

WOMEN'S EMPOWERMENT AND ADAPTIVE CAPACITY TO CLIMATE CHANGE

A CASE OF CHANGES IN THE CHITWAN DISTRICT OF NEPAL

A Dissertation

by

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ABSTRACT

Women in developing countries have always been adjusting their livelihood against the vagaries of climate. The existing gender inequalities add gravity to the situation. Empowering women can reduce their disproportionate sensitivity to climate change and strengthen the entire family's adaptive capacity, thereby improving the communities' adaptive capacity. However, studies linking women, climate change, and adaptive capacity are rare, perpetuating in policies and programs excluding women. The purpose of this study is to get a better understanding of the relationship between women's empowerment and the adaptive capacity of climate change in a Chepang community in Nepal using a quantitative method. Data was collected from surveying 190 randomly chosen households in the Chitwan district of Nepal. Six attributes were used to measure women's empowerment (economic, socio-cultural, familial/interpersonal, legal, political, psychological,) and five attributes to measure adaptive capacity (asset, innovation, knowledge & information, institutions & entitlements, flexible & forward-thinking decision making. Polychoric Principal Component Analysis (PCA) and Factor Analysis for Mixed Data (FAMD) were used to construct the indices for individual determinants. The Ordinary Least Squares (OLS) regression model was used to estimate the effect of women's empowerment on adaptive capacity. Results indicate that women's empowerment has a significant positive impact on households' adaptive capacity in the Chepang communities. Political and psychological components of women's empowerment were particularly important in explaining the adaptive capacity of the households. The economic and legal components were also important but less so than the political and psychological components.

To my beloved parents, Ramhari Khadka and Manju Khadka, for their great support and
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NOMENCLATURE

CEDAW: Convention on the Elimination of all Forms of Discrimination against Women
DEC: Development Exchange Nepal
FAMD: Factor Analysis for Mixed Data
GDP: Gross Domestic Product
GLOF: Glacial Lake Outburst Flood
GoN: Government of Nepal
HIMAWANTI: Himalayan Grassroots Women's Natural Resource Management Association
LAC: Local Adaptive Capacity
LAPA: Local Adaptation Plan of Action
LCD: Least Developed Countries
NAPA: National Adaptation Plan of Action
NLSS: Nepal Living Standard Survey
OLS: Ordinary Least square
PCA: Principal Component Analysis
REDD: Reducing Emissions from Deforestation and Forest Degradation
VDC: Village Development Committee
UNCED: United Nations Conference on Environment and Development
UNDEF: United Nations Democracy Fund
UNFCCC: United Nations Framework Convention on Climate Change
WOCAN: Women Organizing for Change in Agriculture and Natural Resource Management

GLOSSARY

Khoriya

Shifting cultivation

Terai

Southern lowlands of Nepal

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I. INTRODUCTION

1.1 Background

Women from developing countries make up the majority of the world's poor, undertake the majority of agricultural labor, bear unequal responsibility for household food and water security, and rely heavily on natural resources that are vulnerable to climate change (UN Women Watch, 2009; Terry, 2009; Mitchell et al., 2007). Moreover, they have unequal access, control, and ownership of natural resources, and are often excluded from the major decision and policy-making forums and institutions that govern them (Nellemann et al., 2011).

Those who are already weak and marginalized will be hardest hit by climate change. With the existing gender inequalities, women are particularly susceptible to the negative impacts of climate change (WEDO, 2010). Women's vulnerability to climate change stems from several factors - social, economic, and cultural. Women account for seventy percent of the 1.3 billion people living in poverty (Denton, 2002). Women represent a substantial proportion of poor communities that rely heavily on local natural resources for their livelihood, particularly in rural areas where they take up the major responsibility for household water supply and energy for cooking and heating, as well as for food security (Adhikari, 2003). Coupled with inaccessibility to resources and decision-making processes, socio-cultural norms of the society, the impacts of climate change place women in a vulnerable position (Leach et al., 1999).

Gender inequality and other forms of social differences shape the vulnerability and adaptive capacity of a community (Brooks, 2003; Adger et al., 2007; Garg et al., 2007;

IPCC, 2007; Adger et al., 2009; Nightingale, 2009). Adaptive capacity refers to the conditions that enable people to anticipate and respond to change and recover from and minimize the consequences of change (Adger & Vincent, 2005). Adaptive capacity here refers to women's and men's latent abilities to navigate inevitable change. Creating less vulnerable, more resilient individuals, societies, and communities by enhancing the mechanisms that promote adaptive capacity is a principal element to combat climate change (Folke et al., 2002; Smit & Pilifosova, 2003; Adger et al., 2005; Smit & Wandel, 2006; Berkes et al., 2007; Tschakert & Dietrich, 2010).

Enhancing the economic, political, and social status of women can strengthen the entire family's adaptive capacity, thereby improving the communities' adaptive capacity (Ghasemi et al., 2021). The empowerment of women and the improvement of their political, social, economic, and health status are all essential goals in and of themselves. Women's empowerment here refers to an improvement in women's ability to make strategic life choices where such ability did not exist previously (Kabeer, 2001). In addition, empowering women leads to women taking a more active role in their development and participation in decision-making in their communities, which improves the community's adaptive capacity. Women's participation in decision-making and exercising leadership roles at all levels, whether at the family, community, or national level, is one of the most critical measures for reducing their disproportionate sensitivity to climate change and increasing their adaptive capacity (Carvajal-Escobar et al., 2008; Laddey et al., 2011).

Women are frequently depicted as victims of climate change for all the reasons mentioned above. Women are considered as being more vulnerable to the effects of

climate change than men (IPCC, 2007; Sultana, 2014). However, they can be a powerful agent to curb the effect of climate change. Despite their vulnerability and limited access to resources, information, and support, women in developing countries have adapted to the changing climate and can clearly articulate what they need to secure and sustain their livelihoods more effectively (Mitchell, et al., 2007). Women have historically developed knowledge and skills related to water harvesting and storage, food preservation and rationing, and natural resource management for a long time. They remain the key players in households' livelihood strategies and adaptive capacity (Geradine, 2009; Masika, 2002; Patt et al., 2009).

However, studies linking women, climate change, and adaptive capacity are rare, especially in forest-dependent Indigenous communities. Thus, women are still being excluded from laws and policies development processes, and climate initiatives. Given these findings, it is important to understand the role that women's empowerment can play in influencing the adaptive capacity of a system.

Therefore, this study explored the relationship between women's empowerment and adaptive capacity in the Chepang community, a highly marginalized Indigenous community from the mid-hills in Nepal. Indigenous women are particularly more vulnerable to the adverse effects of climate change. The intersection of race and gender exacerbates the disproportionate impacts (Dankelman, 2010). Their rights and their institutions often lack recognition. The combination of such social, economic, political, and environmental issues faced by Indigenous women places them in a unique position of vulnerability to climate change, compared to other groups in society, including the

poor. Despite their high vulnerability, Indigenous peoples are rarely discussed in academic, policy, or public discussions about climate change.

1.2 Statement of Problem

Climate change has mostly been viewed as a scientific issue, with a narrow focus on economic consequences, efficiency, and technological issues (Hemmati & Rohr, 2009). Economic incentives (e.g., carbon trading, and carbon taxes) are considered viable solutions to encourage behavioral changes and investment in technical advances (Mainlay & Tan, 2012). There is a lack of a broader understanding and strategies required to identify a suitable response to climate change (Bennett, 2005). When it comes to climate solutions, several factors need to be considered. The relationship between women and climate change is one of them.

Long-standing gender inequality is one of the greatest barriers to tackling climate change (CARE International, 2014). Harnessing the knowledge, skills, and leadership of women can be an integral part of the climate solution. Understanding how women can influence the adaptive capacity of a household is important for determining which types of adaptation strategies could be useful for specific cases and particular contexts.

However, data on women's empowerment are lacking, particularly in communities that rely on the forest. Such a lack of data implies that it is difficult to design projects and allocate funding toward those areas. Most studies that measure women's empowerment are undertaken at a large scale (national or regional level), leaving the composition of women's empowerment at the local level unaccounted for. In addition, studies linking women, climate change, and adaptive capacity are rare, especially in forest-dependent Indigenous communities. Little is known about the relationship between women's

empowerment and climate change, and their interconnected impact on adaptive capacity. This lack of understanding frequently manifests itself in policies and practices that perpetuate uneven access to resources and women's exclusion from development processes, policymaking, and initiatives (Leduc et al., 2008; Sterrit, 2011). Women also have limited access to economic and social resources, such as land, money, education, modern technology, social capital, and climate adaptation and preparedness training (Mackenzie, 1995; Prior & Heinamaki, 2017; Verma, 2001), placing them in a vulnerable position. This study hopes to fill the gap in understanding the relationship between women and climate change by studying the role of women's empowerment on the adaptive capacity to climate change.

1.3 Need for the Study

Women are often excluded from policies, practices, development processes, and decision-making initiatives that govern them (Sterrit, 2011). This has resulted in women having unequal access, control, and ownership of economic, political, and social resources (Nellemann et al., 2011). There is a lack of gender-focused understanding of climate change, linking women and climate change, which has played a role in exacerbating this situation. Given the limited data currently available on gender and climate change and the invisibility that women's work still has in risk reduction and adaptation, it is necessary to better document these relationships (Carvajal-Escobar, 2015).

This study advances the understanding of the relationship between women's empowerment and adaptive capacity to climate change at the household level, and in doing so, contributes to a more comprehensive discussion of household adaptive

capacity and what role women have in enhancing it. Enhancing adaptive capacity at a household level eventually leads to the enhancement of communities, and subsequently nations,' adaptive capacity. Very few studies in the literature measure the household-level adaptive capacity to climate change (Elrick-Barr et al., 2014), especially in forest-based communities. In addition, most of the research is macro in scope, either focusing on the municipal, provincial, or regional levels. These studies are unable to capture the barriers to family adaptation to climate change. This study fills this gap by focusing on the understanding of adaptive capacity at the household level in an Indigenous community. It provides insights into the causes and composition of adaptive capacity for households that are exposed to similar climate risks and how empowering women can make a difference. Identifying the importance of women's empowerment on adaptive capacity is beneficial from both scholarly and policy perspectives. It has the potential to contribute to the formulation of policies and direct funding toward empowering women. Programs addressing women's empowerment are not only beneficial from a human rights perspective, but they are transformative economically as well.

1.4 Purpose of the Study

The study focuses on the Chepang population in the Chitwan District of Nepal where the Indigenous women are highly vulnerable to the impacts of climate change. The purpose of the study was to examine how empowered women can influence the adaptive capacity of the household to climate change in a community. The following research questions served as the foundation for this study:

Research Question 1: How does women's empowerment impact the adaptive capacity of the household in the Chepang community?

Research Question 2: What components of women's empowerment are most important in explaining the adaptive capacity of a household in the Chepang community?

1.5 Delimitations of the Study

There are several delimitations of the study. First, participants are limited to Chepang women of the Chitwan district of Nepal. Second, a self-reported questionnaire was used to assess the study variables (i.e., women's empowerment, adaptive capacity, and socio-demographics). Although it is a widely used data collection method in social sciences, it may involve some measurement errors, such as response bias and response variance.

1.6 Limitations of the Study

There are several limitations to this study. First, as this work is a case study, the findings are limited in their relevance to communities outside of Chitwan, Nepal. Particularly, given the unique characteristics of Chepang, these findings may be less relevant to women living in other communities across Nepal or any other Indigenous community. Second, the experience was assessed by self-report. This aspect of the study might have been affected by the individual's judgment.

Third, the approach used to measure local adaptive capacity and women's empowerment in this study is not immune from limitations since adaptive capacity and women's empowerment are both latent and dynamic concepts. Some of these include the possibility of exclusion of some indicators, the dynamic nature of the indicators, limitations to using the findings in top-bottom policy-making contexts, and limited institutional capacity at lower levels (Matewos, 2019).

1.7 Definition of Terms

- *Adaptation*: Adaptation to climate change refers to adjustments in ecological, social, and economic systems in response to actual or expected climatic stimuli and their effects or impacts (Smit & Wandel, 2006).
- *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” (IPCC, 2014)
- *Climate Change*: Change in climate globally or regionally including changes in temperature, precipitation, and severity of weather events over an extended period (IPCC, 2014).
- *Mitigation*: Avoiding and reducing emissions of heat-trapping greenhouse gases into the atmosphere to prevent the planet from warming to more extreme temperatures (IPCC, 2014).
- *Resilience*: The ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate.
- *Vulnerability*: Vulnerability is referred to as the degree to which a system is susceptible to and unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC, 2007).
- *Women empowerment*: A process whereby women become able to organize themselves to increase their self-reliance, to art their independent right to make choices and control resources which will assist in challenging and eliminating their subordination (Rowland, 1995).

II. LITERATURE REVIEW

2.1 Introduction to Nepal

Nepal is a small landlocked country (about 147,181 square km.) located between India and China. The Himalayas cover eighty percent of the territory, and it boasts eight of the fourteen highest mountains in the world. The country is home to two percent of the world's plants, 9.3 percent of its birds, and 4.5 percent of its mammals (IUCN, 2008). The estimated population of Nepal is over 28 million (World Bank, 2019), distributed among more than 60 different ethnic groups, speaking over 100 languages. The population is 84 percent rural, while 16 percent live around the capital in Kathmandu valley (Ministry of Health & Population, 2008).

Nepal is among the poorest and least developed countries in the world, with almost one-quarter of its population living below the poverty line (UNDP, 2007). Agriculture is the mainstay of the economy, providing a livelihood for three-quarters of the population and accounting for about one-third of the gross domestic product (GDP). Industrial activity mainly involves the processing of agricultural products, including pulses, jute, sugarcane, tobacco, and grain. The majority (83%) of the Nepali population live in rural areas where poverty is high (the poverty rate is 35% in rural areas compared to 10% in urban areas) according to the 2001 national census.

2.1.1 Women in Nepal

Half of the population in Nepal is represented by women (Pradhan, 2004). However, as in most countries of the world, they are underrepresented in political and economic institutions (Leduc et al., 2008). Nepalese women face more discrimination than men. Men usually have more opportunities than women in all sectors regardless of ethnic

group, religion, caste, or class they belong. Women's social roles and responsibilities are subject to their age, position in the family (daughter-in-law or mother-in-law), marital status (single, married, widowed), and ethnic/caste group (Nembang, 2010).

The unequal gender disparities can be seen in different sectors in Nepal. Girls have less access to education than boys, thus more women are illiterate than men. According to recent reports, the Nepal Living Standards Survey 2010-2011 (NLSS- III), Nepal has an adult literacy rate of 56.6 percent and out of which 71.6 percent are male and 44.5 percent are female.

Women have less access to paid jobs and incomes than men, and they do more unpaid work. In 2005, the female economic activity rate (ages 15 and above) was 49.9 percent (UNDP, 2007). Women, particularly in remote areas, have less access to health services as evidenced by the maternal mortality rate estimated from 2003 to 2008 at 830 maternal deaths per 10,000 live births (Neilemann et al., 2011). Women are also subject to gender-based violence, harassment, and psychological violence within the household (Leduc et al., 2008). According to a study conducted in 2007 by the non-governmental organizations SAATHI and the Asia Foundation, 95 percent of the women and girls surveyed reported first-hand knowledge of violence, and in 77 percent of cases, this was inflicted by their family members (Asian Development Bank, 1999).

Nepalese women confront multiple forms of discrimination from laws, institutions, religion, and ways of thinking. Women tend to be bound by unfavorable traditions, cultures, and values, and a great deal of pressure is put on girls and women to behave in certain ways. For instance, women's parents generally choose their partner for marriage, and they stay with their in-laws' after marriage. Thereafter, the husband

and/or in-laws make most of the household decisions. Despite these pressing issues, women in Nepal are not represented equally in policy and decision-making.

2.1.2 Indigenous Women in Nepal

Indigenous women are the most marginalized group in Nepal. Accounting for more than 18% of the population (CBS, 2011), they face "triple discrimination" based on gender, race, and poverty (Leduc et al., 2008).

While their non-indigenous counterparts are recognized as legal entities under the constitution, laws, and policies, Indigenous women are not recognized (Satyal et al., 2020). Indigenous women are invisible in the constitution, laws, plans, policies, and programs, and are victims of historical injustice and structural violence. Indigenous women in Nepal also continue to face the appropriation of their customary and traditional lands, resulting in the loss of customary occupations, livelihoods, and roles in their societies (CEDAW, 2011).

They continue to experience low entrance levels too, and accomplishments in, schooling due to a lack of proficiency in the only official language, Khas Nepali, and have difficulty communicating in local government offices due to previous bans on using their languages, even in judicial proceedings (Phyak, 2011). Despite the laws and policies in place for Indigenous people, they continue to be one of the most marginalized groups in society who are rendered vulnerable by the lack of their political voice and lack of attention to their specific needs and rights.

However, Indigenous women do not see themselves as victims. Faced with discrimination and prejudice, Indigenous women have been forced to develop skills and

strategies for survival – for themselves, their peoples, and their cultures (Robins, 2009). They have learned to survive oppression and marginalization, discrimination, and violence, without losing the wisdom and patience to build on and share these experiences (Burger, 1987). Yet often their contribution to the struggle of Indigenous peoples is not recognized or acknowledged. There is an increasing recognition that empowering Indigenous women is essential both to realize women’s rights and to achieve broader development goals such as economic growth, poverty reduction, health, education, and welfare (Golla et al., 2011).

2.2 Climate Change in Nepal

Nepal’s contribution to global emissions is negligible, yet it is extremely vulnerable to climate change (Gentle & Marseni, 2012; Godar Chettri, 2012). Nepal is known to be the fourth most climate-vulnerable nation in the present world (Adhikari et al., 2018; Gentle et al., 2014; Maplecroft, 2011). Rugged topography; geologically fragile hills and mountains; livelihoods predominantly dependent on natural resources; limited institutional capacity; and low levels of infrastructure and technological development add to the gravity of the problem (Regmi & Adhikari, 2007).

Temperature

The average annual temperature in Nepal has been increasing steadily at an average annual rate of 0.06⁰C with a higher rate of warming in the high-altitude mountains than in the lowland plains (Ebi et al., 2007; Shrestha et al., 1999). Winter temperature, however, shows a decreasing trend in certain pockets of the southern plains (Practical Action, 2009). As for future projections, average annual temperatures are expected to increase by 3⁰C to 4.7⁰C by the end of this century (Bajracharya et al., 2018).

Precipitation

The precipitation trend in the country shows that it is highly variable across the country both spatially and seasonally. Precipitation is very erratic with large interannual variations, thereby resulting in no significant trend over the years. Monsoon and pre-monsoon precipitation have been heavier than previous records indicate, it has become more unpredictable and more erratic with more droughts and shorter periods of winter rainfall (Duncan et al., 2013; Shrestha et al., 2000). The overall mean annual precipitation is also expected to increase across the country with no clear trend (Agarwal et al., 2003). Monsoon and post-monsoon rainfall are predicted to increase while winter rainfall is projected to decrease indicating that monsoon rain is going to be more intense while the winters will be even drier (Baidya & Karmacharya, 2007; Practical Action, 2009).

