rice only takes 3.5 months” (Le, AM). This shift is not merely a response to changing market conditions but also a necessity born out of environmental pressures. The 2016 drought and subsequent salinity events catalysed this transformation, as rice production became less profitable, prompting farmers to seek alternatives. A male farmer in An My states, “This year, fruit orchards are doing slightly better than rice farming, but not by much. Three years ago, though, fruit orchards far outperformed rice farming” (Van, AM).

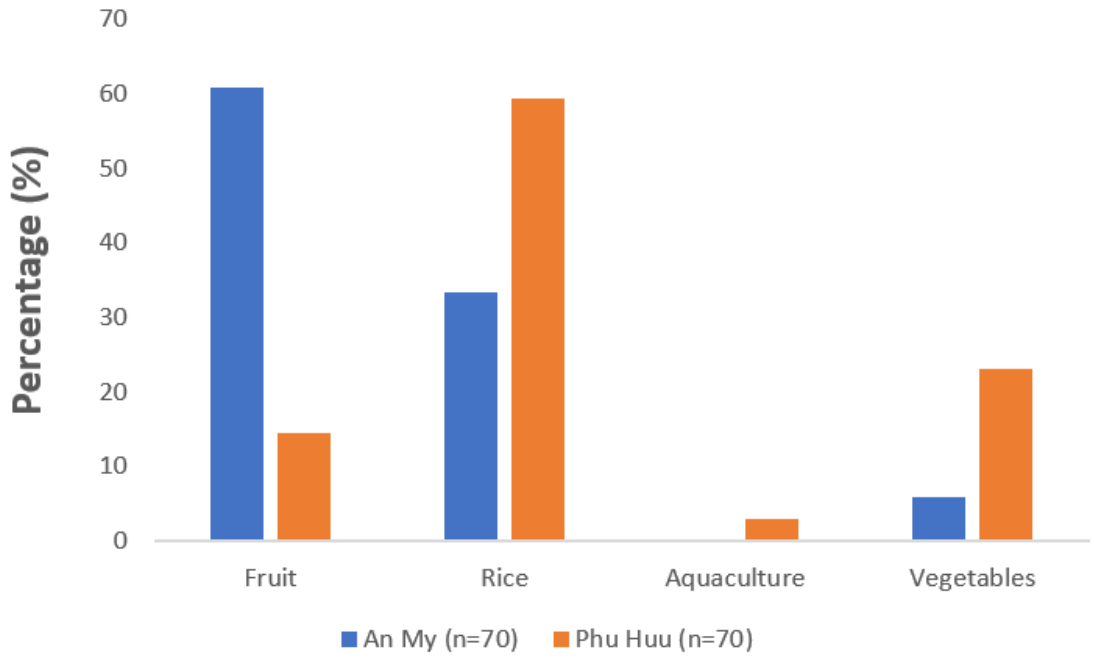


Figure 5.4 Food production characteristics of the selected participants (n=140)

Source: Household survey (2024).

Rice production is the main economic activity of An Giang province, which is located in the northern part of the Vietnamese delta and accounts for 85% of land use (An Giang Statistics Office 2013). As shown in Figure 5.4, rice remains the predominant crop in Phu Huu, with 59.4% of surveyed households engaged in rice cultivation. In contrast, fruit production is considerably less common (14.5%), indicating a continued reliance on rice-based livelihoods. However, farmers have started switching to other crops, such as fruits and vegetables, as a

result of the diminishing revenues from rice in recent years, as the Phu Huu commune chairman noted, “Most residents support dikes, with some transitioning from three rice crops to two rice and one crop of fruits like jackfruit, longan, and mango, yielding up to 10 million VND per field, especially mangoes” (Nguyen, official). This indicates that diversification not only improves financial stability but also enables farmers to adjust to fluctuating environmental and economic circumstances. Nonetheless, Mesfin et al. (2011) argue that access to finance, technical expertise, and stable markets may influence the degree to which farmers can effectively use this technique.

The declining rice output in Phu Huu highlights the difficulties encountered by farmers. Although external causes like climate change may influence the situation, diminished productivity has immediate financial repercussions to those who depend on rice as their primary crop (Le, 2016; Sok et al., 2021). A farmer articulated this reduction, asserting, “Rice yield has also dropped. Last year and the year before, we got about 800-900 kg per *công* (0.1 ha) … This year it’s down to 400 kg per *công*” (Hung, PH). The diminishing productivity may compel additional farmers to pursue new crops; however, the move is not invariably uncomplicated (Rising & Devineni, 2020). Individuals with constrained financial resources or insufficient expertise of fruit cultivation may be unable to transition, resulting in their trapping in a cycle of low yields and economic instability (Keller et al., 2024).

Notwithstanding diversification initiatives, the financial challenges of rice cultivation endure, underscoring the necessity for many farmers to seek alternatives (Ho et al., 2024). The elevated production costs, coupled with restricted profit margins, have rendered rice farming progressively unsustainable (Mottaleb & Mohanty, 2015). A farmer articulated his dissatisfaction, asserting, “Living off rice doesn’t allow for life improvement. We make a rice crop to get by to the next. High expenses, 8,000 VND/kg and 600 kg per công, but each công costs 2.5 million VND, leaving only a little profit” (Bo, PH). This situation underscores an underlying problem within Vietnam's rice sector, wherein escalating input costs, variable market prices, and legislative constraints hinder farmers from attaining economic stability (Dev & Rao, 2010). In the absence of interventions like subsidies, access to financing, or enhanced market processes, smallholder rice farmers are likely to persist in their struggles, with minimal prospects of escaping subsistence farming (Cai et al., 2024).

With a 2.9% share, aquaculture is a small but noticeable part of Phu Huu's farming systems. This suggests some degree of diversification in Phu Huu's farming systems, potentially taking advantage of the water resources available from the rivers. The lack of aquaculture in An My

indicates that it is either unfeasible or not conventionally done in the area. The existence of aquaculture in Phu Huu, albeit at a minimal proportion, underlines a level of variety in their agricultural systems. Vegetable agriculture exhibits a notable disparity between the two villages as well. In Phu Huu, vegetables constitute 23.2% of agricultural activity, but in An My, they represent 5.8%, indicating that other crops, particularly fruit and rice, are prioritized. Generally, agricultural systems in Phu Huu seem to be more diversified.

To sum up, An My and Phu Huu have a different farming structures and practices due to their distinct environmental conditions and geographical locations, and may have been impacted by socioeconomic status. Farming practices in An My predominantly concentrate on fruit cultivation, whereas Phu Huu prioritises rice and vegetable production, with a slight emphasis on aquaculture.

5.4 Community perception and experiences of climate risk and vulnerability

5.4.1 Ecological influences on community perception and experiences

5.4.1.1 Farmers' conceptualization of climate change

Farmers were asked via in-depth interviews about how they view climate change and how it affects their socioeconomic activities in their local languages. According to Harmer and Rahman (2014), the physical environment, agricultural activities, and financial stability of farmers all influence their understanding of and approaches to climate change adaptation. Participants' answers to the open-ended question, "What does climate change mean to you?" varied. Some farmers immediately answered:

> *Yes, there's always a risk, but that's part of it. You have to accept it. You can't avoid the risks in farming; you just learn to live with them and hope for the best each year* (Hua, AM).

> *Climate change makes life harder, not easier. The sun and rain are more unpredictable than before – back when I was 15-16 years old, it wouldn't rain in February. Now, early February brings scattered rain* (Quan, PH).

The study identified that farmers' primary concern regarding climate change is the effects of climate variability on agricultural yield and livelihoods, which is also consistent with the studies of Hilmi et al. (2024), Aragón et al. (2021), and Habib-ur-Rahman et al. (2022). Agriculture is highly vulnerable to changes in the climate, particularly for farmers in developing nations (Watson, 2014). According to Aryal et al. (2021) and Debangshi (2021),

farmers are at serious risk from climate change, which can result in cyclones, heavy rains, flooding, salinity, droughts, and an increase in animal and crop diseases. This aligns with experts' observations regarding the significant impact of climate change on crop production, since increasing sea levels and erratic rainfall patterns have disturbed conventional farming systems. An academic expert at Can Tho University stated: "At the global level, we see climate change affecting rainfall patterns and rising sea levels" (Nhan, expert). With notable events in 2015–2016 and 2019–2020, this shift has worsened drought conditions and increased salinity intrusion. The fact that "nearly 100% of farming households" were affected in 2015-2016 and "around 30% damage" occurred in 2019-2020, underlines the extent of vulnerability faced by rural communities in the region (Nhan, expert). These extreme events have not only caused direct losses in agricultural productivity but also forced farmers to adopt new, often risky, strategies to sustain their livelihoods.

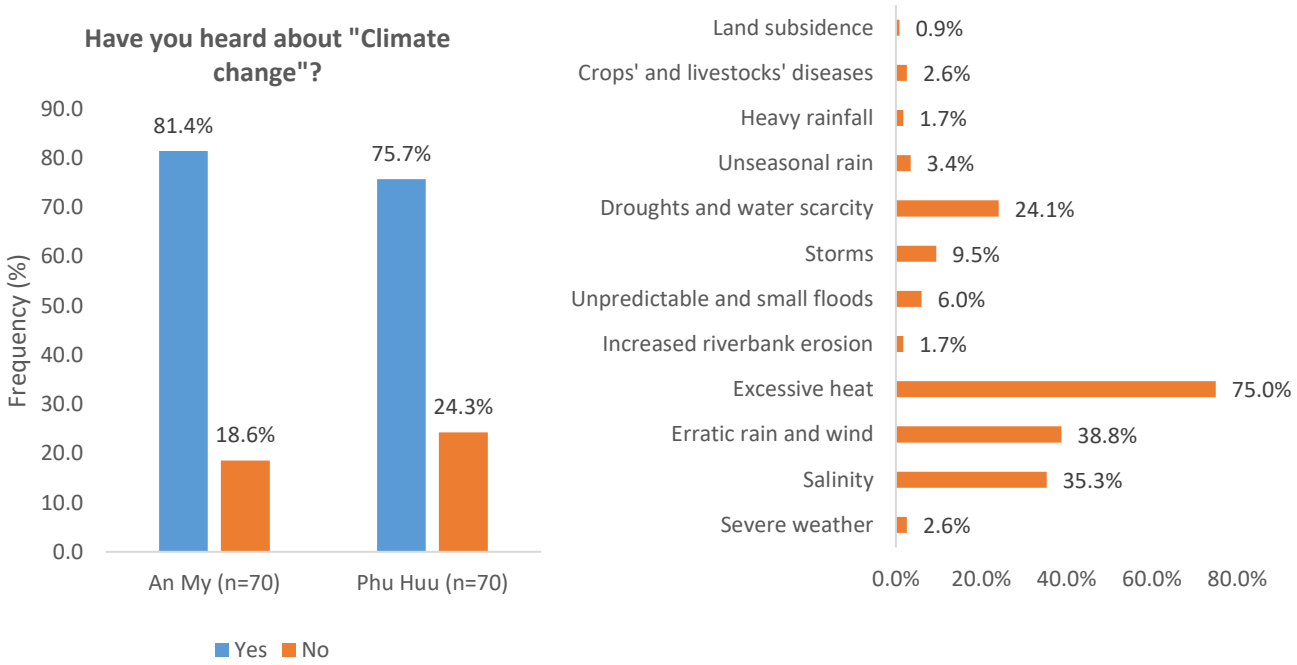


Figure 5.5 Farmers' interpretation of 'climate change' by the two study sites (Multiple Responses; n=140)

Source: Household survey (2024).

Furthermore, the quantitative findings revealed that 81.4% of farmers in An My and 75.7% of farmers in Phu Huu recognise and provide the meaning for the term 'climate change' (see Figure 5.5). This high degree of awareness suggests that farmers in these areas are aware of how the climate is changing and how it affects their communities. These farmers usually highlight the direct effects of climate change on their farming activities and production, with the majority of the impacts being related to their agricultural livelihoods. In addition, perspectives on climate change are profoundly influenced by local environmental conditions

and experiences. As shown in Figure 5.5, seventy-five percent of participants identified extreme heat as the most significant cause, highlighting the widespread effect of increasing temperatures on the selected communities. This corresponds with wider global patterns, where elevated temperatures serve as a significant and concrete indicator of climate change (Masson-Delmotte et al., 2021).

5.4.1.2 Memories and direct observations of environmental changes

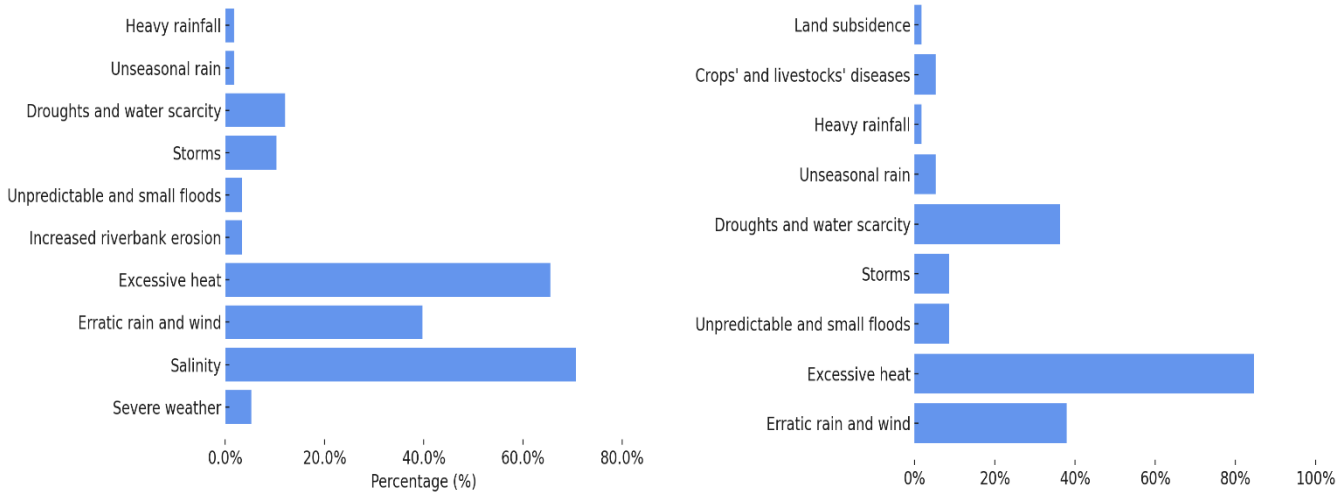
Rising temperatures and climate change will adversely affect crop and livestock productivity, necessitating adaptation within the agricultural sector (Cho et al., 2011). Drought and rising temperatures can cause crop yields to drop by as much as 50%, putting a strain on livestock and agriculture productivity (Lamaoui et al., 2018). Droughts and heat stress also affect the farming systems in these two study locations. Climate change may disrupt the economic and physical underpinnings of farming, as evidenced by the way the rising temperatures have impacted crops and changed conventional agricultural schedules. The participants elaborate further:

> *The heat lasts longer now. It's much hotter than before, and there's less rain… there's been more drought. The climate has shifted, making it much harder to farm* (Phuoc, AM*).*
>
> *In the previous years, we could work until 11AM or 12PM noon, but now by 8AM or 9AM in the morning, it's already unbearable. It's unbearably hot… Everything is on the verge of dying* (Tuan, PH*).*
>
> *If it's too hot, the fish grow slowly and don't eat as well as usual* (Hung, PH*).*
>
> *In past years, the water always reached above my head…This year, it only comes up to here. I don't know. But by March, the water dries up – back then, it didn't dry up as much, but now it's barely enough…It's hard. Too hot to cast nets. I only cast nets at night. Casting nets during the day does not yield any fish* (Chau, PH).

Climate change is expected to significantly intensify water scarcity at both regional and global levels, with some estimates suggesting that over 40% of the global population could experience absolute water scarcity (Schewe et al., 2013). Increasingly frequent and intense extreme heat events, exacerbated by climate change, contribute to water scarcity (Luber & Mcgeehin, 2008). The water scarcity in the selected cases, especially regarding its effect on irrigation, highlights the challenges of climate adaptation. Despite their heavy reliance on tidal water, farmers in Phu Huu commune are finding it more and more challenging to effectively irrigate their farms as

water levels decline. As described, “It takes longer and is less efficient”, with water supply constraints directly affecting crop health (Hung, PH). The participant bemoaned, "The canal is dry now" (Hung, PH) while stressing the value of timely irrigation. This highlighted the impact of unpredictable water availability on day-to-day farming operations and the overall productivity of agriculture.

The differing prioritisation of several aspects between An My and Phu Huu communes underscores the variety of climate change effects. In An My commune, the significant stress of salinity consequences (70.7%) suggests a direct encounter with saltwater intrusion, possibly influencing agricultural productivity and water quality (see Figure 5.6). This differs from Phu Huu, where extreme heat (84.5%) is the primary concern, but drought and water scarcity (36.2%) and erratic weather (37.9%) are also significant issues. This raises the possibility of a different set of difficulties, perhaps involving the supply of water and the consistency of weather patterns.



Farmers’ perception of climate change in An My commune (Multiple Responses; n=70)

Farmers’ perception of climate change in Phu Huu commune (Multiple Responses; n=70)

Figure 5.6 Farmers’ perception of climate change across two study sites (n=140)

Source: Household survey (2024).

5.4.1.3 Paddy-specific effects

Increasing salt intrusion in the Vietnamese Mekong Delta has a major effect on farming practices. Sea level rise compromises freshwater systems in coastal regions, impacting water supply and crop productivity (Fabrice G. Renaud et al., 2015). Projected sea level rise in 2050 resulting from climate change is anticipated to exacerbate salt intrusion in the Mekong Delta, impacting around 30,000 hectares of agricultural land (Vu et al., 2018). Rice farmers in Soc Trang province are modifying their methods in response to the growing threat of saltwater

intrusion in the VMD to agricultural sustainability (Ho & Ubukata, 2017). One farmer in the Ke Sach district's An My commune describes a similar situation, saying, "The saltwater started in January and hasn't gone away yet" (Nam, AM). Farmers are forced to reconsider their irrigation plans due to saltwater intrusion, highlighting an increasing vulnerability to climate-related hazards.

Farmers' memories of “paddy effects” revolved around the destruction of paddies due to salt intrusion. The majority of farmers observed the effects of the hazard on the leaves and fruits of their crops. The narrative commences in 2016, a year deeply marked in the memory of an interviewed farmer in An My commune as a period of hazard. The saltwater encroached prematurely that year, infiltrating the canals and his farmland. Its onset was rapid and merciless. He remembers, "When the saltwater hit, not only did the fruit fall, but the trees died too. Two durian trees, positioned prominently by the roadside, died. A jackfruit tree nearby died as its roots absorbed salt water”. This served as a challenging lesson for him—a stark reminder of the vulnerability of his crops to environmental changes.

Durian, jackfruit, and star apple, formerly mainstays of his farm, were too delicate to endure the attack. The image that emerged in his imaginations was that 'Everything was destroyed...100%.' (Beo, AM), or his sense of powerlessness while confronting the consequences. The longans were resilient, their survival providing a ray of hope amidst the calamity. The farmer recognised the necessity for a shift in his farming approach.

Figure 5.7 Salinity impacts on the star apple tree farm in An My commune

Source: Thai Van Nguyen (2024).

Subsequent to in-depth interviews, a participating farmer commenced modifications to his agricultural plan. He opted to reduce the cultivation of durians and jackfruit, planting a decreased quantity of these sensitive crops. He increased the cultivation area for longans,

allocating 7-8 *công* (about 0.28–0.32 hectares) to these resilient trees. He added a variety of diverse crops, such as coconuts, guavas, and plums, thereby assuring that his livelihood would not rely solely on one or two varieties. Through the diversification of his farm, he established a buffer against potential threats. The "dừa dâu" kind of coconuts was innovative, with their little size rendering them suitable for consumption as a beverage. Simultaneously, guavas and plums diversified his harvest, offering supplementary income streams.

In recent months, one farmer adopted a technological approach to combat saltwater intrusion. A salinity metre, obtained from his nephew, became a crucial instrument in his everyday farming practices. Utilising this instrument, he commenced maintaining records of salinity levels in the river, thereby enhancing his understanding of the fluctuating tides associated with salinity and their effects on his fruit growing systems. "Every morning and afternoon, I measure the salinity", he elucidates. "This morning, it was at 1.1‰". These measures informed his decisions, enabling him to ascertain when to irrigate and when to refrain. Despite being a recent innovation, the device signified a substantial transformation in his farm management.

Today, the farm serves as a reflection of his memories of past hazard-induced challenges and the adaptation he has built over time. The longans persist as a predominant operation, flourishing despite adverse conditions. Coconut palms border his fields, while guavas and plums enhance the periphery with life and colour. While he has not entirely abandoned jackfruit and durian, their quantities are much reduced, a realistic decision shaped by his everyday learning experience (Beo, AM). Saltwater intrusion, while less severe in recent years, continues to pose a persistent concern. He persistently observes salinity levels, his attentiveness reflecting the insights gained from 2016. "When the tide is high, around 7 or 8 AM in the morning, I measure" he states. "In the afternoon, I check again, depending on the water level" (Beo, AM). This practice, albeit simple, has become a fundamental element of his adaptive strategy.

Following to the 2023–2024 dry season, characterised by an exacerbation of saltwater intrusion that adversely affected agricultural productivity, numerous farmers maintained the perspective that this natural occurrence was not predominantly a threat, but rather an aspect to coexist with. A 74-year-old male farmer from An Mỹ commune remarked on this experience, stating, “The water here was salty because of saltwater intrusion but it turns fresh again quickly – so why do we need to block it?” (Beo, AM). This perspective demonstrates an understanding of salinity as a dynamic environmental phenomenon with both beneficial and detrimental effects. Although saline intrusion is frequently perceived as a threat, this rice and fruit farmer acknowledged that attempts to completely prevent it could result in unintended ecological

consequences, including disrupted nutrient cycles, diminished soil fertility, heightened pest and disease prevalence, and stagnant water conditions harmful to crop vitality. His reflection of solid infrastructural interventions: “If we block it now, the water will stagnate. When the water doesn’t go out or come in, it will be more disadvantageous” (Beo, AM) highlights the divergence between state-directed water management strategies and indigenous ecological knowledge.

One of the primary environmental challenges in An My commune is the increasing salinity and prolonged droughts, which have become almost seasonal threats. These environmental changes have serious financial consequences. Farmers in both study locations depend on their crops as their main source of income in addition to food, so when climate change affects these resources, it has a profound impact on their daily life. Farmers stated,

> *“Some years, we lost everything because of the salinity”.*
>
> (Beo, AM)

> *“In 2016, I was hit hard—over 50 durian trees, all of them gone”.*
>
> (Phuong, AM)

> *“In 2015 and 2016, we had a year of saltwater intrusion. We've been trying to flush it out since then, but it's still not clean. Everything was destroyed…100%”.*
>
> (Du, AM)

During the dry season, the substantial effects of saltwater intrusion on farming households in An My commune become more evident. One participant remarked, “Here, during this month, the saltwater is the most challenging. If this month is entirely salty, farmers can’t do anything”. This emphasises the existential risk that saltwater incursion presents, which might make their main farming methods useless. The memory of the 2016 incident that resulted in "100% loss, a total wipe-out" (Quoc, AM) served as an upsetting reminder of the disastrous effects of this intrusion that occurred. Such experiences influence farmers' perceptions on sustainability and adaptation, motivating them to pursue alternative approaches to address climate-induced issues.

Variations in the patterns of rainfall make farming even more difficult. The evolving rainfall patterns considerably hinder agricultural methods in the region. A farmer from An My commune remarked on the changing seasonal patterns, indicating that the dry season often started "after Tet (Vietnamese Lunar New Year), around January". Recent years have witnessed rainfall encroaching upon this period, undermining the unpredictable separation

between wet and dry seasons. Nonetheless, this seasonal pattern is becoming progressively unreliable, as articulated by a farmer in Phu Huu commune, “Since October, there has not been a single rainfall”, which starkly contrasts with historical seasonal precipitation trends. This alteration forced him to modify his irrigation techniques, relying on high tide to supply water for his crops: “We’re awaiting high tide to pump water” *(Hung, PH)*. His assertion demonstrates his dependence on natural water cycles to sustain his crops in an increasingly erratic climate. This remark highlights the increasing unpredictability of climatic circumstances, which presents a significant challenge to agricultural planning and decision-making.

The uncertain climate brought about by the erratic rainfall patterns and rising temperatures makes traditional agricultural practices unfeasible and puts further pressure on farmers' livelihoods. According to Minh et al. (2022), the Vietnamese Mekong Delta's agricultural productivity has been greatly influenced by shifts in rainfall patterns, particularly prolonged periods of drought during the rainy season. In recent years, one farmer has noted a considerable rise in temperature, characterising this year as especially severe: “This year seems so dry, too dry... According to the TV's weather forecast, it is around 38 to 39 degrees. He says, "Every dry season, like last year and the previous years, we'd get rain by March. But this year, we reached April, May, and still no rain" (Thanh, PH*)*, attributing the decreased rainfall during the dry season to the general pattern of rising temperatures. These climatic fluctuations affect the viability of specific crops. He emphasised that “When it rains too much, the okra doesn’t produce pods. But when it’s sunny, it yields well”, (Thien, PH), illustrating the complicated balance required for agricultural success among climatic fluctuations. His story demonstrates a greater knowledge of how weather patterns are changing, especially the rising temperatures and erratic rainfall, which directly affect crop success.

A farmer in Phu Huu commune observed the changes in seasonal patterns, reflecting the risk of severe weather events that upset agricultural cycles and damage the crop. He stated, “Many changes. For example, when it's sunny, it's extremely hot; when it rains that lasted a whole day and night, flooding all the fields” *(Bac, PH)*. This unpredictability has altered the formerly reliable seasonal cycles into a source of anxiety and uncertainty, compromising crop production and livestock health.

As the environment changes, pests increasingly pose a concern, compromising crop quality and necessitating higher expenditures on pest control for farming households. As indicated in the Figure 5.4, the particular issue of illnesses affecting crops and livestock in Phu Huu (5.2%)

adds an additional layer of climate vulnerability. This may reflect disease epidemics that have occurred locally due to shifting weather patterns. The statement, "When it's too hot, pests like planthoppers and others increase, and fruit is more prone to sunburn. Pest outbreaks...they spread too fast, and we can't intervene in time. Sometimes, pests like planthoppers swarm the rice and cause crop failures…When they infest the fields, we don't get any rice grains. Increased heat has lowered productivity... the rice plants look fine, but they don't produce much grain" (Van, AM*).* Another farmer in Phu Huu commune observes, "More pests in the rice fields – this year, there are all sorts", highlighting the ways in which increasing temperatures foster the spread of pests, challenging established farming practices and endangering crop yields. This emphasises how this combined effect has not only raised expenses but also impacted productivity. These environmental issues demonstrate how farmers must constantly adjust in order to protect their crops, an effort that is made more challenging by an increasingly erratic and unpredictable climate.

In both study sites, households feel forced to adapt when temperatures rise, often resulting in greater expenditures. In an in-depth interview, a fruit farmer from An My commune explained that rising temperatures are a new reality that complicates not only his agricultural practices but also his lives. He said, "The heat hasn't really affected the crop, but it makes life harder, more uncomfortable" *(Nam, AM).* When asked about the difference in electricity costs between the dry and rainy seasons, another farmer in Phu Huu responded, "Yes, there's a difference. In the heat, we use more fans. On average, my electricity bill is 700-800 thousand VND per month. It's about 7 million VND per year" *(Son, PH),* highlighting the indirect but significant effects of extreme temperatures on their well-being. This is in line with the quantitative result displayed in Table 5.3, which sheds light on how those selected have responded to climate change through an examination of household electricity and water consumption during the dry and rainy seasons. The study employs a one-sample t-test to analyse the mean expenditures of 140 households, indicating a statistically significant difference between the dry and rainy seasons (DRS). The t-test results indicate a statistically significant difference in the means of the DRS and the households' ability in terms of financial resources among participants (N=140) for the dry season (Mean=2.9719, Std. Deviation=2.70695) and the rainy season (Mean=2.7102, Std. Deviation=2.50197), with a p-value of less than 0.001. This suggests that households' resource allocation varies significantly in response to increasing temperatures, which are more intense during different seasons.

Table 5.3 Comparison of households' expenditure during the dry and rainfall seasons (n=140)

T-test result				
An My commune, Ke Sach district, Soc Trang province (n=70)				
	Mean	Maximum	Minimum	Median
Year of dry season	3.37	18.00	0.00	2.40
Year of rainy season	3.26	18.00	0.00	2.43
Phu Huu commune, An Phu district, An Giang province (n=70)				
Year of dry season	2.58	18.00	0.00	2.10
Year of rainy season	2.16	16.80	0.00	1.80
One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Year of dry season	140	2.97	2.71	.228
Year of rainy season	140	2.71	2.50	.211

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Year of dry season	12.99	139	.000	2.97	2.51	3.42
Year of rainy season	12.81	139	.000	2.71	2.29	3.12

Note: Mean values and standard deviation are shown

Significant levels: * p<0.05, ** p<0.01, *** p<0.001 (2-tail significance), ns. as not significant

This data illustrates the adaptive measures households utilise to manage high temperatures, especially during the dry season. The higher costs during the dry season indicate that, in an effort to lessen the effects of extreme heat, farmers' households are spending more on electric pumping water systems for irrigation and cooling equipment, such as fans and air conditioners. This research supports farmers' main concerns about the effects of climate change, particularly excessive heat.

The findings also highlight the wider effects of climate change on household budgets. With rising temperatures, the financial burden on households is expected to rise, requiring more effective and sustainable adaptation strategies. These results highlight how crucial it is to take seasonal fluctuations into account when developing adaptive strategies and allocating resources in order to more effectively control how climate change may affect farmers' livelihoods in the selected cases.

5.4.2 Social-economic influences on community perception and experiences

5.4.2.1 Livelihood crisis and financial constraints

According to Bernstein et al. (1992), environmental changes and economic crises pose serious threats to rural livelihoods in developing countries. Rural communities, especially those in areas that depend on agriculture, are extremely sensitive to the effects of climate change (Ospina & Heeks, 2011). These communities depend on their crops as their main source of income in addition to food self-provisioning, so when climate change affects these resources, it has a profound impact on their daily lives (Molnar, 2010). A farmer recounts that their entire fruit farm was destroyed by drought in a single season. "We lost everything in some years due to the salinity" *(Du, AM)*. Such crop failures represent more than just economic losses; they also threaten food security, livelihoods, and the overall well-being of farming communities (Tusneem, 2008).

The quantitative results show that farming households in An My and Phu Huu communes have seen a significant change in their economy over the last ten years, highlighting the communities' adaptation and vulnerability. As shown in Figure 5.8, 38.6% in An My and 34.3% in Phu Huu report a decline in their economic circumstances, but a slim majority in An My commune (52.9%) and a smaller portion in Phu Huu commune (38.6%) believe that their economic situation has improved. This disparity indicates that households have experienced uneven economic trajectories during the past decade. Some report enhanced economic conditions, possibly due to livelihood modifications or diversification, while others indicate a deterioration, suggesting ongoing vulnerability to environmental and socio-economic factors. Although enhanced economic conditions may indicate livelihood adaptations to environmental or socio-economic changes, income alone does not serve as a thorough metric of adaptive effectiveness (Blaikie & Coppard, 1998; Pouliotte et al., 2009). Adaptation outcomes should be perceived as multifaceted, incorporating economic indicators alongside vulnerability, stability, and long-term adaptation (Donatti et al., 2020).

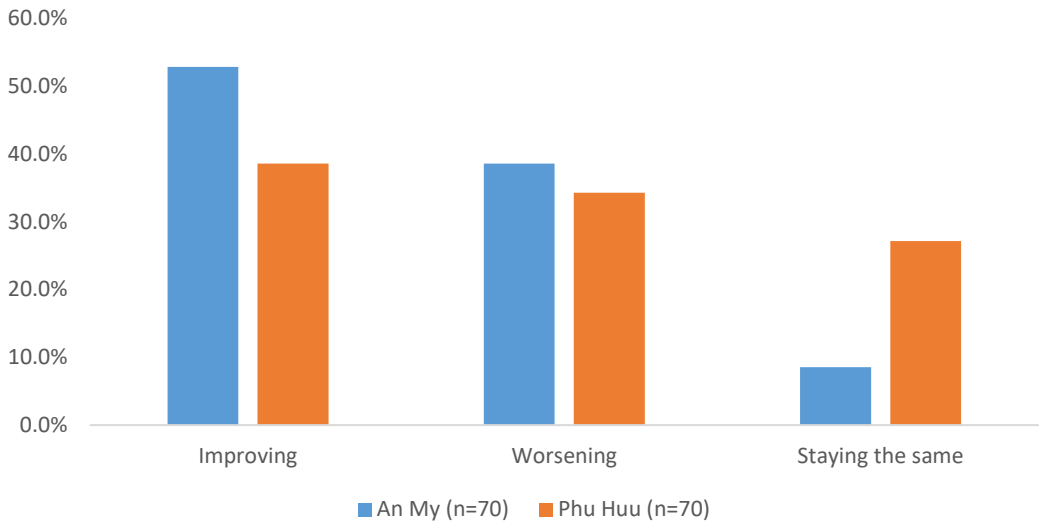


Figure 5.8 Changes of the farm-based household's economic transition in the last 10 years (n=140)

Source: Household survey (2024).

The examination of agricultural households in An My and Phu Huu communes indicates a substantial correlation between changes in household economy and the probability of obtaining new or supplementary livelihoods. The ANOVA results demonstrate a statistically significant disparity among families with improving, worsening, or stable economies regarding the adoption of new livelihoods, evidenced by a significance level of 0.012 ($F = 4.528$). This underscores the significance of economic conditions in shaping livelihood diversification.

The Tukey HSD multiple comparisons test reveals that households with stable economies significantly differ from those with improving economies in terms of gaining new livelihoods ($p = 0.009$). Nevertheless, households facing an economic decline show no statistically significant changes when compared to the other two groups. The data indicate that economic improvement is more crucial in influencing changes in livelihood, whereas economic decline may not significantly affect livelihood adoption.

As shown in Table 5.4, the descriptive data indicate that households experiencing economic improvement report the lowest average probability of obtaining new livelihoods (Mean = 1.50). Conversely, households with stable economies exhibit the greatest mean (Mean = 1.84), signifying an increased tendency to report new or supplementary livelihoods. The results highlight the intricate relationship between economic stability and livelihood diversification, indicating that the households' economic advancement promotes stability, but stagnation could push households to diversify as a coping mechanism. The findings underscore the influence of economic conditions on the livelihood strategies of farming households.

Table 5.4 The changes of the households' economy over the past 10 years (n=140)

Descriptive

New livelihood

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Improving	64	1.5000	.50395	.06299	1.3741	1.6259	1.00	2.00
Worsening	51	1.6078	.49309	.06905	1.4692	1.7465	1.00	2.00
Staying the same	25	1.8400	.37417	.07483	1.6856	1.9944	1.00	2.00
Total	140	1.6000	.49166	.04155	1.5178	1.6822	1.00	2.00

ANOVA

New livelihood

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.083	2	1.042	4.528	.012
Within Groups	31.517	137	.230		
Total	33.600	139			

Multiple Comparisons

Changes of households' economy		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Improving	Worsening	-.10784	.09003	.456	-.3212	.1055
	Staying the same	-.34000*	.11312	.009	-.6080	-.0720
Worsening	Improving	.10784	.09003	.456	-.1055	.3212
	Staying the same	-.23216	.11710	.120	-.5096	.0453
Staying the same	Improving	.34000*	.11312	.009	.0720	.6080
	Worsening	.23216	.11710	.120	-.0453	.5096

*. The mean difference is significant at the 0.05 level.

The effects of drought and salinity in An My commune in 2015–2016 disrupted rural economies, particularly in agricultural households, and drove farmers into debt and economic hardship cycles. A rice farmer disappointedly remarked:

> *We had to rely on loans. We borrowed from the bank. We borrowed around 20-30 million VND at the time to replant after losing our crops. Sometimes, we can't even pay the principal, just the interest. Some people haven't been able to pay the interest at all. Without loans, it would have been impossible to recover from the losses.*
>
> (Nam, AM)

A changing climate and volatile markets present farmers with a number of economic challenges (Olson, 2013). Rosenberg (1992) contends that connections between agriculture and the

broader economy must be considered when examining climate adaptation strategies, including modifications to crops, rotations, and production methods (Malcolm et al., 2012). This aligns with the interviewed farmer's experience of the exacerbated financial challenges driven on by the shifting environment, and unstable markets. This economic adversity profoundly affects the farming community, as the farmer observes:

> *Last year, rice was selling at 10,000 VND per kilogram — if we had a good yield, we made about 4 million VND per cong (1 cong ~0.1 ha). Since we started farming, that's the only season that's been really profitable. The other seasons were unstable — market prices were unpredictable. Right now, the price is good, but later it could drop to 2,000 or 3,000 VND, which is even lower than rice…Currently, we still owe the bank 100 million VND...we've been paying the interest.*
>
> (Phuoc, AM)

> *The price at the time of planting might be 8,000 VND (~AUD 0.47) per kg, but by harvest, it could drop to 7,000 VND (~AUD 0.41) per kg, and you lose.*
>
> (Beo, AM)

> *Taro costs 20 million VND per công to grow, and when I sell it, I only make 18-20 million – I'm losing money on living expenses and interest.*
>
> (Hung, PH)

A vegetable farmer in Phu Huu commune explained, "We sell at whatever price they set – if the traders offer 10,000 VND (~ AUD 0.59), we sell at 10,000 VND; if 5,000 VND (~ AUD 0.29), we sell at 5,000 VND", highlighting their vulnerability to dealers and their inability to obtain steady and equitable prices. The financial pressure has been exacerbated by rising prices for essential goods. One participant observed that "Fertiliser costs have skyrocketed", highlighting the dual burden that the farming community faces from high production costs and unpredictable market returns.

The farmers in both case studies articulate their challenges with variable crop prices and escalating input costs (e.g., fertilisers and pesticides), which directly affect their economic stability. A rice farmer in Phu Huu commune shared, "Living off rice doesn't allow for improvement. We make a crop to get by to the next. High expenses, 8,000 VND per kg and 600 kg per *công (~0.1 ha)*, but each *công* costs 2.5 million VND, leaving only a little

profit…Fertilizer prices keep rising, and we're not earning enough", a sentiment shared by many rural farming communities impacted by inflation and volatile markets.

Rice cultivation continues to be fundamental to rural economies, although it encounters several obstacles. A farmer in An My commune clarified the financial implications: "If there's no salty water, it's still normal. But we have to pump water regularly". This underscores the financial strain imposed on farmers as they struggle with rising input expenses for water and fertilisers. The increased pressure is illustrated by the assertion, "For example, normally one *công* requires about 50 kg of fertilizer, but this month, it might need 60 kg or 70 kg".

Growing agricultural input costs also placed non-poor households in a precarious financial situation. As seen in Figure 5.9, loans for agricultural production, including costs for seeds, fertiliser, pesticides, and other farming necessities (such as clearing land, pumping, and harvesting), accounted for a sizable majority (76.06%) of loans made to medium- and better-off households. This suggests a high level of economic reliance on agriculture, with regular investments made in agricultural output to offset rising input prices, which are exacerbated in light of climate change.

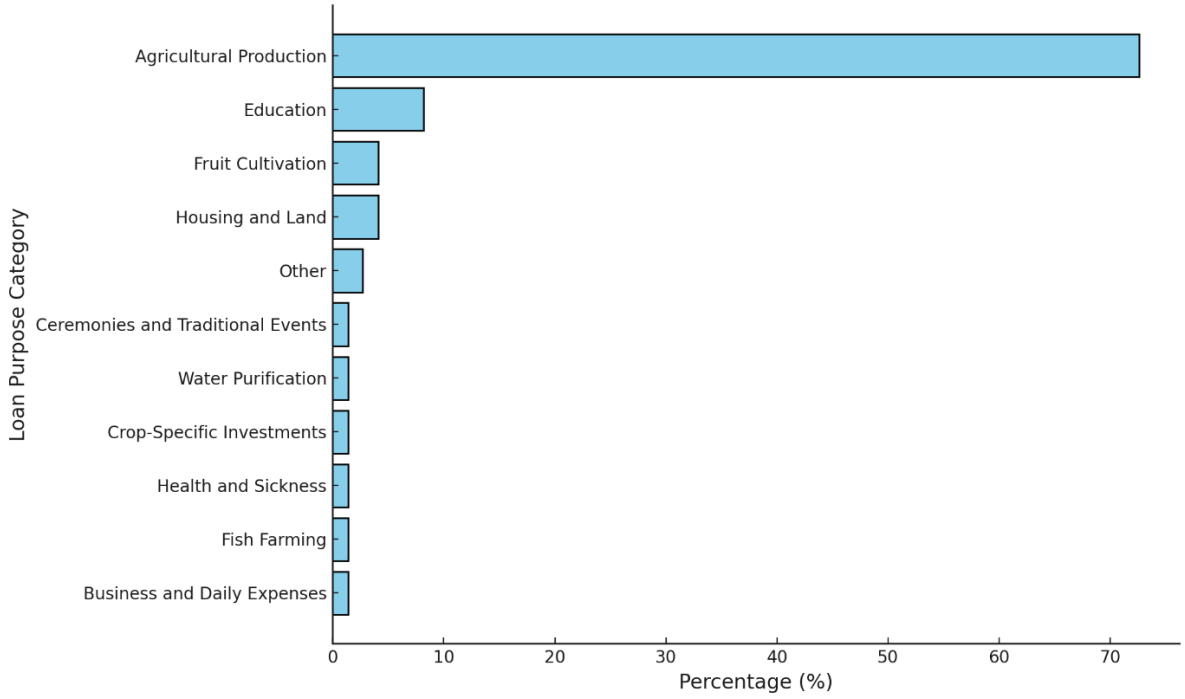


Figure 5.9 Loan purposes by medium and high-income households (n=140)

Source: Household survey (2024).

As shown in Table 5.5, a notable observation is the prevalence of substantial loans beyond 10 million VND annually in both An My and Phu Huu. This category comprises 87.0% of

households in An My and an even greater 95.7% in Phu Huu. These numbers indicate a considerable dependence on borrowing, presumably motivated by enormous financial requirements associated with agricultural productivity and investments in farming inputs. The origins of borrowing further elucidate the economic structure of these communes.

Table 5.5 The selected households' loans in the last 12 months (2023-2024) (n=140)

Total households' number of loans per year	**An My**	**Phu Huu**
Under 2 million VND/year	4.3%	0.0%
2 – 5 million VND/year (AUD 127)	0.0%	0.0%
5 – 10 million VND/year (AUD 318)	8.7%	4.3%
Over 10 million VND/year (AUD 637)	87.0%	95.7%
Total	100.0%	100.0%

Source: Household survey (2024).

Loans associated with agricultural input investments are the most common, with 45.6% of households in An My and 65.1% in Phu Huu depending on them (see Table 5.6). This reliance underscores the significance of agriculture as a primary source of income for households in these communities. Furthermore, formal banking systems have a more significant presence in An My (27.9%) than in Phu Huu (19.0%). The discrepancy may indicate differing access to formal financial institutions or variations in the economic conditions between the two communes. Informal credit sources, including loans from family, friends, and local systems such as "Hui chet", illustrate an additional aspect of borrowing behaviour. Although these sources are comparatively less important, their impact is more evident in An My, where households seem to employ marginally more varied borrowing methods. For instance, 10.3% of households in An My depend on loans from family, whilst 3.6% in Phu Huu do the same. In An My, informal credit circles ("Hui chet") and credit loans are utilised exclusively. These informal channels may function as safety nets for households lacking access to official financial institutions; yet, they also underscore the potential hazards linked to high-interest loans or unregulated credit arrangements.

Table 5.6 The selected households' sources of loans in the last 12 months (2023-2024) (n=140)

Sources of loans	An My		Phu Huu	
	N=68	Percent	N=63	Percent
Loans from relatives	7	10.3%	4	6.3%
Loans from friends	4	5.9%	2	3.2%
Loans from the bank	19	27.9%	12	19.0%
Debt from high-interest loans	2	2.9%	3	4.8%
Credit loans	3	4.4%	-	-
Loans from "Hui chet" (informal credits)	2	2.9%	-	-
Loans from purchasing agricultural input packages*	31	45.6%	41	65.1%
Other	-	-	1	1.6%
Total	68	100.0%	63	100%

*Note: * Farmers purchase input products such as fertilisers, seeds, and insecticides for production. They will then pay this sum in instalments once the crop harvest season is completed.*

Source: Household survey (2024).

Upon reflection on these data, both communes exhibit significant dependence on borrowing; however, their financial strategy and access to credit differ in substantial ways. Households in Phu Huu exhibit a greater reliance on agricultural investment loans, signifying a concentrated dependency on farming as their principal source of income. An My, however, demonstrates a more varied borrowing profile, indicating a wider spectrum of financial behaviours and maybe enhanced access to both legal and informal financial institutions. In general, the considerable dependence on substantial loans, particularly for agricultural supplies, highlights the necessity for robust assistance systems designed for farming households. This is consistent with Kakde et al. (2024), and Brown and Graf (2012) who argue that households should be able to lessen their reliance on borrowing and more effectively manage economic uncertainty by fostering financial literacy and providing options for income diversification.

This financial precarity necessitates a reliance on loans, particularly for basic inputs and labour. The participant admits, "Yes, we take bank loans... Currently, we still owe the bank 100 million VND (~AUD 5,892)... we've been paying the interest. Each year, maybe several million to 100 million—even 200-300 million VND if we have big plans" *(Hung, PH).* This dependence on yearly loans underscores a cyclical debt pattern, intensifying the financial burden on farming

families already facing unpredictable yields and fluctuating input costs. Economic constraints highlight the community's vulnerability, since farmers consistently face challenges from fluctuating markets, variable crop prices, and the debts incurred from bank loans.

5.4.2.2 Psychological effects

The historical and current challenges confronting farmers as a result of climate change have significant emotional and psychological effects. Farmers experience an increasing sense of fear and powerlessness as they face persistent crop failures and environmental problems. These emotions not only signify the challenges of agriculture in erratic climates but also represent a more extensive quest for stability and significance in agrarian lives.

A farmer in An My commune recounted his distressing experiences regarding the effects of salinity on his fruit field. The farmer states, “Recently, I’ve been anxious for the past 10 days or so. At midday, the leaves look withered, but I don’t dare water”. Farmers have become more cautious in the face of climate uncertainty, as evidenced by their reluctance to irrigate plants even when it is clearly necessary. This seemingly insignificant choice—whether or not to water—has a big impact on the survival of crops and, consequently, the ability of entire households to survive.

Fruit crop losses can be especially catastrophic because they represent the loss of not only income but also a dearly held hope. A farmer in An My commune expresses sorrow, “I’ve had a whole durian garden – this year is the 8th year, and we were just pampering it – it bore fruit for one year, and we kept irrigating it – irrigating it non-stop, not holding back water. But if we knew now that the water was salty, we would have just let it go. But, we do not know that.... They died – they died standing". The expression " They died – they died standing" conveys the depth of the loss and the emotional destruction it causes. This season's failure is not only a setback; it is a blow to the farmer's morale, as years of hard work suddenly fade.

The persistent cycle of loss and hope is a significant theme in the experiences of the interviewed agricultural households. In spite of repeated disappointment, they explain the need to move on, frequently by concentrating on the upcoming harvest: “To be honest, it was a bit sad, not being able to achieve what we wanted. We just hung on, managing one crop after another – a few months for each crop. Then, we’d start the next one” *(Beo, AM).* Although remarkable, this adaptation highlights the mental toughness needed to sustain recurrent setbacks without hope of improvement. Despite adversity, farmers exhibit a solid adaptation that supports them, stating, “It was tough, but we managed. We lived in the countryside”.

The perception of inevitability about these environmental challenges exacerbates farmers' anxiety about the future. The idea that "the situation with climate change is only going to get worse, not better" reflects a wider perception that people are resigned rather than hopeful. It seems as though farmers are preparing themselves for an endless cycle of loss and disappointment, and this expectation of worse conditions reflects a deep-seated anxiety of what lies ahead.

Despite these challenges, some farmers have an optimistic attitude towards their challenging labour, viewing it as a necessary aspect of life. A farmer in Phu Huu commune states, “I just keep working – profit or loss”, expressing a robust mentality towards the unpredictable financial results of their labour. Adaptation is particularly more important for farmers who work with riskier crops, such as taro. A farmer expresses concern, stating, “Farming taro is too risky – losses are common, and prices are unstable”. This perspective effectively conveys the challenges that they encounter as well as a composed acceptance of the unpredictability of farming in an ever more unpredictable climate.

5.5 Conclusion

This chapter illustrates that rural farming households in An Giang and Soc Trang provinces are in the forefront of climate-induced vulnerabilities, influenced by the complex relationship of ecological changes socio-economic limitations, and institutional deficiencies. Farmers' perceptions and experiences of climate change, including irregular rainfall, extreme heat, and saline intrusion, demonstrate an acute understanding of environmental disruptions and an acknowledgement of their constrained ability to adapt effectively.

The research emphasises that vulnerability is not solely a result of biophysical exposure but is fundamentally embedded in structural disparities, such as inadequate educational attainment, restricted access to diverse income sources, and insufficient financial institution assistance. Farmers in An My are increasingly constrained by salinity-induced crop losses and water scarcity, necessitating a transition to more resilient yet still undetermined fruit farming practices. In Phu Huu, escalating heat and water scarcity have prompted comparable challenges, prompting farmers to adapt their irrigation practices, crop schedules, and livelihood strategies, frequently at significant financial and psychological expense.

The findings emphasise that although numerous households exhibit significant adaptation through crop diversification, technological adoption (such as salinity metres), and pragmatic optimism, this adaptation is severely tested by persistent environmental shocks, market

volatility, and increased input costs. Adaptation at the household level is hindered by insufficient institutional interventions, market instability, and a deficiency in integrated support networks. Even comparatively wealthy families become stuck in cycles of debt, resource dependency, and emotional strain, underscoring the necessity for a more inclusive, proactive, and locally grounded strategy for climate adaptation.

Although the growing climate risks in the Mekong Delta have been previously documented, this chapter adds to the body of knowledge by showing how these climate hazards are unevenly experienced and negotiated within agricultural households, especially through gendered divisions of labour, resource access, and decision-making authority. Mitigating climate hazards vulnerability in the Mekong Delta necessitates a shift in the design of agricultural planning, and social assistance, emphasising not only environmental realities but also the perspectives, requirements, and capabilities of the most vulnerable farming communities.

Chapter Six: Gender and Socio-Political Power Relations: Climate Adaptation

6.1 Introduction

Climate-induced risks present substantial challenges to agricultural communities, including in the VMD, where environmental stresses such extreme heat, saltwater intrusion, drought, and riverbank erosion are escalating. This chapter aims to address the question: *How do gender and socio-political power relations shape the adaptation of rural individuals, households, and communities to climate hazards?* By examining the experiences of farming households in An My and Phu Huu communes, the research explores how gendered vulnerabilities, resource access, and institutional dynamics interrelatedly influence climate adaptation strategies. The subsequent sections delineate the gendered division of labour within farming households in An My and Phu Huu. It examines the diverse yet complementary roles of men and women in agricultural and domestic activities. This section emphasizes that vulnerability to climatic risks is also influenced by gender, building on the gendered roles discovered in agricultural livelihoods. Utilizing empirical evidence from An My and Phu Huu, it demonstrates how existing socio-political power settings and resource limitations affect women's adaptive potential in comparison to men.

6.2 Gender roles and responsibilities in agricultural livelihoods

Figure 6.1 illustrates that, although men and women in both research locations frequently collaborate within farming households, their roles differ distinctly, with each contributing uniquely and complementarily to the management of agricultural activities. There are gender-specific disparities in decision-making, labour, and resource access, and men and women play different but complementary roles in managing agricultural households (Ahearn & Tempelman, 2010). Women across two study sites involved in the survey undertake a combination of household management, agricultural, and non-agricultural responsibilities. Their principal obligation frequently pertains to domestic tasks (57.14%), encompassing housework, childcare for grandchildren, food preparation, cleaning, and overall household management. Alongside these domestic duties, women often engage in agricultural work. Women indicated engagement in particular agricultural operations, such as fertiliser application, transplanting, weeding, and rice field maintenance (5.71%), alongside involvement in fruit cultivation (12.86%). These contributions frequently pertain to labor-intensive and routine agricultural tasks rather than overall farm management. Conversely, men

more often articulated their function in relation to holistic crop production and agricultural management. For instance, 50.71% of male participants designated rice production as their principal agricultural task, whereas 29.29% acknowledged responsibility for fruit growing. Male participants also more frequently cited activities such as pesticide application, soil preparation, irrigation management, and harvest coordinating. In agricultural settings, men frequently perform duties that call for time and physical strength, or they work in many fields.

The division of labour in the two agricultural communities is clearly gendered, with males generally undertaking more physically demanding duties. A participant remarked, “The men spray pesticides, apply fertilizer—that’s men’s work. The women help with lighter tasks, cooking at home, and if they go to the fields, they do the lighter tasks” (Nam, AM). Such remarks illustrate established gender stereotypes that attribute productive authority to men, reducing women's efforts to a supplementary role. Nevertheless, women's own narratives illustrate a more intricate reality. Numerous female participants stated their job duties as fundamental rather than merely supplemental, noting their roles in “helping with transplanting rice, doing the cooking at home, helps with the farm, and pulling weeds or carrying water” (Van, AM). While framed as “help”, these tasks are labour-intensive and critical to crop productivity.

Furthermore, women represent a substantial percentage of hired agricultural labourers, especially in activities such as weeding and harvesting. In Phu Huu commune, another farmer observes that his wife “helps with some vegetables here and there, but mostly I hire people to do it” (Hung, PH). This suggests that her work is secondary to his own, which mostly consists of planting and watering crops. His statement, "She does other work—like handling weeds and debris”, (Hung, PH) which devalues women to the more mundane and unseen facets of farm labour, further reflects the idea that women's duties are supplementary to men’s.

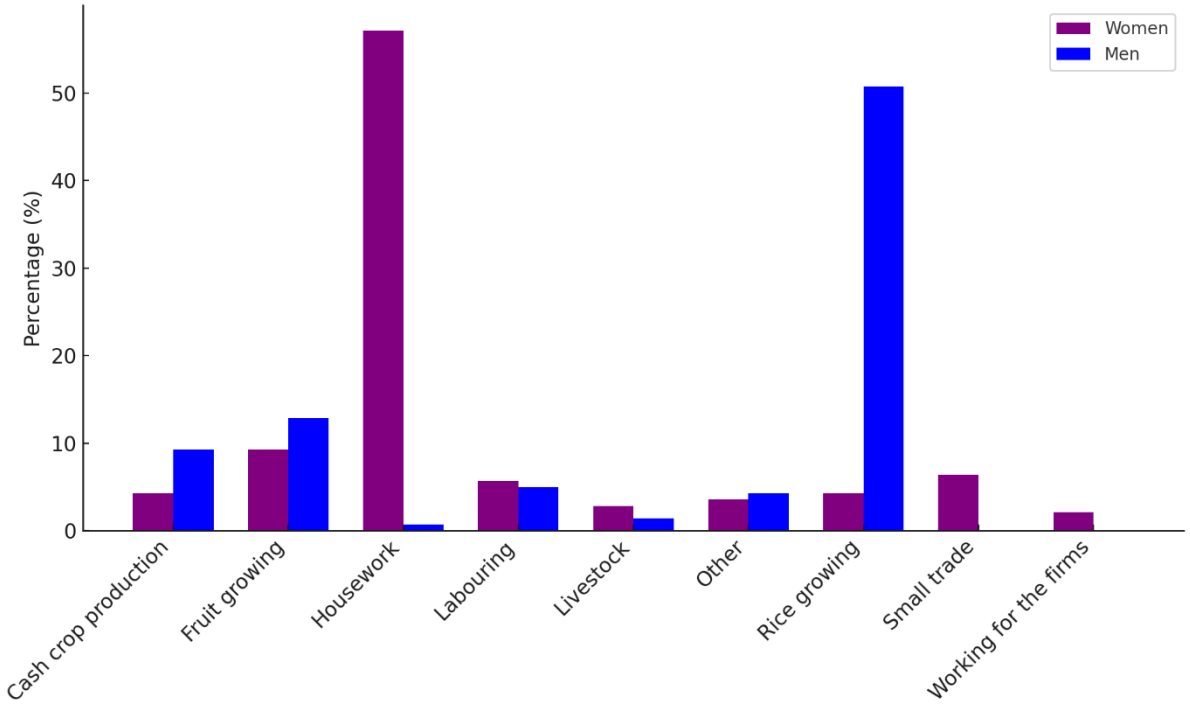


Figure 6.1 Households' gender roles in the two research sites (n=140)

Source: Household survey (2024).

In conclusion, both men and women in the research locations enhance the household's welfare through a combination of agricultural, domestic, informal, and small-scale business activities. Men typically handle physically hard occupations and more general economic interests, while women frequently balance household responsibilities with income-generating activities. The distinct gendered division of labour shown in the villages selected underscores persistent preconceptions that define the responsibilities of men and women in domestic and agricultural spheres. This labour hierarchy reflects conventional gender stereotypes and prompts enquiries about equity and the acknowledgement of women's essential contributions to agricultural productivity and household adaptation (Beuchelt, 2016; Garutsa & Nekhwevha, 2016; Raney et al., 2011).

6.3 Gendered vulnerability and adaptation

6.3.1 Types of climate hazards and risks

During data collection, participants were asked about changes they had seen in the last ten years in relation to specific climate factors and extreme events. Household heads in both locations are exposed to a broad variety of climate-induced risks, which can be categorised into several major groups according to frequency and perceived impact (see Figure 6.2), which displays responses from the 140 farm-household heads interviewed. Nearly 89% of participants surveyed said that excessive heat was the most important hazard. This result may well reflect

the tendency of rising temperatures throughout South-East Asia, especially the Vietnamese Mekong Delta, itself likely influenced by climate change (Nguyen et al., 2014). As argued by Prasad et al. (2015), long-term heat exposure exacerbates water scarcity problems by decreasing soil moisture and increasing evapotranspiration both of which affect crop development. The severity of water-related issues in the case study areas is further shown by the fact that 27.9% of participants are impacted by drought and water scarcity. Nearly half (49.3%) of participants reported saltwater intrusion, which is a serious problem, particularly in coastal areas like Soc Trang province where freshwater supplies are threatened by increasing sea levels. Our field observations indicate that this issue is particularly concerning for rice farmers reliant on freshwater supplies to maintain crop yields.

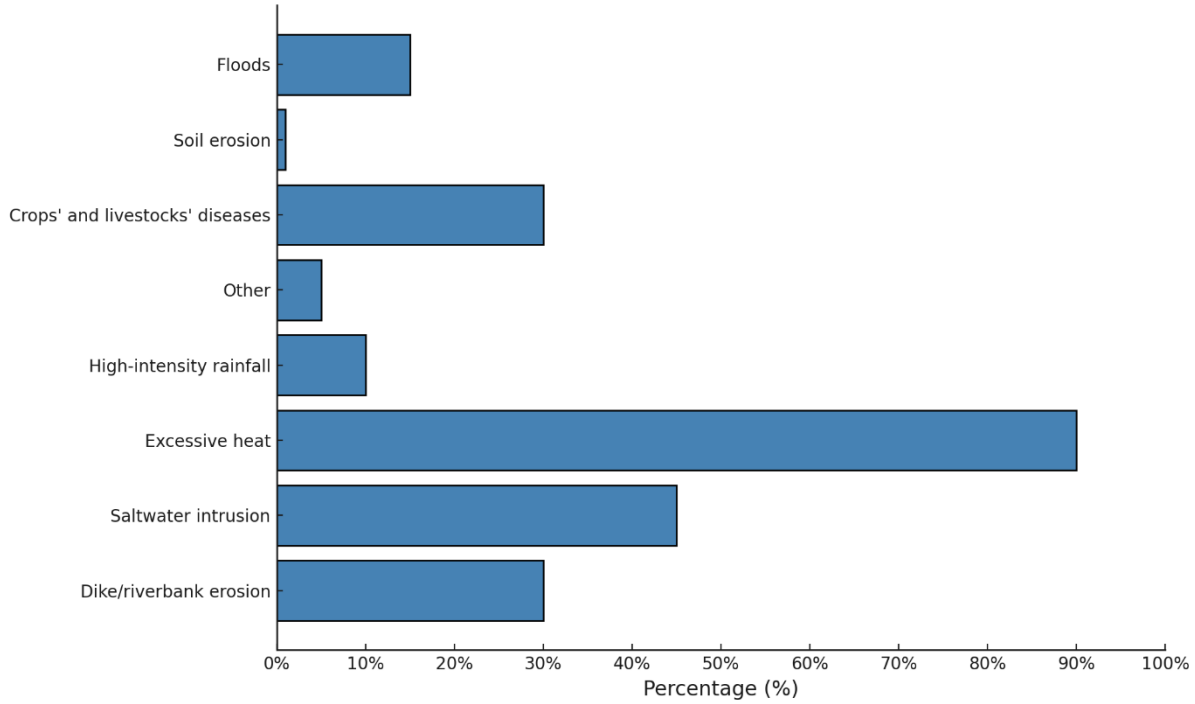


Figure 6.2 Participants' awareness of climate-induced local impacts over the last 10 years (n=140)

Source: Household survey (2024).

In addition, 32.1% of participants expressed serious concern about diseases that impact crops and livestock, which they attribute to shifting environmental conditions and increased humidity brought on by erratic rainfall. The risks inherent in riverine and delta systems are seen in both unusual floods (7.9%) and frequent floods (13.6%). The irregularity of floods increases the risk of crop damage and infrastructure destruction, even while it might benefit rice paddies by supplementing soil nutrients. Furthermore, high-intensity rainfall events (11.4%) can cause waterlogging and affect planting cycles, further compromising crop health. Storms and

typhoons at the onset of the rainy season (29.3%) constitute an ongoing hazard, particularly in floodplain regions such as Phu Huu commune in An Giang province. In Soc Trang province's An My commune, dike or riverbank erosion (30.0%) presents particular risks to infrastructure, particularly to public roadways and fields.

Figure 6.2 illustrates that participants' perception of saltwater intrusion is particularly high, as indicated by the 92.8% of participants in An My commune who answered "Always" and the 5.8% who answered "Often". Saltwater intrusion is a major concern for climate change mitigation and adaptation because of its high proportion and low variance, which highlights how often and consistent the experience is. Similar high frequency events include abnormal floods and dike/riverbank erosion, which were marked as "Always" by 41.7% and 40.5% of participants, respectively. An official in Phu Huu commune remarked, "From 2000 to 2011, abnormal floods were not severe but unusual. Abnormal floods were unexpected, often occurring in July and August in the lunar calendar. Abnormal floods could rise 1.4-2 metres in 4-5 days, unlike regular floods that increase by 5 centimetres to 1 decimetre. Abnormal floods overwhelmed locals, who were unable to respond in time" (Hieu, officials, PH). These findings underscore the urgent necessity for adaptive strategies and robust infrastructure to alleviate the ongoing effects of saltwater intrusion, abnormal flooding, and riverbank erosion on community livelihoods.

The perspectives of stakeholders across the study sites highlight growing concerns over environmental changes, particularly erosion and salinity intrusion. A representative from a local NGO noted that "Erosion and salinity intrusion have both increased, with no signs of decreasing. In the past, we used to think that saltwater intrusion only happened during the dry season, but now it's linked with land erosion during the rainy season as well. Land erosion affects several things: first, transportation routes for goods. When the roads erode, transportation of fruit or other products gets disrupted, which can cause prices to drop" *(Tam, NGO)*. This study highlights the growing unpredictability of environmental stresses, as saltwater intrusion is no longer limited to anticipated seasonal patterns. This is consistent with the study findings of Hine and Ellis (2001), and Schlögl et al. (2019), who state that the disruption of transportation networks caused by land erosion exacerbates rural lives by affecting market access and price stability.

The escalation of river flow is a growing issue, as articulated by a senior farmer who said, "The water quality hasn't changed, but the flow has... It's stronger—it's eroding the banks. The river is so strong that if you try to row a boat across, you won't be able to. That didn't happen in the

past" (Bo, AM). This finding indicates that hydrological changes are transforming the physical landscape, challenging conventional river-based transportation and livelihoods. The farmer's assertion reveals that although water quality is consistent, the heightened flow velocity is exacerbating bank erosion, potentially threatening ground stability, residences, and agricultural areas adjacent to the riverbanks. As per Nilsson (1976) and Park (2024), these alterations may be associated with upstream activities such as dam construction, and sand extraction, which have interrupted natural sediment transport. If riverbank erosion escalates, local farmers may encounter increased displacement risks, necessitating the adoption of costly adaptation measures such as reinforcing embankments or relocating their residences and agricultural operations (Das et al., 2014; Tha et al., 2024).

In Ke Sach district, riverbank erosion continues to be a major problem caused in part by natural events that not only compromise land stability but also directly affect agricultural livelihoods. As a local agricultural authority observed, "Riverbank erosion due to natural hazards has been very severe. When water floods in, it destroys crops and farmland" (Quang, official). This highlights how erosion caused by flooding exacerbates land degradation, directly affecting food production and economic stability. As flooding intensifies and becomes more prevalent, farmers in impacted regions encounter heightened uncertainty concerning the long-term viability of their land (Soe, 2020).

Infrastructure initiatives, including dike construction, have been extensively executed to mitigate flooding; yet they can also result in unforeseen environmental repercussions. A rice farmer in Phu Huu commune cautioned that "Building closed dike systems everywhere would lead to more erosion. Without levees, water spreads across a wide field, but when confined, it flows faster and erodes the land" (Thien, PH). This underscores a key hydrological trade-off: although dikes safeguard some regions from inundation, they disrupt natural water distribution, amplifying the pressure of limited water flow and exacerbating erosion (Nilsson & Berggren, 2000). This engenders concerns over long-term sustainability, since extensive dike construction may establish a cycle wherein secured agriculture is defended to the detriment of unprotected regions, leading to exacerbated erosion and sediment displacement (Morton & Olson, 2014). As per Hartmann et al. (2019), a balanced approach to flood management, incorporating both structural and nature-based solutions, may be essential to mitigate these adverse effects.

The dike compartment's building in 2000 dramatically transformed the hydrological and sediment dynamics of Phu Huu, averting potential severe erosion. As a village leader

explained, “In 2000, a dam was built there. Otherwise, there would’ve been about 45 metres of erosion. Sandbanks around Phu Huu were used for peanut farming. The flow back then was intense. It broke embankments, deposited sediment, and accumulated sand. The sand spread over about 40-50 hectares, piling up to over 2 metres in places" (Hieu, official). This account emphasises the safeguarding function and unexpected repercussions of extensive infrastructure initiatives. As per Ngoc (2017), and Anthony et al. (2015), the dam effectively mitigated erosion in specific regions; but, the alteration of sediment distribution resulted in significant landscape changes, impacting local agriculture and land use. The significant build-up of sand on agricultural land signifies a disturbance in natural sediment deposition processes, potentially impacting soil fertility and agricultural sustainability in the long term (Chapman et al., 2016).

In addition to localised sediment alterations, extensive climate-induced land modifications are becoming increasingly apparent in the Mekong Delta. A senior specialist from Can Tho City remarked, “We’ve observed the long-term impacts of climate change, such as land subsidence and erosion, which have severely damaged the infrastructure in areas like the Mekong Delta. As floodwaters are redirected and stored in reservoirs, they weaken the soil, leading to further subsidence” (Nhan, expert). This remark highlights the unforeseen implications of flood management measures, wherein attempts to regulate water levels may paradoxically result in increased land instability (di Baldassarre et al., 2018). This underscores the pressing necessity for cohesive adaptation strategies that reconcile flood mitigation with sustainable land use planning (Burby & French, 1981).

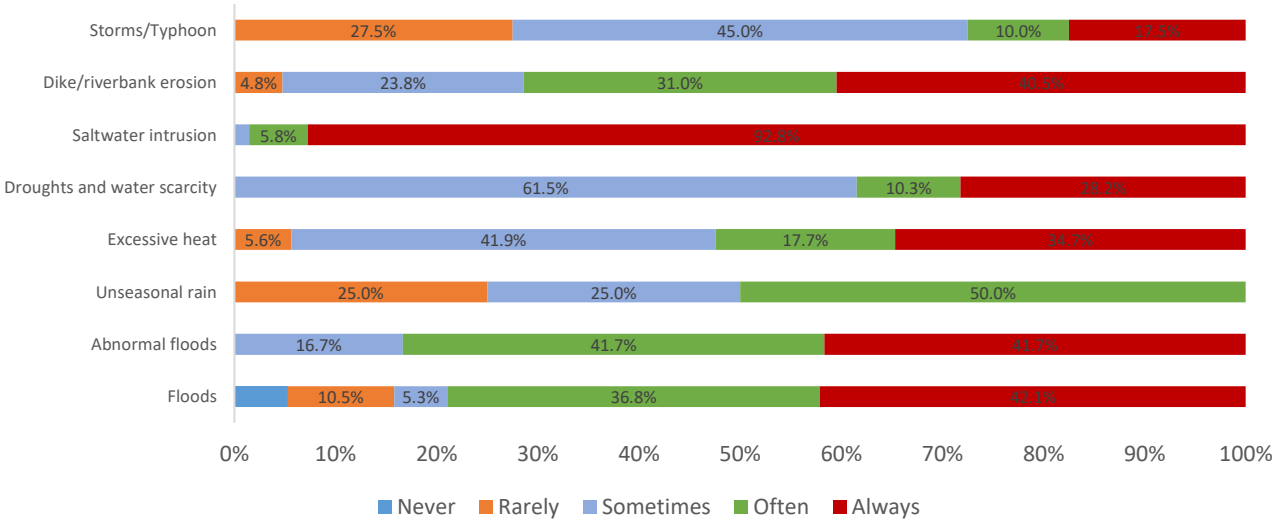
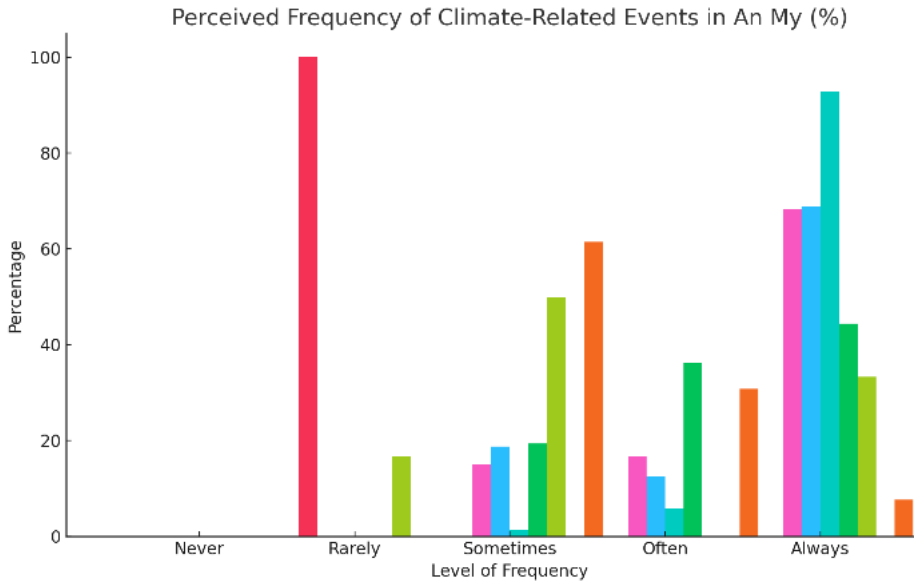


Figure 6.3 Participants' awareness of the frequency of climate hazards in the last 10 years by research sites (n=140)

Source: Household survey (2024).

The frequency and variation of floods and extreme heat are moderate, reflecting seasonal and geographic factors. With 42.1% choosing "Always" and 36.8% choosing "Often", floods are reported frequently but exhibit the most diversity (see Figure 6.3). Smaller percentages, such as 5.3% choosing "Never" and "Sometimes" suggest a variable experience. Geographical disparities may be the cause of this fluctuation, with some areas in both research sites frequently experiencing flooding while others are less affected. Excessive heat was reported as a concern, with 34.7% choosing "Always" and 17.7% choosing "Often", but a noteworthy 41.9% choosing "Sometimes". There may be seasonality to this pattern, with warmer temperatures throughout particular seasons. Water scarcity and droughts occur on average, with 28.2% choosing "Always" and 10.3% choosing "Often", but a significant 61.5% choosing "Sometimes". The farmer noted, “Water seems to be running out even faster” (Khang, PH), indicating the decreased water levels during the dry season as proof of a potential catastrophe. This perspective represents a pragmatic evaluation of impending hazards, including intensified water shortages that may render specific agricultural practices unsustainable. This illustrates an erratic water shortage experience that is probably related to seasonal patterns. The examination of climate-related events frequencies provides a thorough understanding of participants' experiences with environmental hazards and changes.

Across the two study sites, the findings showed that these percentages show both consistent and varied perceptions, underscoring the complexity of climate impacts on these rural farming communities (see Figure 6.4). A detailed analysis of the case study concerning the frequency of climate-related hazards is shown below:



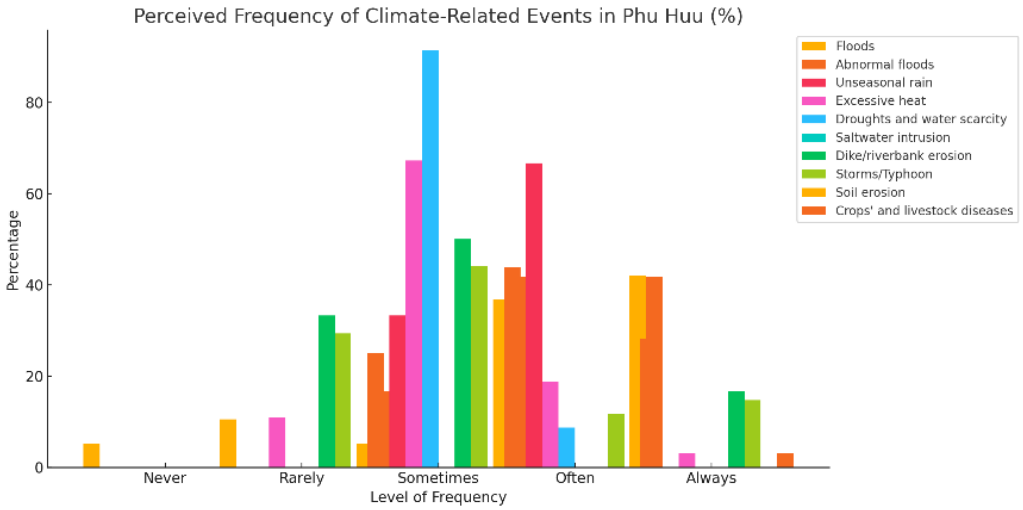


Figure 6.4 Perceived frequency of climate-related events in the case study (n=140)

Source: Household survey (2024).

When asking about the level of importance that climate events have for farming households in the two research sites, the data in Figure 6.4 highlights that "Important" ratings consistently dominate across nearly all climate events, with percentages like 75% for "Unseasonal rain" and 71.8% for "Storms", suggesting a predominant acknowledgment of the relevance of these events to their communities over the last 10 years. A local farmer in Phu Huu commune shared his perspective on unpredictable rain and its impacts: "It's out-of-season rain...when it rains close to harvest time, that's out-of-season rain. We never expect rain, but it can happen unexpectedly" (Hung, PH). Another rice farmer in An My commune remarked, "Compared to the past, the rain and wind used to be more predictable – for example, it would rain during the rainy season and stop during the dry season. But now, sometimes it rains out of season. Sometimes it rains as early as February, or continues until November or December, making the seasons last longer and become more unpredictable" (Beo, AM). The timing of crop planting and harvesting is disrupted by these lengthy seasons, which raises the risks for farmers.

Likewise, the participants experienced strong storms and typhoons annually, as articulated by a local farmer in Phu Huu commune: "Thunderstorms so severe you wouldn't dare go outside. Roofs flying like snakes in the wind...Every year, there's at least one event". However, it's also worth noting that an "Important" rating, as opposed to "Very Important", might imply an anticipated risk rather than an urgent one, signalling that while these events are significant, their impact might be perceived as manageable through current adaptation strategies.

Saltwater intrusion stands out with 71.0% of participants marking it as "Very Important", underscoring a heightened urgency, possibly linked to fears of crop failure and lack of

freshwater (see Figure 6.5). This concern is similarly reflected in 33.3% rating "Very Important" for Crops' and livestock diseases, suggesting that threats directly affecting their agricultural productivity trigger heightened concern. The high "Very Important" ratings in both study sites reflect a prioritization that aligns with these farming communities' dependence on natural resources for economic stability, and food security (Farooq & Ahmad, 2007).

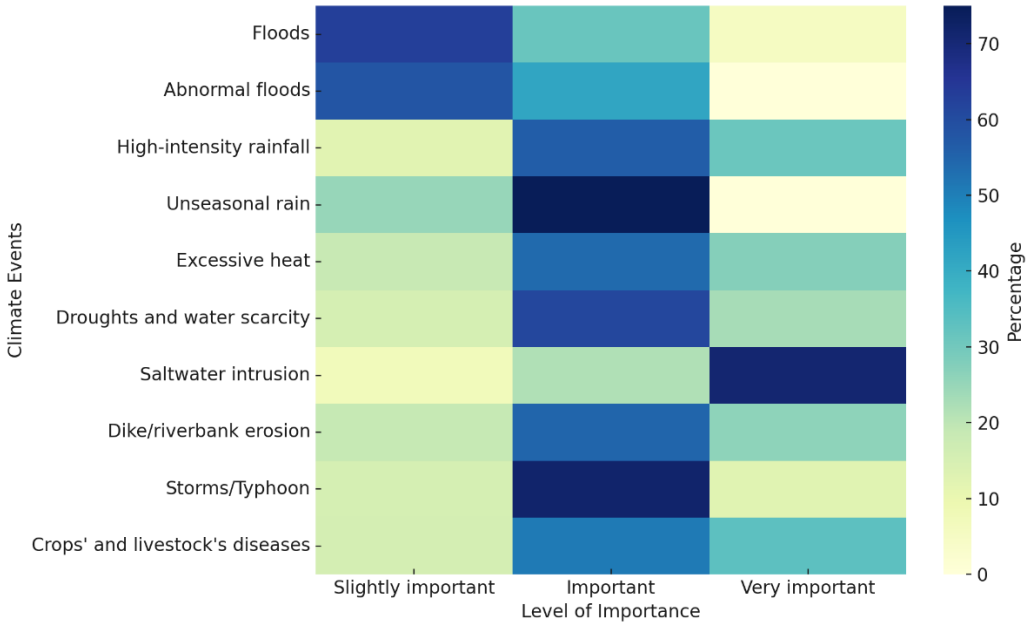


Figure 6.5 Participants' awareness of the importance of climate hazards in the last 10 years by research sites (n=140)

Source: Household survey (2024).

In contrast, events such as abnormal floods show 0.0% in the "Very Important" category, even though 41.7% rated it as "Important". This pattern may suggest that abnormal floods are recognized as significant because they might occur less frequently among other hazards, rendering them slightly less alarming compared to other events. However, it is equally plausible that the lack of urgency could be attributed to a familiarity with *'living with floods'* as part of the natural landscape, where localized knowledge and past experiences inform adaptive strategies. The Chairman of Phu Huu commune stated, "Living with floods only truly applied before 2000, as the area remained flood-prone, without government investment, and considered remote, even bordering areas. During flood seasons, local people raised fish and eels in rivers, utilizing natural resources to increase their income" *(Hieu, official).* Empirical observations in the field revealed that farming household's perceptions of climate vulnerability across the study sites are not merely reactive but shaped by historical adaptation patterns.

The "Slightly Important" scores provide further insight regarding the perceived unpredictability of climatic events. For instance, 63.2% of participants ranked floods as

"Slightly Important", indicating that in particular areas within the study sites, floods may be a common and reasonably foreseeable occurrence, with established adaptation techniques reducing the threat level. Likewise, 58.3% of "Abnormal floods" in the "Slightly Important" category may indicate that these occurrences are acknowledged but not immediately hazardous. Reflecting on the effects of abnormal floods, a farmer in Phu Huu commune noted: "Some years are big floods; some years, it's smaller... The flood season has been fluctuating; recently, it often ends sooner than before". In line with findings from climate adaptation studies by Han et al. (2021), Dakurah et al. (2023) and Etana et al. (2020), who highlight the significance of cultural and experiential factors in forming risk perceptions, the data presented here may suggest a differentiated perception in which frequency, predictability, and familiarity reduce the perceived risk.

Overall, the study finding shows the participants' varied awareness of the climate hazards to their farming livelihoods, both present and predicted. The findings shed insight on the complex landscape of rural farming households' perspectives on the wider social-ecological implications, and climate adaptation.

Furthermore, the analysis of risk rankings among 140 interviewed households in Phu Huu and An My communes of the VMD reveals distinct and shared perceptions of high-risk climate events, highlighting major concerns for saltwater intrusion, excessive heat, and droughts as primary threats to local livelihoods. The data is analysed according to the fact that the greatest number of participants (rather than a percentage) believe that a certain climate event poses a high risk to farmers' livelihood security. As indicated in Figure 6.6, the majority of participants in An My rated saltwater intrusion as a serious concern, making it stand out as a high-risk climatic event. There were no participants for this risk in Phu Huu, which may indicate that exposure or awareness levels differed between the two locations. In An My, saltwater intrusion probably has a more direct impact on water sources and agricultural output. Droughts and excessive heat are considered high-risk by many participants in both communes. This emphasises the effects of water scarcity and warming temperatures, which are prevalent issues for VMD's farming communities (Brown et al., 2018a).

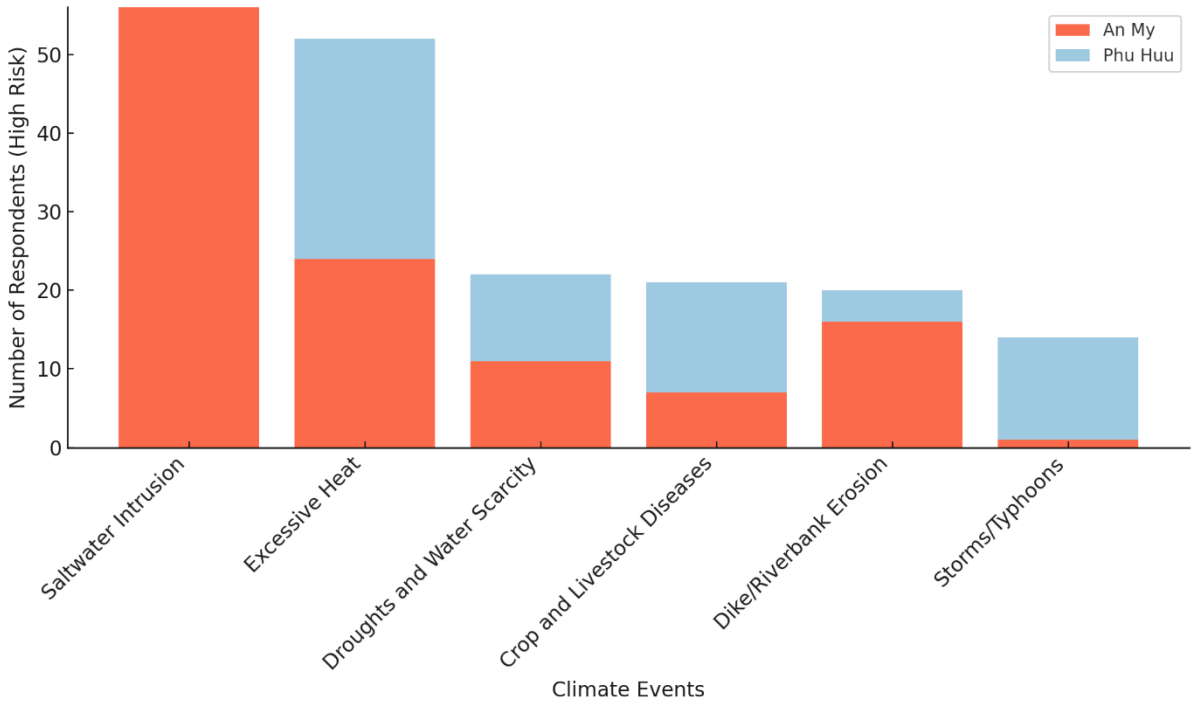


Figure 6.6 Farmers' perception of high-risk climate events across the study sites in the last 10 years (n=140)

Source: Household survey (2024).