2.2.1 Impacts of Climate Change

As a result of these changes in temperature and precipitation, threats of Glacial Lake Outburst Floods (GLOFs) have increased; the problem of flash floods and landslides has increased in the wet season whereas drought has become harsher in the dry season (Gautam et al., 2007a; Gautam et al., 2007b; GoN, 2010; 2007; Vidal, 2006), threatening the livelihoods of people living in rural areas. Nepal's Strategic Program for Climate Resilience (2011) identifies the three most critical climate risks in the country as quantity and quality of water; food security; and ecosystem health (forests and biodiversity). Most climate projections for the region suggest that rainfall is likely to intensify and that extreme events will become even more frequent. Retreating glaciers and changes in seasonal snowfall and melt will lead to greater uncertainty about water

flows and, eventually, diminish water availability and quality (SPCR, 2011). The agriculture sector in Nepal is highly rainfall-dependent, and farmers are increasingly vulnerable to the uncertainties of climate-induced weather changes resulting in food insecurities. Although a large part of the land area is forested, much of these forests are degraded and increasingly prone to forest fires.

Eighty percent of the total population in Nepal practices agriculture as the main occupation to sustain their livelihood (Shrestha & Aryal, 2011) and more than sixty percent of the cultivated area in Nepal is fully reliant on monsoonal rainfall (CBS, 2011). The unpredictable weather patterns are affecting the production of staple crops (Lohani, 2007; Malla, 2008; Regmi, 2007; Urothody & Larsen, 2010). Hazards related to farm productivity also include increasing coverage of invasive weeds, increasing incidence of crop damage from insects and crop diseases, and increasing incidence of livestock diseases (Dhakal et al., 2013; Gentle et al., 2014). People who depend on dryland agriculture with limited livelihood options and low adaptive capacity are mostly affected by this situation (Mertz et al., 2009).

Another visible impact of changing climate is the recession of alpine glaciers which increases the threats of GLOFs, causing a decline in water availability and destruction of settlements, agricultural lands, infrastructure, human lives, and properties (Yao et al., 2004; Barnett et al., 2005; Nogués-Bravo et al., 2007; Xu et al., 2009). Twenty-four GLOF events have been recorded in Nepal only in the last three decades, of which 10 were the result of flood overflows across the Nepal border. There are approximately 1,444 glacial lakes in Nepal, of which 21 are categorized as potentially critical in terms

of GLOF risk (Mool et al., 2011). Climate change is likely to increase the possibility of GLOF events in the future.

Climate change is also expected to increase water scarcity in high mountain regions, affecting the water quality and availability in the middle mountains. Future projections also show more water-related disasters like flooding, landslides, sedimentation, water-borne disease, and vector-borne disease in the Churia-Terai region (Lama et al., 2013) (Fig.1).

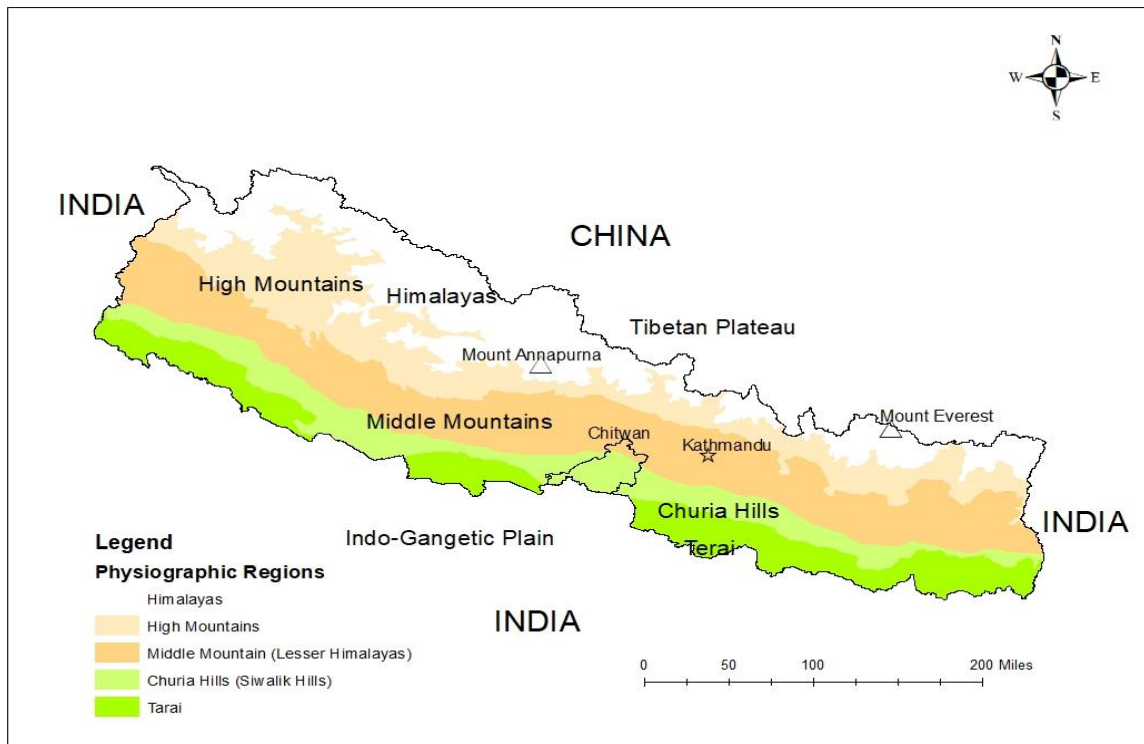


Figure 1 Map of Nepal

Nepal inhabits a fragile ecosystem ranging from sub-tropical forests, high mountain areas, low-lying floodplains, as well as temperate forests which are at the forefront of climate change impacts and threats. Climate change may lead to forest damage as their climatic zones shift leading to changes in their composition and extinction of species.

The impact of this situation not only affects the lives of the majority of people depending on it but also its biodiversity. If this climate situation continues, tropical wet forests and warm temperate rain forests would disappear, and cool temperate vegetation would turn to warm temperate vegetation which will reduce biodiversity impacting wildlife (Shrestha & Aryal, 2011).

2.3 Women and Climate Change in Nepal

It is a widely recognized fact that climate change does not affect people equally (Neilemann et al., 2011). Moreover, it intensifies existing inequalities, vulnerabilities, and unequal power relations (Brody et al., 2008; Neilemann et al., 2011; Solomon et al., 2007). The impacts of climate change are disproportionately falling more upon developing countries (Caesens & Padilla Rodríguez, 2009). Marginalized groups, including those who are most vulnerable owing to the socio-economic factors or lifestyle inextricably linked to nature, feel the effects in more significant ways. Worldwide, women are disproportionately vulnerable to the impacts of climate change due to their socially constructed roles and responsibilities and relatively poor economic and social positions (Bernstein, 2007).

Nepal is among the poorest and least developed countries in the world, with almost one-quarter of its population living below the poverty line (Gurung & Bisht, 2014).

Women constitute the majority of the poor and are therefore amongst the most vulnerable (UNDP Nepal, 2009). Women are highly dependent on natural resources for securing individual and family livelihoods (UN Women Watch, 2009; Terry, 2009; Mitchell et al., 2007). At the same time, cultural, socioeconomic, policy, and legal structures often restrict women's ability to secure access, control, and ownership of

resources such as information and education, as well as land, property, livestock, labor, and health for their families (Leduc, 2009; Mainlay & Tan, 2012). The existing structures limit their capacity to cope with the changing environment. Nepalese culture and society are also characterized by different forms of discrimination based on caste and class – and gender is a cross-cutting factor (Gurung & Bisht, 2014).

Women are impacted by climate change in numerous ways in Nepal. The changes in precipitation patterns impact water availability leading to an increase in the time required for women to collect water which in turn affects other sectors (e.g., agriculture and forest management). Alternative means of accessing water, such as deep boring and rainwater harvesting, are expensive and require technical knowledge, financial resources, and networking which is not available to poor and marginalized households, particularly those headed by women. Water scarcity also deteriorates the sanitation and hygiene conditions for households which often results in health-related problems (Asian Development Bank, 2000).

Similarly in the agricultural sector, the soil quality is degrading due to irregular rainfall, hardening the soil. Hardened soils are very difficult to break and fertilize and require more water and manure (traditionally women's work), translating into additional work and long hours of physical labor in the hot sun for women. Likewise, the emergence of new varieties of weeds and pests has affected farms and storage, increasing women's workload, as they are the ones responsible for weeding. The early ripening of crops and vegetables has created problems with pest infestations in stored seeds and crops, again increasing women's workload as they must check, dry, and clean the pests out of

the crops. This extra burden limits their ability to challenge the status quo, further entrenching their roles and responsibilities (Collins, 2018).

In villages close to urban centers, the poorest families migrate seasonally, together with their children, to work in the brick kilns. This has not only affected the education and health of their children but has also prevented women from participating in community groups and the opportunities offered by such groups and networks. In addition, male outmigration poses several difficulties for women, both at the household and community levels, and is increasingly reversing the gains in women's empowerment (Neilemann et al., 2011). This level of male out-migration in Nepal occurs due to widespread food insecurity that occurs because of climate change-related agricultural disruption (Kim et al., 2019). Some of the key effects of male outmigration on women are mental stress, restrictive mobility, character assassination, etc. (Gurung & Bisht, 2014).

Climate-induced changes in forests and biodiversity are leading to a loss of easy access to natural resources such as water, fuelwood, fodder, food, pasture, medicinal plants, fuel, etc., affecting women. A reduction in the yield of non-timber-based forest products (NTFPs), such as moss, lichens, broom grass, asparagus, and several medicinal plants, has also reduced the side income of poor women and the marginalized groups (Neilemann et al., 2011).

Another area of critical importance is the under-representation of women in policymaking, institutions, climate discourse, governance of natural resources, and other important livelihood dimensions. Women have no voice and are underrepresented at the community level and in international negotiations on climate change in Nepal (Denton, 2002).

Indigenous Women and Climate Change

Climate change consequences affect Indigenous women more strongly than others, deepening exclusionary and discriminatory practices already present within their community and non-Indigenous community. They are significantly impacted by the accelerating impacts of climate change, pushing them into a dire situation (Priori & Heinamaki, 2017).

Different conditions and circumstances make Indigenous women highly vulnerable to climate change. To begin with, Indigenous women are heavily reliant on natural resources, but they lack access to, control over, and ownership of these resources. Natural resources are essential for Indigenous groups' survival since they rely heavily on the environment for their survival, cultural integrity, medical practices, and the sharing of seeds, plants, and other food supplies (Tovar-Restrepo, 2010). Second, they are still subjected to the worst forms of racism and discrimination, physical, sexual, and psychological violence, human rights violations, and social and political exclusion (Vinding & Kampbel, 2012). Third, illiteracy is a problem for them. Access to education by Nepali women, in general, is lower than men and Indigenous women score far below the national average literacy rate. For instance, the literacy rate among the Chepangs (one of the Indigenous communities), among men is 23% and women 1% (Karunamaya Foundation Nepal, 2017). Moreover, their language of instruction adds gravity to the problem. Indigenous women in Nepal are far less likely than Indigenous men to speak the national language. This hampers them at school and eventually causes their early dropout. Without education and a working knowledge of the national language,

Indigenous women are at a disadvantage compared to both Indigenous men and non-Indigenous women.

Indigenous women are frequently excluded from sustainable development and climate action decision-making processes as well. This has resulted in negative consequences with dire implications for Indigenous women. For instance, facing climate change, the government of Nepal has steadily expanded protected areas, which now make up more than one-fourth of Nepal (Nepal et al., 2022). Indigenous groups are removed from their ancestral lands after a *protected area* is declared. Indigenous women, on the other hand, continue to return to their ancestral grounds to collect wild foods, firewood, fodder, and medicinal plants because their livelihoods and cultural survival are based on natural resources. As a result of their actions, Indigenous women face threats, harassment, and abuse from security officers stationed in the protected areas (Pact, 2014).

Despite these issues, Indigenous women in Nepal have been active agents of adaptation. They actively interpret, give meaning to, and adapt to global changes in the local context in ways that are appropriate, sustainable, and culturally specific (Gupta & Ferguson, 1997; Verma, 2001; Moore, 2017). They might not be aware of all possible adaptation strategies or may not be able to afford them, but they certainly know their present situation best and have responded to the threats within their scope and limited access to resources, and disadvantageous gender power relations (Mitchell et al., 2007).

2.4 Climate Change Policy and Gender in Nepal

A range of laws, policies, and programs exists in Nepal concerning climate change. This section examines climate change adaptation policies and political and decision-making structures in Nepal with specific references to gender.

National Adaptation Plan of Action (NAPAs)

NAPA was established by UNFCCC in 2001 to address the most urgent adaptation needs of the Least Developed Countries (LDCs) in the world. The Government of Nepal (GoN) developed and submitted a comprehensive and inclusive NAPA to the UNFCCC in September 2010, followed by an extensive country-driven consultative process in the preceding year (GoN, 2010a). The Plan outlines Nepal's adaptation priorities and needs. Its purpose is to mainstream the outcomes into a national development agenda beyond NAPA to assist in poverty reduction, livelihood diversification, and building community resilience (Tiwari et al., 2014).

All the adaptation projects/priorities in Nepal are based on NAPA. It follows a participatory, bottom-up approach with multi-stakeholders engagement in six Thematic Working Groups (TWGs) to address the different sectorial aspects of climate change: agriculture and food security, forest and biodiversity, water resources and energy, climate-induced disasters, public health, and urban settlements and infrastructure (MoE, 2010).

Nepal's NAPA report includes gender as a cross-cutting theme as recommended in the UNFCCC guidelines. It states that “...*gender-related issues need to be taken into account in the process of developing adaptation strategies to climate change*” (GoN,

2011b, p. 14). It contains a gender impact analysis of differentiated climate change effects and undertook a study on the implications of observed climate change effects on men and women (Ministry of Environment, GoN, 2010). This analysis concluded that men and women are impacted differently by climate change due to their societal roles and existing socio-political norms. The NAPA, therefore, recommended that these findings be taken into consideration in the development of national adaptation strategies and the design of adaptation interventions.

NAPA, however, does not provide any targets for women's involvement or capacity building, nor does it contain any gender-specific projects. Similarly, no governmental authorities that deal with women's issues such as the Ministry of Women, Children and Social Welfare, or the Women's commission were consulted or included in the NAPA process. In addition, the Thematic Working Groups (TWG) are said to be very technocratic, male-dominated groups (Mainly & Tan, 2012).

Local Adaptation Plan of Action (LAPAs)

The National Framework for LAPA was prepared with the objective of incorporating climate change adaptation actions into local development planning and policy (GoN, 2011c). Initiated in 2010, the LAPA framework operationalizes the objectives and priorities set by NAPA and climate change policy (GoN, 2011; Peniston, 2013) which are based on localized and specific climatic trends, and their impacts and adaptation strategies (Maharjan & Nayak, 2012). Four principles guide their development: a bottom-up approach, inclusiveness, responsiveness, and flexible processes (GoN, 2011). The planning units for LAPAs are Village Development Committees (VDCs) and municipalities. LAPAs are prepared at the local level by a multi-stakeholder team

including vulnerable communities (Wiseman et al., 2011). Although the LAPA framework promises to be inclusive, comprehensive, and community-centric, it does not contain a gender component (Gurung & Bisht, 2014).

Reducing Emissions from Deforestation and Forest Degradation Readiness Preparedness Proposal (REDD-RPP)

The REDD-Readiness Preparedness Proposal (REDD-RPP) is a framework that seeks to provide financial incentives for developing countries to conserve and sustainably manage their forests. REDD+ aims to encourage sustainable forest management for the benefit of the people who depend on it. Being an international mechanism, which is part of the current United Nations Framework Convention on Climate Change (UNFCCC), the REDD-RPP process provides many opportunities to address various challenges faced in the forestry sector. Gender-responsive standards and safeguards that incorporate gender equality and women's rights are at the core of REDD policies, programs, and measures. It states that gender and equity concerns will be mainstreamed at all levels and ensures the effective participation of women in the process. However, women's representation and participation in the institutional structure of REDD+ governance, both at the national and district levels, were found to be less than 10% in a study conducted by Women Organizing for Change in Agriculture and Natural Resource Management (WOCAN) and the Himalayan Grassroots Women's Natural Resource Management Association (HIMAWANTI) Nepal (Uprety et al., 2012).

Nepal Climate Change Policy 2011

Endorsed by the Government of Nepal (GoN) the main purpose of the Nepal Climate Change Policy 2011 is to improve livelihoods by mitigating and adapting to the negative effects of climate change. The policy adopts a low-carbon socioeconomic development path in line with international climate change policies (Mainaly & Tan, 2012; Davis & Li, 2013). It has seven policy targets focused mainly on climate change adaptation and disaster risk reduction; low carbon economic development and climate resilience; financial resources; capacity building and participation; research; technology development and transfer; and climate-friendly natural resource management (MoSTE, 2015).

The Nepal Climate Change Policy recognizes the disproportionate impacts of climate change on the poor and marginalized groups and ensures the participation of poor people, Dalits (lowest stratum castes in Nepal), marginalized Indigenous communities, women, children, and youth in the implementation of climate adaptation and climate change-related programs (Mainly & Tan, 2012). The policy recognizes support to address the impacts of climate change as an opportunity for the socio-economic and sustainable development of Nepal.

The Constitution and International Agreements

Nepal is part of several international conventions, for example, the Convention on the Elimination of all Forms of Discrimination against Women (CEDAW) which passed some laws supporting gender equity (Nepal Law Commission, 2006). However, not much has been done to apply these national laws, aside from some progressive

precedents set by the Supreme Court of Nepal. Similarly, the provisions contained in international instruments on women's rights are not reflected in national legislation.

These laws, policies, and programs suggest that there is a good understanding of gender and vulnerability about climate change in Nepal. However, not much emphasis has been given to incorporating this analysis into the development of programs. Gender inclusions are seen in the policies and program documents, but not in the implementation framework (Mainly & Tan, 2012). Including women in climate change-related processes and decision-making at all levels is necessary. Given the analysis of legal and policy frameworks, there are numerous opportunities for strengthening the incorporation of gender issues into the development of policies and programs to address climate change.

2.5 Women's Empowerment and Adaptive Capacity

2.5.1 Women's Empowerment

Conceptualizing Women's Empowerment

During the last few decades, a vast number of research studies on women's empowerment have been conducted around the world. However, there is a considerable dispute in the literature about what constitutes empowerment and how it is measured (Malhotra et al., 2003).

Traditionally, empowerment refers to access to aid, education, and health care (Porter, 2013). But traditional responses often miss how power and politics constrain access for women. The community development literature emphasizes social inclusion in institutions as a critical path to empowerment. For example, Narayan et al. (2000a) focus on state and civil society institutions at both national and local levels, including

informal institutions such as kinship and neighborhood networks. Similarly, Bennett (2002) has developed a framework in which “empowerment” and “social inclusion” are closely related but separate concepts. Drawing on Narayan (2002), Bennett describes empowerment as the enhancement of assets and capabilities of diverse individuals and groups to engage, influence, and hold accountable the institutions which affect them.

The use of the term empowerment also varies with different socio-cultural, economic, and political contexts. Exploring the various definitions of local terminology linked with empowerment around the world yields a diverse set of results. These terms include self-strength, self-control, self-power, self-reliance, personal choice, the capability of fighting for one’s rights, independence, own decision-making power, freedom, etc. These definitions are embedded in local value systems and beliefs (Mandal, 2013).

Despite the lack of consensus in defining women’s empowerment, there is a nexus of a few key, overlapping terms that are most often included: options, choice, control, and power (Malhotra et al., 2002). Most often, these terms refer to women’s ability to make decisions and affect outcomes of importance to themselves and their families (Mbwewe, 1991; Sen, 1993; Batliwala, 1994). Another concept that is commonly included in defining women’s empowerment is self-efficacy. Many definitions include the idea that a fundamental shift in one’s views, or “inner transformation,” is necessary for the formulation of options. That is, women should be able to define self-interest and choice and consider themselves as not only able but entitled to make choices (Sen, 1999; Sen, 1993, Kabeer, 2001; Rowlands, 1995; Nussbaum, 2000; Chen, 1992).