Regarding the disparity in the perception of risk for crop and livestock illnesses, almost half of the participants in Phu Huu perceive these diseases as high risk, whereas a slightly smaller percentage in An My share this concern. This could indicate varying degrees of influence or readiness for risks associated with agriculture in each commune. Whereas An My participants are more concerned with dike and riverbank erosion, Phu Huu participants consider storms and typhoons to be a greater risk.

The findings indicate that the agricultural community in An My commune faces the three primary climate events: saltwater intrusion (100%), excessive heat (46.2%), and dike/riverbank erosion (80%). Conversely, farmers in Phu Huu commune experience their top three climate challenges, namely excessive heat (53.8%), crop and livestock diseases (66.7%), and droughts and water scarcity (50.0%). This discrepancy may arise from regional infrastructure, such as dike constructions in An Giang province (Duc Tran et al., 2018) and saltwater prevention sluice gates in Soc Trang province (Giao, 2021), in addition to the accumulation of local knowledge and experience regarding ongoing climate hazards that enhance farmers' awareness in each commune.

The climate impacts of An My and Phu Huu communes differ significantly, as indicated by the data in Table 6.1. In Soc Trang province, the coastal region's vulnerability to saline water

intrusion is highlighted by the fact that saltwater intrusion is by far the most significant climate impact in An My (86.57%). This might harm freshwater supplies and interfere with local agriculture, especially for farmers' crops that are sensitive to salt levels. Empirical observations in the field revealed that excessive heat and erosion are significant second- and third-order factors, indicating that riverbank erosion and severe temperatures also threaten agricultural stability.

Phu Huu, on the other hand, faces a unique set of climate threats, predominantly characterised by extreme heat (64.5%), followed by storms and typhoons (29.6%). Extreme heat presents considerable difficulties for rice growth, especially with fertiliser efficacy and water retention. An agricultural authority noted that: “In hot weather, fertilizers evaporate more easily than in cooler weather... And with extreme heat, water in the fields depletes faster” (Nghia, official). This observation underscores how increasing temperatures expedite water loss and fertiliser inefficiency, impacting negatively on crop output. This indicates that Phu Huu is vulnerable to extreme weather and temperature variations, potentially harming public and private properties as well as agricultural production (Phu & De, 2019). Windstorms, especially at the commencement of the rainy season, present a continual and localised hazard to rural communities, as articulated by a participant who remarked, “Mainly at the beginning of the rainy season, we get small tornadoes that can cause damage” (Hung, PH). It was observed that these small yet powerful wind phenomena disrupt agricultural operations and infrastructure, exacerbating the climate-related challenges faced by farmers. The erratic nature of these windstorms renders them especially dangerous, as they may cause sudden damage to residences, agriculture, and livelihoods without prior notice. The repetitive occurrence of these storms is highlighted in the participant's assertion that "every year, different houses get hit" (Hung, PH), underscoring that these events are not unique but constitute a seasonal hazard. It was observed that the devastation of roofs and the uprooting of crops like longan illustrate the financial strain imposed on impacted households, necessitating ongoing repairs and recovery of diminished agricultural outputs. We observed that for farmers dependent on fruit crops such severe weather phenomena can lead to considerable economic losses, as they not only destroy plants but also interrupt long-term growth cycles. Because these extreme weather events are unpredictable and frequent, the community is particularly vulnerable, and adaptive methods are needed to minimise financial losses and maintain the adaptation of rural livelihoods and agricultural productivity.

Table 6.1 Comparative analysis of top three climate events by influence level (n=140)

Climate Events	The most significant influence (%)	The second significant influence (%)	The third significant influence (%)
An My commune (n=70)			
Saltwater Intrusion	86.57	11.9	1.5
Excessive Heat	10.53	45.6	43.9
Dike/Riverbank Erosion	0.0	50.0	50.0
Phu Huu commune (n=70)			
Excessive Heat	64.5	25.8	9.7
Storms/Typhoons	29.6	18.5	51.9
Crop and Livestock Diseases	26.9	53.8	19.2

Source: Household survey (2024).

In general, farmers in An My commune have a consistent perspective on the top three climate events by influence level and the top three climate high-risk rankings. Although droughts and water scarcity are ranked among the top three high-risk factors in Phu Huu commune, they do not show up when examining the substantial influence levels, instead showing up as storms and typhoons. This comparison demonstrates how the vulnerability profile of each commune is shaped by particular geographic and environmental factors. Gaining an understanding of these distinctions is essential to creating context-based adaptation strategies that tackle specific challenges faced by each community and increase their ability to withstand climate hazards (Mfitumukiza et al., 2020).

6.3.2 Risk perception varied by gender and study sites

The examination of male and female participants' perceptions of climate hazards in both research sites reveals significant insights, emphasising both shared experiences and gender-specific vulnerabilities related to climate change. Geographical distinctions and gendered experiences with climate adaptation are reflected in the different patterns of vulnerability and perception of climate hazards reported by male and female participants in An My and Phu Huu communes.

6.3.2.1 Water-related challenges and scarcity

When asked about the types of risks faced and their rankings, Table 6.2 presents the responses from both male and female participants. Participants were asked to assess climate-related hazards by ranking them according to perceived frequency, severity of impact, and overall influence on farm production and household livelihoods. Water scarcity and associated challenges are a significant stress for both male and female participants in An My commune. As shown in Table 6.2, among the male participants, 81.3% recognise drought and water scarcity as the most serious risks. Saltwater intrusion (66.7%) and riverbank erosion (69.4%) underscore the prevalent water-related vulnerabilities in this community, impacting agriculture and daily life. However, 100% of female participants in An My identified saltwater intrusion as a major climate issue, indicating that it has a more severe impact on them. This growing concern among women would suggest that saltwater intrusion affects their means of subsistence, especially agricultural irrigation, and may disproportionately affect domestic water use, which is traditionally a woman's major responsibility. In contrast, male participants, presumably because of their active participation in agricultural practices, may endure a more significant direct impact from these climatic occurrences than their female counterparts. This result is consistent with research by Assan (2014) and Goh (2012), who contend that social norms and pre-existing gender inequality cause environmental challenges to affect men and women differently.

In Phu Huu commune, extreme heat was the predominant climate event described by female participants (85.7%), although only 31.7% of male participants recognised it as significant. Notably, floods and droughts were reported by 21.4% of women, while 50% indicated water scarcity, in contrast to 9.8% of men for both occurrences. This also suggests that women take water scarcity more seriously, because they are responsible for managing water for small-scale farming (Huynh & Resurrección, 2014) and household use (Phiri & Velmurugan, 2024). This was further analysed in chapter 7.

Table 6.2 Participants' awareness of the levels of climate-induced risks in the last 10 years by research sites

Climate events	Female participants (n=23) with "Yes" responses	Male participants (n=47) with "Yes" responses
An My commune		
Crops and Livestock Diseases	13%	76.9%
Storms/Typhoons	17.4%	33.3%
Dike/Riverbank Erosion	47.8%	69.4%
Saltwater Intrusion	100%	66.7%
Droughts and Water Scarcity	13.0%	81.3%
Excessive Heat	91.3%	65.0%
High-Intensity Rainfall	13.0%	57.1%
Climate events	**Female participants (n=14) with "Yes" responses**	**Male participants (n=56) with "Yes" responses**
Phu Huu commune		
Floods	21.4%	9.8%
Abnormal floods	7.1%	6.1%
High-intensity rainfall	7.1%	4.9%
Excessive heat	85.7%	31.7%
Droughts and water scarcity	50.0%	9.8%
Storms/Typhoons	57.1%	16.5%

Source: Household survey (2024).

The focus on water-related risks among female participants, particularly saltwater intrusion in An My indicates a more profound vulnerability, maybe at the household level, where women may be more directly affected by the availability of water for agriculture and everyday tasks. Clement and Karki (2018) argue that enhancing women's access to freshwater and making sure that water scarcity initiatives are tailored to meet the specific needs of each community could be the main goals of gender-sensitive adaptation strategies.

6.3.2.2 Heat and temperature, and water-related risks

Excessive heat is a significant problem for men and women in two communes. In An My, 91.3% of women and 65% of men report experiencing excessive heat, while in Phu Huu, 85.7% of women and 31.7% of men identify it as a serious concern. These figures indicate high levels of perceived exposure to heat stress, particularly among female participants. Beyond perception, excessive heat affects crop production and livestock health, potentially increasing livelihood sensitivity. As one female participant in An My observed, "I saw the cow was a bit tired from the sun" (Nga, AM), highlighting concerns about productivity and livestock health. Although prolonged exposure alone does not signify vulnerability, the interplay of heat stress,

reliance on livelihoods, and restricted adaptation strategies may increase risk for these households (Mannepalli et al., 2025).

Severe temperatures impose physical stress on animals, resulting in reduced output and income instability (Abdela, 2016). Another female participant stated, “Due to hot weather, floods come but there is less and less water” (Hoa, PH). This underscores the evolving hydrological patterns affected by increasing temperatures and climate unpredictability (Conway, 2013). Traditionally, floods are linked to an excess of water, restoring crops and supporting ecosystems (Talbot et al., 2018). Our on-site observations reveal that altering hydrological patterns show a paradoxical link between flooding and water scarcity, highlighting the intricate and unpredictable dynamics of climate change in these communes. Addressing such challenges necessitates focused adaptation measures that account for both gender-specific vulnerabilities and the wider ecological changes affecting rural livelihoods (Carr & Thompson, 2014; Ylipaa et al., 2019).

6.3.2.3 Storms and typhoons

The finding highlights a gendered difference in the perception of storms and typhoons across two communes, An My and Phu Huu. In An My, a higher percentage of male participants (33.3%) compared to female participants (17.4%) consider storms and typhoons a significant climate hazard. In contrast, in Phu Huu, the trend is reversed, with 57.1% of female participants identifying these weather events as a threat compared to only 16.5% of male participants.

These differences in perception may be explained by the socio-economic roles that men and women play in each commune. In An My, men’s higher concern about storms and typhoons could be linked to their involvement in agriculture and livelihoods directly dependent on weather conditions. Men may experience greater exposure to these events while working in the farms, leading them to perceive storms and typhoons as major hazards. One male farmer remarked, “For fruit trees, especially when they are flowering, prolonged rain is disastrous. If you are trying to induce flowering and there’s too much rain, it’s a lost cause" (Phuong, AM). This highlights the significant vulnerability of fruit crops to unpredictable weather patterns, particularly during their flowering stage. Observations conducted in the field indicate that prolonged rainfall can disrupt the entire production cycle of farmers who delicately schedule flowering induction to correspond with market demand, resulting in economic losses and unstable livelihoods.

Conversely, in Phu Huu, a significantly higher percentage of women than men perceive storms and typhoons as particularly significant hazards. A major concern among interviewed women is the recurring damage caused by cyclones, which severely impact homes and agricultural activities. Cyclones, in particular, are described as highly disruptive, often leaving houses roofless and flattening crops. One female participant noted, “They mainly affect houses, causing roof damage”, highlighting the widespread and recurrent nature of the destruction across An Phu district. These events not only damage physical structures but also disrupt the community’s psychological and economic stability, as “each year varies; this year *Phú Thạnh* village was hit hard, and next year *Phú Quới* village could be more affected” (Tran, PH). This uncertainty emphasizes how urgently robust hazard response systems and more community preparedness are needed.

These results highlight generally the need of including gender dynamics into climate adaptation plans. Policymakers may create more inclusive and successful interventions addressing the unique vulnerabilities posed by every group by realizing that men and women view and experience climate threats differently (Djoudi et al., 2016).

6.3.2.4 Other climate-related hazards

Other facets of risk perception are shown by other climate-related issues including erosion and heavy rainfall. In An My, 57.1% of male participants recognise high-intensity rainfall as a substantial risk, while 69.4% also acknowledge riverbank erosion. Men, who are more likely to be involved in land management, may view erosion as a greater threat to agricultural stability and infrastructure, as evidenced by the moderate level of concern expressed by female participants (47.8%). A male farmer in An My observed, “Riverbank erosion happens mostly from July to October during the rainy season”**,** highlighting the seasonal aspect of this environmental hazard. The interplay of intense precipitation and elevated water levels during this period exacerbates soil erosion, especially in regions already compromised by saline intrusion (Teh & Koh, 2016).

The ramifications of erosion transcend individual farms, impacting public infrastructure like roads, irrigation canals, and communal areas. Farmers generally assert that “The erosion leads to degradation of farmland and public infrastructure, such as public roads, making farming more challenging and riskier over time” (Phuong, AM) which encapsulates the wider socio-economic implications of land degradation. They also associate the riverbank erosion with their primary activity of crop growing. A farmer remarked, "As roads deteriorate, transportation

becomes more difficult, limiting farmers' access to markets and increasing costs associated with moving goods" (Phuong, AM). This finding highlights that erosion is not a sudden, isolated occurrence but a predictable seasonal phenomenon that farmers must consistently address. Nonetheless, despite its predictability, effective mitigation poses an issue, as conventional land-use strategies and current infrastructure may be inadequate to address the cumulative effects of erosion over time. In contrast, high-intensity rainfall and erosion are less commonly discussed in Phu Huu, probably due to geographical differences and seasonal rainfall patterns. The gendered implications of infrastructure decline, especially for mobility, market accessibility, and domestic responsibilities persist in both communes.

The results underscore the intricate and gender-specific characteristics of climate hazard perceptions and vulnerabilities within rural communities in An My and Phu Huu communes. Both male and female participants acknowledge climate-related risks, although their experiences and concerns are influenced by their socio-economic roles and obligations. Women in both communities demonstrate increased awareness to water-related issues, especially saltwater intrusion and water scarcity, which directly impact their households and small-scale farming operations. Conversely, men, who are more involved in extensive agriculture and land management, express heightened anxiety regarding issues such as crop diseases, erosion, and storms.

The findings indicate spatial disparities in climate hazard perceptions, with extreme heat identified as a significant concern in Phu Huu, especially among women. This indicates that the effects of climate change are both gender-specific and context-dependent, necessitating tailored adaptation techniques. The contrasting perceptions of storms and typhoons between the two communes highlight the necessity of community-based disaster preparedness that considers both gender and regional disparities in susceptibility.

Overall, these observations highlight the necessity of gender-responsive climate adaptation plans that consider the distinct experiences and priorities of men and women. As per Ha et al. (2023), enhancing access to freshwater resources, augmenting disaster preparedness, and including gender-sensitive approaches into climate adaptation planning can improve the adaptive capacity of rural farming households across two study sites. Mitigating these discrepancies will be essential for cultivating more inclusive and effective responses to the escalating climate hazards encountered by communities in the Mekong Delta (Huynh & Resurrección, 2014).

6.4 Gender-specific vulnerabilities in climate hazards

6.4.1 Accessibility to and control over resources

Gender gaps in resource availability profoundly affect the ways in which women and men experience and respond to the impacts of climate change. This section analyses discrepancies across resource dimensions, assessing their implications for gender-specific vulnerability and adaptive capacity in the context of climate change.

6.4.1.1 Gender and natural resource access

Women and men engage with natural resources distinctively according to gender-specific roles, rights, and obligations (Leach, 1992a). As shown in Figure 6.7, the study's findings underscore gender gaps in farmland ownership in An My and Phu Huu, indicating notable differences in ownership patterns. In An My, 61% of agricultural land is exclusively owned by men, while in Phu Huu, this percentage is reduced to 47.7%. This signifies that male-exclusive ownership is more prevalent in An My. Notwithstanding the underlying reasons, An My's greater percentage of male-only ownership may have an impact on women's decision-making and land security (Namubiru-Mwaura, 2014b). This also aligns with Agarwal (2018), who observes that women possess fewer than 20% of global land, considering their substantial contributions to agricultural output. The prevalence of male land ownership illustrates established patriarchal land tenure systems, wherein land is conventionally inherited through male lineage, hence restricting women's access to land resources (Djoudi & Brockhaus, 2011). According to Rao et al. (2019), this disparity seriously impairs women's capacity to carry out climate adaptation measures that need for stable land tenure, including crop diversification or soil conservation.

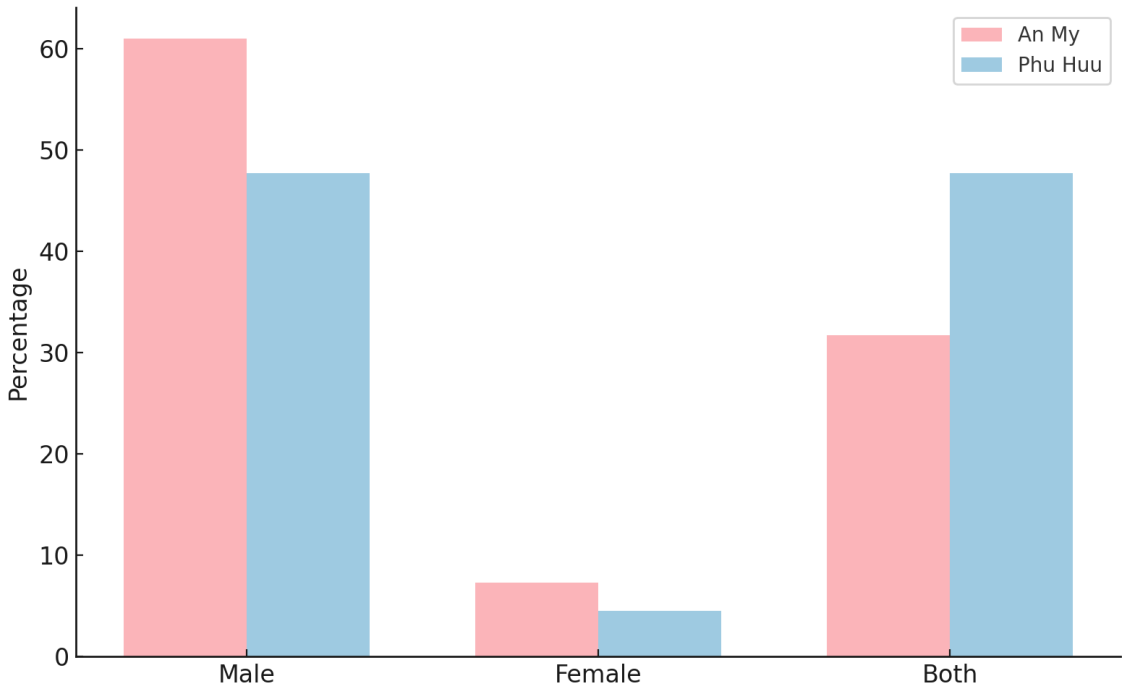


Figure 6.7 Gendered patterns of farmland ownership and co-ownership (n=140)

Source: Household survey (2024).

Women still control a small percentage of farmland—7.3% in An My and 4.5 percent in Phu Huu. The marginally elevated rate in An My may suggest increased female involvement in agriculture; nonetheless, women's ownership remains very low overall. These statistics indicate that women's access to land is severely limited, perpetuating gender-based inequalities in property rights and economic independence (Namubiru-Mwaura, 2014b).

A notable finding is the relatively high rate of joint land ownership in Phu Huu, where 47.7% of farmland is co-owned by both men and women, compared to 31.7% in An My. This indicates a higher official recognition of spousal co-ownership in this commune. The rise in instances of joint ownership in Phu Huu may also indicate the impact of land registration regulations, inheritance structures, or the collaborative dynamics of floodplain agricultural systems, which frequently necessitate coordinated decision-making among spouses or family members. Joint ownership technically acknowledges spousal co-tenure; however, it does not inherently ensure equal involvement in agricultural decision-making. Nonetheless, numerous participants in Phu Huu characterised comparatively collaborative approaches of farm management. As one farmer remarked, “Whatever I do, she does too. They are somewhat similar, but also different for – I spray pesticide, she weeds” (Quan, PH). This account demonstrates shared responsibility along with different allocation of labour. The analysis may indicate negotiated cooperation within existing gendered divisions of labour, rather than an extensive reorganisation of gender roles.

The finding implies a degree of equality in labour involvement, however it also perpetuates gendered divides of responsibilities. Men frequently engage in duties involving chemical applications, machinery operation, or physical labour, such as pesticide spraying, but women typically undertake laborious, repetitive tasks like weeding, which, although crucial, is frequently disregarded. This division of labour illustrates both practical factors and entrenched sociocultural conventions, wherein specific agricultural tasks remain perceived as gender-specific, even as women's participation across diverse aspects of agricultural production continues to expand (Ergas, 2014).

The data highlights enduring gender disparities in land ownership at the research locations. Although joint ownership is more prevalent in Phu Huu, the overall low proportion of female owners underscores the necessity for inclusive land tenure regulations. Rectifying these structural disparities is essential for promoting gender equity in agriculture and rural communities (Elias et al., 2024).

6.4.1.2 Gender-differentiated access to climate information

Substantial gender disparities exist in access to climate-related information sources. Figure 6.8 depicts the differences in channels employed by men and women to acquire climate information. Television is the predominant source for both groups, with 75.9% of men and 69.5% of women relying on it. Our fieldwork reveals that television is the primary medium for disseminating climate-related knowledge, due to its accessibility and credibility in the studied rural areas. As one farmer explained, "I watch the news occasionally. Đồng Tháp Television has great programs that I find useful" (Hung, PH). This underscores the significance of regional media in closing the knowledge gap, especially for rural areas with restricted access to formal training or agricultural extension services (Busungu et al., 2019). Our observation reveals that television shows designed for farmers frequently offer updates on meteorological conditions, pest management measures, market dynamics, and cutting-edge agricultural practices. According to Nassanga (2019), this may improve production and adaptation against environmental and economic concerns.

The Internet serves as a notable source, with 38.8% of men and 36.1% of women using it for climate information. The considerable rate of internet usage indicates enhanced digital access in rural communities; yet, gender-based restrictions on technological access may continue to hinder wider adoption, especially among women. The rising utilization of social media platforms, especially Zalo, by farmers in An My commune illustrates the expanding

significance of digital technology in community-oriented adaptation efforts. Social media facilitates rapid communication and knowledge dissemination, enabling farmers to promptly address environmental concerns (Pattabhi et al., 2023). A male farmer remarked, “People join the Zalo group to get information about salinity levels”, underscoring the significance of digital networks as essential instruments for monitoring climate-related hazards.

Daily updates on salinity levels are essential for irrigation management, as high salinity can harm crops, diminish yields, and deteriorate soil quality. Another male farmer stated, “We get daily updates on the salinity levels through the Zalo group, which helps us manage irrigation”, emphasizing how social media enhances collaborative decision-making and proactive adaptation (Jurgens & Helsloot, 2018). As per Cai and Marks (2021), these platforms enable farmers to exchange real-time observations and debate coping techniques, thereby cultivating a sense of community adaptation crucial during periods of environmental unpredictability.

The statement from a female farmer in Phu Huu commune, “Phones are easy to use, so we look at them more often than anything else”, (Ngan, PH) underscores the growing incorporation of mobile technology into the daily lives and agricultural activities of rural women. We observe that this highlights the accessibility and user-friendliness of mobile phones, rendering them the preferred instrument for obtaining information, including immediate access to weather updates, market pricing, and community debates. This may enable farmers to make prompt and informed decisions.

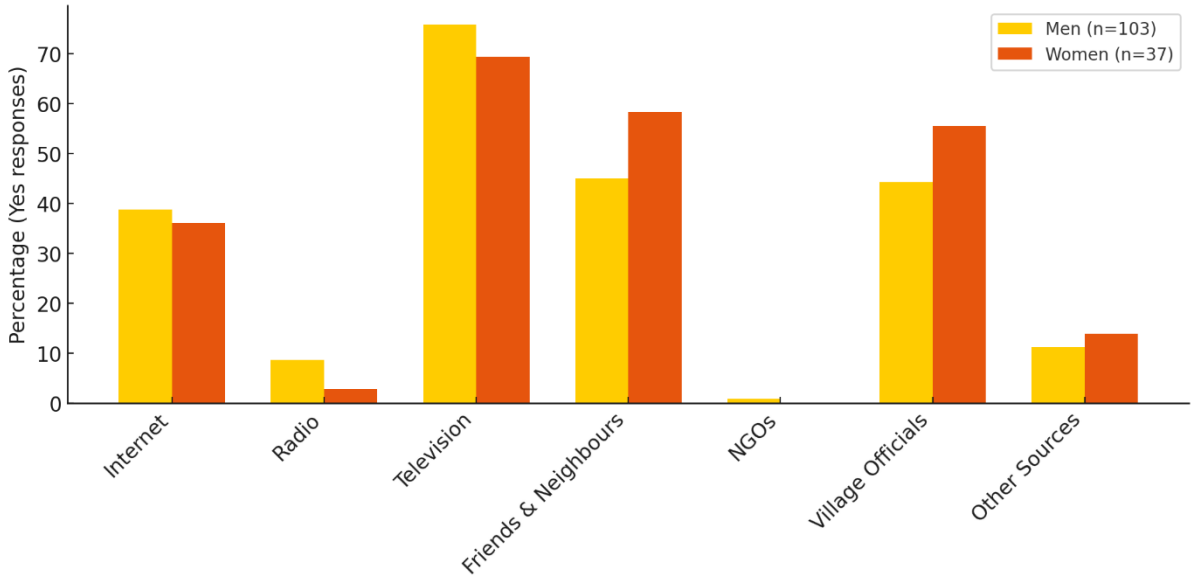


Figure 6.8 Sources of climate information by gender (n=140)

Source: Household survey (2024).

The reliance on friends and neighbours is considerable, with a higher percentage of women (58.3%) than men (45.1%) depending on social networks. This indicates that interpersonal communication is essential for knowledge dissemination among women. The assertion of a female farmer, “If you don’t know something, just ask your neighbours and you’ll know right away; very convenient”, (Ngan, PH) underscores the significance of social networks in knowledge dissemination and climate adaptation among female farmers. In certain instances, within these two examined rural communities, where access to formal climate information may be restricted, informal communication channels function as vital sources of real-time knowledge. According to Winarto et al. (2011), farmers depend on collective experiences, observations, and practical guidance from their counterparts to adapt to evolving environmental conditions, such altered precipitation patterns, severe weather occurrences, or innovative agricultural methods.

Village officials represent a significant source of information, with 55.6% of women and 44.3% of men acquiring climate-related knowledge from them. The elevated rate among women indicates a dependence on community leaders for direction, attributed to their involvement in microcredit initiatives to enhance their home economics. Conversely, dependence on NGOs for climate information is markedly restricted for both genders, with no female participants and merely a small fraction of male participants indicating NGO involvement. This pattern indicates a general lack or limited visibility of NGO participation in the distribution of climate knowledge within the research areas, rather than a gender-specific barrier. The findings indicate that structural limits in external information availability are more significant than gendered exclusion itself.

Radio, formerly a predominant medium, seems to be diminishing as an information source, with merely 8.7% of men and 2.8% of women utilizing it. This indicates a transition towards visual and digital media for climate awareness. Our observations reveal that farmers prefer to get updates regarding news and issues relating to climate change via television rather than radio.

The findings reveal gender-specific patterns in the use of climate information sources and technologies (e.g., salinity metre, and loudspeakers), illustrating how everyday duties and social roles influence information-seeking behaviour. Although television continues to be the predominant source of information for both genders, digital platforms, including the Internet and social media, especially Zalo, are gaining significant influence. Women predominantly

depend on interpersonal networks and village officials, highlighting the significance of social capital and community-oriented communication methods in the distribution of knowledge.

As previously analysed in Chapter 5, women in the study locations encounter restricted access to higher formal education. Reduced educational achievement is frequently correlated with diminished literacy proficiency, restricted access to formal knowledge sources, and limited acquaintance with written or technical documents (Grotlüschen et al., 2016). This gap may affect women's capacity to access and understand written information sources, such government reports, notices, extension brochures, or online text-based resources, in the realm of climate hazard communication. Women with limited formal education may face structural barriers to engagement when climate information is presented in written or highly technical forms (Nyantakyi-Frimpong, 2019).

Such an educational disparity elucidates why social networks, including family, neighbours, and informal conversations with local officials serve as crucial channels for climate information. For women with limited formal education, these interpersonal networks may offer more accessible, culturally relevant, and direct sources of knowledge compared to written sources or formal institutional communication (Ahmad et al., 2004). Consequently, the dependence on social networks instead of textual information should not be viewed merely as a preference, but as a structurally rooted response to educational disparities (Southwell, 2013). The data indicate that gender disparities in formal education may indirectly influence access to climate information, highlighting the necessity of inclusive, orally communicated, and community-oriented communication strategies to prevent the exclusion of women from climate adaptation knowledge systems (Ahmed & Kiester, 2021).

Engagement with NGOs was noted to be minimal among both genders, with merely a small proportion of participants indicating involvement in NGO-led climate activities. The minimal participation indicates a restricted NGO presence or project activity in the studied locations, rather than conclusive proof of gender-specific exclusion. No female participants indicated involvement with NGOs, and male participation was also markedly restricted, suggesting that overarching structural or institutional constraints may hinder NGO outreach in these communes.

The reduction in radio utilisation and the growing dependence on television and digital platforms signify changes in communication trends. Overall, these findings underscore the significance of climate communication methods that encompass mass media, digital platforms,

and community-oriented channels, while acknowledging the influence of gendered mobility, literacy, and institutional involvement on information accessibility.

As shown in Figure 6.9 and 6.10, the study also aimed to determine the ways in which participants' perceptions of climate change were impacted by their gender, age, and level of education. In the 18–29 age group, both male participants (n = 2) answered “Yes”, resulting in a 100% response rate for this subgroup. However, given the very small sample size, this figure should not be interpreted as indicative of higher climate awareness among younger men. On the other hand, a more accurate representation of climate knowledge among older male participants is provided by the 61% affirmative response in the 50+ age group, which has a larger sample size of 100. Age-related increases in the affirmative response rate saw it rise from 0% in the youngest group to 16.7% in the 30-39 group and 19% in the 50+ group. The elderly are more likely to report knowing or being aware of climate challenges, as a result of life experience or exposure to changing environmental conditions over time (Quinn & Adger, 2011).

For old farmers across the two study sites, climate change is a visible reality that directly influences their agricultural operations. Their understanding of climate change is fundamentally based on the observation of alterations in weather patterns and their concrete effects on agricultural output. A 55-year-old farmer articulated these issues concisely, remarking, “Too much sun, no rain, dry river, dry bed, no water for irrigation, rice does not grow, rice is stunted, not good. Longan does not flower much; fruit set is little” (Phuong, PH). This reflects the gradual impacts of severe weather events, especially extended drought, which diminishes water supply, interrupts irrigation, and compromises crop vitality. Therefore, gender and age have a significant impact on climate awareness. This finding aligns with the study by Clayton et al. (2023), which indicates that older participants, especially women in rural farming communities, exhibited more awareness of climate change, potentially linked to their personal experiences with it.

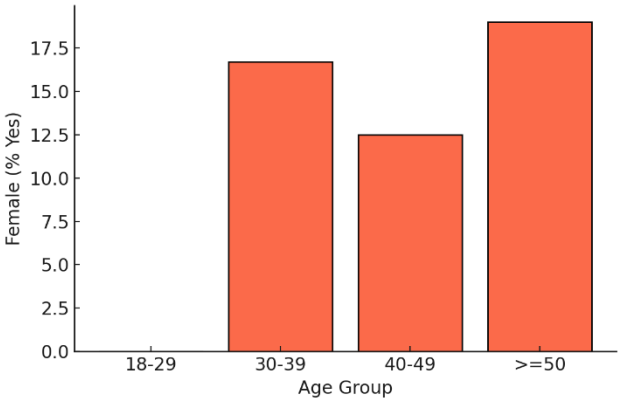


Figure 6.9 Female 'Yes' responses with climate change knowledge by age group (n=37)

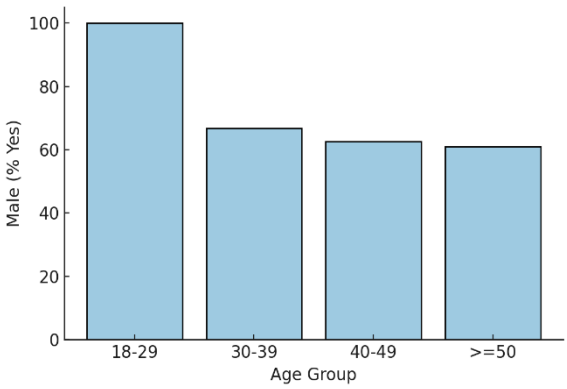
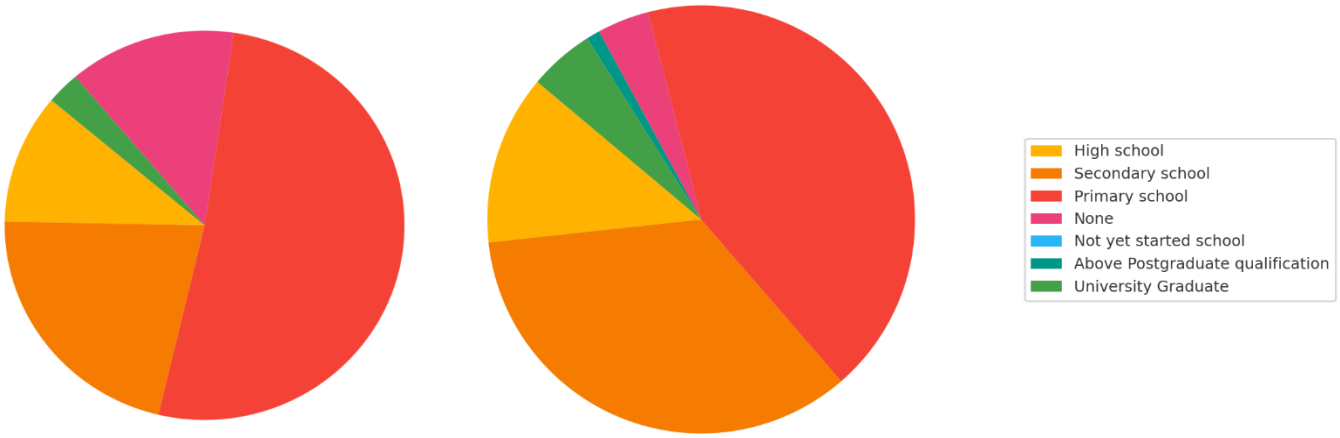


Figure 6.10 Male 'Yes' responses with climate change knowledge by age group (n=103)

Source: Household survey (2024).

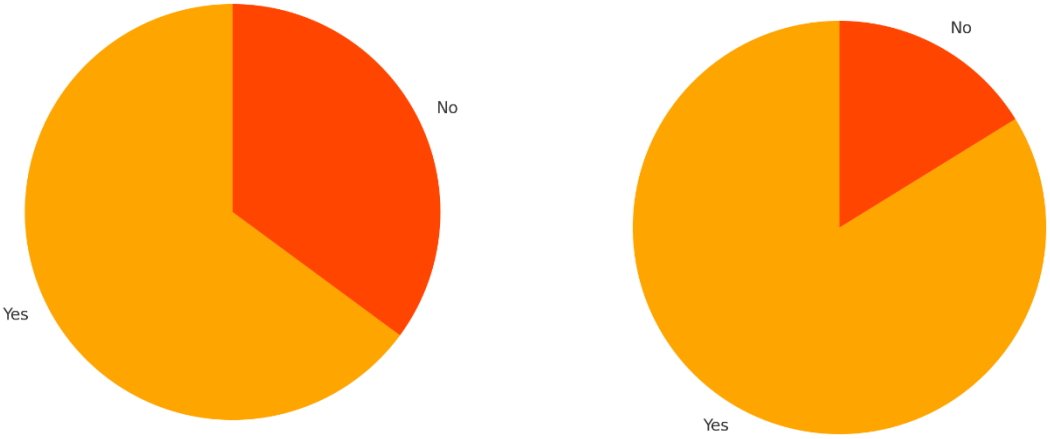
The climate change knowledge attainment data of male and female participants in the survey indicates significant gender differences, highlighting deeper structural disparities in educational access. A notable percentage of female participants (51.4%) achieved only primary school, in contrast to 42.2% of male participants. This indicates that women in the studied communities possess restricted chances for further education beyond the primary level. The gap is more pronounced in secondary education, with 34.3% of male participants attaining this level, in contrast to merely 21.6% of female participants. This suggests that men are more inclined to advance in formal education, whereas women encounter early educational constraints.

Increased degrees of education further exemplify gendered disparities in schooling. A marginally greater percentage of male participants (4.9%) obtained a university degree in contrast to female participants (2.9%), but both demographics exhibited little acquisition of postgraduate qualifications (see Figure 6.11). In rural Vietnam, these patterns may indicate entrenched gendered expectations concerning educational investment, where sons are often favoured for higher education due to expected economic benefits (Patrinos et al., 2018). Moreover, financial limitations, early engagement in agricultural work, and migration trends may restrict ongoing education, especially for women in rural households of Vietnam (Bacud et al., 2021). The percentage of female participants lacking formal education (13.5%) is considerably greater than that of male participants (3.9%). This indicates that women, especially in these two rural communities, are more prone to early exclusion from formal education, hence perpetuating gender-based disparities in literacy and educational opportunity.



Female participants (n=37)

Male participants (n=103)



Female response to being aware of climate change (n=37)

Male response to being aware of climate change (n=103)

Figure 6.11 Educational attainment of participants and their awareness of climate hazards (n=140)

Source: Household survey (2024).

The data about climate change awareness among male and female participants in An My and Phu Huu communes indicates considerable gender inequalities in understanding and experience of climate change effects. A greater percentage of male participants (83.8%) reported awareness of climate change than female participants (64.9%). In contrast, a significant 35.1% of female participants indicated a lack of comprehension on climate change, more than double the proportion of males (16.2%). This indicates that men are more likely to

have greater knowledge of climate-related matters (Wamsler et al., 2012b), possibly due to disparities in education, and access to information sources (Leach, 1998). Wamsler et al. (2012b) also argue that the elevated educational levels of male participants indicate they may possess climate adaptability prospects, hence exacerbating gendered socio-economic disparities (Buchmann et al., 2008).

The results of educational attainment and climate change awareness among male and female participants in An My and Phu Huu communes indicate gender differences that influence individuals' capacity to perceive, comprehend, and address environmental challenges. Data indicates that women, on average, possess lower levels of formal education than men, with a greater proportion achieving merely primary education or lacking formal schooling entirely. This educational disparity is evident in their diminished awareness of climate change, with 35.1% of female participants indicating a lack of comprehension of its implications, in contrast to merely 16.2% of males. The findings indicate that educational attainment significantly influences climate change awareness and adaptation capacity (Buchmann et al., 2008; Wamsler et al., 2012b).

The variation in climate change awareness is likely affected by structural factors, such as access to information, socio-cultural roles, and involvement in agricultural operations (Owusu et al., 2019). Men, due to their greater involvement in market-oriented agriculture and interaction with agricultural extension services, may possess enhanced exposure to climate-related knowledge (Kristjanson et al., 2017). Conversely, women frequently assume home and subsistence farming responsibilities, hence restricting their participation in official climate information networks (Kristjanson et al., 2017). The diminished access to educational resources and climate-related knowledge elevates women's vulnerability, as they may lack essential information required for making educated adaptation decisions.

6.4.2 Social capital and institutional access

Involvement in the social networks essential for climate adaptation demonstrate gender disparities. Women's social networks typically function at localized levels with more robust community links, whereas men's networks generally reach into formal institutions and external resources (Neumayer & Plümper, 2007). Figure 6.12 illustrates that the data regarding male and female involvement in formal social organizations, including Farmers' Associations, Women's Unions, Youth Unions, Veterans Associations, credit groups, agricultural extension groups, and Local Red Cross Unions, supported by local governments, indicates substantial

gender disparities in participation. The data indicates that 28.3% of males (n=103) belong to formal social groups, whilst just 16.2% of women (n=37) do. In contrast, 71.7% of males and 83.8% of women abstain from participating in these groups. This indicates that although both genders exhibit low overall engagement, women appears to be less involved, potentially reflecting underlying structural obstacles and societal norms that restrict their participation in community networks (Gay-Antaki & Liverman, 2018).

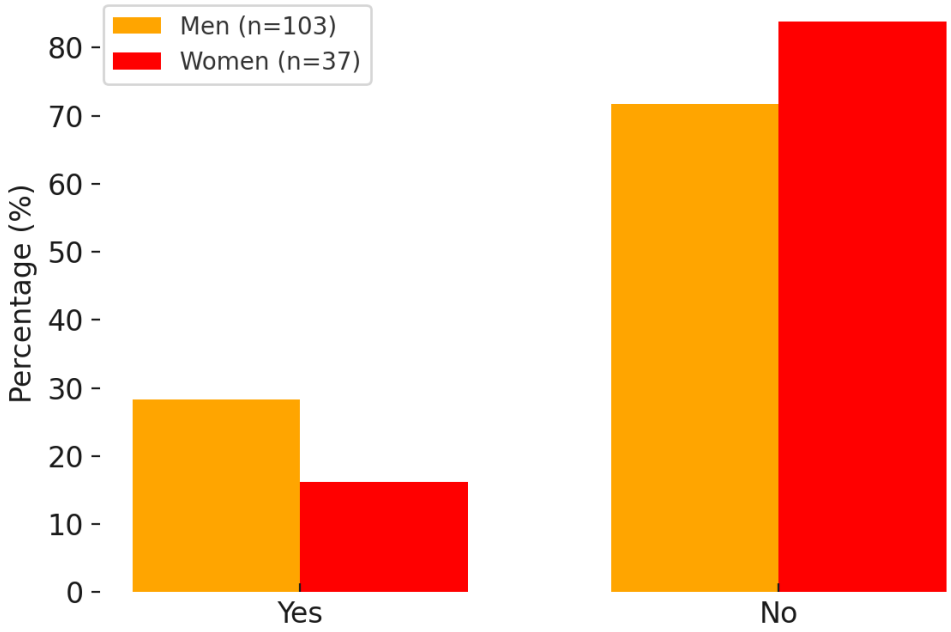


Figure 6.12 Participation of the participants in local social institutions (n=140)

Source: Household survey (2024).

The diminished participation rate among women may be ascribed to gender-specific tasks and responsibilities, including household obligations and childcare, which restrict their ability to partake in community activities. The NVivo analytic tool was employed to investigate the reasons for women's non-participation in community social organizations, with the data illustrated in Figure 6.13 revealing numerous major obstacles. Time limitations and labour obligations constitute a primary constraint on community involvement. A pattern of constrained participation is also observed among Khmer men, although their representation in social networks remains extremely limited. Only five Khmer men reported reasons for non-participation in social networks. Of these, three stated that they “do not know”, suggesting limited awareness or understanding of such organizations. One participant indicated that he was “very busy growing fruits and had no time to attend”, reinforcing the importance of livelihood-related labour demands as a barrier to engagement. The remaining participant

reported that he “does not know how to drive a motorbike to attend the meeting”, highlighting mobility and practical access constraints.

In contrast, numerous female responses suggest that individuals, particularly women, are too preoccupied with income-generating employment, domestic duties, and childcare, hindering their participation in community activities. One female farmer remarked, “I am too busy with my household work and have no time” (Ngan, PH). This underscores the gendered division of labour, wherein women are frequently anticipated to juggle both productive (agricultural) and reproductive (domestic and caregiving) duties, resulting in little time to pursue agricultural training, climate adaptation resources, and social activities (V. I. Nelson & T. E. Stathers, 2009).

Figure 6.13 Reasons for women's non-participation in community social organizations (n=140)

Source: Household survey (2024).

Another difficulty is structural exclusion, as the participants indicated they were never invited or notified about such local meetings. This indicates that restricted participation is not merely a personal decision but may also signify deficiencies in institutional communication. While women indicated informal engagement with village officials via microcredit initiatives, such interactions may not inherently include formal climate adaptation meetings or disaster planning discussions, which may be conducted through alternative administrative processes. This contrast may underscore the fragmented nature of local governing arrangements, wherein involvement in one area does not necessarily ensure inclusion in another. A female farmer stated, “I was never informed about it and never heard anyone mention it”, (Dung, AM),

underscoring structural exclusion as a substantial obstacle hindering female farmers' involvement in local decision-making and climate adaptation initiatives. The insufficient engagement of women in climate governance may stem from entrenched social conventions, male-centric leadership frameworks, or communication deficiencies that overlook women as essential stakeholders (Morrow, 2021). This exclusion may exacerbate gender inequities in access to knowledge, resource distribution, and agricultural decision-making, resulting in female farmers having restricted opportunity to impact local initiatives regarding climate adaptation (Bryan et al., 2024; King, 2015).

A further impediment is literacy and educational limitations. Some participants expressly cite illiteracy as a factor for non-participation, highlighting their challenges in participating in decision-making processes. A female farmer stated, “I am illiterate, so I am limited in attending; when I go to meetings, I can only listen but cannot read” (Chau, PH), highlighting how literacy and educational deficiencies significantly hinder women's involvement in agricultural decision-making and climate adaptation initiatives (Huyer & Partey, 2020). This illustrates wider socio-economic inequalities, wherein individuals with lesser educational attainment experience heightened exclusion from community involvement (Baum et al., 2000). In the absence of accessible alternatives, such as vocal communication or visual aids, those with inadequate literacy remain excluded from communal conversations, thereby perpetuating cycles of marginalization (Ntiri, 2013).

Ethnicity and language barriers exacerbate social exclusion and heighten vulnerability among ethnic minority farmers (Tran et al., 2021), especially Khmer women. A Khmer female farmer stated, “I do not speak Vietnamese, so I do not participate in local groups” (Nèang, AM). Our fieldwork indicates that in An My commune, Vietnamese is the predominant language used in government meetings, agricultural training, and development initiatives, resulting in a communication gap that restricts Khmer farmers' access to essential resources and decision-making opportunities. Consequently, those who lack fluency in the dominant language (Vietnamese) and belong to ethnic minority groups are much likely to face difficulties in participating in local governance, extension services, and community-based projects, further exacerbating their marginalization.

During in-depth interviews, the participant was asked regarding their access to community-based information, including climate information and credit programmes. As one Khmer woman remarked:

> *"Because my house is built right next to a rice field and a small canal, and very far from the market and the town centre, I have to go to the market to buy food to get information about the local area, or sometimes I can get a little information from people passing by in boats. There were times when I heard information at the market and had to find a Khmer person who spoke fluent Vietnamese to explain it to me. I remember there was a time when the local authorities announced a micro-credit program for women; but I didn't know about it in time, so I didn't have the opportunity to participate"* (Phhoung, AM).

The findings demonstrate the intersectionality of geography, ethnicity, and language in influencing uneven access to climate-related resources and financial opportunities. The account of the Khmer woman illustrates that physical isolation is not only a spatial issue but also a structural constraint to engagement in adaptive processes. Living "right next to a rice field and a small canal, and very far from the market and the town centre" restricts her access to official lines of communication, causing her rely on unofficial and infrequent information sources including passing boats or marketplaces. This may illustrate how climate information systems, typically structured around centralised dissemination hubs, may unintentionally marginalise individuals in remote or water-bound locations.

Moreover, it reveals another level of linguistic marginalisation that she had to locate "a Khmer person who spoke fluent Vietnamese to explain" official notifications. Information may be technically available, yet practically inaccessible due to language barriers. This illustrates the multiple vulnerabilities faced by ethnic minority women, who are not only rural farmers subjected to climate hazards but also persons navigating inside a dominant-language institutional framework.

Additionally, the missing possibility to participate in a micro-credit programme exemplifies how the promptness and clarity of communication affect adaptive capacity. Access to credit is frequently essential for investing in drought-resistant crops, salinity management, or livelihood diversification (Batung et al., 2023). Nonetheless, a lack of equitable outreach micro-credit programs; such initiatives may unintentionally favour individuals who are already proximate to administrative hubs or possess greater social connections (Bhatt & Tang, 2001).

These observations indicate that adaptation encompasses not just infrastructure and crop selection but also the dissemination of information, including the timing and language of

dissemination. In this instance, Khmer women in physically remote areas face limitations in climate adaptation due to intersecting types of spatial, linguistic, and institutional exclusion.

6.4.3 Synthesis and conclusion: Intersectionality and compounding vulnerabilities in climate adaptation

The study findings highlight the intricate interactions between gender and socio-political power dynamics that influence vulnerability and climate adaptation in rural agricultural communities. Although climate change is commonly presented as a global issue, the experiences of rural farmers, especially women, demonstrate that adaptation is influenced not just by climatic conditions but also by socio-cultural and political structures (Ylipaa et al., 2019). The enduring gender discrepancies in property ownership, education, access to climate knowledge, and institutional involvement illustrate wider structural disadvantages that influence farmers' ability to address climate hazards (Huyer, 2016b; Tschakert and Machado, 2012). The study findings illustrate that gender discrepancies in land ownership, education, and social network engagement establish structural barriers that limit women's adaptive potential. The limited participation of women in formal institutions and climate governance frameworks further undermines their capacity to shape local adaptation programs, perpetuating structural inequities in climate adaptation. These findings underscore the necessity of overcoming a uniform approach to climate adaptation and instead embracing intersectional frameworks that consider the interactions of gender, ethnicity, socio-economic status, and institutional exclusion (Walker et al., 2019).

The study findings on land ownership among men and women indicate that structural obstacles to women's access to land resources directly impede their capacity to execute long-term adaptation plans. Although shared land ownership is rising in some areas, women retain authority over only a small percentage of agricultural land, hence perpetuating patriarchal power structures that favour men in decision-making roles (Namubiru-Mwaura, 2014a). Moreover, Huyer and Partey (2020) claim that the lack of land ownership or co-management diminishes women's agency in agricultural planning and adaptation, constraining their ability to invest in climate-resilient farming practices. This structural injustice transcends gender, representing a comprehensive socio-political failure that perpetuates economic dependency and disempowerment of women (Murphy, 2015).

In addition to gender, additional overlapping socio-political issues intensify the vulnerability of rural farmers. Ethnic minority women, including Khmer women in An My commune,

experience heightened exclusion due to language obstacles which restrict their access to essential climatic information and agricultural extension services. This linguistic exclusion highlights the interplay of gender and ethnicity in influencing adaptation outcomes, wherein Khmer women encounter dual disadvantages—first as women within a patriarchal agricultural framework and second as ethnic minorities in a Vietnamese-dominated governing system. Their exclusion from government-led initiatives conducted in Vietnamese may place them at a significant disadvantage relative to their Kinh (Vietnamese) counterparts, further marginalizing them within their own communities. This linguistic and ethnic isolation hinders their participation in decision-making processes that could improve their adaptive strategies, demonstrating how various aspects of social identity interact to exacerbate vulnerabilities in climate adaptation (R. Mearns & A. L. Norton, 2009).

The research underscores the socio-political obstacles obstructing women's involvement in formal governance structures. The insufficient representation of women in agricultural extension groups, women's unions, and Farmers' Associations indicates that decision-making processes are primarily dominated by men. The reports from women claiming they have never been invited or informed about these groups regarding community activities suggest systemic biases that favour male involvement. Furthermore, women's time constraints—stemming from their numerous obligations related to home responsibilities, caregiving duties and agricultural labour—impede their involvement in decision-making processes associated with community adaptation efforts. Their disproportionate presence in informal networks—predominantly depending on neighbours and friends for climate information—illustrates their marginalization from official knowledge-sharing institutions. Although these informal networks facilitate essential adaptability, they are devoid of the institutional backing and resources required for enduring climate adaptation (Trundle, 2020). The lack of NGO outreach, especially towards women, indicates a deficiency in gender-responsive adaptation efforts, as institutional solutions frequently overlook the compounded challenges faced by women across the two studied rural areas. According to Lee and Zusman (2018), this highlights the urgent need for institutional reforms that promote inclusive conditions for women's participation in climate governance, such as flexible meeting schedules and childcare support to ensure gender-balanced representation in community leadership.

Another important finding from the research is the influence of education and literacy on climate awareness and adaptive capacity. The findings align with indicate that women in the study locations generally have lower levels of formal education compared to men, which is

associated with diminished awareness of climate change (Wamsler et al., 2012a). This educational disparity is not coincidental; it mirrors entrenched socio-political frameworks that favour male education while limiting women's access to learning and advancement (Leach, 1998; Stromquist, 1989). Climate adaptation frequently necessitates access to technical knowledge, including weather forecasting (Kiparsky et al., 2012), innovative agricultural production techniques, and orientation seminars on livelihood transitions; hence, educational disparities lead to an unequal distribution of adaptive capacity (Wamsler et al., 2012a). The insufficient formal education of women diminishes their capacity to make educated adaptation decisions and constrains their involvement in community leadership and policy discussions on climate adaptation (Cohen et al., 2016). As per Wright et al. (2017). addressing this issue requires targeted interventions, including inclusive agricultural extension programs that prioritize women's participation and include climate knowledge to integrate community-based climate adaptation into large-scale farming practices.

In summary, the findings emphasize that climate adaptation is not merely an environmental or technological issue, but rather a profoundly socio-cultural and political process. Gender inequalities in land rights, education, technology, and institutional access perpetuate overarching power imbalances that influence the adaptation of rural communities to climate hazards. These inequities are not incidental; they are perpetuated by socio-political systems that favour masculinity in decision-making processes. In the absence of focused measures that tackle these systemic impediments, climate adaptation initiatives may exacerbate existing disparities instead of promoting transformative adaptation. Future adaptation initiatives must combine intersectional approaches that recognize and address the compounded vulnerabilities experienced by women, ethnic minorities, and other marginalized groups, including the impoverished and those with illiteracy in rural agricultural communities.

Chapter Seven: Institutional and Gendered Dimensions of Livelihood Transformation

7.1 Introduction

As outlined in Chapter Two, neoliberalism is conceptualised as a governance rationality that prioritises market-based coordination, individual responsibility, and the retrenchment of direct state intervention (e.g., Harvey, 2007; Peck & Tickell, 2017). In Vietnam's socialist-oriented market system, climate change adaptation is officially expressed through a government-led policy framework. This chapter's findings indicate the rise of neoliberal tendencies in adaptive governance, as the responsibility of managing environmental hazards is progressively transferred to individual households. Market processes, such as access to credit, private agricultural inputs, and household-level infrastructure investment, are advocated as key adaptive responses. The dynamics are analysed in further detail in Chapter Eight.

In addition, this chapter examines the institutional frameworks and gendered dynamics influencing climate adaptation and livelihood transformation in the An Giang and Soc Trang provinces of the VMD. Drawing on policy documents, interviews, and survey data, it analyses how state-led interventions, particularly infrastructural projects and disaster governance mechanisms interact with local practices, social norms, and gendered roles in farming communities. This chapter examines the research question: *To what extent do gendered relations coupled with institutional context and actor participation influence the transformation of agricultural households' livelihoods in the Vietnamese Mekong Delta (VMD)?* It underscores the structural opportunities and underlying disparities that affect rural households' adaptation capacities amid increasing climate-induced challenges, including saline intrusion, drought, and excessive heat.

7.2 Institutional context and its influence on gendered relations and livelihood transformation

7.2.1 Multi-level institutional coordination and its governance

The policy framework in Soc Trang and An Giang provinces demonstrates a proactive institutional response to climate change effects, grounded in Vietnam's Decision No.120/NQ-CP (Resolution 120) on sustainable and climate-resilient development in the Mekong Delta. This policy emphasises coexistence with environment via adaptive water governance and agricultural reform. A provincial official remarked, "Since the implementation of Decision 120, all provinces in the Mekong Delta have followed this decision with the spirit of living in

harmony with nature" (Phuong, official). The concept has been implemented through interventions such as salinity management sluices and boat locks *(âu thuyền)*, especially in at-risk districts like Ke Sach district. These constructions are designed not to completely restrict water flows but to facilitate controlled and adaptable water management: "Now there is a regulation to make it suitable for management. When saline water is needed, we have saline water, and when sweet water is needed, we have sweet (fresh) water". This also aligns with the insights of Can Tho University's expert who further explains:

> *"Now, one major policy since Nguyen Xuan Phuc's administration is Resolution 120, known as the "Facilitating Nature" resolution. We have provided evidence to the government showing that our previous production methods are unsuitable under climate change conditions, highlighting threats to upstream development. Meanwhile, floodwaters are not our enemy, and salinity isn't either. We should view these as natural resources and find ways to exploit them. Therefore, in Resolution 120, everything we have can be a resource; the issue is how we find ways to exploit those resources".*
>
> (Tuan, expert).

These remarks indicate a developing institutional perspective that emphasises adaptable and responsive infrastructure for managing both saline and freshwater according to seasonal and ecological constraints. This policy congruence signifies an increasing global understanding of adaptive governance as an essential framework for addressing climatic risks (Huntjens et al., 2011). It also illustrates the growing ability of subnational authorities in Vietnam to interpret national directives within specific ecological and socio-economic circumstances (Berchoux et al., 2023).

In the last ten years, risk management in An Giang province has become more institutionalised, depending on multi-sector cooperation and local mechanisms (see Figure 7.1). In An Phu district, the Climate Change Response, Disaster Prevention, and Civil Defence Command exhibits this approach by including 29 official members and five border guards into an annual disaster planning framework that spans agricultural, education, labour, and social welfare sectors. This integrated mechanism operates mostly through inherent obligations rather than explicit incentives. According to one district official, "The command has 29 members, plus five border guards… but there's no special provision. It's an additional duty" (Nghia, official). Although these institutions seek to enhance local adaptation through the annual renewal of

disaster plans and the formation of commune-level reaction teams with 40–80 people, the absence of financial or institutional incentives may compromise the efficacy and durability of these initiatives (Clarvis et al., 2015).

In An Giang province, institutional assistance for climate adaptation has manifested through specific infrastructure improvements, resulting in measurable reductions in climatic risks and facilitating livelihood diversification. Significant initiatives, including levee systems (e.g., WP9, Road 957), anti-erosion embankments, and canal dredging, have established essential safeguards against seasonal flooding and soil degradation. A local official confirmed the positive effects of these interventions: “Since the embankment was built, there has been no riverbank erosion, and land loss has decreased” These structures not only mitigate additional environmental damage but also establish stable conditions for switching from rice cultivation to more profitable and resilient fruit tree planting. Moreover, infrastructure projects have been engineered for multifunctionality: “Canals are added alongside roads for easy access to water… culverts are also included across the roads” (Nghia, official). These multifunctional investments improve water management and streamline agricultural production for export, aiding the incorporation of adaptation strategies into rural development planning. This type of structural adaptation corresponds with comprehensive climate-resilient development frameworks that prioritise infrastructural durability, and risk mitigation (Lazurko & Pinter, 2022).

In An Phu district (An Giang province), the USAID-sponsored Red Cross programme became a crucial provider of technical and material support. Training on tools like the Torbo software enabled local personnel to enhance disaster impact evaluations and community involvement: “The training involved the development of interview forms for local residents... to evaluate satisfaction, pre- and post-disaster measures, and livelihood effects” (Trang, official). This technical upskilling was supplemented by critical material provisions, including water filters and life jackets delivered to vulnerable communes like Phu Huu and Phu Hoi. The intervention intended to reduce hazard-induced vulnerability, although its implementation adhered mostly to a top-down framework, with minimal indications of participatory engagement at the grassroots level. Specifically, it revealed a lack of the involvement of women-related organisations in decision-making or programme design, prompting questions over the extent of gender integration in externally financed disaster governance projects.

Meanwhile, officials in Soc Trang province evaluated the financial framework supporting climate infrastructure initiatives. While acknowledging certain improvements, they

emphasised the limitations of relying on externally sourced funding, stating, “It is just loan capital… this still places pressure on the national budget” (Trang, official). This highlights a structural vulnerability: whereas foreign projects provide essential resources, they frequently impose financial constraints, particularly when financed through national loans instead of grants. The result is a gradual and inconsistent implementation of infrastructure, notably disadvantaging distant or under-resourced areas.

Stakeholders in climate governance encompass various levels, including central ministries, province agencies, district irrigation units, representatives from local NGO (district level), and local communities. The coordination depends on formal institutional frameworks and digital communication platforms. Officials in Soc Trang province characterised the Zalo messaging system (a Vietnamese social media apps) as a principal means for the distribution of real-time information: “When the province announces something, all districts are informed. Districts, communes, and hamlets have their groups to communicate, and the people also have their groups. Just one message, and within seconds, everyone is informed” (Trang, official). This signifies an institutional effort to integrate real-time responsiveness and enable farmers through timely decision-making.

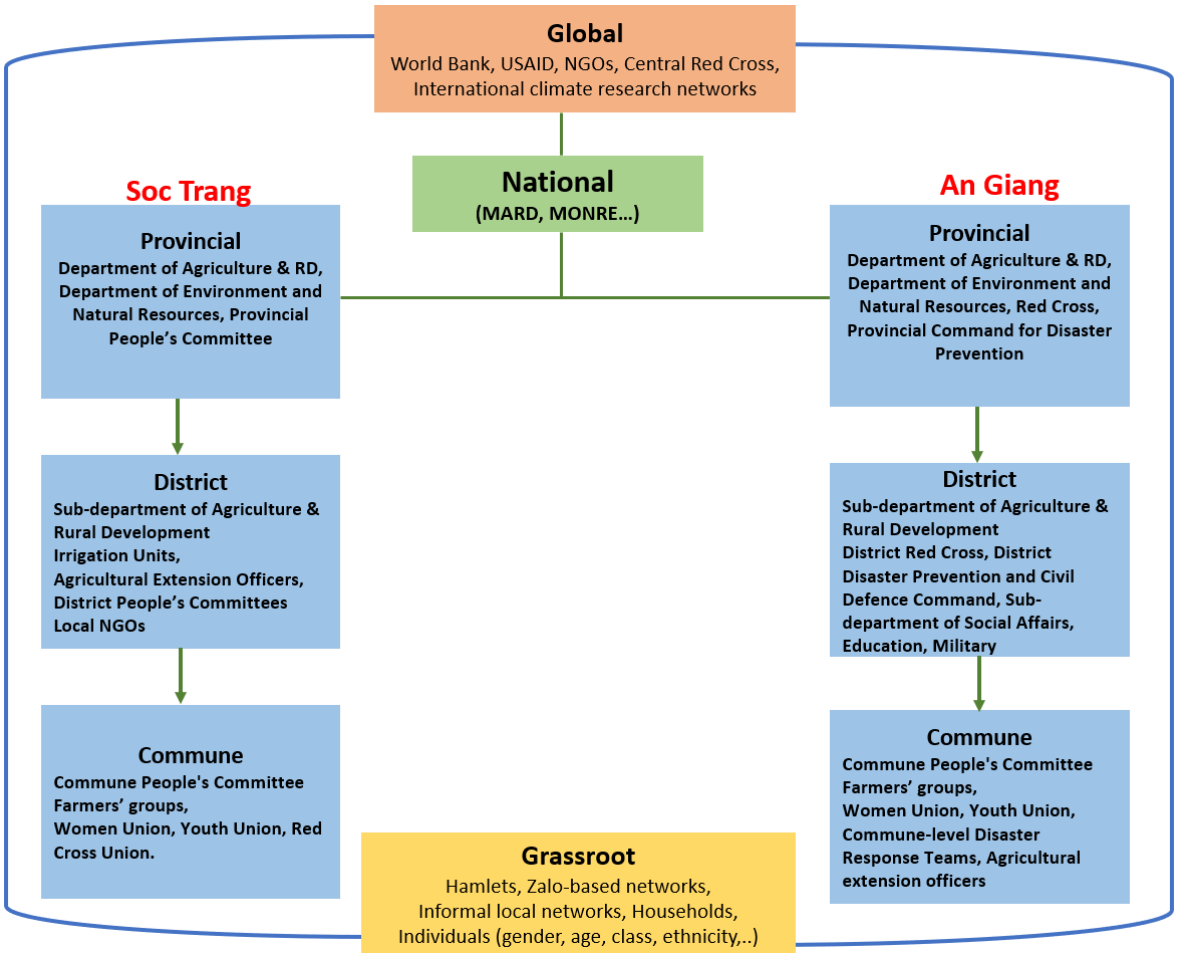


Figure 7.1 Network of the stakeholders involved in climate change adaptation and governance within rural VMD

Source: Author-own illustration (2024).

In An Giang province, governance initiatives engage a variety of stakeholders from the provincial to the commune levels. The Provincial Red Cross coordinates donor-funded initiatives, whilst the District Red Cross serves as the local agent, overseeing daily activities. Other departments, like Labour and Social Affairs, coordinate childcare during floods, while Education facilitates school transportation in flooded regions. It has been observed that "children from working families are monitored in childcare facilities during the flood season" (Nghia, official), and "students are conveyed across flooded roads in communes such as Phú Hội and Vĩnh Hậu" (Nghia, official).

Moreover, commune-level risk response teams execute directions and aid with fixing up houses or emergency aid at the grassroots level. Nonetheless, decision-making continues to be hierarchical. A district official stated, "The risk management plan is developed by us with contributions from local departments; it is not presented to residents for feedback". This

signifies a governance deficiency between strategic planning and local engagement, particularly in marginalised groups.

The climate governance frameworks in Soc Trang and An Giang provinces demonstrate a coordinated institutional commitment to harmonise national policy, specifically Vietnam's Decision 120/NQ-CP, with local adaptation strategies in the Mekong Delta. The focus on harmonising with nature via adaptive water governance and multifunctional infrastructure indicates a progressive governance strategy that integrates ecological and economic goals. Investments in salinity and flood control systems, dikes, and irrigation enhancements yield measurable results, including riverbank erosion mitigation and diminished flood risk, thereby facilitating livelihood diversification and agricultural sustainability.

The institutional framework for adaptation is predominantly influenced by a top-down approach, wherein provincial and district officials direct planning with little grassroots involvement. Risk management teams and local responses function according to central directives, with limited community engagement in strategic planning. This hierarchical framework jeopardises the legitimacy and efficacy of adaptation techniques, particularly in settings characterised by socio-economic disparities.

Although institutional responses in the two provinces exhibit enhanced sophistication in policy interpretation, intersectoral collaboration, and technical execution, challenges persist in guaranteeing equitable participation, decentralised decision-making, and sustainable financial viability. Recognising these governance deficiencies is essential for establishing a robust and socially inclusive adaptation framework in the two specific research locations and the VMD as a whole.

7.2.2 Climate adaptation governance: Stakeholders' perspectives

Institutional support is channelled through multiple mechanisms, including infrastructure development, agricultural training, and the introduction of alternative livelihood pathways. Infrastructural development is a crucial state-driven initiative at the provincial, district, and commune levels, serving as a primary tool to address climate-related concerns, notably saline intrusion, flooding, and drought. The focus on physical interventions, including large-scale sluices, dikes, and water control systems, underscores a persistent dependence on technical solutions to alleviate concerns linked to saline intrusion, flooding, and drought. An illustrative instance of this methodology is the centrally sponsored sluice system being constructed in Nhơn Mỹ commune, designed to convey freshwater from the Hau River to serve adjacent An

My commune. A local NGO official remarked, “It is a project initiated by the central government…” The official stated, "The budget for the Hau River project is 1 trillion VND”, (Tam, NGO) emphasising the magnitude and significance of national investment.

Such an existing solution illustrates an ongoing pattern of state-focused adaptation that prioritises technical solutions and capital-intensive initiatives, frequently in accordance with Vietnam’s Decision 120 and its aspirations for sustainable development in the Mekong Delta. Although this structural strategy provides essential protection and improves water security, an academic in the VMD noted: “These structural solutions are contrary to nature, and when we go against nature, there are consequences. For example, there are more severe droughts, flooding in different areas, and flooding in middle regions like Can Tho and Vinh Long province rather than upstream areas. Those are consequences of structural solutions being applied” (Tuan, expert). These results reflect apprehensions expressed by academics who contend that excessive dependence on physical infrastructure may intensify long-term hazards especially when hydrological systems are compromised and downstream communities suffer the ecological consequence (Käkönen, 2008). Moreover, such strategies may diminish the significance of local knowledge and community-driven adaptation, so supporting technocratic governance models that overlook more inclusive, grassroots approaches (Adger, 2000).

However, ongoing projects during the implementation of Decision 120/NQ-CP in the VMD continue to emphasise on export-oriented development. As an expert from Can Tho University noted, “Many projects—those related to the sustainable management of natural resources to develop livelihoods for subregions at risk, projects on agricultural production adaptation to climate change, and projects that improve and address the agricultural value chain for household livelihood development, especially for households involved in exports” (Nhan, expert). This illustrates a wider trend in Vietnam's rural development strategy, wherein economic modernisation and global commercialisation are emphasised, occasionally to the detriment of locally adapted alternatives (Biggs et al., 2012).

In addition to the state-led initiatives of Resolution 120, the National Target Programme on Sustainable Agricultural Development includes the forthcoming "One Million Hectares of High-Quality Rice" initiative. The central government, including the Prime Minister at international forums, extensively advocates these projects as strategic measures to enhance Vietnamese rural livelihoods and strengthen climate adaptation. A provincial official stated:

"From the government to the province, there are many programs, such as those from the Ministry, national objectives, new rural development programs, sustainable agricultural development programs, and soon the "One Million Hectares of Rice" initiative. These programs must constantly improve to better assist farmers. These are national programs. Additionally, localities may have smaller programs, primarily serving the development of the local economy and society".

(Phuong, official).

Importantly, the "One Million Hectares of High-Quality Rice" initiative has been introduced as one of key mechanisms to help achieve the goals set out in Resolution 120/NQ-CP, particularly in promoting sustainable agricultural development and stimulating the local economy. As one provincial official explained, "The province's goals for implementing the 'One Million Hectares of Rice' program is generally aligned with overarching resolutions, especially those set by the Southern provinces in their five-year plans. Based on these resolutions, the provincial People's Committee and central departments develop action programs and projects to fulfil the objectives established at the congress. That is the framework we operate within" (Phuong, ST's officials).

Nevertheless, critical analyses reveal an inherent contradiction within these policies: whereas sustainability and adaptation are prioritised in discourse, their practical application frequently bolsters the expansion of intensive rice farming systems, especially oriented towards export markets. The One Million Hectares of High-Quality Rice plan might be viewed as a strategy to modernise agricultural output via regional concentration and economies of scale. In line with government objectives to improve export competitiveness and yield quality, this production model tends to favour larger landholders and cooperative enterprises. An academic specialist stated:

Furthermore, "The One Million Hectares of Rice is meant to boost production, increase income, and reduce waste. This initiative is prioritizing developing concentrated production areas. For example, in An Giang, they might concentrate on 200,000-300,000 hectares. It's not like one area has to have a million hectares" (Nhan, expert). It may intensify disparities by marginalising small-scale or subsistence farmers, who may lack access to irrigation, mechanisation, or the finance necessary for participation (Sikor & Müller, 2009).

Another expert of Can Tho University provide insights of the Resolution 120: "Instead of just planting rice, we switch to shrimp farming, which has a higher value. The most significant shift

in Resolution 120 is the pivot—this is a major change. In the past, rice was our top priority. Rice was almost the number one priority in production outcomes. Any province producing over 1 million hectares and over 1 million tons in a crop cycle would have its chairman easily promoted. There's a major obstacle. The reason why Resolution 120 is slow to take effect is that we've already created 'regretful projects', and correcting them is very difficult" (Nhan, expert). This illustrates what academics refer to as "maladaptation traps" (Eriksen et al., 2021), in which prior development pathways hinder current climate-responsive strategies.

Such an export-oriented emphasis, associated with initiatives that advocate for high-quality and high-yield rice production, often prioritises commercial productivity at the expense of the natural landscape and local food security, necessitating the extensive construction of dikes and sluice gates to safeguard the crop. Consequently, whereas national programmes are depicted as beneficial to farmers, they may marginalise more diversified and regionally adapted practices in favour of mono-cropping patterns that could be less resilient to future climatic shocks (Lin, 2011).

Furthermore, the ongoing projects at the two research sites in agricultural training emphasise the promotion of sustainable agriculture; for example, employing the "1 Must Do – 5 Reductions" framework, which advocates for reduced input utilisation while improving environmental outcomes. A local official stated that this programme has allowed farmers to decrease pesticide and fertiliser expenses by 50%, so serving as both an economic and ecological measure. These agricultural improvements are enhanced by initiatives that address water insecurity via infrastructural advancements and informal adaptive strategies. In the lack of formal infrastructure, local inhabitants frequently utilise low-tech methods, such as "cutting trees to make temporary sluices" to manage water flows. Meanwhile, a larger state-led intervention is underway: a central government-funded project that aims to "bring freshwater from the Hau River through Nhon Mỹ" with completion anticipated in 2025. This project is aligned with Vietnam's strategic climate adaptation planning for the Mekong Delta, including the Mekong Delta Plan and Prime Minister Resolution 120 which emphasize water governance as a core adaptation mechanism (Smajgl, 2018).

The impact of provincial governance on farmers' livelihood transformation strategies in the VMD, particularly in Soc Trang province, demonstrates that ecological zoning regulations affect household livelihood strategies, particularly concerning crop selection, land use changes, and income diversification decisions. Nguyen et al. (2020) identified a robust correlation between legislative frameworks throughout the past 30 years regarding land use and livelihood

transformations, while acknowledging the challenges of implementing Vietnamese national legal frameworks at the province level in practice. Le et al. (2023) identified that regional-scale factors, such as local authority processes and water management infrastructure, greatly impacted land-use changes in the VMD, whereas household-scale factors also had a considerable role.

Provincial authorities in Soc Trang province, adhering to national frameworks including Decision 120, seek to advance livelihood patterns customised to local biophysical conditions, promoting fruit growing in freshwater regions and aquaculture in salty areas. In practice, many farmers prioritise rapid market incentives over ecological appropriateness or long-term adaptation strategies. A local official directly remarked, “They are increasingly transitioning crops in response to market demands than climate challenges. For example, if a crop isn’t selling well, they will cut it down and plant another crop”, and some farmers' independent choices that may contradict ecological limitations: “In regions with limited access to freshwater, people sometimes increase their rice crops due to market demands, which is against state management recommendations” (Quang, official). This highlights a prevalent disparity between top-down climate adaptation recommendations and the real situations of smallholder livelihoods. This exemplifies what Adger, I. Lorenzoni, et al. (2009) refer to as the “adaptation gap”, the difference between what is institutionally advocated as sustainable or risk-mitigating and what is implemented in practice due to socio-economic constraints. The decision to expand rice cultivation in areas with limited freshwater resources signifies a misalignment with sustainable agricultural strategies and highlights the socio-economic vulnerabilities that drive farmers to prioritise short-term gains over long-term sustainability (Chapman & Darby, 2016).

Moreover, scholars refer to such kinds of behaviour as "market-driven adaptation”, in which rural responses to climate variability are mostly shaped by economic imperatives, particularly short-term price fluctuations (Li et al., 2017). Farmers frequently adopt a flexible, trial-and-error methodology for adaptation instead of complying rigorously to state-led ecological directives, thereby enhancing short-term income while jeopardising long-term sustainability (Ahsan et al., 2021). The discrepancy between governance rationality and household adaptation strategies highlights substantial governance issues in climate adaptation planning, especially in areas such as the Mekong Delta, where socio-economic vulnerability corresponds with increasing environmental risks.

Likewise, variations in flood patterns and rising temperatures in An Giang province, especially in Phu Huu commune, have prompted shifts in regional agricultural practices. Local officials

report that since 2019, seasonal flooding has markedly diminished, resulting in both advantageous and adverse environmental consequences. Decreased flooding results in diminished damage to levees: “The advantage is that the levees (dikes) aren't damaged as much” (Nghia, official). The lack of natural flood cycles has reduced sedimentation and wild aquatic populations, leading to increased fertiliser application and a decrease in fish-dependent livelihoods: “When fields don’t flood, wild rice doesn’t die off, so farmers need to manage that” highlights a frequently neglected ecological impact of infrastructural developments, such as dike construction, in flood-prone regions like An Phu district, An Giang province.

The construction of dikes has modified the flood regime, reducing the risk of uncontrolled flooding and enabling farmers to shift from traditional, flood-reliant monocultures like rice to diversified or integrated livelihood options. These evolving circumstances have facilitated and promoted climate adaptation. Farmers in dike-protected areas are now transforming rice fields into more diverse agricultural systems, such as mango or lotus production, and integrated farming models like rice-fish farming. According to one official, “In Phu Huu, many have switched from three rice crops to two rice and one fruit crop like jackfruit, longan, and mango, yielding up to 10 million VND per field” emphasises a notable trend: when infrastructure offers a sense of environmental regulation and physical stability, farmers are encouraged to explore higher-value perennial crops such as mango. These transitions are both climate-resilient and economically strategic, establishing with farmers' objectives of income diversification and labour reduction (Fabrice G Renaud et al., 2015).

Such a transition exemplifies what academics refer to as “transformational adaptation” (Pelling et al., 2015) —a restructuring of production processes facilitated by government support and environmental measures. However, it also reflects broader dynamics in which the dike infrastructure offers flood protection and facilitates agricultural intensification, although they concurrently interrupt natural hydrological cycles that were essential in regulating invasive vegetation, such wild rice, and reducing wild fish habitat (V. K. Nguyen et al., 2019).

Nonetheless, whereas infrastructural improvements facilitate adaptation, economic rationale dominates in influencing livelihood decisions. In response to enquiries regarding the motivations for these transitions, an official remarked, “Farmers mainly respond to the market. They’ll plant what’s profitable and switch when prices drop”. This is further underscored by short-term responses to market volatility: “Some years, mango prices are very low – 1,000–2,000 VND/kg. Consequently, they down the trees and cultivate alternative crops. This behaviour corresponds with research on the role of economy in climate adaptation, where

income generation takes priority over long-term ecological planning, especially among smallholders with limited profit margins (Diamond & Ansharyani, 2018).

In conclusion, institutional support for climate adaptation at the two research locations of the VMD is predominantly influenced by state-led infrastructure and training programmes; nevertheless, its effectiveness is influenced by differences between centrally formulated adaptation strategies and the actual experiences of farming households, encompassing gendered labour divisions, ethnic language obstacles, and socioeconomic variations in resource accessibility. This is also consistent with insights of a gender expert, who stated:

> *"Women's knowledge in adapting to climate change. I find that in adaptation programs at both local and national levels, indigenous knowledge, especially that of women, hasn't been considered or addressed adequately. As you can see, climate action, adaptation programs, or action plans often involve big infrastructure projects, like dikes and roads, but don't address the simple issues in people's daily lives".*
>
> (Dang, expert)

The policy framework advocates for overarching goals such rural livelihood enhancement and sustainable development; nonetheless, experts emphasise a notable deficiency in the incorporation of gender equity at the macro level. An expert remarked, "The resolutions and overall plans usually don't focus much on gender. They mainly focus on general issues like creating job opportunities for rural areas, developing rural livelihoods, and sustainability related to social and biological factors. Policies are generally broad, and not very detailed. However, some lower-level programs, such as a program from the Ministry of Agriculture on cooperative development, which serves Decree 120 and the policy changes, have addressed gender issues. For example, they've prioritized creating jobs and livelihoods for women, particularly in cooperatives led by women" (Nhan, expert). It highlights the abstract aspect of high-level plans, which frequently lack practical processes, and measures of accountability to promote gender equity. Resolution 120, although progressive in its environmental vision of "living with nature", fails to explicitly delineate the implementation, monitoring, or resourcing of gender-specific adaptation, thereby exacerbate the actual integration of gender considerations into provincial or district action plans.

Promoting gender equity necessitates an understanding of how historical disparities in education, labour roles, and household decision-making persistently influence adaptive capacity. An expert from Can Tho University (CTU) observed that attaining gender equity in

adaptation is a gradual and socially entrenched process: "This is quite challenging - It requires time. Change takes time, and society must view the involvement of women in this field as natural and necessary. We need policies that prioritize women for lighter jobs compared to men, allowing them to earn higher wages and providing priority access to education. In the past, when families were poor, if they could only afford to send one child to school, it was usually the son who received an education" (Nhan, expert). The analysis underscores that obtaining gender equity demands more than equal participation; it requires specific policies that acknowledge and address enduring socio-cultural and economic disadvantages, providing women meaningful access to opportunities, resources, and leadership in climate adaptation initiatives.

Extensive infrastructural investments, including sluices, and dike construction initiatives, exemplify Vietnam's technocratic adaptation approach in accordance with Resolution 120 and the Mekong Delta Plan. These initiatives seek to improve water security and agricultural sustainability; yet, they may destabilise ecological balances, undermine local adaptation capabilities, and perpetuate structural reliance on technological solutions.

Infrastructural developments facilitate transformative adaptation, notably in areas such as An Giang, where dike systems have permitted crop diversification; yet, this transformation is predominantly market-driven. Farmers in saline-prone and floodplain regions generally prioritise immediate economic gains over ecological compatibility, frequently diverging from state-mandated zoning or cropping practices. The frequent substitution of crops due to price fluctuations demonstrates a flexible yet reactive adaptation approach that lacks alignment with long-term sustainability strategies.

Moreover, whereas infrastructure and policy initiatives establish essential foundations for adaptation, their efficacy depends on the inclusion of community-based approaches, recognition of socio-economic limitations, and promotion of inclusive governance. Failure to align institutional priorities with household-level decisions may exacerbate disparities and ecological vulnerabilities, undermining long-term adaptation in adaptation efforts (Adger, 2000).

7.2.3 Gender inclusion and climate adaptation governance

7.2.3.1 The role of local institutions in climate adaptation from gendered perspectives

The research investigates gendered perspectives of local risk management efforts in farming communities impacted by hazards; utilising household survey responses collected via a Likert scale from 0 (no response or don't know) to 5 (extremely high). The evaluated indicators encompass the perceived effectiveness of hazard instructions, adherence to local regulations, the duties of local authorities, the efficiency of accountable organisations, and general satisfaction with local hazard management. Responses were categorised by gender to examine disparities in the evaluations of institutional responsibilities and risk response procedures by male and female farmers. Figure 7.2 illustrates these tendencies, providing insights into social dynamics and participation under risk governance frameworks.

The finding elucidates numerous critical facts regarding gendered perspectives on risk management efficacy in relation to salinity impacts, identified as the most severe risk especially in An My commune. A prominent characteristic across all measures is the substantial percentage of participants who chose "no response or don't know", particularly among men, with percentages varying from 45.6% to 59.2%. The tendency was marginally lower among women however remained significant, with 40.5% to 54.1% of female participants selecting the same option. This pattern indicates a prevalent uncertainty or detachment from traditional hazard management processes. This may indicate a lack of understanding of institutional functions, ineffective communication techniques, or a greater disconnection between state-led initiatives and local realities. The elevated non-response rates among women may signify social exclusion from decision-making bodies and insufficient access to public information.

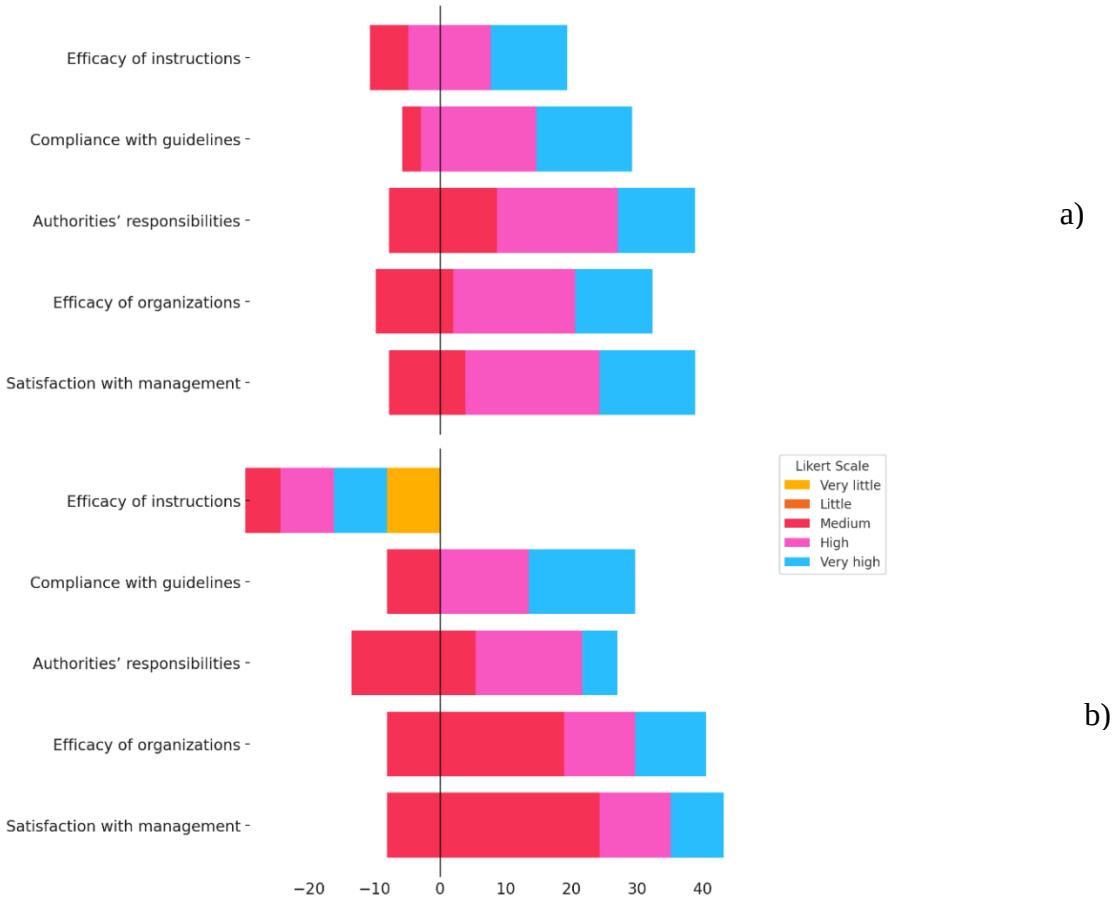


Figure 7.2 Gendered perspectives on risk management towards salinity impacts (n=70)

a) Male perspectives on local risk governance b) Female perspectives on local risk governance

Source: Household survey (2024).