Capturing the common themes in the aforementioned studies, Kabeer (2001) offers a useful definition that can be applied across a range of contexts: The expansion in

people's ability to make strategic life choices in a context where this ability was previously denied to them (Kabeer, 2001, p. 18). This definition will be used as a reference point in this study. Hence, the concept of women's empowerment employed in this research captures the common attributes of empowerment used in various contexts in the literature. In particular, the concept employed includes subjective attributes that enable women's ability to make decisions and affect outcomes of importance to themselves and their families. These common attributes are discussed in detail in chapter 3.

Measuring Women's Empowerment

Various attempts have been made in the literature to build a thorough understanding of empowerment, given there are various dimensions along which women can be empowered. Different authors and frameworks have employed various levels of specificity. For example, CIDA's (1996) framework includes four broad dimensions of empowerment, while Kishor's (2000a) framework includes broad (e.g., valuation of women, marriage equality) as well specific (e.g., lifetime exposure to employment) elements. However, the frameworks put forth by various authors agree that women's empowerment needs to occur along the following dimensions: economic, socio-cultural, familial/interpersonal, legal, political, and psychological (Malhotra, 2002). These dimensions, however, are very broad in scope, and within each dimension, there is a range of sub-domains within which women may be empowered. For example, the —socio-cultural dimension covers a range of empowerment sub-domains, from marriage systems to norms regarding women's physical mobility, to non-familial social support systems and networks available to women (Ranjula et al., 2006). Moreover, to

operationalize these dimensions, one should consider indicators at various levels of social aggregation – the household and the community, as well as regional, national, and even global levels. When classified by level of aggregation, frameworks outlining characteristics of women’s empowerment can provide a viable guideline for operationalizing and assessing women’s empowerment.

Studies have also shown that in given settings, some dimensions of empowerment may be more closely interlinked than others. Kishor (2000a) conducted a factor analysis of several variables that may impact empowerment in Egypt. Among the ten empowerment dimensions that resulted from the analysis, some were comparatively better correlated than others. Dimensions did not all bear equally on the survival of women’s children (measured by child mortality and immunization); only “women’s lifetime exposure to employment” and “family structure” (residence with in-laws, etc.) affected both child survival outcomes. Jejeebhoy (2000) likewise found that, in India, decision-making, mobility, and access to resources were more closely related to each other than to child-related decision-making, freedom from the physical threat from husbands, and control over resources.

Empowerment is multi-dimensional; thus, researchers must be cautious when constructing an index or a scale to measure it. Differential effects of interventions on different facets of empowerment may be obscured by such variables. Inappropriate combining of items of empowerment might also mask the differential effects of component variables on outcomes. For example, Ghuman (2002) critiques a logit regression analysis by Durrant and Sathar (2000), which found that mothers' decision-making autonomy on child-related issues demonstrated a weak, statistically insignificant

effect on child survival. Ghuman (2002) points out that this finding was the result of a summative scale of items on mothers' decision-making about child-related issues such as schooling, illness matters, and punishment for misbehavior, but that these items varied greatly with respect to their associations with child survival. Thus, Durrant and Sathar (2000) found a weak effect because their aggregated scale items had different individual effects. Ghuman (2002) found that punishing children for misbehaving (which she links to women's reluctance to take on authority with respect to other child-related decisions) had an important negative association with child mortality. However, it is also true that a single indicator is not usually sufficient to measure even a specific dimension of empowerment (Kishor, 2000b; Estudillo et al., 2001).

In the last three decades, empirical research on women's empowerment in the fields of anthropology, sociology, demography, and economics has advanced to new levels of sophistication. Different studies have emphasized different variables, employing a variety of indicators (Amin & Becker, 1998; Pradhan, 2003; Kishore & Gupta, 2004; Kabeer, 2005; Schuler, 2006; Klasen, 2006). However, there is no single framework or scale that can be used to assess women's empowerment in its entirety. Research on the components of women's empowerment is prevalent at a macro level; however, studies at a micro (household or individual) level are lacking. The concept of empowerment tends to vary depending on context and macro-level studies can fail to identify issues at the household level. Understanding women's empowerment at a micro level is essential from an academic and policy perspective. Therefore, examining women's empowerment at a micro-level fills an important gap in the literature which is one of the contributions of this dissertation.

2.5.2 Adaptive Capacity

Contextualizing Adaptive Capacity

The term 'adaptive capacity has been used in various fields and disciplines in several ways. For example, from the perspective of political economy and geography, views communities' adaptive capacity as their ability to act communally (Adger, 2003).

Scholars in the field of development studies have raised fundamental questions about how adaptive capacity is distributed across populations and groups. Dow et al. (2006) discuss the disparate abilities of groups to adapt to climate change, highlighting lower levels of adaptive capacity associated with poverty.

Adaptive capacity is one of the most-researched topics in the field of climate change vulnerability (Wang et al., 2014). It is one of three critical components, along with exposure and sensitivity, which determine vulnerability to climate change: the extent to which species, people, and systems will be affected by changing environmental conditions (IPCC, 2001). Adaptive capacity enables or limits the ability of individuals, communities, and nations to adapt in response to change, and its presence or absence is thought to explain the divide between what level of adaptation is theoretically possible and what is observed in practice (Smit & Pilifosova, 2003; Brooks et al., 2005; Smit & Wandel, 2006).

In 2001, the Intergovernmental Panel on Climate Change (IPCC) defined adaptive capacity as "the potential, capability, or ability of a system to adapt to climate change stimuli or their effects or impacts" (Smit et al., 2001, p 881). Since 2001, the number of studies conducted on adaptive capacity, and how the term has been defined have grown dramatically. Definitions range from "preconditions necessary to enable

adaptation” (Hill & Engle, 2013), to “the existence of mechanisms for the evolution of novelty or learning” (Carpenter et al., 2001), to “a cultural process to achieve resilience” (Colombi & Smith, 2012), to “the capacity to adjust responses to changing external drivers and internal processes and thereby allow for development along the current trajectory (stability domain)” (Folke et al., 2010). These definitions share common elements – an ability to change, adjust, evolve, reorganize, cope with, or avoid changing conditions – but they also contain contradictions. While one author defines adaptive capacity as synonymous with coping capacity (Smit & Pilifosova, 2003) another defines it as the ability to change coping capacity (Brooks et al. 2005). However, the most common definition for climate change comes from the fifth assessment report of IPCC which defines it as the “ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” (IPCC, 2014, p.2).

The IPCC’s Assessment report outlines two dimensions of adaptive capacity, namely, the generic and impact-specific dimensions (Adger et al., 2007). The generic dimension of adaptive capacity examines the ability of systems to respond to general climate change stimuli, and the impact-specific dimension denotes the ability of the system to respond to a particular climate change stimulus, e.g., a drought or a flood. The two dimensions of adaptive capacity are closely linked to the idea that adaptive capacity refers to both anticipatory adaptation in the form of planning in advance, as well as the society’s ability to respond or cope with effects as they happen, termed reactive adaptation (IPCC, 2001).

To further understand adaptive capacity, the identification of the determinants of adaptive capacity is crucial. A system's adaptive capacity is determined by several factors that are neither mutually exclusive nor independent, but rather the outcome of a combination of factors. The adaptive capacity literature emphasizes the role of various kinds of determinants including financial, human, social, technological, and political resources in increasing the ability of different individuals and groups to prepare for, respond to, and recover from climate-related impacts (Smit & Wandel, 2006). Some determinants are emphasized more than others in different studies. For instance, in a study conducted in northeastern Mexico farmers, insurance, access to credit, and farmers' involvement in organizations were major determinants of adaptive capacity in the area (Eakin & Bojórquez-Tapia, 2008). In contrast, a study in South Africa found that access to credit, education, tenure security, and off-farm employment opportunities determined farmers' adaptive capacity to climate risks (Gbetibouo et al., 2010). Similarly, in Tanzania farmers' adaptive capacity both social capital and government investment in infrastructure and agricultural technological inputs predicted adaptive capacity (Below et al., 2012). The determinants of adaptive capacity also exist and function differently in different contexts. For example, a strong kinship network may play a significant role in a subsistence-based society, and quite a different role in a developed world agribusiness context where financial and institutional structures will influence adaptability.

To date, there is very little consensus for a robust, specific model of the elements and processes of adaptive capacity. Due to its latency, contextual and multidimensional nature, as well as the relative infancy of research on adaptive capacity, its

characteristics and elements are not entirely agreed upon (Smit & Wandel, 2006; Vincent, 2007; Jones et al., 2010; Wilbanks & Kates, 2010; Arnall, 2011; Hogarth et al., 2014; Hogarth & Wójcik, 2016a,b). Nevertheless, there is considerable understanding that adaptive capacity relates to the extent to which people have the necessary conditions that allow them to adapt successfully (Smit & Pilifosova, 2001; Nelson et al., 2007; Arnall, 2011; Field et al., 2014).

Measuring Adaptive Capacity

Adaptive capacity is a phenomenon that cannot be observed. Measuring such an unobservable phenomenon poses a challenge (Hinkel, 2011). Most of the literature on adaptive capacity has focused on identifying the features and conditions that influence a group's adaptive capacity, but assessing these "determinants," or a system's overall capacity, has been identified as a major problem for the field (Yohe & Tol, 2002; Brooks et al., 2005; Haddad, 2005; Adger et al., 2007; Notenbaert et al., 2012). To address this challenge, researchers have developed a variety of methods to assess adaptive capacity, and these can be broadly divided into two approaches: the use of indices and the use of proxy outcomes.

An index-based approach to assessing adaptive capacity: 1) identifies a set of determinants based on author experience, expert judgment, literature review, or subject of interest (e.g., Brooks et al., 2005; Bryan et al., 2015; Notenbaert et al., 2012); 2) uses an indicator to measure each determinant numerically or qualitatively, and 3) aggregates the determinant scores into a measurement of the overall adaptive capacity of the system. This final measurement may be numeric (Lam et al., 2014) or descriptive (Gupta et al., 2010; Grecksch, 2015). The most cited index is the Adaptive Capacity

Wheel (Gupta et al. 2010), which identifies 22 indicators for six determinants of the adaptive capacity of an institution. Some authors use established indices from other fields, such as Sustainable Livelihoods Analysis, Sustainability Capitals Framework, or Human Development Index. However, the most common practice is for a study to develop its index (Siders, 2019).

The use of indicator-based indices has been criticized, however, in the vulnerability and adaptive capacity literature. The choice of indicators or metrics to assess indicators is not standardized, and there is no outcome measure against which researchers can validate their results (Brooks et al., 2005; Eriksen & Kelly, 2007; Klein, 2009; Hinkel, 2011). Criticism is also aimed at various assumptions behind the choice of indicators, the possible lack of significant variables, and the lack of accounting for interactions between variables (Malone & Engle, 2011).

Alternatively, studies also utilize the proxy measure for assessing adaptive capacity. In this approach, an author 1) identifies a proxy, 2) identifies determinants of adaptive capacity and scores them using indicators, and 3) compares determinant scores to the proxy to identify which determinants correlate significantly. This is most often done quantitatively using statistical analyses but may also be done qualitatively using researcher observations or participant reports. Statistical analysis enables large-scale comparisons and rankings of capacity (e.g., Brooks et al., 2005).

Proxies may include the adoption of a specific adaptation practice, such as the use of community-based natural resource management practices (Fernández-Giménez et al., 2015), and the adoption of modern productivity enhancing strategies (Egyir et al., 2015).

Proxies may also be a specific outcome measure such as the performance of

agricultural yields as a proportion of expected yield (Bryan et al., 2015), or a purely social measure such as the level of labor compensation (Gonseth et al., 2015). The rationale behind these proxies is that individuals or groups with higher capacity are more likely to adopt a practice or achieve an outcome. The most common proxy is the outcome of a recent disaster, which may be quantitative (e.g., dollars of damage sustained, number of cattle lost, national mortality rates) or qualitative based on researcher observation or participant reporting (e.g., quality of recovery).

The conceptual challenge with this approach lies in the presumption that past efforts are indicative of future ability and that an ability to execute a specific adaptation action is synonymous with the ability to adapt more generally. Caution is also required when interpreting results, as a lack of correlation between determinants and proxy outcomes would indicate that conclusions cannot be drawn regarding adaptive capacity.

This study adopted an indicator-based approach to assess generic adaptive capacity in the Chepang community in Nepal. Despite the criticisms of the approach mentioned above, indicator-based studies allow for advances in the state of knowledge of these systems (Malone & Engle, 2011). The strength of the approach lies in its value as a tool for communication. The indicator-based approach is considered effective in summarizing and simplifying complex phenomena into understandable forms (Sharpe, 2004, Saltelli, 2007). This makes them particularly attractive to policymakers.

2.5.3 Relationship Between Women's Empowerment and Adaptive Capacity

Climate change vulnerability is multidimensional, influenced by a variety of characteristics such as geography, livelihood system, socioeconomic level, gender, age, and ethnicity (Ahmed & Fajber, 2009; Hertel & Rosch, 2010). Climate change

vulnerability is referred to as the degree to which a system is susceptible to and unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC, 2007). Women and men are affected differently by climate change impacts, mainly because they represent the majority of the world's poor and are proportionally more dependent on threatened natural resources than men. Men and women have varied roles, responsibilities, and decision-making abilities, as well as access to land and natural resources, opportunities, and requirements. Women are more vulnerable to the impacts of climate change, not because there is something inherently vulnerable about women, but because of different social and cultural structures that stand in their way (Andrijevic et al., 2020; Zhongming et al., 2020). Women have less access than men to resources such as land, credit, agricultural inputs, decision-making structures, technology, training, and extension services that would enhance their capacity to adapt to climate change (Aguilar, 2008). Hence gender is a crucial predictor of vulnerability (Bob & Babugura, 2014; Ziervogel et al., 2006).

Gender relations impose certain limits on the ability of an individual to effectively translate perceptions of an environmental threat into concrete action, in turn affecting individual and household chances of survival (IPCC, 2001). Building capacity to adapt to climate change will require eradicating inequalities of many sorts, including those in terms of gender.

Women undertake most of the agricultural labor, bear unequal responsibility for household food and water security, and rely heavily on natural resources that are vulnerable to climate change. (Terry, 2009; Mitchell et al., 2007). They also have unequal access to, control over, and ownership of these natural resources, as well as

are often excluded from major decision-making and policy-making forums and organizations (Nellemann et al., 2011). Women also have limited access to economic and social resources, such as land, money, education, new technology, social capital, and climate adaptation and preparedness training (Mackenzie, 1995; Prior & Heinamaki, 2017; Verma, 2001).

Despite their vulnerability, women can be active and effective agents and promoters of adaptation and mitigation. For example, by only providing the same access to resources as men, women can increase their agricultural yields by 20 to 30 percent, not only stepping up total agricultural output in their countries by 2.5 to 4 percent but also contributing to world hunger reduction by 12 or 17 percent, according to the UN, poverty reduction enables individuals to better adapt to changes in climate. Communities do better in resilience and capacity-building strategies when women are also involved in planning. Women tend to share information about community well-being that is important for resilience and more willing to adapt to environmental changes since their family lives are impacted.

Women hold critical local knowledge that can enhance climate adaptations and assist in the development of new technologies to address climate variability in areas related to energy, water, food security, agriculture and fisheries, biodiversity services, health, and disaster risk management. In most rural areas where natural resources and agriculture are predominant sources of livelihood, women play multiple roles throughout the processes of production, handling, and preparation of food (Bob, 2002; Galie, 2013). For a long time, women have historically developed knowledge and skills related to water harvesting and storage, food preservation and rationing, and natural resource

management (Ajani et al., 2013). In Africa, for example, older women represent wisdom pools with their inherited knowledge and expertise related to early warnings and mitigating the impacts of disasters. This knowledge and experience that has passed from one generation to another will be able to contribute effectively to enhancing local adaptive capacity and sustaining a community's livelihood.

There are numerous examples in different countries where women's knowledge and activism have helped to control erosion, prevent flood damage, and improve access to water. Women's organizations in Senegal have helped to build crescent-shaped canals to retain water, recover croplands and improve agricultural output in the Keur Moussa community where erosion was destroying their cropping lands (Dankelman, 2008). In Bangladesh, women developed wind and flood-resistant housing foundations for their communities (Roetzel, 2022). A group of women in rural Sudan formed the first-ever Women's Farmers Union to improve food security in their communities facing drought and famine.

As hurricanes become more severe and prevalent, Indigenous women in Nicaragua were motivated to create seed banks to protect biodiversity, creating sustainable livelihoods that are not dependent upon industrialized agriculture (Roetzel, 2022). After Hurricane Maria tore through Puerto Rico, architect Carla Gautier partnered with her friend Maria Gabriela Velasco to rebuild the more than 300,000 homes left severely damaged across the island by repurposing shipping containers (Mayra Cuevas, 2021). And local women around the Pacific Islands have established media networks and monitoring groups to broadcast the impacts of climate change in Fiji to the world. When empowered to actively participate in disaster planning and emergency response,

women display a unique knowledge and skill set that allows communities to recover more quickly and effectively.

Research has also shown that women adopt innovative and preventative measures at a faster rate than men. In a review of 17 studies from around the world, the presence of women in conservation and natural resource management resulted in stricter and more sustainable extraction rules, greater compliance, more transparency and accountability, and better conflict resolution (Leisher et al., 2016). This research has also shown that women tend to think for the collective whole rather than themselves. Women are shown to make more decisions that support the public good, provide fair pay and benefits, and encourage honest and ethical behavior.

Even though women have always been vulnerable and are regarded as the most disadvantaged, they are important actors in sustainable development. Their contributions to the battle against climate change and other socio-environmental challenges must be acknowledged and strengthened (Bousquet et al., 2015). Given equal access to resources and opportunity, women can be agents of change in response to climate change in their communities. By acknowledging the benefits women bring to the table, they can accelerate action to solve the climate crisis.

The empirical literature on climate change adaptation calls for adaptive capacity development of communities and households to minimize climate change-induced impacts (Ludi et al., 2011; Jones et al., 2017). Improved adaptive capacity is required to reduce vulnerability to climate change (Smit et al., 2003). Women are one of the basic pillars of a system that influences its adaptive capacity (Smit & Pilifosova, 2003).

Empowerment of women and girls is critical to building adaptive capacity to climate

change (Bob & Babugura, 2014). Various examples have demonstrated that empowering women to exercise leadership within their communities contributes to climate resilience ranging from disaster preparedness to better forest governance, to coping with the impacts of climate change. The link between women and climate change is undeniable but the resources are still lacking. The literature lacks empirical work on the relationship that empowering women could have on adaptive capacity. Government, non-government organizations, and developing agencies could greatly benefit from a better understanding of the extent to which women's empowerment interventions can enhance a household's adaptive capacity.

2.6 Conceptual Framework of the Study

The conceptual framework of this study is based on the "ecofeminism" theory (Goldblum, 2017; Moore, 2015; Morita, 2007; Sharnappa, 2016). Françoise d'Eaubonne coined the word *eco-feminism* to describe this more holistic understanding of liberation. Ecofeminism combines the ecological movement with women's liberation. The two movements share the common goal of working for a radical reshaping of the basic socioeconomic relations and the underlying values of (today's modern industrial) society (Warren, 1993; Mellor, 1997). It views how two historical issues, women's oppression, and natural degradation, are interconnected (Ling, 2014; Rao, 2012; Salman, 2007). Ecofeminism theory explains the relationship between women and nature and the policy implications of this relationship (Dailey, 2017; Mellor, 1996; Sachs, 2018; Sturgeon, 2016). From an ecofeminist point of view, there is no such thing as a struggle for women's rights separate from a struggle to repair the earth (Spyke, 2002).