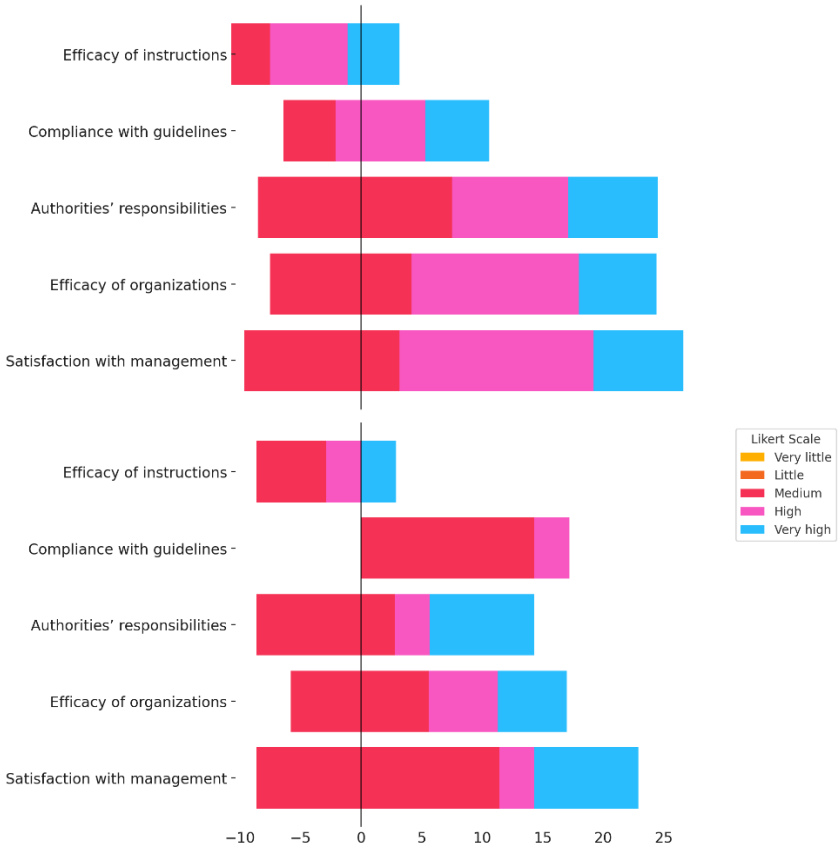
The diverging bar charts in Figures 7.2 and 7.3 were designed to visually distinguish between lower (negative axis) and higher (positive axis) Likert-scale responses. Upon analysing the Likert scale replies while excluding non-responses, a distinct difference in gender becomes evident. Male participants demonstrated the greatest confidence in local risk management, with 35.0% ranking their satisfaction as excellent or very high, in contrast to merely 18.9% of female participants. In a comparable way, 30.4% of males regarded local responsible organisations in risk planning and management as effective, whereas just 21.6% of women held that perspective. The data indicate that male farmers may possess enhanced access to institutional support or are more frequently incorporated into formal communication and training initiatives. Their positions in public or agricultural sectors may facilitate more regular interactions with local authorities, so increasing their sense of institutional efficacy.

Conversely, the relatively lowered favourable ratings among female participants, especially regarding satisfaction with risk management (18.9%) and views on institutional responsibility (21.6%), suggest that women may perceive a lack of support, inclusion, or information from

current risk response frameworks. Their diminished ratings may indicate experiences of exclusion from decision-making settings, inadequate representation in risk preparedness initiatives, or insufficient acknowledgement of their special gendered needs and vulnerabilities in institutional planning. The gender disparities indicate a more profound concern: the insufficient visibility of gender-responsive governance in risk planning. The diminished evaluations from female participants underscore possible deficiencies in the current systems' ability to address the distinct vulnerabilities and roles of women in agricultural areas. Risk preparedness and management frameworks frequently emphasise technical and infrastructural solutions while insufficiently addressing the social aspects of vulnerability (Garschagen & Sandholz, 2017). Consequently, the needs of women, especially in caregiving capacities, domestic water management, and post-disaster recovery, may be neglected.

While there is less of a gender discrepancy in terms of guidelines compliance (32.1% of men and 29.7% of women expressed high or very high agreement), it is still evident that women are continually less likely to have a positive opinion of local risk governance. This pattern highlights the necessity of including gender-sensitive strategies into risk management. Institutional measures have to go beyond standardised technical solutions and consider the distinct experiences of men and women, ensuring equitable access to information, involvement, and support systems for all genders.

The study also examines gendered perspectives on the effectiveness of risk response to extreme heat and droughts, identified as the second disaster risk in the two research locations (see Figure 7.3). Both male and female participants exhibited differing levels of scepticism; however, women were typically more critical or uncertain regarding the roles of local institutions, demonstrating decreased confidence in essential components such as instructional efficacy, adherence to guidelines, and overall satisfaction with risk management.



a)

b)

Figure 7.3 Gendered perspectives on risk management towards excessive heat and drought impacts (n=70)

a) Male perspectives on local risk governance b) Female perspectives on local risk governance

Source: Household survey (2024).

A notable pattern is the restricted positive assessment of hazard instructions. A mere minority of both male and female participants assessed instructional efficacy as "high" or "very high" (10.7% for males and 5.8% for females), with a significant proportion of women opting for lower ratings. This indicates that communication strategies during extreme heat and drought conditions may not be properly reaching or resonating with local inhabitants, particularly women. Their responsibilities in caregiving and domestic water management may lead them to encounter the constraints of these directives more severely, especially if these directives do not account for gender-specific requirements.

In terms of compliance to local risk guidelines, males exhibited marginally more confidence, with over 12% categorising compliance as "high" or "very high", whereas female assessments were predominantly at the "medium" level (14.3%), with no responses at the highest level. This gap may indicate variations in exposure to institutional messaging. Men are more inclined to participate in commune-level meetings or obtain technical briefings, while women may lack

direct access to official channels, resulting in little understanding or experience of hazardous standards.

The perception of local authorities' responsibilities in addressing natural hazards exhibited a comparable trend. A greater percentage of men rated the authorities' roles favourably (more than 17% evaluated them as "high" or "very high"), whereas women's ratings were predominantly in the lower and middle ranges. Merely 11.5% of women considered these organisations high scores. This indicates that, despite continuous governance initiatives, numerous women do not view these measures as sufficiently addressing their needs and interests, perhaps due to insufficient inclusion in risk planning processes.

In rating the effectiveness of responsible organisations in risk planning and recovery efforts, male participants demonstrated greater confidence, with 20.2% ranking it as "high" or "very high", in contrast to merely 11.4% of female participants. The comparatively subdued female reactions may indicate limited organisational involvement with women or a gap between institutional programming and real-life experiences of women in drought-affected households. In the absence of direct outreach or participation, women's perspectives are likely influenced by limited engagement and indirect access to hazard support services.

The indicator reflecting satisfaction with local risk management had the greatest significant gender disparity. Over 23% of men assessed their pleasure as "high" or "very high", whereas only 11.5% of women provided comparable scores. Women predominantly responded with "medium", and a considerable percentage indicated dissatisfaction by selecting "very little" or "little". This discontent may arise from the unequal pressure women endure during extended heat and water stress, or male-dominant risk planning.

The findings indicate profound societal differences in the lived experience and perspectives on risk governance. Men, who are more often engaged in formal networks and positions of power, frequently rate institutions more positively. Conversely, women seem to encounter marginalisation, diminished access to information, and insufficient acknowledgement of their distinct vulnerabilities and duties. These findings underscore the significance of gender-sensitive risk governance, ensuring that women are not merely beneficiaries of aid but also active participants in decision-making, implementation, and feedback processes (Enarson & Chakrabarti, 2009). In the absence of this transition, institutional initiatives may exacerbate the marginalisation of vulnerable populations, especially in response to climate-induced events such as salinity, extreme heat, and droughts (Agrawal & Perrin, 2009).

7.2.3.2 Community-level climate adaptation strategies

The data from An My commune offers insights into gendered participation in climate adaptation approaches addressing saltwater intrusion, specifically regarding the communication channels utilised by local authorities and perceived by rural communities. There exists a pattern of partial overlap in the access to adaptation information between males and females, alongside substantial gender discrepancies that indicate underlying structural barriers.

Chapter 6 presented overarching patterns regarding gendered access to climate information sources, whereas the data shown in Figure 7.4 particularly examines salinity-related information, offering a more nuanced contextual examination of the operational nature of these channels. Among male participants, a substantial 75.9 percent reported receiving salinity updates via Zalo, a mobile messaging service, whereas just 54.5 percent of female participants said the same (see Figure 7.4). Farmers characterise the integration of Zalo as a mechanism for obtaining real-time salinity level notifications, facilitating informed decision-making for irrigation strategies. Assertions such as "We rely on community networks like Zalo for real-time information on salinity, which is crucial for protecting our crops" (Van, AM) indicate that digital media now has a central position in community-based adaptation and local government communication initiatives. However, this difference in reported Zalo usage between men and women may reflect variations in digital access or familiarity, suggesting that men may possess more regular or independent access to cell phones and online platforms, or they may have more time than women to engage with such digital resources. It underscores the digital divide that can impede timely information availability for women in rural areas, hence impacting their climate adaptive capability and decision-making abilities (Huyer, 2016b).

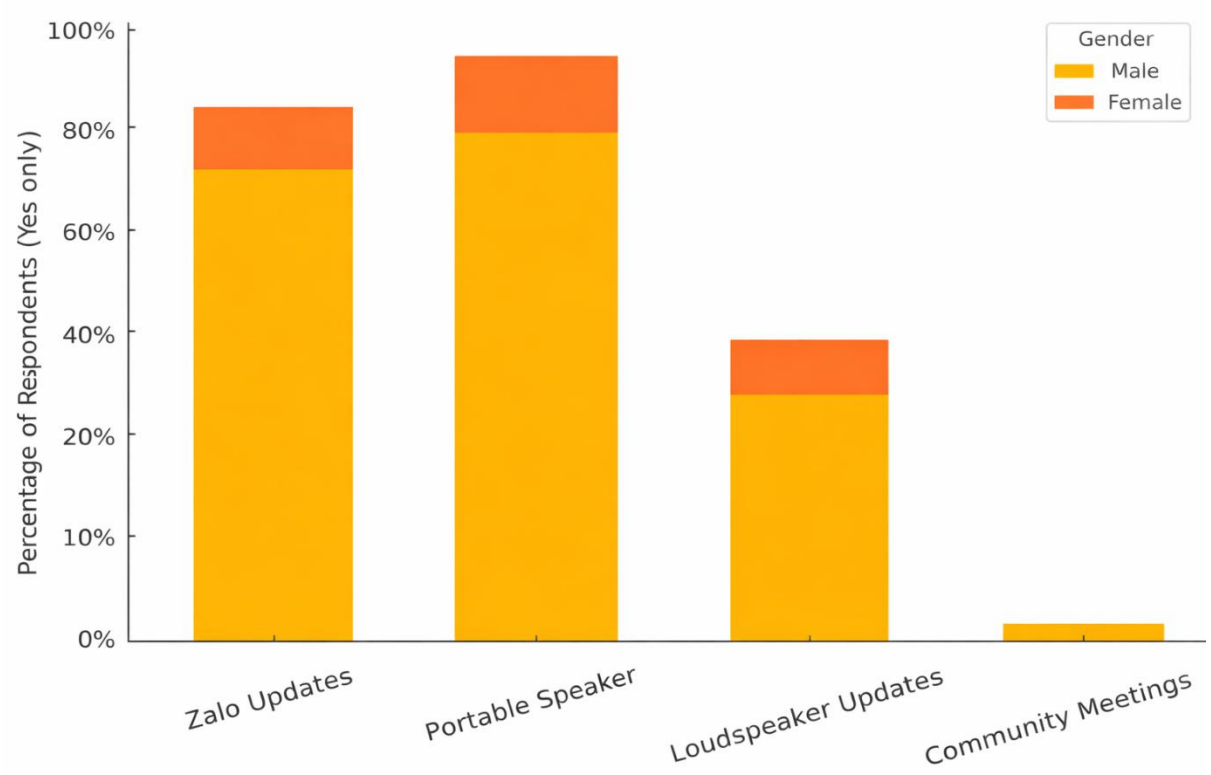


Figure 7.4. Gender-based access to salinity information sources among the selected participants

Source: Household survey (2024).

Portable speakers have become a prevalent and widely accessible means of communication, as indicated by 81 percent of male participants and nearly all female participants reporting access. The device is utilised in emergencies, such as when salinity levels abruptly rise, adversely affecting farmers' growing crops. This indicates that, notwithstanding digital disparities, portable speakers function as an efficient and equitable means for communicating saline intrusion information. The consistency of usage among genders suggests its viability as a fundamental strategy for inclusive adaptation communication, especially in contexts where alternative methods may marginalise specific demographic groups, such as the Khmer.

Concerning loudspeaker notices, a conventional village communication strategy, 41.4 percent of males and 45.5 percent of females indicated they received information through this form of communication. The comparatively diminished use of loudspeakers relative to portable speakers indicates that, although they retain a function, they may be perceived as less reliable or less heard. The relatively equal gender distribution suggests that this channel is broadly inclusive and might be enhanced within a comprehensive risk communication framework.

Participation in community meetings was limited for both genders; however, no female participants indicated that they received hazard information via this form of communication. This pattern may indicate structural or practical limitations on community-level involvement. The overall lack of female involvement in these contexts most likely indicates various obstacles such as time constraints, societal standards, or restricted opportunities to engage in formal discussions. This exclusion has considerable implications, since it restricts women's abilities to express concerns, gain insights from others, and influence local adaptation strategy.

In summary, the data indicate some communication methods, such as local portable speakers, are widely inclusive, whilst others, including Zalo updates and community meetings, exhibit distinct gender discrepancies. These deficiencies highlight the necessity for local authorities to implement a multi-channel communication plan that emphasises women's access to timely and pertinent climate information. Equitable distribution of adaptation efforts among all community members is crucial for strengthening adaptation against environmental stresses like seawater intrusion (Fox et al., 2023).

Additionally, the results show that both male and female participants in Phu Huu commune shared the belief that local efforts to adapt to climate change in the face of extreme heat and drought are either non-existent or ineffectual. Male participants consistently highlighted the absence of observable activities or support, using expressions like "There is none" and "Not yet available", which emphasises a systematic breakdown in communication and implementation. The single male reference to an early warning notice represents the sole limited instance of governmental action, indicating a top-down strategy that is devoid of substantial support or collaboratively planned initiatives for a risk planning and management.

Female participants similarly conveyed a profound sense of neglect, with their succinct yet assertive remarks underscoring the belief that no accessible or responsive adaptation strategies are available. Their repeated usage of "There is none" and "Not yet available" indicates not only a lack of specific interventions but also diminished expectations concerning local institutional support. Additionally, a limited number of women reported receiving formal warnings or participating in institutional communication, and such expressions were infrequent among men as well. This pattern indicates limited outreach overall, although the substantial absence of women's responds may signify further gender-specific obstacles to obtaining information and engaging in adaptation plans. (Gumucio et al., 2020).

The comments illustrate a scenario in which both men and women perceive a lack of institutional support about climate risks; yet, women's expressions seem more succinct and distant, possibly indicating marginalisation and restricted agency. These findings indicate an immediate necessity for local authorities to progress beyond symbolic communication to implement transparent, inclusive, and gender-responsive adaptation planning. According to Ahmed and Fajber (2009), establishing legitimacy and confidence necessitates not just transparent and contextually relevant strategies but also proactive involvement with both men and women in rural communities, ensuring that adaptation is collaboratively operated and fairly implemented.

In summary, the data from An My and Phu Huu communes indicate a distinct gendered aspect in the climate adaptation techniques of institutional governance, specifically with saltwater intrusion, heat, and drought. Typically, the primary link between authorities and grassroots groups in reaction to hazard-related occurrences encompasses communication methods, which differ by gender. While certain channels, such as portable speakers, offer extensive and inclusive access to adaptation information across genders, others, including digital platforms like Zalo and in-person community meetings, demonstrate substantial gender disparities. These disparities indicate underlying structural problems, including unequal digital access, time scarcity, and societal norms that restrict women's involvement in both formal and informal adaptation processes (Gumucio et al., 2020).

The increased access of men to Zalo-based salinity updates underscores the persistent digital gap, whereas women's considerable reliance on portable speakers, likely shaped by constraints in access to mobile technology. The total absence of women at community meetings raises concerns over their exclusion from essential dialogue and decision-making arenas, thereby restricting their capacity to influence and gain from local adaptation measures. These patterns underscore the necessity of implementing multi-channel communication techniques that are attuned to gender-specific constraints and enable marginalised groups, especially women and ethnic minorities, to obtain timely and relevant climate information (Diouf et al., 2019).

Overall, these findings underscore an immediate necessity for local adaptation governance to transcend hierarchical approaches and advance towards inclusive, gender-responsive planning. This necessitates expanding communication channels and maintaining adequate involvement of both men and women in the design, implementation, and evaluation of climate adaptation initiatives. In the absence of such transformations, institutional interventions may exacerbate

existing gaps and neglect to foster the community adaptation essential for addressing increasing environmental risks.

7.2.3.3 Gendered satisfaction of community-level climate adaptation strategies

The gendered experiences of climate adaptation are increasingly acknowledged as essential for understanding the effectiveness and fairness of local responses to environmental change. In the two research sites, both genders encounter climate-induced risks, yet their perceptions of community-level adaptation strategies exhibit nuanced distinctions influenced by roles, resource accessibility, and socio-political power. This section critically analyses the interpretations and satisfactions with adaptation strategies employed by local authorities, based on qualitative insights from male and female participants. Understanding these gendered perspectives is crucial not only for identifying practical gaps in policy implementation but also for revealing how adaptation is socially experienced and interpreted.

Concerning geographical aspects, both male and female participants indicate a profound structural challenge in adaptive governance: the unequal distribution of communication infrastructure. Comments from males, such as “Loudspeaker-based announcements are outside, not reaching us here”, exemplify how geographical obstacles, even within a community, can obstruct timely access to vital information like salinity levels or drought messages. Simultaneously, women's statements: “I live far in the inner field, so community announcements frequently do not reach my house” indicate a dual layer of exclusion: geographic isolation exacerbated by gender-based marginalisation (Ylipaa et al., 2019). Previous research indicates that women in rural regions are less likely to be incorporated into official decision-making processes or to have access to technology-based information platforms, such as smartphones or internet-enabled devices (Huyer, 2016a). Their dependence on indirect verbal communication results in disruptions or deficiencies in these systems, which directly correlate with increasing vulnerability.

In the case of salinity intrusion, both male and female participants recognised and were satisfied with the involvement of local authorities in distributing information regarding salinity and constructing salinity-prevention infrastructure, including sluice gates. Men typically articulated responses about technological effectiveness and system performance, frequently emphasising instruments such as Zalo updates and real-time salinity monitoring (see Figure 7.6). A male participant remarked, “Reporting salinity levels twice a day is already good”, and another stated, “There are groups monitoring water conditions to help farmers prevent salinity”

highlighting the significance of digital communication in agricultural decision-making. This aligns with broader studies indicating that men in rural areas frequently utilise adaptation strategies as extensions of their perceived administrative responsibilities regarding land and infrastructure (Segnestam, 2017). Women, although valuing timely knowledge, underscored the importance of emotional assurance and the social relevance of being informed. Statements like “When they inform us, I feel very happy” exemplify that climate communication encompasses not just the dissemination of information but also the experience of being recognised and supported.

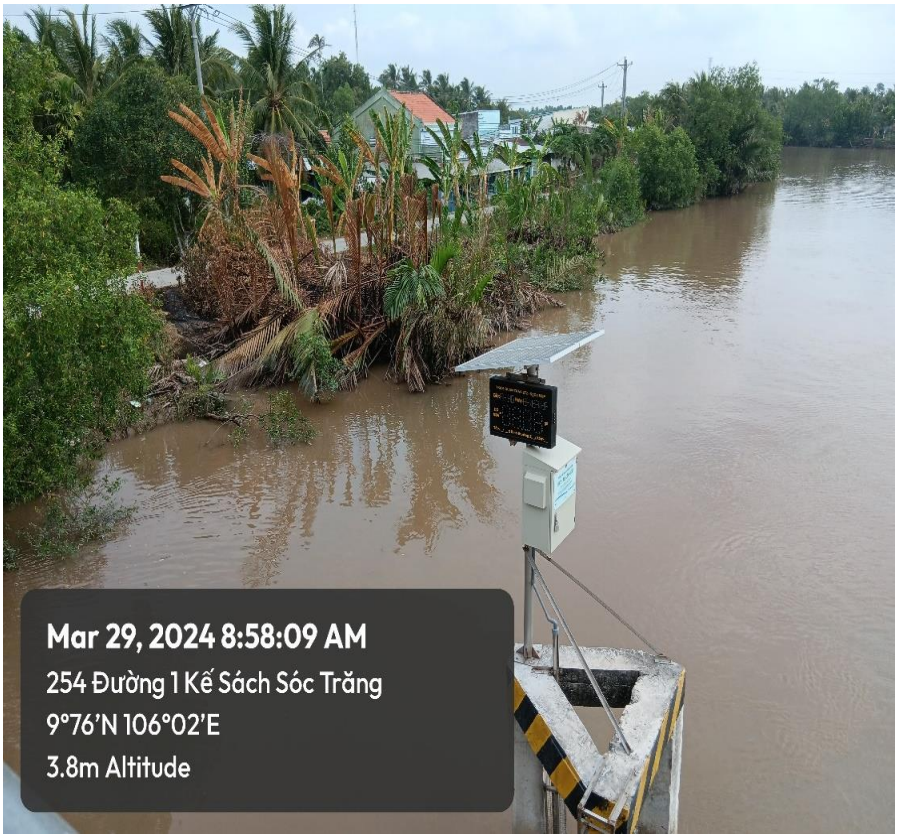


Figure 7.5 Saltwater level measurement system in An My commune

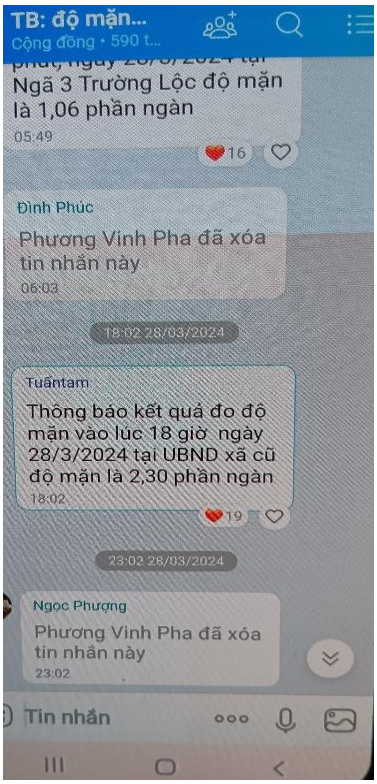


Figure 7.6 An interface of Zalo application for community group managing salinity (590 people) in An My

Source: Thai Van Nguyen (2024).

The gendered disparity in perceptions of post-disaster governance highlights underlying patterns of power, involvement, and access to institutional processes. Male remarks, exemplified by the assertion “Officials chose acquaintances to support instead of those with real needs”, demonstrate male involvement with governmental structures as domains of accountability and equity. The findings correspond with insights from political ecology and catastrophe governance literature, indicating that men, often possessing greater social or

political capital, may be more inclined or capable of challenging perceived disparities within formal institutions (Faas et al., 2014).

Women participants, in contrast, emphasised the lack of practical recovery help rather than political favouritism. As one woman stated, “They only notify about salinity levels, but when damage occurs, no one checks in or provides support (money, recovery plans, or seedlings)”. Another echoed, “We haven’t received any support at all”. Although information transmission, such as salinity alerts through Zalo, has become an important attribute of local adaptation approaches, it demonstrates that information alone is inadequate in the absence of material recovery help. Participants emphasise practical deficiencies, such insufficient financial aid, planting resources (e.g., seedlings), and planning assistance, indicating that their primary concern is the recovery of livelihoods rather than mere warning. This corresponds with responses in the climate adaptation literature that underscore the significance of practical, post-disaster support mechanisms in enhancing risk communication systems. Davies et al. (2009) contend that adaptive capability cannot be fully achieved without adequate investments in social protection, compensation, and livelihood recovery efforts. The community's dissatisfaction highlights a fundamental issue of policy fragmentation, wherein early-warning technologies are implemented but lack corresponding coordinated post-disaster solutions (Perera et al., 2020).

Male participants articulated concerns about current climate governance by recalling past periods when government coordination was perceived as more effective. A male farmer recollected, “Back then, flood management was effective, with coordination between people and authorities. Now, there’s no notification or activity”. Currently, there is an absence of notifications or activity. These remarks indicate a profound expectation of governmental efficacy rooted in historical tradition, and the present disengagement is perceived as a deterioration in governance standards rather than simply an absence. This perspective corresponds with research suggesting that men, frequently occupying formal or public agriculture positions, are more inclined to perceive climate governance in terms of institutional responsibility (Galwab et al., 2024).

In contrast to male participants, who frequently frame adaptation within historical contexts and evaluate institutional efficacy, female participants emphasise current situations and urgent coping needs. Expressions such as “I don’t really hear about climate adaptation plan here clearly, and I’m not satisfied either” indicate both inconsistency and an absence from formal governing frameworks. This disparity is extensively recorded in gender and climate research,

indicating that women, particularly in rural or marginalised settings are often underrepresented in planning procedures and obtain information through informal channels (Dewachter et al., 2018).

Another gendered distinction lies in the way participants interpret and experience institutional support. Some male participants cited specific examples of canal dredging and rapid emergency responses, such as “Certain support was timely within 15–20 minutes, commune staff would arrive”, and “Dredging provides water for pumping” demonstrate a pragmatic and performance-oriented interaction with state-led adaptation. Such comments highlight measurable efficacy and rapid service provision, indicating that male farmers frequently assess institutional support based on criteria of technical performance and operational efficiency. This viewpoint is influenced by their function as land managers and key participants in public agricultural domains, which may enable more direct engagement with local authorities and infrastructure systems (McCarthy & Kilic, 2015).

Conversely, female participants interacted with the same sources of support in a more emotional and experienced manner. The statement, “Canal dredging is very helpful because it is easy to access irrigation, makes me feel secure to cultivate crops”, underscores the psychological and emotional confidence afforded by visible state actions, rather than their technical efficacy. This perspective corresponds with studies indicating that women frequently perceive adaptation in terms of wellbeing, relational stability, and practical significance to everyday livelihoods and household-related activities (Rao et al., 2020).

Overall, the analysis indicates that although both male and female participants from the two research locations recognise the importance of institutional involvement in climate adaptation measures, their experiences, expectations, and levels of satisfaction with these approaches differ markedly along gender lines. Men typically assess the efficacy of adaptation based on technical performance, access to digital communication, and past institutional memory. They frequently express their expectations and remarks by citing previous state-led initiatives and evaluate the quality of support based on efficiency, organisation, and operational reliability.

Conversely, women prioritise emotional reassurance, social inclusion, and the sufficiency of material support after disasters. Their contentment with adaptation tactics is more closely linked to the impression of support and recognition within the community than to technology systems. Women exhibit pronounced dissatisfaction when recovery support is lacking, emphasising shortfalls in essential services such as financial assistance or agricultural

resources, so underscoring their vulnerability in the absence of robust post-disaster frameworks.

The findings highlight ongoing obstacles in communication infrastructure and geographic inclusion, impacting both genders, but disproportionately affecting women due to the compounded difficulties of spatial isolation and restricted access to digital platforms. The isolation of women from community meetings exacerbates their marginalisation in adaptation planning processes, limiting their agency and undermining the inclusiveness of institutional solutions.

Both men and women articulated substantial disagreements with adaptation initiatives for emerging threats such as heat and drought, however their perspectives vary. Men view these gaps as a disruption of established governance traditions, but women emphasise the urgency of unmet needs and their marginalisation from formal planning processes. This gendered disparity in understanding institutional absence illustrates broader socio-political issues in rural governance and adaptation frameworks.

7.4 Social and institutional drivers of climate vulnerability

7.4.1 Perceptions and accessibility to and control over community resources

Comprehending the perceptions and access of men and women to risk management information is essential for evaluating the inclusion and effectiveness of local and national climate adaptation efforts. In the two research sites, where communities are often subjected to climate-induced hazards such as unusual floods, extreme heat, droughts, and saline intrusion, institutional awareness can profoundly impact households' preparedness and adaptive measures. Gendered differences in access to information and participation in formal risk management systems may result in inequitable outcomes in risk reduction and recovery. This analysis utilises semi-structured data to critically assess gender disparities in awareness of disaster policies and programmes.

The research indicates a gender gap in the awareness of local and national disaster management initiatives. Of the 103 male participants, 39.8% indicated awareness of such programmes. Conversely, merely 21.6% of the 37 female participants demonstrated any awareness. This considerable disparity reveals that almost three-quarters of women in the sample are uninformed, in contrast to approximately 60% of men (see Figure 7.7). Despite overall inadequate understanding among both groups, the gender disparity indicates systemic obstacles in the communication and accessibility of risk information. These obstacles are frequently

grounded in gendered social roles, wherein women, especially in rural regions, experience reduced access to official information sources due to limitations such as restricted mobility, lower educational levels, and exclusion from community meetings or agricultural training sessions (Dhaka et al., 2012).

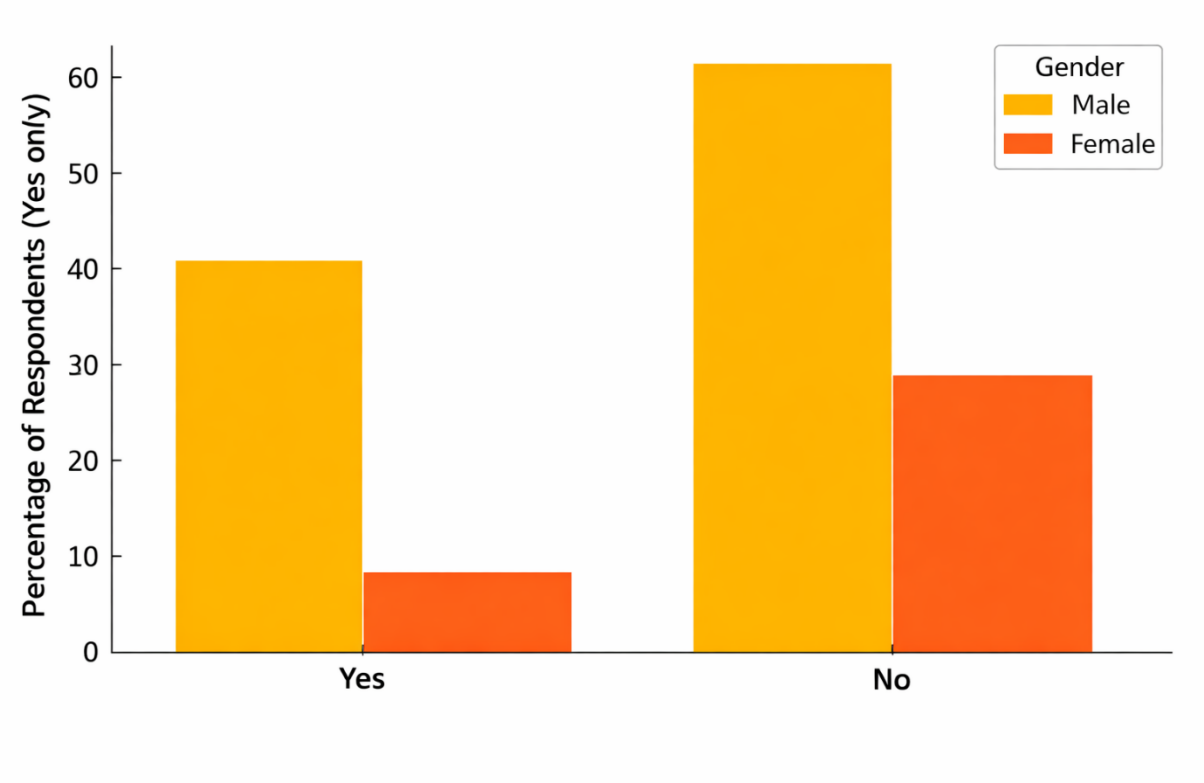


Figure 7.7 Gendered perception of risk management programs (n=140)

Source: Household survey (2024).

Men's heightened awareness is likely influenced by their responsibilities in land and infrastructure management, where they more often participate in commune meetings or engage with local authorities. This access brings them nearer to institutional knowledge sources, albeit they may not consistently act on it. However, the representation of some male farmers highlights the significance of informal social environments, especially the "cafe in the field" as essential venues for the exchange of knowledge and adaptive learning among male farmers (see Figure 7.8). One farmer remarked, "Every morning, a large group of people meet at the local coffee shop to talk about work, farming, and daily life. We go to the coffee shop around 5-6 AM and meet with neighbours to catch up on what's happening. The coffee shop is where most people gather to exchange news and talk about their crops and local events". In contrast to conventional state-operated extension programmes or organised community forums, these informal assemblies illustrate how trust, accessibility, and cultural understanding influence male involvement in discussing about local climate adaptation governance and agricultural decision-making.

Figure 7.8 Informal social gatherings in An My
Source: Thai Van Nguyen (2024).

The daily pattern of early morning discussions illustrates a gendered adaptation framework, wherein males, typically unrestricted by home duties at this time, gather in public venues to deliberate on agricultural techniques, exchange local news, and analyse weather information. Statements such as *"*Talking with others at the coffee shop can give you useful tips about farming and dealing with pests. We learn a lot from each other informally—someone might share how they dealt with a certain issue, and it helps the rest of us*"* exemplify the practical purpose of these environments in facilitating peer-to-peer knowledge exchange. These hubs function as social gatherings and decentralised knowledge networks where experienced insights, particularly those inaccessible through formal routes, are shared and confirmed. This also pertains to extensive research on social capital and adaptive capacity. Adger (2003b) posits that social networks are crucial factors in adaptation, as they enable resource sharing, collaborative decision-making, and local innovation. Nyantakyi-Frimpong and Kerr (2017)

assert that informal learning environments among farmers might cultivate locally suitable solutions that are more congruent with agroecological and cultural contexts.

Conversely, women, whose work is primarily focused on domestic caregiving and informal economic activities, are frequently neglected by communication strategies that emphasise formal meetings or technical distribution methods (Steeves, 1996). Some responses like "We don't participate in anything around here. If we were informed, we'd go, but they don't notify us", and another noted "We don't get informed. If we're told, we go to everything. But if we're not told, we can't go" (Semi-structured interviews, 2024) reflects not disinterest but a fundamental deficiency in communication. The lack of women in public climate-related hazard adaptation initiatives is sometimes misunderstood as a lack of interest, but in actuality, it reflects institutional exclusion and gendered presumptions about who is knowledgeable, whose opinions count, and how information should be disseminated. This corresponds with prior research findings that suggest gendered involvement disparities in climate governance stem not from indifference, but from unequal access to information, time constraints, and social hierarchies (Hemmati & Röhr, 2009). In the absence of intentional measures to include women via avenues that align with their everyday lives, developmental prospects, and social environments, governance frameworks may perpetuate marginalisation and intensify vulnerability (Oloko et al., 2024).

7.4.2 Livelihood transformation: NGO-led interventions in An My commune

In response to the compounding challenges of poverty, climate variability, and social marginalization in Ke Sach district, local NGOs in An My commune has initiated targeted livelihood transformation programs aimed at building climate adaptation and promoting socio-economic inclusion. Supported by international development partners such as ActionAid and Bread for the World, these interventions are framed within a broader agenda of community-based development and risk reduction. As noted by one NGO staff member, "Our primary goal is to support local development programs that help reduce poverty and improve livelihoods for the people".

The initiative, launched in mid-2022, targeted 70 households across three high-risk communes. Selection criteria emphasized the inclusion of communities most at risk, such as low-income groups, Khmer ethnic minorities, and women-headed households. "These communes were chosen based on three criteria: a large Khmer population, a high poverty rate, and being heavily affected by natural hazards" the staff member explained. Community meetings involving 50 to

60 households were held in each village, with local leaders helping to identify eligible participants.

7.4.2.1 H'Mông black chicken farming

A key feature of the intervention was the introduction of a climate-adaptive livelihood model cantered on H'Mông black chicken farming (see Figure 7.9). This model responded directly to the declining viability of traditional practices like rice and fruit farming, which have been adversely impacted by salinity intrusion and erratic weather. "Climate change has had a huge impact on the region... farmers are adapting by shifting away from crops that are vulnerable... and moving towards more resilient models, like livestock farming" (Tam, NGOs) noted the project staff. H'Mông chickens, known for their adaptation to harsh conditions, were selected for their suitability in this changing environment. "They have a stronger immune system and can adapt better to the fluctuating conditions in the Mekong Delta" the staff added.

Each participating household received 100 vaccinated chicks and an incubator. Although the initial plan included providing parent chickens, "we couldn't secure a reliable source for them, so we focused on providing chicks and incubators instead" (Tam, NGOs). The chicks were sourced from a breeding centre in Soc Trang, where they were raised for seven days to receive vaccinations and health checks before distribution. Women played a vital role in the implementation of this model. Even in households officially led by men, "it was often the women who did most of the work with the chickens" (Tam, NGOs). This underscores the gendered labour contributions in their daily livelihoods and reflects how adaptation projects can simultaneously create opportunities for women's economic participation, even when not explicitly framed as gender-focused.

Figure 7.9 H'Mông black chicken farming in An My

Source: Thai Van Nguyen (2024).

To support the implementation, project staff established Zalo groups in each commune, connecting farmers, veterinary personnel, and coordinators for real-time communication and issue resolution. While only selected households received full material support, others were welcomed to join the technical training sessions: “They heard there was free chicken support, so they showed up. But we made sure only the households that met the project’s criteria received full support... we even helped them connect with markets for selling their products”. (Tam, NGOs).

Despite the promising results, challenges remain. The team struggled with sourcing healthy chicks and ensuring that farmers could properly use incubators and manage poultry health. “One of the main challenges has been finding reliable suppliers for the chicks... some farmers need more support in learning how to use the incubators properly” (Tam, NGOs). To address this, the NGO provided hands-on training, regular check-ins, and facilitated access to veterinary services when needed.

Early feedback has been positive, with participants reporting steady income generation and interest in continuing the model. “The farmers who have started with the H’Mông chicken model have been able to raise healthy chickens and generate a steady income” (Tam, NGOs). The model is already showing signs of scalability, and the project team is exploring expansion options. “We’re planning to scale up the model... and improve market access so they can sell their chickens at a better price and reach a wider market” (Tam, NGOs).

The H’Mông chicken livelihood model is a viable option for income diversification and climate adaptation, although it also exposes inherent gendered issues within rural household labour dynamics. Despite the intervention not being expressly framed via a gender perspective, women predominantly assumed the role of performing the daily chores of chicken farming. A project staff member observed, “even when the household was registered in the husband’s name, it was frequently the women who undertook the majority of the work with the chickens” (Tam, NGOs). This demonstrates the continued existence of gendered labour divides behind purportedly gender-neutral livelihood options.

This additional task significantly contributes to the well-documented "double burden" experienced by rural women, who must reconcile productive labour with reproductive and community caregiving roles (Resurrección, 2013). The strategy may unintentionally strengthen existing labour norms by institutionalising women's contributions without acknowledging or compensating their efforts, rather than contesting or redistributing them. Moreover, by failing

to openly confront intra-household power dynamics or advocate for equitable labour obligations, the project compromises the perpetuation of conventional gender hierarchies, wherein men retain decision-making power while women provide labour. If ignored, these interventions can normalise women's invisible labour and reinforce gender norms linking women to unpaid care and subsistence activities (Elmhirst, 2011; Rao, 2020).

Consequently, although the approach is technically proficient and economically advantageous, it underscores the imperative for adaptation projects to extend beyond mere inclusion and rigorously examine the distribution of labour, responsibility, and decision-making across genders. In the absence of this, initiatives aimed at enhancing climate adaptation may unintentionally perpetuate the gender inequities they aim to address.

7.4.2.2 Black Apple Snail (Ốc bươu đen) Farming

In addition to the H'Mông chicken model, the black snail farming initiative in An My commune represents a locally driven, ecologically grounded livelihood innovation aimed at addressing income instability and maximizing the use of natural resources. Initiated in 2019 and still expanding as of the time of study, the black apple snail model arose from local interest and ecological suitability rather than external project design. As noted by a project coordinator, "It was mainly due to the needs and requests of the local people... they didn't want to just use the snails for personal consumption anymore; they wanted to create a stable income for their families".

Black apple snails (ốc bươu đen) are native to the region, commonly found in the freshwater ditches surrounding fruit farms in Ke Sach district. Prior to the project, some households had already raised these snails at small scales, but lacked technical knowledge, disease management skills, or market-oriented practices. "The snails were there, but they didn't know how to manage them, so they'd lose them without understanding the reasons" one staff member observed. In response, the project introduced structured training sessions in partnership with a local snail farm, equipping participants with knowledge on pond cleaning, snail disease prevention, and feeding techniques. The initial provision of snail seeds and exposure to successful farming practices encouraged farmers to treat snail rearing as a viable business rather than an informal activity.

At present, six households in An My are involved, with each generating an income of approximately 2 million VND per month through weekly sales of around 10 kilograms of live snails. As a local NGO staff remarked: "Now they have a steady income... plus, they sell snail

seeds too". Although modest in scale, the model is valued for its adaptability, low capital requirements, and effective use of existing water resources. Moreover, its success has stimulated local demand, with orders now received from larger urban centres such as Can Tho City.

Recognizing the seasonal fluctuation in snail prices and overproduction during the rainy season, the project has recently begun exploring value-added processing. As a local NGO staff remarked: "We're experimenting with something called 'gác bếp' snails—basically, dried snails. This way, we can preserve them for longer, and they can be sold year-round". These efforts have opened new possibilities for product diversification, improved income stability, and local economic adaptation. Simultaneously, the initiative has integrated digital literacy and marketing skills, including Facebook livestreams and photo-based advertising to support small-scale farmers in accessing broader markets.

Figure 7.10 Black Apple Snail (Ốc bươu đen) Farming in An My

Source: Thai Van Nguyen (2024).

Despite its success, a critical gender analysis reveals important tensions. Similar to the chicken farming model, women are likely the main caretakers of the snail ponds, although this contribution is not formally recognized or compensated. Given the labour-intensive nature of snail farming, especially in cleaning ponds, monitoring water quality, and processing snails, this model may inadvertently reinforce gendered labour expectations without addressing the need for redistributing household tasks or enhancing women's decision-making roles. As noted

in broader feminist scholarship, livelihood programs that focus solely on economic outcomes often overlook how these initiatives may entrench or reproduce traditional gender norms (Elmhirst, 2011; Rao, 2020). Without gender-sensitive design and follow-up, the burden of adaptation may fall disproportionately on women, especially in contexts where unpaid labour is normalized.

Nevertheless, the black snail model demonstrates how grounded, ecologically appropriate, and socially embedded strategies can foster not only adaptive capacity but also community ownership of livelihood transitions. “It’s all about adding value to what they’re already doing” one NGO staff member emphasized, highlighting the shift from basic farming to sustainable micro-enterprise. However, for these models to be truly transformative, they must not only improve incomes but also challenge the structural inequities that shape who labours, who decides, and who benefits.

7.4.2.3 Institutional supports towards the poor households

Among the seven hamlets in An My commune, An Nghiep is distinguished. It accommodates approximately 700 to 800 homes, all of which are Khmer. This locale has historically been inhabited by individuals closely linked to the land, although poverty and water scarcity persistently influence daily existence. In recent years, An Nghiep has emerged as a central hub for local initiatives designed to assist impoverished and near-impoverished households. Among the several support measures being implemented, one project has garnered particular attention: the distribution of large-capacity water tanks.

An My, once designated as a disadvantaged commune under Programme 135, has now shifted to receiving assistance through the Ethnic Minority Programme. These programmes emphasise help for underprivileged households, providing financial support, livestock, and vocational training (see Figure 7.11). For instance, within Programme 167 under the Ethnic Minority Program, the assistance per household has escalated from approximately 8–9 million VND to about 40–50 million VND. Families obtain not only monetary assistance but also cattle and counsel to explore new vocational avenues.

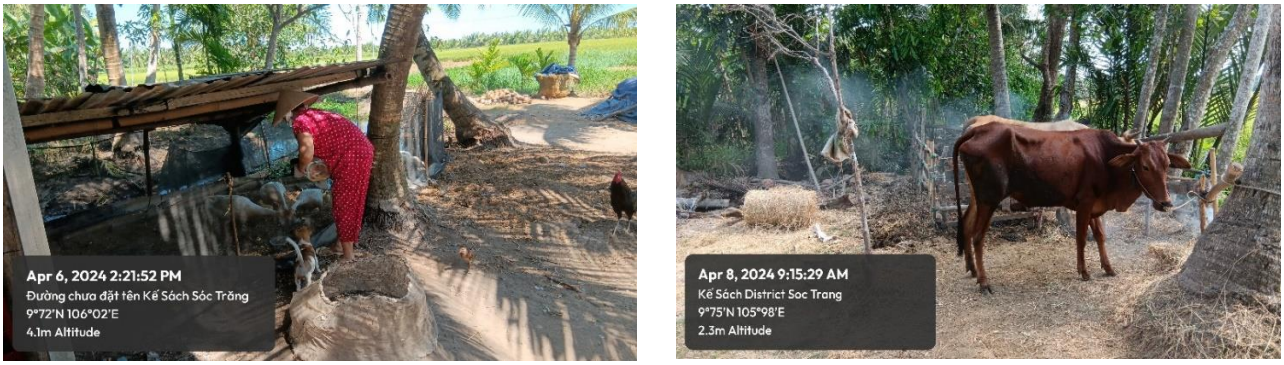


Figure 7.11 Livestock models of the Khmer women under the ethnic minority program

Source: Thai Van Nguyen (2024).

In addition to financial assistance, access to clean water has emerged as a pressing issue, particularly for households residing at a considerable distance from water supply infrastructure. The commune has commenced preparations for the delivery of plastic water tanks. Local officials explained that "poor households that don't have access to clean water receive 2,000-liter plastic water tanks" (Nam, official). These tanks are designated specifically for "those living in fields and gardens, far from access" to piped systems. Previously, only smaller tanks were available. "They've been distributed before, but those were smaller. Previously, they were only 700 litters. Now they're 2,000 litters". Although the new tanks "are being prepared for distribution", they will be targeted to poor and near-poor Khmer households (see Figure 7.12).

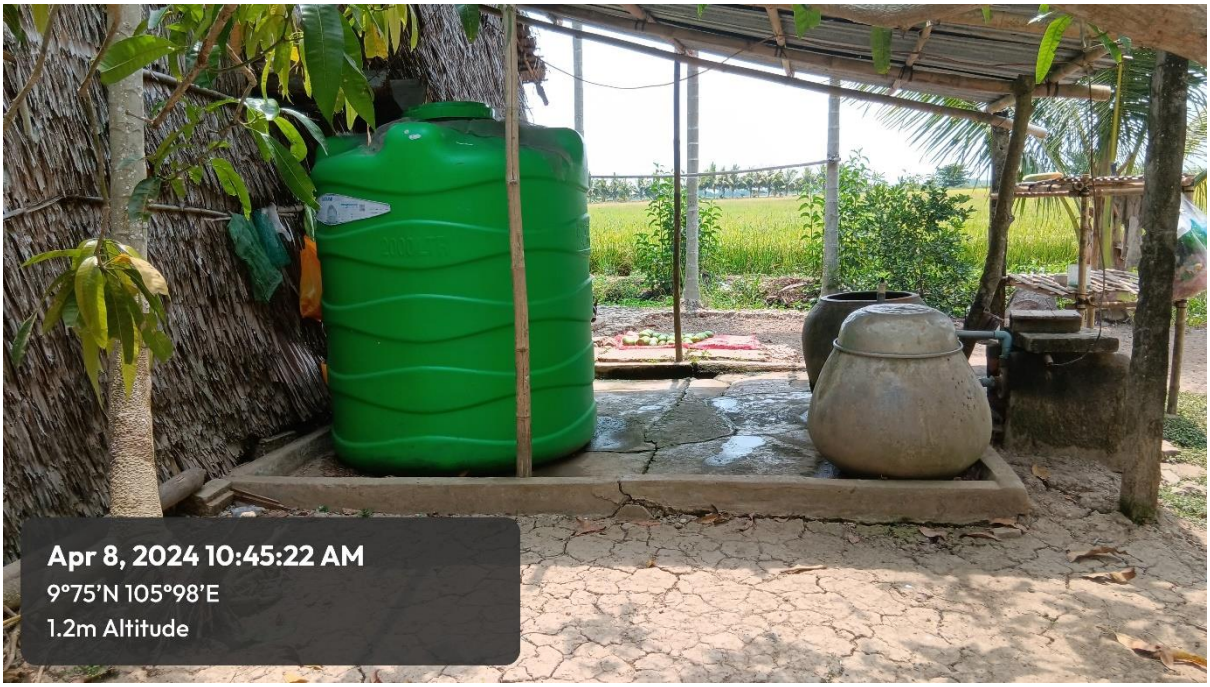


Figure 7.12 Water supply facilities for the poor households in An My commune

Source: Thai Van Nguyen (2024).

Upon installation, the utilisation of these tanks will vary each household. Some individuals may harvest rainwater, while others may utilise well water or alternative sources. However, the tanks signify a pragmatic and significant enhancement in daily living, providing increased water security, particularly during periods of salinity challenges, and alleviating the hardships of poverty in this Khmer community.

However, the results of interviews with Khmer women who participate in and gain from these livelihood support programmes, however, point to a more nuanced and profound reality. While the provision of 2,000-liter water tanks is a welcome intervention, it is the women who shoulder the primary responsibility of "collecting water, storing water and managing water for the whole family" (Nam, official). In practice, they serve as the unseen infrastructure supporting the intervention, guaranteeing that water is available, accessible, and safe for daily utilisation.

Similarly, when households receive financial support to raise livestock, women once again play a central role. As one local woman shared, although "the Khmer [ethnic households] receive the money for livestock", it is often the women who act as "the main carer for this livelihood model". They undertake the daily responsibilities of feeding, cleaning, and maintaining the animals, while also completing their conventional caregiving roles inside the family.

These observations indicate a pressing necessity for contemplation regarding the design of such interventions. Although local programmes are undoubtedly enhancing income stability and material living standards, they may inadvertently perpetuate entrenched gender stereotypes. By placing women at the core of household responsibilities and emerging economic activities without sufficient acknowledgement, remuneration, or assistance, the load of care and labour disproportionately escalates for them.

Therefore, although these support measures are outstanding, they necessitate the incorporation of more inclusive planning. If women's labour is persistently utilised without addressing the inequitable allocation of duties, even thoughtful initiatives may inadvertently perpetuate the disparities they want to mitigate.

7.4.3 Institutional supports after disasters

Furthermore, reflections from both male and female participants regarding their failure to seek disaster assistance over the previous decade indicate a complex interplay of informational, structural, and socio-psychological barriers associated with local climate adaptation governance. A prominent issue that arises is the inadequate understanding or ambiguity regarding the application processes for obtaining governmental assistance during and following

disasters. Numerous participants recognised awareness of governmental support programmes, especially during 2015–2016 concerning salinity effects but were uncertain about the application process or location. A participant stated, “I heard there was cash support in 2015–2016, but I didn’t know how to apply”, underscoring that the lack of explicit instructions from authorities effectively hinders those who are eligible from obtaining essential support. Another woman remarked, “I don’t know how to apply—if there’s support, then fine, otherwise I don’t know what to do” indicate that unclear and inadequately conveyed administrative procedures substantially prevent disadvantaged households from accessing benefits. This corresponds with research highlighting that procedural justice, defined as the equity in decision-making and resource allocation, is a vital aspect of climate governance (Paavola, 2013). When climate adaptation aid is vague or lacks equitable outreach, it may exacerbate existing vulnerabilities and intensify distrust in institutions (Agrawal, 2008).

A common observation is to perceived ineligibility resulting from programme design and targeting criteria. Many people perceived that assistance was restricted to particular activities, such as rice cultivation, or to areas within flood-control embankments, resulting in a sense of exclusion. Statements such as “Support is only for rice, not for fruit farms” exemplify how inadequately structured programmes neglect the variety of rural livelihoods. These exclusionary policies may inadvertent discourage adaptive transformation by making funding contingent upon obsolete land-use categories or location-specific criteria. Another participant noted, “It’s mainly for those with land inside the dikes—if not, then no support” highlighting a substantial deficiency in the inclusiveness of disaster assistance programme, as farmers concentrating on fruit trees, or other non-rice crops are frequently neglected. This also indicate the spatial bias favouring areas within flood-controlled embankments, where infrastructure is more developed and administration is more manageable, resulting in farmers outside these zones feeling systematically marginalised. This exemplifies what academics refer to as territorial inequality, characterised by the uneven distribution of infrastructural investment and state presence across geographical regions (Adefila & Bulus, 2014).

7.4.4 Gendered participation of community groups

The degree of membership in community groups offers essential insights into the varying ways men and women in rural areas access and utilise institutional networks. These entities, comprising farmer associations, credit cooperatives, and extension services, frequently function as essential platforms for the dissemination of agricultural information, the facilitation of risk preparedness, and the promotion of climate adaptation practices. Nonetheless,

engagement in such frameworks is not uniformly allocated. This analysis utilises data presented in Table 7.1 to investigate the engagement of male and female participants with several community groups, illuminating the broader gendered dynamics of social inclusion and exclusion.

The data indicates significant gender discrepancies in community group participation, with the majority of males and an overwhelming number of women exhibiting no engagement in any social or institutional groups. Among 101 male participants, just a fraction indicated involvement in community-based organisations, whilst women's participation was even more restricted, with merely a few active. The minimal degree of total engagement signifies restricted institutional participation in rural areas of Phu Huu and An My communes, with women experiencing heightened exclusion. This discrepancy signifies ingrained gender norms, obstacles to access, and varying prioritisation of domestic versus public responsibilities.

Some men engaged in particular institutional frameworks, especially among groups associated with formal or male-dominated roles. A significant number of men indicated participation in the Farmers' Association (8.9%), the Veterans Association (6.9%), and the Local Red Cross Union (6.9%). These types of interaction indicate men's comparatively greater access to institutional networks linked to land ownership, military service, and civic leadership.

Table 7.1 Gendered participation in community groups in the two research locations (n=140)

Community groups	Male: Yes (n)	Male: Yes (%) of 101 participants	Female: Yes (n)	Female: Yes (%) of 37 participants
Any social group	29	28.7%	6	16.2%
Farmers Association	9	8.9%	2	5.4%
Women Union	2	2.0%	2	5.4%
Youth Union	1	1.0%	0	0.0%
Veterans Association	7	6.9%	1	2.7%
Credit groups	1	1.0%	1	2.7%
Agricultural extension groups	2	2.0%	0	0.0%
Local Red Cross Union	7	6.9%	1	2.7%
Other	9	8.9%	0	0.0%

Source: Household survey (2024).

Conversely, female engagement was negligible across almost all categories. Only a few women participated in the Farmers' Association (5.4%) and the Women's Union (5.4%), the latter being a gender-specific organisation that, in theory, should provide a more robust avenue for institutional involvement. Nonetheless, participation was not extensive even in this context. No women indicated participation in the Youth Union, Agricultural Extension Groups, or other

networks, signifying a near-complete exclusion from essential decision-making or resource-sharing groups. Although some women accessed credit groups like the Red Cross Union (2.7%), such involvement seems more unusual than typical.

The greater participation of men compared to women in various groups highlights the extent of male involvement in numerous local networks, both formal and informal, which are not equally accessible to women. It may indicate men's greater mobility, social capital, or accessibility, whereas women may be restricted by domestic obligations or societal conventions that hinder public participation (Lowndes, 2004).

Overall, this finding indicates that men demonstrate varying levels of engagement across different institutional domains, whereas women remain predominantly disengaged from various community structures. The consequences are substantial: in the realms of climate adaptation, livelihood transformation, and risk preparedness, such restricted institutional access places women in a structurally disadvantaged position. Their absence not only embodies ingrained gender standards but also restricts their capacity to gain from collective actions, or resource-sharing systems (Pandolfelli et al., 2007).

7.4.5 Drivers of influencing gendered involvement in community-based groups

The qualitative responses indicate a complex and intersectional array of constraints to community group engagement, with participants, particularly women, identifying limitations associated with time, literacy, awareness, and previous experiences. These insights offer a profound comprehension of the social dynamics behind minimal institutional engagement. A common issue is the lack of time resulting from occupational and caregiving demands. Participants regularly indicated that they were overly involved in their daily tasks to consider involvement. As one participant remarked, “I am busy with work all day, no time at all”, while another said, “I am always busy making a living, no time to go anywhere”. These assertions emphasise that the necessity to maintain household income, especially in subsistence economies, directly conflicts with chances for political engagement. Women also highlighted caregiving responsibilities, as illustrated by the remark, “I am busy selling and looking after grandchildren, no time”. This highlights the dual burden women frequently bear: providing economic contributions while simultaneously handling unpaid caregiving responsibilities, which are hardly recognised in formal adaptation strategies. This approach embodies broader findings from feminist political ecology, highlighting how time poverty, care work, and

livelihood insecurity converge to influence distinct vulnerabilities and adaptive capacities (Rocheleau et al., 1996).

Institutional outreach seems inadequate or restrictive. This highlights how passive exclusion, characterised by a lack of proactive, inclusive outreach, can result in systematic marginalisation in climate adaptation and community governance initiatives. Numerous participants indicated a lack of awareness regarding the presence of community groups or reported not receiving invitations. One remarked, “I was not informed about it, and I never heard anyone mention it”, while another asserted, “The local authority did not extend an invitation for me to participate”. This passive exclusion demonstrates that, notwithstanding the activity of certain groups, the absence of proactive communication disproportionately impacts marginalised individuals, particularly those with limited social networks or mobility. It illustrates a systemic communication deficit, wherein actors in institutions may presume that knowledge would disseminate naturally. Without intentional attempts to identify, engage, and include underrepresented groups, the most likely participants are generally individuals who already possess power or visibility within the community. Consistent with the research of Sultana (2014), institutional strategies for participation must transcend apparent inclusion and focus on deliberate, inclusive outreach approaches to address the social and practical barriers that marginalise specific groups.

As shown in Table 7.2, educational obstacles, notably illiteracy, exacerbate isolation. A Khmer participant said, “I don’t know how to read, so I don’t go”, and another added, “I’m very uneducated and can’t keep up”. This pattern indicates that institutional engagement presupposes a requisite degree of literacy and confidence, which is not fulfilled by all rural inhabitants. Age and health both surfaced as impediments. One individual stated, “I’m too old now and can’t remember much, so I don’t join”, and another shared, “I feel I’m too old to participate”. These quotations suggest that ageing is both a physical and social impediment to participation, frequently resulting in self-exclusion due to perceived incapacity.

Table 7.2 Qualitative responses on drivers of influencing gendered involvement in community-based groups (n=140)

Themes	Description	Illustrative Quotes
Time Constraints and Workload	Participants are too busy with income-generating activities or caregiving responsibilities to join any community group.	"Work is too busy, no time to join". "I'm busy with work all day, no time at all". "I am always busy making a living, no time to go anywhere". "I have to work to earn money, plus I'm getting old". "I am busy selling and looking after grandchildren, no time". "Just focus on working, no free time".
Lack of Awareness or Invitation	Some participants were unaware of the existence of community groups or reported never being invited to participate.	"The local authority didn't invite me to join". "No one told me about it, and I never heard anyone mention it". "There's nothing like that in this area". "People didn't call me".
Illiteracy and Low Confidence	Illiteracy (the Khmer) and limited education made some participants feel unqualified or uncomfortable to join group meetings.	"I don't know how to read, so I don't go". "I'm illiterate, so when I attend meetings, I can only listen but not read". "I'm very uneducated and can't keep up".
Age and Health Limitations	Old age and health reduced motivation or perceived capacity to participate in collective activities.	"I'm too old now and can't remember much, so I don't join". "I feel I'm too old to participate".
Past Negative Experiences or Group Dissolution	Previous involvement in groups that were mismanaged or dissolved caused loss of trust and discontinuation of engagement.	"I used to be in the Women's Union, but it was dissolved, so I no longer participate". "I was in the Women's Union, but the leader ran off with the credit group, so I quit and don't know where to join now".
Mismatch with Personal Needs or Interests	Some participants felt that group activities did not align with their interests, abilities, or personal needs.	"The Women's Union activities don't suit me". "If my capacity is limited, I don't want to join and not be able to contribute".

Source: Household survey (2024).

Previous experiences with community organisations, particularly instances of breached trust, have discouraged additional involvement. A woman stated, "I was in the Women's Union, but the leader ran off with the credit group, so I quit and don't know where to join now". exposes a profound dimension of relational vulnerability and institutional instability within these community organisations. According to Lucas et al. (2015), it demonstrates how an isolated loss of trust can result in prolonged disengagement, not just for the impacted individual but also possibly for others inside their network.

Ultimately, a few participants conveyed concerns of irrelevance or incompatibility with current organisational structures. Some examples: "The Women's Union activities don't suit me", said one, while another noted, "If my capacity is limited, I don't want to join and not be able to contribute". This underscores the necessity for more flexible, inclusive group structures that accommodate to diverse interests and abilities.

In conclusion, these expressions illustrate how structural exclusion, socioeconomic pressures, inadequate literacy, and previous experience together influence disengagement from community institutions. For climate adaptation governance to be effective, it must recognise

and confront these obstacles by promoting inclusive, accessible, and trust-enhancing modes of engagement that are tailored to the daily reality of marginalised groups, thereby fostering transformative capacity (Ziervogel, 2019).

7.4.5.1 Accessibility to training programs on local risk preparedness and response

Comprehending gendered involvement in risk planning is crucial for developing inclusive and feasible adaptation strategies. Community-based training programmes are essential for improving local capabilities to foresee and address climate-related risks. Participation in such programmes frequently reflects existing social inequities. This reflection examines gender disparities in participation in local risk preparedness training, utilising both quantitative and qualitative data from male and female participants.

The data indicates a significant gender disparity in involvement in local risk preparedness and response training. Figure 7.13 shows that only 12.6% of male participants indicated participation in such training events, whilst female involvement was markedly low, with a mere 2.7% indicating engagement. This notable disparity highlights the systemic exclusion or disengagement of women from institutional risk preparedness frameworks in the rural areas of two selected communes. The lack of risk preparedness training restricts women's involvement in planning and hinders their access to essential information, hence exacerbating gendered vulnerability (Ashraf & Azad, 2015).

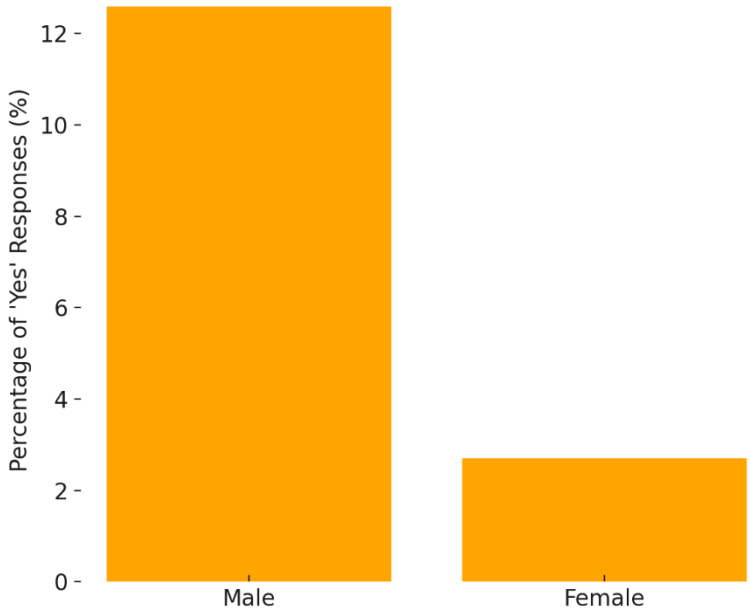


Figure 7.13 Gendered involvement in training programs on local risk preparedness and response (n=140)

Source: Household survey (2024).

As shown in Table 7.3, a prevalent and significant concern among both male and female responders is the lack of locally accessible training programmes. Both men and women observed that risk preparedness courses had never been conducted in their community. The male participant stated, "The local authority did not organise any risk preparedness training", while another woman noted, "The commune didn't organize any training sessions" highlighting a systemic deficiency in local risk governance. Despite the escalating intensity of climate hazards, neither males nor females indicated participation in any formal training sessions pertaining to climate-related risk management. This may indicate a substantial disparity between national adaptation policies and their execution at the commune level.

For men, despite overall low participation, a little yet noticeable fraction has engaged in preparedness actions. This may be attributed to their enhanced mobility, increased probability of receiving invitations to commune-level meetings, or designated responsibilities in overseeing agricultural land and infrastructure, where risk preparedness information may be communicated. These trends indicate that men are more likely to being targeted by or receptive to risk preparedness initiatives, reflecting fundamental gender norms around power and responsibility (Enarson & Pease, 2016).

Table 7.3 Gendered reasons for non-participation in local risk preparedness and response training programs (n=140)

Themes	Male Participants (Quotes)	Female Participants (Quotes)
No Local Training Programs	*"The local authority didn't organize any risk preparedness training".* *"There was no training program, so I couldn't join".*	*"The commune didn't organize any training sessions".* *"There were no classes. We're used to salinity, so we know how to cope".*
Not Informed or Invited	*"No one informed me, so I didn't know to join".* *"I wasn't invited to participate".*	*"The local authority didn't invite me".* *"I didn't hear anyone mention any training".*
Unaware of Program Existence	*"I don't know if any program was organized because I wasn't informed".* *"I'm not sure if anything has been held here".*	*"I don't know whether any program exists or not".* *"I would have joined, but I didn't know about it".*
Time Constraints (Work-Related)	*"I work as a hired labourer, so I don't have time to go".* *"I'm too busy maintaining my dike and garden".*	-
Caregiving Responsibilities	-	*"Even if there was training, I couldn't go because I have to care for elderly family members".*
Perceived Irrelevance / Self-Reliance	*"There are no training sessions; people here rely on their own experience to deal with hazards".*	*"We're used to living with salinity already. We have our own coping skills".*

Educational Barriers / Illiteracy	-	*"I can't read, so I didn't participate".*
Age and Mobility	*"I'm old and can't get around much".* *"I'm elderly now, and my son is too busy with the farm to go".*	-
Willingness to Participate if Invited	*"There's no training here, but if there was, I'd join to learn".* *"If they organized something and told me, I would go".*	*"If I had been invited, I would have gone".* *"If it was available, I would join to learn".*

Source: Household survey (2024).

The substantial lack of women in these trainings indicates a critical gender access gap. This may be affected by various intersecting factors: women's time constraints from household and caregiving duties, reduced literacy rates, or a mere absence of express invites or knowledge. Moreover, women may perceive themselves as less entitled or empowered to participate in local meetings about technical topics historically dominated by men. Statements include: "I can't read, so I didn't join" and physical constraints associated with ageing, especially in men: "I'm elderly and can't move around easily". The findings indicate that vulnerability to exclusion is exacerbated by age, literacy, and gendered social roles, which should be considered when designing inclusive training programmes on risk preparedness and recovery (Gaillard et al., 2017).

The overarching result is that climate-related risk reduction strategies are inadequately reaching women, despite their unequal vulnerability to hazards and their crucial roles in household response and recovery efforts. This exclusion diminishes the efficacy of climate-related risk reduction preparedness efforts and exacerbates existing vulnerabilities. Local authorities and relevant actors must implement gender-responsive risk planning, which includes targeted outreach, simple and accessible training formats, and culturally sensitive approaches that acknowledge women's contributions and capabilities in adaptation building (McNamara et al., 2021). In the absence of these initiatives, the gender disparity in risk preparedness would persist and reinforce wider inequities in climate adaptation governance (Ahmed et al., 2023).

This chapter's findings indicate that climate-related risk reduction and adaptation governance in the VMD are inadequately gender-responsive, with women consistently marginalised from formal preparedness initiatives, despite their pivotal roles in household-level response and recovery. This institutional exclusion diminishes overall adaptation outcomes and exacerbates existing gendered vulnerabilities in climate adaptation governance. Expanding on these findings, the subsequent chapter redirects the analytical emphasis from institutional frameworks to the everyday activities by which individuals navigate and adapt to climate risks

at the household level. This analysis explores the manifestation, negotiation, and perpetuation of the gendered governance gaps identified within daily livelihood strategies, illustrating how neoliberal adaptation frameworks shift the responsibility for climate risk management to individuals while constraining opportunities for collective and inclusive responses.

Chapter Eight: Farming households' Coping and Adaptation Strategies to Climate Risks

8.1 Introduction

This chapter analyses the strategies utilised by men and women to cope and adapt to the effects of climate hazards on their livelihoods and well-being. It seeks to address two central research questions: *How can climate hazards adaptation discourses and strategies account for gender-specific vulnerability and transformational adaptation of livelihoods?* The debate commences with an examination of the primary coping techniques employed by men and women in response to the effects of saline intrusion, (unusual) flooding, extreme heat, and water scarcity, as well as the distinctions in their adaptive behaviours. The subsequent analysis addresses the capabilities and limitations encountered by men and women in coping and adapting to climate hazards, with a specific emphasis on issues concerning resource access, ownership, availability of weather information, social networks, and involvement in local adaptation governance processes. These constraints also demonstrate that adaptation initiatives in the VMD are situated within a neoliberal governance framework, which shifts the responsibility of climate risk management to individuals while concurrently constricting the potential for collective or community-oriented responses.

8.2 Coping and adaptation strategies

8.2.1 Impacts of climate risks on farming communities

This section examines the coping and adaptation techniques utilised by male and female farmers in reaction to climatic stressors in two socio-ecological contexts: An My commune (Soc Trang province) and Phu Huu commune (An Giang province). The analysis investigates how social roles, responsibilities, and access to resources influence varied reactions to significant hazards such as saline intrusion, drought, and altered flood patterns. This section utilises a combination of survey data (n=66), in-depth interviews, and observational fieldwork to identify patterns indicative of gendered perspectives of climate risk and to underscore potential disparities in adaptation capacity.

The study indicates that saltwater intrusion, frequently associated with seasonal drought, is the primary climate-related hazard recognised by farming households in An My commune. Conversely, farmers in Phu Huu expressed heightened concern about other climate threats, as elaborated in the subsequent section. Local farmers recognised salinity as a serious risk to agricultural production, impacting particularly on crop health, and soil fertility (Dewi et al.,

2022; Khong et al., 2020). As shown in Figure 8.1, participants identified three critical salinity thresholds: below 1.0 ppt, between 1.0–2.0 ppt, and above 2.0 ppt, each linked to differing levels of impact on agricultural systems. The salinity levels are categorized into three thresholds based on insights from in-depth interviews with local officials and senior farmers: below 1.0 ppt, between 1.0–2.0 ppt, and above 2.0 ppt. These thresholds are considered critical, as they directly affect crop viability and agricultural productivity. One local official explained, "When saltwater intrusion occurs, it can take three to four years to restore the soil to its original condition. The most severe case was in 2016. Salinity levels here can range from 1.0 to 4.0 ppt. Typically, if it's above 2 ppt, the crops are affected". A senior farmer further added that salinity updates are regularly shared through a local Zalo group, "Here's a message. It is noted: Salinity measured at 5:40 AM on March 29, 2024 — 0.68 ppt. Another one came at 5:25 PM yesterday — it was 2.3 ppt. That's a lot. At 2.3 ppt, no plants can survive". Such levels of salinity also demonstrate farmers' experiential knowledge and awareness of the periodic impacts of saline water on their crops. The line chart also illustrates the gender-based variations in perceptions of salinity-induced farming impacts among male and female farmers across three salinity levels, encompassing adverse effects on farming systems, nutrient depletion in plants, and deaths of plants.

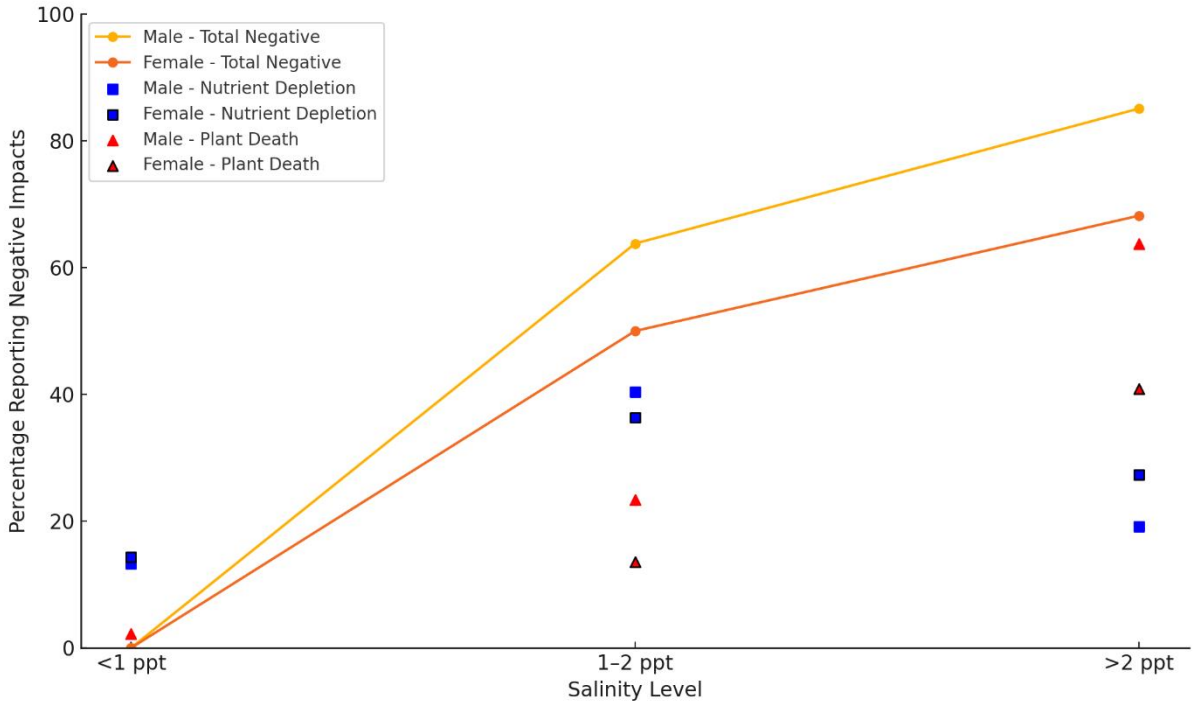


Figure 8.1 Perceived negative impacts of salinity on farming by gender (n=66)

Source: Household survey (2024).

At salinity levels below 1 ppt, both male and female reported no visible adverse effects, indicating that local crops could tolerate such thresholds. As salinity increased to the 1–2 ppt range, however, 63.8% of male and 50.0% of female participants perceived negative effects, particularly regarding nutrient depletion and early signs of plant death. The disparity in perception may indicate gender-specific roles and varying degrees of involvement in field management, or differing access to knowledge regarding salinity thresholds and crop sensitivity (Bhuyan et al., 2024). This period signifies the initiation of stress on plant physiology, impacting yields and necessitating greater attention over water quality.

Figure 8.2 Severe droughts and salinity occur during the dry season in An My commune
Source: Thai Van Nguyen (2024).

When salinity exceeded 2 ppt, perceived risks increased markedly. Here, 85.1% of male participants and 68.2% of female participants reported severe effects, such as widespread plant death. These findings suggest that men may be more exposed to the long-term consequences of salinity due to their roles in irrigation and crop maintenance. A male farmer in An My remarked, "In 2016, the salinity lasted for months here, it was extremely salty – no fresh water at all... Yes, that year star apple, jackfruit, and durian died, and I only had a few trees left. By 2000, salinity happened again, they were all dead" (Van, AM), illustrating the disastrous long-term effects of salinity intrusion. These narratives highlight the compounding impact of salinity over time, especially on perennial crops, and align with the research of Fabrice G Renaud et al. (2015), who argue that the saline level is not just detrimental but possibly transformative,

compelling households to explore alternative crops, modify irrigation strategies, or, in some instances, completely abandon specific areas.

The findings underscore a threshold-based perception of salinity risk among local farmers: salinity below 1 ppt is harmless, the range between 1 and 2 ppt indicates the beginning of degradation, and levels over 2 ppt may require livelihood transformation. Policy measures that include localised early warning systems and adaptive cropping patterns will be essential to assist smallholders in managing increasing salinity exposure, especially in a climate-sensitive area such as An My in particular, and the Mekong Delta at large.

Salinity intrusion represents the paramount climate-related challenges in An My commune, but farmers in Phu Huu commune confront a distinct although equally urgent issue: the altered flood patterns observed over the past decade. In contrast to the salinity-affected regions of An My, where farmers largely focus on the detrimental effects of saltwater on soil and crops, the issues in Phu Huu revolve around the absence or a decrease of seasonal floods, which historically provided vital advantages to local agriculture. Farmers in Phu Huu categorise floods using a three-fold classification: low floods, medium floods (often locally referred as “beautiful floods”), and high floods. Nguyen (2011) asserts that flooding in the VMD is generally a seasonal riverine occurrence. The socio-economic effects of these floods fluctuate based on the flood regime categorised as high, medium, or small, influencing various livelihood activities and assets across diverse socio-economic groups and regional flood contexts. High or small floods often occur once every few years, but medium floods are more prevalent annually. Each flood regime has different impacts on the livelihoods and assets of diverse socio-economic groups and flood-prone areas.

Field investigations indicate that the decrease of medium floods, considered ecologically advantageous, has damaged local ecosystems. As one official explained, “In the past, when people talked about floods, they immediately referred to the concept of 'living with floods' and distinguished between seasonal floods, abnormal/unusual floods, and beautiful floods”. Seasonal floods typically occur between July and August. In contrast, abnormal floods inundate crops rapidly, with water levels rising by 1.4 to 2 metres within just 4 to 5 days. The term "abnormal/unusual floods" stems from the unusually fast rate of water level increase around 5–7 cm per day compared to the more gradual rise of 0.5–1 cm per day observed during "beautiful floods". Interviewees emphasized that beautiful floods facilitated the collection of fish and the influx of nutrient-dense water into agricultural fields.

Additionally, fieldwork and local interviews indicate that an outstanding cultural characteristic of floodplain settlements is the building of stilt houses. These dwellings fulfil various functions: they assist occupants in adapting to annual floods, enhance airflow from the adjacent river, and operate as informal flood indicators. Local residents can monitor and record historical flood levels by noting the annual height of the water on the stilts.

Figure 8.3 Stilt houses of local people in response to flood adaptation in Phu Huu commune

Source: Thai Van Nguyen (2024).

Beautiful floods follow a predictable and stable seasonal pattern, as seen in years like 2003, 2004, 2005, 2010, and 2011. In these years, water levels begin to rise in May, increase further in June, and gradually inundate low-lying areas between July and August (based on the lunar calendar). During this period, local people prepare fishing equipment to take advantage of the seasonal floodwaters. The water begins to recede from September to October, allowing residents to continue catching fish and, by late September to mid-October, begin sowing new crops. However, in 2019, the flood season was notably shorter. Water levels began rising in

early August but receded quickly, lasting only about a month. This shortened duration provided insufficient time for fishing activities, significantly affecting local livelihoods.

Among these floods, low floods have emerged as the primary issue, as they are believed to deliver reduced sediments and nutrients, resulting in diminished soil fertility, heightened insect and disease occurrences, and an increased reliance on chemical fertilisers and pesticides (Chapman et al., 2017). These issues indicate a departure from natural soil regeneration cycles, imposing additional constraints on agricultural systems. Figure 8.4 depicts gender-specific responses to various flood types, with both men and women emphasising the prevalence of low floods as a primary concern for rural households in Phu Huu.

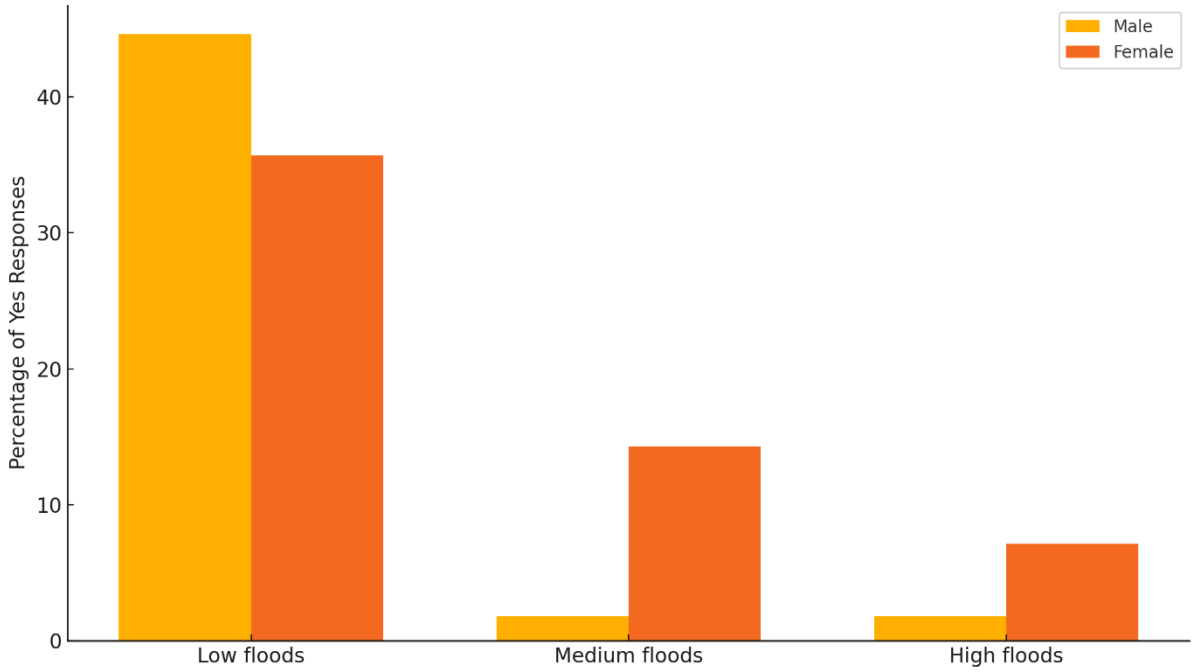


Figure 8.4 Gendered "Yes" response to flood types in Phu Huu (n=70)

Source: Household survey (2024).

Figure 8.5 subsequently illustrates distinct gender variations in the perceived effects of climate-related stressors, such as extreme heat, insufficient irrigation, and early-season thunderstorms on agricultural systems. Extreme heat is prominently identified as the most commonly recognised hazard, with 100% of male and 80% of female participants indicating it as a substantial threat. The consensus indicates that excessive temperatures are evidently impacting both genders, perhaps through agricultural stress, diminished yields, or health hazards associated with heat during farming activities (Dimple et al., 2021).