Ecofeminism has five main discourses related to its vision of nature and women relations. First, if women are exploited, nature will be exploited. Second, women are equated to nature, so the topic of natural freedom is also a topic of women. Third, women tend to recognize environmental issues more rapidly due to their close relationship with nature in their roles domestically and production process. Fourth, women are biologically close to nature with their reproductive features, so they are aware of natural cycles. Finally, women are spiritually tied to nature because many faiths and religions have female idols (Sturgeon, 1997). Hence, ecofeminism argues that any environmental issue is also a women's issue. This paper contributes to the theory by analyzing the role of women's empowerment in enhancing the household's adaptive capacity.

Ecofeminism has long existed in theory and practice. The first major practical impact of ecofeminist thinking was felt at the 1992 United Nations Conference on Environment and Development (UNCED). At this conference, women's environmental organizations lobbied for women's rights and environmental rights to be considered in tandem. UNCED and the 1995 4th Women's Conference in Beijing concluded, for the first time, that women's rights and environmental rights could not be disentangled.

Since then, ecofeminism has been used to support many studies from economics to ecology to education. For instance, ecofeminism contributes to a broader and more sophisticated discussion of diversity and democracy in educational settings than social justice theories have typically envisioned (Hatten-Flisher & Martusewicz, 2018). In the tourism literature, Cataldi (2002) applied an ecofeminist perspective to the circus, discussing the dignity of animals in what she terms' undignified performances. She

explored the depiction of 'the momma bear' in typical circuses to show that we need to extend a 'moral sense of dignity' to animals. Similarly, Jones (2010) approached a different tourism activity, cockfighting, through a gender analysis. She explains that cockfighting is a prime example of gendered animal stereotypes and the sexualization of nature. Roosters are made to appear 'inherently combative,' and cockfighting enthusiasts see their roosters as 'extensions or symbols of their masculinity'. Jones explored how the gendered exploitation of roosters harms both humans and animals (Jones, 2010).

Ecofeminism has also been used to study the prominent role women play in environmental use and protection (Salehi et al., 2015). Salehi et al. (2015) revealed that women pay more attention to environmental issues than men. A few empirical studies in the field of environmental sociology have also focused on gender among urban participants from an ecofeminist perspective. For instance, Ahmadi et al. (2017) in investigating the relationship between gender and environmental citizenship found that women are more environmentally aware than men and are more involved in environmental protection activities. Abbaszadeh and Karimzadeh (2018) also identified that women express strong concerns about the environment. Ecofeminism theory considers a wide range of factors such as gender, structures of power, race, ethnicity, and capitalism in the degradation of the environment and the oppression of women (Allen, 2005; Allison, 2017; Kings, 2017).

From an ecofeminist perspective, increasing the economic and political involvement of women at all levels of society, especially in community-based groups, is necessary for environmental sustainability (Allison, 2017). The concept of ecofeminism will be

employed in the study to explain the relationship between women's empowerment and climate change and the adaptive capacity of the household.

Since the mid-1980s, several studies have discovered that the impacts of climate change aren't gender neutral. Rural women, particularly in developing nations, interact more closely with their environment and are disproportionately adversely affected by environmental changes (Dankelman, 2002). The impacts of climate change highlight gaps in existing social norms and power structures (Schalatek, 2009). Women already face disadvantages in their access to economic and social resources such as land, financing, new technologies, bargaining power, social capital, and training for climate adaptation and disaster preparedness (Prior & Heinamaki, 2017; UNDP, 2007). These inequalities threaten women's resilience to climate change, preventing them from participating fully in the development process of the community and intensifying gender inequalities (Habtezion, 2013). As a result, climate change limits the communities' long-term viability and resilience which in turn limits the country's resilience to climate change.

Women's empowerment is crucial to the success of climate change projects and policies. Women's increased participation is critical in the fight against climate change. Women effectively mobilize the community in different phases of the risk-management cycle and their greater involvement would enhance disaster risk management and reduction (Carvajal-Escobar et al., 2008; Enarson, 2001; Guha-Sapir, 1997; Yonder et al., 2005).

Generally, women seek solutions to the lack of drinking water, access to health and education, reducing factors of vulnerability of their communities in the face of

hydrometeorological events associated with climate change (Carvajal-Escobar et al., 2008) and other potential hazards, establishing networks with other women that increase their social capital (Gittell et al., 2000). They develop broad knowledge and experiences regarding their environment (Ariyabandu, 2013), which are being evaluated constantly and changed when the environmental and social conditions of their surroundings vary. The lack of equity concerning gender relations has limited the contribution of women to climate change adaptation (Carvajal-Escobar et al., 2008). Hence, provided with equal access, resources, and opportunities, women can be agents of change in a community. Therefore, ecofeminism provides the conceptual framework for understanding the relationship between women's empowerment and adaptive capacity.

III. METHOD

3.1 Study Area

This study was conducted in the Chitwan district of Nepal. Chitwan is bordered on the west by Nawalparasi and Tanahun districts, on the east by Makawanpur and Parsa districts, on the north by Dhading and Tanahun districts, and on the south by Bihar India. This district covers an area of 3,219,454 hectares. The district headquarters is Bharatpur. The district is largely made up of Inner Terai hemmed in between Siwalik in the south and Mahabharat in the north. The elevation ranges from 224 to 1,945 meters. Inner Terai Plain is characterized by a tropical climate while the hills surrounding it have a sub-tropical climate. The temperature varies from an average minimum of 16.6°C in the winter to an average maximum of 39.3°C in the summer. The average annual rainfall is 1,512.3 ml. The Narayani River is the main river of the district. Its tributaries originate from across the Himalayas.

Chitwan is one of the four districts where Chepang people reside. As per the 2011 population census, nearly 35% of the Chepang population resides in the Chitwan district (CBS, 2014). Chepang settlements are situated along the geographically fragile and steep Mahabharat Hills within the districts. Few of the Chepang settlements in Chitwan can be found at lower altitudes of around 250 meters above sea level (masl). However, the majority of the settlements are found at altitudes higher than 1,000 masl, ranging up to 1,920 masl represented by the Siraichuli peak located in Kaule ward of Chitwan district, which is also the highest point along with the whole Mahabharata range.

For this study, four Chepang dominant wards of the Chitwan district were selected- Chandibhanjyang, Darechowk, Dahakhani, and Shaktikhor, (Fig 2).

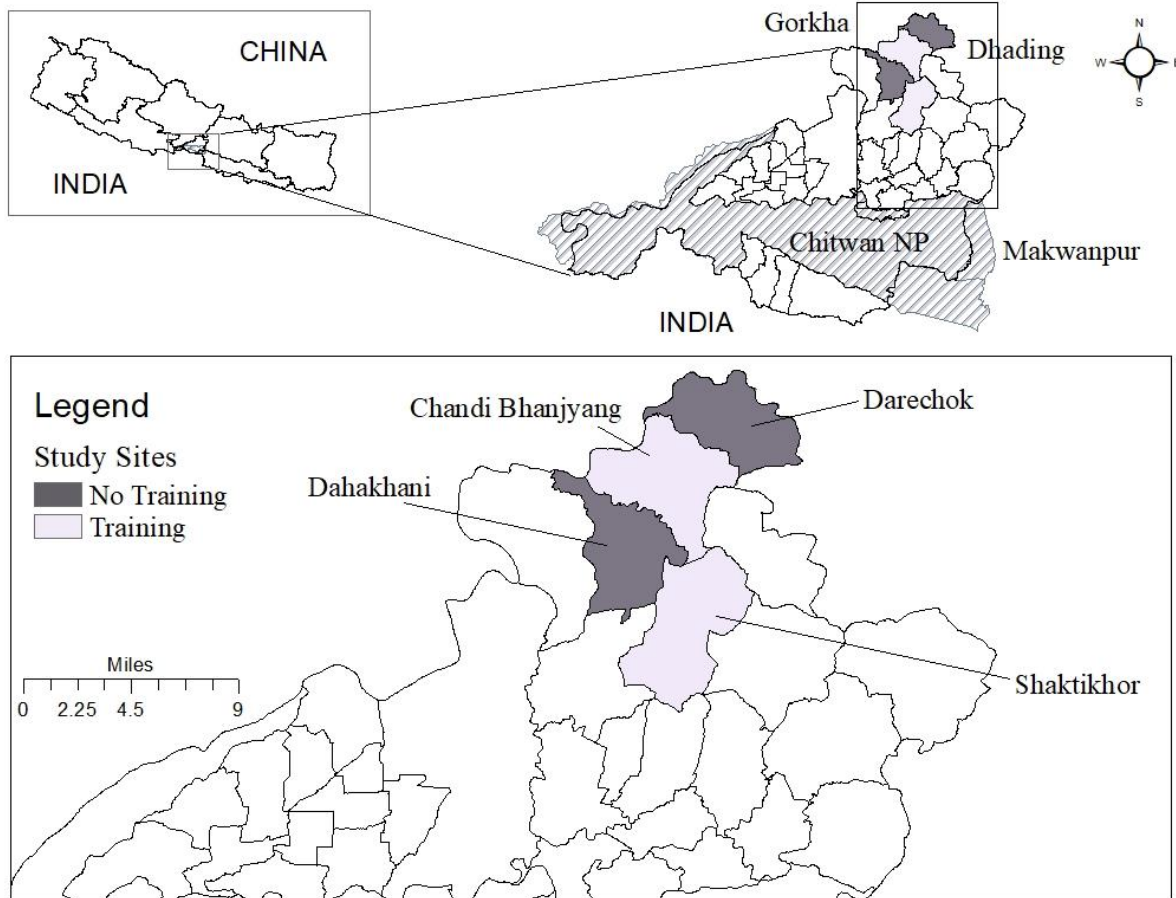


Figure 2 Map of Study Area

The wards were strategically selected. In a joint project, United Nations Democracy Fund (UNDEF) and Development Exchange Center (DEC) Nepal organized a two-year training program (January 2015- December 2016) for Chepang women: *Reinforcing Women of the Chepang Community as Change Agents for Promoting Local Governance*. This project aimed to empower women in the Indigenous Chepang community to increase their engagement in local governance for promoting pro-poor

and gender-responsive decision-making processes (Appendix A). The major objectives of the training were five-fold:

1. To enhance the leadership skills of selected Chepang women facilitators for social mobilization.
2. To enhance the knowledge and skills of Chepang women to participate in various dimensions of Local Self Governance.
3. To increase the participation of Chepang women in the local planning and implementation process.
4. To increase regular communication and coordination between Chepang women and Local Government.
5. To increase accountability among stakeholders and service receivers for the promotion of local good governance.

The project was conducted in six wards in Chitwan. The study area included two of the wards where the project took place, Chandibhanjyang and Shaktikhor. In addition, Darechowk and Dahakhani, where the project did not take place, were included in the study area. The selected wards had a relatively high number of Chepang households, making sampling feasible. The four wards were near each other. The Chepang villages in those four wards were similar in lifestyle, economic background, and physical and social characteristics. The Chepang communities in the wards where the training program was conducted were likely to have higher measures of Women's Empowerment relative to their neighbors. Thus, selecting the four wards for sampling

was likely to have variation in women's empowerment measures, while having other similar characteristics. The physical characteristics of each ward are described below.

In the Kaule ward, with a population of 4,195, Chepang is the most dominant ethnic group, forming 74.7% of the total population of the ward (CBS, 2014). Kaule is connected to the Prithvi Highway by an earthen road only in 2011. Kaule shares its border with Chandibhanjyang, Shaktikhor, and Siddhi wards in Chitwan district; and Jogimara wards in Dhading district. The altitude of Kaule varies from 810 to 1,920 masl (NGIIP, 2006).

Similarly, in the Chandibhanjyang ward, Chepangs form 31.88% of the total population (CBS, 2014). It lies in the Mahabharat zone between the altitudes of 400m to 1200m (Tamang et al., 2017). Chandibhanjyang is a neighbor of Anbukhaireni, Darechok, Kaule, Dahakhani, and Shaktikhor.

Shaktikhor ward is located about 15 kilometers northeast of Narayanghat, the central marketplace of the Chitwan district. Shaktikhor ward is bordered on the south by Chainpur, Jutpani, and Pithuwa ward, on the east by Siddhi ward, on the north by Kaule, and on the west by Kapilas and Dahakhani ward. It extends from 300 to 2500 meters altitude. In Shaktikhor, Chepangs form 36.81% of the total population.

Shaktikhor is linked to the East-West Highway by an all-season earthen road but only up to the foothills of the ward, where the main bazaar is located 13 kilometers northeast of Tandi Bazaar on the East-West Highway.

Dahakhani ward has a significant number of Chepang Communities as well. Of the total population, 26% of them form the Chepang population. Dahakhani is 32.4 kilometers

north of Bharatpur, the district's capital. Due to the lack of a motorable road leading to the ward, it is less accessible. Similarly, Darechok northeast of Chandibhanjyang has an elevation of 1039 meters. Chepangs form 13% of the total population in Darechok.

The Piple ward is located about 36 Km east on the Bharatpur-Hetauda highway. It is bounded by the Lothar River in the west, Bhandara ward in the East, Korak and Lothar wards in the North, and the Rapti River in the South. Nearly half of the Piple VDC area is located in the valley plains and the other half is in the Mahabharat Hills where elevations range from 320 to 950 meters. About one-third of the ward's population lives in settlements in the mountains and the remaining in the plains. Chepangs make up around 11.5% of the total population in Piple.

3.2 Study Participants

Among the various ethnic communities (59 Indigenous groups), Chepangs are one of the Indigenous nationalities of Nepal. Chepang (*Che*: dog, *Pang*: bow) is a name derived from their way of life, in which they hunt animals with a dog and a bow.

According to the population census of 2011, their total population is approximately 68,399 which is about 0.26% of the total population of the country (CBS, 2011). They mostly reside in the northern parts of Chitwan, the western part of Makwanpur, the southern part of Dhading, and the southern part of the Gorkha district (Bhattarai, 1995).

Attributed to common traits such as poverty, illiteracy, lack of food self-sufficiency, food insecurity, and lack of resource ownership, the Chepangs are classified as a highly marginalized Indigenous group (Piya et al., 2012). Many Chepangs still lack citizenship documents due to a lack of understanding of administrative criteria and official procedures.

Chepangs dwell on marginal land, usually on steep slopes. Since the beginning of time, the Chepangs have owned their land. However, due to their practice of *khoriya* or shifting cultivation in the olden days (100- 150 years ago) in place of organized agricultural methods, they do not have legal ownership of the lands they have been using. Even if they have legal title to their private property, the land they own is poor and barren (Piya et al., 2012).

Often described as guardians of the forest, Chepangs are believed to be, until the last 100-150 years ago, a semi-nomadic hunter/gatherer group ranging the forests of Nepal as described by Brian Hodgson in his 1848 article to be “living entirely upon wild fruit and the produce of the chase” (Hodgson, 1874, p. 45). However, their access to forests was severely restricted due to the introduction of new government policies, most notably the enactment of the Private Forest Nationalization Act in 1957. Through this Act, all the forests that had been used in the past under traditional rights were included under government ownership. This put a restriction on hunting and gathering activities, thereby negatively affecting the traditional system of the Chepang livelihoods.

Chepangs had no legal ownership of the land where they practiced *khoriya*, and most of them remained uncultivated patches within the forest area, which was now under government ownership. Restrictions on hunting, gathering and clearing of forest patches for *khoriya* cultivation led to the transition of their livelihoods to sedentary agriculture.

Agriculture is said to be a relatively newer phenomenon for them (Gurung, 1995; Gribnau et al., 1997; Bhattarai et al., 2003). They only started agricultural practices 80 to 120 years ago (Gurung, 1990). Their agricultural practices are still primitive and prefer areas along the slopes and nearby forest areas (Gurung, 1990; Maharjan et al.,

2010). Due to their choice of areas for cultivation, their annual harvest is lower, and it lasts only for a few (4-6) months (Rijal, 2011). It has also been reported that harvest covers only 60% of the families in that duration, although only one percent of them have a cereal food surplus (Aryal, 2013). To cope with the dearth of nutrition, Chepangs still depend on forest resources to a large extent. Wild and uncultivated edible plants play a vital role in their subsistence economy (Maharjan et al., 2010; Acharya et al., 2017; Lamichhane, 2017). Many of them are also experts in fishing and catching honeycombs, wasps, hornets, bats, and wild birds, and fulfill their necessities. However, control over and access to forest resources has been severely restricted due to unfavorable state policies, which in turn threaten their traditional livelihoods (Upreti & Adhikari, 2006).

Besides gathering, Chepangs also depend upon livestock, wage laboring, collection, and sale of NTFPs, skilled and salaried jobs, handicrafts, and remittance for cash income. Many households also rear pigs, chickens, goats, cows, and oxen as a part of their traditional source of income. They sell honey, black gram, beans, mustard, ginger, cabbage, tomato, fruits, etc. They also brew and trade alcoholic products made from fruits, millet, and rice for an alternative income. However, almost 90 percent of Chepangs live below the poverty line, earning around only 6,000 Nepali rupees (\$1 = Rs. 119) per capita annually (CBS, 2001).

Chepangs share distinct characteristics that no other groups in society (ILO, 2017). They are also the most threatened segment of the population in terms of economic, social, and environmental vulnerability (ILO, 2017). Their rights and their institutions often lack recognition. The combination of such social, economic, political, and

environmental issues faced by Indigenous women places them in a unique position of vulnerability to climate change, compared to other groups in society, including the poor.

3.3 Source of data

Quantitative data was generated through survey questionnaires administered to households spread across four Chepang villages in the Chitwan district of Nepal. A survey questionnaire was used to gather information on women's empowerment and adaptive capacity.

A household survey was conducted in the Nepali language. Masters level students of forestry were hired as research assistants to conduct the household survey. The purpose of the study, use of the questionnaire, and data collection procedures was explained to the research assistants elaborately during their orientation.

Once the research assistants completed the orientation, the researcher and the research assistants visited each ward together. The research assistants surveyed the selected households on their premises. Each household was informed about the study objectives prior to the survey. Research assistants debriefed the researcher at the end of each day.

When the number of households from each VDC was determined, a sample was drawn; a random sampling approach was used to choose the households. A list of all the households in the village was obtained from the local administrative office and each household was assigned a number and random numbers were generated using excel. Each questionnaire was administered face-to-face to the participants in their households.

According to the recent census, the total population of the study area was 49,875. The total Chepang population in the area is 13,605, which is 27.28 % of the total population. The total number of households in the area was 9952, which implies that the average household size is approximately five. Since the number of Chepang households in the sample area was unknown, the total Chepang population was divided by average household size, which implies an estimated number of Chepang households in the study area to be 2721. The sample for the study was determined using Sloven's formula $[n=N/1+(Ne^2)]$ with a 95% level of confidence. Hence, the sample number of households was 187. The number of households chosen for the survey from each ward was proportional to the number of Chepang households in the respective ward. Table 1 illustrates the number of households surveyed in each ward.

Table 1 Total Population and Sample Size in the Study Area

Ward	Total Population	Total Household	Chepang Population	Estimated Chepang household*	Chepang Household Sample
Shaktikhor	9418	1909	3467	693	86
Chandibhanjyang	4978	847	1587	317	39
Darechok	9607	2029	1305	261	32
Dahakhani	4803	939	1266	253	31
Total	28806	5724	7625	1470	188

* Number of Chepang households in each district is calculated by dividing the total Chepang population in the district by the average family size of 5.