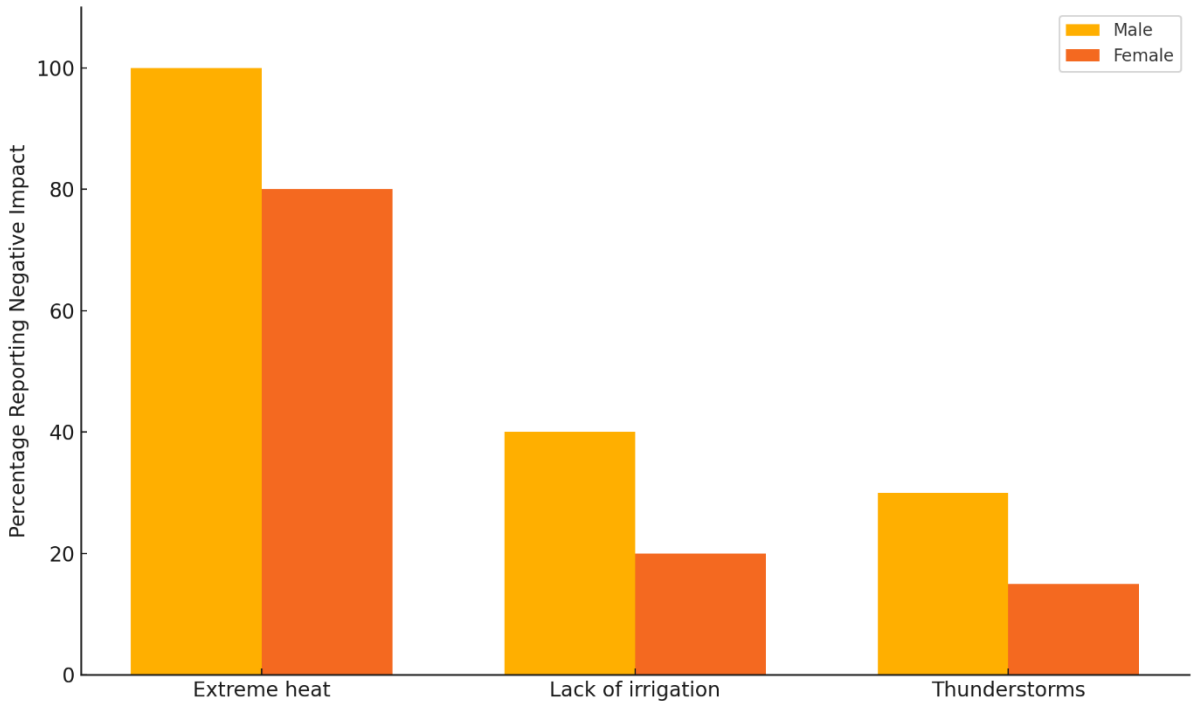


Figure 8.5 Gender differences in reported negative impacts of climate hazards in PH (n=70)

Source: Household survey (2024).

The disparity in perception markedly increases concerning irrigation accessibility and thunderstorm disturbances. As shown in Figure 8.5, male participants were twice as likely as female participants to recognise irrigation scarcity as a significant concern (40% compared to 20%). This may indicate gendered responsibilities in irrigation management, a claim supported by multiple male interviewees tasked with irrigation setup and maintenance. Likewise, 30% of males and 15% of females recognised early-season thunderstorms as a threat to agriculture, potentially associated with gender-specific exposure to risk-laden activities like field preparation and early planting. The observation by a farmer in Phu Huu commune that "Windstorms are mainly at the beginning of the rainy season, we get small tornadoes that can cause damage, causing roofs torn off, and crops like longan uprooted" (Trong, PH), reveals the seasonal and destructive nature of localized extreme weather events**.** While often overshadowed by more widely discussed climate risks like flooding and drought, storms present a recurring threat that significantly affects both infrastructure and agricultural production in the two selected communities.

When farmers were asked, "Where do you obtain information concerning climate risks and their impacts", Figure 8.6 elucidates insights into the gendered discrepancies in access to climate hazard information across five principal stressors: salinity, floods, severe heat,

irrigation, and storms. Male participants exhibit markedly superior access to information channels, especially concerning salinity and flood hazards. For these two climate risks, males claim substantial use of the internet, radio, television, and village officials often over 70% while female access remains negligible. Television is the sole semi-equitable channel, with 50% of women obtaining heat-related information through it, indicating its potential as a more inclusive communication tool. Conversely, risks such as storms and irrigation correlate with a low level of information accessibility, particularly for women who indicate a complete lack of access across all sources. Likewise, NGOs are completely lacking as information providers for both genders across all hazards, highlighting an obvious institutional deficiency in outreach.

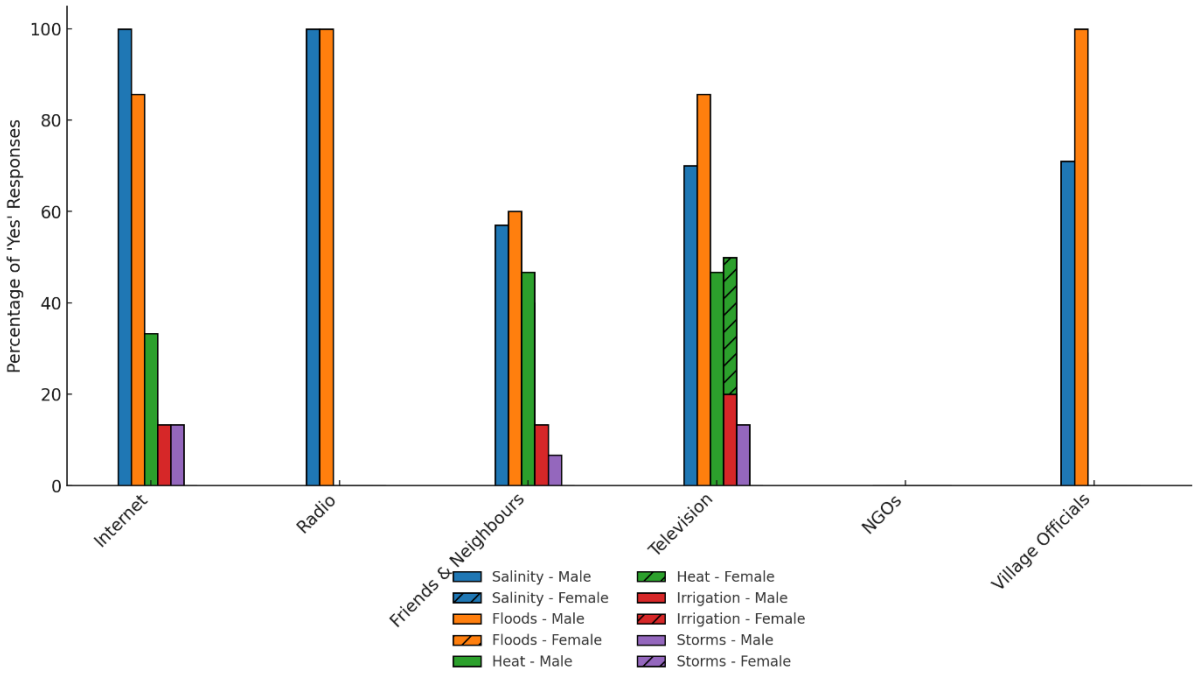


Figure 8.6 Gendered access to information by climate hazard types (n=140)
Source: Household survey (2024).

The survey demonstrates that women's access to salinity and flood information is restricted in comparison to males, whereas interviews indicate that numerous women depend on informal sources, such as neighbours. A female participant in An My stated, ‘The neighbours are close and the rice fields are next to each other, it is easy to ask for information. I don’t use Zalo or attend meetings.’ This signifies a disparity in digital and social access within formal warning systems.

In conclusion, whereas climate risks such as salinity, drought, floods, and excessive heat impact all agricultural households, the perceptions and management of these risks differ markedly by gender. Differences in roles, exposure, and access to information foster disparities in adaptive

capacities. Addressing these discrepancies necessitates sophisticated, gender-sensitive policy measures and engaging communication strategies customised to local socio-ecological settings.

8.2.2 Gender and climate adaptation strategies

8.2.2.1 Climate adaptation strategies to salinity

When queried regarding coping and adaptation methods for climate risks, the majority of farmers in An My, a region susceptible to salinity, articulated considerable concern over the necessity of implementing strategies especially designed to alleviate the effects of salinity intrusion. Likewise, farmers in Phu Huu, situated in floodplain areas, highlighted measures to mitigate water scarcity for both agricultural and aquaculture production throughout the dry season, especially during extreme heat events. These differing responses illustrate how farmers in two different ecological systems prioritise adaptation strategies based on their specific climate-related water challenges.

This data analysis provides gender-disaggregated information on the adoption of certain adaptive strategies that mitigate saline intrusion and irrigation scarcity, both of which significantly impact agricultural systems in the Vietnamese Mekong Delta. This analysis examines the percentage of male and female participants employing strategies such as water storage, crop diversification, and livelihood shifts, revealing how gender roles, decision-making authority, and resource accessibility influence adaptation behaviours across various socio-ecological contexts.

Figure 8.7 depicts the distribution of male and female participants employing specific coping and adaptation strategies in response to saltwater intrusion. The examined strategies, such as water storage, construction of closed dikes, agricultural observation, crop diversification, and the implementation of salt- or flood-resistant crops are pivotal for climate adaptation in the VMD. A consistent pattern emerges: male participants report higher rates of adoption across all strategies.

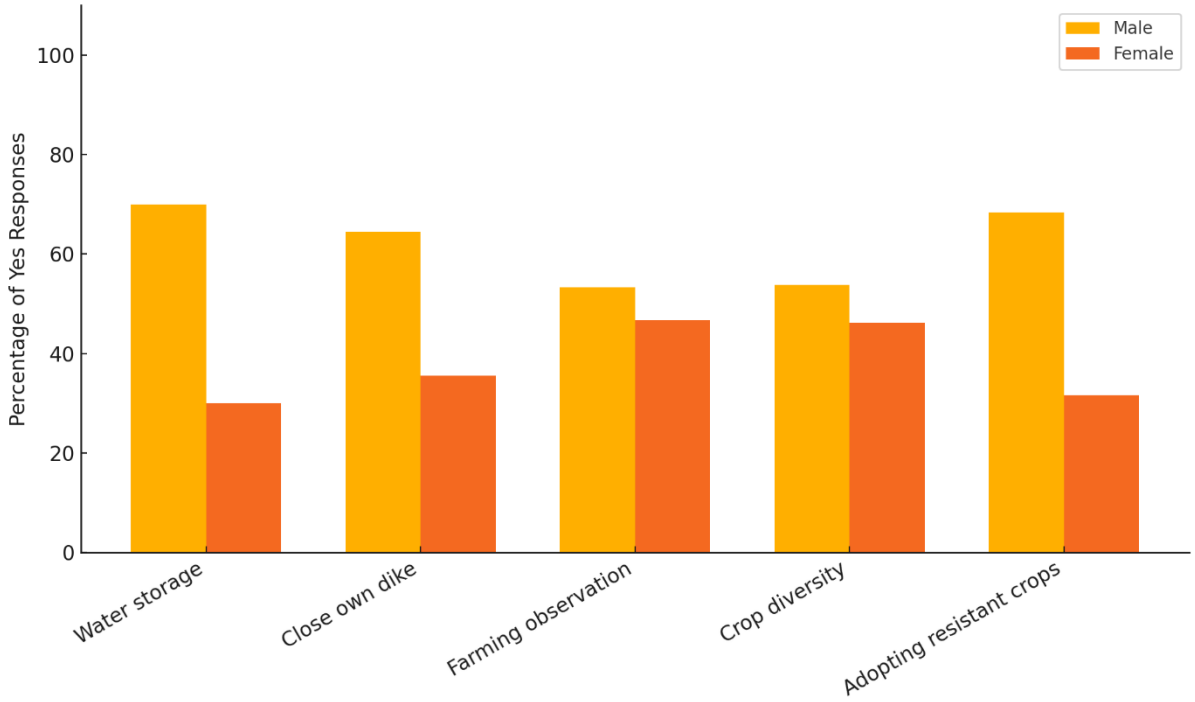


Figure 8.7 Strategies implemented by male and female survey participants to salinity risks (n=70)

Source: Household survey (2024).

Water storage has been one of the most prevalent strategies for managing saline intrusion, yet the data indicates an obvious gender discrepancy in its use. 70% of male participants indicated the use of this method, in contrast to merely 30% of female participants. This disparity highlights the gendered dynamics of access to physical infrastructure, resources, and decision-making power, and agricultural inputs, as observed in other climate-vulnerable settings (Quaye et al., 2016).

Furthermore, the research indicates that women's roles within the household may align them more closely with water utilisation and management for domestic purposes (see Figure 8.8), however not necessarily with infrastructure development or agricultural water planning. A Khmer woman in An My stated, “Domestic water use and management is my main responsibilities. The difficulty here is to get freshwater sources from groundwater sources in dry season. Water here is contaminated with alum and salinity so that water has yellow and red colours” (Neang, AM). Her narrative underscores the intersection of gendered domestic responsibilities, environmental vulnerability, and ethnic identity in the pursuit of clean water, especially during periods of seasonal water scarcity.

Figure 8.8 Household water use and management to adapt with water scarcity in An My

Source: Thai Van Nguyen (2024).

Another substantial gender disparity is shown in the construction of closed farmers' dikes, with 64.5% of males participating in this activity compared to 35.5% of females. This may reflect gendered differences in access to land, technical expertise, and physical labour, or agricultural decision-making, with males traditionally assuming more field-intensive responsibilities (Croppenstedt et al., 2013). A comparable trend is observed in the adoption of climate-resilient crops (68.4% male vs. 31.6% female), possibly due to men's more frequent access to climate-resilient seed markets, extension services, or decision-making forums (Quaye et al., 2016).

In contrast, agricultural monitoring (e.g., reinforcing dikes to prevent leaks) and crop diversification exhibit a reduced gender disparity, demonstrating more equitable involvement among men and women. These techniques are frequently grounded in daily agricultural experience and household-level decisions, where women play central, if often under-acknowledged. The comparatively elevated involvement of women in both strategies (46.7% and 46.2%, respectively) indicates that when strategies become less labour-intensive, women's participation rises.

Overall, the persistent disparities suggest that women face systemic constraints in accessing adaptation resources and decision-making processes. These may encompass restricted access to loans, property ownership, training, and agricultural extension services (Tsige et al., 2020). If neglected, such gaps may intensify existing vulnerabilities and hinder the efficacy of climate

adaptation strategies (Eriksen et al., 2005). This observation underscores the pressing necessity for gender-sensitive adaptation programming that acknowledges and tackles the systemic barriers encountered by women. An equitable adaptation strategy not only bolsters household adaptation but also fosters climate adaptation at the community level (Boston et al., 2024).

8.2.2.2 Gendered perceptions of satisfaction with salinity adaptation strategies

This section provides a gender-disaggregated examination of farmers' perceived satisfaction regarding their current adaptation tactics to saline intrusion in the Vietnamese Mekong Delta. The analysis utilises qualitative interview data gathered from An My and Phu Huu communes to examine how male and female farmers evaluate the effectiveness and adequacy of their adaptation strategies. Satisfaction is regarded not only as a measure of effective adaptation but also as a framework for analysing deeper structural, social, and institutional aspects of adaptation.

This section reveals the fundamental factors, such as infrastructure access, experiential knowledge, resource limitations, and dependence on social networks that influence satisfaction variably by gender through thematic organisation of responses. A grouped bar chart clearly compares the prevalence of these themes between male and female participants, providing essential insights into how gender roles and adaptation capacities affect climate adaptation at the household level. In An My, figure 8.9 reveals notable gendered-based patterns emerged in how male and female farmers frame their satisfaction with salinity adaptation strategies across diverse thematic dimensions.

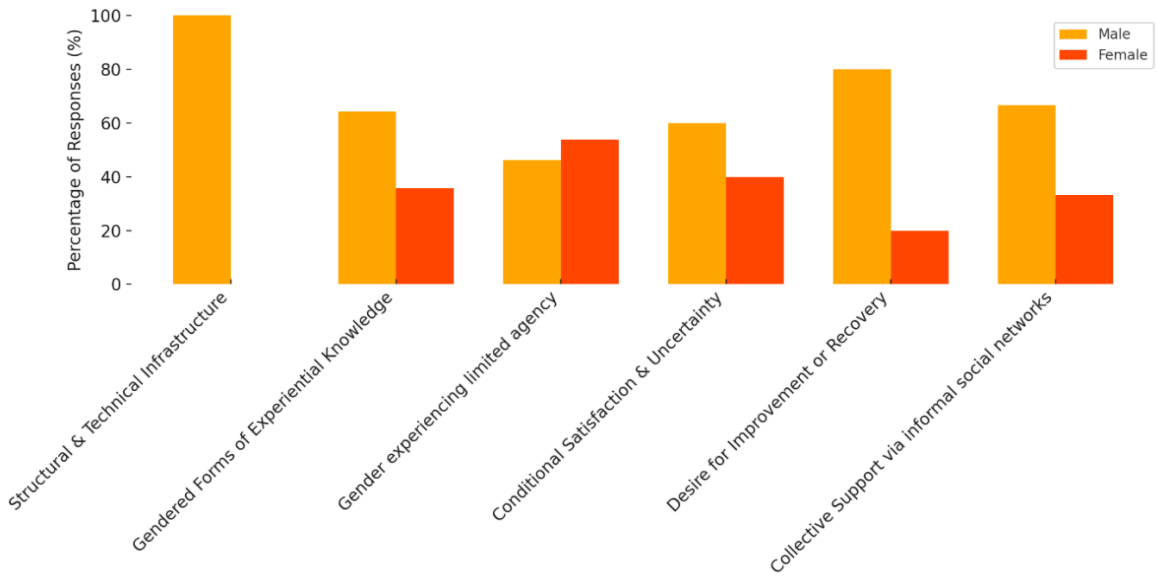


Figure 8.9 Gendered narratives of satisfaction with salinity adaptation strategies (n=70)
Source: Household survey (2024).

Structural and technical infrastructure

In An My commune, male farmers frequently articulated a sense of agency and satisfaction in addressing climate-related challenges, particularly owing to the accessibility and self-construction of physical infrastructure, including double-layered dikes, sluices, and salinity control systems. These structures not only alleviate the impacts of salinity intrusion but also enable farmers to exert direct control over water management and agricultural output. One farmer explained, “Because my family has a double-layered salinity barrier and a salinity metre. We live with salinity; when it's salty, water must go through two sluices. Coconut trees don’t need much water, tolerate salinity well, so water management is easier” (Semi-structured interviews, 2024). This narrative highlights a practical strategy for coping with salt, where infrastructure facilitates not only protection but also wise crop choice and effective water distribution, like growing coconut palms that can withstand higher salinity levels. This also highlights a pragmatic approach to living with salinity**,** rather than attempting to eliminate it entirely.

Another farmer emphasized his agency in local adaptation by stating, “I did it myself: made sluices and elevated dikes on my land”. (Phuc, AM). This indicates a robust sense of self-sufficiency and responsibility for adaptation strategies, especially among men who are frequently more engaged in land management and the development of protective infrastructure (Swai et al., 2012). This proactive behaviour illustrates the significance of personal investments in physical adaptation strategies, while also underscoring possible inequalities as not all households may possess the financial or technological resources to implement such changes autonomously.

A third farmer conveyed optimism toward future infrastructure improvements, stating, “I'm satisfied with the current plan; next year a sluice gate will be built, so saltwater intrusion will stop” (Lap, AM). This viewpoint underscores the belief that government-backed engineering solutions are vital in addressing environmental hazards, and that satisfaction is associated with strategic interventions that ensure enhanced stability and safeguarding. This dependence on infrastructure embodies a technocratic perspective on adaptation, perhaps neglecting the wider socio-economic and ecological complexities (Sage et al., 2015), including maintenance issues, uneven access, and unforeseen downstream consequences.

Overall, these accounts illustrate that infrastructure ownership and technical solutions are essential elements in how some farmers articulate satisfaction with salinity adaptation.

Although male participants in this area more often cited direct infrastructure investment, this should not be construed as an indication that women lack experiential knowledge or adaptive agency. Instead, it illustrates patterns of the interview data, potentially influenced by gendered roles in land management and legal ownership. Broader structural elements, such as land tenure systems, capital accessibility, and decision-making power, continue drastically impacting varying adaptive capacities (J. Brown, 2011).

Gendered forms of experiential knowledge

The disparity in men's and women's expressions of satisfaction with adaptation strategies in An My commune highlights gendered aspects of experimental knowledge. Both men and women utilise personal experience to inform their climatic reactions; nevertheless, males generally characterise their knowledge as active, technical skill, signifying a sense of mastery and control over agricultural systems. This is demonstrated by the statement, “Based on my experience, my techniques are already good enough”, which suggests a degree of confidence in decision-making and an assumption that formal training or external guidance may be unnecessary. These assertions embody a masculinized narrative of competence, wherein knowledge is linked to innovation, construction, and technical problem-solving (Gonda, 2017).

Conversely, women's narratives tend to emphasize routine, task-oriented adaptation strategies, often derived from daily responsibilities in household and agricultural work. For instance, one woman stated, “I just know that when it’s salty, I close the sluice and store water in the pond. I’m satisfied with that and don’t need further training”. Another stated simply, “We do it based on experience, it’s fine”. These remarks underscore that women commonly navigate adaptation by relying on familiarity with daily environmental signals and established coping mechanisms, rather than identifying themselves as technical decision-makers. Their satisfaction arises not from infrastructural innovation but from confidence in executing fundamental, routine tasks that guarantee the functionality of household and farm operations (Amin et al., 2009).

These gendered manifestations of satisfaction indicate deeper inequalities in access to resources, training opportunities, and institutional acknowledgement. Men typically engage in formal irrigation systems and construction-related tasks, whereas women primarily manage water utilisation, safeguard domestic resources, and address urgent environmental changes (Karim, 2006). Consequently, adaptation programmes that emphasise technical capacity-building may neglect women's experiential knowledge and undervalue their contributions to local adaptation (Bryan et al., 2018).

Gender experiencing limited agency

The differing displays of adaptation limitations between female and male farmers in An My commune underscore the gendered aspects of vulnerability and agency in response to saltwater intrusion. Female farmers often expressed a constrained sense of agency, indicating limited influence over adaptation decisions and diminished material means for executing long-term solutions (Haque et al., 2023). For instance, some women articulated,

> *"We depend on the salinity level—if it's salty, we close the sluice; if it's fresh, we let water in. That's the only way I know".*

(Semi-structured interviews, 2024)

This expression exemplifies a reactive adaptation strategy guided by routines environmental observations, rather than by proactive planning. It signals a lack of technical knowledge or institutional support that might enable longer-term, strategic adaptation. This reactive stance may also stem from exclusion from community-level decision-making processes and limited access to agricultural training or advisory services.

Another female participant noted: *"I don't know, because the local authorities only inform about saltwater intrusion or storms; how to cope is left to the people themselves".*

(Semi-structured interviews, 2024)

The participant discloses a deficiency in governance. Although information distribution occurs, there is a lack of institutional follow-up in terms of practical support or advice. It also expresses resignation and marginalisation, emphasising that the responsibilities of adaptation are shifted to individuals, and households disproportionately impacting those with limited resources and reduced institutional relations.

Two additional women remarked:

> *"I am still confused because the local announcements from the People's Committee often don't reach my house".*
>
> *"I'm in a remote inland area, it doesn't reach me".*

(Semi-structured interviews, 2024)

These comments point to structural barriers in climate communication, where geographical isolation and gender-based mobility constraints hinder access to adaptation knowledge. The spatial disconnection illustrates that even helpful climate information systems, such as public

loudspeakers or Zalo groups, may not effectively reach the most vulnerable populations, compounding information inequality based on location and gender.

Other women expressed same feelings of frustration and constraint, asserting, “It’s just a temporary fix. If the salinity lasts long, we are still affected”, and “Even though there’s a sluice, salty water still enters, and we can’t keep freshwater”. These comments highlight a perceived inadequacy of current infrastructure and the restricted duration of comfort it offers. As another woman added, “We can only hold on for a month, even though we close the sluice”, highlighting the temporary nature of their coping mechanisms, which underscores the precariousness of their circumstances, as adaptive measures provide only fleeting respite and sustainable solutions are unattainable. These comments illustrate that women's roles in water and household resource management frequently expose them to heightened climate impacts, particularly when technical knowledge, institutional involvement, or financial resources are deficient (Carr & Thompson, 2014).

The responses received from female farmers in the research area indicate a profoundly gendered experience of adaptation challenges to saltwater intrusion, marked by restricted agency, spatial marginalisation, and institutional disregard. Women’s narratives generally exhibit a reactive stance towards climatic stressors, utilising straightforward, observable indicators such as salinity levels to inform water management techniques, constrained by limited access to technical knowledge, financial resources, or possibilities for training. Their statements are likely to convey an understanding of marginalisation, as institutional communication frequently does not reach their residences, particularly in more isolated regions. This informational and spatial marginalisation amplifies vulnerability and reduces opportunities for strategic adaptation (Nori et al., 2008).

Furthermore, the lack of pragmatic guidance from authorities, aside from fundamental alerts regarding environmental conditions, exacerbates the responsibility of adaptation for individuals and intra-households, particularly women, without providing the essential support to respond to that information. The gendered dynamics demonstrate that adaptation beyond mere physical infrastructure or agricultural choices, being fundamentally influenced by power relations, access to knowledge, and participation in decision-making processes. The results correspond with the critical reflection of hierarchical adaptation governance that neglect the systemic and intersectional elements limiting women's adaptive capacity (Hackfort & Burchardt, 2018). This synthesis underscores the necessity for more inclusive, gender-sensitive approaches that integrate both technical and social dimensions of adaptation.

Conversely, male farmers typically expressed limits through practical trade-offs and technical consideration. One individual remarked, “The current measures only deal with the salt temporarily; still have to spend a lot to treat root problems”. This perspective indicates enhanced access to adaptation resources and a more explicit comprehension of the fundamental structural issues, while also recognising the economic burden associated with sustainable solutions (Arora-Jonsson, 2011). Male expressions demonstrate an ability to consider risks and solutions within a comprehensive decision-making context, suggesting enhanced institutional connection and autonomy in the management of land and infrastructure (Nightingale, 2006).

Collectively, these gendered narratives underscore the substantial influence of access to information, material resources, and institutional support on the experience and expression of adaptation (Ravera, Martín-López, et al., 2016). Women frequently function within constrained parameters of immediate feasibility, lacking the resources to impact or alter overarching systems of water governance. Conversely, men, when faced with challenges, are more inclined to plan for trade-offs and engage in long-term planning. This disparity underscores the necessity for gender-responsive adaptation policies that enhance women's participation, develop their technical capabilities, and guarantee equitable access to resources and decision-making platforms, empowering them to not only cope but also to exercise agency in shaping their adaptive futures (Alston, 2014a; Tschakert and Machado, 2012).

Conditional satisfaction and uncertainty

Both men and women expressed conditional satisfaction for salinity adaptation initiatives, albeit with varying emphases influenced by gendered experiences of vulnerability. A man from An My explained, “It works, but if salinity lasts too long, there's no water for irrigation and the corn dies”, framing the limitation in terms of specific crop losses and technical failure. Similarly, a woman echoed the uncertainty, stating, “If the salinity lasts long, we still suffer due to water shortage”. However, women were more likely to express acceptance of losses as inevitable, as reflected in another woman’s remark, “It’s just a temporary fix. If the salinity lasts long, we are still affected”. Such expressions indicate a coping approach influenced by restricted access to resources, hence limiting the adaptation alternatives open to women.

This pattern corresponds with extensive research indicating that women in rural agricultural contexts face heightened vulnerability to the effects of sustained climatic stress while simultaneously lacking the means to respond effectively, attributable to limited access to financial resources, adaptive technologies, land ownership, and institutional support (Alston,

2014a; Tschakert and Machado, 2012). Although both genders are affected by saline intrusion, women's coping mechanisms are often more reactive and restricted, highlighting systemic disparities that hinder their capacity to adopt long-term adaptation strategies (Carr & Thompson, 2014). Conversely, men's expressions of discontent are frequently associated with technical deficiencies and identified risk factors, indicating a higher degree of agency in problem identification and resolution (Nightingale, 2006).

Desire for improvement or recovery

Men frequently expressed ambitions for enhancement and investment in adaptation, indicating a more proactive approach to environmental and livelihood concerns. One male participant stated, “Planning to invest in a drip irrigation system to save water”, while another noted, “The fruit farm is already old and not productive, so it’s acceptable now. If I had capital to improve it, I would”. These statements indicate that male farmers are more inclined to perceive adaptation as a strategic investment and future planning, frequently associated with access to financial resources, technical expertise, and decision-making autonomy.

Conversely, female responses exhibited significantly less emphasis on proactive investment. Only one woman mentioned an improvement initiative, stating, “I’m not fully satisfied, still want to dredge the canal to hold more water during high salinity”. The widespread lack of comparable comments from women underscores the enduring gender disparity in obtaining the resources required for adaptation improvements. The observed patterns align with prior research indicating that women in rural agricultural settings frequently experience diminished access to capital, agricultural extension services, credit, and formal decision-making authority, thereby constraining their ability to initiate or drive adaptation investments (Huyer, 2016b).

Collective support via informal social networks

A limited number of female participants highlighted social support and information exchange as crucial components of their satisfaction with adaptation initiatives. One woman remarked, “I got timely advice and support from neighbours”, while another added, “It is effective and timely. Just hearing people talk at the coffee shop in the morning helps me prepare”. These reflections underscore that women frequently depend more on informal social networks for adaptive knowledge and early warnings, especially in situations where they may be marginalised from formal agricultural institutions or male-dominated decision-making arenas (Marimo et al., 2021).

This dependence on peer-to-peer learning and community support mechanisms corresponds with broader research indicating that women's adaptation strategies often stem from collective action, information sharing, and mutual assistance (Khalil et al., 2020), particularly when access to technical extension services, financial resources, and formal climate governance frameworks is constrained (Carr & Thompson, 2014). Unlike male farmers, who typically engage more directly with institutional channels and infrastructural investments (Siemiatycki et al., 2020), women's adaptation pathways tend to be more social, decentralised, and relational (Edvardsson Björnberg & Hansson, 2013), underscoring the vital significance of sustaining robust community networks for adaptation as part of broader climate adaptation strategies (Newman & Dale, 2005).

8.2.2.3 Climate adaptation strategies to excessive heats, especially in lacking of irrigation

This section explores the gendered dimensions of climate adaptation strategies employed by farming households facing irrigation challenges during periods of excessive heat in Phu Huu commune**.** Drawing on survey data, it examines the specific responses adopted by male and female farmers to cope with water scarcity and its effects on agricultural production. The analysis highlights the extent to which gender influences both the type and frequency of adaptation measures, providing insight into the differentiated vulnerabilities and capacities shaped by socio-economic and institutional factors. The following chart presents the percentage of male and female participants who reported undertaking various adaptation strategies.

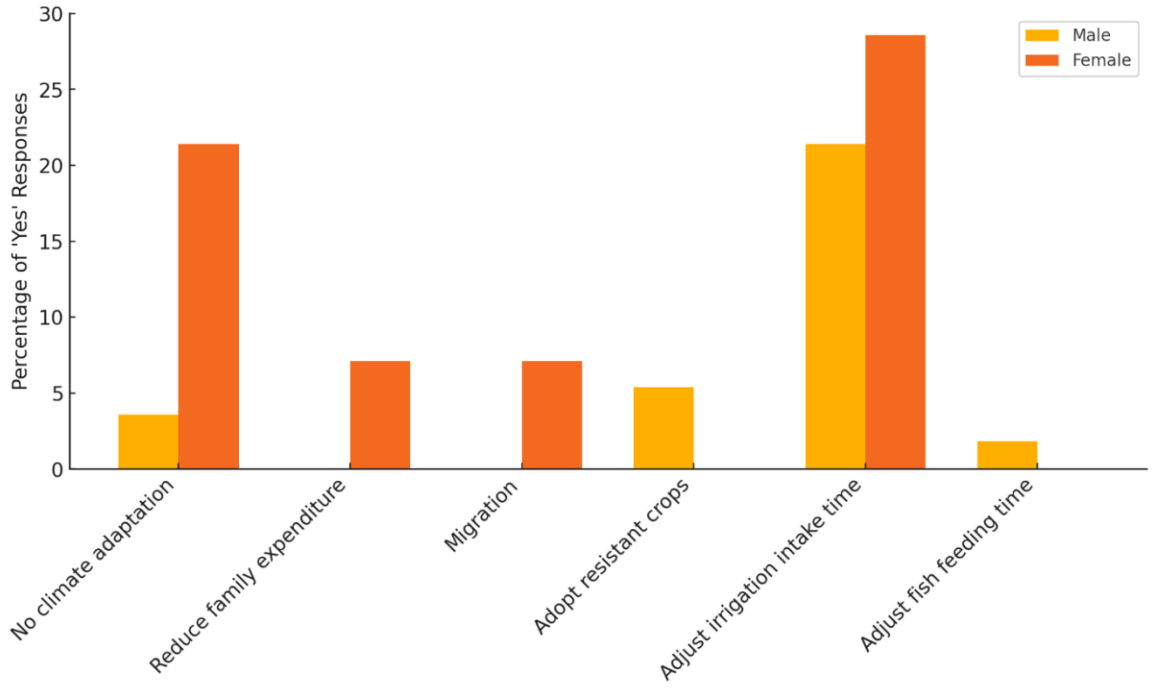


Figure 8.10 Climate adaptation strategies to excessive heats (n=70)

Source: Household survey (2024).

The chart illustrates various statistically and contextually relevant gender-based disparities in climate adaptation responses to irrigation difficulties. As shown in Figure 8.10, a greater proportion of female participants (21.4%) said that they undertook no climate adaptation measures, in contrast to merely 3.6% of male participants. This disparity indicates possible structural obstacles hindering women's adaptive capabilities, such as limited access to agricultural resources, technical expertise, or decision-making power (Alston, 2014a; Tschakert and Machado, 2012). Moreover, only women reported implementing household-level coping methods, including lowering family expenditures (7.1%) and migrating temporarily (7.1%), which were not cited by any male participants. The findings suggest that female farmers may predominantly depend on short-term, non-technical solutions that align with their responsibilities in family management and susceptibility to economic pressures, rather than on structural alterations in agricultural techniques (Carr & Thompson, 2014).

Conversely, male participants exhibited a heightened inclination for farm-level, technological adaptations. For example, 5.4% of men indicated the adoption of resistant crops—a technique not reported by any women—while 1.8% of men modified fish feeding schedules, with no female participation. The observed gendered trends correspond with existing literature suggesting that men often have greater access to agricultural extension services, capital, and land-use decision-making, hence facilitating their adoption of more proactive or technology-

driven solutions to climate stresses (Peterman et al., 2014). Additionally, the predominant strategy, specifically in modifying irrigation intake timing was acknowledged by both sexes, with 28.6% of women and 21.4% of men using it. This suggests a very attainable technique that may not necessitate significant resources or institutional assistance, therefore being feasible for a broader demography. The gendered disparity in adaptation practices highlights the necessity of integrating gender-sensitive strategies in climate adaptation planning. Mitigating structural inequalities, such as access to information, financial resources, and involvement in decision-making will be essential for fostering equitable and effective adaptation capacities for both male and female farmers (Adger, 2003a).

8.2.2.4 Gendered perceptions of satisfaction with extreme heat adaptation strategies

This section provides an examination of gendered analysis of climate adaptation satisfaction to irrigation shortages during excessive heat in Phu Huu commune, An Giang province. Nine emergent themes, derived from semi-structured interviews, demonstrate the differing techniques, attitudes, and satisfaction levels of male and female farmers in their navigation of climatic stress. Male participants often cited the unpredictability of weather, dependence on traditional knowledge, and geographic proximity to irrigation canals, while also recognising the substantial economic expenses and variable results of their endeavours. Conversely, female farmers articulated more significant limitations, consistently referencing the lack of feasible alternatives, deteriorating agricultural productivity, and dependence on fundamental coping strategies such as water availability and nutrient enhancement. Both groups acknowledged the restricted and frequently transient efficacy of their existing techniques; the analysis underscores how structural inequalities, especially regarding access to resources, information, and decision-making avenues disproportionately influence women's adaptive capacities. These gendered viewpoints highlight the necessity for more inclusive, contextually aware adaptation strategies in water-scarce and heat-impacted areas of the Mekong Delta.

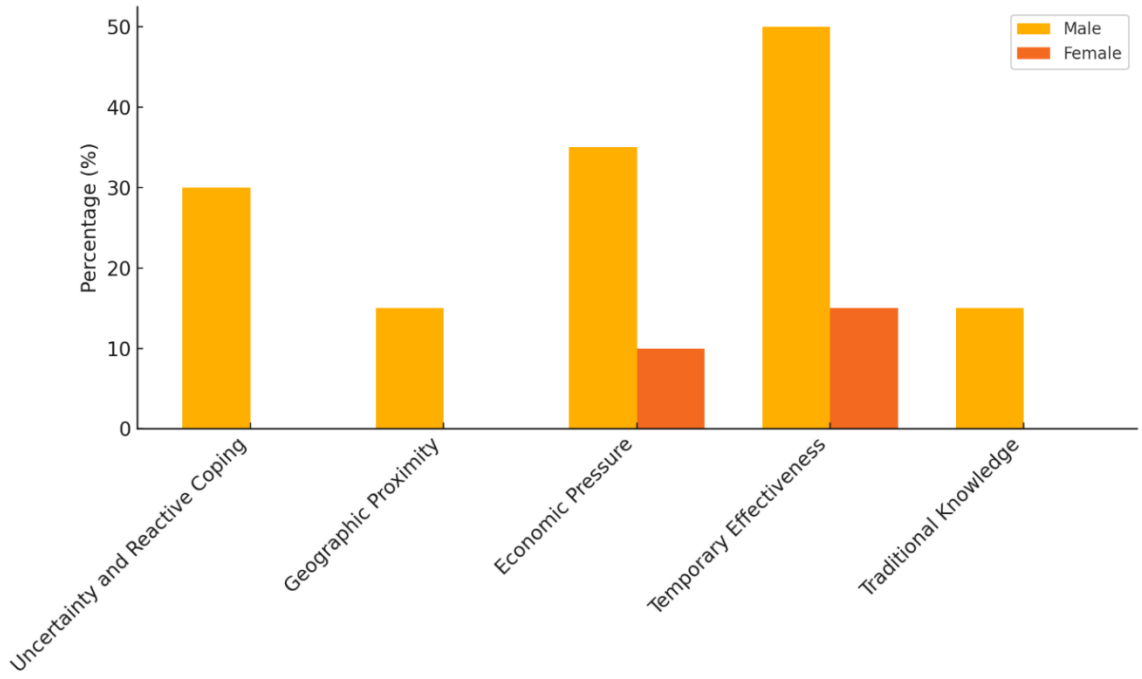


Figure 8.11 Gendered themes in coping with climate impacts (n=70)

Source: Household survey (2024).

Uncertainty and reactive coping

Thirty percent of male farmers and none of the female farmers consistently highlighted the unpredictability of weather and hazards, prompting many to choose a reactive rather than proactive approach in their adaptation strategies. A participant stated, “As you know, natural hazards and weather are unpredictable; we just deal with it as it comes”. Another echoed, “You can’t predict natural hazards, so you can’t plan for them”. These assertions indicate a greater dependence on lived experience and straight-forward coping strategies instead of systematic, long-term proactive risk mitigation techniques.

This inclination for reactive adaptation corresponds with studies indicating that smallholder farmers frequently rely on historical knowledge and awareness of local climatic patterns, rather than external predictions or structured planning models (Tschakert & Dietrich, 2010). Although experiential knowledge is beneficial, excessive dependence on it may hinder readiness for the increasingly unpredictable and severe weather phenomena associated with climate change. Furthermore, the belief that hazards are infrequent can diminish the incentive to invest in preventative strategies, particularly when institutional support or risk communication is inadequate (Adger et al., 2009; Nguyen & James, 2013).

Geographic proximity

Fifteen percent of male farmers indicated a diminished vulnerability to climate-induced water stress owing to advantageous local water conditions or their geographical proximity to irrigation infrastructure (see Figure 8.12). One participant remarked, “Water here is relatively better than in other areas”, while another explained, “My rice field is located near a canal, so there’s water. Those far from water sources suffer”. These remarks demonstrate how spatial elements, including geographic position within the irrigation network, influence varied experiences of vulnerability and resource accessibility.

Figure 8.12 Water management systems in Phu Huu commune

Source: Thai Van Nguyen (2024).

This localised spatial discrepancy in water supply is extensively documented in climate vulnerability studies, indicating that proximity to canals, reservoirs, or state-managed irrigation systems might provide some protection against saline intrusion, drought, or water shortages (Mirhanoğlu et al., 2022; Teller, 2016). Farmers situated near water-related infrastructure (e.g., sluice gates, irrigation pumping stations) are typically more capable of sustaining agricultural yields and managing climatic shocks, whereas those in remote or downstream regions experience increased vulnerability and diminished coping capacity (Salman et al., 2022). Moreover, these physical disparities in water access are often exacerbated by socio-political and economic inequalities, such as land tenure, influence within water-user associations, and ties to local governance structures (Adger et al., 2009). Geographic advantage thus reflects not

only environmental positioning but also intersects with broader dynamics of institutional power and resource availability.

Economic pressure and cost concerns

Increased input costs for agricultural production have been a continual issue for both male (35%) and female (10%) farmers. Although acknowledging the efficacy of specific adaptation approaches, numerous responses conveyed discontent stemming from the financial strain caused by escalating production costs. One farmer stated, “Talking about my current climate adaptation options, I am not really satisfied because of high costs of farming inputs”, while another observed, “Crops are growing, but input investments are too high”. Others echoed this frustration: “Inputting for farming production is still costly”, and “Thanks to fertiliser, rice grows but costly”. These reactions demonstrate the economic burden of sustaining output amid climate stress, when dependence on inputs such as chemical fertilisers, irrigation technology, or insect management becomes progressively essential however financially unfeasible for many different groups.

This corresponds with extensive research indicating that climate adaptation in agriculture frequently necessitates substantial capital investment, especially in areas such as the Mekong Delta, where salinity intrusion, drought, and changing crop conditions compel farmers to implement high-input strategies to maintain yields (Schneider & Asch, 2020). Nevertheless, these strategies are sometimes unsustainable for smallholders, particularly when market prices fluctuate and governmental assistance systems are inadequate or inconsistently allocated (Kim Dang et al., 2021).

The influence of economic constraints on adaptive capacity is well-documented in scholarly works, demonstrating that financial constraints diminish adaptation and exacerbate inequities between wealthy and at-risk households (Haldon et al., 2021). Financial restrictions are identified in adaptation literature as a primary issue hindering farmers' transition from reactive to transformational techniques (Alie et al., 2024). In the absence of targeted financial assistance, bank access, or governmental investment in communal infrastructure, numerous farmers are trapped in a cycle of short-term survival reliant on expensive inputs, with no prospects for structural adaptation and long-term adaptation (Ponte, 2001).

Temporary effectiveness

Fifty percent of male farmer and 15% percent of female farmers recognised that their existing techniques were only partially effective or merely temporary solutions in response to persistent

climate constraints. Many regarded their adaptation initiatives as inadequate to tackle underlying, systemic vulnerabilities. One male participant shared, “Adapting with extreme heat and no rain is just temporarily okay” while another remarked, “It is temporary only, not stable long term”. A female farmer reported, “It’s somewhat better, the plants have started to grow again”—others emphasized ongoing limitations: “It is still not good because there’s no water supply; without water, it’s very difficult”. These thoughts indicate a prevalent acknowledgement that whereas reactive coping mechanisms may provide temporary alleviation, long-term planning and sustainable recovery plans are predominantly lacking.

These findings align with broader remarks of community-level adaptation, where insufficient institutional support, inadequate infrastructure, and the unpredictability of climate impacts frequently hinder efforts to progress beyond immediate coping strategies to climate risks (Friend & Thinphanga, 2018). In several rural areas, climate adaptation is often incremental and temporary, inadequately addressing fundamental causes of vulnerability, such as unequal access to resources due to gender, age, belief systems, and other social identifiers, inadequate water management systems, reliance on a limited variety of crops, and insufficient financial reserves (Schipper, 2007).

The disparity between reactive and transformational adaptation underscores the necessity of formulating climate responses that incorporate proactive planning, anticipatory learning, and equitable access to adaptation resources (Kates et al., 2012). In the absence of these systemic transformations, communities will continue to face recurrent disruptions and an escalating uncertainty regarding their futures in a changing environment (Wamsler & Brink, 2014).

Use of traditional knowledge

The study revealed that 15% of male farmers and none of female farmers indicated dependence on traditional knowledge to address climate-induced issues, highlighting the significance of informal learning systems in influencing adaptation behaviours. A male farmer stated, “We deal with climate-related hazards in rice farming using experience". These responses indicate that male farmers frequently rely on their acquired agricultural experience rather than formal education or institutional assistance to inform their adaptation strategies.

This dependence on traditional knowledge illustrates an ongoing pattern in agricultural settings where farmers involved in land and resource management cultivate and utilise traditional knowledge systems to address environmental fluctuations (Mugambiwa & Makhubele, 2021). The lack of references to formal training or institutional involvement in male farmers’

narratives may indicate either insufficient outreach or a belief that external support is perceived as less pertinent or less credible than personal experience (Sumberg, 2011). This highlights the necessity for adaptation programmes that connect local and scientific knowledge systems, merging farmers' experiential insights with comprehensive institutional strategies to improve adaptation while also tackling disparities in training access across gender and class divisions (Wright et al., 2017).

This study's findings underscore challenges impacting farmers' adaptation techniques to climate-related hazards. Primarily reactive coping strategies, influenced by uncertainty and dependence on experiential information, restrict long-term readiness and systemic resistance to climate effects (Fazey et al., 2010). Spatial disparities intensify vulnerability, as farmers situated near irrigation infrastructure disproportionately gain relative to their more remote, resource-scare areas (Fazey et al., 2010). Economic pressures profoundly affect the feasibility of adaptation approaches, highlighting the need for specific financial assistance to enable sustained shifts from short-term coping to transformative adaptation measures (Shardul & Samuel, 2008). In both study sites, farmers' increasing understanding of current strategies as inadequate and provisional highlights an urgent requirement for extensive institutional assistance, and substantial infrastructure investment (Kattumuri et al., 2017). Combining traditional experiential knowledge with formal training and institutional interventions may close gaps in climate adaptation efficacy, improve community adaptation, and promote greater equity in climate adaptation outcomes (Gómez-Baggethun et al., 2013).

8.2.2.5 Impacts of climate-induced hazards on farmers' property management

As shown in Figure 8.13, the comparison analysis indicates that among smallholder farmers, both male and female participants, salinity intrusion in An My commune seems to be a larger driver of land-use adaptation. It necessitates more transformative responses, such as shifting crop varieties, which may indicate both the intensity and spatial predictability of salinity effects, in contrast to the gradual, seasonal characteristics of heat and drought stress.

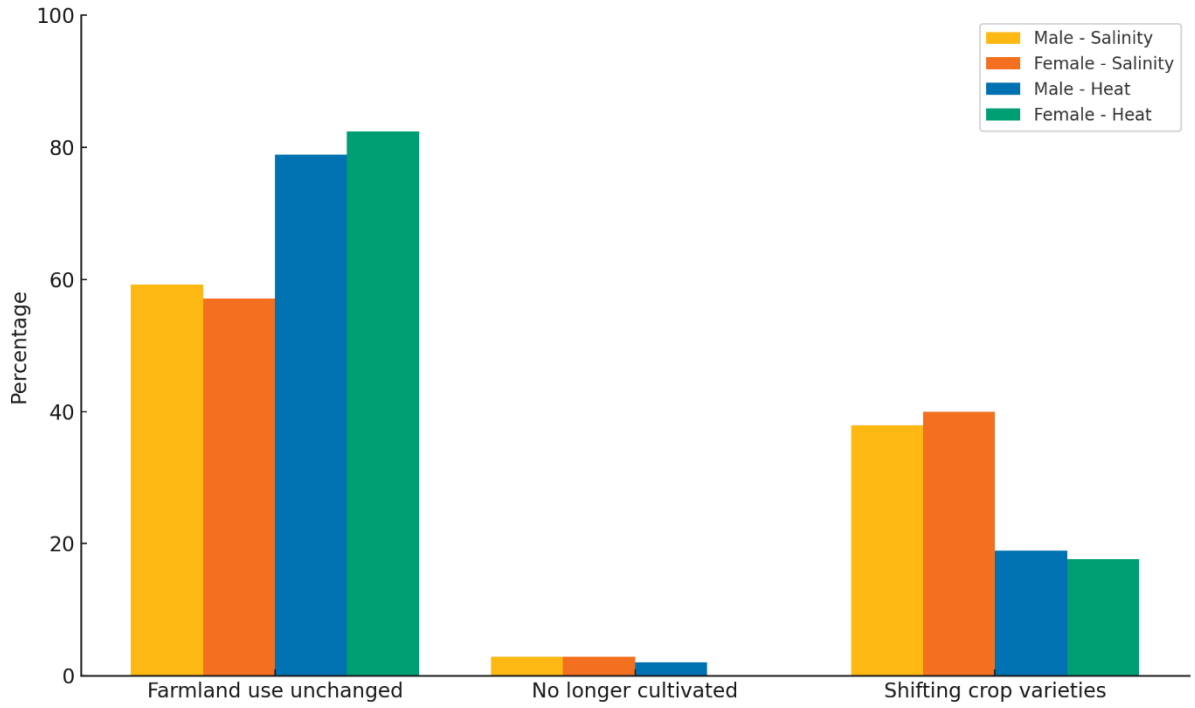


Figure 8.13 Gendered land use changes: salinity and excessive heat impacts (n = 138)
Source: Household survey (2024).

The results indicate notable parallels in land use responses across male and female farmers, although nuanced gender differences point to underlying differences in adaptive capacity and strategy. A majority of participants from both sexes reported continuing their agriculture despite the effects of salinity with 59.2% of males and 57.1% of females. This may indicate the limited adaptability to modify land use in reaction to environmental stress (Zurick, 1988), particularly in salt intrusion. The consistency in land use may not indicate adaptation, but rather a lack of adaptive options or institutional support for transformation (Baldwin et al., 2023).

A substantial percentage of participants with 37.9% of men and 40.0% of women reported that they maintained their farms while altering crop varieties, such as transitioning from durian to coconut, or switching from one farming system to another, such as rice to fruit cultivation. This comparable pace of transformative land use indicates that both genders are participating in adaptive diversification instead of abandonment. It emphasises the ability to adapt to salinity by altering production methods, potentially through the adoption of salt-tolerant varieties. The comparable percentages indicate that adaptive experimentation takes place across gender boundaries; nevertheless, the quality and efficacy of these modifications are likely dependent upon access to extension services, information on the market, and financial resources (Ragasa et al., 2013).

A mere 2.9% of both male and female participants indicated that land is no longer cultivated, suggesting that total abandonment of farming due to salt is uncommon. This may indicate either a profound commitment to land as a source of livelihood or a lack of viable alternative economic alternatives, especially in rural areas where agriculture prevails as the primary economic activity (Carter & Zegarra, 2000).

Across the two study sites, the majority of participants including male and female reported no changes in cultivation practices in reaction to extreme heat and the associated water scarcity; however, it is evident that farmers in Phu Huu commune were the most concerned. Specifically, 78.9% of male participants and 82.4% of female participants indicated that their agricultural activities remained stable during and after these climatic stress events. This prevailing pattern of continuity in land use may suggest either perceived adaptation or, alternatively, constrained adaptive potential (Dearing, 2008). The persistence of traditional practices may be shaped by economic, cultural, or gendered limitations, which particularly hinder women, from implementing substantial land-use changes (Jost et al., 2016).

In the analysis of transformation-oriented responses, 18.9% of men and 17.6% of women reported that their land remained cultivated, albeit with a modification in the type of crop, livestock, or aquatic products. The roughly identical proportions indicate a common, albeit minor, inclination across both genders to pursue adaptive agricultural diversification in reaction to heat-related stressors. Insights from senior farmers in in-depth interviews also revealed critical reflections and adaptive knowledge regarding the long-term effects of salinity on productivity, and reinforcing the complexity of responses to chronic climatic pressures in shaping land-use strategies.

> ***Question:*** *Do you think saltwater, once it enters the soil, stays there for a long time?*
> ***Response:*** *Yes, the saltwater stays in the soil. Even after repeated flushing, some of it still remains. You need fresh water to flush it out, and proper drainage is essential—water in from one side, out from the other. For example, if this is your field, you need to pump water in from one end and let it drain out the other.*
>
> ***Question:*** *Do you mean that water must be pumped in from one side and flushed out the other?*
> ***Response:*** *That's the only effective way. If you just pump water and let it settle without proper drainage, it won't work. For rice, you need salt- and drought-tolerant varieties; otherwise, the crop will die.*
>
> (Beo, AM)

Another farmer in Phu Huu commune remarked on the changes in their work schedule for farm production.

Question: *Since the past five years, which year marked a noticeable rise in heat?*
Response: *Each year, gradually. But in the last two years, it's intensified.*

Question: *Does your wife help with the fields and crops?*
Response: *Yes.*

Question: *What does she do, and what do you do?*
Response: *I handle the fields and crops; she does the same.*

Question: *Specifically, in rice farming, how does she assist you?*
Response: *She handles the weeding. I manage fertilizing, hiring workers to spray.*

Question: *What else does she do?*
Response: *Weighing rice, transplanting, dealing with snail pests.*

Question: *Besides fertilizing, what else do you do?*
Response: *I water, fertilize, and spray pesticides.*

Question: *Have responsibilities changed over the years for men and women?*
Response: *It's the same; I still do the same work, no changes.*

Question: *Are you the head of the household?*
Response: *Yes.*

Question: *Is she concerned about the heat like you?*
Response: *Of course – we're equally affected. Heat causes losses.*

Question: *What does she say to you, as she directly assists with rice farming? With weeding and transplanting, does she feel the impact of the heat?*
Response: *Yes, it's hard to bear the heat. We can only work a few hours in the morning. Before, we worked until 11–12 noon. Now we have to stop by 9–10 a.m.*

Question: *So, has her work changed with the heat?*
Response: *Not really, but we're working later.*

Question: *You've adjusted your work schedule?*
Response: *Yes, timing has changed. Before, we worked two shifts, morning and afternoon; now we only work in the morning.*

Question: *So, you work in the early morning?*
Response: *Yes, in the morning, and then rest in the afternoon.*

Question: *In the morning, what time do you usually start?*
Response: *We start at 6 a.m.*

Question: *And what time did you use to work before?*
Response: *Also 6 a.m., but we could work until 11 or 12 noon. Now, we can only go until 9 or 10 a.m., sometimes even 8–9 a.m. when the sun hits.*

Question: *So, the working time has shortened?*
Response: *Yes, it has shortened.*

Question: *Then how do you get all the work done?*
Response: *If we can't finish, we do it later; we just keep at it, stop, then keep going – today isn't enough, so we continue tomorrow.*

(Thien, PH)

Such modifications typically entail transitioning to drought-resistant varieties, altering planting schedules, or adjusting agricultural inputs to maintain productivity under more severe climatic events. This indicates a degree of flexibility; yet, the low proportion underscores the necessity for enhanced support systems, including better availability to irrigation innovations, and training in heat adaptation.

A little gender disparity was noted in the choice to cease agriculture entirely, with 2.1% of male farmers reporting they had stopped cultivating their land, compared to none among female farmers. Although the percentage is minimal, this may indicate that male farmers who frequently possess land titles are slightly more inclined to withdraw from farming, either temporarily or permanently, when circumstances become untenable (Sharma & Bhaduri, 2009).

The decision of female farmers to abandon rented land and pursue wage labour in the cities signifies a turning point in which agriculture is no longer regarded as a sustainable means of existence. A female farmer stated, "Renting land led to losses, so we returned the land and went to the city to work" indicating a transition influenced by economic and climate vulnerabilities, as well as the enduring obstacle of land ownership for women in rural regions, push women exist agriculture (Tacoli & Mabala, 2010). Another female farmer remarked, "We rented land to cultivate rice to earn daily income, but the rice was unstable now. So, we no longer rent the land for farming until now" emphasises that fluctuations in rice markets or production, whether caused by compound impacts of climate variability and rising input costs, make ongoing cropping unsustainable. These examples illustrates broader patterns in which women, lacking of financial reserves, and stable land rights, are compelled to leave agriculture, further exacerbating gendered economic vulnerability (Tacoli & Mabala, 2010). As Tamang et al. (2014) argue that many women continue farming out of necessity, relying on daily income while lacking access to viable alternative livelihoods.

In conclusion, gender trends regarding climatic events at the two study locations exhibit notable consistency: women demonstrate marginally elevated rates of continuity, reduced

abandonment, and slightly fewer alterations in production systems, potentially indicative of restricted access to capital, technology, or land-use decision-making authority. While behavioural responses appear similar, the underlying motivations and constraints are distinctly gendered. Policies designed to improve adaptive capacity should consequently differentiate between the types of stressors, such as salinity versus extreme heat. Additionally, customise interventions to address the specific gendered obstacles that hinder transformation, including access to salt-resistant varieties, drought-adapted technologies, systems for irrigation, and financial institutions (Glemarec, 2017).

8.2.2.6 Factors contributing to climate-induced hazards

Figure 8.14 delineates gender disparities in the perceptions of male and female farmers regarding the catalysts of environmental risks in the VMD. Although there are some similarities, the data reveal fundamental variations in access to knowledge, lived experiences, and socio-political standing.

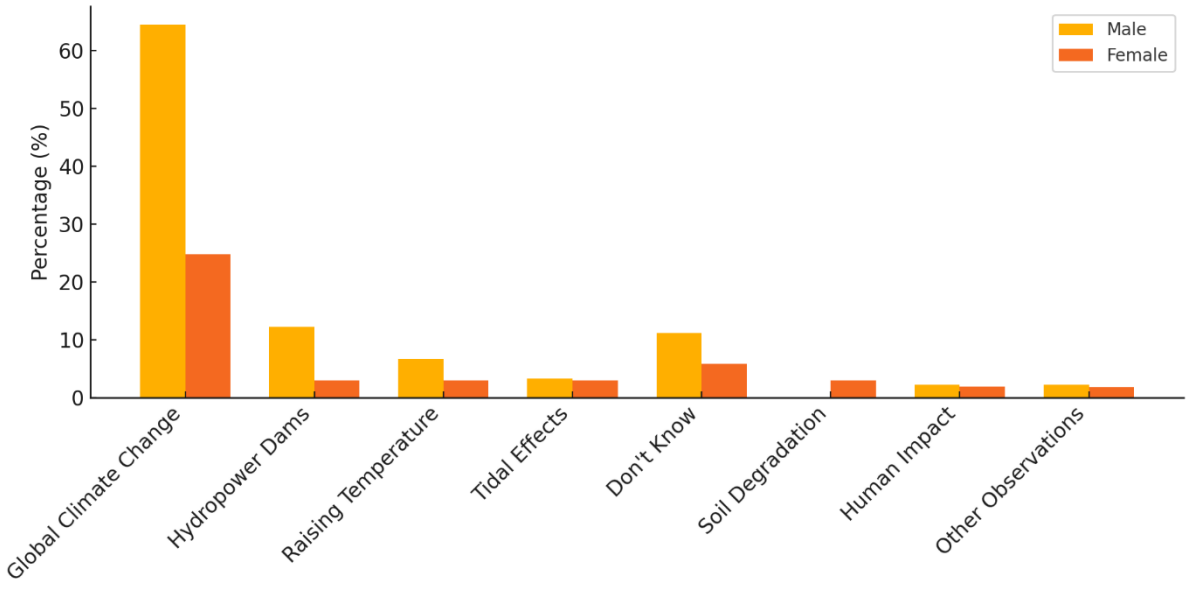


Figure 8.14 Perceived causes of environmental risks among men (n=58) and women (n=22)
Source: Household survey (2024).

Both male and female participants primarily attributed hazard-related risks to global climate change, with 58 responses from males and 22 from females. The percentage was slightly higher in women (59.5%) than in men (56.3%). This convergence signifies a growing public knowledge, perhaps shaped by national discourse and media communication. The frequent mention of "It is because of effects of global climate change" by both male and female participants often without more explanation underscores a broad knowledge of climate alterations while indicating a restricted localised comprehension. Although these statements

were frequently used in interviews, especially by female participants, they tended to serve as general attributions rather than contextually specific explanations. This trend may indicate the extensive dissemination of climate change discourse via media or institutional initiatives, yet lacks corresponding endeavours to convert global narratives into locally relevant knowledge or practical applications (Rai, 2010).

Male farmers more frequently conveyed a nuanced and situated understanding of saline intrusion, providing various explanations beyond mere allusions to climate change. Their rationale often connected salinity to upstream hydroelectric dams, tidal fluctuations, and temperature extremes. One farmer stated, “China builds dams to make fresh water, but the silt cannot return, so salt water from the sea flows inland”. Another added, “Too many dams cause less water to be brought upstream, combined with seawater encroachment”. These observations indicate that male farmers may experience heightened exposure to environmental pressures or acquire information regarding transboundary water governance and hydroclimatic processes, enabling them to establish causal links between regional infrastructure and local agricultural outcomes. These observations indicate a greater engagement with hydrological processes and regional infrastructural dynamics, emphasising how exposure to land-use decisions and institutional discourses may promote more advanced environmental understanding (Kaplan et al., 2008).

Conversely, female farmers infrequently referenced such specific procedures. An exception was a woman who stated, "Due to the absence of returning upstream freshwater, the monsoon winds bring salinity". This remark reflects an evolving understanding of how diminished freshwater supplies from upstream regions may affect monsoonal patterns, hence exacerbating salt intrusion. The majority of female remarks, however, stayed generic, suggesting little use of institutionalised or formalised methods of information sharing.

Perceptions linking upstream dam construction to downstream salinity indicate an increasing recognition of how hydropower development along the Mekong River has modified sediment transport, and freshwater discharge significantly impacting deltaic agricultural systems (Kondolf et al., 2018). These findings also illustrate the integration of personal experience with wider area environmental discourses, in contrast to the more generalised sentiments observed among female farmers.

Moreover, uncertainty was more pronounced among female participants, as seen by clear statements such as "I don’t know" and "I can’t think of it, don’t know". These expressions

signify not just limited access to knowledge but also possible exclusion from environmental decision-making processes or hesitance to engage due to perceived deficiencies or lack of confidence. This form of uncertainty often arises from institutional barriers that restrict women's access to technical information, climate-related training, or participation in community planning dialogues (Smith et al., 2017).

Conversely, male participants, even in uncertainty, more often attempted to formulate incomplete or theoretical explanations based on environmental or institutional narratives. A man remarked, “I don't know why, maybe because of the hydroelectric dam upstream and rising sea levels”. Such responses indicate that men's uncertainty was more frequently contextualised within overarching discourses concerning water governance and climate change, implying a greater exposure to environmental dialogues.

This gendered gap in expressing uncertainty reveals systemic inequalities in knowledge access, trust in institutional entities, and societal norms around the articulation of technical viewpoints. Women's expressions of "not knowing" might be construed not only as informational deficiencies but also as consequences of exclusion from formal adaptation planning, resulting in increased dependence on experiential knowledge and social networks instead of institutional resources (Smucker & Wangui, 2016). Bridging this knowledge gap necessitates deliberate actions to enhance women's capacity through participation in climate governance via inclusive outreach, participatory training, and localised climate communication (Gupta, 2015). Despite this, women contributed grounded observations often absent in formal climate frameworks. For instance, one farmer in Phu Huu noted, “Soil is getting poorer because of continuous cultivation”, drawing attention to issues of soil degradation resulting from intensive farming practices.

These findings represent an intricate form of local ecological knowledge based on everyday observation and personal experience. Although this information may not consistently utilise technical or institutional terminology, it frequently identifies essential environmental stresses overlooked by top-down adaptation strategies (Ellis, 2005). Women responsible for managing household resources frequently observe and react to environmental changes; yet, their experiences and coping techniques are rarely recognised or integrated into formal governmental responses (Mark & Winniefridah, 2010).

The analysis concludes that although both genders recognise climate-induced risks, men more frequently articulate structured, technical explanations, whereas women frequently reference

experiential, environmental, or ambiguous factors. Systemic disparities in access to information, education, and power dynamics within households and institutions persist in influencing these variations. A gender-sensitive approach to climate governance should strive to bridge the knowledge gap, democratise access to adaptation resources, and elevate women's lived experiences, recognising them not merely as vulnerable stakeholders but as informed actors of local environmental change.

8.2.2.7 Livelihood transformation and agricultural restructuring as climate adaptation pathways

In the last ten years, climate-related hazards including salt intrusion, drought, extreme heat, and flooding have compelled rural people to modify their livelihoods. Instead of ceasing agricultural practices, both male and female farmers predominantly continue participating in on-farm operations, reconfiguring their crop and land-use strategies to adapt to evolving environmental conditions.

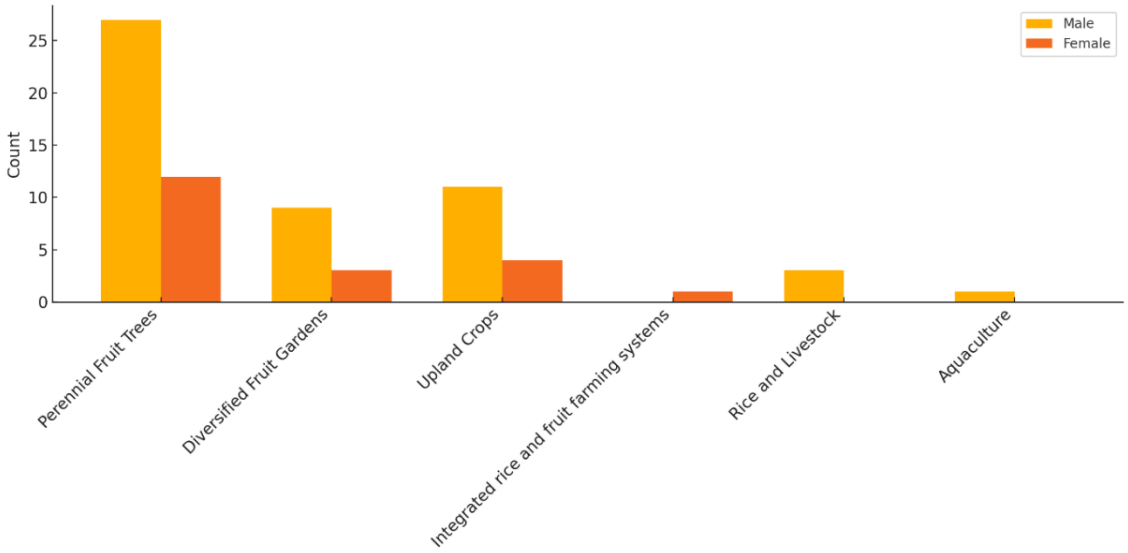


Figure 8.15 Gendered comparison of livelihood transformations (n=103 Male, n=37 Female)
Source: Household survey (2024).

On-farm adaptation pathways: Gendered patterns and constraints

Both genders markedly transitioned towards the planting of perennial fruit trees as a resilient on-farm practice. Among male farmers, 26.2% (27 out of 103) indicated this change, whereas 32.4% (12 out of 37) of female farmers did so (see Figure 8.15). This indicates a collective understanding that tree crops, such as limes, mango, pomelo, coconut, banana, and star apple provide more long-term income potential, exhibit superior tolerance to saline or drought-prone soils compared to rice, and necessitate reduced seasonal labour. The farmers' decision to transition to more salt-tolerant crops, like limes and coconuts, exemplifies a locally initiated

climate adaptation strategy based on deliberate agricultural diversification. One male participant stated, “We started planting limes because they can survive the saltwater conditions better than other crops. Coconuts are also more tolerant to saltwater intrusion, so we focus on those as well. We chose limes and coconuts because they’re more resilient to the environmental challenges we face, like saltwater intrusion” (Van, AM). This initiative demonstrates a realistic strategy to mitigate risk amid escalating salinization, a rising concern in the low-lying coastal regions of the Mekong Delta.

In light of the constraints presented by escalating water shortages, the participant indicated a shift in agricultural practices from rice cultivation to mango planting. A female participant in Phu Huu commune stated, “I switched to mango cultivation because water does not reach my area” (Ngoc, PH). Mangoes, being less water-intensive than rice, present a more resilient agricultural alternative with decreasing irrigation availability. This transition signifies a wider trend in climate adaptation, wherein farmers alter their crop choices to correspond with evolving environmental conditions (Kurukulasuriya & Mendelsohn, 2008), especially in areas where traditional methods like rice farming become untenable due to drought, or hydrological disturbances.

Crop substitution is acknowledged as an effective adaptation method to mitigate susceptibility and improve climate adaptation, particularly in drought-prone areas (Elias et al., 2019). In the Mekong Delta, the transition to drought-resistant crops such as limes and coconuts in An My commune of Soc Trang province, as well as less water-dependent varieties like mangoes in Phu Huu commune of An Giang province, exemplifies a pragmatic approach to anticipatory adaptation, rooted in both empirical knowledge and ecological imperatives (Burchfield & Gilligan, 2016). These transformations are not only environmentally adaptable but can also yield economic advantages when bolstered by appropriate market circumstances and institutional frameworks (Westley et al., 2011). Nonetheless, unequal access to essential resources for these changes, including capital, seedlings, market access, and extension support, remains inequitable, frequently reflecting greater structural inequities (Croppenstedt et al., 2013). Facilitating adaptive crop selection for all farmers, particularly the most vulnerable, necessitates inclusive policy framework that integrates local knowledge with institutional support systems (Derbile et al., 2019).

A further 8.7% of male and 8.1% of female participants indicated the diversification of their farming systems through the incorporation of mixed fruit species. This intra-farm diversity, which includes the integration of lemon, guava, starfruit, and coconut, serves as a mechanism for risk mitigation. This decision occurs frequently in An My commune. It reduces susceptibility to crop-specific failures, salinization, water scarcity, or declines in market prices, illustrating agency in diversification even under constrained conditions This technique underscores that farmers, even within their transformation, are proactively managing risk while maintaining their agricultural practices and enhancing adaptation (Lin, 2011).

Figure 8.16 Integrated intercropping farming systems of fruit trees in An My commune
Source: Thai Van Nguyen (2024).

Upland crop agriculture, including corn, beans, and chilli, is barely among males (10.7%) than women (10.8%) in Phu Huu commune. It demonstrates gendered convergence in the pursuit of alternative farming systems amid climatic stress. Integrated rice and fruit tree systems emerged as a uniquely feminine method (2.7%), but male participation in rice-livestock (2.9%) and aquaculture (1.0%) systems is low and entirely absent among women. These methods, although potentially productive, may require amounts of capital, labour, or infrastructure that are challenging to sustain with escalating climatic stress (Eriksen et al., 2005).

The gendered patterns indicate a prevailing inclination towards adaptation in farming systems, rather than complete agricultural abandonment. The diversity of strategies, from intercropping to total crop substitution, indicates varying levels of knowledge access, risk tolerance, and adaptive capacity. These distinctions confirm that although both genders face comparable environmental problems, their adaptation paths are influenced by socio-economic status, institutional involvement, and access to resources.

On-farm livelihood transformation vs crop diversification

The study indicates that the correlation between livelihood transformation and agricultural practices is analysed in Table 8.1. Specially, it examines whether the implementation of new livelihood strategies correlates with differences in crop diversification among farming households at the two research locations. An ANOVA test was performed to assess the statistically significant difference in crop diversification between households that implemented on-farm livelihood transformation approaches and those that did not. The findings demonstrate statistically significant differences between the two groups ($F = 4.383$, $p = 0.038$). Households employing new livelihood strategies had a greater mean level of multiple crop diversity in their agricultural systems ($M = 1.6875$, $SD = 0.46718$) than those lacking such strategies ($M = 1.5135$, $SD = 0.50323$). These findings suggest that adopting new livelihood strategies is associated with greater diversification in crop farming.

Table 8.1 Differences in crop diversification based on new on-farm livelihood adoption (n=140)

Descriptive

New on-farm livelihood strategies

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Yes	64	1.68	.46718	.05840	1.57	1.80	1.00	2.00
No	74	1.51	.50323	.05850	1.39	1.63	1.00	2.00
Total	138	1.59	.49283	.04195	1.51	1.67	1.00	2.00

ANOVA

New on-farm livelihood strategies

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.03	1	1.03	4.383	.038
Within Groups	32.23	136	.237		
Total	33.27	137			

Source: Household survey (2024).

Households participating in new livelihood activities are likely more motivated and capable to diversify their crops, either as a risk management technique, an adaptation to fluctuating market conditions, and an adaptive response to environmental problems. Such a relationship highlights the significance of livelihood transformation, particularly for farmers engaged in on-farm livelihoods, in influencing agricultural decision-making and adaptive capacity at the household level amid concurrent economic and environmental challenges.

Livelihood transformation associated with crop diversification vs household income characteristics

This section analyses the correlation between household income characteristics and variations in agricultural diversification to shed light on the financial conditions affecting it. One-way ANOVA tests were performed to evaluate the variation in crop diversity in relation to total household income, total savings, and total household debt.

The research indicated a statistically significant disparity in crop diversity among households with varying levels of annual total income ($F = 13.718$, $p = 0.000$). Households with higher income ($M = 418.84$, $SD = 518.58$) exhibited greater crop diversification compared to those with lower income ($M = 176.65$, $SD = 200.14$), indicating that economic capacity may facilitate investment in diversified farming systems, potentially due to enhanced access to resources, inputs, or market opportunities.

Table 8.2 Differences in crop diversification based on household income characteristics (n=140)

Descriptive

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Total amount of the entire HH	Yes	62	418.84	518.58	65.860	287.14	550.53	41	3642
	No	74	176.65	200.13	23.266	130.28	223.02	12	1348
	Total	136	287.06	397.28	34.067	219.69	354.43	12	3642
HH savings	Yes	46	3.85	.556	.082	3.68	4.01	1	4
	No	39	3.54	.790	.126	3.28	3.79	1	4
	Total	85	3.71	.687	.075	3.56	3.85	1	4
Total debt of the HH	Yes	44	3.89	.321	.048	3.79	3.98	3	4
	No	46	3.85	.631	.093	3.66	4.04	1	4
	Total	90	3.87	.502	.053	3.76	3.97	1	4

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Total amount of the entire HH	Between Groups	1978778.27	1	1978778.277	13.718	.000
	Within Groups	19328753.25	134	144244.427		
	Total	21307531.52	135			
HH savings	Between Groups	2.02	1	2.020	4.456	.038
	Within Groups	37.62	83	.453		
	Total	39.64	84			
Total debt of the HH	Between Groups	.033	1	.033	.131	.718
	Within Groups	22.36	88	.254		
	Total	22.40	89			

Source: Household survey (2024).

A notable disparity was noted for household savings ($F = 4.456$, $p = 0.038$). Households exhibiting higher savings levels ($M = 3.85$, $SD = 0.56$) demonstrated a greater likelihood for crop diversification than those with diminished savings ($M = 3.54$, $SD = 0.79$). This suggests that households' financial reserves, such as savings, may facilitate households in adopting more diversified and potentially adaptive agricultural systems.

Conversely, no statistically significant difference in crop diversification was observed when comparing households based on overall debt levels ($F = 0.131$, $p = 0.718$). This finding indicates that indebtedness does not significantly affect decisions regarding crop diversification, potentially because the burden of debt may limit rather than enhance adaptive

capacity, or because debt levels are evenly distributed among households irrespective of crop diversification practices.

The results indicate that financial assets, particularly income and savings, are crucial enabling variables for agricultural diversification, while debt alone does not inherently influence crop diversification strategies.

Livelihood transformation associated with crop diversification vs demographic characteristics

A one-way ANOVA was conducted to evaluate the impact of the household head's demographic characteristics, such as age, gender, and ethnicity on livelihood transformation decisions associated with crop diversification. The research revealed no statistically significant variations in crop diversification related to any of these characteristics.

There was no significant difference in crop diversity strategies related to the age of the household head ($F = 0.023$, $p = 0.879$). The average age was comparable across the two groups ($M = 58.67$ for 'Yes', $M = 58.37$ for 'No'), indicating that age does not significantly impact diversification behaviours in this context.

Table 8.3 Differences in crop diversification based on demographic characteristics (n=140)

Descriptive

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
HH's age	Yes	54	58.66	9.04	1.23	56.19	61.1343	44.00	78.00
	No	68	58.36	11.87	1.43	55.49	61.2411	27.00	87.00
	Total	122	58.50	10.67	.966	56.58	60.4125	27.00	87.00
HH's gender	Yes	54	1.05	.23121	.031	.9924	1.1187	1.00	2.00
	No	68	1.11	.32459	.039	1.03	1.1962	1.00	2.00
	Total	122	1.09	.28760	.026	1.03	1.1417	1.00	2.00
HH's ethnicity	Yes	54	1.11	.31722	.043	1.02	1.1977	1.00	2.00
	No	68	1.07	.26294	.031	1.00	1.1372	1.00	2.00
	Total	122	1.09	.28760	.026	1.03	1.1417	1.00	2.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
HH's age	Between Groups	2.69	1	2.691	.023	.879
	Within Groups	13773.80	120	114.782		
	Total	13776.50	121			
HH's gender	Between Groups	.116	1	.116	1.408	.238
	Within Groups	9.892	120	.082		
	Total	10.008	121			
HH's ethnicity	Between Groups	.043	1	.043	.512	.476
	Within Groups	9.966	120	.083		
	Total	10.008	121			

Source: Household survey (2024).

As shown in Table 8.3, crop diversification did not differ significantly between male- and female-headed households ($F = 1.408$, $p = 0.238$), indicating comparable mean diversification scores across gender groups. Similarly, crop diversification did not vary significantly across ethnic groups ($F = 0.512$, $p = 0.476$). Overall, ANOVA results indicate that crop diversification levels did not vary significantly by the age, gender, or ethnicity of the household head within the sampled households ($n = 140$).

The analysis emphasises that livelihood transformation is closely linked to increased crop diversity, indicating that farmers who modify their agricultural practices are addressing urgent climate threats while also enhancing their long-term adaptation. Financial capacity, particularly

income and savings, is a crucial facilitator of this transition, but demographic features show a diminished influence on diversification behaviour in such a setting.

These findings underscore the necessity of focused financial and institutional assistance to cultivate diverse resilient agricultural systems, especially for households with constrained economic means. Interventions that facilitate livelihood transformation and financial inclusion, including access to finance, market connections, and extension services, might boost household-level adaptation amidst escalating climatic and economic pressures.

8.2.2.8 Gendered division of roles and decision-making authority at household levels

Table 8.4 depicts a gendered division of roles and decision-making power within households in response to hazard-related risks via livelihood transformation. A distinct pattern emerges: husbands predominantly dominate both the suggestion and decision-making processes, especially from the viewpoint of male participants. Specifically, 66.7% of male participants indicated that the husband proposed and ultimately decided on the transformation of the livelihood structure. This illustrates the ingrained patriarchal framework in rural farming households, where men conventionally possess authority over agricultural strategies, land use, and income-generating options (Godfrey, 2010).

Table 8.4 Gendered roles in on-farm decision-making within the household (n=140)

Roles in Decision	Who Suggested the Livelihood Transformation?		Who Made the Final Decision on Livelihood Transformation?	
	Reported by Male (%)	Reported by Female (%)	Reported by Male (%)	Reported by Female (%)
Wife	2.2	21.1	2.2	21.1
Husband	66.7	42.1	66.7	26.3
Both	24.4	36.8	24.4	52.6
Son or daughter	6.7	0	6.7	0

Source: Household survey (2024).

Conversely, the responses from female participants offer a more detailed and relational account of intra-household interactions, reflecting greater attention to both individual and shared decision-making roles. A substantial majority continued to ascribe decision-making to husbands (42.1% suggested, 26.3% decided), although women were more inclined to acknowledge collaborative decision-making: 36.8% indicated that the suggestion originated from both partners, and over half (52.6%) stated that the ultimate choice was reached jointly. This gendered disparity in perception indicates that men may underreport collaborative

procedures, whereas women are more inclined to recognise the everyday negotiations and co-responsibility within the household that influence.

A notable distinction exists in the acknowledgement of the wife's agency. Among female participants, 21.1% reported that the wife proposed the concept, and the same percentage indicated that she rendered the last decision. Nonetheless, male participants assigned similar positions to wives in merely 2.2% of instances, indicating a substantial underrecognition of women's strategic involvement. Such gendered discrepancies in perception echo wider findings that , women's roles in household adaptation are often informal, unacknowledged, and undervalued, despite their essential responsibilities in food production, risk management, and household adaptation (Grace et al., 2015).

8.2.2.9 Gendered roles in livelihood transformation pathways

Table 8.5 illustrates persistent gender disparities in the divisions of agricultural labour within farming households, which greatly shape the selected households' decision-making dynamics and practical abilities to pursue on-farm livelihood transformation options. In the rural agricultural settings of the two case studies, especially those facing climate-induced challenges like salinity, drought, and excessive heat, the capacity for households to adapt or change their livelihoods is not equitably distributed between men and women. Labour duties, access to agricultural resources, and decision-making authority in farming are distinctly gendered, thereby influencing both the direction and scope of adaptive strategies at the household level.

Table 8.5 Gendered division of on-farm livelihood tasks as reported by male and female household members (n=140)

Task	% of Male Participants Reporting They Do the Task	% of Female Participants Reporting They Do the Task	% of Male Participants Reporting Female Household Members Do the Task	% of Female Participants Reporting Male Household Members Do the Task
Spread fertilizer/spray	95.6	17	11.1	9
Pump irrigation	95.6	16	8.9	9
Harvest & sell	80	15	31.1	14
Clean barns	2.2	0	2.2	0
Feed animals	2.2	0	2.2	0
Manage disease	2.2	0	2.2	0
Weeding	95.6	16	35.6	11
Rice planting	0	0	4.4	0
Other tasks	0	0	68.9	7

Source: Household survey (2024).

Male participants predominantly occupy technical, resource-based, and market-oriented roles. The findings reveal that more than 95% of male participants participate in the application of fertiliser and pesticides, irrigation water pumping, and weeding activities – tasks closely tied to production efficiency and farm system management. Moreover, 80% of men indicated responsibilities for harvesting and market agricultural products. These positions are directly connected to agricultural production, resource management, and market participation tasks frequently associated with decision-making authority, reinforcing men's position as key actors in strategic adaptation planning (Gebre et al., 2021). This dominance reflects wider socio-cultural norms that designate men as the primary cultivators and strategic planners (Kazianga & Wahhaj, 2013). Thus, males not only execute positions directly related to crop output but also frequently hold decision-making authority on the transformation of the farm system, including its timing and methodology (Shibata et al., 2020). In this context, male agricultural labour and domestic authority are mutually reinforcing.

Conversely, women's agricultural contributions are often more dispersed throughout supportive and less prominent roles. Although female involvement in mechanical activities like spraying or irrigation is limited, a significant number are occupied in harvesting, weeding, and particularly in other jobs (e.g., food processing, seed preparation, caregiving, or home-based agricultural support). For example, 68.9% of female participants indicate involvement in these extensive, frequently overlooked activities. These functions, while crucial for household adaptation and agricultural sustainability, are insufficiently recognised in decision-making arenas. Consequently, despite their contributions to labour, women often lack the authority to influence the development of livelihood adaptation options, including altering crop varieties, embracing innovative farming techniques, or investing in climate-resilient infrastructure (Djoudi & Brockhaus, 2011).

This marginalisation may arise from institutional limitations such as restricted access to agricultural resources, training, and land ownership, alongside cultural norms that restrict women to domestic labour domains (Croppenstedt et al., 2013). The inadequate representation of women in essential production roles often results in their exclusion from engagements with extension officers, market agents, and agricultural cooperatives, so further constraining their ability to contribute to transformative initiatives (Farnworth & Colverson, 2015). Furthermore, prior survey data substantiates that male participants are significantly more inclined to assert responsibility for proposing and finalising decisions about livelihood transformations, hence

highlighting the marginalisation of women's perspectives in strategic agricultural planning (Croppenstedt et al., 2013).

These findings emphasise that effective climate adaptation necessitates the redistribution of authority and acknowledgement of the broad range of labour and understanding provided by both men and women. In the absence of gender-sensitive support mechanisms and equitable access to decision-making forums, transformations in on-farm livelihoods may exacerbate rather than mitigate existing disparities.

Non-farm and off-farm adaptation pathways: gendered patterns and constraints

The results indicate enduring gender-based differences in the choice of non-farm and off-farm livelihood choices in response to climate-related hazards throughout the past ten years (see Figure 8.17 & 8.18). These distinctions signify more than personal preferences; they are fundamentally embedded in socio-economic positions, institutional accessibility, and social constraints that differentially influence the adaptive capacities of men and women.

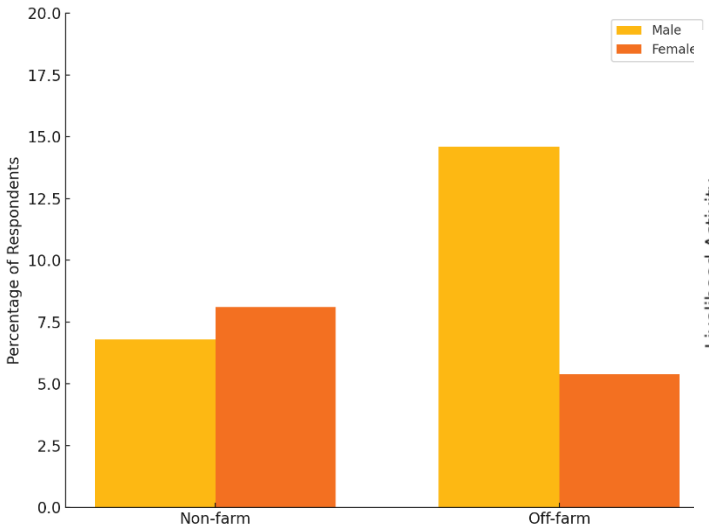


Figure 8.17 Gendered participation in non-farm and off-farm livelihoods (% of Participants) over the past 10 years (n=140)

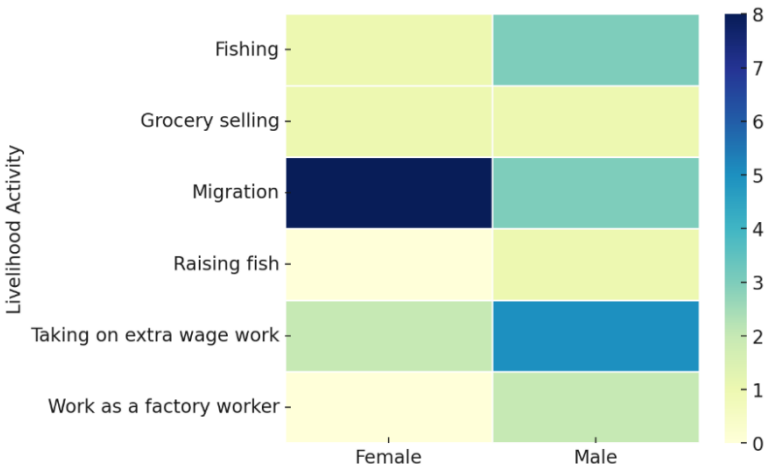


Figure 8.18 Frequency of male and female engagement in specific livelihood activities over the past 10 years (n=140)

Source: Household survey (2024).

Female participants predominantly identified migration as a principal non-farm option. A marginally greater proportion of female participants (8.1%) indicated their involvement in migration from rural areas to urban centres for supplementary income, in contrast to male participants (6.8%). This suggests that, in the context of constrained local options, migration is frequently perceived as an essential response to economic and environmental pressures. This

pattern indicates that women, confronted with environmental and economic instability, may either migrate themselves or enable the movement of household members to obtain remittances. The gendered turn toward migration may reflect not only a constrained livelihood context but also the absence of gender-inclusive local employment policies and adaptation assistance mechanisms in rural areas (Chindarkar, 2012). Conversely, their diminished participation in wage labour and other employment types (e.g., small business, or accommodation services) may indicate societal norms, inequitable access to training or financial resources, or expectations surrounding domestic labour (Deshpande & Kabeer, 2024).

Conversely, male participants demonstrated a broader range of off-farm livelihood options, especially in pursuits such as wage labour, fishing, and factory employment. Across these activities, the number of male participants was noticeably greater than the number of female participants, indicating a gendered pattern in access to and engagement with off-farm work. These activities are frequently more physically demanding, potentially indicating enhanced access to local labour markets or reduced migration pressures in comparison to women. The prevalence of fish farming solely among male participants highlights conventional roles in resource management and indicates unequal access to aquaculture or capital investment — elements that consistently impede women's engagement in profitable off-farm sectors (Omeje et al., 2021).

The limited adoption of non-farm and off-farm livelihoods by both genders indicates that on-farm livelihoods prevail, with transformation being slow and restricted. Nevertheless, the patterns emphasise a critical aspect: gender fundamentally influences the ability to diversify livelihoods but also the pathways and constraints through which this diversification occurs. Effective climate adaptation strategy must consequently tackle these rooted inequalities that inhibit equitable access to diversified livelihood opportunities. This entails formulating targeted policies and initiatives that enhance women's access to skills training, financing, movement, and assistance networks, thereby facilitating inclusive and sustainable livelihood transformation.

8.2.2.10 Gendered assessment of livelihood transformation

The integrated examination of quantitative and qualitative data uncovers both common and distinct gendered experiences in livelihood transformation across the two research sites over the last decade. Quantitatively, 58.5% of male participants and 55.0% of female participants perceived an increase in their livelihoods, whilst 32.1% of men and 30.0% of women reported

a decline (see Figure 8.19). A minor percentage in both groups indicated no substantial change, however this perception was marginally more prevalent among women (15.0% versus 9.4% for men). The percentages indicate broad commonalities in overall evaluations, although obscure more profound gendered justifications that are revealed upon analysing qualitative responses.

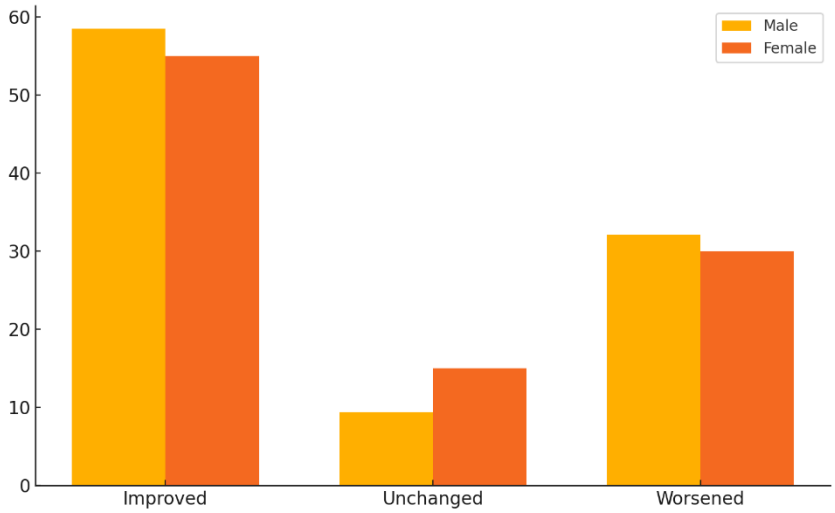


Figure 8.19 Gendered assessment of livelihood transformation over the past 10 years (n=140)
Source: Household survey (2024).

Male participants frequently associated improving their livelihoods with enhanced income, diversification, and diminished labour strain. A planned transition from rice agriculture to fruit tree farming has been observed, motivated by increasing market pricing and diminished production risks. A male participant stated, “Fruit selling prices are rising, and income is more stable than that of rice, that faces price fluctuations”, highlighting the increasing assumption that rice cultivation, previously predominant, is becoming more volatile and economically risky. Another said, “As I get older, switching to fruit trees saves labour and offers more stable income”, indicating how ageing, labour limitations, and long-term sustainability affect land-use choices. These reflections illustrate the intersect between socioeconomic variables and demographic variables that influence adaptation efforts in climate-vulnerable areas (Ahmed & Eklund, 2024).

These shifts align with underlying patterns in the VMD, where small-scale farmers are progressively adopting perennial crops to mitigate market and climatic uncertainties (H. Q. Nguyen et al., 2019). Fruit tree production necessitates a preliminary investment but is frequently regarded as a more stable and less labour-intensive livelihood choice, particularly among older farmers and households with constrained labour resources (Kassa, 2015). This transition exemplifies a pragmatic strategy for adaptation, integrating livelihood diversification

with methods that alleviate physical stresses and diminish seasonal reliance on water availability (Marschke & Berkes, 2006).

Conversely, women's narratives of enhancement were frequently articulated in terms of financial feasibility, household economic stability, and everyday necessities. Although they also gained advantages from transitioning to fruit plants, the focus was on stable and reliable income sources. One woman stated, “Since switching from rice to fruit trees, the family's income has become more stable”, and another noted, “There’s enough money for the family’s monthly expenses”. This also indicates a preference for stable, reliable income rather than maximising returns, a strategy influenced by caregiving obligations and risk aversion stemming from past marginalisation in economic planning and land ownership (Rutterford & Maltby, 2007).

Additionally, reduced input costs and labour demands factored into women's decision-making. One woman explained, “Sesbania (a local native plant in the floodplain zone) is easy to grow, doesn’t require much capital, but it’s tiring to harvest. If I put in the effort, I’ll have food”. This demonstrates a practical approach that harmonises accessibility, and household utility. In contrast to the capital-intensive adaptation tactics typically preferred by male farmers, women’s approaches prioritise immediate viability and food security, highlighting the necessity to acknowledge alternate adaptation rationales (Bastakoti & Doneys, 2020). Gendered insights are crucial for developing equitable climate adaptation frameworks that incorporate daily economic realities and acknowledge the unpaid labour and care responsibilities disproportionately shouldered by women (Butt et al., 2020).

In evaluating livelihood transformation, some women were more inclined to indicate that transformations had little effect on their household wellbeing. Some assertions like “Fruit prices aren’t high. It’s just enough to live on” and “The fruit farm can withstand salinity, and the fruit trees can at least maintain themselves”. These statements indicate an understanding that adaptive measures, while essential, have not resulted in significant improvements in livelihood security. Instead, they represent a coping mechanism wherein adaptation mechanisms are employed to prevent decline rather than to foster advancement. This perspective embodies what the literature refers to as “coping without adaptation”, as households employ strategies that facilitate short-term survival but fail to diminish long-term vulnerability or improve wellbeing (Eriksen et al., 2005). Some female farmers face adaptation challenges due to restricted access to markets, capital, or infrastructure, leading to a cycle of negligible benefits and persistent vulnerability (Ylipaa et al., 2019). These experiences

highlight the necessity of formulating gender-sensitive adaptation approaches that transcend mere survival and promote inclusive, equitable transformation capable of ensuring long-term well-being (V. Nelson & T. Stathers, 2009).

Reports of worsening livelihood conditions were common across both male and female participants; however, gendered patterns in the articulation of hardship reveal distinct vulnerabilities. Female participants often linked livelihood declines to financial insecurity, crop failure, and the burden of indebtedness stemming from adaptive attempts that did not yield anticipated benefits. A woman expressed regret, stating, "Growing papaya led to a loss. So, we were 90 million VND (~ AUD 5,390.30) in debt", while another shared, "Plums are too hard to grow… so we lost money and switched to jackfruit". These statements highlight the unequal financial risks women encounter during transition processes, particularly in the absence of institutional support, professional assistance, or savings to mitigate failure. These findings correspond with extensive literature indicating that adaptive experimentation might exacerbate economic vulnerability for women, who are frequently marginalised from formal credit institutions or land ownership, hence complicating recovery from failure (Wekwete, 2014). Women's narratives indicate an issue of "adverse incorporation" in which efforts at adaptability perpetuate vulnerability instead of mitigating it (Tschakert and Machado, 2012). These experiences necessitate improved support systems, including access to credit and cooperative networks that are explicitly gender-responsive and aimed at alleviating the financial risks women face while adapting to climate-induced livelihood shifts (Schalatek & Nakhooda, 2016).

Table 8.6 Gendered assessments of the outcomes of livelihood transformation across the two study sites over the past 10 years (n=140)

Livelihood outcomes	Male responses	Female responses
Improved	*"Selling prices are high, income is more stable than rice, which has fluctuating prices".* *"Additional source of income".* *"As I get older, switching to fruit trees saves labour and offers more stable income".* *"Switching to fruit crops is better. If there's no salinity, income is smoother than rice".* *"I'm old now; planting coconut gardens is less labour-intensive, and I also do motorbike rides to earn extra income".* *"Sold at a good price, high yield, high income".* *"There's monthly income".* *"Better than the crops I planted before".* *"Brings more income than planting rice".* *"Still sellable, and provides income".* *"Income is higher than before".*	*"Since switching from rice to fruit trees, the family's income has become more stable".* *"Because we changed crops continuously—if one died, we just planted another".* *"We shifted to perennial crops because rice wasn't yielding well. Now with perennial crops, we have just enough to eat; fruit prices aren't high but it's enough to live".* *"In the past, growing fruit trees brought more money. Now we grow coconuts and areca nuts. This year is the first time they've had a good price".*

	"High yield, good prices, monthly harvest". *"Monthly income from both rice and lemon crops".* *"Chosen for salinity tolerance".* *"More sources of income".* *"High yield and good price".* *"Rice can't tolerate salinity, but corn can. I also dug a reservoir, so even with slight salinity, I can still grow it".* *"Stable income".* *"Lemon and banana sell steadily—money comes in and out regularly".* *"Guava bears fruit year-round; plum has multiple harvests per year".* *"When the salinity hit and crops failed, I went to work for extra income".* *"Coconut provides monthly income".* *"Income for the household during times when cultivation isn't possible due to salinity".* *"New trees perform better than old ones, replacing dead crops".* *"There's money in and out—daily income".* *"If the yield is good, income is higher than rice".* *"Choosing rice because it's easier to cultivate and less labour than fruit growing".* *"Income is stable".* *"Work is productive, so there's surplus. My children work and are self-sufficient, so I don't worry about them".*	*"We have monthly income, and the family economy is better".* *"Income is a bit better, and production costs are lower".* *"We have more money than before".* *"Though the income is not higher than other crops, there is monthly income".* *"There's enough money for the family's monthly expenses".* *"We have daily income, and the crops are easy to grow".* *"Sesbania is easy to grow, doesn't require much capital, but it's tiring to harvest. If I put in the effort, I'll have food".*
Unchanged	*"Income compared to before hasn't really changed".* *"The economy is about the same as before switching to longan".* *"Fruit trees have higher economic value and provide monthly income".* *"There's money for household expenses during off-seasons".*	*"Though the income isn't higher than other crops, there's still monthly income".* *"Fruit prices aren't high—it's just enough to live on".* *"The orchard can withstand salinity, and the fruit trees can at least maintain themselves".*
Worsened	*"Because fruit prices are low and fuel, fertilizer, and pesticide costs are high—there's no profit".* *"Since changing crops, life hasn't been as good as before. If crops fail, we have to replant".* *"In the past, star apple was more stable since switching, life has been harder".* *"Since the salinity arrived, crops have failed more, leading to more crop changes. New crops often die, and the land is degraded".* *"Growing star apple in the past was smoother—now garden income is very unstable".* *"Rice farming failed due to salinity, and I got into debt multiple times".* *"Due to salinity, crop yields are poor. In the past, if there was no salinity, I could grow durian or jackfruit for good prices".* *"Coconut has no price and low yield".* *"Salinity damage leads to poor fruiting, and the trees are weakening".* *"The fruit farm is affected by salinity and doesn't yield much, so I went to work to have a stable income".* *"Recent years have seen low floods, so there's not much fish—just enough to eat, saving money on fish feed".* *"7–8 years ago, shrimp farming was more profitable. Now, with less water, it's not as productive".* *"Income is unstable, there aren't many jobs—only during*	*"Growing papaya led to a loss. We were 90 million VND in debt. Lemons yield well, but the price is low".* *"Plums are too hard to grow, require a lot of chemicals, and don't sell for a good price, so we lost money and switched to jackfruit".* *"Fruit is okay, but the price isn't high".* *"It costs more, and we only harvest lemons—but even then, the crop failed, and there was no good yield".* *"Last year, the water level was low, and there were fewer fish. Now I earn about 200,000 VND a day, compared to around 500,000 five years ago".* *"Chili prices dropped too low, and we lost tens of millions of VND. I had to go find capital to repay debt and then rent land to farm again. My daughter saw that this kind of*

peak seasons is there more work". *"Crop failure and price crashes".* *"When I first raised fish, it was very productive. But in the past 3 years, I've had only losses due to disease and low fish prices".* *"My son's job is also unstable, the wages are low—now he's thinking of quitting and coming back".*	*farming had no future, so she went to the city".*

Source: Semi-structured interviews (2024).

The results presented in Table 8.6 demonstrate that livelihood transition due to salinity intrusion and market volatility in the VMD's two case studies yields distinct yet intersecting gendered experiences. Both male and female participants noticed livelihood change—mainly via crop switching, diversification, and participation in off-farm employment—as a strategy to stabilise income during environmental unpredictability. The definitions of "improvement", "stability", and "decline" differ subtly based on gender-specific roles and duties within the household economy.

For both men and women, improved livelihood outcomes are predominantly linked to increased income stability rather than markedly larger earnings. Consistent income flow, perennial fruiting crops, and diversification beyond rice agriculture are often valued for their capacity to mitigate seasonal volatility and salinity hazards. Men frequently characterise improvement in terms of output, market pricing, technical modifications, and comparative profitability, generally highlighting productivity increases or the relative benefits of salinity-resistant crops. Their narratives contextualise outcomes about economic performance and production effectiveness. In contrast, women more frequently emphasise income sufficiency, reduced production costs, and the ability to meet household expenses. Improvement is thus conceptualised not primarily as profit maximisation but rather as the ability to sustain daily existence and ensure household survival. This disparity illustrates broader gendered labour divisions, wherein men concentrate on work and revenue generation, while women are primarily involved in managing domestic consumption and economic reproduction.

In instances where livelihood outcomes are unchanged, both men and women characterise the situation as one of maintenance rather than progression. Men typically articulate this in terms of economic comparison, with income remaining comparable to prior crops, whereas women underscore the notion of "just enough to live", emphasising subsistence-level stability over growth. Consequently, stability is perceived differently: for men as economic continuity, and for women as the continuous management of sufficiency under restricted circumstances.

Considerable gender disparities are evident in reports of worsened livelihood outcomes. Both men and women ascribe the reduction to salt intrusion, agricultural failure, escalating input

prices, market price collapses, and diminished fisheries production. Male participants also reported worsening conditions, but their reflections often emphasized external environmental degradation and market instability as primary causes. One man explained, “Since the salinity arrived, crops have failed more, leading to more crop changes. New crops often die, and the land is degraded”. Another highlighted the dual burden of ecological and economic pressures: “Fruit prices are low and input costs are high. So, there’s no profit”. In contrast, women's narratives emphasise the household-level repercussions, such as debt accumulation, financial instability, labour exhaustion, and the social ramifications of livelihood uncertainty. These stories indicate a gendered narrative in which males perceive livelihood reduction as influenced by macro-level structural causes, including climate variability, market instability, and land degradation (Lambrou & Nelson, 2010). This contrasts with women's focus on debt and household instability, reflecting men's positioning inside decision-making spheres that directly interact with larger market and resource systems (Rickson & Daniels, 1999).

Further exemplifying the impact of climatic variability, a male participant noted the declining profitability in aquaculture: “7–8 years ago, shrimp farming was more profitable”. Currently, with diminished water availability, productivity has declined. These accounts illustrate an increasing disparity between historical livelihood strategies and present ecological conditions, a pattern confirmed by research indicating that climate-induced stressors exacerbate existing agricultural vulnerabilities and necessitate prevalent livelihood investigation (de la Riva et al., 2013). Male narratives generally indicate systemic decline and the deterioration of previously stable agricultural systems, underscoring the necessity for adaptation planning that considers both biophysical pressures and variable economic conditions (Carr & Thompson, 2014; Eriksen et al., 2011).

In conclusion, the gendered analysis indicates that although both men and women encounter structural and environmental challenges, their assessment and reaction to shifts in livelihood are influenced by their differentiated roles, responsibilities, and resource accessibility. Men typically prioritised overarching economic goals and market integration, whereas women focused on coping mechanisms rooted in family stability and risk minimisation. Women reported unchanged or deteriorated results more frequently, indicating ongoing gender-based disparities in land ownership, access to capital, and decision-making authority for adaptation. Consequently, livelihood transformation in climate-affected areas such as the VMD is not a neutral process but is intricately intertwined with gendered socio-political settings, requiring

interventions that address power imbalances and facilitate equitable, participatory adaptation planning.

8.3 Factors influencing gendered decision-making processes

The analysis of male and female participants concerning livelihood transformation demonstrates that, although both genders are greatly impacted by climate-induced events, their motivations for transforming livelihoods, the pathways they select, and the strategies they emphasise are influenced by unique gendered experiences, roles, and restrictions. These disparities are not only incidental but are deeply rooted in institutional disparities over access to resources, land tenure, labour markets, and domestic responsibilities. The gendered decision-making process is influenced by a convergence of ecological, economic, social, and cultural factors, which collectively affect how men and women perceive and react to environmental challenges.

8.3.1 Shared triggers, divergent pathways

Both men and women consistently recognised drought and salinity as the most frequent causes of agricultural failure, notably impacting rice, starfruit, and other sensitive crops. These climatic stressors were widely perceived as the primary drivers of livelihood change. This convergence in perception between men and women highlights the extensive ecological implications of the 2015–2016 saltwater crisis and the enduring deterioration of land and water systems. This consensus in perception highlights the systemic nature of these climate events and the pressing necessity for transformation across both genders.

The shifts in cropping patterns reported by farmers indicate a major shift towards livelihood transformation, rather than mere isolated modifications. As salinity and diminishing market returns undermine the feasibility of traditional farming practices, farmers are not merely replacing certain crops but are also restructuring their production systems towards more economically and environmentally sustainable patterns. A male farmer stated, “I used to grow rice but failed due to salinity and low prices, so shifted to fruit cultivation to earn more money”, while a female farmer remarked, “Lemon trees gradually died due to saltwater intrusion, so I switched to new crops” (Semi-structured interviews, 2024). These narratives illustrate how farmers are transcending short-term coping mechanisms, instead participating in proactive livelihood planning influenced by ecological challenges and market constraints.

The response pathways differ by gender. Men frequently adapted by transitioning to alternative perennial fruit trees (cash crops) such as coconut, lemon, or jackfruit, or by implementing

integrated farming systems with economic viability. Some also sought alterations to land use connected to infrastructure, such as transforming fields due to enclosed dikes or drainage constraints. One man explained, “Starfruit died due to salinity… switched to coconut, plum, jackfruit because these trees tolerate salt better”. This response illustrates an economically motivated adaptation strategy, wherein men, often possessing greater land tenure security and decision-making authority, invest in commercial crops with enhanced market viability and adaptation (Deininger et al., 2021).

Conversely, women's responses tended to be more pragmatic and varied within smaller landholdings, encompassing intercropping, risk diversification, and variable planting schemes. As one woman shared, “I interplant crops, practice diversified farming… if one fails, another survives—so there’s still income”. Another woman added, “When I first started the fruit growing system, it was better. Now it’s harder… if a tree bears fruit, I keep it; if not, I cut it”. As per Agboola et al. (2018), these observations underscore a risk-averse, incremental strategy, grounded in navigating uncertainty and securing sustenance through diverse cropping systems—an adaptive strategy extensively recorded among women in rural agricultural settings across the two research locations. Such responses correspond with the prior literature on women's adaptation in rural contexts, where decisions are frequently influenced by underlying socio-political inequalities in access to land, credit, labour, and agricultural extension services (Ravera, Martín-López, et al., 2016).

8.3.2 Gendered motives for agricultural and livelihood options

While both male and female farmers shifted their livelihoods in reaction to environmental challenges, some tendencies emerged in how decisions around crop selection were rationalised. Several male participants pointed to economic factors, such as profit maximisation, market orientation, and investment potential in high-value crops. Assertions such as: “Mango cultivation was ineffective, so I switched to jackfruit and starfruit”. while another observed, “Corn brings higher income than rice and allows better control over water and cropping season”. These assertions suggest a market-driven rationale in crop selection, wherein economic risk and return are crucial to the decision-making process. Nonetheless, these motivations were not solely attributed to men; comparable considering occasionally manifested in women's responses as well. Men exhibit considerably greater access to market information and land-use decision-making processes, which may shape how and when such strategic shifts are enacted (Quaye et al., 2016). Rather than indicating strict gendered divisions, these patterns

reflect how differentiated access to resources and decision-making power can influence adaptation trajectories within households.

In contrast, female farmers expressed their crop selections based on labour manageability and the necessity of safeguarding household livelihoods. Their decision-making is practical and based on firsthand experiences with climate concerns, ageing, and land constraints. One woman noted, “Because rice had low productivity, I switched to fruit trees with easier water control”. Another remarked, “Coconuts tolerate salinity well, are easy to grow, and need less care as I'm getting older”. These remarks illustrate how women prioritise crops that are easy to cultivate, resilient to drought and salinity, and provide a reliable, albeit low, income to satisfy household requirements. This corresponds with research indicating that women's adaptive choices are influenced by structural inequities in land ownership, access to credit, labour capacity, and age-related vulnerabilities, resulting in pragmatic, survival-focused strategies (Tschakert and Machado, 2012).

In summary, although both genders exhibit agency in adopting new agricultural techniques, male decisions are predominantly influenced by investment and market considerations, whereas female strategies focus on adaptation, accessibility, and the sustenance of practical livelihoods (Radovic Markovic, 2021).

8.3.3 Off-farm work and migration as gendered coping mechanisms

Both male and female participants indicated that they turned to wage labour and migration as coping mechanisms in reaction to agricultural and climate-related stressors; however, the reasons and experiences were influenced by gender dynamics. Women's narratives highlighted economic imperatives and debt management, frequently integrating off-farm employment with persistent farming duties. One woman stated, “I’m growing fruit trees and doing wage labour to cover daily expenses”, illustrating the dual load faced by many rural women who manage both subsistence agriculture and additional money generating. Another shared, “Chili farming failed… went to the city to earn money to repay debt”, demonstrating that migration was motivated not by opportunity but by economic hardship and agricultural failure. These accounts emphasise that women's coping mechanisms are frequently reactive and based on survival needs rather than planned adaptation. This corresponds with extensive research indicating that rural women's participation in wage labour and migration is often influenced by limited access to land, credit, and information, alongside caring duties that restrict mobility and economic options (Srivastava & Srivastava, 2010; Tacoli & Mabala, 2010; Yen et al., 2015).

Conversely, male narratives frequently framed migration and non-agricultural employment as voluntary or planned choices, highlighting adaptability and assistance for household adjustments. One man stated, “My son didn’t want to farm, so found another job. I didn’t force him”, indicating a generational transition in livelihood preferences. This aligns with broader research indicating that men are more inclined to influence the conditions and destinations of migration or wage labour, whereas women's participation is frequently responsive and motivated by household survival requirements (Yen et al., 2015).

These findings demonstrate that livelihood diversification and movement, although prevalent practices, are experienced differently according to gender-specific roles, limits, and expectations (Lawless et al., 2019). Women frequently find themselves compelled into insecure off-farm employment conditions, whilst men are more inclined to characterise their choices as elements of strategic long-term adaptation (Elder et al., 2020).

8.3.4 Structural barriers and social positioning

Gendered access to land, capital, and infrastructure profoundly influenced the development of adaptation strategies among farming households in the two research locations. These limits signify not only household-level disparities but also wider institutional exclusions that impede women's transformative adaptation. Most female participants expressed their vulnerability due to dependence on land rental and absence of ownership, which constrained their capacity for strategic or long-term adaptation decisions. One woman said, “I don’t have land; I rent land, so it’s easy to incur losses”. Another noted, “The green bean crop failed due to low prices; then, we switched to rice, which attracted rats. Others in my surroundings switched to fruit cultivation, forcing my shift to mango farming”. These accounts illustrate a reactive adaptation pattern influenced by market volatility and the lack of secure land tenure, proving results that women's farming options are frequently dictated by short-term pressures and hindered by structural disparities in resource access (Namubiru-Mwaura, 2014b; Ngum & Bastiaensen, 2021).

Conversely, male participants demonstrated enhanced authority over land-use decisions and investment capabilities. One stated, “Shifted the homestead to mango because the land lies within an enclosed dike. It doesn’t flood anymore, so rice became hard to grow”, signifying a strategic alteration of land use in response to environmental changes and infrastructural settings. Another added, “I rented other land to farm while my son found other work”, indicating adaptability and control in labour and resource distribution. Men exhibited an

understanding of how extensive infrastructure development affects agricultural decisions, as seen by the remark, “Due to the dike, water no longer floods… upland farming became unprofitable”. These findings correspond with research indicating that men are more inclined to participate in long-term adaptation planning, facilitated by greater access to financial assets, property rights, and institutional support (Curran & Meijer-Irons, 2014).

Collectively, these findings underscore the intersection of gendered social positioning with structural and institutional inequalities, influencing distinct adaptation pathways. Men typically pursue proactive adaptation by utilising infrastructure, land, and finances, whereas women are often restricted to immediate, survival-based strategies due to the limitations imposed by their social and economic marginalisation.

In conclusion, these gendered differences highlight the necessity of tackling structural barriers in climate adaptation initiatives. In the absence of fair access to land and infrastructure, women are constrained in their ability to adapt properly or engage in transformative pathways (Resurrección et al., 2019). Gender-responsive adaptation must extend beyond intra-household interventions to encompass institutional reforms that tackle land tenure insecurity and inequitable access to climate-resilient infrastructure, and empower them to participate equally in agricultural planning and decision-making (Tschakert and Machado, 2012).

8.4 Gendered perspectives on livelihood transformation: Moving forwards

In exploring future livelihood practices for the forthcoming decade, the findings indicate that male and female farmers express comparable concerns regarding maintaining of secure on-farm incomes, although they differ in their rationale for sustaining existing livelihood patterns. These gendered disparities are founded on physical capabilities, economic logic, land limitations, and family obligations.

8.4.1 Masculine issues: aging, labour reduction, and economic pragmatism

The gendered representations of ageing as a factor in adaptation correspond with research indicating that older male farmers frequently emphasise stability and familiarity rather than innovation when faced with diminished labour capacity and capital (Brown et al., 2019). In contrast to younger or more financially stable individuals who possess the flexibility to take risks, older farmers typically uphold established systems to manage their constrained adaptive ability. The finding emphasises the necessity of incorporating age and the lifespan into adaptation planning, guaranteeing that support systems are customised not just for gender but also for generational susceptibility and physical capability (Thompson-Hall et al., 2016).

Male farmers predominantly rationalised the continuation of their existing livelihood patterns by highlighting the physical convenience and labour-saving advantages of perennial crop cultivation. A participant stated, “Shifting to fruit farming is now easier, the income is more stable, and as I get older, fruit farming requires less labour”. This underscores the significant influence of ageing and diminishing physical capability on adaptation decisions, frequently leading to a preference for techniques that reduce effort and risk. Another man noted, “We’ll leave things as they are. I’m old now and can’t renovate again—it requires too much labour”. Such reflections indicate that the persistence of current methods is not just attributable to satisfaction or success, but rather stems from physical restrictions and financial constraints that restrict opportunities for further transformation.

A prevalent theme among male farmers is dependence on traditional cash crops to maintain their livelihoods against an unpredictable climate and market context. One participant remarked, “Currently, the main income comes from areca and coconut trees, and this farming model will continue”, indicating that retaining established and profitable sectors is perceived as more secure than expanding into unpredictable or unfamiliar markets. This disposition exemplifies a planned form of risk aversion influenced by prior investments, established knowledge frameworks, and a preference for economic stability over innovation. The resistance to pursue additional livelihood transformation is influenced by issues regarding economic instability, as illustrated by the assertion: “Salinity caused tree death. In a few years, I may return the land because I’m afraid of losses and debts”. Such accounts reveal how failed adaptation efforts can create both psychological hesitation and financial constraints, deterring future investment in alternative livelihood strategies.

The result corresponds with existing literature on rural adaptation and risk aversion, indicating that the perception of accumulating debt frequently surpasses the potential advantages of adaptation transformation, especially in the absence of financial safety nets or institutional support (Binswanger & Sillers, 1983). In such instances, farmers are inclined to prefer risk-averse practices, even if they yield diminished returns. Ultimately, male participants expressed subsistence-oriented reasoning, with one stating, “Even if there’s no profit, we have food for the relatives—it’s still something”. This highlights that livelihood transformation decisions are not exclusively motivated by economic considerations; social obligations and family duties also influence decision-making, especially in situations when markets and climate variability are unpredictable or physical capacity has diminished. These findings reflect a comprehensive perspective of livelihood adaptation, wherein socio-cultural duties and the imperative for

continuity frequently influence adaptation priorities alongside economic rationality (Diamond & Ansharyani, 2018).

8.4.2 Women's issues: market volatility, household security, and strategic caution

In the forthcoming decade, female farmers exhibit a distinct understanding of market dynamics and farming performance, while their adaptive strategies are frequently more reactive and aligned with current household need. A woman remarked, "In past years, rice prices were low, and the fruit tree brought in more income. But this year, rice has gone up in price, so it's now the main source of income". This demonstrates how women observe increasing price signals and adapt gradually, rather than undertaking permanent changes to their livelihoods. This responsiveness indicates an adaptive flexibility rooted in economic pragmatism and the emphasis on household stability. Another female participant remarked, "With lemons, if the yield is low, the price is high; if the yield is high, the price is low. So, the income is stable monthly". The statement illustrates how women effectively navigate agricultural uncertainty and market unpredictability to secure monthly financial stability, often essential for meeting regular household expenses.

These adaptive patterns correspond with existing gender literature indicating that women generally prioritise stability and consistency over high-risk, high-return strategies (Bee, 2013). Men often engage in agricultural investments with a focus on profit margins or long-term returns, but women typically adopt methods centred on daily provisioning and balancing labour inputs, financial limitations, and seasonal uncertainties. Their adaptive choices demonstrate a nuanced interplay between environmental unpredictability and socio-economic demands, influenced by their positions as income earners and principal home managers (Lawson et al., 2020). Consequently, whereas female farmers confront comparable environmental and market challenges, the reasoning and magnitude of their adaptations vary, underscoring the necessity for gender-responsive strategies in agricultural assistance and extension programmes (Croppenstedt et al., 2013).

Women emphasise that the constraints of age and gendered social roles serve as substantial barriers to mobility and livelihood transformation. One Khmer woman stated, "I want to go to the city with my child, but I'm too old and there's no work for me, so I stay home, rent land and work just to get by". The observation highlights the intersection of ageing, ethnicity and gendered labour expectations that restrict women's economic agency, especially in rural regions where employment opportunities are few and land access is frequently unstable (Wood

et al., 2021). Such limits perpetuate a cycle of reliance on limited resources, rendering adaptation less a matter of strategic change and more an issue of survival within constrained possibilities (Djoudi & Brockhaus, 2011).

Despite experiencing challenges such as environmental unpredictability, economic instability, and insufficient institutional assistance, some women expressed cautious optimism by employing livelihood diversification approaches for improving future adaptation. For example, one shared, "I planted more types of crops in the fruit farm so we can have more to harvest in the future". This approach demonstrates a pragmatic strategy to mitigate risk by diversifying labour and resource allocations among various crops. Nonetheless, that persistent perception of uncertainty is apparent: "I am not sure what to do yet. It's difficult to grow anything nowadays". These narratives of initiative and scepticism underscore the struggle women face between immediate coping and long-term adaptation, influenced by social, ecological, and economic instability. Literature indicates that women's adaptation strategies are frequently integrated into their caregiving responsibilities and limited by unequal access to information, resources, and institutional assistance (Djoudi & Brockhaus, 2011).

The findings indicate that although both male and female farmers in the two study sites of the VMD strive for continuity in on-farm livelihoods over the next decade, their motivations vary greatly by gender. Male farmers have been impacted by ageing, the necessity for labour-saving initiatives, and a pursuit of economic stability based on prior experiences. Their decisions frequently demonstrate risk aversion, influenced by physical constraints and uncertainty regarding financial loss, particularly in situations where previous adaptation attempts have been unsuccessful and where institutional backing is insufficient. This situates men's livelihood strategies within a pragmatic subsistence framework, prioritising continuity rather than innovation.

Conversely, female farmers have a more adaptive strategy for livelihood change, influenced by a thorough understanding of market variations and household financial stability. Their adaptations are frequently practical and short-term, focused on addressing immediate demands rather than seeking substantial change. Nonetheless, their agency is restricted by age, gendered social roles, constricted mobility, and insecure land tenure. Notwithstanding these constraints, women persist in pursuing gradual diversity as a cautious strategy for adaptation, navigating between optimism and anxiety.

These gendered patterns point to the need for adaptation strategies that are sensitive to intersecting factors, such as age, gender, ethnicity, work capacity, and socio-economic status. Policy intervention should not just concentrate on technical measures but also tackle structural disparities that influence varying vulnerabilities and adaptive capacity. Grounding adaptation planning in local contexts allows for that remedies are pertinent and tailored to varied household experiences.

8.5 Conclusion

The research illustrates that climate-related hazards in the Vietnamese Mekong Delta result in a predominantly reactive, gender-specific strategy for climate coping and adaptation, wherein structural limitations influence possibilities considerably more than individual agency. In the salinity-affected An My and floodplain Phu Huu, both genders possess profound experiential knowledge of the critical thresholds at which saline water, disrupted floods, excessive heat, and irrigation failures render farming challenging. However, men generally possess the resources, infrastructure, and decision-making power required to convert that knowledge into proactive initiatives, such as building double-layer dikes, adjusting the schedule of crop irrigation, adopting salt-tolerant crop varieties, or shifting to market-oriented perennial crops. Women, frequently lacking land titles, technical skills, or independent capital, depend on routine household water use practices, informal social networks, and incremental crop diversification; their adaptations focus on stabilising household consumption rather than increasing production. Perceptions of success reflect this disparity: males assess success based on technical performance and long-term profitability, whereas women perceive present measures as transitory solutions that only mitigate deeper losses.

Livelihood shifts further elucidate the gendered dynamics of transformation. Perennial fruit cultivation, diverse fruit trees systems, and selected migration have become predominant strategies, while their motivating factors vary. Men regard perennial crops as labour-saving investments that mitigate market risk and adapt to an ageing workforce; women recognise these crops for their consistent monthly cash flow and lower input expenses. Migration, factory employment, or wage labour function as strategic diversification for males and as a safety nett for women to mitigate debt when agricultural efforts fail. Statistical analysis corroborates qualitative patterns: income and savings, rather than the age, gender, or ethnicity of the household head, account for variations in crop diversity. Furthermore, households dissatisfied with official salinity strategies exhibit more pronounced diversification, indicating a lack of confidence in state-led adaptation efforts.

The findings address the research questions by demonstrating that gender relations, mediated by land tenure, access to finance, divisions of labour, and institutional representation, considerably influence both the magnitude and pattern of livelihood transformation. They demonstrate that dominant adaptation narratives neglect women's limitations and experiential insights, potentially leading to maladaptation that reinforces vulnerability. Equitable adaptation necessitates: (1) land-use and credit reforms that safeguard women's agricultural rights; (2) gender-specific extension services that integrate technical solutions with locally relevant training; (3) participatory water management frameworks that include women's perspectives in salinity and irrigation governance; and (4) financial mechanisms that distribute the costs and risks associated with experimentation. In the absence of such measures, adaptation in the two research locations is likely to be fragmented, perpetuating patriarchal dominance over productive resources while burdening women with the unpaid costs of climatic variability.

These findings demonstrate that climate change adaptation in the VMD is influenced by a neoliberal governance structure that both individualises responsibility for risk management and limits options for collective action. Although both men and women have substantial experiential knowledge regarding climate thresholds related to salt intrusion, flooding, and heat stress, their ability to act on such knowledge is unevenly influenced by gendered disparities in access to land, capital, infrastructure, and decision-making power. Men's adaptive methods generally conform to neoliberal principles of productivity and market rationality, facilitating the mobilisation of private investments, technical innovations, and agricultural reforms focused on long-term profitability. Conversely, women's adaptation techniques predominantly involve household-level coping strategies, informal social networks, and gradual livelihood modifications that emphasise consumption stability and risk mitigation over accumulation. The gendered patterns illustrate the extensive neoliberal restructuring of adaptation governance, wherein climate risk is assigned to individual households without an equivalent shift of resources or authority, thus perpetuating existing disparities.

Chapter seven delineates that extensive, technocratic investments in flood and salinity control infrastructure, funded by multilateral development frameworks, have enforced increasingly standardised and regimented agricultural practices that constrain local autonomy and livelihood diversity. Instead of facilitating community adaptation, these measures have restricted the potential for locally negotiated solutions and strengthened individualised adherence to imposed crop calendars and irrigation schedules. Moreover, chapter four illustrates that historical experiences of enforced collectivization during the pre–Doi Moi era intersect with these

neoliberal dynamics, cultivating a lasting distrust of collaborative arrangements and diminishing farmers' motivation to participate in collective action, even when efficiencies and mutual benefits are apparent. Consequently, adaptation is neither entirely collective nor equitably individualised; rather, it manifests through disjointed, household-focused techniques that are profoundly influenced by gender and constrained by structural factors.

Chapter Nine: Discussion and Conclusion

9.1 Introduction

Climate change presents substantial and intricate issues for scientific enquiry, policy formulation, and society as a whole. The impacts of climate change will not be equally experienced across regions or communities, and this discrepancy will influence the capacity of individuals and societies, particularly in rural areas, to respond effectively. This is especially apparent in the Global South, where numerous rural communities depend on natural and agricultural systems that are progressively compromised by climate instability (Agrawal & Perrin, 2009; Atkinson & Atkinson, 2023). Concurrently, alterations in global capital and resource allocation are expected to exacerbate these vulnerabilities. Researchers in global environmental change have underscored the urgent necessity to produce practical knowledge that households may apply in their everyday activities. Equally important is the necessity to address and resolve the structural vulnerabilities that hinder these households' ability to respond and adapt.

Discourse on climate change is increasingly prioritising adaptation, especially for impoverished countries (IPCC, 2014a). Climate change is now broadly recognised as a phenomenon that is not merely technical but fundamentally social, experienced variably based on individuals' and households' positions within intersecting identity and inequality systems, including gender, socioeconomic status, ethnicity, and class (Carr and Thompson, 2014; Tschakert and Machado, 2012). However, dominant climate discourse frequently depends on unchangeable gender assumptions that depict men and women as possessing inherently distinct and enduring positions within public or domestic domains. This limited framework sometimes overlooks the wider social and cultural forces that shape and manifest gender, including relationships, norms, and institutional structures.

Gender dynamics significantly influence the living situations of individuals and households, as well as the vulnerability of their livelihood activities to hazards. These relationships also dictate a household's ability to cope with stressors by affecting access to resources, opportunities, social safety nets, and the capacity to select among diverse adaptive responses. In the rural societies of VMD, especially those investigated in this study, established domestic traditions profoundly influence gender roles within household and social structures. Men and women participate in economic, cultural, social, and political domains in unique yet interrelated manners, contributing through their labour, decision-making capacities, and levels of authority.

Identifying and examining these gendered disparities and their interactions is crucial for developing adaptation strategies and policies that effectively address households' livelihood needs in the face of increasing climate uncertainty.

This thesis employs a disaggregated approach in its research and analysis to reveal context-specific insights into the complex intersections of gender, socio-political relations, livelihoods, and environmental and climate hazards. I propose adopting a more inclusive gendered perception that transcends the binary male–female distinction and incorporates cross-crossing aspects such as ethnicity and geographic location. This approach emphasises that vulnerability and adaptation to climate and livelihood challenges are not static processes but rather dynamic, socially produced, and profoundly influenced by context. These mechanisms continually become impacted and redefined through social negotiations. My approach deliberately diverges from prevailing narratives on climate change and gender that construe gender in binary ways. It highlights that transformative livelihood practices, as adaptive pathways, are influenced by overarching cultural, economic, and political frameworks, especially those pertaining to gender standards associated with roles and responsibilities, land tenure, and resource accessibility, which greatly influence male and female responses to environmental stressors.

This concluding chapter synthesises the principal findings of the thesis to address the key four research questions: (1) How does the existing social-ecological setting influence the perceptions and experiences of rural farming households in relation to climate hazards vulnerability? (2) How do gender and socio-political power relations shape the adaptation pathways of rural individuals, households, and communities to climate hazards? (3) To what extent do gendered relations coupled with institutional context and actor participation influence the transformation of agricultural households' livelihoods in the VMD? and (4) How can climate hazards adaptation discourses and strategies account for gender-specific vulnerability and transformational adaptation of livelihoods? In the following sections, I synthesise the primary points examined in the prior chapters, especially the interaction among gender dynamics, livelihood strategies, and climatic effects. I examine the wider ramifications and significance of the study's contributions and close by highlighting areas requiring future investigation to enhance knowledge and strengthen more inclusive adaptation initiatives.

9.2 Summary of major findings

The main findings of this thesis concerning the research questions can be succinctly discussed and synthesised as follows:

9.2.1 Climate hazards and community perceptions and experiences

This introductory section delineates the vulnerability framework utilised in this thesis, building upon and expanding the research of Preston and Stafford-Smith (2009). It underscores that the aspect of vulnerability is influenced by the interlink of various elements, including exposure, sensitivity, and adaptive capacity, which collectively generate uneven and inequitable experiences of climate change both within and between populations. This research significantly contributes by applying the concept of adaptive capacity to the setting of climate adaptation in the rural regions of the Vietnamese Mekong Delta, drawing on prior empirical studies by Pouliotte et al. (2009) and T. A. Tran, H. James, et al. (2020). I integrate a feminist political ecology standpoint, according to Sultana's (2014) interpretation of gender-environment connections as dynamic, contested, and rooted in everyday activities. This perspective recognises that environmental concerns are interconnected with wider social, economic, and political frameworks that adaptation initiatives must address. The structural factors are the fundamental sources of vulnerability in the investigated communities. The framework posits that significant adaptation necessitates a transformative strategy that addresses these fundamental drives and provides a novel viewpoint on the interplay between vulnerability and adaptation.

Utilising this approach in the selected case studies of VMD, as outlined in Chapters Five and Six, demonstrates that communities face diverse environmental pressures that substantially impact their livelihoods and well-being, albeit in varying degrees among men and women. Floodplain and coastal regions exhibit significant vulnerability to severe climate-related hazards, including (fresh) water scarcity due to saline intrusion, excessive heat, unpredictable low-level flooding, and prolonged droughts. Nonetheless, the results revealed gender-specific disparities in the perception of these threats. Women articulated heightened concern regarding increasing temperatures, saltwater intrusion, and erosion of dikes and riverbanks, whereas men predominantly recognised hazards to crops cultivation, especially those associated with drought and restricted irrigation, as their principal concerns. The divergent perceptions are intricately linked to gender-specific roles and responsibilities: women, generally more involved in managing domestic water requirements and small-scale agriculture, exhibit heightened sensitivity to water-related disruptions, while men, whose labour predominantly revolves

around substantial agricultural activities, concentrate on threats to crops and irrigation systems. Spatial variations significantly influenced circumstances with An My commune notably impacted by salinity, whereas inhabitants of Phu Huu commune regularly encountered extreme heat and extended drought.

9.2.2 Understanding exposure and sensitivity at global-local economic intersection

Chapter Five delineates that the socio-ecological challenges encountered by the selected communities arise from several underlying structural and political processes, many of which are ingrained in local and regional governance frameworks. These issues cannot be exclusively ascribed to natural environmental changes. They stem from extensive global economic transformations, manifested through national and regional policy decision-making, and exacerbated by climate change. Vulnerability in such settings emerges at the intersection of livelihood systems, socioeconomic class, and geographical factors. Exposure was not solely a result of physical proximity to the coastline or the geographic arrangement of agricultural land. It also illustrates the impact of institutionalised policy frameworks and initiatives that have established the Mekong Delta as a primary hub for 'rice' export-oriented agricultural development, as previously mentioned in Chapter Four and Seven. The transition to the industrialisation of subsistence, as articulated by Bernstein (2010), included these communities into market-oriented agricultural production, radically transforming traditional livelihoods, land use processes, and agrarian social structures. This encompassed policy transformations like the "Doi Moi" reforms, the impacts of the Green Revolution, and the extensive utilisation of high-yield crops varieties dependent on chemical inputs. These developments produced significant and enduring effects on local communities and social-ecological systems of VMD.

The substantial dependence on agriculture and natural resources has rendered these communities particularly vulnerable to the extensive environmental and economic changes occurring. Throughout all research locations, agricultural livelihoods have been markedly affected by modernisation initiatives, increased market integration, and national policies that emphasise export-oriented agriculture. Chapter seven reflects Vietnam's Resolution 120/NQ-CP, which delineates a strategic vision for sustainable and climate-resilient development in the Mekong Delta, with a pronounced focus on boosting agricultural production and exports. Nevertheless, for households reliant on subsistence agriculture and natural resource extraction, these changes have resulted in diminishing returns. They are increasingly impacted by deteriorating agricultural trade circumstances, unpredictable seasonal variations, increasing

temperatures, and exacerbating water shortages, all of which amplify livelihood insecurity and vulnerability.

Alongside existing challenges, the implications of climate change provide a considerable and escalating concern. The community mostly lacked comprehension of the fundamental causes or future consequences of environmental change, although they were acutely aware of shifting climate patterns and had begun to encounter the results. Field observations indicated evidence of saltwater intrusion, altered rainfall patterns, interrupted seasonal cycles, increased temperatures, and escalating water scarcity. These changes are particularly concerning due to the concurrent emergence of seasonal variations and escalating heat and drought conditions. Climate change was not presenting entirely new challenges but rather exacerbating pre-existing environmental issues, surpassing the ability of local communities to manage alone. This encompasses the long-term impacts of sea level rise on salinity and the exacerbating consequences of water-related stress. Notwithstanding these facts, government agencies and stakeholders frequently prioritised large-scale technical solutions, such as the construction of sluice gates and dikes, as their principal response. These techniques arise from the perspective of climate variability as an external, and global issue, rather than one influenced by and interacting with regional contexts. Failing to incorporate regional environmental factors into adaptation planning will hinder the development of remedies that are both effective and sustainable.

9.2.3 Gendered vulnerability and the politics of adaptation

The vulnerability of the environment previously mentioned cannot be properly understood without examining the overarching social and political structures that influence how communities encounter climate and ecological transformations. This research aims to investigate the socially constructed essence of vulnerability, critically interacting with the extensive arguments examined in Chapter Two, especially those highlighting the gendered aspects of environmental risk. The majority of the literature currently in publication highlights how women are disproportionately affected by environmental damage, primarily as a result of long-standing gender inequality that limits their access to essential resources, limits their capacity for mobility, and closely links them to the natural world for their everyday needs (Alston & Akhter, 2016; Cannon, 2002; Demetriades & Esplen, 2010b).

Consequently, numerous development projects have prioritised women in environmental action, seeking to understand their vulnerabilities while enhancing their responsibilities,

voices, and leadership in sustainability activities. Nonetheless, this emphasis has occasionally perpetuated limited representations of women as enduring victims and carers, burdened with the responsibility for the sustenance of their families and communities (Alston & Whittenbury, 2012b). These static representations threaten to obscure the underlying frameworks of gendered inequality. To address this constraint, it is essential to concentrate on the fundamental causes of gendered vulnerability and the wider patterns of social exclusion (Resurreccion, 2012).

In Chapter Six and Eight, I analysed how gender relations and inequality influence households' experiences of climate hazards, emphasising the significance of institutional frameworks, women's agency, and the intersections with factors such as age, gender, education, and ethnicity. In accordance with Sultana's (2009) framework, gender in this study is regarded as a dynamic and geographically dependent process, perpetually influenced by historical and political structures (Momsen, 2009). Utilising Allen and Sachs' (2012) gendered examination of food systems with the entitlements capabilities framework, I assessed how the allocation of power and resources within households influences food and livelihood insecurity and produces diverse vulnerabilities (Pritchard et al., 2013). These conceptual instruments were essential in departing from deterministic perspectives on women's vulnerability. They provided a framework to analyse how local gender dynamics are integrated into broader socio-political and economic systems. This approach facilitated a more nuanced and contextual comprehension of the ways in which vulnerability is experienced and challenged at the grassroots level.

Concerning vulnerability factors, as outlined in Chapter Six, women's vulnerability to climate change in the studied case studies arises from both overarching societal structures and the dynamics within their households. These systems tend to favour male positions, decision-making power, and resource ownership, so perpetuating uneven gender norms. The exposure of women to environmental risks is determined by socially imposed labour expectations, along with limited rights and abilities, which are also affected by their socioeconomic position and political setting.

Women frequently bear socio-cultural responsibilities, especially in domestic water management, household tasks, and caregiving, which necessitate their continual engagement with deteriorating natural resources. These obligations are crucial not only for household welfare but also for women's perception of agency and identity. Women, particularly Khmer women, reported substantial language barriers that hindered their access to local emergency

infrastructure, community announcements, and accessible risk preparedness plans, hence exacerbating their vulnerability.

In terms of natural resource access, water scarcity in the studied villages directly impacted women's daily responsibilities as carers. As water sources become progressively unreliable, this situation places women under stress in obtaining water for home consumption and crop irrigation. Although water was significant for men, especially concerning rice and fruit agriculture as well as aquaculture, they frequently prioritised modifying the irrigation schedule for their agricultural output. This disparity resulted in gender-specific consequences due to variations in salinity and river water levels.

In the case study communities, women's labour transcended home limits, incorporating both formal and informal economic engagement, as well as unpaid domestic responsibilities. This corresponds with Allen and Sachs' (2007) conceptualisation of the intersecting domains of women's labour. Nonetheless, in these areas, women's contributions were consistently undervalued relative to men's, which restricted their ability to engage actively and persistently in adaptation processes.

Despite women's growing involvement in agricultural activities, some of which were characterised as gender-shared, such engagement did not inherently contest or reframe existing gender norms or expectations. Women's agricultural employment was often viewed not as a standard change, but as a reaction to economic strain within the household. This perspective reinforced established gender roles and failed to result in broader recognition or entitlement. Particularly, women across the two research locations persistently encounter systemic barriers in obtaining land ownership, accessing market information, engaging in community meetings related to microcredit initiatives, or producing adequate income to influence adaptation strategies.

Moreover, these gender-specific vulnerabilities were positioned within a wider framework of economic instability. Poor agricultural productivity, deteriorating environmental conditions, and the absence of robust social protection measures have combined exacerbated the livelihood challenges in these communities. Migration is often regarded by women in the studied areas as a crucial reaction to economic and environmental challenges. This pattern suggests that women, faced with environmental and economic instability, may either migrate themselves or facilitate the migration of household members to get remittances, underscoring the limited

availability of gender-inclusive local employment opportunities. These activities may compromise long-term adaptive capacity and reinforce vulnerability.

The results indicated a persistent trend of women undertaking greater workloads, thus exemplifying the gendered double burden. In the absence of systemic support or increased entitlements, women were compelled to augment their participation in economic spheres while still maintaining traditional socio-cultural obligations. The additional roles, executed under existing constrained settings, hindered women's adaptive capacities. Consequently, their capacity to engage in livelihood diversification or implement alternative adaptation techniques was markedly limited, affecting not just themselves but also their households as a whole.

These findings indicate that adaptation programmes should extend beyond limited focuses on intra-household assistance. It is the intersection of agricultural policy, economic adversity, and power imbalances within households that generates gendered vulnerabilities. The structural structure of labour, decision-making, and resource accessibility all influence the varying experiences of risk and adaptation. Consequently, transformative adaptation must address the foundational social and institutional frameworks, encompassing conventional and structural elements that perpetuate unequal gender relations.

9.2.4 Reinforcing inequality: Gendered power and the constraints of climate adaptation

As elaborated in Chapters Two and Seven, this study adopts Pelling's (2005) conceptualisation of adaptation as encompassing both discrete social, institutional, material, and behavioural actions that individuals, communities, and systems undertake in reaction to both climate-related and non-climate-related issues, shaped significantly by social structures and relationships that inform such responses. This definition allows for adaptation to be understood as not only a behavioural response to environmental change but also as a socially embedded process shaped by both internal capacities and external constraints, as outlined within the adaptive capacity and vulnerability framework.

Nonetheless, a significant gap persists in the literature about the integration of the adaptive capacity paradigm to the critical assessment of adaptation activities, especially concerning their outcomes, efficacy, and capability to tackle the structural roots of vulnerability. As outlined in Chapter Eight, participants at the research sites engaged in a variety of actions categorised as adaptation. These encompassed agricultural and non-agricultural livelihood methods, including on-farm activities (e.g., rice, fruit, and cash crop production), off-farm employment (wage labour, fishing, etc.), and non-farm efforts (migration). This research specifically investigated

initiatives including the adoption of adaptive crop varieties (salt-tolerant crops), the establishment of integrated farming systems or crop diversification in An My, adjustments to irrigation schedules for crop production in Phu Huu, alterations to fieldwork hours in Phu Huu, sesbania cultivation during flood seasons in Phu Huu, and infrastructure-oriented responses such as self-dike construction to manage salinity and flooding.

Exposure, sensitivity, and adaptive capacity analyses of the aforementioned adaptation approaches yield several important insights. Initially, while some initiatives facilitated minor changes in gender roles, most adaptation techniques reinforced existing gendered power relations. Established disparities between public and private domains endured, and women's restricted access to entitlements and capabilities continued to hinder their equitable participation in adaptation decisions. As a result, many efforts fell short in addressing the structural problems that exacerbate women's vulnerability. Secondly, these initiatives' design and execution embodied overarching neoliberal principles, which progressively assign the responsibility of adaptation to individuals and households. These minor interventions concentrated mostly on immediate, practical requirements, tackling observable manifestations of vulnerability instead of its underlying structural causes. In doing so, they may risk the reinforcement of exclusionary practices and shift the responsibility for adaptation from institutions to households already under pressure.

9.2.5 Beyond adaptation: Rethinking neoliberal adaptation practices

A broader trend towards the individualisation and neo-liberalization of adaptation is reflected in the current emphasis on small-scale, household-level adaptation strategies as opposed to more comprehensive, collective or regional approaches. In this framework, the responsibility of managing climate hazards is increasingly shifted to individuals and households, while the state's role in promoting community well-being is steadily reduced (Tierney, 2015). According to (Tierney, 2015), this adaptation structure prioritises the adaptive abilities of individuals identified as resilient over collective resistance, thereby undermining the political will and institutional frameworks required to tackle the fundamental, structural roots of vulnerabilities.

Collective action is widely recognised as a crucial means of advancing gender justice, as was previously stated in Chapter Two. This approach promotes shared agency, allowing for the presentation of community concerns and improving procedural justice via inclusive participation in decision-making processes. Additionally, it fosters a more equitable allocation of resources, enables risk-sharing, and supports strategic, long-term responses to climate

stresses (Hafiza & Neelormi, 2015; Kabeer, 2012). The prioritisation of individual adaptation over collective action undermines transformational potential and perpetuates systemic inequalities that exacerbate climate-related vulnerability.

The predominant adaptation measures identified in the study sites were focused on individual households, primarily aimed at improving household income and agricultural output. These encompassed measures such as the implementation of adopted crop varieties namely salt-tolerant crops, the development of integrated farming systems or crop diversification, and small-scale sesbania production among impoverished households. Although these efforts addressed urgent, practical needs, especially for women and their households, they primarily functioned at a basic level, tackling the visible indications of vulnerability instead of the underlying structural factors that produce it. These micro-level schemes, while advantageous in the short-term, achieved little progression in addressing the fundamental social and ecological determinants of risk. Little technical modifications to agricultural systems are unlikely to endure the increasing and compounding effects of climate hazards. This is evident in areas affected by severe hazardous events, such as the prolonged droughts in 2015-2016, where rising salinity has surpassed the tolerance thresholds of fruit crops, including the star apple tree and durian, as recorded in An My commune. These instances demonstrate the inadequacies of reactive, fragmented adaptation systems that impose the responsibility for climate adaptation on individual households. An equitable and sustainable approach necessitates a long-term perspective that includes future climate trajectories and critically analyses the political and institutional factors contributing to environmental deterioration.

The primary focus on income generation in the observed adaptation practices further demonstrates the impact of neoliberal ideologies on the establishment of adaptation measures. Gendered roles, responsibilities and their positions within the households contributed significantly to exacerbating vulnerability, as detailed in Chapter Six and Eight, by diminishing household capabilities and restricting access to fundamental rights; yet, a sole emphasis on income may lead to an oversimplification of the matter. Economic hardship in these communities was linked to persistent food insecurity, inadequate access to critical services, constrained property ownership, and a lack of capacity for long-term planning. Nevertheless, only addressing income deficiencies without examining the structural causes for these issues provides only a partial remedy (Rice, 2001).

While several initiatives yielded slight improvements in household income and food security, they failed to substantially enhance the overall capabilities or rights of households

and communities. The small-scale livelihood interventions involving H'Mông black chicken farming and black snail rearing in An My commune, supported by the NGO, as well as large-scale water tanks projects and cattle livestock are unlikely to benefit households from persistent poverty or adequately address climate adaptation alternatives. The initiative initially increased participants' income, however, over time, it resulted in exploitation, characterised by insufficient compensation and unreasonable demands on women's time. Furthermore, the implementation of adaptive varieties of seeds necessitates substantial expenditures linked to this adaptation strategy, hence constraining the potential for transformation of these interventions. Although slight income enhancements may offer temporary alleviation, they hardly affect the overarching socio-economic and political settings that hinder long-term adaptation. Establishing the responsibility of adaptation on households within limited systems exposes the shortcomings of development-focused strategies for enhancing adaptation (Cannon & Müller-Mahn, 2010; Grist, 2008).

The number of small-sized adaptation initiatives that are adequate to mitigate uncertain and long-term climate dangers has been questioned. Many studies relied on pre-established and frequently oversimplified interpretations of environmental change, reflecting a wider critique in the adaptation literature (Forsyth, 2013). Households and farmers surveyed for this study were predominantly unable to carry out the proactive planning required to foresee and address the evolving and potentially severe consequences of climate change. This constraint was influenced not just by their precarious economic conditions but also by a restricted comprehension of the wider causes and ramifications of the changing climate globally.

Although the local community recognised noticeable alterations in weather patterns, they were devoid of the scientific and institutional expertise necessary to contextualise these changes within the framework of long-term global climate processes. Consequently, they were predominantly marginalised from the strategic planning essential for addressing future climate challenges. This was especially apparent in economically disadvantaged households, such as those in An My commune, which relied significantly on fluctuating fruit market prices for their livelihood. Others were still managing the repercussions of prior environmental disturbances, particularly the salt intrusion in 2015–2016, which further limited their capacity to deploy resources for future adaptation.

Furthermore, the lack of continuous planning, coordination, and assistance from local NGOs and state authorities severely diminished the prospects for long-term adaptation. Participatory consultation and formal implementation methods were absent in the examined

communities. These findings bolster current criticisms of Community-Based Adaptation approaches, especially those that challenge its ability to adequately address the wider political, economic, and ecological aspects of vulnerability (Forsyth, 2013). Ultimately, localised initiatives, in isolation, lack the structural support necessary to tackle the complex and fundamental nature of climate risk.

Evidence indicated a predominant tendency among governmental entities and related stakeholders to prefer technocratic, top-down adaptation decisions that neglected the region's past environmental degradation. Decontextualized approaches compromise the effectiveness of adaptation initiatives by disregarding historical results and local ecological conditions. This trend is exemplified by the ongoing state support for high-yield crop varieties and the significant allocation of climate financing for infrastructure-intensive projects, such as saline sluice gates and flood dikes. These policies, instead of strengthening adaptation, frequently promote the privatisation of the Vietnamese Mekong Delta (VMD), thus displacing resources and authority from those with vulnerabilities and exacerbating environmental deterioration.

9.2.6 Inclusive adaptation: Addressing gendered barriers to adaptation

The development, production, and negotiation of gendered identities and subjectivity were influenced by everyday environmental practices, such as labour divisions, norms, and rights related to food, water, and land, as covered in Chapters Two and Six. Thus, changes in environmental, social, and political circumstances may intensify gender-based inequities (Sultana, 2009). Alterations in gendered labour divisions concerning climate change and adaptation signify re-negotiations of gender roles and the limitations imposed on men and women in particular situations, rather than solely adjustments to evolving material and environmental circumstances (Alston & Whittenbury, 2013).

Despite certain findings of minor shifts in the dynamics of gender, numerous observed initiatives relied on entrenched divisions of work and authority, hence creating and sustaining gender interactions both within households and farming. These findings reflect the research of Bhattarai et al. (2015), and Carr (2008a), who have highlighted how adaptation initiatives might involve women in emerging positions lacking associated enhancements in their capabilities, rights, and entitlements. Understanding the persistent characteristics and essential processes involved in adaptation attempts offers insights into possibilities for more transformational and socially just initiatives (Carr, 2008a).

Numerous adaptation activities explored in this study can be classified as broadly 'gender sensitive' according to Ahmed and Fajber (2009). These initiatives frequently aimed at addressing women's practical needs while functioning within established gender hierarchies, thereby strengthening conventional roles instead of contesting them. Consequently, these activities often limited the capacity for transformative change or the advancement of strategic gender objectives. For example, in the context of livelihood diversification via H'mong chicken raising, the initiative sought to incorporate households, with a specific emphasis on women, in its implementation. The planning and execution of this effort risked reinforcing conventional assumptions regarding women's restricted economic agency, ultimately bolstering men's labour and overall household income instead of challenging prevailing notions of women's roles in community productivity. Without inclusive and participatory planning processes that meaningfully integrate women's perspectives and goals, the adaptation alternatives accessible to women remained limited and externally determined. The absence of comprehensive co-design restricted women's capacity to influence adaptation methods based on their specific needs, abilities, and ambitions, hence reinforcing gendered constraints within adaptation governance.

A significant issue arising from the research sites was the ongoing gendered marginalisation within community cooperation frameworks. Notwithstanding the stated objective of inclusive local governance, decision-making procedures remained predominantly male-dominated, with women consistently marginalised from community meetings, agricultural extension services, and discourses concerning risk preparedness and recovery planning. This absence signifies a persistent institutional bias that favours men's involvement while marginalising women's agency in essential areas of local climate adaptation. In both research sites, women were consistently underrepresented among the attendees to community meetings. Despite invitations, numerous women encountered substantial obstacles to participation, such as time limitations and household duties and care responsibilities, which restricted their capacity to attend and engage meaningfully. These obstacles are intricately linked to embedded socio-cultural standards that restrict women's roles to domestic duties, therefore perpetuating their invisibility in public and institutional domains. Such factors perpetuate gender relations that directly enhance women's vulnerability. By neglecting to confront these structural exclusions, local governance processes inadvertently perpetuate patterns of inequality that obstruct women's ability to obtain knowledge, assets, and authority to make decisions, which are crucial elements in fostering adaptation to environmental hazards.

The adaptation pathways of women were greatly impacted by their sense of agency, influencing their decisions both in their own homes and outside. Utilising Mahmood's (2005) conceptualisation of agency, it is argued that women's involvement in adaptation within the home might be perceived as an active process intricately linked to and negotiated through existing social, cultural, political, and, in certain instances, religious norms, especially those related to Khmer cultural traditions. Women persisted performing traditional domestic duties, encompassing food preparation, childcare, and collecting of water from underground sources or nearby rivers. Nonetheless, adaptation measures also promoted the diversification of livelihood alternatives inside the home, such as small-scale livestock rearing, allowing women to participate in income production and food security while adhering to their cultural responsibilities. In the domestic sphere, women frequently fulfilled their caregiving duties in accordance with both personal and household expectations, while also creating new avenues to enhance household adaptation. This illustrates that agency, even when enacted within conventional gender restricts, can significantly influence capacity for adaptation and diversify livelihood alternatives. However, these additional obligations reinforced the narrative of women as primary carers and their adaptation, potentially exacerbating women's challenges in the future (Resurrección, 2011).

Men and women were seen navigating, adapting to, or quietly resisting established social norms outside the home, creating the opportunities for renegotiating gendered power relations (Mahmood, 2005). A variety of off-farm and non-farm livelihoods were carried out by men and women, such as fishing, raising fish, trading groceries, wage labour, industrial work, and seasonal or temporary migration. The increasing feminisation of agricultural employment was evident, as women progressively assumed productive responsibilities to maintain household livelihoods. While these transitions predominantly occurred within the framework of existing gender norms, they nonetheless suggested the potential for gradual change, which may be perceived as small transformations in gender relations. Nonetheless, despite the increasing involvement of women in fields historically dominated by men, these changes hardly resulted in significant alterations to gender norms or the satisfaction of women's strategic requirements.

Furthermore, Moser's (1989) notion of the elasticity of women's labour is pertinent, as women engaged in productive and commercial activity in response to family demands; yet, this increased workload did not coincide with a comparable redistribution of male roles or responsibilities. As a result, these changes did not lead to increased access to land, improved mobility, or enhanced engagement in formal employment for women. Sen (1999) contended

that the increase in women's economic engagement does not necessarily lead to more agency or empowerment. Instead, these shifts frequently reproduce existing gender hierarchies in altered forms. Caraway (2006) also notes that changing employment arrangements often reshape, rather than eliminate, underlying gender inequities, thereby constraining the revolutionary potential of women's enhanced economic participation.

These study results suggest that although changes in the environment may facilitate alterations in gender roles, responsibilities, and interactions with natural resources, such transformations typically occur within the constraints of established gender identities. Power dynamics hardly changed fundamentally as a result of emerging material realities. Instead of facilitating transformative change, these the micro-level alterations frequently led to in an escalation of responsibility for women without equivalent rights or entitlements. Changes in gender roles typically perpetuated socioeconomic inequalities within households, as women persisted in fulfilling caregiving and subsistence responsibilities while depending on increasingly limited resources, namely food, land, and water.

Involvement at the macro and micro scales is necessary to achieve gender justice through adaptation. Addressing enduring structural inequalities necessitates ensuring the availability of essential developmental opportunities and services at both household and community levels. Nonetheless, these efforts must be contextualised within a comprehensive framework of systemic transformation throughout the Vietnamese Mekong Delta. This entails reforming institutional frameworks to enhance women's entitlement to and authority over arable land, advancing educational achievement, ensuring equitable participation in community activities, and incorporating women into the process of planning and making decisions for risk preparedness and recovery. Moreover, enhancing social mobility and establishing supportive networks via community-based groups may increase women's adaptive capacity. These extensive institutional improvements demonstrate that gender norms are not unchangeable, but rather capable of transformation under encouraging settings. Consequently, adaptation measures must be developed with consideration for both urgent practical requirements and long-term strategic objectives to effectively tackle the entrenched gendered aspects of vulnerability.

9.2.7 Implications for policy directives and future research

Despite limited evidence of incremental changes in gendered power dynamics, numerous adaptation initiatives ultimately fostered a structural environment that disproportionately

shifted the responsibility of addressing degradation of the environment onto individual households. This happened even though larger systemic and political processes are the source of such forms of degeneration. Although these initiatives frequently offered temporary relief, little income increases, and immediate assistance, they failed to address the underlying economic, political, and social frameworks that contribute to environmental vulnerability. Instead of enabling revolutionary change, these activities threatened to reinforce the status quo, therefore perpetuating the mechanisms that lead to continued environmental degradation. Pelling (2011) warns that adaptation-oriented initiatives often neglect to examine the fundamental causes of vulnerability. Rather than facilitating institutional reform, they frequently perpetuate and validate current institutional frameworks, thereby intensifying ecological instability and social inequality over time.

A strong necessity exists to reconceptualize adaptation within both global and local political structures, transitioning from incremental and technocratic responses to more revolutionary approaches. Pelling (2011) asserts that transformative adaptation involves addressing the fundamental and frequently undisclosed causes of vulnerability through a critical analysis of prevailing assumptions, institutional priorities, and structural limitations. In order to do this, adaptation strategies that actively address the political causes of environmental degradation, investigate power dynamics at the micro level, and analyse the larger political system that shapes vulnerability and adaptive ability are required.

The findings emphasise the importance of integrating adaptation techniques within the political structures, both local and regional, where climate impacts occur. Although communities and institutional actors have recognised pressing environmental challenges, including saline intrusion and water scarcity, these challenges must be contextualised within the VMD's overarching geopolitical and hydrological systems. The future adaptation of the region is contingent upon the renegotiation of transboundary water governance frameworks. A formal convention on Mekong water sharing, as suggested by Khan (2012), is crucial for securing long-term water security and preventing additional damage associated with upstream projects.

In the realm of environmental governance, a redefined understanding of vulnerability necessitates significant collaboration with transboundary stakeholders regarding water security, alongside the enhancement of climate adaptation policy implementation and integration. Locals' lived experience, particularly their understanding of the political and historical facets of climate change, can be used to advocate for causes like water rights, land access, and salinity. According to Eakin et al. (2015), access to information and technology is

universally acknowledged as an essential element of effective climate change adaptation. Particularly, early warning systems have emerged as a focal point in adaptation research. The reliable and efficient distribution of early warning information can greatly improve public preparedness by allowing individuals to implement protective actions, such as evacuation and risk reduction, before to and during climate-related hazards (Zhang et al., 2014). The findings of this thesis indicate that the availability of climate-related information and announcements is influenced by gender, with men and women depending on distinct sources and methods for obtaining such information. These disparities are influenced by socio-cultural norms, communication preferences, and varying access to technology and public locations. To ensure the efficacy of early warning systems, they must be constructed with an awareness of gendered communication patterns and customised to address the distinct informational requirements of both women and men. Integrating gender-sensitive methods of communication into early warning systems might improve adaptive capacity by ensuring that all individuals are prepared to make informed decisions regarding everyday impacts of climate variability and natural hazards (Bomuhangi et al., 2016). This strategy enhances the efficacy of risk communication and facilitates equitable adaptation planning by tackling inequities in access to essential information. Accordingly, one of the major chances to improve procedural justice on a regional and international level is to improve environmental education (Gellers & Jeffords, 2015). Multidisciplinary approaches should be used in future research to examine the connections between environmental stresses and social vulnerability, as well as to locate possibilities for collective action. An effective adaptation agenda must address immediate local needs while promoting structural change through inclusive, context-specific, and politically aware approaches.

A fundamental aspect of inherent vulnerability in the study context arose from insufficient capabilities and entitlements within a compromised natural resource base, underscoring the necessity for more transformative initiatives to diversify and improve agricultural livelihoods. The situation in Phu Huu commune exemplifies this dynamic, as local farmers exhibited restricted adaptation capacity to maintain rice and cash crop farming within dike systems during periods of low flooding, excessive heat, and prolonged drought, particularly in the lack of sufficient assistance from local authorities. In regions where salinity intrusion is projected to grow and endure, there is an imperative to invest in techniques and systems for monitoring salinity levels, while also acknowledging the gender-specific implications of water procurement. The roles of women in collecting water from underground sources and adjacent

rivers are crucial for household survival and are intricately linked to their social identities and caregiving duties. Therefore, enhancing adaptive capability necessitates transcending household-level advancements in income or agricultural productivity. It involves structural transformation to establish equitable circumstances where impacted communities, particularly women, can fully fulfil their rights, capabilities, and entitlements.

Adger (2006) delineates the primary determinants of social vulnerability as resource availability, the allocation of those resources, and the role of regulatory institutions. In a supplementary analysis, Alston (2013) emphasises a comprehensive array of interconnected social systems, encompassing inequality, technological access, power dynamics, cultural values, knowledge, policy frameworks, governance structures, and institutional arrangements, all of which possess gendered dimensions that affect vulnerability levels. The results of this study show that a complex interplay of social, economic, and institutional factors affects vulnerability in the research community for both men and women. In particular, control and availability of resources became crucial factors in determining the extent to which individuals and households were able to respond to changing climates. While risk reduction requires access to adaptable resources, the study shows that access is unevenly distributed, with men disproportionately owning and managing most important resources, namely land. These findings provide significant insights into the shortcomings of traditional adaptation planning approaches, which frequently emphasise augmenting asset bases through support interventions without thoroughly analysing the gendered dynamics of resource ownership and control. Nabikolo et al. (2012) observed that such initiatives may accidentally reinforce existing inequalities by favouring male beneficiaries, therefore worsening gender-specific vulnerabilities instead of mitigating them. To achieve equitable and effective adaptation results, it is imperative that policymakers use gender-disaggregated assessments in the formulation and execution of climate change adaptation initiatives. By doing this, established gender disparities in the distribution of resources and decision-making authority will be minimised, especially in rural communities of the Global South, where these imbalances are frequently most evident.

While women often served as catalysts for adaptation, their agency was constrained by intersecting economic, social-political, and environmental limitations. Their ability to act was consequently influenced by wider contexts of constraints and marginalisation. Although it is recognised that no individual action can achieve the necessary scale of transformation, many strategic approaches may guide adaptation initiatives away from ineffectual, temporary solutions and towards more systemic, justice-oriented transformation. An equitable strategy to

adaptation must prioritise opportunities for women to exercise their agency both individually and collectively, overcoming the constraints imposed by gender norms. This requires the promotion of procedural justice by ensuring that adaptation initiatives meet both urgent practical demands and long-term strategic objectives. By combining social protection mechanisms with community-based adaptation, the adaptive social protection model proposed by Tschakert and Machado (2012) offers a workable strategy that increases marginalised communities' capacity to stand up for their rights and advocate for themselves.

Facilitating women's access to social safety nets may promote educational progress, promote innovation, and strengthen the link between pragmatic survival measures and overarching empowerment goals. Procedural fairness in the VMD's context entails not only the incorporation of women in adaptation projects but also the practical integration of their expertise, perceptions, and priorities. According to Lahiri-Dutt (2012), strengthening women as political actors and making sure that their knowledge is at the core of community adaptation plans would require reforming local governance systems to remove obstacles to women's public participation and eliminate participatory exclusion. Future research must concentrate on recognising and integrating prospects for social-political structural transformation within community-based adaptation initiatives, emphasising the promotion of collective action. These paths provide not just more equal adaptation results but also the capacity to alter the fundamental factors that perpetuate gendered vulnerability.

The study also highlighted that gender and ethnicity are essential factors influencing individuals' and households' experiences of vulnerability and adaptation regarding climate change. The analysis examined additional intersecting social categories, including age and educational attainment, concerning the varying experiences of different groups with climate-related risks, especially in contexts where Vietnamese is the predominant language for disseminating risk preparedness information, recovery plans, and community announcements. These language limitations affect people's access to timely and life-saving information, as well as their capacity to participate in community events and access possibilities for diversification of their sources of income. The qualitative findings of the study indicated that households with poor Vietnamese proficiency, frequently from the Khmer ethnic minority backgrounds or possessing lower educational attainment, encounter heightened vulnerability due to restricted participation in these critical processes. The interplay between gender and these additional social variables necessitates more investigation. Understanding the intersection of these

characteristics is vital for elucidating the complex nature of susceptibility and for developing inclusive adaptation options that address the varied demands of impacted communities.

Furthermore, changes in gender dynamics, socio-political power dynamics, and environmental perceptions throughout time can be documented by longitudinal study. It may offer insight into the evolution of communities' experiences with climate-related stresses and how the effectiveness of existing adaptation mechanisms may change in response to intensifying climate impacts. This approach could also be especially effective in evaluating how institutional frameworks evolve in response to unforeseen climate-related hazards, while also investigating whether adaptation strategies promote gender equity and facilitate the transformation of livelihoods towards enduring sustainability at the grassroots level.

The historical experiences of men and women in An My commune with regard to climate vulnerability and adaptation, namely in reaction to salt intrusion and other livelihood issues, were also attempted to be documented within the scope and period of this study. The insights were predominantly obtained through in-depth ethnographic interviews. A comprehensive longitudinal study is essential for comprehensively assessing the progression of these lived experiences over time and the negotiation and transformation of adaptive responses among different social categories.

According to Whitehead (2002), tracking alterations in the livelihoods of both men and women over extended periods is essential for understanding the mechanisms of transformative adaptation. This is especially pertinent for instances like An My, where continued observation will be essential for assessing the socio-environmental impacts of significant infrastructure projects, including the establishment of salinity management sluices and boat locks. In Phu Huu commune, where inhabitants reside within dike systems yet encounter unusual flooding, excessive heat, extended drought, and deteriorating soil fertility, a longitudinal analysis is essential to comprehend the cumulative effects on agricultural productivity and community adaptation. These relationships emphasise the necessity of ongoing, gender-sensitive research that properly captures the intricacies of adaptation processes and their consequences for equitable, transformative change.

9.3 Significance of research

9.3.1 Contextualising climate adaptation: A constructivist approach

With the assistance of ethnographic techniques including semi-structured household surveys, participant observation, life history narratives, and open-ended questions from in-depth interviews, this thesis highlights the importance of a constructivist epistemological framework in revealing the underlying gendered cultural rationality influencing adaptation practices. These methodologies enabled an examination of the interplay between local conceptions of gender and national discourses on climate change and gender. By employing this approach, the research advances the central argument that recognising gender relations and socio-political power structures in their setting is crucial to understanding how adaptation processes and transformations in livelihoods occur.

The field of climate change research continues to overlook constructivist methodologies, especially those that look at social relations as contextually entrenched and temporally dynamic (Kaijser & Kronsell, 2014). This study addresses the gap by expanding climate research into new epistemological realms, concentrating on how local communities perceive, experience, and interpret climate-related changes. Instead of considering gender and climate change as unchangeable categories or realities, the study explores how individuals and communities understand, negotiate, and implement these ideas within specific social, cultural, and political contexts. The study of contextual and gender relations draws on the interpretive framework of social constructed reality, which asserts the presence of multiple, coexisting realities created by discourse rather than an independent objective truth (Guba & Lincoln, 1989). From such a perspective, meaning-making emerges as a primary concern, especially about how historical, economic, social, and political settings shape the formulation of truth claims. This paradigm facilitates a critical examination of the production, contestation, and reconfiguration of vulnerability and adaptability discourses within the contexts of climate change and gender over time. It further elucidates how diverse stakeholders at both local and national levels strategically position themselves within these discourse domains to claim legitimacy, negotiate identities, and influence adaptation agendas.

9.3.2 Rural and regional geographies of adaptation

This study examines the perceptions, experiences, and mechanisms of vulnerability and adaptability into a wider cultural and social setting influenced by the intersection of class, ethnicity, gender, and other structural factors, as observed in two village populations. Despite

increasing awareness of climate change effects, insufficient emphasis has been placed on how these environmental stresses affect the daily lives of individuals and influence gender dynamics within households and communities. This study examines how rural households and their members deal with livelihood and climate-related issues, as well as the social, economic, and political adaptation mechanisms they employ.

The findings regarding vulnerability, adaptive capacity, and localised adaptation techniques hold significant importance for other regions within the Vietnamese Mekong Delta (VMD) and the broader Asia-Pacific, since these contexts may be inadequately addressed in contemporary climate change literature. Indigenous communities in these locations may frequently experience disproportionate impacts from climate-induced disruptions, encountering reduced agricultural output, uncertain incomes, and increased threats to livelihood security (Reyes-García et al., 2024). Nevertheless, local communities often rely on enduring indigenous knowledge and traditional practices that shape context-specific and frequently effective adaptive strategies (Reyes-García et al., 2024). Therefore, the experiences of local communities have important implications for future study and the development of frameworks for climate-related risk management, as well as for understanding the lived consequences of climate-related hazards. Recognising and integrating these locally grounded perspectives is crucial for formulating equitable and culturally appropriate adaptation policies in comparable socio-ecological contexts.

9.3.3 Underlying understandings of vulnerability

By merging insights from feminist political ecology with the adaptive capacity framework, this study enhances our understanding of vulnerability. This interdisciplinary paradigm for a detailed examination of how communities perceive and react to environmental change, emphasising the socio-political processes that shape differentiated vulnerabilities. In particular, this study advances our knowledge of climate vulnerability in the VMD by showing how localised environmental changes driven by agricultural and political interventions alongside ongoing neo-liberalization processes, may exacerbate climate change exposure and frequently intensify injustice and environmental degradation (Himley, 2008; Liverman & Vilas, 2006).