The survey questionnaire (Appendix B) was divided into three sections. The first section gathered information on women's empowerment. The second section gathered information on the adaptive capacity of the household. The third section gathered information on socio-economic characteristics of the household related to household

size and composition, landholding, livestock owned, education levels, diversification of income sources (forest, agriculture, livestock, and off-farm), etc.

3.4 Measurement

3.4.1 Women's Empowerment

Empowerment is an endogenous latent variable, i.e., not directly observable. There is no consensus on a set of variables used to measure women's empowerment. Instead, the measurement varies across studies based on the context of the study and how the concept of women's empowerment is defined. Studies that measure women's empowerment over the last 20 years have focused on measuring empowerment in specific components, such as economic, socio-cultural, decision making, or some combination of these components (Schuler & Hashemi, 1993; Jejeebhoy, 1995; Stromquist, 1995; Hashemi et al., 1996; Sen, 1999; Kishor, 2000). No existing framework stands out above others as the one to be adopted, taken as a whole.

Thus, this study analyzed subjective attributes of women's empowerment based on the definitions of women empowerment in the literature in six key elements (Malhotra et al., 2002). Allowing for overlaps, these frameworks suggest that women's empowerment includes the following attributes: economic, socio-cultural, familial/interpersonal, legal, political, and psychological.

Though not measured as a whole, each attribute of women's empowerment in this study has been studied and validated in the literature. The six attributes and the studies that have used them in the literature are:

- Economic (Mizan, 1993; Schuler & Hashemi, 1993; Amin & Pebley, 1994; Jejeebhoy, 1995; CIDA, 1996; Hashemi et al., 1996; Kishor, 2000; Kabeer, 2001 & 2005, Ashraf et al., 2006; Rahman et al., 2009)
- Socio-cultural (Amin & Pebley 1994; Schuler et al., 1996; Zaman, 1998; Banu et al., 2001, Pitt et al., 2003; Rahman et al., 2009)
- Familial/interpersonal (Amin & Pebley 1994; Goetz & Sen Gupta, 1996; Grasmuck & Espinal, 2000; Frankenberg & Thomas, 2001; Zaman, 2001)
- Legal (CIDA, 1996; Zaman, 1998, 2001; Banu et al., 2001)
- Political (Schuler & Hashemi 1994; Stromquist, 1995; CIDA, 1996; Hashemi et al., 1996; Schuler et al. 1997)
- Psychological (Stromquist, 1995; Kabeer, 1997 & 1998).

It should also be noted that these attributes are very broad in scope, and within each dimension, women can be empowered in a variety of sub-domains. For this study, we use Malhotra et al. (2002)'s measure. The determinants of the measure and their descriptions are given below.

Table 2 Determinants and Indicators of Women's Empowerment

Dimension	Indicators	Measures
Economic	Control over income	Categorical
	Women's contribution to family support	Categorical
	Access to and control of family resources	Categorical
	Ownership of assets and land	Categorical
	Women's access to credit	Categorical
	Women's access to employment	Categorical
	Involvement and/or representation in local trade association	Categorical
	Access to market	Categorical
Socio-cultural	Women's freedom of movement	Categorical

	Women's access to transportation	Categorical
	Lack of discrimination against daughters	Categorical
	Commitment to educating daughters	Categorical
	Women's access to educational options	Categorical
	Women's visibility and access to social space	Categorical
	Women's participation in social networks	Categorical
	The shift in patriarchal norms (such as son preference)	Categorical
Familial/Interpersonal	Participation in domestic decision-making	Categorical
	Ability to make childbearing decisions	Categorical
	Access to contraception and abortion	Categorical
	Women's decisions on contraception and abortion	Categorical
	Women's control over spouse selection and marriage timing	Categorical
	Freedom from domestic violence	Categorical
	Option for divorce	Categorical
Legal	Knowledge of legal rights	Categorical
	Awareness of legal rights over women's right to seek legal protection	Categorical
	Domestic support for exercising rights	Categorical
	Effective local enforcement of legal rights	Categorical
Political	Knowledge of the political system and means of access to it	Categorical
	Domestic support for political engagement	Categorical
	Stand in local election	Categorical
	Exercising the right to vote	Categorical
	Representation in Local bodies of government	Categorical
Psychological	Decision-making power	Categorical
	self-efficacy	Categorical
	Psychological well-being	Categorical

3.4.2 Adaptive Capacity

To guide our understanding of adaptive capacity, this study relied on the conceptual framework based on Jones et al. (2010) who developed the Local Adaptive Capacity (LAC) framework to better understand adaptive capacity at the local level. The framework envisages that the capacity to adapt at the local level depends on asset base, innovation, knowledge and information, institutions, and entitlements, and flexible and forward-thinking decision-making and governance (Fig. 3).

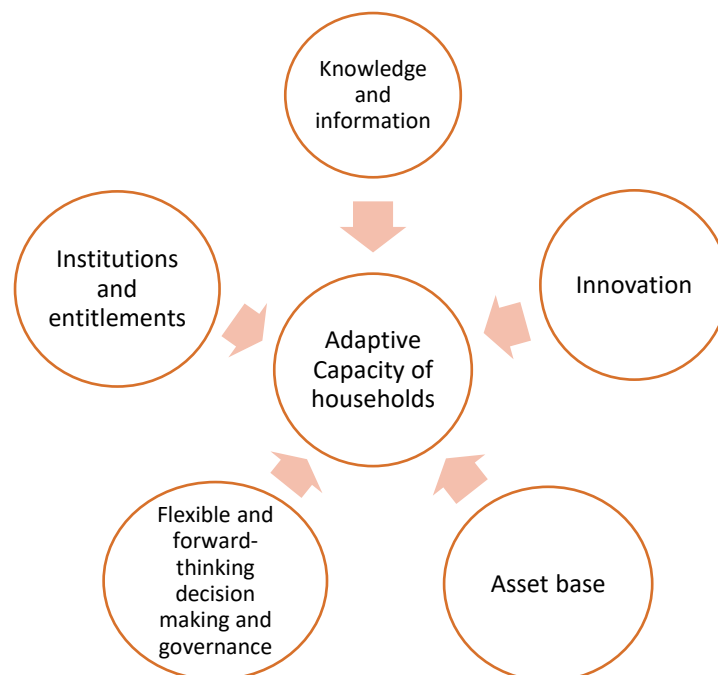


Figure 3 Conceptual Framework for Assessing the Adaptive Capacity of Households

These components form an integrated and systematic part of the adaptive capacity of households, determining the degree to which a community or a household is resilient and responsive to climate-related changes (Jones et al., 2010).

Traditional asset-based frameworks (Yaro et al., 2015; Asante et al., 2009; Nakuja et al., 2012; Defiesta & Rapera, 2014; Serrat, 2010) have been criticized for their failure to capture important contextual information (Park et al., 2012) and the underlying social

and institutional processes that create capacity (Elrick-Barr et al., 2014). The LAC framework highlights the important role that various intangible and dynamic processes play in supporting capacity at the community level. While asset-based approaches are useful in helping us to understand the resources at the disposal of a system to cope with and adapt to changing environments, they typically mask the role of processes and functions in supporting adaptive capacity (Elrick-Barr et al., 2014; Jones et al., 2010; Mortreux & Barnett, 2017). Therefore, following the LAC framework, this study includes four other dimensions in addition to the livelihood assets, namely flexible and forward-thinking decision making, institutions and entitlements, knowledge and information, and innovation. This framework was selected because it has been practically tested and shown to be effective in different countries (See Ashley et al., 2016; Hogarth & Wojcik, 2016a; Matewos, 2020; Mesfin et al., 2020). The framework has been implemented in three African countries (Ethiopia, Uganda, and Mozambique) in eight research sites (Matewos, 2020). The five dimensions refer to the following meanings and variables (Tables 3 & 4).

Table 3 LAC’s Five Characteristics and their Features

Characteristic	Features that reflect a high adaptive capacity
Asset base	Availability of key assets that allow the system to respond to evolving circumstances
Institutions and entitlements	Existence of an appropriate and evolving institutional environment that allows fair access and entitlement to key assets and capitals
Knowledge and information	The system has the ability to collect, analyze and disseminate knowledge and information in support of adaptation activities
Innovation	The system creates an enabling environment to foster innovation, experimentation, and the ability to explore niche solutions to take advantage of new opportunities

Flexible forward-looking decision-making and governance	The system is able to anticipate, incorporate and respond to changes concerning its governance structures and future planning
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In the existing literature, the five livelihood assets (natural, physical, financial, human, and social assets) are considered to be an important component of adaptive capacity (Vincent, 2007; Elrick-Barr et al., 2014; Daze et al., 2009; Dulal et al., 2010). However, assessments focusing solely on livelihood assets have been criticized for failing to capture crucial contextual information as well as the underlying social and institutional processes that build capacity (Park et al., 2012; Elrick-Barr et al., 2014).

Adapted from Mesfin et al. (2020) relevant indicators were incorporated to assess each dimension of adaptive capacity at the local level. Sixty representative indicators were examined and distributed among five primary components and associated subcomponents. Adaptive capacity was measured at a household level; however, some indicators are measured at the community level. This implies that such indicators, although at the community level, affect the households' adaptive capacity. For instance, a household in a community that has formal climate change-related organizations is likely to have higher adaptive capacity than a household in a community without such organizations. Hence, it is essential to measure community-level indicators that can potentially affect household-level adaptive capacity.

Table 4 Determinants and Indicators of Adaptive Capacity

Determinants of adaptive capacity	Indicators	Measures	Hypothesized relation
Asset base			
Natural assets			
<i>Farmland</i>	Share of more productive land possessed	% of the total	+
	Share of less productive land possessed	% of the total	-
<i>Grazing land</i>	Access to grazing	Categorical	+
	Size of grazing land	Number	+
<i>Woodland</i>	Ownership of woodland	Categorical	+
	Size of woodland	Number	+
<i>Water</i>	Access to water resources	Ordinal	+
	Quality of water	Ordinal	+
Physical Asset			
	Type of house	Ordinal	+
	Have radio/T.V.	Categorical	+
	Have a mobile phone	Categorical	+
	Have access to electricity	Categorical	+
	Walking distance to the nearest road	Hours	-
	Agricultural tools	Rupees	+
	Irrigated land	% of the total	+
Financial asset			
	Gross annual income per capita	Rupees	+
	Remunerative income sources	Number	+
	Total household savings	Rupees	+
	Total loan received by the household	Rupees	+
	Ownership of livestock	Number	+
Human asset			
	Highest qualification in the household	Years	+
	Health status of the household	Ordinal	+
	Dependency ratio	Number	-
Social asset			
	Memberships in community-based organizations	Number	+
	Network and mutual support organizations	Categorical	+
	Access to credit through social contacts	Categorical	+
	Exclusion	Ordinal	-

Collective action	Ordinal	+
Support from the community	Categorical	+
Trust in matters of borrowing and lending	Categorical	+
Looking out for the welfare of one another	Ordinal	+
Cooperation in farming activities	Categorical	+
Resolving dispute	Categorical	+

Institutions and entitlement

Formal local organizations	Number	+
Informal local organizations	Number	+
Local institutions relied upon for support during times of climate hazard	Number	+
Equitability of access to the support provided by local institutions	Categorical	+
Regulating access to key resources during times of climate hazard	Categorical	+
Equitability of access to key resources	Categorical	+
Dependence on outside support from local institutions	Categorical	-
Restraining local rules and norms	Categorical	-

Knowledge and information

Knowledge and information on adaptation strategies	Categorical	+
Adequacy of knowledge and information	Categorical	+
Systems for data gathering, information analysis, and dissemination	Categorical	+

Innovation

Adoption of new practices	Categorical	+
Taking risks and exploiting new opportunities	Categorical	+
Ability and willingness to adjust	Categorical	+
Access to new and improved technology	Categorical	+

Flexible and forward-looking decision-making

Access to climate information	Categorical	+
Capacity to deal with hazards	Categorical	+
Provision of support	Categorical	+
Government subsidy	Categorical	+
Developing plans	Categorical	+
Learning from experience	Categorical	+
Taking the right measures	Categorical	+
Flexibility in decision making	Categorical	+

Systems for reviewing and adjusting priorities	Categorical	+
Transparency in decision making	Categorical	+
Regulations to protect natural resources	Categorical	+

Source: Mesfin et al., 2020

3.4.3 Pilot Study

The purpose of the pilot study was to test the effectiveness of the measures used in measuring women’s empowerment and adaptive capacity, and the validity and reliability of the scale. Specific issues of concern were the number of items in the instrument, the readability of the items, content and face validity, the format, and other potential problems which would be discovered in the pilot test.

The questionnaires were administered in two different wards; one that received the training and one that did not. The pilot test was conducted in both trained and untrained wards to prevent any threat to the survey's validity. The questionnaire was only filled out by individuals who were willing to participate.

The instrument was pilot tested with 20 Chepang women (10 in each ward). A week was spent at the study site with the study participants to understand their view on women’s empowerment and adaptive capacity. Based on the observations of the pilot questionnaire, adjustments were made to the scale, e.g., changes in wording, deletion, and addition of some indicators, etc.

3.5 Data Analysis

3.5.1 Women’s Empowerment and Adaptive Capacity

Most observations (indicators) were measured at the household level. For community-level indicators, each household in a community was given the same score. In the case

where the indicator responses from various community households were different, the average score was assigned to each household in the community.

The construction of indices is one of the popular tools for empirically assessing women's empowerment and adaptive capacity (Burton et al., 2002). The use of Indicators and indices allows a complex reality or comparisons across locations to be simplified (Vincent, 2004). Doing so requires that the individual indicators for each determinant are aggregated to a determinant value and then the determinant values are aggregated into an overall index of women's empowerment and adaptive capacity. However, each indicator has a different value. Thus, each value needs to be normalized to make valid comparisons (Vincent, 2004; Swanson et al., 2007; Gbetibouo & Ringler, 2009; Nelson et al., 2010). A common approach of normalization, also used by the United Nations Development Program (UNDP) to annually report the Human Development Index, is subtracting the mean from the observed value, and dividing by standard deviation (Vincent, 2004; Swanson et al., 2007) as given by the following formula.

$$\text{Normalized value} = \frac{\text{Observed Value} - \text{Mean}}{\text{Standard Deviation}}$$

Assigning weights to each indicator is necessary to create indices. One approach is to assign equal weights to each indicator. Such an arbitrary approach, however, can result in overweighting unessential indicators and underweighting important ones. Another approach is to use expert judgment; however, this approach is criticized for being too subjective. Thus, Principal Component Analysis (PCA) was used to assign weights. The approach is not without its critiques. PCA converts categorical data into dummy variables and the use of dummy variables is not justified for PCA. To circumvent the

issue, Polychoric PCA and Factor Analysis for Mixed Data (FAMD) were utilized to construct the indices for individual determinants. Polychoric PCA was used in cases where all indicators were categorical and FAMD was used in cases where some indicators were categorical, and others were continuous.

First principal components were used to construct the indices as they capture the most variation in the data. To construct the overall Women Empowerment and Adaptive Capacity indices, PCA was conducted with all their determinants. The indices were then scaled from 0 to 1 with 0 being the lowest and 1 being the highest.

3.5.2 Impact of Women's Empowerment on Adaptive Capacity

Once the indices for Women Empowerment and Adaptive Capacity were constructed, the Ordinary Least Squares (OLS) regression model was used to estimate the effect of Women's empowerment on Adaptive capacity. Below is the Regression model used.

$$Y_{ij} = \alpha + \beta_1 * WE_{ij} + \Lambda_j + \beta * X_{ij} + \epsilon_{ij}$$

Where Y_{ij} is the Adaptive Capacity of household in the village, α is the intercept, WE_{ij} is the measure of Women's Empowerment of household in the village, Λ_j is the village fixed effect that controls for time-invariant properties of the village such as geographical location, topology, culture, etc., X_{ij} is the matrix of other control variables that include household demographic and economic variables that are not part of the Women Empowerment or Adaptive Capacity measures, and ward level variables. ϵ_{ij} are error terms that are assumed to be uncorrelated with each other. The coefficient of interest is β_1 , which provides the estimated effect of Women's Empowerment on Adaptive Capacity. To estimate the effect of a determinant on Women's Empowerment, the index

for the determinant was used as the explanatory variable. In addition, the effect on each determinant of Adaptive Capacity was estimated by using them as the dependent variable.

IV. RESULTS

4.1 Socio-demographic Background

Data were collected from a survey of Chepang Households in the Chitwan district in Nepal. A total of 190 responses were recorded. Based on the responses of the sampled households, the mean age of women was 33 with a range of 17 to 70. Women aged 25 to 34 made up 43.68% of the total. The majority of women (52%) had some formal education, while about 40% of the sample had none. The average income of the households was Nrs 2,46,814 (US\$1942) with a range of Nrs 4,500 – 21,00,000 (US\$35 – US\$16,531\$). Farming was the principal occupation listed by the majority of households (56.84%), followed by labor (which includes carrying stones, driving, etc.) at second place (22.10%). More than two-thirds of the household were male-headed (68.42%), while only 17% of the households were female-headed, with the remainder being other heads of the household such as parent-in-law, grandparent-in-law, etc. The average number of children per family was 2.55, with a family size of 5.32. Table 5 reports the summary statistics of the socio-demographic variables of the sampled households.

Table 5 Socio-demographic Characteristics of the Sample Households

Variables	Categories	Frequency	Percentage
Age	18 – 24	45	23.60%
	25 – 34	83	43.68%
	35 – 44	32	16.84%
	45 – 54	15	7.89%
	55 – 64	10	5.26%
	65+	5	2.63%
Household Income per year (in Nrs) (US\$ 1.00 = Nrs 127)	Less than 1,00,000	55	28.94%
	1,00,001 – 2,00,000	53	27.89%
	2,00,001 – 3,00,000	31	16.31%
	3,00,001 – 4,00,000	17	8.94%
	More than 4,00,000	34	17.89%

Head of household	Women	34	17.89%
	Husband	130	68.42%
	Others	26	13.68%
Women Education	No education	78	41.05%
	Some school	99	52.10%
	Highschool	8	4.21%
	Some college	3	1.57%
	Bachelor's degree	1	0.52%
	Graduate degree	1	0.52%
The primary occupation of household	Farmer	108	56.84%
	Business	5	2.63%
	Labor	42	22.10%
	Salaried job	9	4.73%
	Job abroad	2	1.05%
	Non-farmed skilled job	24	12.63%
Marital status	Married	179	94.21%
	Single	0	0%
	Divorced/separated	1	0.52%
	Widow	10	5.26%
Religion	Hindu	58	30.52
	Christian	132	68.42%
Family Type	Joint	74	38.94%
	Nuclear	116	61.05%
Family size	1 - 2	10	5.26%
	3 - 4	65	34.21%
	5 - 6	73	38.42%
	7 or more	42	22.10%
Number of children in a household	1	31	16.31%
	2	67	35.26%
	3	41	21.57%
	4	21	11.05%
	5 or more	19	10%

4.2 Key Determinants of Women's Empowerment in Chepang Households

To construct the index for women's empowerment, the indices for the six components (Economic, Socio-cultural, Familial/Interpersonal, Political, Legal, and Psychological), as described in Table 6, were constructed. Since the indicators for each of the components were mixed (continuous and ordinal), following (Mesfin, 2018), Polychoric PCA was used

to construct the indices. The indices were then normalized before constructing the Women's Empowerment Index. The Women's Empowerment Index was constructed from the indices of the components using the PCA. The women's empowerment index was then normalized to be between 0 and 1 with a higher value indicating a higher level of women's empowerment. Figure 4 illustrates the steps visually.