The findings highlight the necessity for climate adaptation and environmental justice initiatives to be closely linked with comprehensive analyses of previous policy shortcomings, especially in agricultural development and climate-related risk management. Effective and equitable adaptation cannot be realised independently of the structural factors that have persistently

fostered environmental vulnerability (R. Mearns & A. Norton, 2009). Future research, especially in environmental sociology and political ecology, should further develop the integrative framework established in this study. A thorough investigation of the political, economic and ecological factors associated with adaptation and vulnerability is crucial for shaping transformational policy and practice in climate-impacted regions.

9.3.4 Adaptation as transformation: Gendered adaptive capacity lens

Following narrow-minded vulnerability research, Tschakert and Machado (2012) suggest contextualising our mutual fragility and committing to livelihood adaptation. This research shifts the focus from traditional studies of vulnerability to a more nuanced examination of gendered adaptive capacity and the lived, embodied experiences of livelihood adaptation. This transition emphasises the necessity of understanding the intricate and contextually contingent connections among the economic, social, cultural, and political forces that influence adaptive responses. Climate-related pressures are not consistently experienced; they are influenced by gendered roles and responsibilities, along with historically entrenched norms, practices, and power structures (Jordan, 2019). These factors profoundly affect individual and community perceptions and responses to environmental hazards as well as their roles in adaptation processes.

This study challenges the prevailing impact-oriented methodologies that have historically defined climate change adaptation research (Alaimo, 2009). This has entailed progressing beyond merely descriptive evaluations of gendered vulnerability to systematically analyse the foundational social and political dynamics that dictate gendered livelihoods at one's individual, household, and community levels. The investigation encompasses both community and individual agency in the formation of adaptive behaviours, focusing on how this sense of agency is experienced, restricted, and negotiated in everyday life.

This research has transitioned from investigating the gendered effects of environmental change to exploring the fundamental reasons why the intersection of gender and socio-political power structures is crucial for understanding the ongoing nature of gendered vulnerability and the possibilities for improving adaptive capacity. The study enhances a transformative and justice-focused comprehension of adaptation in rural regions impacted by climate change.

Furthermore, this study enhances critical discourse on climate adaptation by examining the shortcomings of neoliberalism adaptation strategies and by promoting feminist political ecology studies through a more robust engagement with the mechanisms required for structural

transformation. Drawing on the pivotal analyses of Parvin and Johnson (2015), the study elucidates how technocratic and development-centric frameworks, grounded in neoliberal principles, persist in influencing national climate policy and the operational strategies of non-governmental organisations. In this setting, adaptation programmes often perpetuated existing power hierarchies instead of challenging them. These findings emphasise the persistence of established social norms, especially those pertaining to gender, and illustrate the enduring gaps in gender that adaptation efforts frequently neglect. The research indicates that although adaptation is presented as a strategy for enhancing adaptation, it frequently serves to perpetuate the injustices that contribute to vulnerability. Recognising these disparities is both challenging and crucial for attaining profoundly transformational and equitable climate adaptation outcomes.

9.3.5 The relationship between climate change and gender

One important advantage of considering livelihoods as parts of an interconnected system, rather than as disparate elements, is that it enables the recognition of alternative approaches for mitigating the effects of climate change. This integrated perspective underscores the necessity of creating alternative income-generating options, such as the implementation of H'mong chicken rearing as a livelihood model that promotes diversification for rural households. Chapter Eight delineate several adaptation requirements—on-farm, off-farm, and non-farm examined in the setting of the overarching dynamics of climate variability and livelihood transformation. This comprehensive perspective has enabled a contextual investigation of gender relations and social dynamics across several institutional tiers, ranging from the household and community to the state, within the context of socio-economic, environmental and livelihood pressures. The results of the case study show that it is challenging to understand the effects of environmental change in isolation; instead, they intersect with and are exacerbated by additional stresses, such as continuous livelihood transitions, national restructuring policies, migration, and mental health issues. The diverse and intersecting effects together shape community perceptions and responses to risks associated with climate change.

The cumulative impacts of prolonged climate change are expected to intensify existing vulnerabilities, especially in areas where social, economic, and environmental issues intersect. This thesis illustrates that the impact of gender on vulnerability and adaptation must be examined within its broader social and political context. It also engages with and contributes to current research and critical discussions regarding the socio-political aspects of vulnerability and climate adaptation (Cannon, 2008; Carr, 2008; Roncoli et al., 2001).

This research further enhances the expanding scholarship on gender and environmental change by addressing significant inadequacies in prevailing approaches that have frequently conceptualised gender in static and generalised terms. Gender is perceived not as a static category but as a dynamic and developing social practice influenced by everyday interactions with environmental, social, and institutional factors, utilising an integrated feminist political ecology and adaptive capacity framework. This theoretical framework facilitated the recognition of gender-specific reactions to environmental stress, micro-level alterations in gender identities and relationships, and varied manifestations of autonomy. In the case study communities, women's adaptive capacities were hindered by socio-economic and institutional constraints, including limited rights and entrenched gender norms. Notwithstanding these limitations, women persistently attempted to maintain their obligations and identities, frequently amidst escalating climate crises.

9.4 Concluding remarks

The institutions that govern our regional economies, agricultural systems, and global connections face a serious existential threat from climate change. The effects of climate change put thousands of people's existences and livelihoods under risk in Vietnam, particularly in the Mekong Delta, where many already live in challenging socio-ecological settings. The risk of climate hazards in this region is not isolated; it results from prolonged economic, political, and environmental exclusion that has systematically weakened community adaptation, making them highly vulnerable, sensitive, and with restricted adaptive capacity. This study emphasises that the environmental challenges confronting rural communities in the Vietnamese Mekong Delta are intricately linked to the political ecology of agricultural development, wherein climate change interacts with the commodities of agriculture. The intersections have exacerbated the vulnerability of agricultural communities, especially with restricted livelihood alternatives, inadequate governance, and constrained access to climate-related information. The consequent effects on food and water security have exacerbated the instability of rural livelihoods.

This research argues that effectively addressing climate change adaptation necessitates a fundamental understanding of the gendered and socio-political power dynamics influencing livelihood transformations. Women’s involvement in agriculture, both on-farm and off-farm, has rendered them particularly vulnerable to the cumulative effects of environmental stressors. They encounter heightened challenges concerning water accessibility, labour responsibilities, and vulnerability to market volatility. Nonetheless, their adaptive potential is hindered by

limited entitlements and capabilities, including restricted availability of productive assets, involvement in markets, and processes for making decisions. Moreover, the adaptation measures identified in the studied communities predominantly failed to address the roots of vulnerability. In some instances, these activities unintentionally strengthened the mechanisms, such as gender disparities, market dependencies, and governance deficiencies that led to community vulnerability. These findings highlight the necessity of formulating adaptation strategies that transcend conventional interventions to address the fundamental causes of vulnerability in an inclusive, transformative, and socially equitable manner.

Understanding vulnerability as a social and political state, notably influenced by gendered power dynamics, necessitates a transformative approach to adaptation. Such approaches must transcend apparent signs of environmental change and expand beyond narrowly defined, small-scale, household-oriented interventions. The scope of the transformative structural changes required to tackle these rooted vulnerabilities beyond the capabilities of any individual project; thus, the incorporation of these objectives must be fundamental to all adaptation attempts to prevent inappropriate adaptation and attain substantial progress.

Moreover, transformative adaptation pathways require collective action, fair and inclusive governance, and decision-making procedures that decentralise power and elevate local voices. A re-contextualized comprehension of environmental concerns, which considers historical, political, and socio-cultural factors, can facilitate the development of more inclusive and equitable climate responses. Simultaneously, these processes may facilitate the extensive structural transformations necessitated by climate change, perhaps fostering the profound systemic changes essential for enduring adaptation and equity.

The research's findings robustly reinforce the theoretical paradigm outlined in chapter one, which conceptualizes livelihood transformation as a gendered and socio-politically influenced process shaped by climatic vulnerability, institutional dynamics, and extensive socio-economic restructuring. Empirical evidence from the VMD indicates that climate exposure alone does not explain rural livelihood vulnerability; instead, vulnerability is socially and politically constructed through historically established gender disparities, market dependencies, and governance frameworks. The study demonstrates that women's increased vulnerability stems not just from environmental stressors but also from inequitable access to resources, decision-making processes, and institutional support, which limits their adaptive capability despite their pivotal role in agricultural livelihoods. Furthermore, the shortcomings of existing adaptation strategies underscore the insufficiency of limited, household-focused interventions and validate

the framework's conceptualisation of adaptation as a transformative process necessitating procedural fairness, collective action, and inclusive governance. By emphasising gendered power dynamics and political ecology, the framework facilitated a more profound comprehension of vulnerability and underscores the necessity for transformative adaptation pathways that tackle the fundamental causes of inequality and promote socially equitable and resilient livelihood transformations.

REFERENCES

Abdela, N. (2016). Impact of Stress on Health and Productivity of Animal: A Review. *Journal of Biology, Agriculture and Healthcare, 6*, 64-70.

Abeling, T. (2015). *Can We Learn to be Resilient?: Institutional Constraints for Social Learning in Heatwave Risk Management in London, UK* King's College, London].

Adam, F., & Rončević, B. (2003). Social capital: Recent debates and research trends. *Social science information, 42*(2), 155-183.

Adams, W. C. (2015). Conducting Semi-Structured Interviews. In K. E. Newcomer, H. P. Hatry, & J. S. Wholey (Eds.), *Handbook of practical program evaluation*. Wiley Online Library.

Adamse Jr, R. H. (1995). Agricultural income, cash crops, and inequality in rural Pakistan. *Economic Development and Cultural Change, 43*(3), 467-491.

Adefila, J., & Bulus, J. (2014). Spatial inequalities in infrastructural development in Plateau State, Nigeria. *American International Journal of Contemporary Research, 4*(7), 89-97.

Adger W.N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., Naess, L. O., Wolf, J., & Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic Change, 93*(3-4), 335-354. https://doi.org/10.1007/s10584-008-9520-z

Adger, N. (1998). *Social Vulnerability to Climate Change in Vietnam* University of East Anglia.

Adger, W. N. (1999). Social vulnerability to climate change and extremes in coastal Vietnam. *World Development, 27*(2), 249-269.

Adger, W. N. (2000). Institutional Adaptation to Environmental Risk under the Transition in Vietnam. *Annals of the Association of American Geographers, 90*(4), 738-758. https://doi.org/10.1111/0004-5608.00220

Adger, W. N. (2000). Social and ecological resilience: are they related? *Progress in Human Geography, 24*(3), 347-364. https://doi.org/http://dx.doi.org/10.1191/030913200701540465

Adger, W. N. (2001). Scales of governance and environmental justice for adaptation and mitigation of climate change. *Journal of International Development, 13*(7), 921-931.

Adger, W. N. (2003a). Social aspects of adaptive capacity. In *Climate change, adaptive capacity and development* (pp. 29-49). World Scientific.

Adger, W. N. (2003b). Social capital, collective action, and adaptation to climate change. In *Der klimawandel* (pp. 327-345). Springer.

Adger, W. N. (2006). Vulnerability. *Global Environmental Change, 16*(3), 268-281.

Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change, 15*(2), 77-86.

Adger, W. N., Benjaminsen, T. A., Brown, K., & Svarstad, H. (2002). Advancing a Political Ecology of Global Environmental Discourses. *Development and Change, 32*(4), 681-715. https://doi.org/10.1111/1467-7660.00222

Adger, W. N., Brown, K., Fairbrass, J., Jordan, A., Paavola, J., Rosendo, S., & Seyfang, G. (2003). Governance for Sustainability: Towards a 'Thick' Analysis of Environmental Decisionmaking. *Environment and Planning A: Economy and Space*, *35*(6), 1095-1110. https://doi.org/10.1068/a35289

Adger, W. N., Eakin, H., & Winkels, A. (2009). Nested and teleconnected vulnerabilities to environmental change. *Frontiers in Ecology and the Environment, 7*(3), 150-157.

Adger, W. N., & Kelly, P. M. (1999). Social vulnerability to climate change and the architecture of entitlements. *Mitigation and Adaptation Strategies for Global Change, 4*(3), 253-266.

Adger, W. N., Lorenzoni, I., & O'Brien, K. L. (2009). *Adapting to climate change: Thresholds, values, governance*. Cambridge University Press.

Adger, W. N., & Vincent, K. (2005). Uncertainty in adaptive capacity. *Comptes Rendus Geoscience, 337*(4), 399-410. https://doi.org/10.1016/j.crte.2004.11.004

Adzawla, W., & Baumüller, H. (2020). Effects of livelihood diversification on gendered climate vulnerability in Northern Ghana. *Environment, Development and Sustainability, 23*(1), 923-946. https://doi.org/10.1007/s10668-020-00614-3

Agarwal, A., Perrin, N., Chhatre, A., Benson, C. S., & Kononen, M. (2012). Climate policy processes, local institutions, and adaptation actions: mechanisms of translation and influence. *Wiley Interdisciplinary Reviews: Climate Change, 3*(6), 565-579.

Agarwal, B. (1988). Who sows? Who reaps? Women and land rights in India. *The Journal of Peasant Studies, 15*(4), 531-581.

Agarwal, B. (1994a). *A field of one's own: Gender and land rights in South Asia*. Cambridge University Press.

Agarwal, B. (1994b). Gender and command over property: A critical gap in economic analysis and policy in South Asia. *World Development, 22*(10), 1455-1478.

Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World Development, 29*(10), 1623-1648.

Agarwal, B. (2003). Gender and land rights revisited: Exploring new prospects via the state, family and market. *Journal of agrarian change, 3*(1-2), 184-224.

Agarwal, B. (2018). Gender equality, food security and the sustainable development goals. *Current Opinion in Environmental Sustainability, 34*, 26-32.

Agboola, T. O., Balogun, O. L., & Elugbaju, D. A. (2018). Uncertainty, risk aversion, and management strategies A case of cocoa farmers in Osun State Nigeria. *African Journal of Agricultural Research, 13*(17), 897-903.

Agrawal, A. (2008). The role of local institutions in adaptation to climate change.Washington, DC: World Bank.

Agrawal, A., & Perrin, N. (2009). Climate adaptation, local institutions and rural livelihoods. *Adapting to climate change: thresholds, values, governance*, 350-367.

Ahearn, M. C., & Tempelman, D. (2010). Gender Issues in Agricultural and Rural Household Well-Being Presentation at the Third Global Conference on Agricultural and Rural Household Statistics, 24-25 May 2010, Washington, D.C.

Ahmad, F., & Ali, A. (2011). Decentralised Governance and People Participation in Local Development. *Indian Journal of Public Administration, 57*(2), 234-241.

Ahmad, F., Shik, A., Vanza, R., Cheung, A., George, U., & Stewart, D. E. (2004). Popular health promotion strategies among Chinese and East Indian immigrant women. *Women & health, 40*(1), 21-40.

Ahmed, S., & Eklund, E. (2024). Intersectionality shapes the access to various adaptive resources in climate-vulnerable contexts. *Environmental Research: Climate, 3*(4), 045021.

Ahmed, S., Eklund, E., & Kiester, E. (2023). Adaptation outcomes in climate-vulnerable locations: understanding how short-term climate actions exacerbated existing gender inequities in coastal Bangladesh. *Journal of Environmental Planning and Management, 66*(13), 2691-2712.

Ahmed, S., & Fajber, E. (2009). Engendering adaptation to climate variability in Gujarat, India. *Gender & Development, 17*(1), 33-50.

Ahmed, S., & Kiester, E. (2021). Do gender differences lead to unequal access to climate adaptation strategies in an agrarian context? Perceptions from coastal Bangladesh. *Local Environment, 26*(5), 650-665.

Ahsan, D., Brandt, U. S., & Faruque, H. (2021). Local agricultural practices to adapt with climate change. Is sustainability a priority? *Current Research in Environmental Sustainability, 3*, 100065.

Akasha, H., Patricia, B.-S., & Barbara, S. (1982). *But Some of Us Are Brave : Black Women's Studies*. The Feminist Press at CUNY. https://doi.org/NL1158354EPUB

Akter, S., & Mallick, B. (2013). The poverty–vulnerability–resilience nexus: Evidence from Bangladesh. *Ecological Economics, 96*, 114-124. https://doi.org/10.1016/j.ecolecon.2013.10.008

Alaimo, S. (2009). Insurgent vulnerability and the carbon footprint of gender. *Kvinder, Køn & Forskning*(3-4).

Alam, A., Asad, R., & Parvin, A. (2015). Climate change adaptation through grassroots responses: learning from the "Aila" affected coastal settlement of Gabura, Bangladesh. In *Handbook of climate change adaptation* (pp. 2011-2034). Springer.

Aldrich, D. P., Oum, S., & Sawada, Y. (2015). *Resilience and recovery in Asian disasters: Community ties, market mechanisms, and governance*. Springer.

Alexander, J. M. (2016). *Capabilities and social justice: The political philosophy of Amartya Sen and Martha Nussbaum*. Routledge.

Alie, M. E. K., Yateh, M., Bavumiragira, J. P., & Liao, Z. (2024). Identifying challenging barriers to farmers' adaptation to climate change in Bo district, Sierra Leone: A review. *Journal of Water and Climate Change, 15*(7), 2992-3014.

Allen, P., & Sachs, C. (2012a). Women and food chains: The gendered politics of food. *The International Journal of Sociology of Agriculture and Food, 15*(1), 1-23.

Allison, E. H., & Ellis, F. (2001). The livelihoods approach and management of small-scale fisheries. *Marine Policy, 25*(5), 377-388.

Almarzouqi, I. M. Z. (2017). *An analysis of disaster vulnerability in the United Arab Emirates*. University of Northumbria at Newcastle (United Kingdom).

Alobo Loison, S. (2019). Household livelihood diversification and gender: Panel evidence from rural Kenya. *Journal of Rural Studies, 69*, 156-172. https://doi.org/10.1016/j.jrurstud.2019.03.001

Alston, M. (2013). Women and adaptation. *Wiley Interdisciplinary Reviews: Climate Change, 4*(5), 351-358.

Alston, M. (2014b). Gender mainstreaming and climate change. *Women's Studies International Forum, 47*, 287-294. https://doi.org/10.1016/j.wsif.2013.01.016

Alston, M., & Akhter, B. (2016). Gender and food security in Bangladesh: the impact of climate change. *Gender, Place & Culture, 23*(10), 1450-1464.

Alston, M., & Kent, J. (2008). The Big Dry: The link between rural masculinities and poor health outcomes for farming men. *Journal of Sociology, 44*(2), 133-147.

Alston, M., & Whittenbury, K. (2012a). Does climatic crisis in Australia's food bowl create a basis for change in agricultural gender relations? *Agriculture and Human Values, 30*(1), 115-128. https://doi.org/10.1007/s10460-012-9382-x

Alston, M., & Whittenbury, K. (2012b). *Research, action and policy: Addressing the gendered impacts of climate change*. Springer Science & Business Media.

Alston, M., & Whittenbury, K. (2013). Does climatic crisis in Australia's food bowl create a basis for change in agricultural gender relations? *Agriculture and Human Values, 30*, 115-128.

Amin, H., Ali, T., Ahmad, M., & Zafar, M. I. (2009). Capabilities and competencies of Pakistani rural women in performing house hold and agricultural tasks: A case study in tehsil Faisalabad. *Pakistan Journal of Agricultural Sciences, 46*(1), 58-63.

Amoore, L. (2013). *The politics of possibility: Risk and security beyond probability*. Duke University Press.

Anh, L. T., Takagi, H., Thao, N. D., & Esteban, M. (2017). Investigation of awareness of typhoon and storm surge in the Mekong Delta–Recollection of 1997 Typhoon Linda. *Journal of Japan Society of Civil Engineers, 73*(2), I_168-I_173.

Ánh, T. S., Cuong, B. T., Goodkind, D., & Knodel, J. (1997). Living arrangements, patrilineality and sources of support among elderly Vietnamese. *Asia-Pacific Population Journal, 12*(4), 69-88.

Anthony, E. J., Brunier, G., Besset, M., Goichot, M., Dussouillez, P., & Nguyen, V. L. (2015). Linking rapid erosion of the Mekong River delta to human activities. *Scientific Reports, 5*(1), 14745.

Antón, J., Cattaneo, A., Kimura, S., & Lankoski, J. (2013). Agricultural risk management policies under climate uncertainty. *Global Environmental Change, 23*(6), 1726-1736. https://doi.org/10.1016/j.gloenvcha.2013.08.007

Appiah, F. (2021). *Enhancing Resilience to Drought and Ecosystem Change in Drylands: Assessing Principles of Building Social-Ecological Resilience in Northern Ghana*

Ara Begum, R., Lempert, E., Ali, E., Benjaminsen, T. A., Bernauer, T., Cramer, W., Cui, X., Mach, K., Nagy, G., & Stenseth, N. C. (2022). Point of Departure and Key Concepts. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. In D. C. R. H.-O. Pörtner, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (Ed.), (pp. 121–196). https://doi.org/10.1017/9781009325844.003

Aragón, F. M., Oteiza, F., & Rud, J. P. (2021). Climate change and agriculture: Subsistence farmers' response to extreme heat. *American Economic Journal: Economic Policy, 13*(1), 1-35.

Armitage, D., & Plummer, R. (2010). Adapting and transforming: governance for navigating change. In *Adaptive capacity and environmental governance* (pp. 287-302). Springer.

Arnall, A., Oswald, K., Davies, M., Mitchell, T., & Coirolo, C. (2010). Adaptive social protection: mapping the evidence and policy context in the agriculture sector in South Asia. *IDS Working Papers, 2010*(345), 01-92.

Arnell, N. W. (1999). Climate change and global water resources. *Global Environmental Change, 9*, S31-S49.

Arora-Jonsson, S. (2011). Virtue and vulnerability: Discourses on women, gender and climate change. *Global Environmental Change, 21*(2), 744-751. https://doi.org/10.1016/j.gloenvcha.2011.01.005

Aryal, J. P., Sapkota, T. B., Rahut, D. B., Marenya, P. P., & Stirling, C. (2021). Climate risks and adaptation strategies of farmers in East Africa and South Asia. *Scientific Reports, 11*.

Ashraf, M. A., & Azad, M. A. K. (2015). Gender issues in disaster: Understanding the relationships of vulnerability, preparedness and capacity. *Environment and Ecology Research, 3*(5), 136-142.

Assan, N. (2014). Gender, agriculture and climate change impact and vulnerability of resource poor farmers in Africa.

Atkinson, C. L., & Atkinson, A. M. (2023). Impacts of climate change on rural communities: Vulnerability and adaptation in the Global South. *Encyclopedia, 3*(2), 721-729.

Atkinson, R., & Flint, J. (2001). Accessing hidden and hard-to-reach populations: Snowball research strategies. *Social research update, 33*(1), 1-4.

Atteridge, A., & Remling, E. (2017). Is adaptation reducing vulnerability or redistributing it? *WIREs Climate Change, 9*(1). https://doi.org/10.1002/wcc.500

Australian Bureau of Statistics (2020). Standard for sex, gender, variations of sex characteristics and sexual orientation variables. https://www.abs.gov.au/statistics/standards/standard-sex-gender-variations-sex-characteristics-and-sexual-orientation-variables

Bacud, E. S., Puskur, R., Duyen, T. N. L., Sander, B. O., & Luis, J. (2021). Rural outmigration-feminization-agricultural production nexus: Case of Vietnam. *Migration and Development, 10*(3), 442-466.

Badolo, M. (2024). ClimGender, an innovative scientific framework for gender and social inclusion integration in sectoral climate change resilience policies. *ScienceOpen Preprints*.

Bailey, J., Steeves, V., Burkell, J., Shade, L. R., Ruparelia, R., & Regan, P. (2019, 2019/01/01). Getting at Equality: Research Methods Informed by the Lessons of Intersectionality. *International Journal of Qualitative Methods, 18*, 1609406919846753. https://doi.org/10.1177/1609406919846753

Baker, L. (2006). Observation: A complex research method. *Library trends, 55*(1), 171-189.

Bakker, K., & Bridge, G. (2006). Material worlds? Resource geographies and thematter of nature'. *Progress in Human Geography, 30*(1), 5-27.

Baldwin, C., Hamerlinck, J., & McKinlay, A. (2023). Institutional support for building resilience within rural communities characterised by multifunctional land use. *Land Use Policy, 132*, 106808.

Bankoff, G. (2019, Apr). Remaking the world in our own image: vulnerability, resilience and adaptation as historical discourses. *Disasters, 43*(2), 221-239. https://doi.org/10.1111/disa.12312

Bardsley, D. K. (2014). Limits to adaptation or a second modernity? Responses to climate change risk in the context of failing socio-ecosystems. *Environment, Development and Sustainability, 17*, 41-55.

Barnett, J., & Adger, W. N. (2007). Climate change, human security and violent conflict. *Political geography, 26*(6), 639-655.

Barrett, C. B., Reardon, T., & Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy, 26*(4), 315-331.

Barrett, S. (2015). Subnational adaptation finance allocation: comparing decentralized and devolved political institutions in Kenya. *Global Environmental Politics, 15*(3), 118-139.

Bastakoti, G. B., & Doneys, P. (2020). Gendered perceptions of climate variability, food insecurity, and adaptation practices in Nepal. *Climate and Development, 12*(6), 547-563.

Batung, E. S., Mohammed, K., Kansanga, M. M., Nyantakyi-Frimpong, H., & Luginaah, I. (2023). Credit access and perceived climate change resilience of smallholder farmers in semi-arid northern Ghana. *Environment, Development and Sustainability, 25*(1), 321-350.

Baulch, B., Chuyen, T. T. K., Haughton, D., & Haughton, J. (2007). Ethnic minority development in Vietnam. *The Journal of Development Studies, 43*(7), 1151-1176.

Baum, F. E., Bush, R. A., Modra, C. C., Murray, C. J., Cox, E. M., Alexander, K. M., & Potter, R. C. (2000). Epidemiology of participation: an Australian community study. *Journal of Epidemiology & Community Health, 54*(6), 414-423.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*(4), 544-559.

Bazeley, P. (2004). Issues in mixing qualitative and quantitative approaches to research. *Applying qualitative methods to marketing management research, 141*, 156.

Bebbington, A. (1999). Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty. *World Development, 27*(12), 2021-2044.

Bebbington, A. (2004). Social capital and development studies 1: critique, debate, progress? *Progress in development studies, 4*(4), 343-349.

Beck, U. (2015). Emancipatory catastrophism: What does it mean to climate change and risk society? *Current Sociology, 63*(1), 75-88. https://doi.org/10.1177/0011392114559951

Bee, B. (2013). Who reaps what is sown? A feminist inquiry into climate change adaptation in two Mexican ejidos. *ACME: An International Journal for Critical Geographies, 12*(1), 131-154.

Bee, B. A. (2014). "Si no comemos tortilla, no vivimos:" women, climate change, and food security in central Mexico. *Agriculture and Human Values, 31*(4), 607-620. https://doi.org/10.1007/s10460-014-9503-9

Bee, B. A. (2016). Power, perception, and adaptation: Exploring gender and social–environmental risk perception in northern Guanajuato, Mexico. *Geoforum, 69*, 71-80. https://doi.org/10.1016/j.geoforum.2015.12.006

Bélanger, D. (2000). Regional differences in household composition and family formation patterns in Vietnam. *Journal of Comparative Family Studies, 31*(2), 171-189.

Bélanger, D., & Li, X. (2009). Agricultural land, gender and kinship in rural China and Vietnam: A comparison of two villages. *Journal of agrarian change, 9*(2), 204-230.

Béné, C., Wood, R. G., Newsham, A., & Davies, M. (2012). Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes. *IDS Working Papers, 2012*(405), 1-61.

Benzie, M. (2014). Social Justice and Adaptation in the UK. *Ecology and Society, 19*(1). https://doi.org/10.5751/es-06252-190139

Berchoux, T., Hutton, C. W., Hensengerth, O., Voepel, H. E., Tri, V. P., Vu, P. T., Hung, N. N., Parsons, D., & Darby, S. E. (2023). Effect of planning policies on land use dynamics and livelihood opportunities under global environmental change: Evidence from the Mekong Delta. *Land Use Policy, 131*, 106752.

Beresford, M. (1989). *National unification and economic development in Vietnam*. Springer.

Beresford, M., & Phong, D. (2000). *Economic transition in Vietnam: trade and aid in the demise of a centrally planned economy*. Edward Elgar Publishing.

Bernstein, H., Crow, B., & Johnson, H. (1992). Rural Livelihoods: Crises and Responses.

Beuchelt, T. D. (2016). Gender, social equity and innovations in smallholder farming systems: Pitfalls and pathways. *Technological and institutional innovations for marginalized smallholders in agricultural development*, 181-198.

Bhatt, N., & Tang, S.-Y. (2001). Making microcredit work in the United States: Social, financial, and administrative dimensions. *Economic Development Quarterly, 15*(3), 229-241.

Bhattacherjee, A. (2012). *Social science research: Principles, methods, and practices*. USA.

Bhattarai, B., Beilin, R., & Ford, R. (2015). Gender, Agrobiodiversity, and Climate Change: A Study of Adaptation Practices in the Nepal Himalayas. *World Development, 70*, 122-132. https://doi.org/10.1016/j.worlddev.2015.01.003

Bhuiyan, M. J. A. N., & Dutta, D. (2012). Assessing impacts of sea level rise on river salinity in the Gorai river network, Bangladesh. *Estuarine, Coastal and Shelf Science, 96*, 219-227. https://doi.org/10.1016/j.ecss.2011.11.005

Bhuyan, M. I., Supit, I., Kumar, U., Mia, S., & Ludwig, F. (2024). The significance of farmers' climate change and salinity perceptions for on-farm adaptation strategies in the south-central coast of Bangladesh. *Journal of Agriculture and Food Research, 16*, 101097.

Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological methods & research, 10*(2), 141-163.

Biersack, A. (2006). Reimagining political ecology. In A. Biersack & J. B. Greenberg (Eds.), *Reimagining Political Ecology*. Duke University Press.

Biggs, D., Miller, F., Hoanh, C. T., & Molle, F. (2012). The delta machine: water management in the Vietnamese Mekong Delta in historical and contemporary perspectives. In *Contested waterscapes in the Mekong Region* (pp. 203-225). Routledge.

Bilge, S. (2013). Intersectionality undone: Saving intersectionality from feminist intersectionality studies. *Du Bois review: Social science research on race, 10*(2), 405-424.

Binswanger, H. P., & Sillers, D. A. (1983). Risk aversion and credit constraints in farmers' decision-making: A reinterpretation. *The Journal of Development Studies, 20*(1), 5-21.

Björkdahl, A., & Selimovic, J. M. (2015). Gendering agency in transitional justice. *Security Dialogue, 46*(2), 165-182. https://doi.org/10.1177/0967010614552547

Black, T. (2016). Race, gender, and climate injustice: dimensions of social and environmental inequality. In *Systemic Crises of Global Climate Change* (pp. 172-184). Routledge.

Blaikie, P., & Coppard, D. (1998). Environmental change and livelihood diversification in Nepal: Where is the problem? *HIMALAYA, the Journal of the Association for Nepal and Himalayan Studies, 18*(2), 11.

Block, S., & Webb, P. (2001). The dynamics of livelihood diversification in post-famine Ethiopia. *Food Policy, 26*(4), 333-350.

Bloom, G. (2004). Health in a Changing World. *35*(3), 38-41.

Bohle, H. G., Downing, T. E., & Watts, M. J. (1994). Climate change and social vulnerability: toward a sociology and geography of food insecurity. *Global Environmental Change, 4*(1), 37-48.

Bomuhangi, A., Nabanoga, G., Namaalwa, J., Jacobson, M., & Gombya-Ssembajjwe, W. (2016). Gendered decision making and adaptation to climate change in Mt. Elgon Region, Eastern Uganda. *International Research Journal of Environmental Sciences and Studies, 1*(1), 1-23.

Bookwalter, J. T., Fuller, B. S., & Dalenberg, D. R. (2006). Do household heads speak for the household? A research note. *Social Indicators Research, 79*(3), 405-419.

Boothroyd, P., Phạm, X. N., & Nam, P. X. (2000). *Socioeconomic renovation in Viet Nam: The origin, evolution, and impact of doi moi*. Idrc.

Boston, M., Bernie, D., Brogden, L., Forster, A., Galbrun, L., Hepburn, L.-A., Lawanson, T., & Morkel, J. (2024). Community resilience: a multidisciplinary exploration for inclusive strategies and scalable solutions. *Resilient Cities and Structures, 3*(1), 114-130.

Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of Theory and Research for the Sociology of Education*. Westport, CT: Greenwood: 241–58.

Brand, F. S., & Jax, K. (2007). Focusing the meaning (s) of resilience: resilience as a descriptive concept and a boundary object. *Ecology and Society*, *12*(1).

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2016). (Mis)conceptualising themes, thematic analysis, and other problems with Fugard and Potts' (2015) sample-size tool for thematic analysis. *International Journal of Social Research Methodology*, *19*(6), 739-743. https://doi.org/10.1080/13645579.2016.1195588

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589-597. https://doi.org/10.1080/2159676x.2019.1628806

Bridenthal, R., & Koonz, C. (1977). *Becoming visible : Women in European history*.

Brisley, R., Welstead, J., Hindle, R., & Paavola, J. (2012). Socially just adaptation to climate change. *Joseph Roundtree Foundation, York, UK*.

Brooks, N. (2003, 01/01). Vulnerability, Risk and Adaptation: A Conceptual Framework. *Tyndall Centre for Climate Change Research, Working Paper No, 38*.

Brooks, N., & Adger, W. N. (2004). Assessing and enhancing adaptive capacity. *Adaptation policy frameworks for climate change: Developing strategies, policies and measures*, 165-181.

Brooks, N., Neil Adger, W., & Mick Kelly, P. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change*, *15*(2), 151-163. https://doi.org/10.1016/j.gloenvcha.2004.12.006

Brown, J. (2011). Assuming too much? Participatory water resource governance in South Africa. *The Geographical Journal*, *177*(2), 171-185.

Brown, K. (2011). Sustainable adaptation: An oxymoron? *Climate and Development*, *3*(1), 21-31.

Brown, M., & Graf, R. (2012). Financial Literacy, Household Investment and Household Debt: Evidence from Switzerland. *Research Papers in Economics*.

Brown, P., Daigneault, A., & Dawson, J. (2019). Age, values, farming objectives, past management decisions, and future intentions in New Zealand agriculture. *Journal of Environmental Management, 231*, 110-120.

Brown, P. R., Tuan, V. V., Nhan, D. K., Dung, L. C., & Ward, J. (2018a). Influence of livelihoods on climate change adaptation for smallholder farmers in the Mekong Delta Vietnam. *International Journal of Agricultural Sustainability, 16*, 255 - 271.

Brown, P. R., Tuan, V. V., Nhan, D. K., Dung, L. C., & Ward, J. (2018b). Influence of livelihoods on climate change adaptation for smallholder farmers in the Mekong Delta Vietnam. *International Journal of Agricultural Sustainability, 16*(3), 255-271. https://doi.org/10.1080/14735903.2018.1472858

Bryan, E., Alvi, M. F., Huyer, S., & Ringler, C. (2024). Addressing gender inequalities and strengthening women's agency to create more climate-resilient and sustainable food systems. *Global Food Security*.

Bryan, E., Bernier, Q., Espinal, M., & Ringler, C. (2018). Making climate change adaptation programmes in sub-Saharan Africa more gender responsive: insights from implementing organizations on the barriers and opportunities. *Climate and Development, 10*(5), 417-431.

Bryant, J. (1996). Northern vietnamese households. *Journal of the Australian Population Association, 13*(2), 169-186.

Buchmann, C., DiPrete, T. A., & McDaniel, A. (2008). Gender inequalities in education. *Annu. Rev. Sociol, 34*(1), 319-337.

Buckingham, S., & Kulcur, R. (2009). Gendered geographies of environmental injustice. *Antipode, 41*(4), 659-683.

Buechler, S. (2009). Gender, water, and climate change in Sonora, Mexico: implications for policies and programmes on agricultural income-generation. *Gender & Development, 17*(1), 51-66. https://doi.org/10.1080/13552070802696912

Bullard, R. D. (2018). *Dumping in Dixie: Race, class, and environmental quality*. Routledge.

Burby, R. J., & French, S. P. (1981). Coping With Floods: The Land Use Management Paradox. *Journal of the American planning association, 47*, 289-300.

Burchfield, E. K., & Gilligan, J. M. (2016). Dynamics of individual and collective agricultural adaptation to water scarcity. 2016 Winter Simulation Conference (WSC),

Burton, I. (1997). Vulnerability and adaptive response in the context of climate and climate change. *Climatic Change, 36*(1), 185-196.

Burton, I., Soussan, J., & Hammill, A. (2003). *Livelihoods and climate change: Combining disaster risk reduction, natural resource management and climate change adaptation in a new approach to the reduction of vulnerability and poverty*. https://portals.iucn.org/library/sites/library/files/documents/2003-034.pdf

Busungu, C., Gongwe, A., Naila, D. L., & Munema, L. (2019). Complementing extension officers in technology transfer and extension services: Understanding the influence of media as change agents in modern agriculture. *Int J Res-Granthaalayah, 7*, 248-269.

Butt, M. N., Shah, S. K., & Yahya, F. A. (2020). Caregivers at the frontline of addressing the climate crisis. *Gender & Development, 28*(3), 479-498.

Byerly, C. M. (2017). Feminist intersectionality research in communications: Origins, contributions and tensions. *Ex aequo, 35*, 23-31.

Byrne, D., & Ragin, C. C. (2009). The Sage handbook of case-based methods. *The SAGE Handbook of Case-Based Methods*, 1-560.

Cagauan, A. (1995). The impact of pesticides on ricefield vertebrates with emphasis on fish. In *Impact of pesticides on farmer health and the rice environment* (pp. 203-248). Springer.

Cai, B., Shi, F., Meseretchanie, A., Betelhemabraham, G., & Zeng, R. (2024, 2024-March-07). Agricultural socialized services empowering smallholder rice producers to achieve high technical efficiency: empirical evidence from southern China [Original Research]. *Frontiers in Sustainable Food Systems, 8*. https://doi.org/10.3389/fsufs.2024.1329872

Cai, Y., & Marks, D. (2021). Photovoice in the age of social media: Helping to build participation needed for urban climate resilience? *Urban Climate, 40*, 101019.

Call, M., & Sellers, S. (2019). How does gendered vulnerability shape the adoption and impact of sustainable livelihood interventions in an era of global climate change? *Environmental Research Letters, 14*(8), 083005.

Cameron, E. C., Hemingway, S. L., Cunningham, F. J., & Jacquin, K. M. (2021). Global Crises: Gendered Vulnerabilities of Structural Inequality, Environmental Performance, and Modern Slavery. *Human Arenas, 4*(3), 391-412. https://doi.org/10.1007/s42087-020-00154-2

Cannon, T. (2002). Gender and climate hazards in Bangladesh. *Gender & Development, 10*(2), 45-50.

Cannon, T., & Müller-Mahn, D. (2010). Vulnerability, resilience and development discourses in context of climate change. *Natural Hazards, 55*(3), 621-635. https://doi.org/10.1007/s11069-010-9499-4

Cao, B. T., Tchale, H., Chandrasekharan Behr, D., Nguyen, P. H. A., & Jaffee, S. M. (2022). Agricultural Land Use and Sustainable Livelihoods in the Mekong Delta: Alternative Scenarios and Policy Implications.

Capobianco, M., DeVriend, H. J., Nicholls, R. J., & Stive, M. J. (1999). Coastal area impact and vulnerability assessment: the point of view of a morphodynamic modeller. *Journal of Coastal Research*, 701-716.

Carastathis, A. (2014). The concept of intersectionality in feminist theory. *Philosophy compass, 9*(5), 304-314.

Cardona, O. D., Van Aalst, M. K., Birkmann, J., Fordham, M., Mc Gregor, G., Rosa, P., Pulwarty, R. S., Schipper, E. L. F., Sinh, B. T., & Décamps, H. (2012). Determinants of risk: exposure and vulnerability. In *Managing the risks of extreme events and disasters to advance climate change adaptation: special report of the intergovernmental panel on climate change* (pp. 65-108). Cambridge University Press.

CARE International (2010). *Adaptation, Gender and Women's Empowerment*. https://www.care.org/wp-content/uploads/2020/05/CC-2010-CARE_Gender_Brief.pdf

Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From Metaphor to Measurement: Resilience of What to What? *Ecosystems, 4*(8), 765-781. http://www.jstor.org/stable/3659056

Carr, E. R. (2008a). Between structure and agency: Livelihoods and adaptation in Ghana's Central Region. *Global Environmental Change, 18*(4), 689-699. https://doi.org/10.1016/j.gloenvcha.2008.06.004

Carr, E. R. (2008b). Men's Crops and Women's Crops: The Importance of Gender to the Understanding of Agricultural and Development Outcomes in Ghana's Central Region. *World Development, 36*(5), 900-915. https://doi.org/10.1016/j.worlddev.2007.05.009

Carr, E. R., & Thompson, M. C. (2014). Gender and climate change adaptation in agrarian settings: Current thinking, new directions, and research frontiers. *Geography Compass, 8*(3), 182-197.

Carter, M. R., & Maluccio, J. A. (2003). Social Capital and Coping with Economic Shocks: An Analysis of Stunting of South African Children. *World Development, 31*(7), 1147-1163. https://doi.org/10.1016/s0305-750x(03)00062-7

Carter, M. R., & Zegarra, E. (2000). Land markets and the persistence of rural poverty: post-liberalization policy options. In *Rural poverty in Latin America* (pp. 65-85). Springer.

Cavendish, W. (2000). Empirical regularities in the poverty-environment relationship of rural households: Evidence from Zimbabwe. *World Development, 28*(11), 1979-2003.

Chambers, R., & Conway, G. (1992). *Sustainable rural livelihoods: practical concepts for the 21st century*. Institute of Development Studies (UK).

Chandra, A., McNamara, K. E., & Dargusch, P. (2017). The relevance of political ecology perspectives for smallholder Climate-Smart Agriculture: a review. *Journal of Political Ecology, 24*(1), 821-842.

Chant, S. (1998). Households, gender and rural-urban migration: reflections on linkages and considerations for policy. *Environment and Urbanization, 10*(1), 5-22.

Chapman, A., & Darby, S. (2016). Evaluating sustainable adaptation strategies for vulnerable mega-deltas using system dynamics modelling: Rice agriculture in the Mekong Delta's An Giang Province, Vietnam. *Science of the Total Environment, 559*, 326-338.

Chapman, A., Darby, S., Tompkins, E., Hackney, C., Leyland, J., Van, P. D. T., Pham, T. V., Parsons, D., Aalto, R., & Nicholas, A. (2017). Sustainable rice cultivation in the deep flooded zones of the Vietnamese Mekong Delta. *Vietnam Journal of Science, Technology and Engineering, 59*(2), 34-38.

Chapman, A. D., Darby, S. E., Hồng, H. M., Tompkins, E. L., & Van, T. P. (2016). Adaptation and development trade-offs: fluvial sediment deposition and the sustainability of rice-cropping in An Giang Province, Mekong Delta. *Climatic Change, 137*, 593-608.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. sage.

Chiem, N. H. (1994). Former and present cropping patterns in the Mekong Delta. *Japanese Journal of Southeast Asian Studies, 31*(4), 345-384.

Chindarkar, N. (2012). Gender and climate change-induced migration: proposing a framework for analysis. *Environmental Research Letters, 7*(2), 025601.

Chinh, D. T., Bubeck, P., Dung, N. V., & Kreibich, H. (2016). The 2011 flood event in the Mekong Delta: preparedness, response, damage and recovery of private households and small businesses. *Disasters, 40*(4), 753-778.

Chipanshi, A., Chanda, R., & Totolo, O. (2003). Vulnerability Assessment of the Maize and Sorghum Crops to Climate Change in Botswana. *Climatic Change, 61*, 339-360.

Cho, S., Crenshaw, K. W., & McCall, L. (2013). Toward a field of intersectionality studies: Theory, applications, and praxis. *Signs: Journal of women in culture and society, 38*(4), 785-810.

Cho, S. J., Ding, J., McCarl, B. A., & Yu, C.-H. (2011). Economic Impacts of Climate Change on Agriculture: Adaptation and Vulnerability.

Chornesky, E. A., Ackerly, D. D., Beier, P., Davis, F. W., Flint, L. E., Lawler, J. J., Moyle, P. B., Moritz, M. A., Scoonover, M., Byrd, K. B., Álvarez, P., Heller, N. E., Micheli, E., & Weiss, S. B. (2015). Adapting California's Ecosystems to a Changing Climate. *BioScience, 65*, 247-262.

Choudhury, M.-U.-I., Haque, C. E., & Habib, S. (2016). Participatory exclusion of women in natural resource management: silent voices from wetland communities in Bangladesh. *Community Development Journal*. https://doi.org/10.1093/cdj/bsw007

Ciplet, D., Roberts, J. T., & Khan, M. R. (2015). *Power in a warming world: The new global politics of climate change and the remaking of environmental inequality*. MIT press.

Clark, R. G., & Steel, D. G. (2007). Sampling within households in household surveys. *Journal of the Royal Statistical Society: Series A (Statistics in Society), 170*(1), 63-82.

Clarvis, M. H., Bohensky, E., & Yarime, M. (2015). Can resilience thinking inform resilience investments? Learning from resilience principles for disaster risk reduction. *Sustainability (Switzerland), 7*(7), 9048-9066.

Clayton, S. D., Pihkala, P., Wray, B., & Marks, E. M. (2023). Psychological and Emotional Responses to Climate Change among Young People Worldwide: Differences Associated with Gender, Age, and Country. *Sustainability*.

Cleaver, F. (2005). The inequality of social capital and the reproduction of chronic poverty. *World Development, 33*(6), 893-906. https://doi.org/10.1016/j.worlddev.2004.09.015

Cleaver, F., & Hamada, K. (2010). 'Good'water governance and gender equity: a troubled relationship. *Gender & Development, 18*(1), 27-41.

Clement, F., & Karki, E. (2018). When Water Security Programmes Seek to Empower Women – A Case Study from Western Nepal.

Clément, V., & Rivera, J. (2016). From Adaptation to Transformation: An Extended Research Agenda for Organizational Resilience to Adversity in the Natural Environment. *Organization & Environment, 30*(4), 346-365. https://doi.org/10.1177/1086026616658333

Cohen, P. J., Lawless, S., Dyer, M., Morgan, M., Saeni, E., Teioli, H., & Kantor, P. (2016). Understanding adaptive capacity and capacity to innovate in social–ecological systems: Applying a gender lens. *Ambio, 45*, 309-321.

Colding, J., Elmqvist, T., & Olsson, P. (2002). Living with disturbance: building resilience in social-ecological systems. In F. Berkes, J. Colding, & C. Folke (Eds.), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press.

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology, 94*, S95 - S120.

Collier, S. J. (2008). Enacting catastrophe: preparedness, insurance, budgetary rationalization. *Economy and society*, *37*(2), 224-250.

Collins, P. H. (2015). Intersectionality's definitional dilemmas. *Annual review of sociology, 41*(1), 1-20.

Collins, P. H., & Bilge, S. (2020). *Intersectionality*. John Wiley & Sons.

Collins, T. W., Grineski, S. E., & Chakraborty, J. (2018). Environmental injustice and flood risk: a conceptual model and case comparison of metropolitan Miami and Houston, USA. *Regional Environmental Change, 18*(2), 311-323.

Comfort, L., Wisner, B., Cutter, S., Pulwarty, R., Hewitt, K., Oliver-Smith, A., Wiener, J., Fordham, M., Peacock, W., & Krimgold, F. (1999). Reframing disaster policy: the global evolution of vulnerable communities. *Global Environmental Change Part B: Environmental Hazards, 1*(1), 39-44.

Connell, R. (2014). The sociology of gender in Southern perspective. *Current Sociology, 62*(4), 550-567.

Conway, D. (2013). Water security in a changing climate. In *Water security* (pp. 80-100). Routledge.

Corbetta, P. (2003). *Social research: Theory, methods and techniques*. Sage.

Corbridge, S., & Mawdsley, E. (2003). Editors' introduction: The practices of fieldwork. *Singapore journal of tropical geography*, *24*(2), 145-146.

Cosslett, T. L., & Cosslett, P. D. (2018). *Sustainable development of rice and water resources in Mainland Southeast Asia and Mekong River Basin*. Springer.

Cote, M., & Nightingale, A. J. (2012). Resilience thinking meets social theory:Situating social change in socio-ecological systems (SES) research. *Progress in Human Geography*, *36*(4), 475-489. https://doi.org/10.1177/0309132511425708

Coulthard, S. (2012). Can We Be Both Resilient and Well, and What Choices Do People Have? Incorporating Agency into the Resilience Debate from a Fisheries Perspective. *Ecology and Society*, *17*(1). https://doi.org/10.5751/es-04483-170104

Crenshaw, K. (1989). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *u. Chi. Legal f.*, 139.

Crenshaw, K. (1990). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stan. L. Rev.*, *43*, 1241.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches (Second edition)*. Sage publications.

Cretney, R. (2014). Resilience for whom? Emerging critical geographies of socio-ecological resilience. *Geography Compass*, *8*(9), 627-640.

Croppenstedt, A., Goldstein, M., & Rosas, N. (2013). Gender and agriculture: Inefficiencies, segregation, and low productivity traps. *The World Bank Research Observer*, *28*(1), 79-109.

Cuc, L. T., Rambo, A. T., Gillogly, K., & Network, S. A. U. A. (1993). Too many people, too little land: the human ecology of a wet rice-growing village in the Red River delta of Vietnam.

Cupples, J. (2002). The field as a landscape of desire: sex and sexuality in geographical fieldwork. *Area*, *34*(4), 382-390.

Curran, S. R., & Meijer-Irons, J. (2014). Climate variability, land ownership and migration: evidence from Thailand about gender impacts. *Washington journal of environmental law & policy, 4*(1), 37.

Curtis, S. E., & Oven, K. J. (2012). Geographies of health and climate change. *Progress in Human Geography, 36*(5), 654-666.

Cutter, S. L. (1995). The forgotten casualties: women, children, and environmental change. *Global environmental change : human and policy dimensions, 5 3*, 181-194.

Cutter, S. L. (1996a). Societal responses to environmental hazards. *International Social Science Journal, 48*(150), 525-536.

Cutter, S. L. (1996b). Vulnerability to environmental hazards. *Progress in Human Geography, 20*(4), 529-539.

Dakurah, G., Osei-Wusu Adjei, P., & Osbahr, H. (2023). We used to 'chase the rains' away in the past: the role of cultural values and beliefs in shaping farmers' perceptions of climate variability and change in North-west Ghana. *Climate and Development*.

Dankelman, I. (2002). Climate change: Learning from gender analysis and women's experiences of organising for sustainable development. *Gender & Development, 10*(2), 21-29. https://doi.org/10.1080/13552070215899

Dankelman, I. (2010). *Gender and climate change: An introduction*. Routledge.

Dankelman, I., Alam, K., Ahmed, W. B., Gueye, Y. D., Fatema, N., & Mensah-Kutin, R. (2008). *Gender, climate change and human security lessons from Bangladesh, Ghana and Senegal*. https://repository.ubn.ru.nl/bitstream/handle/2066/72456/72456.pdf

Das, T. K., Haldar, S. K., Gupta, I. D., & Sen, S. (2014). River Bank Erosion Induced Human Displacement and Its Consequences. *Living Reviews in Landscape Research, 8*.

Dasgupta, P. (2003). Social Capital and Economic Performance: Analytics. In E. Ostrom & T.-K. Ahn (Eds.), *Foundations of social capital*. Edward Elgar Publishing.

Dasgupta, S. (2019). Gender-based vulnerabilities and adaptation to a changing Climate: a case study in Tra Hat hamlet, Bac Lieu province, Vietnam. *Gender dimension of*, 17.

Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D., & Yan, J. (2009). The impact of sea level rise on developing countries: a comparative analysis. *Climatic Change, 93*(3), 379-388.

Dasgupta, S., Laplante, B., Murray, S., & Wheeler, D. (2009). Sea-level rise and storm surges: A comparative analysis of impacts in developing countries. *World Bank Policy Research Working Paper*(4901).

Davies, M., Guenther, B., Leavy, J., Mitchell, T., & Tanner, T. (2009). Climate change adaptation, disaster risk reduction and social protection: complementary roles in agriculture and rural growth? *IDS Working Papers*, *2009*(320), 01-37.

Davies, S. (2016). *Adaptable livelihoods: Coping with food insecurity in the Malian Sahel*. Springer.

de Bruijn, K. M. (2004). Resilience indicators for flood risk management systems of lowland rivers. *International Journal of River Basin Management*, *2*(3), 199-210. https://doi.org/10.1080/15715124.2004.9635232

De La Fabián, R. (2020). Resilience and sovereignty in the context of contemporary biopolitics. *Critical Times*, *3*(3), 327-357.

de la Riva, M. V., Lindner, A., & Pretzsch, J. (2013). Assessing adaptation–Climate change and indigenous livelihood in the Andes of Bolivia. *Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS)*, *114*(2), 109-122.

de Lourdes Olivo, M. (1997). Assessment of the vulnerability of Venezuela to sea-level rise. *Climate Research*, *9*(1-2), 57-65.

De Schutter, O. (2013). The agrarian transition and the 'feminization'of agriculture. *New Haven*.

De Vaus, D. (2013). *Surveys in social research*. Routledge.

Dearing, J. A. (2008). Landscape change and resilience theory: a palaeoenvironmental assessment from Yunnan, SW China. *The Holocene*, *18*(1), 117-127.

Debangshi, U. (2021). Crop Microclimate Modification to Address Climate Change. *International Journal of Research and Review*.

DeBlaere, C., Watson, L. B., & Langrehr, K. J. (2018). Intersectionality applied: Intersectionality is as intersectionality does.

Deininger, K., Xia, F., Kilic, T., & Moylan, H. (2021). Investment impacts of gendered land rights in customary tenure systems: Substantive and methodological insights from Malawi. *World Development*, *147*, 105654.

Delgado, J. M., Merz, B., & Apel, H. (2012). Monsoon Variability and the Mekong Flood Regime. In F. G. Renaud & C. Kuenzer (Eds.), *The Mekong Delta System: Interdisciplinary Analyses of a River Delta* (pp. 233-244). Springer Netherlands. https://doi.org/10.1007/978-94-007-3962-8_9

Dembedza, V. P., Chopera, P., Mapara, J., & Macheka, L. (2022). Impact of climate change-induced natural disasters on intangible cultural heritage related to food: a review. *Journal of Ethnic Foods*, *9*(1), 32.

Demetriades, J., & Esplen, E. (2010a). The gender dimensions of poverty and climate change adaptation. *Social dimensions of climate change: Equity and vulnerability in a warming world*, *4*(2), 133-143.

Demetriades, J., & Esplen, E. (2010b). The gender dimensions of poverty and climate change adaptation. *Social dimensions of climate change: Equity and vulnerability in a warming world*, 133-143.

Denton, F. (2002). Climate change vulnerability, impacts, and adaptation: Why does gender matter? *Gender and Development*, *10*(2), 10-20. https://doi.org/10.1080/13552070215903

Denton, F. (2002). Climate change vulnerability, impacts, and adaptation: Why does gender matter? *Gender & Development*, *10*(2), 10-20.

Denton, F. (2004). Gender and climate change: Giving the “latecomer” a head start.

Denton, F. (2010). Climate change vulnerability, impacts, and adaptation: Why does gender matter? *Gender & Development*, *10*(2), 10-20. https://doi.org/10.1080/13552070215903

Department of Agricultural and Rural Develpment of Soc Trang (2016). *Situation of crops damaged by natural disasters*.

Department of Agricultural and Rural Develpment of Soc Trang (2020). *Agricultural production land damaged by droughts and salinity until March 3rd, 2020*.

Derbile, E. K., Dongzagla, A., & Dakyaga, F. (2019). Livelihood sustainability under environmental change: Exploring the dynamics of local knowledge in crop farming and implications for development planning in Ghana. *Journal of Planning and Land Management*, *1*(1), 154-180.

Deshpande, A., & Kabeer, N. (2024). Norms that matter: Exploring the distribution of women's work between income generation, expenditure-saving and unpaid domestic responsibilities in India. *World Development, 174*, 106435.

Dev, S. M., & Rao, N. C. (2010). Agricultural price policy, farm profitability and food security. *Economic and political weekly, 45*, 174-182.

Dewachter, S., Holvoet, N., & Van Aelst, K. (2018). How does water information flow? Intersectionality in water information networks in a rural Ugandan community. *Water International, 43*(5), 553-569.

Dewi, E. S., Abdulai, I., Bracho-Mujica, G., & Rötter, R. P. (2022). Salinity constraints for small-scale agriculture and impact on adaptation in North Aceh, Indonesia. *Agronomy, 12*(2), 341.

Dhaka, B., Poonia, M., Chayal, K., Tyagi, S., & Vatta, L. (2012). Constraints in knowledge and information flow amongst farm women. *International Journal of Agriculture, Environment and Biotechnology, 5*(2), 167-170.

di Baldassarre, G., Kreibich, H., Vorogushyn, S., Aerts, J. C. J. H., Arnbjerg-Nielsen, K., Barendrecht, M. H., Bates, P. D., Borga, M., Botzen, W. J. W., Bubeck, P., De Marchi, B., Llasat, C., Mazzoleni, M., Molinari, D., Mondino, E., Mård, J., Petrucci, O., Scolobig, A., Viglione, A., & Ward, P. J. (2018). Hess Opinions: An interdisciplinary research agenda to explore the unintended consequences of structural flood protection. *Hydrology and Earth System Sciences*.

Diamond, S., & Ansharyani, I. (2018). Mismatched priorities, smallholders, and climate adaptation strategies: landuse scientists, it's time to step up. *Journal of Land Use Science, 13*(4), 447-453.

Dimple, Rajput, J., Indu, & Kumar, M. (2021). Human Health Hazards and Risks in the Agriculture Sector. In *Recent Technologies for Disaster Management and Risk Reduction: Sustainable Community Resilience & Responses* (pp. 229-244). Springer.

Dineen, K., & Le, Q. V. (2015). The impact of an integrated microcredit program on the empowerment of women and gender equality in rural Vietnam. *The Journal of Developing Areas, 49*(1), 23-38. http://www.jstor.org/stable/24241267

Diouf, N. S., Ouedraogo, I., Zougmoré, R. B., Ouedraogo, M., Partey, S. T., & Gumucio, T. (2019). Factors influencing gendered access to climate information services for farming in Senegal. *Gender, Technology and Development, 23*(2), 93-110.

Dixon, R. K., Perry, J. A., & Vanderklein, E. L. (1996). Vulnerability of forest resources to global climate change: case study of Cameroon and Ghana. *Climate Research, 6*(2), 127-133.

Djoudi, H., & Brockhaus, M. (2011). Is adaptation to climate change gender neutral? Lessons from communities dependent on livestock and forests in northern Mali. *International Forestry Review, 13*(2), 123-135.

Djoudi, H., Locatelli, B., Vaast, C., Asher, K., Brockhaus, M., & Basnett Sijapati, B. (2016, Dec). Beyond dichotomies: Gender and intersecting inequalities in climate change studies. *Ambio, 45*(Suppl 3), 248-262. https://doi.org/10.1007/s13280-016-0825-2

Dollar, D., Glewwe, P., & Litvack, J. I. (1998). *Household welfare and Vietnam's transition*. World Bank Publications.

Donatti, C. I., Harvey, C. A., Hole, D., Panfil, S. N., & Schurman, H. (2020). Indicators to measure the climate change adaptation outcomes of ecosystem-based adaptation. *Climatic Change, 158*(3), 413-433.

Downing, T. E., Olsthoorn, A. A., & Tol, R. S. (1999). *Climate, change and risk*. Routledge London.

Doyle, L., Brady, A.-M., & Byrne, G. (2016). An overview of mixed methods research – revisited. *Journal of research in nursing, 21*(8), 623-635. https://doi.org/10.1177/1744987116674257

Duc Tran, D., Van Halsema, G., Hellegers, P. J., Phi Hoang, L., Quang Tran, T., Kummu, M., & Ludwig, F. (2018). Assessing impacts of dike construction on the flood dynamics of the Mekong Delta. *Hydrology and Earth System Sciences, 22*(3), 1875-1896.

Dun, O. (2014). Shrimp, salt and livelihoods: Migration in the Mekong Delta, Vietnam.

Dunn, F. E., & Minderhoud, P. S. (2022). Sedimentation strategies provide effective but limited mitigation of relative sea-level rise in the Mekong delta. *Communications Earth & Environment, 3*(1), 2.

Eakin, H. (2002). *Rural households' vulnerability and adaptation to climatic variability and institutional change*

Eakin, H., & Luers, A. L. (2006). Assessing the vulnerability of social-environmental systems. *Annual review of environment and resources, 31*(1), 365-394.

Eakin, H., Wightman, P. M., Hsu, D., Gil Ramón, V. R., Fuentes-Contreras, E., Cox, M. P., Hyman, T.-A. N., Pacas, C., Borraz, F., & González-Brambila, C. (2015). Information and communication technologies and climate change adaptation in Latin America and the Caribbean: A framework for action. *Climate and Development, 7*(3), 208-222.

Eakin, H. C. (2000). Smallholder Maize Production and Climatic Risk: A Case Study from Mexico. *Climatic Change, 45*, 19-36.

Eakin, H. C., & Patt, A. (2011). Are adaptation studies effective, and what can enhance their practical impact? *WIREs Climate Change, 2*(2), 141-153. https://doi.org/10.1002/wcc.100

Easterling, W. E. (1996). Adapting North American agriculture to climate change in review. *Agricultural and forest meteorology, 80*(1), 1-53.

Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2020). Who suffers most from extreme weather events? Weather-related loss events in 2018 and 1999 to 2018. *Global Climate Risk Index*.

Edvardsson Björnberg, K., & Hansson, S. O. (2013). Gendering local climate adaptation. *Local Environment, 18*(2), 217-232.

Egert, P. R. (2014). A rising tide does not lift all boats equally: Gender as hazard in disaster planning and response. In *Issues of gender and sexual orientation in humanitarian emergencies: Risks and risk reduction.* (pp. 75-97). Springer International Publishing.

Elder, G. H., Robertson, E. B., & Foster, E. M. (2020). Survival, loss, and adaptation: A perspective on farm families. In *Families in troubled times* (pp. 105-126). Routledge.

Elias, E. H., Flynn, R., Idowu, O. J., Reyes, J., Sanogo, S., Schutte, B. J., Smith, R., Steele, C., & Sutherland, C. (2019). Crop vulnerability to weather and climate risk: Analysis of interacting systems and adaptation efficacy for sustainable crop production. *Sustainability, 11*(23), 6619.

Elias, M., Zaremba, H., Tavenner, K., Ragasa, C., Paez Valencia, A. M., Choudhury, A., & de Haan, N. (2024). Towards gender equality in forestry, livestock, fisheries and aquaculture. *Global Food Security*.

Ellis-Jones, J. (1999). Poverty, land care, and sustainable livelihoods in hillside and mountain regions. *Mountain Research and Development*, 179-190.

Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies, 35*(1), 1-38. https://doi.org/10.1080/00220389808422553

Ellis, F. (2000). *Rural livelihoods and diversity in developing countries*. Oxford university press.

Ellis, F., & Bahiigwa, G. (2003). Livelihoods and Rural Poverty Reduction in Uganda. *World Development, 31*(6), 997-1013. https://doi.org/10.1016/s0305-750x(03)00043-3

Ellis, F., & Biggs, S. (2001). Evolving themes in rural development 1950s-2000s. *Development Policy Review, 19*(4), 437-448.

Ellis, F., & Freeman, H. A. (2004). *Rural livelihoods and poverty reduction policies*. Routledge.

Ellis, S. C. (2005). Meaningful consideration? A review of traditional knowledge in environmental decision making. *Arctic*, 66-77.

Elmhirst, R. (2015). Feminist political ecology. In *The Routledge handbook of political ecology* (pp. 519-530). Routledge.

EM-DAT. (2022). *Disaster Classification*. https://public.emdat.be/data

Emmett, T. (2000). Beyond community participation? Alternative routes to civil engagement and development in South Africa. *Development Southern Africa, 17*(4), 501-518. https://doi.org/10.1080/03768350050173903

Enarson, E., & Chakrabarti, P. G. D. (2009). *Women, Gender, and Disaster: Global Issues and Initiatives*. SAGE Publications.

Enarson, E., & Meyreles, L. (2004a). International perspectives on gender and disaster: differences and possibilities. *International Journal of Sociology and Social Policy*.

Enarson, E., & Meyreles, L. (2004b). International perspectives on gender and disaster: differences and possibilities. *International Journal of Sociology and Social Policy, 24*(10/11), 49-93. https://doi.org/10.1108/01443330410791064

Enarson, E., & Pease, B. (2016). The gendered terrain of disaster: Thinking about men and masculinities. In *Men, masculinities and disaster* (pp. 2-20). Routledge.

Enarson, E. P. (2000). *Gender and natural disasters*. ILO Geneva.

Enarson, E. P. (2012). *Women Confronting Natural Disaster: From Vulnerability to Resilience*. Lynne Rienner Publishers. https://doi.org/NL552040PDF

Engle, N. L., & Lemos, M. C. (2010). Unpacking governance: Building adaptive capacity to climate change of river basins in Brazil. *Global Environmental Change*, *20*(1), 4-13. https://doi.org/10.1016/j.gloenvcha.2009.07.001

Ensor, J., & Berger, R. (2009). Community-based adaptation and culture in theory and practice. *Adapting to climate change: thresholds, values, governance*, 227-239.

Erban, L. E., Gorelick, S. M., & Zebker, H. A. (2014). Groundwater extraction, land subsidence, and sea-level rise in the Mekong Delta, Vietnam. *Environmental Research Letters*, *9*(8), 084010.

Ergas, C. (2014). Barriers to Sustainability: Gendered Divisions of Labor in Cuban Urban Agriculture.

Eriksen, S., Aldunce, P., Bahinipati, C. S., Martins, R. D. A., Molefe, J. I., Nhemachena, C., O'Brien, K., Olorunfemi, F., Park, J., Sygna, L., & Ulsrud, K. (2011). When not every response to climate change is a good one: Identifying principles for sustainable adaptation. *Climate and Development*, *3*(1), 7-20. https://doi.org/10.3763/cdev.2010.0060

Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., Harding, B., Khatri, D., Lenaerts, L., Liverman, D., Mills-Novoa, M., Mosberg, M., Movik, S., Muok, B., Nightingale, A., Ojha, H., Sygna, L., Taylor, M., Vogel, C., & West, J. J. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? *World Development*, *141*. https://doi.org/10.1016/j.worlddev.2020.105383

Eriksen, S. H., Brown, K., & Kelly, P. M. (2005). The dynamics of vulnerability: locating coping strategies in Kenya and Tanzania. *Geographical Journal*, *171*(4), 287-305.

Eriksen, S. H., & O'Brien, K. (2007). Vulnerability, poverty and the need for sustainable adaptation measures. *Climate Policy*, *7*(4), 337-352. https://doi.org/10.1080/14693062.2007.9685660

Eskelinen, T. (2011). Relative Poverty. In D. K. Chatterjee (Ed.), *Encyclopedia of global justice*. Springer.

Eslami, S., Hoekstra, P., Minderhoud, P. S., Trung, N. N., Hoch, J. M., Sutanudjaja, E. H., Dung, D. D., Tho, T. Q., Voepel, H. E., & Woillez, M.-N. (2021). Projections of salt intrusion in a mega-delta under climatic and anthropogenic stressors. *Communications Earth & Environment*, *2*(1), 142.

Etana, D., van Wesenbeeck, C. F. A., & de Cock Buning, T. (2020). Socio-cultural aspects of farmers' perception of the risk of climate change and variability in Central Ethiopia. *Climate and Development, 13*, 139 - 151.

Etzold, B., Ahmed, A. U., Hassan, S. R., & Neelormi, S. (2013). Clouds gather in the sky, but no rain falls. Vulnerability to rainfall variability and food insecurity in Northern Bangladesh and its effects on migration. *Climate and Development, 6*(1), 18-27. https://doi.org/10.1080/17565529.2013.833078

Evans, P. (1996). Government action, social capital and development: reviewing the evidence on synergy. *World Development, 24*(6), 1119-1132.

Faas, A. J., Jones, E., Whiteford, L., Tobin, G., & Murphy, A. (2014). Gendered access to formal and informal resources in postdisaster development in the Ecuadorian Andes. *Mountain Research and Development, 34*(3), 223-234.

Fafchamps, M., & Minten, B. (1998). *Returns to social capital among traders*.

FAO. (2011). *The State of Food and Agriculture 2010-11: Women in Agriculture: Closing the Gender Gap for Development*. Food and Agriculture Organization of the United Nations.

.

FAO. (2016). "El Nino" event in Vietnam: Agriculture food security and livelihood needs assessment in response to drought and sal water instrusion. https://reliefweb.int/report/viet-nam/el-ni-o-event-viet-nam-agriculture-food-security-and-livelihood-needs-assessment

Farnworth, C. R., & Colverson, K. E. (2015). Building a gender-transformative extension and advisory facilitation system in Sub-Saharan Africa. *Journal of Gender, Agriculture and Food Security (Agri-Gender), 1*(1), 20-39.

Farnworth, C. R., Hà, T. T., Sander, B. O., Wollenberg, E., de Haan, N. C., & McGuire, S. (2017). Incorporating gender into low-emission development: a case study from Vietnam. *Gender, Technology and Development, 21*(1-2), 5-30. https://doi.org/10.1080/09718524.2017.1385314

Farooq, U., & Ahmad, M. (2007). Natural Resource Conservation, Poverty Alleviation, and Farmer Partnership. *The Pakistan Development Review, 46*, 1023-1049.

Fazey, I., Gamarra, J. G., Fischer, J., Reed, M. S., Stringer, L. C., & Christie, M. (2010). Adaptation strategies for reducing vulnerability to future environmental change. *Frontiers in Ecology and the Environment, 8*(8), 414-422.

Feiock, R. C. (2013). The institutional collective action framework. *Policy studies journal, 41*(3), 397-425.

Fforde, A., & De Vylder, S. (1996). *From plan to market: The economic transition in Vietnam*. Routledge.

Field, C. B. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation: special report of the intergovernmental panel on climate change*. Cambridge University Press.

Fielding, N. (2010). Mixed methods research in the real world. *International Journal of Social Research Methodology, 13*(2), 127-138. https://doi.org/10.1080/13645570902996186

Fieldman, G. (2011). Neoliberalism, the production of vulnerability and the hobbled state: Systemic barriers to climate adaptation. *Climate and Development, 3*(2), 159-174.

Fine, B. (1999). The Developmental State Is Dead - Long Live Social Capital? *Development & Change, 30*(1), 1.

Fisher, S. (2010, Aug). Violence against women and natural disasters: findings from post-tsunami Sri Lanka. *Violence Against Women, 16*(8), 902-918. https://doi.org/10.1177/1077801210377649

Fletcher, R. (2012). Using the master's tools? Neoliberal conservation and the evasion of inequality. *Development and Change, 43*(1), 295-317.

Flowerdew, R., & Martin, D. (2005). *Methods in human geography: a guide for students doing a research project*. Pearson Education.

Folke, C. (2006, 2006/08/01/). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change, 16*(3), 253-267. https://doi.org/https://doi.org/10.1016/j.gloenvcha.2006.04.002

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2002). Resilience and sustainable development: building adaptive capacity in a world of transformations. *AMBIO: A journal of the human environment, 31*(5), 437-440.

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society, 15*(4).

Forbes, D. K. (1991). *Doi Moi: Vietnam's renovation, policy, and performance*. Department of Political and Social Change, Research School of Pacific ….

Fordham, M. (2012). Gender, sexuality and disaster. In *The routledge handbook of hazards and disaster risk reduction* (pp. 424-435). Routledge.

Forsyth, T. (2001). Critical realism and political ecology. In J. Lopez & G. Potter (Eds.), *After postmodernism: an introduction to critical realism* (pp. 146-154).

Forsyth, T. (2008). Political ecology and the epistemology of social justice. *Geoforum*, *39*(2), 756-764. https://doi.org/10.1016/j.geoforum.2006.12.005

Forsyth, T. (2013). Community-based adaptation: a review of past and future challenges. *Wiley Interdisciplinary Reviews: Climate Change*, *4*(5), 439-446.

Foster, J. E. (1998). Absolute versus relative poverty. *The American economic review*, *88*(2), 335-341.

Fox, N., Tilt, J. H., Ruggiero, P., Stanton, K., & Bolte, J. (2023). Toward equitable coastal community resilience: Incorporating principles of equity and justice in coastal hazard adaptation. *Cambridge Prisms: Coastal Futures*, *1*, e36.

Fraenkel, J., Wallen, N., & Hyun, H. (2018). *How to design and evaluate research in education. 10thedn*. New York: McGraw-Hill Education.

Francis, E. (2002). Rural Livelihoods, Institutions and Vulnerability in North West Province, South Africa. *Journal of Southern African Studies*, *28*(3), 531-550. https://doi.org/10.1080/0305707022000006503

Friend, R., & Thinphanga, P. (2018). Urban water crises under future uncertainties: The case of institutional and infrastructure complexity in Khon Kaen, Thailand. *Sustainability*, *10*(11), 3921.

Fuchs, S., Kuhlicke, C., & Meyer, V. (2011). Editorial for the special issue: vulnerability to natural hazards—the challenge of integration. *Natural Hazards*, *58*(2), 609-619. https://doi.org/10.1007/s11069-011-9825-5

Fukuyama, F. (2010). Social capital, civil society and development. *Third World Quarterly*, *22*(1), 7-20. https://doi.org/10.1080/713701144

Füssel. (2007a). Adaptation planning for climate change: concepts, assessment approaches, and key lessons. *Sustainability Science*, *2*(2), 265-275. https://doi.org/10.1007/s11625-007-0032-y

Füssel. (2007b). Vulnerability: A generally applicable conceptual framework for climate change research. *Global Environmental Change, 17*(2), 155-167. https://doi.org/10.1016/j.gloenvcha.2006.05.002

Gaillard, J.-C., Sanz, K., Balgos, B. C., Dalisay, S. N. M., Gorman-Murray, A., Smith, F., & Toelupe, V. a. (2017). Beyond men and women: a critical perspective on gender and disaster. *Disasters, 41*(3), 429-447.

Gaillard, J. C. (2007). Resilience of traditional societies in facing natural hazards. *Disaster Prevention and Management: An International Journal, 16*(4), 522-544. https://doi.org/10.1108/09653560710817011

Galletta, A. (2013). The Semi-Structured Interview as a Repertoire of Possibilities. In *Mastering the Semi-Structured Interview and Beyond* (pp. 45-72). New York University Press.

Galwab, A. M., Koech, O. K., Wasonga, O. V., & Kironchi, G. (2024). Gender-Differentiated Roles and Perceptions on Climate Variability Among Pastoralist and Agro-Pastoralist Communities in Marsabit, Kenya. *Nomadic Peoples, 28*(1), 41-71.

Garcia, A., Tschakert, P., & Karikari, N. A. (2020). 'Less able': how gendered subjectivities warp climate change adaptation in Ghana's Central Region. *Gender, Place & Culture, 27*(11), 1602-1627.

Garschagen, M., & Sandholz, S. (2017). Linking critical infrastructure resilience to social vulnerability through minimum supply concepts: review of gaps and development of an integrative framework. *Nat. Hazards Earth Syst. Sci. Discuss*, 1-20.

Garutsa, T. C., & Nekhwevha, F. H. (2016). Labour-burdened women utilising their marginalised indigenous knowledge in food production processes: The case of Khambashe rural households, Eastern Cape, South Africa. *South African Review of Sociology, 47*(4), 106-120.

Gay-Antaki, M. (2017). *Feminist Geographies of Gender and Climate Change: From International Negotiations to Women in Mexico* The University of Arizona.

Gay-Antaki, M., & Liverman, D. (2018). Climate for women in climate science: Women scientists and the Intergovernmental Panel on Climate Change. *Proceedings of the National Academy of Sciences, 115*(9), 2060-2065.

Gebre, G. G., Isoda, H., Rahut, D. B., Amekawa, Y., & Nomura, H. (2021). Gender gaps in market participation among individual and joint decision-making farm households:

Evidence from Southern Ethiopia. *The European Journal of Development Research, 33*, 649-683.

Geisler, G. (1993). Silences speak louder than claims: Gender, household, and agricultural development in Southern Africa. *World Development, 21*(12), 1965-1980.

Gellers, J. C., & Jeffords, C. (2015). Procedural environmental rights and environmental justice: Assessing the impact of environmental constitutionalism. *Available at SSRN 2646739*.

Gerring, J. (2007). *Case study research: Principles and practices*. Cambridge university press.

GFDRR. (2015). *Country Profile - Vietnam*. https://www.gfdrr.org/en/region/vietnam

Giao, N. T. (2021). Assessing impact of saline intrusion on rice cultivating area in Ke Sach district, Soc Trang province, Vietnam.

Giddens, A. (1985). Time, space and regionalisation. In *Social relations and spatial structures* (pp. 265-295). Springer.

Gilfillan, D., Nguyen, T. T., & Pham, H. T. (2017). Coordination and health sector adaptation to climate change in the Vietnamese Mekong Delta. *Ecology and Society, 22*(3).

Gillham, B. (2000). *Case study research methods*. Bloomsbury Publishing.

Glemarec, Y. (2017). Addressing the gender differentiated investment risks to climate-smart agriculture. *AIMS Agriculture and Food, 2*(1), 56-74.

Glewwe, P. (2004). An overview of economic growth and household welfare in Vietnam in the 1990s. *Economic growth, poverty, and household welfare in Vietnam, 1*.

Godden, N. J., Macnish, P., Chakma, T., & Naidu, K. (2020). Feminist Participatory Action Research as a tool for climate justice. *Gender & Development, 28*(3), 593-615. https://doi.org/10.1080/13552074.2020.1842040

Godfrey, A. B. (2010). Household gender and resource relations: Women in the marketing arena of income generating crops in Uganda. *Eastern Africa Social Science Research Review, 26*(2), 1-30.

Goetz, A. M. (2007). Gender Justice, Citizenship and Entitlements. In *Gender Justice, Citizenship & Development* (pp. 15-57). International Development Research Centre.

Goh, A. (2012). A literature review of the gender-differentiated impacts of climate change on women's and men's assets and well-being in developing countries.

Gold, R. L. (2017). Roles in sociological field observations. In *Sociological Methods* (pp. 363-380). Routledge.

Goldsworthy, H. (2010). Women, global environmental change, and human security. *Global environmental change and human security, 2010*, 215-236.

Gómez-Baggethun, E., Corbera, E., & Reyes-García, V. (2013). Traditional ecological knowledge and global environmental change: research findings and policy implications. *Ecology and society: a journal of integrative science for resilience and sustainability*, *18*(4), 72.

Gonda, N. (2017). Revealing the patriarchal sides of climate change adaptation through intersectionality: A case study from Nicaragua. In *Understanding climate change through gender relations* (pp. 173-189). Routledge.

Goodman, D., & Watts, M. (1997). *Globalising food: agrarian questions and global restructuring*. Psychology Press.

Goodman, L. A. (1961). Snowball sampling. *The annals of mathematical statistics*, 148-170.

Goulden, M. C. (2006). *Livelihood diversification, social capital and resilience to climate variability amongst natural resource dependent societies in Uganda* University of East Anglia].

Grace, D., Roesel, K., Kang'ethe, E., Bonfoh, B., & Theis, S. (2015). *Gender roles and food safety in 20 informal livestock and fish value chains* (Vol. 1489). Intl Food Policy Res Inst.

Graham, J. P., Hirai, M., & Kim, S.-S. (2016). An analysis of water collection labor among women and children in 24 sub-Saharan African countries. *PLoS One*, *11*(6), e0155981.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis*, *11*(3), 255-274.

Grist, N. (2008). Positioning climate change in sustainable development discourse. *Journal of International Development: The Journal of the Development Studies Association*, *20*(6), 783-803.

Grootaert, C. (2004). *Measuring social capital: An integrated questionnaire*. World Bank Publications.

Grotlüschen, A., Mallows, D., Reder, S., & Sabatini, J. (2016). Adults with low proficiency in literacy or numeracy. *OECD education working papers, 2016*.

Grzanka, P. R., Flores, M. J., VanDaalen, R. A., & Velez, G. (2020). Intersectionality in psychology: Translational science for social justice.

GSOVN. (2015). *Vietnam General Statistic Office. Statistical handbook 2015*.

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Sage.

Guest, G., MacQueen, K., & Namey, E. (2012). Applied Thematic Analysis. In. SAGE Publications, Inc. https://doi.org/10.4135/9781483384436

Gumucio, T., Hansen, J., Huyer, S., & Van Huysen, T. (2020). Gender-responsive rural climate services: a review of the literature. *Climate and Development, 12*(3), 241-254.

Gupta, H. (2015). Women and climate change: linking ground perspectives to the global scenario. *Indian Journal of Gender Studies, 22*(3), 408-420.

Ha, H. D., Tan, N. Q., Thang, T. N., Que, H. T. H., & Van Tuyen, T. (2023). Towards inclusive resilience: Understanding the intersectionality of gender, ethnicity, and livelihoods in climate-prone upland areas of Central Vietnam. *Environment and Ecology Research, 11*(4), 630-646.

Habib-ur-Rahman, M., Ahmad, A., Raza, A., Hasnain, M. U., Alharby, H. F., Alzahrani, Y. M., Bamagoos, A. A., Hakeem, K. R., Ahmad, S., Nasim, W., Ali, S., Mansour, F., & EL Sabagh, A. (2022, 2022-October-10). Impact of climate change on agricultural production; Issues, challenges, and opportunities in Asia [Review]. *Frontiers in Plant Science, 13*. https://doi.org/10.3389/fpls.2022.925548

Habiba, U., Abedin, M. A., Shaw, R., & Hassan, A. W. R. (2014). Salinity-induced livelihood stress in coastal region of Bangladesh. In *Water insecurity: A social dilemma*. Emerald Group Publishing Limited.

Hackfort, S., & Burchardt, H.-J. (2018). Analyzing socio-ecological transformations–a relational approach to gender and climate adaptation. *Critical Policy Studies, 12*(2), 169-186.

Haenfler, R. (2021). Intersectionality as an Activist Knowledge Project and a Theory in the Making [Intersectionality as Critical Social Theory, Patricia Hill Collins]. *Symbolic Interaction, 44*(2), 457-459. https://www.jstor.org/stable/27084989

Hafiza, S., & Neelormi, S. (2015). *Climate resilient and empowering livelihoods for women*. https://wrd.unwomen.org/index.php/explore/library/climate-resilient-and-empowering-livelihoods-women

Hak, D., Nadaoka, K., Bernado, L. P., Le Phu, V., Quan, N. H., Toan, T. Q., Trung, N. H., Van Ni, D., & Tri, V. P. D. (2016). Spatio-temporal variations of sea level around the Mekong Delta: their causes and consequences on the coastal environment. *Hydrological Research Letters, 10*(2), 60-66.

Haldon, J., Binois-Roman, A., Eisenberg, M., Izdebski, A., Mordechai, L., Newfield, T., Slavin, P., White, S., & Wnęk, K. (2021). Between resilience and adaptation: A historical framework for understanding stability and transformation of societies to shocks and stress. In *COVID-19: Systemic risk and resilience* (pp. 235-268). Springer.

Hall, R. (2013). Mixed methods: In search of a paradigm. *Conducting research in a changing and challenging world*, 71-78.

Hallegatte, S. (2016). *Shock waves: managing the impacts of climate change on poverty*. World Bank Publications.

Hamin, E. M., & Gurran, N. (2009). Urban form and climate change: Balancing adaptation and mitigation in the U.S. and Australia. *Habitat International, 33*(3), 238-245. https://doi.org/10.1016/j.habitatint.2008.10.005

Han, G., Schoolman, E. D., Arbuckle, J. G., & Morton, L. W. (2021). Weather, Values, Capacity and Concern: Toward a Social-Cognitive Model of Specialty Crop Farmers' Perceptions of Climate Change Risk. *Environment and Behavior, 54*, 327 - 362.

Handmer, J. W., Dovers, S., & Downing, T. E. (1999). Societal Vulnerability to Climate Change and Variability. *Mitigation and Adaptation Strategies for Global Change: An International Journal Devoted to Scientific, Engineering, Socio-Economic and Policy Responses to Environmental Change, 4*(3-4), 267-281.

Hanh, H., & Ha, V. (2025). Promoting ethnic cultural identity and developing agricultural economy in the mekong delta region in the context of current climate change. *International Journal of Education and Social Science Research, 08*, 302-312. https://doi.org/10.37500/IJESSR.2025.8422

Hanson, A.-M., & Buechler, S. (2015). Introduction: Towards a feminist political ecology of women, global change, and vulnerable waterscapes. In *A Political Ecology of Women, Water, and Global Environmental Change* (pp. 1-16). Routledge.

Haque, A. S., Kumar, L., & Bhullar, N. (2023). Gendered perceptions of climate change and agricultural adaptation practices: a systematic review. *Climate and Development, 15*(10), 885-902.

Hardin, G. J. (1998). Extensions of "The Tragedy of the Commons". *Science, 280*, 682 - 683.

Harmer, N., & Rahman, S. (2014). Climate change response at the farm level: A review of farmers' awareness and adaptation strategies in developing countries. *Geography Compass, 8*(11), 808-822.

Harpe, S. E. (2015). How to analyze Likert and other rating scale data. *Currents in pharmacy teaching and learning, 7*(6), 836-850.

Harris, L. (2015). Hegemonic waters and rethinking natures otherwise. *Practicing feminist political ecologies: moving beyond the green economy, ed. W. Harcourt, and IL Nelson*, 157-181.

Harris, L. M. (2009). Gender and emergent water governance: comparative overview of neoliberalized natures and gender dimensions of privatization, devolution and marketization. *Gender, Place & Culture*, *16*(4), 387-408. https://doi.org/10.1080/09663690903003918

Harris, L. M., Goldin, J. A., & Sneddon, C. (2013). Contemporary water governance in the global South. *Scarcity, Marketization and Participation*.

Hartmann, T., Slavíková, L., & McCarthy, S. (2019). Nature-based solutions in flood risk management. *Nature-based flood risk management on private land: Disciplinary perspectives on a multidisciplinary challenge*, 3-8.

Harvey, D. (2007). *A brief history of neoliberalism*. Oxford university press.

Harvey, D. L. (2009). Complexity and Case. In D. Byrne & C. Ragin (Eds.), *The SAGE Handbook of Case-Based Methods*. SAGE Publications Ltd. https://doi.org/10.4135/9781446249413

Hawkins, R. Z. (1998). Ecofeminism and Nonhumans: Continuity, Difference, Dualism, and Domination. *Hypatia*, *13*(1), 158-197. http://www.jstor.org/stable/3810611

Hazell, P. B. (1985). Sources of increased variability in world cereal production since the 1960s. *Journal of Agricultural Economics, 36*(2), 145-159.

Heltberg, R., Jorgensen, S. L., & Siegel, P. B. (2008). Addressing Human Vulnerability to Climate Change: Toward a 'No Regrets' Approach. *Agricultural & Natural Resource Economics*.

Hemmati, M., & Röhr, U. (2009). Engendering the climate-change negotiations: experiences, challenges, and steps forward. *Gender & Development, 17*(1), 19-32. https://doi.org/10.1080/13552070802696870

Henne, K., & Troshynski, E. (2013). Mapping the margins of intersectionality: Criminological possibilities in a transnational world. *Theoretical Criminology, 17*(4), 455-473.

Hewitt, K. (1983). *Interpretations of calamity: From the viewpoint of human ecology*. Routledge.

Hewitt, K. (2014). *Regions of risk: A geographical introduction to disasters*. Routledge.

Hilmi, Y. S., Tóth, J., Gabnai, Z., Király, G., & Temesi, Á. (2024). Farmers' resilience to climate change through the circular economy and sustainable agriculture: a review from developed and developing countries. *Renewable Agriculture and Food Systems, 39*, e15, Article e15.

Himley, M. (2008). Geographies of environmental governance: The nexus of nature and neoliberalism. *Geography Compass, 2*(2), 433-451.

Hine, J. L., & Ellis, S. D. (2001). Agricultural marketing and access to transport services. *Wokingham, United Kingdom: Transport Research Laboratory*.

Hirschman, C., & Loi, V. M. (1996). Family and household structure in Vietnam: Some glimpses from a recent survey. *Pacific affairs*, 229-249.

Ho, T. D., Tsusaka, T. W., Kuwornu, J. K., Lam, L. M., & Vu, T. T. (2024). Does livelihood capital influence the livelihood diversification strategies of smallholder rice farmers? Evidence from the Mekong Delta of Vietnam. *Cogent Economics & Finance, 12*(1), 2397456.

Ho, T. D. N., Tsusaka, T. W., Kuwornu, J. K. M., Datta, A., & Nguyen, L. T. (2021). Do rice varieties matter? Climate change adaptation and livelihood diversification among rural smallholder households in the Mekong Delta region of Vietnam. *Mitigation and Adaptation Strategies for Global Change, 27*(1). https://doi.org/10.1007/s11027-021-09978-x

Ho, T. T., & Ubukata, F. (2017). CLIMATE CHANGE IN VIETNAM'S MEKONG DELTA: SOC TRANG RICE FARMERS' PERCEPTIONS AND ADAPTIVE BEHAVIORS. *Journal of Environmental Science for Sustainable Society, 8*, 1-14.

Hoang, L. A. (2008). *Social structures and the ability to choose: migration decision-making in rural Vietnam* University of East Anglia].

Hoang, L. A. (2011a). Gender Identity and Agency in Migration Decision-Making: Evidence from Vietnam. *Journal of Ethnic and Migration Studies, 37*(9), 1441-1457. https://doi.org/10.1080/1369183x.2011.623618

Hoang, L. A. (2011b). Gendered networks and migration decision-making in Northern Vietnam. *Social & Cultural Geography, 12*(5), 419-434. https://doi.org/10.1080/14649365.2011.588800

Holling, C. S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics, 4*, 1-23. http://www.jstor.org/stable/2096802

Holling, C. S., & Gunderson, L. H. (2002a). *Panarchy: understanding transformations in human and natural systems*. Washington, DC: Island Press.

Holling, C. S., & Gunderson, L. H. (2002b). Resilience and adaptive cycles. *In: Panarchy: Understanding Transformations in Human and Natural Systems, 25-62*.

Homer-Dixon, T. F. (2010). Environment, scarcity, and violence. In *Environment, scarcity, and violence*. Princeton University Press.

Hopkins, P. (2018). Feminist geographies and intersectionality. *Gender, Place & Culture, 25*(4), 585-590. https://doi.org/10.1080/0966369x.2018.1460331

Hoque, S. F., Quinn, C., & Sallu, S. (2017). Differential livelihood adaptation to social-ecological change in coastal Bangladesh. *Regional Environmental Change, 18*(2), 451-463. https://doi.org/10.1007/s10113-017-1213-6

Howie, C. A. (2011). *Co-operation and Contestation: Farmer-state Relations in Agriculture Transformation, An Giang Province, Vietnam* Royal Holloway, University of London].

Htun, M., & Weldon, S. L. (2012). The civic origins of progressive policy change: Combating violence against women in global perspective, 1975–2005. *American Political Science Review, 106*(3), 548-569.

Huitema, D., Adger, W. N., Berkhout, F., Massey, E., Mazmanian, D., Munaretto, S., Plummer, R., & Termeer, C. C. (2016). The governance of adaptation: choices, reasons, and effects. Introduction to the Special Feature. *Ecology and Society, 21*(3).

Huntjens, P., Pahl-Wostl, C., Rihoux, B., Schlüter, M., Flachner, Z., Neto, S., Koskova, R., Dickens, C., & Nabide Kiti, I. (2011). Adaptive water management and policy learning in a changing climate: a formal comparative analysis of eight water management regimes in Europe, Africa and Asia. *Environmental Policy and Governance, 21*(3), 145-163.

Huq, S., & Reid, H. (2004). Mainstreaming Adaptation in Development. *IDS Bulletin, 35*, 15-21.

Huyer, S. (2016a). Closing the gender gap in agriculture. *Gender, Technology and Development, 20*(2), 105-116.

Huyer, S. (2016b). Gender and international climate policy: An analysis of progress in gender equality at COP21.

Huyer, S., & Partey, S. (2020). Weathering the storm or storming the norms? Moving gender equality forward in climate-resilient agriculture: Introduction to the Special Issue on Gender Equality in Climate-Smart Agriculture: Approaches and Opportunities. *Climatic Change, 158*(1), 1-12.

Huynh, L. T. M., & Stringer, L. C. (2018). Multi-scale assessment of social vulnerability to climate change: An empirical study in coastal Vietnam. *Climate Risk Management, 20*, 165-180. https://doi.org/10.1016/j.crm.2018.02.003

Huynh, P.-T., & Resurrección, B. P. (2014). Women's differentiated vulnerability and adaptations to climate-related agricultural water scarcity in rural Central Vietnam. *Climate and Development, 6*, 226 - 237.

Ibrahim, S. S., Ozdeser, H., & Cavusoglu, B. (2019, Jan). Vulnerability to recurrent shocks and disparities in gendered livelihood diversification in remote areas of Nigeria. *Environ Sci Pollut Res Int, 26*(3), 2939-2949. https://doi.org/10.1007/s11356-018-3854-5

Ingebritsen, S. E., & Galloway, D. L. (2014). Coastal subsidence and relative sea level rise. *Environmental Research Letters, 9*(9), 091002.

IPCC. (2007). Impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change. *Cambridge University Press, Cambridge, UK*.

IPCC. (2012). Managing the risks of extreme events and disasters to advance climate change adaptation: special report of the intergovernmental panel on climate change. In C. B. Field, V. Barros, T. F. Stocker, & Q. Dahe (Eds.). Cambridge University Press.

IPCC. (2014a). *Climate change 2014 impacts, adaptation, and vulnerability* (Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change, Issue. https://ianas.org/wp-content/uploads/2020/08/ClimateChange_IPCC_A.pdf

IPCC. (2014b). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change*. Ipcc.

IPCC. (2022). *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. https://www.ipcc.ch/report/ar6/wg2/

Ireland, P., & McKinnon, K. (2013). Strategic localism for an uncertain world: A postdevelopment approach to climate change adaptation. *Geoforum, 47*, 158-166. https://doi.org/10.1016/j.geoforum.2013.01.005

IUCN, & VAWR. (2016). *Vietnam: Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods (MD-ICRSL) Project – Regional Social Assessment Revision.*

J.Watts, M. (1998). Recombinant capitalism: state decollectivisation and the agrarian question in Vietnam. In J. Pickles & A. Smith (Eds.), *Theorizing Transition : The Political Economy of Post-Communist Transformations*. Taylor & Francis Group. http://ebookcentral.proquest.com/lib/vu/detail.action?docID=242213

Jaisridhar, P., Nirosha, R., Jasimudeen, S., Senthilkumar, M., Ponsneka, I., & Raja, P. (2025). Institutional dynamics in climate change adaptation–a bibliometric analysis. *Frontiers in Environmental Science, 13*, 1598908.

Janmaat, J., & Ruijs, A. (2007). Sharing the load? Floods, droughts, and managing international rivers. *Environment and Development Economics, 12*(4), 573-592.

Janssen, M. A. (2007). An update on the scholarly networks on resilience, vulnerability, and adaptation within the human dimensions of global environmental change. *Ecology and Society, 12*(2).

Jerneck, A. (2018). Taking gender seriously in climate change adaptation and sustainability science research: views from feminist debates and sub-Saharan small-scale agriculture. *Sustainability Science, 13*(2), 403-416.

Joffre, O. (2010). Mangrove Dynamics in Soc Trang Province 1889–1965. *Management of Natural Resources in the Coastal Zone of Soc Trang Province. Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) GmbH, Bonn, Germany 60pp*.

Johnson, D. E., Fisher, K., & Parsons, M. (2022). Diversifying Indigenous vulnerability and adaptation: An intersectional reading of Māori women's experiences of health, wellbeing, and climate change. *Sustainability, 14*(9), 5452.

Jordan, A., & O'Riordan, T. (1995). *Institutional Adaptation to Global Environmental Change (I): Social Institutions, Policy Change and Social Learning*. https://www.researchgate.net/publication/242220619_Institutional_adaptation_to_global_environmental_change_I_social_institutions_policy_change_and_social_learning

Jordan, J. C. (2019). Deconstructing resilience: Why gender and power matter in responding to climate stress in Bangladesh. *Climate and Development, 11*(2), 167-179.

Jost, C., Kyazze, F., Naab, J., Neelormi, S., Kinyangi, J., Zougmore, R., Aggarwal, P., Bhatta, G., Chaudhury, M., & Tapio-Bistrom, M.-L. (2016). Understanding gender dimensions of agriculture and climate change in smallholder farming communities. *Climate and Development, 8*(2), 133-144.

Juhola, S., & Westerhoff, L. (2011). Challenges of adaptation to climate change across multiple scales: a case study of network governance in two European countries. *Environmental Science & Policy, 14*(3), 239-247. https://doi.org/10.1016/j.envsci.2010.12.006

Jurgens, M., & Helsloot, I. (2018). The effect of social media on the dynamics of (self) resilience during disasters: A literature review. *Journal of contingencies and crisis management, 26*(1), 79-88.

Kabeer, N. (2002). *The power to choose: Bangladeshi women and labor market decisions in London and Dhaka*. Verso.

Kabeer, N. (2011). Between affiliation and autonomy: navigating pathways of women's empowerment and gender justice in rural Bangladesh. *Development and Change, 42*(2), 499-528.

Kabeer, N. (2012). Empowerment, Citizenship and Gender Justice: A Contribution to Locally Grounded Theories of Change in Women's Lives. *Ethics and Social Welfare, 6*(3), 216-232. https://doi.org/10.1080/17496535.2012.704055

Kabeer, N., Mahmud, S., & Tasneem, S. (2011). Does paid work provide a pathway to women's empowerment? Empirical findings from Bangladesh.

Kaijser, A., & Kronsell, A. (2013). Climate change through the lens of intersectionality. *Environmental Politics, 23*(3), 417-433. https://doi.org/10.1080/09644016.2013.835203

Kaijser, A., & Kronsell, A. (2014). Climate change through the lens of intersectionality. *Environmental Politics, 23*(3), 417-433.

Kakde, H. S., Lad, K., & Kalani, R. (2024). Fostering Financial Resilience: A Pathway Through Financial Wellness. *Educational Administration: Theory and Practice, 30*(5), 5777-5783.

Käkönen, M. (2008). Mekong Delta at the crossroads: more control or adaptation? *Ambio*, 205-212.

Kandiyoti, D. (1988). Bargaining with patriarchy. *Gender & Society, 2*(3), 274-290.

Kaplan, R., Kaplan, S., & Austin, M. E. (2008). Factors shaping local land use decisions: Citizen planners' perceptions and challenges. *Environment and Behavior, 40*(1), 46-71.

Karim, K. R. (2006). Gendered social institutions and the management of underground irrigation water resources in a Bangladeshi village. *Gender, Technology and Development, 10*(1), 13-36.

Karim, Z., Hussain, S. G., & Ahmed, M. (1996). Assessing impacts of climatic variations on foodgrain production in Bangladesh. In *Climate change vulnerability and adaptation in Asia and the Pacific* (pp. 53-62). Springer.

Kasperson, R. E., Kasperson, J. X., Turner, B., Dow, K., & Meyer, W. B. (1995). Critical environmental regions: concepts, distinctions, and issues. *Regions at risk: comparisons of threatened environments*, 1-41.

Kassa, G. (2015). Profitability analysis and determinants of fruit tree based agroforestry system in Wondo District, Ethiopia. *African Journal of Agricultural Research, 10*(11), 1273-1280.

Katapa, R. S. (2006, May). A comparison of female- and male-headed households in Tanzania and poverty implications. *J Biosoc Sci, 38*(3), 327-339. https://doi.org/10.1017/S0021932005007169

Kates, R. W., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences, 109*(19), 7156-7161.

Kattumuri, R., Ravindranath, D., & Esteves, T. (2017). Local adaptation strategies in semi-arid regions: study of two villages in Karnataka, India. *Climate and Development, 9*(1), 36-49.

Kazianga, H., & Wahhaj, Z. (2013). Gender, social norms, and household production in Burkina Faso. *Economic Development and Cultural Change, 61*(3), 539-576.

Keller, C., Joshi, S., Joshi, T., Goldmann, E., & Riar, A. (2024, 2024-May-01). Challenges for crop diversification in cotton-based farming systems in India: a comprehensive gap analysis between practices and policies [Original Research]. *Frontiers in Agronomy, 6*. https://doi.org/10.3389/fagro.2024.1370878

Kelly-Gadol, J. (1977). *Did women have a Renaissance?* Houghton Mifflin Boston.

Kelly, P. M., & Adger, W. N. (2000). Theory and practice in assessing vulnerability to climate change andFacilitating adaptation. *Climatic Change, 47*(4), 325-352.

Kelso, C., & Vogel, C. (2015). Diversity to decline-livelihood adaptations of the Namaqua Khoikhoi (1800–1900). *Global Environmental Change, 35*, 254-268. https://doi.org/10.1016/j.gloenvcha.2015.09.005

Khademi, S., Essers, C., & Van Nieuwkerk, K. (2024). Refugee entrepreneurship from an intersectional approach. *International Journal of Entrepreneurial Behavior & Research, 30*(11), 45-63.

Khalil, M. B., Jacobs, B. C., McKenna, K., & Kuruppu, N. (2020). Female contribution to grassroots innovation for climate change adaptation in Bangladesh. *Climate and Development, 12*(7), 664-676.

Khan, A. E., Ireson, A., Kovats, S., Mojumder, S. K., Khusru, A., Rahman, A., & Vineis, P. (2011). Drinking water salinity and maternal health in coastal Bangladesh: implications of climate change. *Environmental health perspectives, 119*(9), 1328-1332.

Khan, F., Higgins, B. F., & Adonis, W. (2022). Saving or Seizing the City: Discursive Formations in Cape Town, South Africa. *Sustainability, 14*(3), 1376.

Khang, N. D. (2008). Sensitivity of salinity intrusion to sea level rise and river flow change in Vietnamese Mekong Delta-impacts on availability of irrigation water for rice cropping. *J. Agric. Meteorol., 64*(3), 167-176.

Khong, T. D., Loch, A., & Young, M. D. (2020). Perceptions and responses to rising salinity intrusion in the Mekong River Delta: What drives a long-term community-based strategy? *Science of the Total Environment, 711*, 134759.

Kien, N. T. (2021). Understanding disaster vulnerability in the Vietnamese Mekong Delta.

Kim Dang, K., Do, T. H., Le, T. H. L., Le, T. T. H., & Pham, T. D. (2021). Impacts of farmers' adaptation to drought and salinity intrusion on rice yield in Vietnam's Mekong Delta. *Journal of Agribusiness in Developing and Emerging Economies, 11*(1), 27-41.

King, A. (2015). Structural Exclusion and Just Development. *Int. J. Technoethics, 6*, 14-30.

Kinsey, B., Burger, K., & Gunning, J. W. (1998). Coping with drought in Zimbabwe: Survey evidence on responses of rural households to risk. *World Development, 26*(1), 89-110.

Kiparsky, M., Milman, A., & Vicuña, S. (2012). Climate and Water: Knowledge of Impacts to Action on Adaptation. *Annual review of environment and resources, 37*, 163-194.

Kiplimo, T. I., & Makame, M. O. (2020). Assessing Socio-Economic Factors Influencing Household Vulnerability to Climate Change in Kaskazini (A) District, Zanzibar, Tanzania. *International Journal of Innovative Research and Development, 10*(9).

Klasen, S., Lechtenfeld, T., & Povel, F. (2015). A Feminization of Vulnerability? Female Headship, Poverty, and Vulnerability in Thailand and Vietnam. *World Development, 71*, 36-53. https://doi.org/10.1016/j.worlddev.2013.11.003

Klein, N. (2015). *This changes everything: Capitalism vs. the climate*. Simon and Schuster.

Klein, R. J., & Maciver, D. C. (1999). Adaptation to climate variability and change: methodological issues. *Mitigation and Adaptation Strategies for Global Change, 4*(3), 189-198.

Klein, R. J., Nicholls, R. J., Ragoonaden, S., Capobianco, M., Aston, J., & Buckley, E. N. (2001). Technological options for adaptation to climate change in coastal zones. *Journal of Coastal Research*, 531-543.

Klein, R. J., Nicholls, R. J., & Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Global Environmental Change Part B: Environmental Hazards, 5*(1), 35-45.

Knack, S., & Keefer, P. (1997). Does social capital have an economic impact? A cross-country payoff. *Quarterly Journal of Economics, 112*(4), 1251-1288.

Knio, K. (2022). Rethinking the multilateral order between Liberal internationalism and neoliberalism/Neoliberalisation processes. *Politics and Governance, 10*(2), 6-14.

Kondolf, G. M., Rubin, Z. K., & Minear, J. (2014). Dams on the Mekong: Cumulative sediment starvation. *Water Resources Research, 50*(6), 5158-5169.

Kondolf, G. M., Schmitt, R. J., Carling, P., Darby, S., Arias, M., Bizzi, S., Castelletti, A., Cochrane, T. A., Gibson, S., & Kummu, M. (2018). Changing sediment budget of the Mekong: Cumulative threats and management strategies for a large river basin. *Science of the Total Environment, 625*, 114-134.

Kracauer Hartig, E., Grozev, O., & Rosenzweig, C. (1997). Climate change, agriculture and wetlands in Eastern Europe: vulnerability, adaptation and policy. *Climatic Change, 36*(1), 107-121.

Kristjanson, P., Bryan, E., Bernier, Q., Twyman, J., Meinzen-Dick, R., Kieran, C., Ringler, C., Jost, C., & Doss, C. (2017). Addressing gender in agricultural research for development in the face of a changing climate: where are we and where should we be going? *International Journal of Agricultural Sustainability, 15*(5), 482-500.

Kunreuther, H., Heal, G., Allen, M. R., Edenhofer, O., Field, C. B., & Yohe, G. W. (2012). Risk Management and Climate Change. *NBER Working Paper Series*.

Kurukulasuriya, P., & Mendelsohn, R. (2008). Crop switching as a strategy for adapting to climate change. *African Journal of Agricultural and Resource Economics, 2*(1), 105-126.

Lahiri-Dutt, K. (2012). Climate Justice Must Integrate Gender Equality: What are the Key Principles? *Impact of Climate Change on Water and Health*, 106-119.

Lal, M., Singh, K., Rathore, L., Srinivasan, G., & Saseendran, S. (1998). Vulnerability of rice and wheat yields in NW India to future changes in climate. *Agricultural and forest meteorology, 89*(2), 101-114.

Lamaoui, M., Jemo, M., Datla, R., & Bekkaoui, F. (2018). Heat and Drought Stresses in Crops and Approaches for Their Mitigation. *Frontiers in Chemistry, 6*.

Lambrou, Y., & Nelson, S. (2010). Farmers in a changing climate: Does gender matter?

Lan, N. T. P. (2011). From rice to shrimp: ecological change and human adaptation in the Mekong Delta of Vietnam. In *Environmental change and agricultural sustainability in the Mekong Delta* (pp. 271-285). Springer.

Lavell, A., Oppenheimer, M., Diop, C., Hess, J., Lempert, R., Li, J., & Myeong, S. (2012). Managing the risks of extreme events and disasters to advance climate change adaptation. *A special report of working groups I and II of the intergovernmental panel on climate change (IPCC), 3*, 25-64.

Lawless, S., Cohen, P., McDougall, C., Orirana, G., Siota, F., & Doyle, K. (2019). Gender norms and relations: implications for agency in coastal livelihoods. *Maritime Studies, 18*(3), 347-358.

Lawson, E. T., Alare, R. S., Salifu, A. R. Z., & Thompson-Hall, M. (2020). Dealing with climate change in semi-arid Ghana: understanding intersectional perceptions and adaptation strategies of women farmers. *GeoJournal, 85*(2), 439-452.

Lazurko, A., & Pinter, L. (2022). Infrastructure investments for resilience: Opportunities, barriers, and a future research agenda from the Orange-Senqu River Basin. *Climate Risk Management, 35*, 100393.

Le Coq, J.-F., Trébuil, G., & Dufumier, M. (2004). History of rice production in the Mekong Delta. In *Smallholders and Stockbreeders* (pp. 163-185). Brill.

Le, T. N., Bregt, A. K., van Halsema, G. E., Hellegers, P. J., & Ngo, T. T. T. (2023). Multi-scale drivers of land-use changes at farm level I: Conceptual framework and application in the highly flooded zone of the Vietnamese Mekong Delta. *Land, 12*(7), 1273.

Le, T. T. (2016). Effects of climate change on rice yield and rice market in Vietnam. *Journal of Agricultural and Applied Economics, 48*(4), 366-382.

Le, T. V. H., Nguyen, H. N., Wolanski, E., Tran, T. C., & Haruyama, S. (2007). The combined impact on the flooding in Vietnam's Mekong River delta of local man-made structures, sea level rise, and dams upstream in the river catchment. *Estuarine, Coastal and Shelf Science, 71*(1-2), 110-116.

Leach, F. (1998). Gender, education and training: an international perspective. *Gender and Development, 6 2*, 9-18.

Leach, M. (1992a). Gender and the environment: Traps and opportunities. *Development in Practice, 2*, 12-22.

Leach, M. (1992b). Gender and the environment: Traps and opportunities. *Development in Practice, 2*(1), 12-22.

Leach, M. (1995). Women, the Environment and Sustainable Development: Towards a Theoretical Synthesis. *Feminist Review, 49*(1), 121-123.

Leach, M., Mearns, R., & Scoones, I. (1999). Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *World Development, 27*, 225-247.

Lebel, L., Anderies, J. M., Campbell, B., Folke, C., Hatfield-Dodds, S., Hughes, T. P., & Wilson, J. (2006). Governance and the capacity to manage resilience in regional social-ecological systems. *Ecology and Society, 11*(1).

Lee, S.-Y., & Zusman, E. (2018). Participatory climate governance in Southeast Asia: Lessons learned from gender-responsive climate mitigation. In *Routledge handbook of climate justice* (pp. 393-404). Routledge.

Lee, W. C. (2015). *The political economy of Vietnam: the evolution of state-business relationships* SOAS, University of London].

Lei, Y., Wang, J. a., Yue, Y., Zhou, H., & Yin, W. (2013). Rethinking the relationships of vulnerability, resilience, and adaptation from a disaster risk perspective. *Natural Hazards, 70*(1), 609-627. https://doi.org/10.1007/s11069-013-0831-7

Leichenko, R., & Silva, J. A. (2014). Climate change and poverty: vulnerability, impacts, and alleviation strategies. *WIREs Climate Change, 5*(4), 539-556. https://doi.org/10.1002/wcc.287

Leichenko, R. M., & O'brien, K. L. (2002). The dynamics of rural vulnerability to global change: the case of southern Africa. *Mitigation and Adaptation Strategies for Global Change, 7*(1), 1-18.

Lépinard, É. (2014). Impossible intersectionality? French feminists and the struggle for inclusion. *Politics & Gender, 10*(1), 124-130.

Levy, P., Cannell, M., & Friend, A. (2004). Modelling the impact of future changes in climate, CO2 concentration and land use on natural ecosystems and the terrestrial carbon sink. *Global Environmental Change, 14*(1), 21-30.

Li, S., Juhász-Horváth, L., Harrison, P. A., Pintér, L., & Rounsevell, M. D. (2017). Relating farmer's perceptions of climate change risk to adaptation behaviour in Hungary. *Journal of Environmental Management, 185*, 21-30.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of psychology*.

Lin, B. B. (2011). Resilience in agriculture through crop diversification: adaptive management for environmental change. *BioScience, 61*(3), 183-193.

Lin, B. B., & Petersen, B. (2013). Resilience, Regime Shifts, and Guided Transition under Climate Change: Examining the Practical Difficulties of Managing Continually Changing Systems. *Ecology and Society, 18*(1). https://doi.org/10.5751/es-05128-180128

Linh, H. T., Truc, D. T., Binh, N. T., & Tri, V. P. D. (2025). Assessing Water Governance Trends and Challenges at a Local Level—An Application of the OECD Water Governance Framework in Soc Trang Province, Vietnam. *Water, 17*(3), 320.

Little, P. D., Mahmoud, H., & Coppock, D. L. (2001). When deserts flood: risk management and climatic processes among East African pastoralists. *Climate Research, 19*(2), 149-159.

Little, P. D., Smith, K., Cellarius, B. A., Coppock, D. L., & Barrett, C. (2001). Avoiding disaster: diversification and risk management among East African herders. *Development and Change, 32*(3), 401-433.

Liu, S., Lu, P., Liu, D., Jin, P., & Wang, W. (2009). Pinpointing the sources and measuring the lengths of the principal rivers of the world. *International Journal of Digital Earth, 2*(1), 80-87.

Liverman, D. M. (1990). Drought impacts in Mexico: climate, agriculture, technology, and land tenure in Sonora and Puebla. *Annals of the Association of American Geographers, 80*(1), 49-72. https://doi.org/10.1111/j.1467-8306.1990.tb00003.x

Liverman, D. M. (1999). Vulnerability and adaptation to drought in Mexico. *Nat. Resources J., 39*, 99.

Liverman, D. M., & O'Brien, K. L. (1991). Global warming and climate change in Mexico. *Global Environmental Change, 1*(5), 351-364.

Liverman, D. M., & Vilas, S. (2006). Neoliberalism and the environment in Latin America. *Annu. Rev. Environ. Resour., 31*(1), 327-363.

Loc, H. H., Low Lixian, M., Park, E., Dung, T. D., Shrestha, S., & Yoon, Y.-J. (2021, 2021/11/10/). How the saline water intrusion has reshaped the agricultural landscape of the Vietnamese Mekong Delta, a review. *Science of the Total Environment, 794*, 148651. https://doi.org/https://doi.org/10.1016/j.scitotenv.2021.148651

Lovell, R. J. (2019). Identifying alternative wetting and drying (AWD) adoption in the Vietnamese Mekong River Delta: A change detection approach. *ISPRS International Journal of Geo-Information, 8*(7), 312.

Lowndes, V. (2004). Getting on or getting by? Women, social capital and political participation. *The British Journal of Politics and International Relations, 6*(1), 45-64.

Luber, G., & Mcgeehin, M. A. (2008). Climate change and extreme heat events. *American journal of preventive medicine, 35 5*, 429-435.

Lucas, C., Leith, P., & Davison, A. (2015). How climate change research undermines trust in everyday life: a review. *Wiley Interdisciplinary Reviews: Climate Change, 6*(1), 79-91.

Luttrell, C. (2001). An institutional approach to livelihood resilience in Vietnam.

MacGregor, S. (2009). A stranger silence still: The need for feminist social research on climate change. *The Sociological Review, 57*(2 suppl), 124-140.

MacGregor, S. (2010). 'Gender and climate change': from impacts to discourses. *Journal of the Indian Ocean Region, 6*(2), 223-238. https://doi.org/10.1080/19480881.2010.536669

Mack, N. (2005). Qualitative research methods: A data collector's field guide.

MacLeavy, J. (2019). Neoliberalism and the new political crisis in the West. *Ephemera, 19*(3), 627-640.

MacMahon, A. (2017). Climate change adaptation in southwest Bangladesh: vulnerability and gender inequality.

Magrin, G. O., Travasso, M. I., Díaz, R. A., & Rodríguez, R. O. (1997). Vulnerability of the agricultural systems of Argentina to climate change. *Climate Research, 9*(1-2), 31-36.

Mahmood, S. (2005). Politics of piety. In *Politics of Piety*. Princeton University Press.

Mahul, O., & Stutley, C. J. (2010). *Government support to agricultural insurance: challenges and options for developing countries*. World Bank Publications.

Mai, N. P., Kantoush, S., Sumi, T., Thang, T. D., Trung, L. V., & Van BINH, D. (2018). Assessing and adapting the impacts of dams operation and sea level rising on saltwater intrusions into the Vietnamese Mekong Delta. *Journal of Japan Society of Civil Engineers, Ser. B1 (Hydraulic Engineering), 74*(5), I_373-I_378.

Maja, M. M., Idiris, A. A., Terefe, A. T., & Fashe, M. M. (2022). Gendered Vulnerability, Perception and Adaptation Options of Smallholder Farmers to Climate Change in Eastern Ethiopia. *Earth Systems and Environment*. https://doi.org/10.1007/s41748-022-00324-y

Makita, R. (2008). The visibility of women's work for poverty reduction: implications from non-crop agricultural income-generating programs in Bangladesh. *Agriculture and Human Values, 26*(4), 379-390. https://doi.org/10.1007/s10460-008-9167-4

Malcolm, S., Marshall, E., Aillery, M., Heisey, P., Livingston, M., & Day-Rubenstein, K. (2012). Agricultural adaptation to a changing climate: economic and environmental implications vary by US region. *USDA-ERS Economic Research Report*(136).

Manh, D. H., Huy, H. A., Phuong, T. T. L., & Tuyen, L. T. (2016). Livelihood vulnerability assessment to climate change at community level using household survey: a case study from Nam Dinh Province, Vietnam. *Mediterranean Journal of Social Sciences, 7*(3 S1), 358-358.

Manh, N. V., Dung, N. V., Hung, N. N., Kummu, M., Merz, B., & Apel, H. (2015). Future sediment dynamics in the Mekong Delta floodplains: Impacts of hydropower development, climate change and sea level rise. *Global and Planetary Change, 127*, 22-33. https://doi.org/10.1016/j.gloplacha.2015.01.001

Manh, N. V., Dung, N. V., Hung, N. N., Merz, B., & Apel, H. (2014). Large-scale suspended sediment transport and sediment deposition in the Mekong Delta. *Hydrol. Earth Syst. Sci., 18*(8), 3033-3053. https://doi.org/10.5194/hess-18-3033-2014

Mannepalli, B. K., Kushwaha, S., Kamalvanshi, V., Parida, P. K., Kemboi, E., Yadav, A., Deep, P., & Mukherjee, R. (2025). The adaptation triangle: a multivariate analysis of vulnerability, resilience and livelihood strategies in semi-arid regions of India. *Frontiers in Climate, 7*, 1674565.

Marimo, P., Otieno, G., Njuguna-Mungai, E., Vernooy, R., Halewood, M., Fadda, C., Mulumba, J. W., Nyamongo, D. O., & Mollel, M. (2021). The role of gender and institutional dynamics in adapting seed systems to climate change: case studies from Kenya, Tanzania and Uganda. *Agriculture, 11*(9), 840.

Mark, M., & Winniefridah, M. (2010). Gender, resource management, and the rural landscape in Africa. *Journal of Sustainable Development in Africa, 12*(4), 153-163.

Marschke, M. J., & Berkes, F. (2006). Exploring strategies that build livelihood resilience: a case from Cambodia. *Ecology and Society, 11*(1).

Martens, P., Kovats, R., Nijhof, S., De Vries, P., Livermore, M., Bradley, D., Cox, J., & McMichael, A. (1999). Climate change and future populations at risk of malaria. *Global Environmental Change, 9*, S89-S107.

Massé, F., Givá, N., & Lunstrum, E. (2021). A feminist political ecology of wildlife crime: The gendered dimensions of a poaching economy and its impacts in Southern Africa. *Geoforum, 126*, 205-214. https://doi.org/10.1016/j.geoforum.2021.07.031

Massey, E., Biesbroek, R., Huitema, D., & Jordan, A. (2014). Climate policy innovation: The adoption and diffusion of adaptation policies across Europe. *Global Environmental Change, 29*, 434-443. https://doi.org/10.1016/j.gloenvcha.2014.09.002

Massey, E. E., & Huitema, D. (2015). The emergence of climate change adaptation as a new field of public policy in Europe. *Regional Environmental Change, 16*, 553-564.

Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S. L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M. I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J. B. R., Maycock, T. K., Waterfield, T., Yelekçi, O., Yu, R., & Zhou, B. (2021). *Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. https://doi.org/10.1017/9781009157896.001

Matyas, D., & Pelling, M. (2015). Positioning resilience for 2015: the role of resistance, incremental adjustment and transformation in disaster risk management policy. *Disasters, 39*(s1), s1-s18.

Maxwell, J. A. (2008). *Designing a qualitative study* (Vol. 2). The SAGE handbook of applied social research methods.

May, V. M. (2014). "Speaking into the void"? Intersectionality critiques and epistemic backlash. *Hypatia, 29*(1), 94-112.

McCarthy, N., & Kilic, T. (2015). The nexus between gender, collective action for public goods and agriculture: evidence from Malawi. *Agricultural Economics, 46*(3), 375-402.

McDonald, M., & Brown, K. (2000). Soil and water conservation projects and rural livelihoods: options for design and research to enhance adoption and adaptation. *Land Degradation & Development, 11*(4), 343-361.

McFadden, L. (2007). Governing coastal spaces: the case of disappearing science in integrated coastal zone management. *Coastal Management, 35*(4), 429-443.

McKinzie, A. E., & Richards, P. L. (2019). An argument for context-driven intersectionality. *Sociology compass, 13*(4), e12671.

McLaughlin, P. (2011). Climate change, adaptation, and vulnerability: Reconceptualizing societal–environment interaction within a socially constructed adaptive landscape. *Organization & Environment, 24*(3), 269-291.

McLaughlin, P., & Dietz, T. (2008). Structure, agency and environment: Toward an integrated perspective on vulnerability. *Global Environmental Change, 18*(1), 99-111. https://doi.org/10.1016/j.gloenvcha.2007.05.003

McMichael, P. (1994). Global Restructuring

Some Lines of Inquiry. In P. McMichael (Ed.), *The Global Restructuring of Agro-Food Systems* (pp. 277-300). Cornell University Press. http://www.jstor.org/stable/10.7591/j.ctvv41798.17

McMichael, P., & Lawrence, G. (2001). Globalising agriculture: structures of constraint for Australian farming.

McNamara, K. E., Clissold, R., & Westoby, R. (2021). Women's capabilities in disaster recovery and resilience must be acknowledged, utilized and supported. *Journal of Gender Studies, 30*(1), 119-125.

McNeill, P. (2006). *Research methods*. Routledge.

Mearns, R., & Norton, A. (2009). *Social dimensions of climate change: Equity and vulnerability in a warming world*. World Bank Publications.

Mearns, R., & Norton, A. L. (2009). Social dimensions of climate change : equity and vulnerability in a warming world. *World Bank Publications*, 1-348.

Meinzen-Dick, R., & Gregorio, M. d. (2004). Collective action and property rights for sustainable development.

Mekong River Commission (2015). *Annual Mekong Flood Report 2011: Flood management and mitigation program*. https://www.mrcmekong.org/assets/Publications/basin-reports/Annual-Mekong-Flood-Report-2011.pdf

Mekong River Commission (2010). State of the Basin Report 2010. https://www.mrcmekong.org/publications/state-of-the-basin-report-2010-summary-english/

Mendoza, V. M., Villanueva, E. E., & Adem, J. (1997). Vulnerability of basins and watersheds in Mexico to global climate change. *Climate Research, 9*(1-2), 139-145.

Menon, N., Van der Meulen Rodgers, Y., & Kennedy, A. R. (2017). Land reform and welfare in Vietnam: Why gender of the land-rights holder matters. *Journal of International Development, 29*(4), 454-472.

Menon, N., Van der Meulen Rodgers, Y., & Nguyen, H. (2014). Women's land rights and children's human capital in Vietnam. *World Development, 54*, 18-31.

Merchant, C. (1980). *The death of nature: Women, ecology, and the scientific revolution*.

Mesfin, W., Fufa, B., & Haji, J. (2011). Pattern, trend and determinants of crop diversification: empirical evidence from smallholders in eastern Ethiopia. *Journal of Economics and Sustainable Development, 2*(8), 78-89.

Meyer, W. B., & Turner, B. L. (1995). Changes in land use and land cover: a global perspective. *Bulletin of the Torrey Botanical Club, 122*, 248.

Mfitumukiza, D., Roy, A. S., Simane, B., Hammill, A., Rahman, M. F., & Huq, S. (2020). Scaling local and community-based adaptation.

Miller, F. (2003). *Society-Water Relations in the Mekong Delta: A Political Ecology of Risk* University of Sydney]. https://scholar.google.com.au/citations?view_op=view_citation&hl=en&user=Zw7xe54AAAAJ&citation_for_view=Zw7xe54AAAAJ:9yKSN-GCB0IC

Miller, F., Osbahr, H., Boyd, E., Thomalla, F., Bharwani, S., Ziervogel, G., Walker, B., Birkmann, J., Van der Leeuw, S., & Rockström, J. (2010). Resilience and vulnerability: complementary or conflicting concepts? *Ecology and Society, 15*(3).

Mills, J., Bonner, A., & Francis, K. (2006). The development of constructivist grounded theory. *International Journal of Qualitative Methods, 5*(1), 25-35.

Minderhoud, P., Coumou, L., Erban, L., Middelkoop, H., Stouthamer, E., & Addink, E. (2018). The relation between land use and subsidence in the Vietnamese Mekong delta. *Science of the Total Environment, 634*, 715-726.

Minderhoud, P., Coumou, L., Erkens, G., Middelkoop, H., & Stouthamer, E. (2019). Mekong delta much lower than previously assumed in sea-level rise impact assessments. *Nature communications, 10*(1), 1-13.

Minderhoud, P. S., Erkens, G., Pham, V., Bui, V. T., Erban, L., Kooi, H., & Stouthamer, E. (2017). Impacts of 25 years of groundwater extraction on subsidence in the Mekong delta, Vietnam. *Environmental Research Letters*, *12*(6), 064006.

Minh, H. V. T., Kumar, P., Van Ty, T., Duy, D. V., Han, T. G., Lavane, K., & Avtar, R. (2022). Understanding Dry and Wet Conditions in the Vietnamese Mekong Delta Using Multiple Drought Indices: A Case Study in Ca Mau Province. *Hydrology*.

Minkman, E., Nguyen, H. Q., Luu, T., Dang, K. K., Nguyen, S. L., Du, H., Huizer, T., & Rijke, J. (2022). From national vision to implementation: governance challenges in sustainable agriculture transitions in the Vietnamese Mekong Delta region. *Regional Environmental Change*, *22*(2), 35.

Mirhanoğlu, A., Loopmans, M., & Özerol, G. (2022). Social head-enders: Access and authority in irrigation governance. *Society & Natural Resources*, *35*(2), 185-203.

Mishra, A. K., & Pede, V. O. (2017). Perception of climate change and adaptation strategies in Vietnam: are there intra-household gender differences? *International Journal of Climate Change Strategies and Management*, *9*(4), 501-516.

Molnar, J. J. (2010). Climate Change and Societal Response: Livelihoods, Communities, and the Environment. *Rural Sociology*, *75*, 1-16.

Molyneux, M. (1985). Mobilisation without Emancipation? Women's Interests, the State and Revolution in Nicaragua. In *Women's Movements in International Perspective* (pp. 38-59). https://doi.org/10.1057/9780230286382_3

Momsen, J. (2009). *Gender and development*. Routledge.

MONRE. (2009). *Vietnam assessment report on climate change*. https://www.unep.org/

MONRE. (2016). Climate change and sea level rise scenarios for Vietnam. *Ministry of Natural resources and Environment. Hanoi, Vietnam*.

Morrow, K. (2021). Gender in the global climate governance regime. *Gender, intersectionality and climate institutions in industrialised states*, 17-35.

Mortimore, M. J., & Adams, W. M. (2001). Farmer adaptation, change and 'crisis' in the Sahel. *Global Environmental Change*, *11*(1), 49-57.

Morton, L. W., & Olson, K. R. (2014). Addressing Soil Degradation and Flood Risk Decision Making in Levee Protected Agricultural Lands under Increasingly Variable Climate Conditions. *Journal of Environmental Protection*, *05*, 1220-1234.

Moser, C. O. (1989). Gender planning in the Third World: meeting practical and strategic gender needs. *World Development, 17*(11), 1799-1825.

Mössner, S., & Freytag, T. (2014). Setting the ground for global city formation: Neoliberalisation and local elites in Frankfurt on the main. *Quaestiones Geographicae, 33*(4), 81-88.

Mottaleb, K. A., & Mohanty, S. (2015). Farm size and profitability of rice farming under rising input costs. *Journal of Land Use Science, 10*(3), 243-255.

Mugambiwa, S., & Makhubele, J. (2021). Indigenous knowledge systems based climate governance in water and land resource management in rural Zimbabwe. *Journal of Water and Climate Change, 12*(5), 2045-2054.

Murphy, S. (2015). Glass ceilings and iron bars: Women, gender, and poverty in the post-2015 development agenda. *Global Justice: Theory Practice Rhetoric, 8*(1).

Murray, C. (2010). Livelihoods Research: Transcending Boundaries of Time and Space. *Journal of Southern African Studies, 28*(3), 489-509. https://doi.org/10.1080/030570702000006486

Nabikolo, D., Bashaasha, B., Mangheni, M., & Majaliwa, J. (2012). Determinants of climate change adaptation among male and female headed farm households in eastern Uganda. *African Crop Science Journal, 20*, 203-212.

Namubiru-Mwaura, E. (2014a). Land tenure and gender : approaches and challenges for strengthening rural women's land rights.

Namubiru-Mwaura, E. (2014b). Land tenure and gender: approaches and challenges for strengthening rural women's land rights.

Narayan, D., & Pritchett, L. (1999). Cents and sociability: Household income and social capital in rural Tanzania. *Economic Development and Cultural Change, 47*(4), 871-897.

Nassanga, G. L. (2019). Empowering Rural Farmers to Improve Livelihoods Through Environmental Risk Communication: A Case Study of Uganda. *Agriculture and Ecosystem Resilience in Sub Saharan Africa: Livelihood Pathways Under Changing Climate*, 595-612.

Neil Adger, W., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change, 15*(2), 77-86. https://doi.org/10.1016/j.gloenvcha.2004.12.005

Nelson, V., & Stathers, T. (2009). Resilience, power, culture, and climate: a case study from semi-arid Tanzania, and new research directions. *Gender & Development, 17*(1), 81-94.

Nelson, V. I., & Stathers, T. E. (2009). Resilience, power, culture, and climate: a case study from semi-arid Tanzania, and new research directions. *Gender & Development, 17*, 81 - 94.

Neumayer, E., & Plümper, T. (2007). The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events on the Gender Gap in Life Expectancy, 1981–2002. *Annals of the Association of American Geographers, 97*(3), 551-566. https://doi.org/10.1111/j.1467-8306.2007.00563.x

Newman, L., & Dale, A. (2005). Network structure, diversity, and proactive resilience building: a response to Tompkins and Adger. *Ecology and Society, 10*(1).

Ngcamu, B. S. (2023). Climate change effects on vulnerable populations in the Global South: a systematic review. *Natural Hazards, 118*(2), 977-991.

Ngoc, T. A. (2017). Assessing the Effects of Upstream Dam Developments on Sediment Distribution in the Lower Mekong Delta, Vietnam. *Journal of Water Resource and Protection, 09*, 822-840.

Ngum, F., & Bastiaensen, J. (2021). Intersectional perspective of strengthening climate change adaptation of agrarian women in Cameroon. In *African handbook of climate change adaptation* (pp. 2169-2191). Springer.

Nguyen, A. D. (2008). *Salt Intrusion, Tides and Mixing in Multi-Channel Estuaries: PhD: UNESCO-IHE Institute, Delft*. CRC Press.

Nguyen, A. T., Nguyen, L. T., Nguyen, H. H., Van Ta, H., Van Nguyen, H., Pham, T. A., Nguyen, B. T., Pham, T. T., Tang, N. T. T., & Hens, L. (2019). Rural livelihood diversification of Dzao farmers in response to unpredictable risks associated with agriculture in Vietnamese Northern Mountains today. *Environment, Development and Sustainability, 22*(6), 5387-5407. https://doi.org/10.1007/s10668-019-00429-x

Nguyen, D., Robson, G., & George, E. (2003). Report on residential clusters in an Giang, Dong Thap and Long an Provinces in the Mekong Delta. *Adam Fforde and Associates, Melbourne, Australia*.

Nguyen, D. Q., Renwick, J. A., & McGregor, J. (2014). Variations of surface temperature and rainfall in Vietnam from 1971 to 2010. *International Journal of Climatology, 34*.

Nguyen, H. Q., Korbee, D., Ho, H. L., Weger, J., Thi Thanh Hoa, P., Thi Thanh Duyen, N., Dang Manh Hong Luan, P., Luu, T. T., Ho Phuong Thao, D., & Thi Thu Trang, N. (2019). Farmer adoptability for livelihood transformations in the Mekong Delta: a case in Ben Tre province. *Journal of Environmental Planning and Management, 62*(9), 1603-1618.

Nguyen, K. V., & James, H. (2013). Measuring Household Resilience to Floods: a Case Study in the Vietnamese Mekong River Delta. *Ecology and Society, 18*(3).

Nguyen, M., & Le, K. (2023). The impacts of women's land ownership: Evidence from Vietnam. *Review of Development Economics, 27*(1), 158-177.

Nguyen, Q. H., Tran, D. D., Dang, K. K., Korbee, D., Pham, L. D., Vu, L. T., Luu, T. T., Ho, L. H., Nguyen, P. T., & T. Ngo, T. T. (2020). Land-use dynamics in the Mekong delta: From national policy to livelihood sustainability. *Sustainable Development, 28*(3), 448-467.

Nguyen, T. A., Nguyen, B. T., Van Ta, H., Nguyen, N. T. P., Hoang, H. T., Nguyen, Q. P., & Hens, L. (2021). Livelihood vulnerability to climate change in the mountains of Northern Vietnam: comparing the Hmong and the Dzao ethnic minority populations. *Environment, Development and Sustainability, 23*(9), 13469-13489. https://doi.org/10.1007/s10668-020-01221-y

Nguyen, V. (2014). An Economic Evaluation of Flood Dike Construction in the Mekong Delta. Cost-Benefit Analysis of Flood Protection Dike Construction in An Giang Province.

Nguyen, V., Dang, K., & Nguyen, T. (2025). Trends in rice production in the coastal Soc Trang province, Vietnamese Mekong Delta in 2020-2023-High-quality rice production expansion. IOP Conference Series: Earth and Environmental Science,

Nguyen, V. K. (2011). Social Capital, Livelihood Diversification and Household Resilience to Annual Flood Events in the Vietnamese Mekong River Delta.

Nguyen, V. K., Pittock, J., & Connell, D. (2019). Dikes, rice, and fish: How rapid changes in land use and hydrology have transformed agriculture and subsistence living in the Mekong Delta. *Regional Environmental Change, 19*(7), 2069-2077.

Nicholls, R. J. (2004). Coastal flooding and wetland loss in the 21st century: changes under the SRES climate and socio-economic scenarios. *Global Environmental Change, 14*(1), 69-86.

Nielsen, J. Ø., & Reenberg, A. (2010). Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change, 20*(1), 142-152. https://doi.org/10.1016/j.gloenvcha.2009.10.002

Nightingale, A. (2006). The nature of gender: work, gender, and environment. *Environment and Planning D: Society and Space, 24*(2), 165-185.

Nightingale, A. J. (2011). Bounding difference: Intersectionality and the material production of gender, caste, class and environment in Nepal. *Geoforum, 42*(2), 153-162. https://doi.org/10.1016/j.geoforum.2010.03.004

Nilsson, B. H. (1976). The Influence of Man's Activities in Rivers on Sediment Transport. *Hydrology Research, 7*, 145-160.

Nilsson, C., & Berggren, K. (2000). Alterations of riparian ecosystems caused by river regulation: Dam operations have caused global-scale ecological changes in riparian ecosystems. How to protect river environments and human needs of rivers remains one of the most important questions of our time. *BioScience, 50*(9), 783-792.

Ninh, N. H. (2007). Flooding in the Mekong River delta, Viet Nam. human development report 2007/2008. *United Nations Development Program*.

Nong, T. T. H. (2020). *Climate change, agriculture and gender: An investigation of North Vietnam: A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy at Lincoln University* Lincoln University].

Nori, M., Taylor, M., & Sensi, A. (2008). *Browsing on fences: pastoral land rights, livelihoods and adaptation to climate change*. IIED.

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008, Mar). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *Am J Community Psychol, 41*(1-2), 127-150. https://doi.org/10.1007/s10464-007-9156-6

North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge university press.

Noy, C. (2008). Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology, 11*(4), 327-344. https://doi.org/10.1080/13645570701401305

Ntiri, D. W. (2013). How minority becomes majority: Exploring discursive and racialized shifts in the adult literacy conversation. *Western Journal of Black Studies, 37*(3), 159.

Nussbaum, M. (2002). Capabilities and social justice. *International Studies Review*, *4*(2), 123-135.

Nyantakyi-Frimpong, H. (2019). Combining feminist political ecology and participatory diagramming to study climate information service delivery and knowledge flows among smallholder farmers in northern Ghana. *Applied Geography, 112*, 102079.

Nyantakyi-Frimpong, H., & Kerr, R. B. (2017). A political ecology of high-input agriculture in northern Ghana. In *Africa's Green Revolution* (pp. 21-43). Routledge.

O'Brien, K., Eriksen, S. E., Schjolden, A., & Nygaard, L. P. (2004). What's in a word? Conflicting interpretations of vulnerability in climate change research. *CICERO Working Paper*.

O'brien, K. L., & Leichenko, R. M. (2000). Double exposure: assessing the impacts of climate change within the context of economic globalization. *Global Environmental Change, 10*(3), 221-232.

O'Brien, K., Leichenko, R., Kelkar, U., Venema, H., Aandahl, G., Tompkins, H., Javed, A., Bhadwal, S., Barg, S., Nygaard, L., & West, J. (2004). Mapping vulnerability to multiple stressors: climate change and globalization in India. *Global Environmental Change, 14*(4), 303-313. https://doi.org/10.1016/j.gloenvcha.2004.01.001

O'Connell, D., Walker, B., Abel, N., & Grigg, N. (2015). The resilience, adaptation and transformation assessment framework: from theory to application. *Australia: CSIRO*.

O'Neill, R. V., DeAngelis, D. L., Waide, J. B., & Allen, T. F. H. (1986). *A Hierarchical Concept of Ecosystems. (MPB-23), Volume 23* (Vol. 123). Princeton University Press. https://doi.org/10.2307/j.ctv1sfsf8d

Oakley, A. (1979). Feminism and Sociology-Some Recent Perspectives [Dependence and Exploitation in Work and Marriage., Diana Leonard Barker, Sheila Allen; Sexual Divisions and Society: Process and Change., Diana Leonard Barker, Sheila Allen; Being Female: Reproduction, Power and Change., Dana Raphael; Woman, Culture and Society., Michelle Zimbalist Rosaldo, Louise Lamphere]. *American Journal of Sociology, 84*(5), 1259-1265. http://www.jstor.org/stable/2778229

Oakley, E., & Momsen, J. H. (2007). Women and seed management: A study of two villages in Bangladesh. *Singapore journal of tropical geography, 28*(1), 90-106.

Ogra, M. V., & Badola, R. (2015). Gender and climate change in the Indian Himalayas: global threats, local vulnerabilities, and livelihood diversification at the Nanda Devi

Biosphere Reserve. *Earth System Dynamics*, *6*(2), 505-523. https://doi.org/10.5194/esd-6-505-2015

Okolosie, L. (2014). Beyond 'talking'and 'owning'intersectionality. *Feminist Review*, *108*(1), 90-96.

Oloko, A., Teh, L., Le Billon, P., Cheung, W., Harper, S., & Sumaila, U. R. (2024). Making the case for gender-inclusive fisheries governance, policies and climate adaptation. *Discover Oceans*, *1*(1), 1-14.

Olson, K. (2013). Trends, issues, threats, and opportunities affecting farmers. *Agrekon*, *52*, 148 - 167.

Olsson, L., Jerneck, A., Thoren, H., Persson, J., & O'Byrne, D. (2015). Why resilience is unappealing to social science: Theoretical and empirical investigations of the scientific use of resilience. *Science advances*, *1*(4), e1400217.

Omeje, J. E., Achike, A. I., Sule, A. M., & Arene, C. J. (2021). Gender roles and economic differentials in aquaculture of kainji lake basin, Nigeria. *Research on World Agricultural Economy*, *2*(2), 1-10.

Omolo, N., & Mafongoya, P. L. (2019). Gender, social capital and adaptive capacity to climate variability. *International Journal of Climate Change Strategies and Management, ahead-of-print*(ahead-of-print). https://doi.org/10.1108/ijccsm-01-2018-0009

Onwuegbuzie, A. J., & Johnson, R. B. (2006). The validity issue in mixed research. *Research in the Schools*, *13*(1), 48-63.

Ortner, S. B. (1972). Is Female to Male as Nature Is to Culture? *Feminist studies*, *1*(2), 5-31. https://doi.org/10.2307/3177638

Ospina, A. V., & Heeks, R. (2011). ICT-Enabled Responses to Climate Change in Rural Agricultural Communities.

Ostrom, E., & Ahn, T. K. (2003). *Foundations of Social Capital*. https://www.academia.edu/34569962/Foundations_of_Social_Capital

Owusu, M., Nursey-Bray, M., & Rudd, D. (2019). Gendered perception and vulnerability to climate change in urban slum communities in Accra, Ghana. *Regional Environmental Change*, *19*, 13-25.

Oxfam, & UN Vietnam (2009). *Responding to climate change in Viet Nam: Opportunities for improving gender equality*. https://lib.icimod.org/record/14419

Paavola, J. (2013). Seeking justice: international environmental governance and climate change. In *The Globalization of Environmental Crisis* (pp. 27-40). Routledge.

Pallant, J. (2020). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. Routledge.

Pandolfelli, L., Meinzen-Dick, R., & Dohrn, S. (2008). Gender and collective action: motivations, effectiveness and impact. *Journal of International Development, 20*(1), 1-11. https://doi.org/10.1002/jid.1424

Pandolfelli, L., Meinzen-Dick, R. S., & Dohrn, S. (2007). Gender and collective action: A conceptual framework for analysis.

Paris Agreement (2015). Paris agreement to the United Nations framework convention on climate change. *UNFCCC, Paris*.

Park, E. (2024). Sand mining in the Mekong Delta: Extent and compounded impacts. *The Science of the total environment*, 171620.

Park, S. E., Marshall, N. A., Jakku, E., Dowd, A. M., Howden, S. M., Mendham, E., & Fleming, A. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change, 22*(1), 115-126.

Parry, M., & Carter, T. (1998). *Climate impact and adaptation assessment: a guide to the IPCC approach*. Earthscan Publications Ltd.

Parry, M. L., Rosenzweig, C., Iglesias, A., Livermore, M., & Fischer, G. (2004). Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Global Environmental Change, 14*(1), 53-67.

Patomäki, H. (2021). Neoliberalism and nationalist-authoritarian populism: Explaining their constitutive and causal connections. *Protosociology. An International Journal of Interdisciplinary Research, 37*, 101-151.

Patrinos, H. A., Thang, P. V., & Thanh, N. D. (2018). The economic case for education in Vietnam. *World Bank Policy Research Working Paper*(8679).

Patt, A. (2013). Should adaptation be a distinct field of science? *Climate and Development, 5*, 187 - 188.

Pattabhi, S. G., Prashanth, P., Sreenivasulu, M., & Madavilata, A. (2023). Effectiveness of social media agricultural information on farmer's knowledge. *Environment Conservation Journal, 24*(1), 123-129.

Patwardhan, A., Semenov, S., Schnieder, S., Burton, I., Magadza, C., Oppenheimer, M., Pittock, B., Rahman, A., Smith, J., & Suarez, A. (2007). Assessing key vulnerabilities and the risk from climate change. *Climate change*, 779-810.

Peck, J., & Tickell, A. (2017). Neoliberalizing space. In *Economy* (pp. 475-499). Routledge.

Peet, R., & Watts, M. (2004). *Liberation ecologies: environment, development and social movements*. Routledge.

Pelling, M. (2003). *Natural disaster and development in a globalizing world*. Routledge.

Pelling, M., & High, C. (2005a). Social learning and adaptation to climate change. *Benfield Hazard Research Centre, Disaster Studies Working Paper, 11*, 1-19.

Pelling, M., & High, C. (2005b). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change, 15*(4), 308-319. https://doi.org/10.1016/j.gloenvcha.2005.02.001

Pelling, M., High, C., Dearing, J., & Smith, D. (2008). Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. *Environment and Planning A, 40*(4), 867-884.

Pelling, M., & Manuel-Navarrete, D. (2011). From resilience to transformation: the adaptive cycle in two Mexican urban centers. *Ecology and Society, 16*(2).

Pelling, M., O'Brien, K., & Matyas, D. (2015). Adaptation and transformation. *Climatic Change, 133*(1), 113-127. https://doi.org/10.1007/s10584-014-1303-0

Perera, D., Agnihotri, J., Seidou, O., & Djalante, R. (2020). Identifying societal challenges in flood early warning systems. *International Journal of Disaster Risk Reduction, 51*, 101794.

Perez, C., Jones, E., Kristjanson, P., Cramer, L., Thornton, P. K., Förch, W., & Barahona, C. a. (2015). How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change, 34*, 95-107.

Peterman, A., Behrman, J. A., & Quisumbing, A. R. (2014). *A review of empirical evidence on gender differences in nonland agricultural inputs, technology, and services in developing countries*. Springer.

Pham, H. H. (2012). *'The developmental state,'the evolving international economic order, and Vietnam* University of Birmingham].

Pham, P., Doneys, P., & Doane, D. L. (2016). Changing livelihoods, gender roles and gender hierarchies: The impact of climate, regulatory and socio-economic changes on women and men in a Co Tu community in Vietnam. *Women's Studies International Forum, 54*, 48-56. https://doi.org/10.1016/j.wsif.2015.10.001

Pham Thi, H., Hải, N., & Nguyen Huu, N. (2023, 09/26). Impact of gender equality on implementation of land use rights through land access of ethnic minorities in central Vietnam. *Multidisciplinary Science Journal, 6*, 2024036. https://doi.org/10.31893/multiscience.2024036

Pham, V. H. T., Ho, V. H., Tran, D. D., Pham, T. D., Huynh, D. N., & Chau, N. X. Q. (2024). Impact of water resources variation on winter–spring rice yield in the upper Vietnamese Mekong Delta: A case study of An Giang Province. *Irrigation and Drainage, 73*(2), 574-587.

Phiri, A. C., & Velmurugan, T. (2024). An Exploratory Study on Water Scarcity and Coping Mechanisms Among Women Households with Special Reference to Chidothe Village in Zomba, Malawi. *Journal of Arts, Humanities and Social Science*.

Phu, P. X., & De, N. N. (2019). Vulnerability Assessment of Farmer's Livelihood to Flood in An Giang Province. *Asia-Pacific Journal of Rural Development, 29*, 37 - 51.

Pielke Jr, R. A. (1998). Rethinking the role of adaptation in climate policy. *Global Environmental Change, 8*(2), 159-170.

Pimm, S. (1984, 01/26). The Complexity and Stability of Ecosystems. *Nature, 307*, 321-326. https://doi.org/10.1038/307321a0

Plummer, R. (2013). Can adaptive comanagement help to address the challenges of climate change adaptation? *Ecology and Society, 18*(4).

Plumwood, V. (1993). *Feminism and the Mastery of Nature*. Routledge.

Ponte, S. (2001). Policy reforms, market failures and inputs use in African smallholder agriculture. *The European Journal of Development Research, 13*(1), 1-29.

Poortinga, A., Nguyen, Q., Tenneson, K., Troy, A., Saah, D., Bhandari, B., Ellenburg, W. L., Aekakkararungroj, A., Ha, L., & Pham, H. (2019). Linking earth observations for assessing the food security situation in Vietnam: a landscape approach. *Frontiers in Environmental Science, 7*, 186.

Pouliotte, J., Smit, B., & Westerhoff, L. (2009). Adaptation and development: Livelihoods and climate change in Subarnabad, Bangladesh. *Climate and Development, 1*(1), 31-46.

Prasad, P. V. V., Staggenborg, S. A., & Ristić, Z. (2015). Impacts of Drought and/or Heat Stress on Physiological, Developmental, Growth, and Yield Processes of Crop Plants.

Preston, B. L., & Stafford-Smith, M. (2009). *Framing vulnerability and adaptive capacity assessment: Discussion paper*. CSIRO Climate Adaptation National Research Flagship Aspendale, Australia.

Preston, N., & Clayton, H. (2003). Rice-shrimp farming in the Mekong Delta: biophysical and socioeconomic issues.

Pretty, J., & Ward, H. (2001, 2001/02/01/). Social Capital and the Environment. *World Development, 29*(2), 209-227. https://doi.org/https://doi.org/10.1016/S0305-750X(00)00098-X

Pritchard, B., Rammohan, A., Sekher, M., Parasuraman, S., & Choithani, C. (2013). *Feeding India: Livelihoods, entitlements and capabilities*. Routledge.

Pulido, L. (1996). *Environmentalism and economic justice: Two Chicano struggles in the Southwest*. University of Arizona Press.

Quang, N. M., & De Wit, J. (2020). Transformative learning and grassroots climate adaptation: case studies in Vietnam's Mekong delta. *Nature Conservation, 39*, 19-43.

Quay, R. (2010). Anticipatory Governance. *Journal of the American planning association, 76*(4), 496-511. https://doi.org/10.1080/01944363.2010.508428

Quaye, W., Dowuona, S., Okai, M., & Dziedzoave, N. (2016). Gender dimensions of decision-making on production assets and challenges facing women. *Development in Practice, 26*(1), 77-90.

Quinn, C. H., Huby, M., Kiwasila, H., & Lovett, J. C. (2003). Local perceptions of risk to livelihood in semi-arid Tanzania. *Journal of Environmental Management, 68*(2), 111-119.

Quinn, K., & Bates, J. (2017). Resisting neoliberalism: the challenge of activist librarianship in English Higher Education. *Journal of Documentation, 73*(2), 317-335.

Quinn, T., & Adger, W. N. (2011). Climate Change When You are Getting on in Life. *Environment and Planning A, 43*, 2257 - 2260.

Radford Ruether, R. (1975). New woman/new Earth: Sexist ideologies and human liberation. *New York, NY: Seabury*.

Radovic Markovic, M. (2021). Gender and technology adoption among farmers in Banglash. *International Review*.

Ragasa, C., Berhane, G., Tadesse, F., & Taffesse, A. S. (2013). Gender differences in access to extension services and agricultural productivity. *The Journal of Agricultural Education and Extension, 19*(5), 437-468.

Rahman, M. H., & Alam, K. (2016a). Forest dependent indigenous communities' perception and adaptation to climate change through local knowledge in the protected area—A Bangladesh case study. *Climate, 4*(1), 12.

Rahman, M. H., & Alam, K. (2016b). Forest Dependent Indigenous Communities' Perception and Adaptation to Climate Change through Local Knowledge in the Protected Area—A Bangladesh Case Study. *Climate, 4*(1). https://doi.org/10.3390/cli4010012

Rai, J. K. (2010). Global and local discourses on climate change: a perspective from the concept of embeddedness. *Dhaulagiri Journal of Sociology and Anthropology, 4*, 143-180.

Raney, T., Anríquez, G., Croppenstedt, A., Gerosa, S., Lowder, S. K., Matuschke, I., & Skoet, J. (2011). The role of women in agriculture.

Ranjitkar, P., & Haukanes, H. (2022). Participation in climate change adaptation programs in Nepal: an intersectional study. Forum for Development Studies,

Rao, N. (2011). Women's access to land: An Asian perspective. Expert paper prepared for the UN Group Meeting 'Enabling Rural Women's Economic Empowerment: Institutions, Opportunities and Participation'. Accra, Ghana,

Rao, N., Lawson, E. T., Raditloaneng, W. N., Solomon, D., & Angula, M. N. (2019). Gendered vulnerabilities to climate change: insights from the semi-arid regions of Africa and Asia. *Climate and Development, 11*(1), 14-26.

Rao, N., Singh, C., Solomon, D., Camfield, L., Sidiki, R., Angula, M., Poonacha, P., Sidibé, A., & Lawson, E. T. (2020). Managing risk, changing aspirations and household dynamics: Implications for wellbeing and adaptation in semi-arid Africa and India. *World Development, 125*, 104667.

Rashid, A., & Khan, M. R. (2013). Community based adaptation: Theory and practice. In *Climate change adaptation actions in Bangladesh* (pp. 341-362). Springer.

Rashid, S. R. (2013). Bangladeshi Women's Experiences of Their Men's Migration. *Asian Survey, 53*(5), 883-908. https://doi.org/10.1525/as.2013.53.5.883

Rato, M. (2003). *Peasants and the countryside in post-1975 Vietnamese literature*. University of London, School of Oriental and African Studies (United Kingdom).

Ravera, F., Iniesta-Arandia, I., Martín-López, B., Pascual, U., & Bose, P. (2016). Gender perspectives in resilience, vulnerability and adaptation to global environmental change. *Ambio, 45*(Suppl 3), 235-247.

Ravera, F., Martín-López, B., Pascual, U., & Drucker, A. (2016). The diversity of gendered adaptation strategies to climate change of Indian farmers: A feminist intersectional approach. *Ambio, 45*(Suppl 3), 335-351.

Rehman, M., Santhanam, D., & Sukhera, J. (2023). Intersectionality in medical education: A meta-narrative review. *Perspectives on medical education, 12*(1), 517.

Reid, P., & Vogel, C. (2006). Living and responding to multiple stressors in South Africa—Glimpses from KwaZulu-Natal. *Global Environmental Change, 16*(2), 195-206.

Reid, S., Smit, B., Caldwell, W., & Belliveau, S. (2006). Vulnerability and adaptation to climate risks in Ontario agriculture. *Mitigation and Adaptation Strategies for Global Change, 12*(4), 609-637. https://doi.org/10.1007/s11027-006-9051-8

Reinharz, S., & Davidman, L. (1992). *Feminist methods in social research*. Oxford University Press.

Renaud, F. G., Dun, O., Warner, K., & Bogardi, J. (2011). A Decision Framework for Environmentally Induced Migration. *International Migration, 49*, e5-e29. https://doi.org/10.1111/j.1468-2435.2010.00678.x

Renaud, F. G., Le, T. T. H., Lindener, C., Guong, V. T., & Sebesvari, Z. (2015). Resilience and shifts in agro-ecosystems facing increasing sea-level rise and salinity intrusion in Ben Tre Province, Mekong Delta. *Climatic Change, 133*, 69-84.

Renaud, F. G., Le, T. T. H., Lindener, C., Lindener, C., Lindener, C., Guong, V. T., & Sebesvari, Z. (2015). Resilience and shifts in agro-ecosystems facing increasing sea-level rise and salinity intrusion in Ben Tre Province, Mekong Delta. *Climatic Change, 133*, 69-84.

Renaud, F. G., Szabo, S., & Matthews, Z. (2016). Sustainable deltas: livelihoods, ecosystem services, and policy implications. *Sustainability Science, 11*(4), 519-523.

Resurreccion, B. P. (2012). The gender and climate debate: More of the same or new pathways of thinking and doing? In *Human Security and Climate Change in Southeast Asia* (pp. 111-127). Routledge.

Resurrección, B. P. (2013). Persistent women and environment linkages in climate change and sustainable development agendas. *Women's Studies International Forum, 40*, 33-43. https://doi.org/10.1016/j.wsif.2013.03.011

Resurrección, B. P., Bee, B. A., Dankelman, I., Park, C. M. Y., Haldar, M., & McMullen, C. P. (2019). Gender-transformative climate change adaptation: advancing social equity. *Paper commissioned by the Global Commission on Adaptation (GCA)*.

Reyes-García, V., García-Del-Amo, D., Porcuna-Ferrer, A., Schlingmann, A., Abazeri, M., Attoh, E. M., Vieira da Cunha Ávila, J., Ayanlade, A., Babai, D., & Benyei, P. (2024). Local studies provide a global perspective of the impacts of climate change on Indigenous Peoples and local communities. *Sustainable Earth Reviews, 7*(1), 1.

Reynaud, A., Nguyen, M.-H., & Aubert, C. (2017). Is there a demand for flood insurance in Vietnam? Results from a choice experiment. *Environmental Economics and Policy Studies, 20*(3), 593-617. https://doi.org/10.1007/s10018-017-0207-4

Ribot, J. (2010). Vulnerability does not just fall from the sky: Toward multi-scale pro-poor climate policy. In *Handbook on climate change and human security* (pp. 164-199). Edward Elgar Publishing.

Rice, J. K. (2001). Poverty, welfare, and patriarchy: How macro-level changes in social policy can help low-income women. *Journal of Social Issues, 57*(2), 355-374.

Rice, K. C., Hong, B., & Shen, J. (2012, Nov 30). Assessment of salinity intrusion in the James and Chickahominy Rivers as a result of simulated sea-level rise in Chesapeake Bay, East Coast, USA. *J Environ Manage, 111*, 61-69. https://doi.org/10.1016/j.jenvman.2012.06.036

Rickards, L., & Howden, S. M. (2012). Transformational adaptation: agriculture and climate change. *Crop and Pasture Science, 63*(3), 240-250.

Rickson, S. T., & Daniels, P. L. (1999). Rural Women and Decision Making: Women's Role in Resource Management During Rural Restructuring 1. *Rural Sociology, 64*(2), 234-250.

Rising, J., & Devineni, N. (2020, 2020/10/05). Crop switching reduces agricultural losses from climate change in the United States by half under RCP 8.5. *Nature communications, 11*(1), 4991. https://doi.org/10.1038/s41467-020-18725-w

Robbins, P. (2019). *Political ecology: A critical introduction*. John Wiley & Sons.

Roberts, J. T., & Parks, B. (2006). *A climate of injustice: Global inequality, north-south politics, and climate policy*. MIT press.

Robson, C., & McCartan, K. (2016). *Real World Research. A Resource for Users of Social Research Methods in Applied Settings*. Wiley Global Education.

Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (1996). *Feminist political ecology: Global issues and local experience*. Routledge.

Rockenbauch, T., Sakdapolrak, P., & Sterly, H. (2019). Beyond the local–Exploring the socio-spatial patterns of translocal network capital and its role in household resilience in Northeast Thailand. *Geoforum, 107*, 154-167.

Rodgers, Y., & Menon, N. (2010). Gender differences in socioeconomic status and health: Evidence from the 2008 Vietnam household living standard survey.

Rodó-de-Zárate, M., & Baylina, M. (2018). Intersectionality in feminist geographies. *Gender, Place & Culture, 25*(4), 547-553. https://doi.org/10.1080/0966369x.2018.1453489

Romieu, E., Welle, T., Schneiderbauer, S., Pelling, M., & Vinchon, C. (2010). Vulnerability assessment within climate change and natural hazard contexts: revealing gaps and synergies through coastal applications. *Sustainability Science, 5*(2), 159-170. https://doi.org/10.1007/s11625-010-0112-2

Roncoli, C., Ingram, K., & Kirshen, P. (2001). The costs and risks of coping with drought: livelihood impacts and farmers¹ responses in Burkina Faso. *Climate Research, 19*(2), 119-132.

Rosaldo, M. Z., Lamphere, L., & Bamberger, J. (1974). *Woman, culture, and society* (Vol. 133). Stanford University Press.

Rose, G., Gregson, N., Foord, J., Bowlby, S., Dwyer, C., Holloway, S., Laurie, N., Maddrell, A., & Skelton, T. (1997). *Feminist geographies: Explorations in diversity and difference*. Routledge.

Rosenberg, N. J. (1992). Adaptation of agriculture to climate change. *Climatic Change, 21*(4), 385-405.

Roson, R., & Van der Mensbrugghe, D. (2012). Climate change and economic growth: impacts and interactions. *International Journal of Sustainable Economy, 4*(3), 270-285.

Roy, M., & Venema, H. D. (2002). Reducing risk and vulnerability to climate change in India: The capabilities approach. *Gender & Development, 10*(2), 78-83. https://doi.org/10.1080/13552070215904

Rutterford, J., & Maltby, J. (2007). "The nesting instinct": women and investment risk in a historical context. *Accounting History, 12*(3), 305-327.

Rydström, H. (2019). Disasters, Ruins, and Crises: Masculinity and Ramifications of Storms in Vietnam. *Ethnos, 85*(2), 351-370. https://doi.org/10.1080/00141844.2018.1561490

Sachs, C. (1996). Rural Women: Agriculture and the Environment in Vietnam. In *Vietnam's Women in Transition* (pp. 246-259). Springer.

Sachs, C. E. (2019). Gender, agriculture and agrarian transformations. In *Gender, Agriculture and Agrarian Transformations* (pp. 3-7). Routledge.

Sadian, S. (2022). Wolfgang Streeck on consumption, depoliticisation and neoliberal capitalism. *European Journal of Social Theory, 25*(4), 596-613.

Sage, D., Sircar, I., Dainty, A., Fussey, P., & Goodier, C. (2015). Understanding and enhancing future infrastructure resiliency: a socio-ecological approach. *Disasters, 39*(3), 407-426.

Saha, C. K. (2014). Dynamics of disaster-induced risk in southwestern coastal Bangladesh: an analysis on tropical Cyclone Aila 2009. *Natural Hazards, 75*(1), 727-754. https://doi.org/10.1007/s11069-014-1343-9

Salem, S. (2018). Intersectionality and its discontents: Intersectionality as traveling theory. *European Journal of Women's Studies, 25*(4), 403-418.

Salleh, A. (1991). Staying Alive: Women, Ecology and Development. By Vandana Shiva. London: Zed Books, 1989. *Hypatia, 6*(1), 206-214. https://doi.org/10.1111/j.1527-2001.1991.tb00218.x

Salman, D., Yassi, A., & Demmallino, E. B. (2022). Livelihood vulnerability of smallholder farmers to climate change: A comparative analysis based on irrigation access in South Sulawesi, Indonesia. *Regional Sustainability, 3*(3), 244-253.

Sarch, M.-T., & Allison, E. H. (2001). Fluctuating fisheries in Africa's inland waters: well adapted livelihoods, maladapted management.

Sarch, M. T., & Birkett, C. (2000). Fishing and farming at Lake Chad: Responses to lake-level fluctuations. *Geographical Journal, 166*(2), 156-172.

Savath, V., Fletschner, D., Peterman, A., & Santos, F. (2014). *Land, assets, and livelihoods: Gendered analysis of evidence from Odisha state in India* (Vol. 1323). Intl Food Policy Res Inst.

Schafer, J. (2002). *Supporting livelihoods in situations of chronic conflict and political instability: Overview of conceptual issues*. Citeseer.

Schalatek, L., & Nakhooda, S. (2016). Gender and climate finance. *Heinrich Böll Stiftung*.

Schewe, J., Heinke, J., Gerten, D., Haddeland, I., Arnell, N. W., Clark, D. B., Dankers, R., Eisner, S., Fekete, B. M., Colón-González, F. J., Gosling, S. N., Kim, H., Liu, X., Masaki, Y., Portmann, F. T., Satoh, Y., Stacke, T. I., Tang, Q., Wada, Y., Wisser, D., Albrecht, T., Frieler, K., Piontek, F., Warszawski, L., & Kabat, P. (2013). Multimodel assessment of water scarcity under climate change. *Proceedings of the National Academy of Sciences, 111*, 3245 - 3250.

Schipper, E. L. F. (2006). Conceptual history of adaptation in the UNFCCC process. *Review of European Community & International Environmental Law, 15*(1), 82-92.

Schipper, E. L. F. (2007). Climate change adaptation and development: Exploring the linkages. *Tyndall Centre for climate change research working paper, 107*, 13.

Schipper, E. L. F., Eriksen, S. E., Fernandez Carril, L. R., Glavovic, B. C., & Shawoo, Z. (2020). Turbulent transformation: abrupt societal disruption and climate resilient development. *Climate and Development, 13*(6), 467-474. https://doi.org/10.1080/17565529.2020.1799738

Schlögl, M., Richter, G., Avian, M., Thaler, T., Heiss, G., Lenz, G., & Fuchs, S. (2019). On the nexus between landslide susceptibility and transport infrastructure – an agent-based approach. *Natural Hazards and Earth System Sciences*.

Schlosberg, D. (2012). Climate justice and capabilities: A framework for adaptation policy. *Ethics & International Affairs, 26*(4), 445-461.

Schlosberg, D., & Collins, L. B. (2014). From environmental to climate justice: climate change and the discourse of environmental justice. *Wiley Interdisciplinary Reviews: Climate Change, 5*(3), 359-374.

Schmitt, K., Albers, T., Pham, T., & Dinh, S. (2013). Site-specific and integrated adaptation to climate change in the coastal mangrove zone of Soc Trang Province, Viet Nam. *Journal of Coastal Conservation, 17*(3), 545-558.

Schmitt, R. J., Giuliani, M., Bizzi, S., Kondolf, G. M., Daily, G., & Castelletti, A. (2021). Strategic basin and delta planning increases the resilience of the Mekong Delta under future uncertainty. *Proceedings of the National Academy of Sciences, 118*(36), e2026127118.

Schneider, P., & Asch, F. (2020). Rice production and food security in Asian Mega deltas—A review on characteristics, vulnerabilities and agricultural adaptation options to cope with climate change. *Journal of Agronomy and Crop Science, 206*(4), 491-503.

Scholtz, B., & Gomez, M. (2004). *Bringing Equality Home: Promoting and Protecting the Inheritance Rights of Women*. https://gsdrc.org/document-library/bringing-equality-home-promoting-and-protecting-the-inheritance-rights-of-women/

Scott, S. (2003). Gender, household headship and entitlements to land: New vulnerabilities in Vietnam's decollectivization. *Gender, Technology and Development, 7*(2), 233-263.

Scott, S. (2017). Gender, Household Headship and Entitlements to Land: New Vulnerabilities in Vietnam's Decollectivization. *Gender, Technology and Development, 7*(2), 233-263. https://doi.org/10.1080/09718524.2003.11910085

Segnestam, L. (2017). Gendered experiences of adaptation to drought: patterns of change in El Sauce, Nicaragua. *Latin American Research Review, 52*(5), 807-823.

Seguino, S. (2013). Toward gender justice: Confronting stratification and unequal power. *Géneros, 2*(1), 1-36.

Sen, A. (1981). *Poverty and famines: an essay on entitlement and deprivation*. Oxford university press.

Sen, A. (1999). Development as freedom (1999). *The globalization and development reader: Perspectives on development and global change, 525*.

Shackleton, S., Ziervogel, G., Sallu, S., Gill, T., & Tschakert, P. (2015a). Why is socially-just climate change adaptation in sub-Saharan Africa so challenging? A review of barriers identified from empirical cases. *Wiley Interdisciplinary Reviews: Climate Change, 6*(3), 321-344.

Shackleton, S., Ziervogel, G., Sallu, S., Gill, T., & Tschakert, P. (2015b). Why is socially-just climate change adaptation in sub-Saharan Africa so challenging? A review of barriers identified from empirical cases. *WIREs Climate Change, 6*(3), 321-344. https://doi.org/10.1002/wcc.335

Shardul, A., & Samuel, F. (2008). *Economic aspects of adaptation to climate change costs, benefits and policy instruments: costs, benefits and policy instruments*. OECD Publishing.

Sharma, A., & Bhaduri, A. (2009). The "tipping point" in Indian agriculture: Understanding the withdrawal of the Indian rural youth. *Asian Journal of Agriculture and Development, 6*(1), 83-97.

Sharma, V., Reddy, B., & Sahu, N. (2014). Sustainable rural livelihoods approach for climate change adaptation in Western Odisha, Eastern India. *Development in Practice, 24*(4), 591-604. https://doi.org/10.1080/09614524.2014.911817

Sherif, M. M., & Singh, V. P. (1999). Effect of climate change on sea water intrusion in coastal aquifers. *Hydrological processes, 13*(8), 1277-1287.

Shi, L. (2020). Beyond flood risk reduction: How can green infrastructure advance both social justice and regional impact? *Socio-Ecological Practice Research, 2*(4), 311-320.

Shi, L. (2021). From progressive cities to resilient cities: Lessons from history for new debates in equitable adaptation to climate change. *Urban Affairs Review, 57*(5), 1442-1479.

Shibata, R., Cardey, S., & Dorward, P. (2020). Gendered intra-household decision-making dynamics in agricultural innovation processes: assets, norms and bargaining power. *Journal of International Development, 32*(7), 1101-1125.

Shiva, V. (1988). *Staying alive: Women, ecology, and survival in India* (Vol. 84). Kali for Women New Delhi.

Siemiatycki, M., Enright, T., & Valverde, M. (2020). The gendered production of infrastructure. *Progress in Human Geography, 44*(2), 297-314.

Sikor, T., & Müller, D. (2009). The limits of state-led land reform: An introduction. *World Development, 37*(8), 1307-1316.