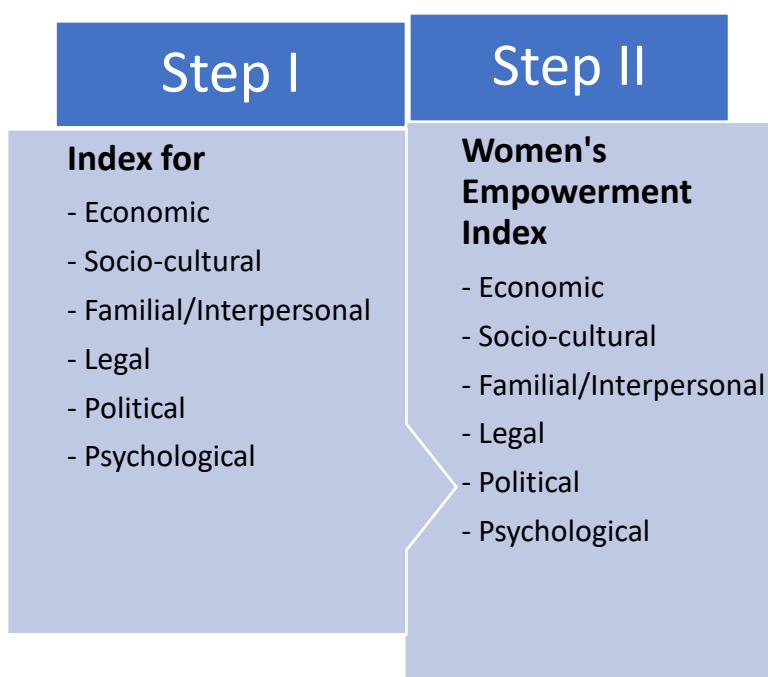


Figure 4 Steps for Generating the Women's Empowerment Index

Figure 5 presents the weights (factor loadings) assigned to the respective components when constructing the Women's Empowerment Index. The weights signify their relative contribution to the aggregate Women's Empowerment Index. The analysis indicates that all components have positive contributions to women's empowerment.

Psychological (0.57) had the highest influence on women's empowerment followed by socio-cultural (0.47), familial/interpersonal (0.41), political (0.36), economic (0.36) and

legal (0.16). The proportion of variation of the component indices explained by the first principal component for the women's empowerment index was 38 percent.

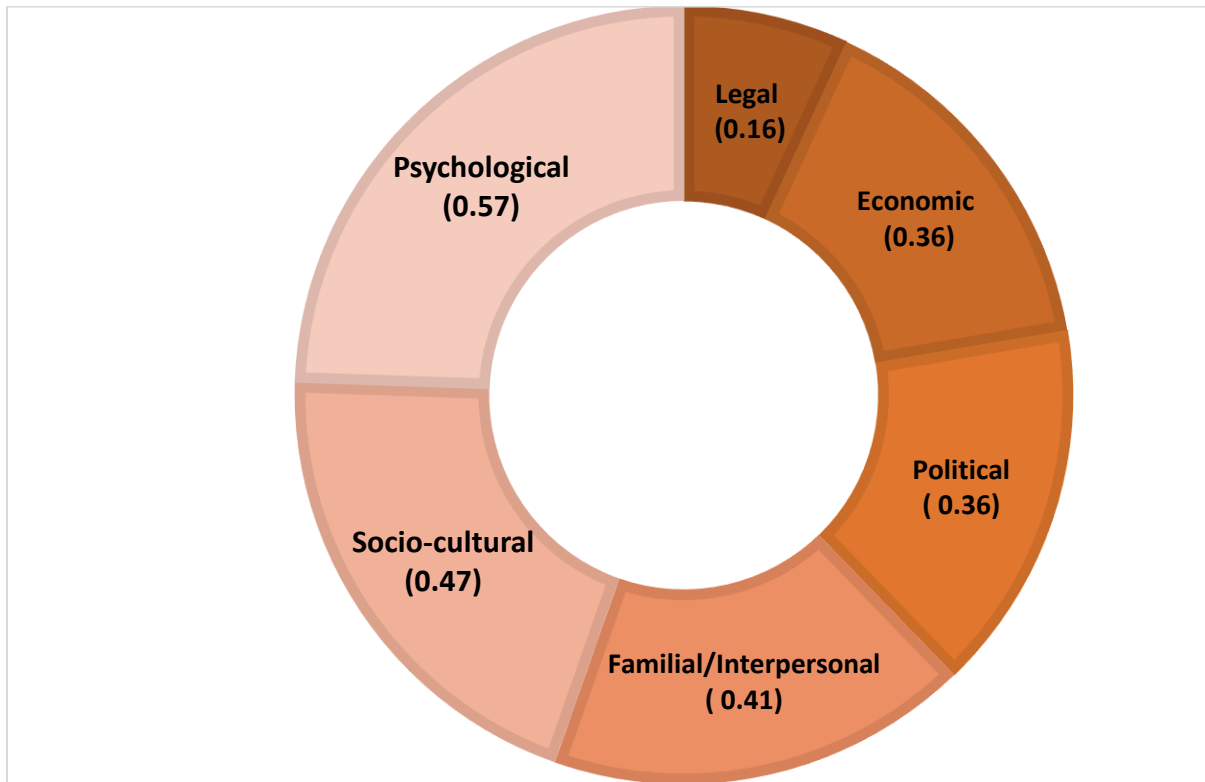


Figure 5 Factor Loading of Determinants of Women's Empowerment

4.3 Key Determinants of Adaptive Capacity in Chepang Households

The following steps were taken to construct the index of adaptive capacity. First, indices for four sub-components of the Asset Base were constructed: Natural asset, Physical asset, Financial asset, and Human and Social asset. In the case of Financial assets where all indicators were continuous, PCA was used. In the cases of Natural and Physical assets where the indicators were a mix of continuous and ordinal, Polychoric PCA was used. In the case of Human and Social assets, the determinants were a mix of quantitative (continuous and ordinal) and qualitative, Factor Analysis for Mixed Data (FAMD) was used. Second, the index for the Asset base was then constructed using PCA on the four

sub-components. Third, indices for institution and entitlement, knowledge and information, innovation, and flexible decision-making were constructed using Polychoric PCA. Fourth, the index for adaptive capacity was constructed using PCA on the five components. The components were normalized before constructing the Adaptive Capacity Index, which was then normalized to be between 0 and 1. A higher value of the index indicates a higher adaptive capacity. Figure 5 illustrates the steps visually.

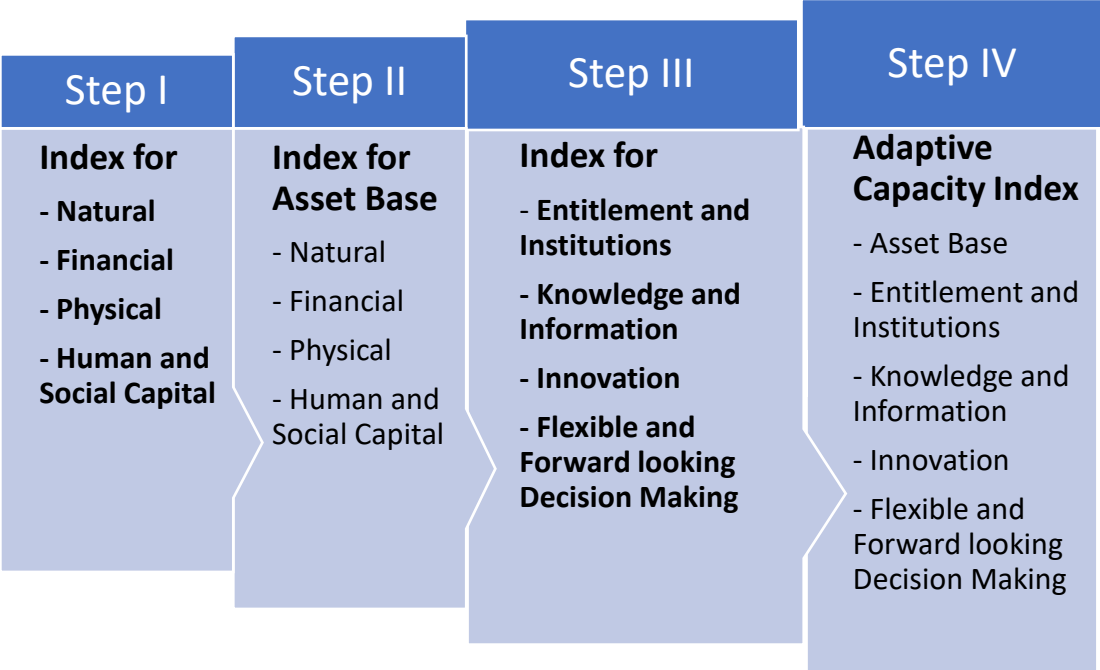


Figure 6 Steps for Generating the Adaptive Capacity Index

Figure 6 presents the weights (factor loadings) assigned to the respective components when constructing the Adaptive Capacity Index. The weights signify their relative contribution to the aggregate Adaptive Capacity Index. The analysis indicates that all components have positive contributions to the adaptive capacity. Institution and entitlement (0.55) have the highest influence on adaptive capacity followed by knowledge (0.54), flexibility (0.51), asset base (0.29), and innovation (0.23). The proportion of

variation of the component indices explained by the first principal component for the adaptive capacity index was 38 percent.

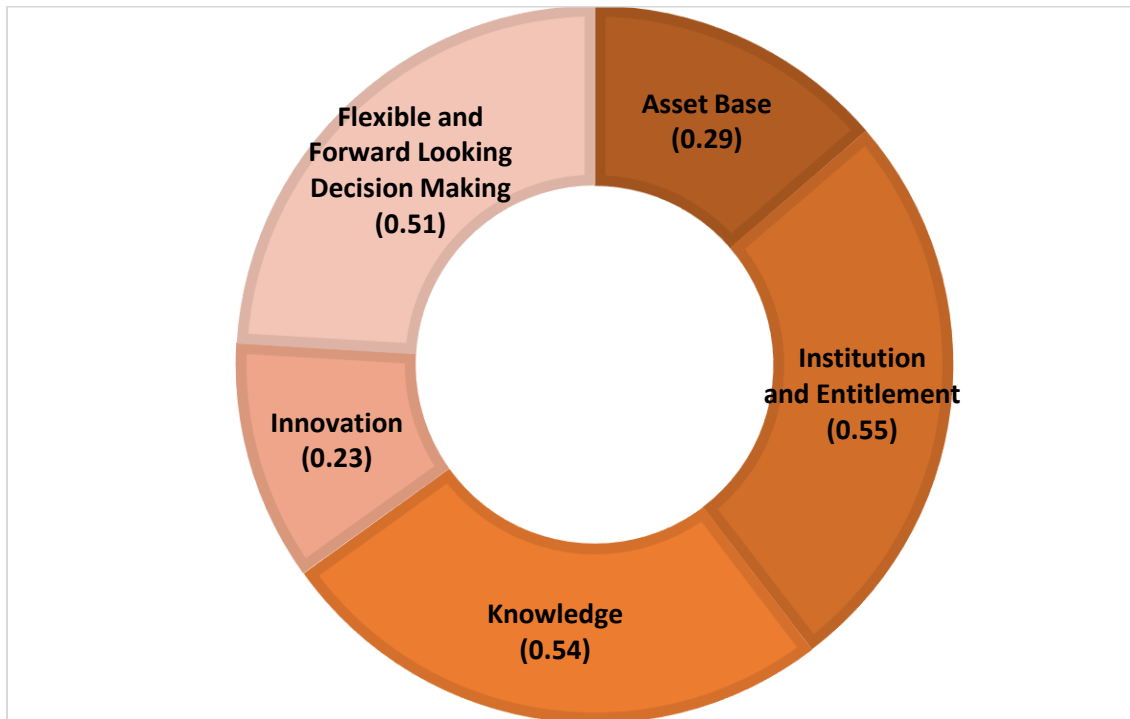


Figure 7 Factor Loading of Determinants of Adaptive Capacity

4.4 Effect of Women’s Empowerment Training on Women’s Empowerment

This section presents an analysis of the effect of the women’s empowerment training that took place in the six wards in Chitwan. Note that two of the four wards in the sample, Chandibhanjyang, and Shaktikhor, received the trainings, while the other two (Darechok and Dahakhani) did not. The average women’s empowerment index in the wards that received the training was 0.53 with a 95% confidence interval of (0.49, 0.57), compared to the average index of 0.46 with a 95% confidence interval of (0.43, 0.49) in the wards that did not receive the training (Table 6). The results indicate that there is a significant difference between the average women's empowerment index in the wards that received the training and in those that did not.

Table 6 Difference in Women’s Empowerment Index of Two Types of Communities

Training	Communities	Mean Women’s Empowerment Index	Standard Error	95% Confidence Interval
No	Darechok Dahakhani	0.46	0.017	(0.42, 0.49)
Yes	Chandibhanjyang Shaktikhor	0.53	0.019	(0.49, 0.57)

To identify the effect of the training on the women’s empowerment of the households, regression analysis was conducted. The results of the regression analysis are presented in Table 7. The dependent variable in the analysis is the Women’s Empowerment Index. The table presents the results of three different specifications. Model 1 controls for households’ socio-demographic characteristics. Model 2 includes ward fixed effects to control for time-invariant characteristics of the wards such as geography, culture, etc. Model 3 controls for both households’ socio-demographic characteristics and ward-fixed effects. Day-fixed effects and interviewer-fixed effects are included in all three models to ensure that the results are not significantly affected by the day of the interview and potential interviewer bias.

The results of the regression analysis indicated that the overall model was supported (as reported by R-Squares). Analysis of the significance levels indicated that the women’s empowerment training significantly affected women’s empowerment. The coefficients of women’s empowerment training are statistically significant in all three models illustrating the robustness of the finding. This finding suggests that receiving the training is associated with a higher (0.12 to 0.15) women’s empowerment index. In summary, the

finding suggests that the women's empowerment training was successful in achieving the goal of empowering the women in the wards.

Table 7 Effects of Women's Empowerment Trainings on Women Empowerment

Variables	Model 1	Model 2	Model 3
Women's empowerment training	.13*** (.04)	.15** (.05)	.12** (.05)
Age	.00 (.00)	-	.00 (.00)
Family size	-.00 (.01)	-	-.00 (.008)
Number of children	.00 (.01)	-	.00 (.01)
Family type	.01 (.03)	-	.01 (.03)
Head of household	-.03** (.01)	-	-.04** (.01)
Head of household education	-.00 (.01)	-	-.01 (.02)
Primary occupation of household	-.01 (.01)	-	-.00 (.01)
Marital status	.03 (.02)	-	.03 (.02)
Remittance status	-.01 (.04)	-	-.01 (.04)
Approx. income last year	.00 (.00)	-	.00 (.00)
Religion	-.06** (.03)	-	-.06** (.03)
Ward	-	-.02 (.05)	-.03 (.05)
Constant	.43	.33	.44
R square	.42***	0.33***	.42***
F	5.86	8.46	5.57
N	190	190	190

Notes: All regression analysis include day fixed effects and interviewer fixed effects. Standard errors are reported in parenthesis. * p < .10, ** p < .05, *** p < .01

4.5 Impact of Women's Empowerment on Adaptive Capacity of the Households

This section presents the findings on the effect of women's empowerment on the adaptive capacity of the households. Regression analysis was used to analyze this relationship. Table 8 reports the relationship between women's empowerment and adaptive capacity. The dependent variable in the analysis is the Adaptive Capacity index. The table presents the results of three different specifications. Model 1 (specification presented in the second column) controls for households' socio-demographic characteristics. Model 2 (specification presented in the third column) includes ward fixed effects to control for time-invariant characteristics of the wards such as geography, culture, etc. Model 3 (specification presented in the fourth column) controls for both households' socio-demographic characteristics and ward fixed effects. Day-fixed effects and interviewer-fixed effects are included in all three models to ensure that the results are not significantly affected by the day of the interview and potential interviewer bias.

The results of the regression analysis indicated that the overall model was supported (as reported by R-Squares). Analysis of the significance levels indicated that women's empowerment significantly affects the adaptive capacity of the household. The coefficients of women's empowerment are statistically significant in all three models, illustrating the robustness of the finding.

The interpretation of these results showed that an increase in the women's empowerment index by 1 raises the adaptive capacity index of the household by 0.31 to 0.42. In addition to women's empowerment, family size ($b = 0.02$, $p < .05$), number of children ($b = -0.03$, $p < .05$) and marital status ($b = 0.04$, $p < .05$) affect the adaptive capacity, although the coefficients are very small.

The findings in this section indicate that women’s empowerment significantly affects households’ adaptive capacity. Households with a higher level of Women’s Empowerment Index are associated with a higher level of adaptive capacity on average. Hence, women’s empowerment is an important factor in explaining the households’ adaptive capacity to climate change.

Table 8 Results of Regression Analysis for Adaptive Capacity

Variables	Model 1	Model 2	Model 3
Women’s empowerment	.40*** (.089)	.31*** (.08)	.42*** (.083)
Age	-0.00 (0.00)	-	-0.00 (.001)
Family size	.02** (0.01)	-	.02** (.009)
Number of children	-0.03** (.012)	-	-0.03** (.012)
Family type	.02 (0.03)	-	.04 (.032)
Head of household	-.00 (.01)	-	.01 (0.012)
Head of household education	-.01 (.02)	-	.01 (.02)
Primary occupation of household	.01 (.01)	-	.00 .007
Marital status	-.04* (.02)	-	-.05** (.021)
Remittance status	.01 (0.04)	-	.04 (.041)
Approx. income last year	.00 (.00)	-	0.00 (0.00)
Religion	.02 (.03)	-	.01 (.03)
Ward	-	.22*** (.05)	.27*** (.053)
Constant	.34	0.45	.33

R square	.43***	.42***	.5***
F	5.59	11.03	7.26
N	190	190	190

Notes: All regressions include day fixed effects and interviewer fixed effects. Standard errors are reported in parenthesis. * $p < .10$, ** $p < .05$, *** $p < .01$

4.6 Components of Women's Empowerment in Explaining Adaptive Capacity

Next, the results show which components of women's empowerment are particularly important in explaining the adaptive capacity of a household. Regression analysis on the Adaptive Capacity Index with components of women's empowerment as explanatory variables were performed. Table 9 presents the results of the analysis. For the sake of brevity, only the coefficients and standard errors of the components are presented.

The findings suggest that economic, legal, political, and psychological factors significantly affected the adaptive capacity of the household at a 5% confidence level. The coefficient of familial/interpersonal factors was significant only at a 10% level, whereas socio-cultural factors did not seem to significantly affect the adaptive capacity of the households. The effects of political ($b = 0.33$, $p < .01$) and psychological ($b = 0.30$, $p < .01$) components of women's empowerment are the largest followed by economic ($b = 0.20$, $p < .05$) and legal ($b = 0.18$, $p < .01$) components, respectively.

Table 9 Factors Influencing Adaptive Capacity of Chepang Households

Determinants of Women's Empowerment	Coefficient	Standard Error
Economic	.20**	.086
Socio-cultural	.061	.063
Familial/Interpersonal	.18*	.097
Legal	.18***	.05
Political	.33***	.076

Psychological

.30***

.07

Notes: All regressions include day fixed effects and interviewer fixed effects. Standard errors are reported in parenthesis. * $p < .10$, ** $p < .05$, *** $p < .01$

V. DISCUSSION & CONCLUSION

This study examined the relationship between women's empowerment and adaptive capacity in the Chepang community of the Chitwan district in Nepal. Below is the summary of the findings of the paper and their implications. The main finding of the paper suggests that women's empowerment has a significant positive effect on the adaptive capacity to climate change of the households in the Chepang community. Empirical studies linking women's empowerment to adaptive capacity are lacking in the literature and this study fills the gap in the literature.