Silva, J. F., Santos, J. L., Ribeiro, P. F., Canadas, M. J., Novais, A., Lomba, Â., Magalhães, M. R., & Moreira, F. (2020). Identifying and explaining the farming system composition of agricultural landscapes: The role of socioeconomic drivers under strong biophysical gradients. *Landscape and Urban Planning, 202*, 103879.

Silverstein, S. (1975). [Woman, Culture and Society, Michelle Zimbalist Rosaldo, Louise Lamphere]. *African Studies Review, 18*(3), 125-127. https://doi.org/10.2307/523726

Simpson, M. C., Gössling, S., Scott, D., Hall, C. M., & Gladin, E. (2008). Climate change adaptation and mitigation in the tourism sector: frameworks, tools and practices. *Climate change adaptation and mitigation in the tourism sector: frameworks, tools and practices.*

Sircar, S. (2019). Feminism and intersectionality in Swedish Geography. *Gender, Place & Culture, 26*(7-9), 1261-1270. https://doi.org/10.1080/0966369x.2018.1563526

Skutsch, M. M. (2002). Protocols, treaties, and action: The 'climate change process' viewed through gender spectacles. *Gender & Development, 10*(2), 30-39. https://doi.org/10.1080/13552070215908

Smajgl, A. (2018). Climate change adaptation planning in Vietnam's Mekong Delta.

Smit, B., Burton, I., Klein, R. J., & Street, R. (1999). The science of adaptation: a framework for assessment. *Mitigation and Adaptation Strategies for Global Change, 4*(3), 199-213.

Smit, B., Burton, I., Klein, R. J., & Wandel, J. (2000). An anatomy of adaptation to climate change and variability. In *Societal adaptation to climate variability and change* (pp. 223-251). Springer.

Smit, B., McNabb, D., & Smithers, J. (1996). Agricultural adaptation to climatic variation. *Climatic Change, 33*(1), 7-29.

Smit, B., & Pilifosova, O. (2003). Adaptation to climate change in the context of sustainable development and equity. *Sustainable Development, 8*(9), 9.

Smit, B., & Skinner, M. W. (2002). Adaptation options in agriculture to climate change: a typology. *Mitigation and Adaptation Strategies for Global Change, 7*(1), 85-114.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change, 16*(3), 282-292. https://doi.org/10.1016/j.gloenvcha.2006.03.008

Smith, A., Simelton, E., Duong, M. T., & Coulier, M. (2017). Gender-differences in Agro-Climate Information Services (Findings from ACIS baseline survey in Ha Tinh and Dien Bien provinces, Vietnam).

Smith, E. F., Keys, N., Lieske, S. N., & Smith, T. F. (2015). Assessing socio-economic vulnerability to climate change impacts and environmental hazards in New South Wales and Queensland, Australia. *Geographical Research, 53*, 451-465.

Smith, K., & Petley, D. N. (2009). *Environmental Hazards : Assessing Risk and Reducing Disaster*. Taylor & Francis Group. http://ebookcentral.proquest.com/lib/vu/detail.action?docID=409514

Smooth, W. G. (2013). Intersectionality from theoretical framework to policy intervention. In *Situating intersectionality: Politics, policy, and power* (pp. 11-41). Springer.

Smucker, T. A., & Wangui, E. E. (2016). Gendered knowledge and adaptive practices: Differentiation and change in Mwanga District, Tanzania. *Ambio, 45*, 276-286.

Soc Trang Statistics Office (2022). *Soc Trang Statistical Yearbook 2021*. Statistical Publishing House. http://tailieuso.thuviensoctrang.org.vn:82/html/php/view.php

Socialist Republic of Vietnam (2004). *National report on disaster reduction in Vietnam*.

Soe, K. K. (2020, 2020/03/01). Climate change effects on agriculture in thabaung township, ayeyarwady region, Myanmar: challenges and perceptions of farmers. *IOP Conference Series: Earth and Environmental Science, 451*(1), 012030. https://doi.org/10.1088/1755-1315/451/1/012030

Sofaer, S. (1999). Qualitative methods: what are they and why use them? *Health services research, 34*(5 Pt 2), 1101.

Sok, S., Chhinh, N., Hor, S., & Nguonphan, P. (2021). Climate Change Impacts on Rice Cultivation: A Comparative Study of the Tonle Sap and Mekong River. *Sustainability, 13*(16).

Song, S.-G., Anh, L. T. N., & Dung, N. T. K. (2023). Inclusion of Intersectionality and Gender Analysis in Social Policy Development in Vietnam. *Vietnam Social Science, 4*. https://doi.org/ https://doi.org/10.56794/VSSR.4

Southwell, B. G. (2013). *Social networks and popular understanding of science and health: Sharing disparities*. JHU Press.

Spreen, M. (1992). Rare populations, hidden populations, and link-tracing designs: what and why? *Bulletin of Sociological Methodology/Bulletin de Methodologie Sociologique, 36*(1), 34-58.

Springer, S. (2010). Neoliberalism and geography: Expansions, variegations, formations. *Geography Compass, 4*(8), 1025-1038.

Srivastava, N., & Srivastava, R. (2010). Women, work, and employment outcomes in rural India. *Economic and political weekly*, 49-63.

Stacey, R. D. (1996). *Complexity and creativity in organizations*. Berrett-Koehler Publishers.

Stake, R. E. (2005). Qualitative Case Studies. In N. K. Denzin & Y. S. Lincoln. (Eds.), *The Sage handbook of qualitative research, 3rd ed.* (pp. 443-466). Sage Publications Ltd.

Steenwerth, K. L., Hodson, A. K., Bloom, A. J., Carter, M. R., Cattaneo, A., Chartres, C. J., Hatfield, J. L., Henry, K., Hopmans, J. W., Horwath, W. R., Jenkins, B. M., Kebreab, E., Leemans, R., Lipper, L., Lubell, M., Msangi, S., Prabhu, R., Reynolds, M. P., Sandoval Solis, S., Sischo, W. M., Springborn, M. R., Tittonell, P., Wheeler, S. M., Vermeulen, S. J., Wollenberg, E. K., Jarvis, L. S., & Jackson, L. E. (2014). Climate-smart agriculture global research agenda: scientific basis for action. *Agriculture & Food Security, 3*, 1-39.

Steeves, H. L. (1996). Sharing information in Kenya: Communication and information policy considerations and consequences for rural women. *Gazette (Leiden, Netherlands), 56*(3), 157-181.

Steger, M. B., & Roy, R. K. (2021). *Neoliberalism: A very short introduction* (Vol. 222). Oxford University Press.

Stevenson, E. G., Greene, L. E., Maes, K. C., Ambelu, A., Tesfaye, Y. A., Rheingans, R., & Hadley, C. (2012). Water insecurity in 3 dimensions: an anthropological perspective on water and women's psychosocial distress in Ethiopia. *Social science & medicine, 75*(2), 392-400.

Stewart, M. A., & Coclanis, P. A. (2011). *Environmental change and agricultural sustainability in the Mekong Delta* (Vol. 45). Springer Science & Business Media.

Stonich, S. (2000). The Human dimensions of climate Change: The political ecology of vulnerability. *Department of Anthropology Environmental Studies, University of California*.

Stromquist, N. P. (1989). Determinants of Educational Participation and Achievement of Women in the Third World: A Review of the Evidence and a Theoretical Critique. *Review of Educational Research, 59*, 143 - 183.

Sugden, F., Maskey, N., Clement, F., Ramesh, V., Philip, A., & Rai, A. (2014). Agrarian stress and climate change in the Eastern Gangetic Plains: Gendered vulnerability in a stratified social formation. *Global Environmental Change, 29*, 258-269.

Sultana, F. (2006). Gendered waters, poisoned wells: Political ecology of the arsenic crisis in Bangladesh. In *Fluid bonds: Views on gender and water* (pp. 362).

Sultana, F. (2009). Fluid lives: subjectivities, gender and water in rural Bangladesh. *Gender, Place & Culture, 16*(4), 427-444. https://doi.org/10.1080/09663690903003942

Sultana, F. (2011). Water, culture, and gender: An analysis from Bangladesh. In *Water, cultural diversity, and global environmental change* (pp. 237-252). Springer.

Sultana, F. (2014). Gendering Climate Change: Geographical Insights. *The Professional Geographer, 66*(3), 372-381. https://doi.org/10.1080/00330124.2013.821730

Sultana, F. (2022). The unbearable heaviness of climate coloniality. *Political geography, 99*, 102638.

Sumberg, J. (2011). 'Good farmers' in Sub-Saharan Africa: evolving narratives. *Outlook on AGRICULTURE, 40*(4), 293-298.

Swai, O. W., Mbwambo, J. S., & Magayane, F. T. (2012). Gender and adaptation practices to the effects of climate change in Bahi and Kondoa Districts Dodoma Region, Tanzania. *Journal of sustainable development, 5*(12), 65.

Swart, R., Biesbroek, R., & Lourenço, T. C. (2014). Science of adaptation to climate change and science for adaptation. *Frontiers in Environmental Science, 2*.

Sweetman, C. (2013). Introduction, Feminist Solidarity and Collective Action. *Gender & Development, 21*(2), 217-229. https://doi.org/10.1080/13552074.2013.819176

Syvitski, J. P., Kettner, A. J., Overeem, I., Hutton, E. W., Hannon, M. T., Brakenridge, G. R., Day, J., Vörösmarty, C., Saito, Y., & Giosan, L. (2009). Sinking deltas due to human activities. *Nature Geoscience, 2*(10), 681-686.

Tacoli, C., & Mabala, R. (2010). Exploring mobility and migration in the context of rural—urban linkages: why gender and generation matter. *Environment and Urbanization, 22*(2), 389-395.

Takagi, H., Thao, N. D., & Anh, L. T. (2016). Sea-level rise and land subsidence: impacts on flood projections for the Mekong Delta's largest city. *Sustainability, 8*(9), 959.

Takagi, H., Ty, T., Thao, N. D., & Esteban, M. (2015). Ocean tides and the influence of sea-level rise on floods in urban areas of the M ekong D elta. *Journal of Flood Risk Management, 8*(4), 292-300.

Talbot, C. J., Bennett, E. M., Cassell, K., Hanes, D. M., Minor, E. C., Paerl, H., Raymond, P. A., Vargas, R., Vidon, P. G., & Wollheim, W. (2018). The impact of flooding on aquatic ecosystem services. *Biogeochemistry, 141*, 439-461.

Tamang, S., Paudel, K. P., & Shrestha, K. K. (2014). Feminization of agriculture and its implications for food security in rural Nepal. *Journal of Forest and Livelihood, 12*(1), 13-13.

Tamura, M., Yasuhara, K., Ajima, K., Trinh, V. C., & Pham, S. V. (2018). Vulnerability to climate change and residents' adaptations in coastal areas of Soc Trang Province, Vietnam. *International Journal of Global Warming, 16*(1), 102-117.

Teh, S. Y., & Koh, H. L. (2016). Climate change and soil salinization: impact on agriculture, water and food security. *International Journal of Agriculture, Forestry and Plantation, 2*, 1-9.

Teller, A. S. (2016). Moving the conversation on climate change and inequality to the local: socio-ecological vulnerability in agricultural Tanzania. *Sociology of Development, 2*(1), 25-50.

Tellis, W. (1997). Introduction to case study. *The Qualitative Report, 3*(2), 1-14.

Tembo, F. (2003). Multiple Identities and Representations: Experiences in the Study of People's Life-worlds in Rural Malawi. *Singapore journal of tropical geography, 24*(2), 229-241.

Temple, B. (2002). Crossed wires: Interpreters, translators, and bilingual workers in cross-language research. *Qualitative health research, 12*(6), 844-854.

Termeer, C., Biesbroek, R., & Van den Brink, M. (2012). Institutions for adaptation to climate change: comparing national adaptation strategies in Europe. *European Political Science, 11*(1), 41-53.

Termeer, C. J. A. M., Dewulf, A., & Biesbroek, G. R. (2016). Transformational change: governance interventions for climate change adaptation from a continuous change perspective. *Journal of Environmental Planning and Management, 60*(4), 558-576. https://doi.org/10.1080/09640568.2016.1168288

Terry, G. (2009a). *Climate change and gender justice*. Oxfam GB.

Terry, G. (2009b). No climate justice without gender justice: an overview of the issues. *Gender & Development, 17*(1), 5-18. https://doi.org/10.1080/13552070802696839

Tessler, Z., Vörösmarty, C. J., Grossberg, M., Gladkova, I., Aizenman, H., Syvitski, J. P., & Foufoula-Georgiou, E. (2015). Profiling risk and sustainability in coastal deltas of the world. *Science, 349*(6248), 638-643.

Tha, T., Piman, T., Kittipongvises, S., & Ruangrassamee, P. (2024). Riverbank erosion vulnerability assessment and coping strategies: A case study of the riparian communities in the Mekong River Basin in Cambodia. *Heliyon, 10*(3).

Thanh, V. Q., Roelvink, D., Van Der Wegen, M., Reyns, J., Kernkamp, H., Van Vinh, G., & Linh, V. T. P. (2020). Flooding in the Mekong Delta: the impact of dyke systems on downstream hydrodynamics. *Hydrology and Earth System Sciences, 24*(1), 189-212.

Thao, V. T. (2013). Making a Living in Rural Vietnam from (Im)mobile Livelihoods: a Case of Women's Migration. *Population, Space and Place, 19*(1), 87-102. https://doi.org/10.1002/psp.1706

Thi Ut, T., & Kajisa, K. (2006). The Impact of Green Revolution on Rice Production in Vietnam. *The Developing Economies, 44*(2), 167-189. https://doi.org/10.1111/j.1746-1049.2006.00012.x

Thinh, P. T., Thoi, H., Manh, T. H., Hai, L. T., & Schmitt, K. (2009). Tool Box for mangrove rehabilitation and management. *Management of Natural Resources in the Coastal Zone of Soc Trang Province. GTZ and Soc Trang Provincial People's Committee. 55pp*.

Thomas, D. S. G., & Twyman, C. (2005). Equity and justice in climate change adaptation amongst natural-resource-dependent societies. *Global Environmental Change, 15*(2), 115-124. https://doi.org/10.1016/j.gloenvcha.2004.10.001

Thomas, K., Hardy, R. D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., Roberts, J. T., Rockman, M., Warner, B. P., & Winthrop, R. (2019, Mar-Apr). Explaining differential vulnerability to climate change: A social science review. *Wiley Interdiscip Rev Clim Change, 10*(2), e565. https://doi.org/10.1002/wcc.565

Thomas, K. A. (2023). Compelled to compete: rendering climate change vulnerability investable. *Development and Change, 54*(2), 223-250.

Thomas, K. B. (2020). Intersectionality and epistemic erasure: a caution to decolonial feminism. *Hypatia, 35*(3), 509-523.

Thomas, V., & López, R. (2015). Global increase in climate-related disasters. *Asian Development Bank Economics Working Paper Series*(466).

Thompson-Hall, M., Carr, E. R., & Pascual, U. (2016). Enhancing and expanding intersectional research for climate change adaptation in agrarian settings. *Ambio, 45*, 373-382.

Thuy, L. N. T., & Thanh, T. D. (2022). Adaptation Strategies and Livelihood Vulnerability of Ethnic Minorities in Vietnam: A Case of the Khmer Community in Mekong Delta. *Sustainability and Climate Change, 15*(6), 408-421.

Thwe, S. M. (2022). Intersectionality and livelihoods of conflict-induced displaced Myanmar women in Mae Sot, Thailand.

Tierney, K. (2015). Resilience and the neoliberal project: Discourses, critiques, practices—and Katrina. *American Behavioral Scientist, 59*(10), 1327-1342.

Tinh, D. Q., & Hang, P. T. (2003). Living with floods in the Mekong River Delta of Vietnam. *Department of Dike Management, Flood and Storm Control, Ministry of Agriculture and Rural Development, Hanoi, Socialist Republic of Vietnam*.

Toan, P. V., Sebesvari, Z., Blasing, M., Rosendahl, I., & Renaud, F. G. (2013, May 1). Pesticide management and their residues in sediments and surface and drinking water in the Mekong Delta, Vietnam. *Sci Total Environ, 452-453*, 28-39. https://doi.org/10.1016/j.scitotenv.2013.02.026

Tompkins, E. L. (2005). Planning for climate change in small islands: Insights from national hurricane preparedness in the Cayman Islands. *Global Environmental Change, 15*(2), 139-149. https://doi.org/10.1016/j.gloenvcha.2004.11.002

Tompkins, E. L., & Adger, W. N. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society, 9*(2).

Tran, D. D., Park, E., Tuoi, H. T. N., Thien, N. D., Tu, V. H., Anh Ngoc, P. T., Van, C. T., Kim Long, P., Ho, H. L., & Quang, C. N. X. (2022, 2022/11/01/). Climate change impacts on rice-based livelihood vulnerability in the lower Vietnamese Mekong Delta: Empirical evidence from Can Tho City and Tra Vinh Province. *Environmental*

Technology & Innovation, 28, 102834. https://doi.org/https://doi.org/10.1016/j.eti.2022.102834

Tran, D. D., Quang, C. N. X., Tien, P. D., Tran, P. G., Kim Long, P., Van Hoa, H., Ngoc Hoang Giang, N., & Thi Thu Ha, L. (2020). Livelihood Vulnerability and Adaptation Capacity of Rice Farmers under Climate Change and Environmental Pressure on the Vietnam Mekong Delta Floodplains. *Water, 12*(11). https://doi.org/10.3390/w12113282

Tran, D. D., van Halsema, G., Hellegers, P. J., Ludwig, F., & Seijger, C. (2018a). Stakeholders' assessment of dike-protected and flood-based alternatives from a sustainable livelihood perspective in An Giang Province, Mekong Delta, Vietnam. *Agricultural Water Management, 206*, 187-199.

Tran, D. D., van Halsema, G., Hellegers, P. J. G. J., Ludwig, F., & Seijger, C. (2018b). Stakeholders' assessment of dike-protected and flood-based alternatives from a sustainable livelihood perspective in An Giang Province, Mekong Delta, Vietnam. *Agricultural Water Management, 206*, 187-199. https://doi.org/10.1016/j.agwat.2018.04.039

Tran, D. H. (2018). Basic trends and strategic viewpoints for sustainable development in adaptation to climate change in the Mekong delta. *Vietnam Journal of Science, Technology and Engineering, 60*(2), 92-96.

Tran, H., Tran, T., & Kervyn, M. (2015). Dynamics of land cover/land use changes in the Mekong Delta, 1973–2011: A remote sensing analysis of the Tran Van Thoi District, Ca Mau Province, Vietnam. *Remote Sensing, 7*(3), 2899-2925.

Tran, T. A. (2019). Land use change driven out-migration: Evidence from three flood-prone communities in the Vietnamese Mekong Delta. *Land Use Policy, 88*. https://doi.org/10.1016/j.landusepol.2019.104157

Tran, T. A., James, H., & Nhan, D. K. (2020). Effects of social learning on rural farmers' adaptive capacity: empirical insights from the Vietnamese Mekong Delta. *Society & Natural Resources, 33*(9), 1053-1072.

Tran, T. A., Pittock, J., & Tran, D. D. (2020). Adaptive flood governance in the Vietnamese Mekong Delta: A policy innovation of the North Vam Nao scheme, An Giang Province. *Environmental Science & Policy, 108*, 45-55.

Tran, T. A., Tran, D. D., Van Vo, O., Pham, V. H. T., Van Tran, H., Yong, M. L., Le, P. V., & Dang, P. T. (2024). Evolving pathways towards water security in the Vietnamese Mekong Delta: An adaptive management perspective. *Ambio*.

Tran, V. T., An-Vo, D.-A., Cockfield, G., & Mushtaq, S. (2021). Assessing livelihood vulnerability of minority ethnic groups to climate change: A case study from the northwest mountainous regions of Vietnam. *Sustainability, 13*(13), 7106.

Tri, N. H., Choowaew, S., Van Ni, D., & Kansantisukmongkol, K. (2019). Impact of saline intrusion and adaptation options on rice-and fish-farming households in the Mekong Delta of Vietnam. *Kasetsart Journal of Social Sciences, 40*(2), 427-433.

Tri, V. P. D., Trung, N. H., & Tuu, N. (2012). Flow dynamics in the Long Xuyen Quadrangle under the impacts of full-dyke systems and sea level rise. *VNU J. Sci. Earth Sci, 28*, 205-214.

Tri, V. P. D., Yarina, L., Nguyen, H. Q., & Downes, N. K. (2023). Progress toward resilient and sustainable water management in the Vietnamese Mekong Delta. *Wiley Interdisciplinary Reviews: Water, 10*(6), e1670.

Tria Kerkvliet, B. J. (2017). *Dilemmas of development: Vietnam update 1994*. Canberra, ACT: Dept. of Political and Social Change, Research School of ….

Triet, N. V. K., Dung, N. V., Fujii, H., Kummu, M., Merz, B., & Apel, H. (2017). Has dyke development in the Vietnamese Mekong Delta shifted flood hazard downstream? *Hydrology and Earth System Sciences, 21*(8), 3991-4010. https://doi.org/10.5194/hess-21-3991-2017

Trieu, T. T. N., & Phong, N. T. (2015). The impact of climate change on salinity intrusion and Pangasius (Pangasianodon Hypophthalmus) farming in the Mekong Delta, Vietnam. *Aquaculture International, 23*(2), 523-534.

Tripathi, A. (2017). Socioeconomic backwardness and vulnerability to climate change: evidence from Uttar Pradesh state in India. *Journal of Environmental Planning and Management, 60*, 328 - 350.

True, J. (2013). Gendered violence in natural disasters: Learning from New Orleans, Haiti and Christchurch. *Aotearoa New Zealand Social Work, 25*(2), 78-89.

Truelove, Y. (2011a). (Re-) Conceptualizing water inequality in Delhi, India through a feminist political ecology framework. *Geoforum, 42*(2), 143-152.

Truelove, Y. (2011b). (Re-)Conceptualizing water inequality in Delhi, India through a feminist political ecology framework. *Geoforum, 42*(2), 143-152. https://doi.org/10.1016/j.geoforum.2011.01.004

Trundle, A. (2020). Resilient cities in a Sea of Islands: Informality and climate change in the South Pacific. *Cities, 97*, 102496.

Trung, L. D. (2015). Economic and welfare impacts of disasters in East Asia and policy responses: The case of Vietnamese communities. In *Resilience and Recovery in Asian Disasters* (pp. 51-73). Springer.

Truong, Q. C., Nguyen, T. H., Pham, V. T., & Nguyen, T. H. (2024). Land-Use Optimization and Allocation for Saltwater Intrusion Regions: A Case Study in Soc Trang Province, Vietnam. *Climate*, *12*(2), 16.

Tschakert, P. (2012). From impacts to embodied experiences: tracing political ecology in climate change research. *Geografisk Tidsskrift-Danish Journal of Geography*, *112*(2), 144-158.

Tschakert, P. (2016). The Role of Inequality in Climate-Poverty Debates.

Tschakert, P., & Dietrich, K. A. (2010). Anticipatory learning for climate change adaptation and resilience. *Ecology and Society*, *15*(2).

Tschakert, P., & Machado, M. (2012). Gender justice and rights in climate change adaptation: Opportunities and pitfalls. *Ethics and Social Welfare*, *6*(3), 275-289.

Tschakert, P., & Machado, M. R. (2012). Gender Justice and Rights in Climate Change Adaptation: Opportunities and Pitfalls. *Ethics and Social Welfare*, *6*, 275 - 289.

Tsige, M., Synnevåg, G., & Aune, J. B. (2020). Gendered constraints for adopting climate-smart agriculture amongst smallholder Ethiopian women farmers. *Scientific African*, *7*, e00250.

Tuan, V. V. (2014). *Vulnerability assessment of different socio-economic groups to floods in the rural Mekong Delta of Vietnam* Universität Bonn]. Universität Bonn.

Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., Eckley, N., Kasperson, J. X., Luers, A., & Martello, M. L. (2003). A framework for vulnerability analysis in sustainability science. *Proceedings of the National Academy of Sciences*, *100*(14), 8074-8079.

Tusneem, M. E. (2008). Food Security in a Changing Climate. *The Pakistan Development Review*, *47*, 815-816.

Tuy, S. (2019). Discrimination against Women in Accessing Higher Education in Cambodia. *Journal of Southeast Asian Human Rights*.

Twyman, C., Morrison, J., & Sporton, D. (1999). The final fifth: autobiography, reflexivity and interpretation in cross-cultural research. *Area*, *31*(4), 313-325.

UN Women (2021a). *The State of Gender Equality and Climate Change in Viet Nam*. https://asiapacific.unwomen.org/en/digital-library/publications/2021/04/the-state-of--gender-equality-and-climate-change-in-viet-nam

UN Women (2021b). Women's representation in local government: A global analysis. *Hämtad*, *27*(2021), 2022-2001.

UNDP Viet Nam (2016). Vietnam drought and saltwater intrusion transitioning from Emergency to Recovery. *Analysis Report and Policy Implications*.

UNDP Vietnam (2017). *Fact Sheet on poverty reduction in Vietnam* https://www.undp.org/vietnam/publications/fact-sheet-poverty-reduction-vietnam

UNEP. (2011). *Women at the Frontline of Climate Change: A Rapid Response Assessment*. https://wedocs.unep.org/handle/20.500.11822/7985

UNGA. (2016). *Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction*. https://digitallibrary.un.org/record/852089#record-files-collapse-header

United Nation (1995). *World Summit for Social Development Programme of Action. Chapter 2: Eradication of Poverty*. https://www.un.org/esa/socdev/wssd/text-version/agreements/poach2.htm

Urwin, K., & Jordan, A. (2008). Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Global Environmental Change*, *18*(1), 180-191. https://doi.org/10.1016/j.gloenvcha.2007.08.002

Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis.

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & health sciences*, *15*(3), 398-405.

Van Chat, N. (2024). Indigenous Knowledge in Tourism Development: The Case of Hô River Island, Tra Vinh Province, Vietnam. IOP Conference Series: Earth and Environmental Science,

Van, C. T., Thuy, H. T. T., Viet, C. T., Anh, L. N., Van Anh, V. T., & Tran, D. D. (2024, 2024/05/01/). Unveiling flood vulnerability in the Vietnamese Mekong Delta: A case study of an Giang province. *International Journal of Disaster Risk Reduction, 106*, 104429. https://doi.org/https://doi.org/10.1016/j.ijdrr.2024.104429

Van, C. T., Thuy, H. T. T., Viet, C. T., Van Anh, V. T., & Tran, D. D. (2024). Unveiling flood vulnerability in the Vietnamese Mekong Delta: A case study of an Giang province. *International Journal of Disaster Risk Reduction, 106*, 104429.

van den Berg, H. J. H. (2021). *Equity and Climate Change Adaptation: Toward a Better Understanding of Resource Allocation* Harvard University].

Van Lieshout, M., Kovats, R., Livermore, M., & Martens, P. (2004). Climate change and malaria: analysis of the SRES climate and socio-economic scenarios. *Global Environmental Change, 14*(1), 87-99.

Van, P., Popescu, I., Van Griensven, A., Solomatine, D., Trung, N., & Green, A. (2012). A study of the climate change impacts on fluvial flood propagation in the Vietnamese Mekong Delta. *Hydrology and Earth System Sciences, 16*(12), 4637-4649.

Van Thanh, D., Truong, V. H., & Phat, N. T. (2022). Challenges and Opportunities for Women and Girls in Adaptation to the Climate Change Action Plan 2021-2030: A Case Study in Mekong Delta, Vietnam. *Vietnam Journal of Social Sciences & Humanities, 8*(5).

Vance, L. (1990). [Rape of the Wild: Man's Violence against Animals and the Earth, Andree Collard, Joyce Contrucci; The Recurring Silent Spring, H. Patricia Hynes; Healing the Wounds: The Promise of Ecofeminism, Judith Plant; Staying Alive: Women, Ecology and Development, Vandana Shiva]. *NWSA journal, 2*(3), 485-489. http://www.jstor.org/stable/4316052

Venugopal, R. (2015). Neoliberalism as concept. *Economy and society, 44*(2), 165-187.

Vermeulen, S. J., Dinesh, D., Howden, S. M., Cramer, L., & Thornton, P. K. (2018). Transformation in practice: a review of empirical cases of transformational adaptation in agriculture under climate change. *Frontiers in Sustainable Food Systems, 2*, 65.

Vincent, K. (2004). Creating an index of social vulnerability to climate change for Africa. *Tyndall Center for Climate Change Research. Working Paper, 56*(41), 1-50.

Vincent, K. (2007). Uncertainty in adaptive capacity and the importance of scale. *Global Environmental Change, 17*(1), 12-24. https://doi.org/10.1016/j.gloenvcha.2006.11.009

Vincent, K., Cull, T., & Archer, E. R. (2010). Gendered vulnerability to climate change in Limpopo province, South Africa. *Gender and climate change: an introduction*, 160-167.

Vincent, K., & Cundill, G. (2021). The evolution of empirical adaptation research in the global South from 2010 to 2020. *Climate and Development, 14*(1), 25-38. https://doi.org/10.1080/17565529.2021.1877104

Vincent, K., Wanjiru, L., Aubry, A., Mershon, A., Nyandiga, C., Cull, T., & Banda, K. (2012). Gender, Climate Change and Community-Based Adaptation, UNDP-United Nations Development Programme. *New York.*

Vinh, N. Q. (1996). Women and Institutional Changes in a Developing Rural Area. In *Vietnam's Women in Transition* (pp. 207-213). Springer.

Vu, D., Yamada, T., & Ishidaira, H. (2018). Assessing the impact of sea level rise due to climate change on seawater intrusion in Mekong Delta, Vietnam. *Water Science and Technology, 77*(6), 1632-1639.

Waite, L. (2000). How is household vulnerability gendered? Female-headed households in the collectives of Suleimaniyah, Iraqi Kurdistan. *Disasters, 24*(2), 153-172.

Walker, H. M., Culham, A., Fletcher, A. J., & Reed, M. G. (2019). Social dimensions of climate hazards in rural communities of the global North: An intersectionality framework. *Journal of Rural Studies, 72*, 1-10.

Wamsler, C., & Brink, E. (2014). Moving beyond short-term coping and adaptation. *Environment and Urbanization, 26*(1), 86-111.

Wamsler, C., Brink, E., & Rentala, O. (2012a). Climate change, adaptation, and formal education: the role of schooling for increasing societies' adaptive capacities in El Salvador and Brazil. *Ecology and Society, 17*(2).

Wamsler, C., Brink, E., & Rentala, O. (2012b). Research, part of a Special Feature on Education and Differential Vulnerability to Natural Disasters Climate Change, Adaptation, and Formal Education: the Role of Schooling for Increasing Societies' Adaptive Capacities in El Salvador and Brazil.

Warner, K., Van Der Geest, K., Kreft, S., Huq, S., Harmeling, S., Kusters, K., & De Sherbinin, A. (2012). *Evidence from the frontlines of climate change: loss and damage to communities despite coping and adapation*. UNU-EHS.

Watson, D. D. (2014). Climate Change and Agriculture: Countering Doomsday Scenarios.

Watson, E. E. (2004). ‘What a dolt one is’: language learning and fieldwork in geography. *Area, 36*(1), 59-68.

Watts, M. J. (2013). *Silent violence: Food, famine, and peasantry in northern Nigeria* (Vol. 15). University of Georgia Press.

Watts, M. J. (2015). Now and then: the origins of political ecology and the rebirth of adaptation as a form of thought. In *The Routledge handbook of political ecology* (pp. 19-50). Routledge.

Wekwete, N. N. (2014). Gender and economic empowerment in Africa: Evidence and policy. *Journal of African Economies, 23*(suppl_1), i87-i127.

Wenger, E. (2000, 2000/05/01). Communities of Practice and Social Learning Systems. *Organization, 7*(2), 225-246. https://doi.org/10.1177/135050840072002

Wenger, E. (2001). Communities of Practice. In N. J. Smelser & P. B. Baltes (Eds.), *International Encyclopedia of the Social & Behavioral Sciences*. NJ Smelser and PB Baltes.

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., Thompson, J., Nilsson, M., Lambin, E., & Sendzimir, J. (2011). Tipping toward sustainability: emerging pathways of transformation. *Ambio, 40*, 762-780.

Wheelock, J., & Oughton, E. (1996). The household as a focus for research. *Journal of economic issues, 30*(1), 143-159.

White, H., & Masset, E. (2003). The Importance of Household Size and Composition in Constructing Poverty Profiles: An Illustration from Vietnam. *Development & Change, 34*(1), 105-126. https://doi.org/10.1111/1467-7660.00298

White, I. (2002). *Water management in the Mekong Delta: changes, conflicts and opportunities*. Citeseer.

Whitehead, A. (2010). Tracking Livelihood Change: Theoretical, Methodological and Empirical Perspectives from North-East Ghana. *Journal of Southern African Studies, 28*(3), 575-598. https://doi.org/10.1080/0305707022000006521

WHO. (2002). *Gender and health in disasters*. https://apps.who.int/iris/bitstream/handle/10665/68886/a85575.pdf

Wiens, T. B. (1998). Agriculture and rural poverty in Vietnam. *Household Welfare and Vietnam's Transition, 1998*, 61-98.

Wiest, R. E., Mocellin, J. S., & Motsisi, D. T. (1994). *The needs of women in disasters and emergencies*. Disaster Research Institute, University of Manitoba Winnipeg, MB, Canada.

Wilby, R. L., & Dessai, S. (2010). Robust adaptation to climate change. *Weather, 65*.

Wilson, K. (2013). Agency as 'smart economics': neoliberalism, gender and development. In *Gender, agency, and coercion* (pp. 84-101). Springer.

Wilson, K. (2015). Towards a radical re-appropriation: Gender, development and neoliberal feminism. *Development and Change, 46*(4), 803-832.

Winarto, Y. T., Stigter, K., Prahara, H., Anantasari, E., & Kristiyanto. (2011). Collaborating on Establishing an Agro-meteorological Learning Situation among Farmers in Java. *Anthropological Forum, 21*, 175 - 197.

Winter, G. (2000). A comparative discussion of the notion of validity in qualitative and quantitative research. *The Qualitative Report, 4*(3), 1-14.

Wise, R. M., Fazey, I., Stafford Smith, M., Park, S. E., Eakin, H. C., Archer Van Garderen, E. R. M., & Campbell, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change, 28*, 325-336. https://doi.org/10.1016/j.gloenvcha.2013.12.002

Wisner, B. (2001). Capitalism and the shifting spatial and social distribution of hazard and vulnerability. *The Australian Journal of Emergency Management, 16*(2), 44-50.

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (1994). *At risk: natural hazards, people's vulnerability and disasters*. Routledge.

Wood, A. L., Ansah, P., Rivers III, L., & Ligmann-Zielinska, A. (2021). Examining climate change and food security in Ghana through an intersectional framework. *The Journal of Peasant Studies, 48*(2), 329-348.

Woolcock, M. (2000). Using social capital: Getting the social relations right in the theory and practice of economic development. *The World Bank Research Observer, 15*(2), 225-249.

World Bank (2010). *Economics of Adaptation to Climate Change in Vietnam*. https://openknowledge.worldbank.org/handle/10986/12747

World Bank (2015). *World Bank Forecasts Global Poverty to Fall Below 10% for First Time; Major Hurdles Remain in Goal to End Poverty by 2030*. https://www.worldbank.org/en/news/press-release/2015/10/04/world-bank-forecasts-global-poverty-to-fall-below-10-for-first-time-major-hurdles-remain-in-goal-to-end-poverty-by-2030

World Bank Group (2021). *Vulnerability - Natural Hazard Statistics in Vietnam*. https://climateknowledgeportal.worldbank.org/country/vietnam/vulnerability

Wright, H., Vermeulen, S., Laganda, G., Olupot, M., Ampaire, E., & Jat, M. L. (2017). Farmers, food and climate change: ensuring community-based adaptation is mainstreamed into agricultural programmes. In *Community-based adaptation* (pp. 40-50). Routledge.

Wutich, A., York, A. M., Brewis, A., Stotts, R., & Roberts, C. M. (2012). Shared cultural norms for justice in water institutions: Results from Fiji, Ecuador, Paraguay, New Zealand, and the US. *Journal of Environmental Management, 113*, 370-376.

Xuân, V.-T., & Matsui, S. (1998). *Development of farming systems in the Mekong Delta of Vietnam*. Ho Chi Minh City Publishing House Ho Chi Minh City.

Yen, K. C., Platt, M., Yeoh, B. S., & Lam, T. (2015). Structural Conditions and Agency in Migrant Decision-Making: A Case of Domestic and Construction Workers from Java, Indonesia. *Sussex: Migrating out of Poverty Research Programme Consortium*.

Ylipaa, J., Gabrielsson, S., & Jerneck, A. (2019). Climate change adaptation and gender inequality: insights from rural Vietnam. *Sustainability, 11*(10), 2805.

Yuan, R., Zhu, J., & Wang, B. (2015). Impact of sea-level rise on saltwater intrusion in the Pearl River Estuary. *Journal of Coastal Research, 31*(2), 477-487.

Zhang, N., Huang, H., Su, B., Zhao, J., & Zhang, B. (2014). Information dissemination analysis of different media towards the application for disaster pre-warning. *PLoS One, 9*(5), e98649.

Zhao, H., Gu, X., Yang, T., & Gu, B. (2022). Evolutionary logic and development foresight of environmental collaborative governance policy in the Yangtze River Delta. *Land, 11*(9), 1404.

Ziervogel, G. (2019). Building transformative capacity for adaptation planning and implementation that works for the urban poor: Insights from South Africa. *Ambio, 48*(5), 494-506.

Ziervogel, G., & Calder, R. (2003). Climate variability and rural livelihoods: assessing the impact of seasonal climate forecasts in Lesotho. *Area, 35*(4), 403-417.

Zinzani, A. (2018). Deconstructing coastal sustainable development policies: towards a political ecology of coastalscapes in Vietnam. *Geography Notebooks, 2*(1), 81.

Zurick, D. N. (1988). Resource needs and land stress in Rapti Zone, Nepal. *The Professional Geographer, 40*(4), 428-444.

List of Acronyms

AM	An My
AP	An Phu
AR	Assessment Report
AUD	Australian Dollar
USAID	United States Agency for International Development
CTU	Can Tho University
DARD	Department of Agriculture and Rural Development
FPE	Feminist Political Ecology
GSO	General Statistics Office
HH	Household
HYVs	High Yielding Varieties
IPCC	Intergovernmental Panel on Climate Change
LXQ	Long Xuyen Quadrangle
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
MRC	Mekong River Commission
NGOs	Non-Governmental Organisations
OECD	Organisation for Economic Co-operation and Development
PH	Phu Huu
PPC	Provincial People's Committee
UN	United Nations
UNDP	United Nations Development Program
UNFCC	United Nations Framework Convention on Climate Change
VMD	Vietnamese Mekong Delta
VND	Vietnamese Dong
WGSG	Women and Geography Study Group

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Appendices

Appendix 1: Human research ethics clearance

Human Research Ethics
Research Services
University of New England
Armidale NSW 2351 Australia
Phone 02 6773 3449
humanethics@une.edu.au

www.une.edu.au/research-services

UNIVERSITY OF NEW ENGLAND HUMAN RESEARCH ETHICS COMMITTEE

MEMORANDUM TO: Prof Neil Argent, Dr Sonya Glavac & Dr Van Nguyen (ADJSD),
School of Humanities, Arts and Social Sciences

PROJECT TITLE: The role of gender and socio-political power relations in transforming smallholder livelihoods: A case study from the Vietnamese Mekong Delta.

APPROVAL No.: HE23-186

COMMENCEMENT DATE: 18 March, 2024

Thank you for submitting the above research project for ethical review. This project was considered by the University of New England Human Research Ethics Committee (UNE HREC) at its meeting held on 30 November, 2023
I am pleased to advise you that the above research project meets the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and ethical approval for this research project has been granted by UNE HREC.

Approval of this project from UNE HREC is valid from 18 March, 2024 to 31 December, 2024 subject to the following conditions being met:

- Immediately report anything that might warrant review of ethical approval of the project.
- Notify the UNE HREC of any event that requires a modification to the protocol or other project documents and submit any required amendments in accordance with the instructions provided by the HREC. These instructions can be found at Applying for human ethics approval - University of New England (UNE)
- Submit any necessary reports related to the safety of research participants in accordance with UNE HREC policy and procedures.
- If the project runs for longer than 12 months, report to the UNE HREC annually in the specified format by completing the Progress Report form found at Applying for human ethics approval - University of New England (UNE)
- Notify the HREC when the project is completed at all sites by completing the Final Report form found at Applying for human ethics approval - University of New England (UNE)
- Notify the UNE HREC if the project is discontinued at a participating site before the expected completion date, with reasons provided.
- Notify the UNE HREC of any plan to extend the duration of the project past the approval period listed above and submit any associated required documentation. Instructions for obtaining an extension of approval can be found at Applying for human ethics approval - University of New England (UNE).
Researchers cannot conduct any research on the project if the approval period has lapsed.
- Notify the UNE HREC of their inability to continue as Principal Investigator including the name of and contact information for a replacement or a project abandonment notification.

Human Research Ethics
Research Services
University of New England
Armidale NSW 2351 Australia
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This letter constitutes ethical approval only. This project cannot proceed at any site until separate research governance authorisation has been obtained from the CEO or Delegate of the institution under whose auspices the research will be conducted at that site.

Should you have any queries about the UNE HREC's consideration of your project please contact the Research Ethics Officer. The UNE HREC's Terms of Reference, Standard Operating Procedures, membership and standard forms are available from Human Research Ethics - University of New England (UNE)

The University of New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully,

[redacted]

Prof Christopher Armstrong
Deputy Vice-Chancellor, Research
University of New England

This HREC is constituted and operates in accordance with the National Statement on Ethical Conduct in Human Research (2007).

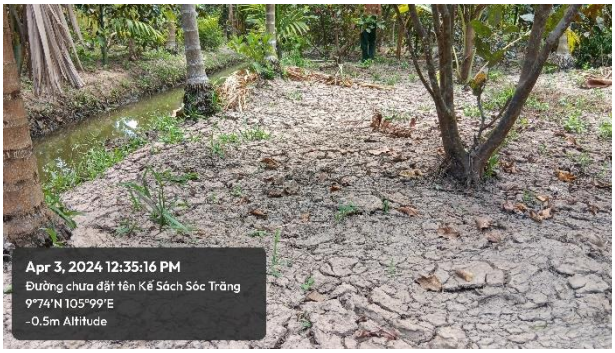
Appendix 2: Glossary of Terms

Key terms	Definition	Supporting literature
Gender	Gender refers to socially constructed roles, responsibilities and opportunities associated with men and women, as well as hidden power structures that govern the relationships between them [(1)]. Gender is viewed as a social and cultural concept. It refers to social and cultural differences in identity, expression and experience as a man, woman or non-binary person. Non-binary is an umbrella term describing gender identities that are not exclusively male or female [(2)].	[(1)] Vincent et al. (2012) [(2)] Australian Bureau of Statistics (2020)
Sex	Sex is understood in relation to sex characteristics. Sex recorded at birth refers to what was initially determined by sex characteristics observed at birth or infancy.	Australian Bureau of Statistics (2020)
Gendered vulnerability	Gendered vulnerabilities to climate change arise from unequal power dynamics, unequal involvement in decision-making, and culturally ingrained norms that limit fair access to opportunities and resources.	Rao et al. (2019)
A natural disaster	A natural disaster is the realization of a natural hazard. A natural disaster is the actual consequence of a natural hazard within a social system.	Smith and Petley (2009)
Disaster risks	The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity [(1)]. Disaster risk is a combination of the factors that determine the potential for people to be exposed to particular types of natural hazard. But it also depends fundamentally on how social systems and their associated power relations impact on different social groups (through their class, gender, ethnicity, etc.) [(2)].	[(1)]UNGA (2016, p. 14) [(2)]Wisner et al. (1994, p. 7)

Climate hazards	The rising occurrence of severe climate hazards, including floods, cyclones, mudslides, heat waves, and droughts, linked to climate change, is exerting pressure on already fragile livelihoods by impacting both tangible and intangible cultural heritage assets. (1) Climate hazards indicate high-intensity phenomena such as floods, storms, droughts, and heatwaves that have escalated in frequency and severity worldwide due to anthropogenic climate change. (2)	(1) Dembedza et al. (2022) (2) Thomas and López (2015)
Social-ecological system	Social-ecological system is integrated system of ecosystems and human society with reciprocal feedback and interdependence. The concept emphasizes the humans-in-nature perspective.	Folke et al. (2010, p. 3)
Socio-ecological adaptation	Social-ecological adaptation is the 'capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure and feedbacks, and therefore identity, that is, the capacity to change in order to maintain the same identity'.	Folke et al. (2010)
Transformation	Transformation can be defined as "a fundamental qualitative change . . . that often involves a change in paradigm and may include shifts in perception and meaning, changes in underlying norms and values, reconfiguration of social networks and patterns of interaction, changes in power structures, and the introduction of new institutional arrangements and regulatory frameworks".	IPCC (2012, p. 465)
Transformational adaptation	Transformational adaptation in agriculture entails significant, non-marginal alterations in reaction to climate change. (1) Transformational adaptation of agricultural livelihoods involves significant, non-linear changes in response to climate change, frequently necessitating the reallocation of a minimum of one-third of essential productive resources, like land, labour, or capital. (2)	(1) Rickards and Howden (2012) (2) Vermeulen et al. (2018)

Appendix 3: Natural landscapes and climate hazards in An My commune, Soc Trang province

Riverbank erosion along the public road

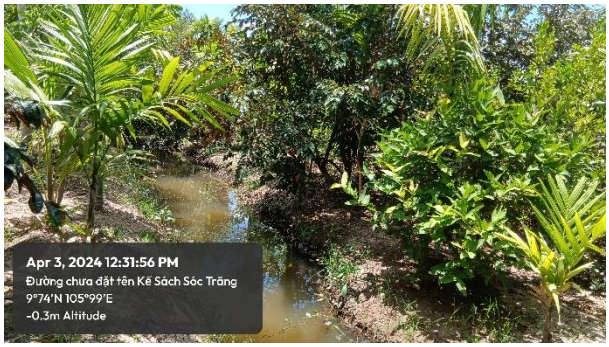


Severe droughts facing by fruit farmers

Reduced water levels affect the transportation and food deliveries

Saltwater intrusion and water shortage for irrigation

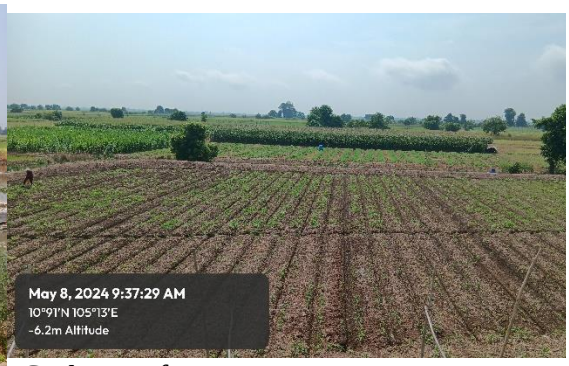
Small canals maintaining for water storage



sive integrated fruit farming practices

Appendix 4: Natural landscapes and climate hazards in Phu Huu commune, An Giang province

River-dependent livelihoods



Cash crop farming practices

Aquaculture farming systems

In-depth interviews with local fishermen

Sluice gates for flood management

Intensive rice farming practices

Appendix 5: (SEMI-STRUCTURED) HOUSEHOLD SURVEY QUESTIONNAIRE

Hamlet, District, Commune:		Date of Interview:	
Household ID:		**Interview Duration:**	
Percentage of Questionnaire Completed (verified by the interviewer):		Interviewer's Full Name:	

SECTION A – SOCIO-ECONOMIC AND DEMOGRAPHIC INFORMATION

1. Household structure and composition

1.1 Total number of household members: ..... (persons)

a. Male: ..... (persons)

b. Female: ..... (persons)

Among them:

c. Children: ..... (persons)

d. Elderly: ..... (persons)

1.2 Migrant family members: ..... (persons)

a. Year-round migrants: ..... (persons)

b. Seasonal migrants: ..... (persons)

1.3 Is the interviewee the household head?

Yes (proceed to 1.4.2)

No (proceed to 1.4)

1.4 Information on household members

a. Identifier (No name required)	**b. Age (Year of birth)**	**c. Gender (1=Male, 2=Female, 3=Other)**	**d. Ethnicity (1=Kinh, 2=Khmer, 3=Cham, 4=Hoa)**	**e. Relationship to household head (1=Spouse, 2=Parent, 3=Son/Daughter, 4=Grandparent, 5=Other)**	**f. Residency (1=Permanent, 2=Temporary)**	**g. Highest education attained***	**h. Main occupation****	**i. Secondary occupation****
1. Interviewee								

2. Household head								

Note:

*Education levels:

0 = Illiterate; 1 = Primary school; 2 = Lower secondary school; 3 = Upper secondary school; 4 = University graduate; 5 = Postgraduate; 6 = Never attended school

**Main and secondary occupations: 1 = Child (under 6 years old); 2 = Student; 3 = Housework; 4 = Rice farmer; 5 = Vegetable grower; 6 = Livestock farmer; 7 = Aquaculture farmer; 8 = Government employee; 9 = Private sector employee; 10 = Self-employed (non-agricultural); 11 = Income from government subsidies; 12 = Income from family remittances; 13 = Natural fishing; 14 = Fruit grower

1. Household Income Details

Please indicate how many income sources your household had over the past 12 months (from January to December 2023):

a. Name of Income Source*	b. Type of Income (1 = Main; 2 = Secondary)	c. Total Amount (Million VND/year)
2.1		
2.2		
2.3		
2.4		
2.5		
2.6		

***Occupations (main and secondary):** 1 = Child (under 6 years old); 2 = Student; 3 = Housework; 4 = Rice farmer; 5 = Vegetable grower; 6 = Livestock farmer; 7 = Aquaculture farmer; 8 = Government employee; 9 = Private sector employee; 10 = Self-employed (non-agricultural); 11 = Government subsidies; 12 = Family remittances; 13 = Natural fishing 14 = Fruit grower

2.5 Total income from main sources over the past 12 months: ..... million VND/year

2.6 Total income from secondary sources over the past 12 months: ..... million VND/year

2.7 Total household income over the past 12 months: ..... million VND/year

3. Household Expenditure

3.1 Total household expenditure (excluding production investment) over the past 12 months: ..... million VND/year

3.1.a Electricity/Water expenses (dry season): ..... million VND/month × ..... months

3.1. b Electricity/Water expenses (rainy season): ..... million VND/month × ..... months

3.2 Total household expenditure for production investment over the past 12 months: ..... million VND/year

SECTION B – HOUSEHOLD ASSETS, SAVINGS, AND CREDIT

4. In the past 12 months, has your household owned or used any agricultural land?

- 1 = Yes (please continue with the table below)
- 2 = No (skip to question 5)

Plot No.	a. Area	b. Farming model (multiple	c. Land location	d. Tenure	e. Rental cost	f. Who engages in production	g. Who owns the land	h. Since what year have you

		choices allowed):						**owned/rented/leased this land?**
	(m^2/household)	1=Fruit trees, 2=Rice, 3=Livestock (e.g. chickens, ducks), 4=Aquaculture, 5=Other (specify)	1=Adjacent to house, 2=Further away (distance in km), 3=Other	1=Owned, 2=Rented, 3=Leased out, 4=Other – specify ownership/use agreement	(million VND/1,000m^2/year)	1=Male, 2=Female, 3=Children, 4=Youth (male & female), 5=Both male & female, 6=Everyone	1=Male, 2=Female, 3=Both male and female	
1. Plot 1								
2. Plot 2								
3. Plot 3								
4. Plot 4								

5. Household Savings and Credit: ***Please respond to the following questions (circle the appropriate answer):***

1. Savings Do you currently have any household savings? 1 = Yes 2 = No	**a. Please indicate the amount of household savings:** 1 = Less than 2 million VND/year 2 = 2 – 5 million VND/year 3 = 5 – 10 million VND/year 4 = More than 10 million VND/year	**b. What forms of savings or investment are you using?** (Multiple choices allowed) 1 = Buying gold 2 = Keeping cash at home 3 = Bank deposits 4 = Purchasing insurance (excluding health and accident insurance) 5 = Other (please specify)	**c. What are your purposes for saving?** (Multiple choices allowed) 1 = Health care (for illness, disease prevention, etc.) 2 = Travel 3 = Purchasing assets (e.g., farmland, house construction, motorbike, tractor, etc.) 4 = Covering children's educational expenses 5 = Costs for ceremonies and festivals (e.g., weddings, Lunar New Year) 6 = Investment in a new occupation 7 = Emergency needs 8 = Disaster response (e.g., flood, drought, storm, salinity intrusion) 9 = Other (please specify)
2. Credit/Debt Do you currently have any household debt? 1 = Yes 2 = No	**a. Please indicate the total household debt (if known):** 1 = Less than 2 million VND/year 2 = 2 – 5 million VND/year 3 = 5 – 10 million VND/year 4 = More than 10 million VND/year	**b. Source and type of credit/debt program: (Multiple choices allowed)** 1 = From relatives 2 = From friends 3 = From a bank 4 = Informal loan (from financial company or individuals) 5 = Credit debt (installment purchase) 6 = Rotating savings and credit group (e.g., informal mutual fund) 7 = Other (please specify)	**c. What was the purpose of the loan?** …… …… …… …… …… ……

SECTION C – CLIMATE CHANGE CONTEXT: EXPERIENCES, PERCEPTIONS, AND RESPONSES

6. How has your household's economic situation changed over the past 10 years?

1 = Improved

2 = Worsened

3 = Unchanged (skip to question 8)

7. What are the main reasons for the changes in your household economy over the past 10 years?

……

……

8. Have you ever heard or received any information about “climate change”? (Note: Read the phrase exactly as written)

1 = Yes

2 = No (skip to question 9)

If yes:

a. How do you understand the concept of climate change?

……

……

b. How has it affected your household economy?

……

……

9. What types of extreme weather events or natural disasters have you experienced in the past 10 years? How did they affect your family life? What did your family do to respond to or mitigate the impacts?

a. Type of Disaster	**b. Time of Occurrence (Month)**	**c. Severity (impact on agricultural livelihoods) (1 = Not severe, 2 = Severe, 3 = Very severe)**	**d. Frequency of Occurrence (1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Frequently, 5 = Always)**	**e. Risk Impact Level (1 = Low, 2 = Medium, 3 = High risk)**	**f. Ranking of Disaster Impact (1 = Most impactful, 2 = Second most, 3 = Third most)**
1. Flood					
2. Unusual flooding					
3. Heavy rainfall					
4. Unseasonal rain					
5. Excessive heat (High temperature)					
6. Drought and water scarcity					
7. Saline intrusion/drought					
8. Land subsidence					
9. River/dike bank erosion					
10. Storms					
11. Soil erosion					

12. Water pollution					
13. Crop/livestock epidemics					
14. Changes in upstream water flow					
15. Other (please specify):					

10. [CASE: SALINE INTRUSION] – How has your household's agricultural livelihood model been affected by salinity intrusion? Please answer the following information:

Salinity levels	**a. How has it affected your agricultural model?** 1 = No effect 2 = Nutrient depletion in crops (yellowing, leaf wilting, etc.) 3 = Crop death (especially young plants) 4 = Other (please specify)	**b. Where did you access information from?** 1 = Internet 2 = FM/Radio 3 = Friends 4 = Television 5 = Non-Governmental Organizations (NGOs) 6 = Hamlet/commune officials (Zalo groups/mobile speakers) 7 = Fixed loudspeakers 8 = Other (please specify)	**c. Household disaster response and recovery strategies***		**d. Local government disaster response and recovery strategies**	
			1. Coping strategies: a = Water storage (pumping water into cultivation fields) b = Blocking dikes (preventing water from entering the fields) c = Monitoring agricultural areas (checking/reinforcing embankments/dikes to prevent leakage) d = Other	**2. Post-disaster recovery strategies:** 1 = Borrowing money (from banks) 2 = Contract-based production (e.g., buying fertilizers on credit from agents) 3 = Working as hired labor 4 = Pawning agricultural land 5 = Other (please specify)	**1. Coping strategies:** 1 = Daily salinity updates via Zalo 2 = Mobile speakers 3 = Announcements via fixed loudspeakers 4 = Other (please specify)	**2. Post-disaster recovery strategies:** 1 = Financial or land compensation support 2 = Support with fertilizers/seedlings 3 = Other
1. Salinity below 1.0 ppt (parts per thousand)						
2. Salinity from 1.0 to under 2.0 ppt						
3. Salinity above 2.0 ppt						

Reference: *Coping strategies: 1 = Selling assets; 2 = Borrowing money or food; 3 = Working as a hired laborer; 4 = Receiving aid/gifts from organizations or charitable individuals; 5 = Reducing household expenditures; 6 = Starting a new livelihood activity; 7 = Fishing/gathering wild vegetables; 8 = Labor migration to earn additional income; 9 = Community-based activities (religious, cultural, or social); 10 = Converting agricultural land to aquaculture; 11 = Switching from crop cultivation to livestock raising; 12 = Increasing the number of crop seasons; 13 = Crop diversification; 14 = Using flood- or salinity-resistant crops; 15 = Other (please specify)*

10.4 Have you been satisfied with your household's current disaster response strategies?

1 = Yes
2 = No
3 = Not sure

10.4.a If not or unsure, why?

……

10.5 Have you been satisfied with the local government's current disaster response strategies?

1 = Yes
2 = No
3 = Not sure

10.5.a If not or unsure, why?

……

11. [CASE: WATER-RELATED CHALLENGES] – Has your household's agricultural livelihood model been affected by water-related issues (floods, inundation, etc.)? Please answer the following information:

Types of climate events	**a. How did it affect your farming systems?**	**b. Where did you access information from?** 1 = Internet 2 = FM/Radio 3 = Friends 4 = Television 5 = Non-Governmental Organizations (NGOs) 6 = Hamlet/block/commune leaders 7 = Other (please specify)	**c. Household disaster response and recovery strategies***		**d. Local government disaster response and recovery strategies***	
			1. What coping strategies were used?	2. What post-disaster recovery strategies were used?	1. What coping strategies were used?	2. What post-disaster recovery strategies were used?
1. Low (small) floods						

2. Medium floods ('beautiful flooding')						
3. High floods						
4. Excessive heat						
5. Irrigation water shortages						
6. Storms (early rainy season)						
7. Riverbank/road erosion						

Note: *Response strategies include*: 1 = Selling assets; 2 = Borrowing money or food; 3 = Working as hired labor; 4 = Receiving aid/gifts from organizations or individuals; 5 = Reducing household expenditure; 6 = Starting new livelihood activities; 7 = Fishing/gathering wild vegetables; 8 = Migrating for work to earn income; 9 = Community activities (religious, cultural, social)*

10 = Converting farmland to aquaculture; 11 = Shifting from crop to livestock farming; 12 = Increasing crop seasons; 13 = Diversifying crops; 4 = Using flood/salinity-tolerant crop varieties; 15 = Other (please specify).

11.4 Have you been satisfied with your household's current disaster response strategies?

1 = Yes 2 = No 3 = Not sure

11.4.a Why?

……

11.5 Have you been satisfied with the local government's current disaster response strategies?

1 = Yes 2 = No 3 = Not sure

11.5.a Why?

……

12. Please describe the status of land ownership when natural disasters occurred over the past 10 years:

a. Type of disaster (Refer to question 9e)*)*	**b. Status of cultivated land at the time of the disaster (the largest land plot):** 1 = Still cultivated 2 = No longer cultivated 3 = No change	**c. Before the disaster, did you have more or less land?** 1 = Less land 2 = More land 3 = No change	**d. Please explain why you had more or less land after the disaster:**
1.			

2.			
3.			

13. In your opinion, what are the causes of extreme weather patterns (climate change) in your locality over the past 10 years?

a. Type of disaster (Refer to question 9e)	**b. Cause of the disaster:** 1 = Due to global climate/weather change 2 = Due to tidal surges 3 = Due to construction of closed dike systems 4 = Other (please specify)	**c. How has your household been affected?** 1 = Damage to agricultural livelihoods (crops/livestock) 2 = Reduction/loss of freshwater aquatic resources 3 = Other (please specify)	**d. Who is the most vulnerable person in your household?** 1 = Woman (or wife) 2 = Man (or husband) 3 = Both men and women 4 = Children (sons and daughters) 5 = Elderly	**e. Has your family adopted any NEW livelihood or farming models?** 1 = Yes (go to question 14) 2 = No	**f. Has your family added any SUPPLEMENTARY livelihood or farming models?** 1 = Yes (go to question 15) 2 = No
1. Disaster 1: **…….**					
2. Disaster 2: **……**					
3. Disaster 3: **……**					

14. What NEW livelihood/farming models (completely replacing old ones) has your household adopted due to the impacts of natural disasters over the past 10 years?

……

……

15. What SUPPLEMENTARY livelihood/farming models (added in addition to existing ones) has your household adopted due to the impacts of natural disasters over the past 10 years?

……

……

16. If your household has transformed or added livelihood/farming models, please explain why you made these changes.
……
17. What percentage of your household's total income comes from these new livelihood/farming models?
% Contribution: ……
18. How would you assess the change in your household's livelihood/farming models (new or supplementary) over the past 10 years?
a. Improved
b. No change
c. Worsened
Please explain why:
……
19. Do you expect these new/supplementary livelihood/farming models to become your household's MAIN source of income in the next 10 years?
1 = Yes
2 = No
a. Why?
……
……
……
……

20.1. Please provide additional details about the supplementary or transformed livelihood/farming models your household has adopted:

Household Livelihood Activities (based on answers in questions 14 and 15)	**a. Who in the household proposed the idea/plan to implement this model?** 1 = Female (or wife) 2 = Male (or husband) 3 = Both male and female 4 = Child (son or daughter)	**b. Who in the household made the final decision to implement this model?** 1 = Female (or wife) 2 = Male (or husband) 3 = Both male and female 4 = Child (son or daughter)	**c. Roles and responsibilities of household members***	
			1. Male: (please specify assigned tasks)	2. Female: (please specify assigned tasks)
1. Agricultural activities (e.g., crop farming, livestock, aquaculture) – specify: ……				
1.a Is this your current livelihood activity? 1 = Yes 2 = No				

2. Non-farm activities (e.g., selling pesticides/fertilizers, processed product businesses) – specify: ……				
2.a Is this your current livelihood activity? 1 = Yes 2 = No				
3. Off-farm activities (e.g., grocery selling, fishing, street vending) – specify: ……				
4. Other activities – specify: ……				
4.a Is this your current livelihood activity? 1 = Yes 2 = No				

Note: ****Examples of household member responsibilities:*** *1 = Spraying fertilizers/pesticides; 2 = Irrigation and water pumping; 3 = Managing, transporting, harvesting, and selling produce; 4 = Cleaning animal sheds; 5 = Feeding livestock daily; 6 = Managing animal health (buying veterinary medicine); 7 = Weeding; 8 = Replanting rice; 9 = Field weeding.*

21. Over the past 10 years, how would you evaluate the participation of local authorities/organizations in mitigating the impacts of natural disasters? Please share your opinion on the following aspects:

Aspects of Governance	**Evaluation for the 3 disasters mentioned in question 9f** (Scale: 1 = Very low, 2 = Low, 3 = Moderate, 4 = High, 5 = Very high, 0 = No response/Don't know)		
	Disaster 1 ……..	**Disaster 2** ……	**Disaster 3** ……
1. The local authorities provided clear guidance on what to do during disasters.			
2. Your level of compliance with the local authority's guidance for disaster response.			
3. Responsibility of local authorities in responding to disasters.			
4. Effectiveness of support from organizations/authorities in helping you recover after disasters.			
5. Your level of satisfaction with the disaster response efforts by organizations/local authorities.			

SECTION D – GENDER RELATIONS, CLIMATE CHANGE, AND LIVELIHOODS

Gender Roles and Responsibilities

22. What are the MAIN roles and responsibilities of women in your household?

……

23. What are the MAIN roles and responsibilities of men in your household?

……

24. Do women have any ADDITIONAL responsibilities?

1 = Yes

2 = No

a. If yes, please specify what these responsibilities are:

……

25. How do these ADDITIONAL roles and responsibilities affect women's participation in income-generating activities?

……

26. Have women's roles changed over time due to the impacts of extreme climate events?
1 = Yes
2 = No
a. If yes, why and how have they changed?
……
……

Access to Local Weather/Climate Information

27a. Have you received weather information from any source in the past 5 years?
1 = Yes 2 = No
28b. From which sources do you follow weather/climate information?
(Multiple choices allowed)
1 = Internet
2 = FM/Radio
3 = Television
4 = Friends
5 = Non-Governmental Organizations (NGOs)
6 = Hamlet/commune officials (Zalo/mobile loudspeakers, etc.)
7 = Other (please specify): _____

29c. What are your two most preferred sources of weather/climate information? (1) Most preferred; (2) Second most preferred

1. Internet	☐	2. FM/Radio	☐
3. Tivi	☐	4. Friends	☐
5. NGOs	☐	6. Hamlet/commune officials (Zalo/mobile loudspeakers)	☐
7. Other (specify) ……	☐		

30d. For each preferred weather/climate information source, please explain why it is prioritized:
(1) Most preferred: ……
(2) Second most preferred: ……
31a. Do you find the above weather/climate information sources useful in helping you prepare for natural disasters in your locality?
1 = Yes 2 = No 3 = Not sure

32b. If not, why do you think the above weather/climate information is not useful?

……

SECTION E – SOCIAL NETWORK AND THE ROLE OF LOCAL AUTHORITIES

33. Are you a member of any local group or organization in your community?

1 = Yes

2 = No

a. If "No", please explain why:

……

b. If "Yes", which of the following local groups do you participate in?

(Multiple choices allowed)

1 = Farmers' Union

2 = Women's Union

3 = Youth Union

4 = Veterans' Association

5 = Credit group (e.g., informal savings groups)

6 = Agricultural Extension Association

7 = Local Red Cross

8 = Other (please specify):

c. Have you participated in any activities (e.g., tree planting, dike reinforcement, bank protection) organized by these local groups in the past 10 years?

1 = Yes

2 = No

If yes or no, please explain your reason:

……

34a. Have you received any support from local groups during natural disasters?

1 = Yes (continue to 35b)

2 = No (skip to 35c)

35b. If "Yes", what kind of support did you receive?

(Multiple choices allowed)

1 = Financial support during the disaster

2 = Financial support for relocation

3 = Compensation for disaster-related damages

4 = Livelihood transition advice
5 = Other (please specify):
35c. If “No”, please explain why:
……
36a. Was the support timely and effective in helping you respond to the disaster?
1 = Yes
2 = No (continue to 36b)
36b. If yes or no, please explain why:
……
37a. Are you aware of any national or local disaster management programs/policies?
1 = Yes (continue to 37b)
2 = No (skip to 37g)
37b. Have you ever applied for assistance from any of these programs/policies to cope with a disaster in the past 10 years?
1 = Yes (continue to 37d)
2 = No (continue to 37c)
37c. If “No”, please explain why you did not seek assistance:
……
37d. If “Yes”, what type(s) of assistance did you receive?
(Multiple choices allowed)
1 = Financial aid
2 = Food
3 = Housing
4 = Advisory information
5 = Other (please specify): _____
37e. Were you satisfied with the assistance you received?
1 = Yes
2 = No (continue to 37f)
37f. If “No”, why were you not satisfied?
……
37g. Why are you not aware of national or local disaster management programs/policies?
……
38a. Have you participated in any training programs on disaster preparedness and response in your locality?

1 = Yes (continue to 38b)
2 = No (skip to 38e)
38b. If yes, did you find the training program timely?
1 = Yes (continue to 38c)
2 = No
38c. Was the training useful in helping you reduce the impacts of disasters?
1 = Yes (continue to 39)
2 = No (continue to 38d)
38d. If "No", why was the training not useful to you?
……
38e. Why didn't you participate in the disaster preparedness and response training program?
……
39. What do you think you could do to improve your participation in disaster risk reduction decision-making or planning in your community?
39a. Yes, please specify:
……
39b. Not applicable

Thank you for completing the survey!

Appendix 6**: QUESTIONS FOR SEMI-STRUCTURED INTERVIEWS**

(Local farmers)

Date of investigation:

Name of interviewer:

SECTION A- PARTICIPANT CHARACTERISTICS

A1. Sex of Participant 1. Male 2. Female 3. Other gender/no specific gender

A2. Age of Participant……...

A3. Marital status of participant

1. Single 2. Married 3. Divorced 4. Widowed 5. Separated

A4. Ethnic groups

1. Vietnamese 2. Islamic 3. Khmer 4. Chinese

A5. Education Level:

0-None; 1-Primary; 2-Secondary; 3-High School; 4-Graduate; 5-Above graduate; 6- Not yet started school

A6. What is your main occupation?

1=Child; 2=School; 3=House/farm; 4= Farmer; 5=Fishermen; 6= Govt-based employee; 7= Private sector employee; 8= Self-employed (non-farm).

A7. Positions in the household (Heads of household/housewife):

……..

A8. How long have you been living in this community?.....

A9. Can you read or write (any language)?

1. Yes (specify…….) 2. No

SECTION B - CLIMATE HAZARDS AND GENDER PERCEPTIONS

B1. Do you believe that the local climate is changing? If yes, which aspects of the climate are changing?

B2. What time of year do you experience such events? (Ask participants to recall their experiences using seasonal calendars.)

B3. Which of the climatic events have you been experiencing **frequently** in the last five years?

B4. How severe have these events/disasters been on women in terms of:

a. Occupation/livelihoods
b. Household duties
c. Health
d. Access to communal infrastructure (water and sanitation, health, market facilities etc.)

B5. What do you believe are the causes of these climate events? (Ask participants to list as many potential causes as they can and rate them in order of significance to them.)

SECTION C - GENDER ROLES AND RESPONSIBILITIES

C1. Have women's roles changed over time as a result of climate variability? If yes, why?

C2. Are women now sharing in roles/responsibilities that were previously performed by men in the household? If yes, why?

C3. Are these roles dependent on availability of natural resources such as water and fuel? If yes, why?

C4. What are the main livelihood activities engaged in by women in this community? Do these livelihood activities differ from or match with those of men? If yes, why?

C5. Have there been any shifts in livelihood activities of women as a result of climate change? If yes, in what ways?

SECTION D - CLIMATE HAZARDS AND THE ROLE OF LOCAL INSTITUTIONS

D1. Do the local authorities of your community have a plan for disaster mitigation? If so, what mechanisms do the local authorities employ to engage you in disaster planning and response?

D2. How do local authorities disseminate information about reducing the risk of natural disasters to the community? Do you believe this procedure of disseminating information takes women's needs and priorities into account?

D3. Are there any social networks in the community that assist women in responding to disasters? If so, how useful are these networks for enhancing your climate-related disaster adaptation?

D4. Does the community have a formal or informal leadership structure? What is the leadership structure of the community? Are women proportionally represented in the leadership of the community? If not, what are the reasons for the current situation?

D5. Are you consulted about or involved in community leadership decisions regarding climate change-related activities and disaster management? If so, what is the level of consultation and/or participation?

D6. Are your contributions considered by local authorities when developing disaster mitigation plans? If not, what obstacles prevent your participation in this process?

SECTION E - ADAPTATION STRATEGIES AND CHANGES OF FUTURE LIVELIHOOD PATTERNS

E1. What categories of resources do women in the community own and control the majority of?

E2. Do you have access to information regarding early warning? If true, then from whom and how?

E3. How would you characterise your disaster recovery since the disaster?

E4. What steps has your family taken to recover and avoid future hazards?

E5. From whom has your family obtained recovery assistance? Why did you seek out this individual or organisation? What forms of social support (money, food, knowledge, etc.) have

they provided for your family? How have you developed your relationships with them? What alterations occur in these relationships during and after the disaster?

E6. From whom do you seek assistance when confronting hardships (lack of funds, illness, etc.)? Why?

E7. Is there anyone from your household who has migrated? Did anyone leave after the disaster events? Where have people gone? Why?

E8. Have your household's livelihood activities changed over the past five years? In what way and why? What does your family/community need to deal with these changes in the future?

E9. What recovery strategies do you adopt in dealing with the climate event and what reasons inform the choice of these strategies?

Thank you for your time!

Appendix 7: **QUESTIONS FOR SEMI-STRUCTURED INTERVIEWS**

(Authorities officials/village heads)

Date of interview:
Place of interview:

Section A: Interviewee's information

Interview's organization:
Position:
Job Responsibilities:
Contact Information:

Section B: Questions about local economy and environmental challenges

B1. How long have you worked in the village?

……
……

B2. How is the village going?

……
……

B3. What are the most significant challenges and opportunities facing the village and region, in your opinion?

……
……

B4. Could you describe the climatic events/disasters affecting farm-based livelihoods in the community (asking for reports, databases)?

……
……

B5. What are the impacts of the disasters on the province/the district/ the commune/village?

……
……

Section C: Questions about local climate adaptation plans/projects

C1. How has your organisation helped farmers in the disaster recovery plans/projects? Do these plans/projects consider gender as a priority issue?

……
……

C2. Could you describe any past disaster recovery plans and/or activities implemented by your community? How about future planning for disaster recovery?

……
……

C3. How long will these plans/activities last?

……
……

C4. Which locations will these plans/activities be implemented in?

……
……

C5. Could you identify particular forms of support for each plan or activity?

……
……

C6. How do these support activities function?

……
……

C7. What are the results of these strategies and activities? How successful are these plans/activities? Are these plans and activities adequate to address current and prospective disasters?

……
……

C8. When a project is planned for a community, how do you get involved? Are you satisfied with this involvement, or do you think it should be different in some way?

……
……

C9. Does your organisation consider gender-related factors when planning and implementing climate adaptation plans/projects?

……
……

C10. To what extent are women's representatives involved in the development and implementation of climate adaptation plans/projects?

……
……

Section D: Questions about laws/ policies

D1. What are the laws, regulations, policies, and strategies that An Giang province/ An Phu district/ Phu Huu commune, and Soc Trang province/Ke Sach district/Nhon My-Xuan Hoa commune's authorities have applied for farm-based livelihood activities?

……
……
……
……
……
……

Thank you for your time!

Appendix 8: **QUESTIONS FOR SEMI-STRUCTURED INTERVIEWS (Experts/NGOs)**

Date of interview:
Place of interview:

Section A: Interviewee's basic information

Interview's organization:
Position:
Job Responsibilities:
Work Experience (years):
Areas of expertise/interests:
Contact Information:

Section B: Questions about the participant's organization

B1. What are the goals and objectives of your organization/projects related to VMD?
……
……
B2. How long has the organisation operated in the VMD?
……
……
B3. What kind of activity does your organisation implement and support for the VMD community?
……
……

Section C: Questions about perception of disaster risks in Mekong Delta

C1. What specific challenges regarding environmental issues do you perceive communities in the MD facing?
……
……
C2. How have these environmental challenges or natural disasters affected the delta?
……
……
C3. Could you provide information about projects related to the disaster risks that you have known or participated in, as well as their impacts on socio-economic development in rural communities?
……
……
C4. Have these outcomes of your organization's projects facilitated the creation of new forms of livelihood for the local community? If yes, in what ways?
……
……

Section D: Questions about government policies related to disaster management

D1. What are the government's strategies and policies for developing the Mekong Delta? To what extent are gender issues incorporated in any formal strategies?
……
……
D2. Has the traditional role of women in disaster management changed over generations?
……
……
……
……

D3. What management strategies do you believe are necessary to enhance women's participation in local disaster management?

……
……

D4. In your opinion, what aspects need to be considered when analysing the impacts of disaster recovery plans for women?

……
……
……
……

D5. How has your personal perspective on gender aspects in disaster management evolved over the years?

……
……

D6. What recommendations and plans should be implemented to ensure gender equality in household and public disaster management?

……
……

D7. How have the government’s strategies for the Mekong Delta’s development affected local farmers?

……
……

D8. Why does your work emphasize gendered and women's issues associated with disaster risks and management?

……
……

D9. In terms of policy, what main reasons hinder the effectiveness of national and provincial gender mainstreaming policies in disaster management?

……
……
……
……

D10. What factors determine the success of gender integration in disaster management projects within rural communities?

……
……

D11. What new forms of livelihood have emerged as a result of the effects of disaster risks?

……
……

D12. How has the government responded to these changes in livelihood?

……
……

Thank you for your time!

Appendix 9: Example of Consent Form for Participants

CONSENT FORM for PARTICIPANTS

Research Project: The role of gender and socio-political power relations in transforming smallholder livelihoods: A case study from the Vietnamese Mekong Delta

---

I, ……., have read the information contained in the Information Sheet for Survey Participants and any questions I have asked have been answered to my satisfaction.
Yes/No

I agree to participate in this activity, realizing that I may withdraw at any time.
Yes/No

I agree that research data gathered for the study may be quoted and published using a pseudonym. Yes/No

I agree to keep confidentially my identity in this research. Yes/No

I agree that my survey response is being used solely for the purpose of this research.
Yes/No

I am 18 years of age or older. Yes/No

…….. …….
Participant Date

…….. …….
Researcher Date

Appendix 10: Example of Interview Recruitment Materials to Key Informants

School of Humanities, Arts and S Sciences
University of New England
Armidale NSW 2351
Australia
Phone: 02 6773 3119
humanethics@une.edu.au

Interview Recruitment Materials to Key Informants

The role of gender and socio-political power relations in transforming smallholder livelihoods: A case study from the Vietnamese Mekong Delta

Type of research: PhD research
PhD investigator: Thai Van Nguyen
Research sites: (1) An My commune, Ke Sach district, Soc Trang province
(2) Phu Huu commune, An Phu district, An Giang province

Introduction and objectives of the semi-structured interviews

Thank you for your agreement to get involved in this interview. Your personal viewpoint is very much appreciated and important to my study.

My name is Thai Van Nguyen, a researcher of the Climate Change Institute, An Giang University, Vietnam. I am currently a PhD candidate at the Department of Geography and Planning, School of Humanities, Arts, and Social Sciences, University of New England (UNE), Australia. This research is being done as part of my PhD project and my supervisor's name is Prof. Neil Argent (Principal supervisor) and Dr. Sonya Glavac (co-supervisor). My PhD study aims to learn about the role of gender and their influence on livelihood transformative adaptation of farming communities impacted by climate hazards in An Giang and Soc Trang provinces of the Vietnamese Mekong Delta.

This interview is to gain an in-depth understanding of your perceptions and experiences with farm-based livelihoods facing climate-related disasters. I'm also interested in examining how your current situation, gender, and social-political relationships influence your livelihood practices. I wish to learn how you developed your livelihood transforming adaptation initiatives, as well as how you interacted with other actors to effectively adapt to such natural disasters.

In order to participate, you must be a local resident aged 18-65 who currently resides in research sites such as An Giang and Soc Trang provinces in Vietnam. This discussion will be recorded, but your confidentiality will be maintained, so do not feel intimidated by the recording. The recording is required for transcription and analysis of data for my research report. If you are unwilling to answer any questions during the interview, please let me know and we can skip them. You have the right to refuse or withdraw from the interview at any point if you are uncomfortable with the questions.

The interview will last approximately 90 to 100 minutes. The information to be recorded will be kept confidential, and no one other than myself will have access to it. Your name will be removed from the file, and a number assigned instead. In addition, the report will be written under a pseudonym.

There is no right or incorrect answer. I am eager to hear your thoughts, ideas, and any experiences you may have. I would highly appreciate it if you could respond honestly to this interview. Your information disclosed in the interview is confidential. I truly appreciate you taking the time to complete this.

For all other questions, or if you would like additional information to assist you in reaching a decision about participation, please feel free to contact Prof. Neil Argent at (02) 6773 2803 and email: nargent@une.edu.au.

Thank you in advance for your interest in this project.

Sincerely yours,

Contact details:
Thai Van Nguyen, PhD Candidate
Department of Geography and Planning
School of Humanities, Arts, and Social Sciences
University of New England, Elm Avenue, Armidale NSW 2351, Australia
Email: tnguy239@myune.edu.au
Phone: (+61) 0493265399.

Appendix 11: Example of Survey Information for Participants

I wish to invite you to participate in my research project, described below.

My name is Thai Van Nguyen and I am conducting this research as part of my PhD in the Department of Geography and Planning, School of Humanities, Arts and Social Sciences at the University of New England. My supervisors are Prof. Neil Argent and Dr. Sonya Glavac.

Research Project	**The role of gender and socio-political power relations in transforming smallholder livelihoods: A case study from the Vietnamese Mekong Delta**
Aim of the Research	The research aims to explore the role of gender in the decision-making of Vietnamese smallholder farm households in relation to natural hazards. Specifically, this research aims to assess: (1) how the geographical setting influences the farming households' perceptions of climate hazards vulnerability; and (2) how gender and social power relations shape the adaptation of rural individuals, households, and communities to climate hazards. This study hopes to provide important insights for local communities, non-profit organisations and governments in promoting adaptation to natural hazards.
Questionnaire survey	I would like to complete a questionnaire with you at your house or at some other mutually convenient place. The questionnaire will take approximately 90 minutes. If you are uncomfortable answering any of the questions, you can leave them blank.
Confidentiality	Any personal details gathered in the course of the study will remain confidential. No individual will be identified by name in any publication of the results. All names will be replaced by pseudonyms; this will ensure your anonymity. If you agree I would like to quote some of your responses. This will also be done in a way to ensure that you are not identifiable.
Participation is Voluntary	Please understand that your involvement in this study is voluntary and I respect your right to stop participating in the study at any time without consequence and without needing to provide an explanation. Once you begin the survey your anonymous data which you have already provided can be withdrawn. Furthermore, prior to my arrival at the research sites, you will have the opportunity to gain access to the ISP through delivery services conducted by local officials. When physically visiting the research sites, I will enquire about your readiness to voluntarily participate in my research. If you agree to participate in the research, I will begin asking questions from the interview schedule.
Questions	The questions will not be of a sensitive nature: rather they are general, and will enable me to enhance my knowledge of the intersection of gender and socio-political power relations as well as climatic variability in the adaptation decisions and transformational livelihood strategies of small-scale farmers in the Vietnamese Mekong Delta.
Use of Information	I will use information from the interview as part of my doctoral thesis, which I expect to complete in the end 2025. Information from the questionnaire may also be used in academic journal articles and conference presentations before and after this date. At all times, I will safeguard your identity by presenting the information in a way that will not allow you to be identified.
Upsetting Issues	It is unlikely that this research will raise any personal or upsetting issues but if it does you may wish to contact your local Community Health Centre at An Phu district via +84 2993826718 and at Ke Sach district via +84 2993 876245.

Storage of Information	During the field work, I will keep both the recorded data on my laptop and hard copy in secure place in accommodation. When I return to UNE in Armidale, I will keep all hardcopy notes and recordings of the interviews in a locked cabinet in my office at the University of New England's School of Humanities, Arts and Social Sciences. Any electronic data will be kept on cloud.une.edu.au, UNE's centrally managed cloud server managed by the research team. It will also be kept on a password protected computer in the same location. Only the research team will have access to the data.
Disposal of Information	All the data collected in this research will be kept for a minimum of five years after successful submission of my thesis, after which it will be disposed of by deleting relevant computer files, and destroying or shredding hardcopy materials.
Approval	This project has been approved by the Human Research Ethics Committee of the University of New England (Approval No. HE23-186, Valid to 31/12/2024).
Researchers Contact Details	Feel free to contact me with any questions about this research by email at tnguy239@myune.edu.au or by phone on +61 493265399. You may also contact my supervisors. My Principal supervisor's name is Prof. Neil Argent and he can be contacted by email at nargent@une.edu.au or by phone on (02) 6773 2803 and my Co-supervisor's name is Dr. Sonya Glavac and her email address is sglavac@une.edu.au and phone number is (02) 6773 3124.
Complaints	Should you have any complaints concerning the manner in which this research is conducted, please contact: **Local contact for complaints:** Dr. Nguyen Tran Nhan Tanh Director of Climate Change Institute An Giang University Email: ntntanh@agu.edu.vn Phone: (+84) 918752344 Mrs Jo-Ann Sozou Human Research Ethics Officer Research Services University of New England Armidale, NSW 2351 Tel: (02) 6773 1115 Email: humanethics@une.edu.au Thank you for considering this request and I look forward to further contact with you. Kind regards, Mr Thai Van Nguyen, Prof. Neil Argent and Dr. Sonya Glavac.