When examining the role of each determinant of women's empowerment on adaptive capacity, the findings suggest that political and psychological components of women's empowerment are particularly important in enhancing household adaptive capacity in the Chepang community. The findings indicate a crucial role played by these components of women's empowerment on adaptive capacity which has not received much attention in the academic literature and policy. The findings highlight a need to invest in empowering women on psychological and political fronts from both the academic and policy perspective.

The paper also identifies the key determinants of women's empowerment and adaptive capacity. The findings on the determinants contributing to women's empowerment suggest that the psychological component is the largest determinant of women's empowerment, followed by socio-cultural and political components. This finding is important because the literature that studies the effect of women's empowerment mostly

focuses on economic and socio-cultural empowerment. The findings highlight the need to address these other components as well from both scholarly and policy perspectives.

The findings on the determinants of adaptive capacity suggest that institution and entitlements, knowledge, and flexible and forward-thinking decision-making are the three largest determinants of household adaptive capacity. This finding is significant since most of the literature stresses asset base as the primary determinant of adaptive capacity, ignoring the process and intangible components that are essential to building adaptive capacity. The finding is also significant from a policy viewpoint as well because the majority of measures are geared toward enhancing economic conditions while giving other drivers little to no consideration. This finding on the key determinant of adaptive capacity highlights the fact that other determinants play an even bigger role than the asset base in determining adaptive capacity and hence, need to be focused on in empirical studies and when designing policies to enhance adaptive capacity.

This paper also provides comprehensive approaches to measuring women's empowerment and adaptive capacity. The existing literature on the conceptualization of women's empowerment and adaptive capacity is narrowly focused on measuring the socio-economic aspects of a household and using the measure as a proxy for respective indices. In measuring the indices in a comprehensive manner that encompasses a wide range of components, this study contributes significantly to the literature.

5.1 Key Determinants of Women's Empowerment in a Chepang Households

The study identified the key determinants of women's empowerment in a Chepang household. Of the six dimensions of women's empowerment (economic, socio-cultural,

familial/interpersonal, legal, political, and psychological), the psychological dimension was found to be the most influential in explaining women's empowerment, followed by socio-cultural, familial/interpersonal, political, economic, and legal.

The findings have significant implications. First, the findings suggest that aspects other than economic should receive comparable consideration from both a research and policy viewpoint. While the economic component is an important aspect of women's empowerment, the findings of this study suggest that other components are equally or more important.

Among all components of women's empowerment, economic empowerment is widely seen as being the most important and is considered to be the strongest indicator of women's empowerment in the literature (see Jain et al., 2010 for example). Jane and Barker (2005) argue that a greater sense of economic empowerment results in a greater willingness to pursue a diversity of livelihoods that ensure financial security and leads to higher levels of aspiration, bargaining, negotiating, and analytical power, which are needed for better livelihoods. Mandal (2013) argues that other rights and scopes are meaningless without economic empowerment.

This study, however, reveals that other forms of empowerment, psychological, socio-economic, and political, are more or equally crucial. Without the establishment of women's legal and political awareness and rights, women's empowerment is incomplete (Mandal, 2013). Women should be able to contribute at all levels of society and not just in the home (Griffin, 1987). Awareness and participation of women in the political field and various decision-making bodies is a valuable tool for empowerment (Mandal, 2013). Likewise, legal empowerment is crucial to assure a supportive social safety net that

gives women freedom without being concerned by violence and exploitation (Sharma & Das, 2021). The findings support these notions and suggest that factors other than economic and socio-cultural factors need to be considered when assessing women's empowerment.

Women's empowerment is a multidimensional concept that encompasses various aspects (Medina & Herrarte, 2020). A single dimension is not usually sufficient to measure empowerment (Kishor 2000b; Estudillo et al. 2001). However, the existing body of research has mainly focused on examining household decision-making processes, financial control, and social or familial constraints explicitly as indicators of women's empowerment. Only sporadic efforts have been made in the literature at capturing empowerment indicators for social capital and support, women's engagement in public spaces and processes, psychological state, or political involvement. (Kabeer, 1997 & 1998; Mayoux, 2001; Malhotra, 2002). The existing empirical literature presents an incomplete picture of women's empowerment with much emphasis on economic and socio-cultural factors. As a result, the existing policies and programs largely focus on improving the economic environment for women. By going beyond the typical socio-economic variables and evaluating the subjective attributes of women's empowerment in six key elements, this study gives a comprehensive picture of women's empowerment and significantly contributes to the existing literature on the conceptualization of women's empowerment. This also implies a need for alternative ways of conceptualization of the idea, taking into consideration different aspects of women's empowerment, and developing practical approaches and techniques of operationalization of the concept variable. The findings also give the agencies and

government a significant direction as to where the focus is most needed (i.e., psychological dimension) for new policies and initiatives.

5.2 Key Determinants of Adaptive Capacity in Chepang Households

The study examined the key determinants that affect the household's capacity to adapt to climate change in a Chepang community. Five determinants (asset base, institution and entitlement, knowledge, innovation, and flexible and forward-looking decision making) were used to assess the adaptive capacity of a household (Jones et al., 2010). The findings revealed that all components positively contribute to adaptive capacity. The most significant factors affecting adaptive capacity were institution and entitlement, followed by knowledge, flexible and forward-looking decision making, asset base, and innovation.

There are several implications of the findings. First, components other than the asset base contribute more to the adaptive capacity, contrary to the popular notion in the literature. Second, the components with higher contributions show that dimensions other than asset base need to receive more attention in local level adaptive capacity assessments. This study provides an example of a need for a wider and more comprehensive analysis that goes far beyond measuring adaptive capacity based only on the five-livelihood assets. The literature on adaptive capacity so far has adopted assets as direct indicators of adaptive capacity at local levels (Osman-Elasha et al., 2005; Wall & Marzall, 2006; Vincent, 2007; Deressa, 2008; Swanson et al., 2009; Nelson et al., 2010; Piya et al., 2012). Thus, it fails to capture important contextual information (Park et al., 2012) and the underlying social and institutional processes that create adaptive capacity (Elrick-Barr et al., 2014). Studies that are exclusively asset-

based conceal how intangible functions and processes enable adaptive capacity (Jones et al., 2010; Elrick-Barr et al., 2014). The study provides a major contribution to the literature by highlighting the importance of these components that are overlooked in the literature.

Assets are crucial, but to have a strong adaptive capacity, the processes that mobilize them must also be effective (Brooks & Adger, 2005; Wall & Marzall, 2006). The mere existence of assets is not sufficient. A system's adaptive capacity cannot be fully understood by focusing only on the asset base of a household. As suggested by the findings in this paper, asset base assessments need to be complemented by assessments of the intangible processes that are crucial in defining a system's capacity to react to shocks and stresses like the impacts of climate change. It is more practical to incorporate dimensions other than the commonly used asset base, such as institutions, knowledge, and forward-thinking decision-making. Given that adaptive capacity is multidimensional and driven by the intricate interrelationship of numerous elements at various scales (Vincent, 2007), institutions and entitlements can act as a conduit for access to and control of assets (Jones et al., 2010). Such considerations will open avenues of improvements in overall adaptive capacity and pave the way for a wider and more comprehensive analysis of local adaptive capacity.

The findings also suggest that policies, at both local and national levels, designed to improve household adaptive capacity should focus on improving the components with a high level of contribution to the adaptive capacity. This does not, however, imply that the other components should be neglected as they also contribute significantly to adaptive capacity. To increase the adaptive capacity of any household, it is critical that all

elements and indicators function as an integrated and organized part of households' adaptive capacity.

The findings provide important insights into policy relevance. First, it promotes the need for a wider and more comprehensive analysis of adaptive capacity. Second, it aids in directing efforts towards components that have a higher contribution to adaptive capacity. The immediate policy focus should be geared towards improving the contribution of institutions and entitlements, household knowledge and information to climate-related matters, and flexible and forward-looking decision-making as they make the most significant contributions. Policies should focus on creating stronger institutions, improving knowledge dissemination in the community, and making more transparent and inclusive decisions while continuing to improve their asset base. Striking the right balance between the components is very crucial. Similarly, carrying out continuous assessments would also help monitor a household's progress in terms of its ability to adapt to climate-related changes.

5.3 Effect of Women's Empowerment Training on Women's Empowerment

The study also assessed the effect of women's empowerment training that took place in two of the wards in the study, Chandibhanjyang, and Shaktikhor. The major objectives of the training were to enhance leadership skills and knowledge, increase participation in various dimensions of local self-governance, and increase regular communication and coordination between Chepang women. The study findings suggest that the training was effective in improving women's empowerment.

Studies in the literature document the effects of trainings/programs that pertain to a single activity (such as gardening, financing, skill development, abuse, etc.). Research

on the effect of trainings targeted towards improving a broad range of elements of women's empowerment is lacking. This study adds to the literature by documenting the effect of training targeted toward enhancing women's empowerment as a whole through various channels, e.g., leadership, and political.

Comparing these study findings with the existing literature is problematic as studies in the literature narrowly focus on training intended to improve women's ability in a single dimension or activity. Nevertheless, the findings in this study are consistent with that of the literature supporting the notion that the trainings geared towards enhancing women's livelihoods are effective in enhancing women's well-being. For instance, Jadav et al. (2014) found that training women in dairy farming can enhance knowledge, improve skills, and bring change in the attitudes of rural women in India. Tiwari et al. (2005) found that empowerment intervention was effective in reducing intimate partner violence (IPV) and improving the health status of the women among Chinese abused pregnant women. Patalagsa et al. (2015) provided training in home gardening and nutrition in Bangladesh and found that the trainings showed gradual but clear evidence of women's empowerment. Based on the findings of this paper and those of the literature, it is safe to conclude that trainings are effective, regardless of whether they are aimed towards empowering women generally or in a specific activity. Hence, offering more trainings designed to enhance women's empowerment, especially in disadvantaged communities like Chepangs, can benefit not only the women but also the households and the communities.

5.4 Impact of Women's Empowerment on Adaptive Capacity of the Household

Women's empowerment significantly influenced the household's adaptive capacity in the Chepang community. The finding supports the central thesis of the study, which states that women's empowerment enhances a household's adaptive capacity. The finding is important on multiple fronts. First, the finding contributes to the literature on women's empowerment by connecting the role of women's empowerment to adaptive capacity. Second, it provides a major contribution to the literature on adaptive capacity by identifying the fact that women's empowerment is a significant contributor to enhancing adaptive capacity. This link has been missing in the literature thus far. Third, it contributes to the literature on climate change mitigation and adaptation by suggesting a potential path to climate solutions. Fourth, from a policy perspective, this finding provides a policy direction by identifying a need to empower women and bring them to the forefront of climate adaptation plans.

The main finding of this paper is consistent with the conceptual studies that claim a positive role of women's empowerment in climate adaptation and mitigation (e.g., Bob & Babugura, 2014; Smit & Pilifosova, 2003). The findings of the study are also supported by other studies that have examined the role of women in various aspects of climate adaptation and mitigation, as well as sustainable development (Bousquet et al., 2015; Leisher et al., 2016; Ludi et al., 2011; Jones et al., 2017; Smit et al., 2003; Smit & Pilifosova, 2003). For instance, Ghasemi et al. (2021) found a significant mediating role of women's empowerment in conservation efforts in rural Iran. Similarly, Sachs (2018) and Sturgeon (2016) argue that women's empowerment is related to effective environmental conservation. Other studies have also claimed that empowering women

is necessary for sustainable development (Quisumbing & Meinzen-Dick, 2001; Mukoni, 2013; Women Watch, 2008).

Empowering women has a greater impact than the sum of their parts because they help their families and communities grow. Economically independent women were found to invest 90 percent of their money back into their families and communities, compared to 35 percent for men, improving not only the household but also the neighborhood's livelihood. (CGI, 2009). Similarly, economically empowered women were found to have increased ability to exercise a 'voice' in the household decision-making process which in turn increased their resilience to climatic hazards (Wrigley-Asante et al., 2019).

Participation of women in natural resource management has also been linked to better resource governance and conservation outcomes (UN, 2019). Studies have found correlations between women in positions of political authority and lower national carbon footprints, between parliaments with a greater proportion of female members and ratification of environmental treaties, and between higher percentages of women on corporate boards and disclosure of carbon emissions information (Gender & Alliance, 2016). A study by the UN in the *páramo* ecosystem of the Ecuadorian Andes found that the Indigenous women used sustainable agricultural production and landscape management to restore the fragile ecosystem to health after years of desertification and overgrazing. According to a UN Women Representative in Ecuador Bibiana Aido, "the *páramo* initiative shows us that without women, it's not possible to talk about solutions to climate change and sustainable development" (UN Women, 2019).

Numerous studies have looked at how women might contribute to climate change mitigation and adaptation efforts (Edvardsson Björnberg & Hansson, 2013; Huyer &

Gumucio, 2020; Wester & Lama, 2019), as well as their sensitivity to its effects (Arrora Johnson, 2011; Denton, 2002; Friedman et al., 2019; Yadav & Lal, 2018). There is no denying the connection between women and climate change, yet the resources are still insufficient. These studies, however, fail to mention empowering women to improve their capacity for adaptation.

This study provides a direct link that women's empowerment has on adaptive capacity empirically. Government, non-government organizations, and development agencies could substantially benefit from understanding the relationship between women's empowerment and households' adaptable capacity. With this finding, policies can be directed toward funding programs that empower women, such as the training program conducted in the Chepang community mentioned in this study or trainings geared towards improving women's livelihood, microcredit programs that are shown to have a significant effect on women's empowerment (Mamun et al., 2014).

Programs fostering women's empowerment are transformative not only from the women's perspective but also from communities' as it advances the adaptive capacity of households. Enhancing adaptive capacity at the household level eventually leads to the enhancement of communities, and subsequently nations,' adaptive capacity.

5.5 Components of Women's Empowerment in Explaining Adaptive Capacity

Based on the findings of the analysis on the effects of components of women's empowerment in adaptive capacity, the adaptive capacity was significantly impacted by political, psychological, economic, and legal issues. The familial/interpersonal and socio-cultural components did not appear to significantly affect the households' ability to adapt.

The findings imply that the political and psychological components of women's empowerment are particularly important in explaining the adaptive capacity of the households. The economic and legal components are also important but less so than the political and psychological components. The majority of the literature contains studies that focus on empowering women on the economic and socio-cultural fronts, e.g., de la Torre-Castro et al., 2022, while effects of political and psychological empowerment are mostly missing. Similarly, governmental policies are also focused on improving the economic status of women, paying little to no attention to other components. The finding on the importance of political and psychological components suggests a need to focus on political and psychological empowerment in both academic research and policymaking.

The findings on the political and psychological components are significant because little is known in the empirical literature about either of those components. Evaluating the impacts of the political and psychological components is challenging, particularly for the psychological component. The significance of those components suggests a need for better approaches to measuring them and studying their effects. Although not examined in the context of adaptive capacity, research has demonstrated that women's beliefs about their role in the household, contribution to the household, capability for making decisions, and level of trust in their family members play a significant role in determining their environmental behavior (Sturgeon, 2016; Sachs 2018). Similarly, Mandal's (2014) finding on political empowerment supports the findings in this study. Women's political awareness and engagement in various decision-making bodies is an important instrument for women's empowerment and hence, adaptive capacity. In addition to

political, psychological, and economic empowerment, legal empowerment is important to ensure a strong social safety net that gives women the opportunity to live their lives without fear of abuse or exploitation. (Sharma & Das, 2021).

Despite failing to establish significance in this study, the importance of familial/interpersonal and socio-cultural elements must not be overlooked. These factors have been found to significantly influence women's empowerment (Khan & Maan, 2008; Khan, 2010). Yogendrarajah (2013) found that there is a strong relationship between decision-making authority and women's empowerment. Similarly, Banerjee et al. (2020) found that more freedom of movement increased women's decision-making power, and thus empowerment. Women's ability to make childbearing decisions and family planning methods are also associated with women's empowerment (Haque et al., 2011).

These findings suggest that more needs to be done to improve women's political engagement and psychological well-being. This can be done by improving women's participation in various local institutions such as political and micro-credit unions and by designing and implementing more programs that provide capacity-building trainings.

5.6 Research Implications

Women are an integral part of society. Women perform various functions that are critical to the survival of the family and its well-being. Thus, empowering women is an essential goal in and of itself and a means to increase the adaptive capacity of a household to climate change. Using data from the Chepang community in the Chitwan district of Nepal, this study attempted to identify the importance of women's empowerment in influencing the adaptive capacity of a household guided by ecofeminism theory.

The results confirm that empowering women significantly influences the adaptive capacity of a household in the Chepang community of Chitwan district, Nepal. The findings indicate that political and psychological aspects of women's empowerment are especially significant in boosting household adaptive capacity when analyzing the impact of each determinant of women's empowerment. The results also confirm that providing women's empowerment training increase women's empowerment in a household. The findings will enable future researchers and policymakers to better understand how women's empowerment and adaptive capacity are linked and which components of women's empowerment are particularly important in influencing household adaptive capacity.

From a theoretical perspective, the findings contribute to the use of ecofeminism theory in identifying the significant role women have in enhancing adaptive capacity. The findings support the notion put forth by ecofeminism theory that women and nature are related, and that environmental sustainability depends on strengthening the role of women at all levels of society.

The paper also identified the key determinants of women's empowerment and adaptive capacity. The findings on factors influencing women's empowerment suggest that psychological factors have the most significant contribution, followed by socio-cultural and political factors. Similarly, the findings on components influencing the household's adaptive capacity reveal that knowledge, flexible and forward-thinking decision-making, and institutional and entitlement support are the three most significant factors influencing the household's capacity to adapt to changing climates.

This study contributes to the comprehensive discussion of household adaptive capacity and women's empowerment because indices used to measure household adaptive capacity and women's empowerment incorporate a wide range of components that are otherwise missing in the literature. In doing so, the study finds that components other than commonly identified economic conditions can have more important contributions to measuring household adaptive capacity as well as women's empowerment. Moreover, the results provide further information to stakeholders including policymakers, researchers, and development actors on which subcomponent(s) to focus on and make improvements by unveiling their relative importance to women's empowerment and adaptive capacity.

This study also provides inputs to the methodological aspects of assessing adaptive capacity at the local level, particularly concerning indicator selection and method of analysis. Although this research utilizes a wide range of variables and indicators, a list of indicators would need to be modified based on the context.

This is one of the first studies attempting to measure women's empowerment that incorporates most of the subjective attributes discussed in the literature, (e.g., economic, socio-cultural, familial/interpersonal, political, psychological, etc.). The scale provides a starting point for future researchers to better understand women's empowerment as a whole and to build on the scale.

Empowering women by improving the psychological and political aspects is critical for improving the adaptive capacity of their households. Agencies that work to improve women's empowerment should deliver training designed to enable women to improve their psychological confidence and political skills, along with other aspects like

economic and socio-cultural. Women's empowerment strategies need to include the resources that ensure women have the space, resources, and platform through which to express their needs and views on climate actions. It is essential to establish or strengthen women's community-based organizations to enhance women's social participation and provide the necessary conditions for supporting participation in social programs. Women need to be involved in decision-making at the grassroots level; however, due to the cultural, social, and political environment in many rural settings, women may not be allowed to get involved in critical decision-making. It is in the local spaces that change must occur, and it is here that women have traditionally been most powerless.

Along with the women's empowerment training, several other measures also need to be considered, undertaken, and prioritized to empower women. New and women-friendly technologies should be made available at little or no cost to women at all levels to reduce their burden as a socially vulnerable group, and more importantly to enable them to mitigate and adapt effectively to the impacts of climate change and other resource-related ecological challenges. In addition to this, efforts need to be made in extending adaptation technology to women through the distribution of weather forecasting devices, as well as the allocation of extension agents to assist in interpreting weather information to enable them to make appropriate decisions concerning farm operations.

5.7 Limitations and Recommendations for Future Research

This study has limitations and recommendations for future research on women's empowerment and adaptive capacity. First, this study focuses on the case of Chepangs from the Chitwan district of Nepal, so an obvious question is whether the patterns

observed in this study apply to other Indigenous communities in Nepal or other regions of the world. The growing number of trainings provided in rural communities makes it possible to examine the generalizability of the patterns found in this Chepang community. So future studies could examine the relationship in diverse communities with different demographics and social compositions. Different kinds of trainings can also be explored.

Second, although this study identifies several factors associated with women's empowerment and adaptive capacity, a large fraction of variation in those measures (62% for both) remains unexplained. Future research could examine additional variables that may explain women's roles in influencing the adaptive capacity of a household or even a community. Variables that could be considered include assets brought to the marriage, proximity to other family members, characteristics of the respondent's parents and upbringing, etc.

Third, both adaptive capacity and women's empowerment are latent and dynamic concepts, hence, difficult to measure accurately. While the indicators for measuring tangible components, such as asset base, and economic components, are well-defined in the literature, there are no proper sets of indicators defined to adequately measure the intangible components, such as psychological well-being, institution, entitlement, etc. The findings on the importance of these intangible components poses a major limitation in itself. For instance, although the findings suggest that psychological component is the most important contributor to adaptive capacity, there are several challenges to improve women's psychological well-being. First, it is difficult to measure psychological well-being, and the literature does not provide a framework to adequately

measure it. The implication of the shortcoming is that little is known about the component and its impacts. Second, it's a structural issue that does not have a quick fix. Several factors need to be improved and/or changed to improve women's psychological well-being. For instance, women's economic, socio-cultural and decision-making independence, legal and political awareness and participation are necessary conditions to improve their psychological state. This process could take years to materialize, especially in rural, male dominated communities such as Chepangs. This study takes a step in the direction of inclusion and proper measurement of such components, but more improvements need to be made to properly measure such indices and their effects.

Fourth, future research should consider employing a more representative sample and additional data collection methods. Given limited time and resources, only the cross-sectional data of the sample of the Chepang population were used. Panel data from multiple years would allow researchers to use a quasi-experimental approach that would help more accurately identify the causal relationship between women's empowerment and adaptive capacity. In addition, qualitative data collection, (e.g., interviews, ethnographic study, etc.), that includes multiple perspectives, such as more diverse households, policymakers, and industry can help shed light on a better understanding of the findings.

Finally, future research is needed to study the effect of women's empowerment on household outcomes such as health and nutrition. The level of women's empowerment within different domains (e.g., community level, national level) may also matter such as roles in particular sectors. By providing a comprehensive approach to measuring

household adaptive capacity and women's empowerment, and by identifying a direct relationship between the two, this study helps further the research on topics related to both household adaptive capacity and women's empowerment.

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APPENDIX A

Training Description

In a joint project, United Nations Democracy Fund (UNDEF) and Development Exchange Center (DEC) Nepal organized a two-year training program for Chepang women: *Reinforcing Women of the Chepang Community as Change Agents for Promoting Local Governance*. This 2-year project (1 January 2015- 31 December 2016) project aimed at empowering women in the Indigenous Chepang community to increase their engagement in local governance for promoting pro-poor and gender-responsive decision-making processes. The major objectives of the training were five-fold:

1. To enhance the leadership skills of selected Chepang women facilitators for social mobilization.
2. To enhance the knowledge and skills of Chepang women to participate in various dimensions of Local Self Governance.
3. To increase the participation of Chepang women in the local planning and implementation process.
4. To Increase regular communication and coordination between Chepang women and Local Government.
5. To increase accountability among stakeholders and service receivers for the promotion of local good governance.

The training was conducted in 6 villages in the Chitwan district. The project collaborated with local government agencies and influential male leaders so that they were more accountable to the needs and aspirations of these marginalized sections of society.

The project adopted CARE's women empowerment framework to enhance the leadership capacity and networking skills of Chepang women. The framework covers three major areas: (a) Agency: change in an individual capacity, leadership, self-esteem, and aspirations, (b) Structure: change in national, social, and local laws and norms, values, and behaviors, and (c) Relationship: change in the way women and men, people and policymakers interact with each other.

Reinforcing Women of the Chepang Community as Change Agents for Promoting Local Governance: Program Outline

21 participants from 6 Chepang dominant VDCs of Chitwan district- Siddhi, Korak, Kaule, Chandibhanjyang, Shaktikhor, and Lothar attended the "Training of Trainer" training. Of these, 18 were Chepang women selected based on their education and active association with village development groups, and 3 were potential influential Chepang men, who were associated with the Village Development Committee and were members of the Chepang Community Promotion Group. The 18 Chepang females are referred to as Local Resource Persons (LRPs).

The training program was focused on five themes: 1. Women Leadership and Gender Equality 2. Good Governance and Development 3. Social Accountability 4. Social Mobilization 5. Plans and Policies of Government. Six Cascade Training events were

held by Local Resource Persons in their respective Villages (a total of 6 villages). The main objective of cascade training was to:

- i. To increase facilitation skills of Local Resource Persons (LRPs) enabling them to inspire other Chepang women to raise their concerns.
- ii. To increase knowledge of Chepang women on the local governance planning process, Social Accountability, and Social Mobilization.

The contents covered in the training were gender, equity and equality, social mobilization concept, qualities of social mobilizer, facilitation skills, the concept of reflecting model, steps of the budget planning process, intervention of Chepang Women in Budget planning process at VDC level, role of WoCAF, the concept of Social Accountability and its tools like Community Score Card (CSC), Public Hearing, Social Audit with a highlight on CSC.

The LRPs then established 30 Women Chepang Action Fora (WoCAFs) comprising each of 25 Chepang Women (750 women). Six campaigns, twelve network meetings, and 100 radio program broadcasts were conducted by each WoCAF. The campaigns consisted of knowledge sharing at the district and national levels, and social audits at the village level.

APPENDIX B

Questionnaire

WOMEN'S EMPOWERMENT AND ADAPTIVE CAPACITY TO CLIMATE CHANGE: A CASE OF CHEPANGS IN CHITWAN DISTRICT OF NEPAL

Dear respondent, this study will be conducted to assess the relationship between women's empowerment and adaptive capacity to climate change in the Chitwan district of Nepal. The objective of this questionnaire is to collect primary data on women's empowerment, adaptive capacity, and the socio-economic condition of the community. It is intended for women in the Chepang Community in the Chitwan district. Your household was selected randomly from a list of households living in this area.

This questionnaire will take approximately 30-40 minutes to fill out. Your participation in this study is voluntary. Your answers will remain anonymous. Only aggregated results will be reported. We appreciate you taking the few minutes necessary to complete this questionnaire. Thank you!

Date:
Ward:

Day:
Interviewer:

I. Empowerment

1. Economic

1.1. How much did you contribute to the total income of the household?

1 = None 2 = Less than 10% 3 = Some (approx. 20%) 4 = About half
5 = More than half 6 = All

1.2. Who makes decisions in your household about how to spend money?

1 = Other 2 = My spouse 3 = My spouse and I decide together
4 = My spouse and I decide on our own 5 = Me 6 = Don't know

1.3. Do you get to spend any of the income you earned of your own free will on things other than basic necessities?

1 = No, none 2 = Yes, some 3 = Yes, half 4 = Yes, most
5 = Yes all

1.4. About what percent of your own income do you save?

1 = None 2 = Less than 10% 3 = Some (approx. 20%) 4 = About half
5 = More than half 6 = Don't know

1.5. Ownership of assets and land

	How many (items) does your household own?	How much do you own?
Cow		
Goats		
Poultry		
Land (in Katha)		
Other Assets		

1.6 Of the total land owned by the household, how much do you own?

1 = None 2 = Less than 10% 3 = Some (approx. 20%) 4 = About half 5 = More than half 6 = All

1.7 What percentage of the household loan do you own?

1 = None 2 = Less than 10% 3 = Some (approx. 20%) 4 = About half
5 = More than half 6 = All

1.8. Are you a member of any local trade association in your community?

1 = Yes 0 = No

1.9. How active is your participation in those associations?

1 = Non-active 2 = Somewhat active 3 = Very active 4 = Leader

1.10. How far is the nearest market (bazaar) from your house in kilometers?

[Kilometers]

1.11 Do you have a right to buy and sell things in the market without asking for permission in your house?

1 = Yes 0 = No

2. Socio-cultural

2.1. Women's freedom in movement; Women's access to transportation

	Are you allowed to visit the following places alone?	Are you permitted to visit any place riding on public transport?
	1=Never 2=Yes, but never alone 3=Yes, alone, with permission 4=Yes, alone, do not need permission	1=Never 2=Yes, but never alone 3=Yes, alone, with permission 4=Yes, alone, do not need permission
Friends'/Relative		
Market		
Community center in the village		
Health center		
Fair		
Neighboring village		

2.2. It is more important that a boy goes to a school than a girl.

1 = Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree
5 = Strongly Agree

2.3 Are your daughter(s) or daughter-in-law allowed to engage in an income-generating activity?

1 = Yes 0 = No

2.4 How far would you allow your daughter to travel to get a job?

1 = Home-based work only 2 = Within the village 3 = Within the ward 4 = Within the district
5 = Within the province 6 = Within the Country 7 = Abroad

2.5 How far would you allow your daughter-in-law to travel to get a job?

1 = Home-based work only 2 = Within the village 3 = Within the ward 4 = Within the district
5 = Within the province 6 = Within the Country 7 = Abroad

2.6. What is your level of education?

1 = No education 2 = Some school 3 = High school graduate/GED 4 = Some college
5 = Bachelor's degree 6 = Graduate degree

2.7. What level of education would you like your son(s) to achieve (if you have a son(s))?

[Level]

2.8. What level of education would you like your daughter(s) to achieve (if you have a daughter(s))?

[Level]

2.9. Do women have equal access to education as men?

1 = Yes 0 = No

2.10. How difficult is it for a married woman to continue her schooling?

1 = Impossible 2 = Very difficult 3 = Somewhat difficult 4 = Not at all

2.11. Women's visibility and access to social space; Women's participation in extra-familial and social networks

	Are you a member of any of the organizations below? 1 = Yes 0 = No	Level of participation? 1 = <i>Non-active</i> 2 = <i>Somewhat active</i> 3 = <i>Very active</i> 4 = <i>Leader</i>
Women's Association		
Credit microfinance group		
Mutual/Self-help group (<i>Samuha</i>)		
Religious group		
Village Development Committee		
Other village committee		
NGO		
Political party		
Business or farmer's association		
Any other group		

3. Familial-Interpersonal

3.1. In your household, who normally makes most of the decisions about the activities listed below?

	1 = Other 2 = My spouse 3 = My spouse and I decide together 4 = My spouse and I decide on our own 5 = Me
How much of the crops harvested should be kept for consumption in the household	
How to spend the money made from the sale of crops [or main household income-generating activity]	
What food to buy and consume	
Purchase of furniture for the house	
Purchase and/or sale of the cattle and other livestock	
Purchase and/or sale of land	
Whether the household should take out a loan, from what source, and how much to borrow	
How to invest borrowed money	

3.2. Ability to make childbearing decisions

	1 = Others 2 = My spouse 3 = My spouse and I decide together 4 = My spouse and I decide on our own 5 = Me
Who decides when to have children?	
Who decides how many children to have?	
Who decides on the gender preference?	

3.3. Is abortion practiced in your village?

1 = Yes 0 = No

3.4. According to you, what is the main reason for abortion?

1 = If it's a girl 2 = Pressure from family 3 = Health reasons 4 = Others, specify

3.5. Who decided or will decide on your husband or your daughter's husband?

1 = Others 2 = Parents 3 = Self with parents 4 = Self

3.6. Who decided or will decide when you or your daughters get married?

1 = Others 2 = Parents 3 = Self with parents 4 = Self

3.7. Can you remember any incidents in which a woman in your household, including yourself, was a victim of violence in the last 6 months?

1 = Yes 0 = No

3.8 In your community, how likely is it that a married woman would divorce?
1 = Very unlikely 2 = Unlikely 3 = Could happen 4 = Somewhat likely
5 = Very Likely

3.9. Do you know women can legally divorce?
1 = Yes 0 = No

3.10. Do you know a woman has the right to ask for alimony from her husband?
1 = Yes 0 = No

4. Legal

4.1. Do you know women can seek legal protection?
1 = Yes 0 = No

4.2. Do you know women can receive legal services for free?
1 = Yes 0 = No

4.3. Does your family support you if you want to exercise your legal rights?
1 = No 2 = Maybe 3 = Yes

4.4. How effective are the institutions that enforce legal rights in your community?
1 = Very ineffective 2 = Mostly ineffective 3 = Somewhat effective
4 = Mostly effective 5 = Very effective

5. Political

5.1. What are your most important sources of information about what the government is doing? (Choose all that apply)

- Relatives, friends, neighbors Local market Radio
 Political associates Television Groups or associations
 Community leaders Government agents Internet

5.2 How frequently do you discuss politics with people outside of your family?
1 = Never 2 = Once 3 = Every other month 4 = Every month 5 = Every week
6 = Every day

5.3. How easy is it to meet the local political leaders?
1 = Failed or was unable to meet 2 = Must come back several times 3 = Have to wait
4 = Easy 5 = Very easy

5.4. How often do you attend community meetings?
1 = Never 2 = Once a year 3 = Every other month 4 = Every month 5 = Every week
6 = Every day

5.5. In the past year, have you contacted any community leaders about some important problem or to give them your views?
1 = Yes 0 = No

5.6. Have you run for office in the election of any community leaders (such as community mobilizers, water committees, etc.)?
1 = Yes 0 = No

6.3. Do you feel that people like yourself can generally change things in your community if they want to?

1= No, not at all 2 = Yes, but with a great deal of difficulty 3 = Yes, but with a little difficulty
 4 = Yes, fairly easily 5 = Yes, very easily

6.4. How strongly do you agree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I feel helpless.					
I am driven and motivated to work hard.					
I feel I can provide for my family and meet their needs.					
I have no confidence in myself.					
I feel like my life has importance					
Overall, I am satisfied with myself					

II. Adaptive Capacity

Asset base

1. Natural asset

1.1. Do you own land?

1 = Yes 0 = No

1.2. If yes, what is the size of your land in “ropani”?

Code	Classification of land	Size in “ropani”	Hectare equivalent
1	Farmland		
2	Grassland		
3	Wooded grassland		
4	Woodland		
5	Bare land		
6	Settlement		
7	Total land area		

1.3. Do you farm any land that you don’t own?

1 = Yes 0 = No

1.4. If yes, what is the size of the land?

[ropani]

1.5. How do you assess the productivity of your farmland?

1 = Very poor 2 = Poor 3 = Medium 4 = Productive 5 = Very productive

1.6 Do you have livestock?

1 = Yes 0 = No

1.7 If yes, where do you graze your animals? (multiple responses)

1 = Communal grazing land 2 = In private grazing land 3 = Cut and carry

4 = Others, specify _____

1.8 How do you assess the adequacy of the grazing land?

1 = Very scarce 2 = Inadequate 3 = Adequate 4 = Very adequate
 5 = Plenty, no problem of grazing land

1.9 If grazing is a problem what are the reasons? (*multiple responses*)

1 = Shortage of grazing land 2 = Low productivity of grazing land 3 = High population of animals
 4 = Others, specify _____

1.10 What are the sources of water for the household?

Code	Source of water	Check	Distance from home in minutes
1	Spring	<input type="checkbox"/>	
2	River	<input type="checkbox"/>	
3	Lake	<input type="checkbox"/>	
4	Private well	<input type="checkbox"/>	
5	Public well	<input type="checkbox"/>	
6	Public standpipe water	<input type="checkbox"/>	
7	Public tap water (Piped into the home)	<input type="checkbox"/>	
8	Rainwater	<input type="checkbox"/>	

1.11 How do you assess your access to water resources?

1 = Very scarce 2 = Inadequate 3 = Adequate 4 = Very adequate
 5 = Plenty, no problem with water

1.12 How do you assess the quality of water you are using?

1 = Very poor 2 = Poor 3 = Medium 4 = Good 5 = Very good

2. Physical asset

2.1 Which of the following assets do you own?

Code	Asset type	1 = Yes 2 = No
1	House	
	1. Thatch roof	
	2. Tin roof	
	3. Cemented	
	4. Other, specify _____	
2	Mobile phone	
3	Radio	
4	Television	
5	Cable line	
6	Refrigerator	
7	Solar panel	
8	Electricity	
9	Toilet	
10	Bicycle	
11	Motorbike	
12	Car	

2.2 How far is the nearest road in Kilometers?

[Km]

2.3 Do you own agricultural tools?

1 = Yes 0 = No

2.4 If yes, how much is it worth do you think it is?
[Rupees]

2.5 What percent of the land you own is irrigated?
[%]

3. Financial asset

3.1 Which of the following represents your financial assets?

Code	Financial asset	1 = Yes 0 = No	Approx. amount in rupees (in last year)
1	Sales of livestock		
2	Sale of wood		
3	Sale of cash crops		
4	Sale of NTFPs		
5	Sale of vegetables		
6	Remunerative income sources		
	- Salaried job		
	- Skilled non-farm job		
	- Remittance		

3.2 What is your approximate total household saving annually?
[Rupees]

3.3 What is the total loan received by the household the n last year?
[Rupees]

4. Human asset

4.1. How do you overcome the problem due to not having enough labor to conduct the household 's economic activities?

1 = Hiring outside labor 2 = Finding support from relatives 3 = Finding support from neighbors 4 = No solution, just leaving the activities 5 = Other, specify, _____

4.2. Do you or the household members have skills other than the skill needed to carry out farming activities?

1 = Yes 0 = No

4.3 If yes what are those skills?

1 = Weaving 2 = Carpentry 3 = Pottery 4 = Mason work 5 = Tailoring
6 = Other, specify _____

4.4. Have you or your household members taken trainings related to your livelihood?
_____ times

4.5. How do you state your current state of health as compared to people of the same age as you?

1 = Very poor 2 = Poor 3 = Fair, average 2 = Good 5= Excellent

4.6. In general, would you say the health of the household members is:

1 = Very poor 2 = Poor 3 = Fair, average 4 = Good 5= Excellent

5. Social asset

5.1. Is anyone in your household a member of any local organization?

1 = Yes 0 = No

5.2. If yes, please complete the table below.

No	Household member	Type of organization 1. Farmers Group 2. Fishermen's group 3. Cooperative 4. Credit/finance group 5. School Committee 6. Health committee 7. Water Group 8. Cultural association 9. Religious group 10. Neighborhood association 11. NGO 12. Youth Group 13. Women 's group 14. Parent Group 15. Sports Group 16. Other, specify _____	Degree of participation 1. Leader 2. Very active 3. Somewhat active 4. Non-active	Most important organizations to your household (list up to three types of organizations using their codes)
1	Member 1			
2	Member 2			
3	Member 3			
4	Member 4			

5.3 In general, how effective is the organization's leadership?

1 = Not effective at all 2 = Somewhat effective 3 = Very effective

5.4 Do you think that by belonging to the organization(s) you have acquired new skills or learned something valuable or obtained some advantages?

1 = Yes 0 = No

5.5 If there were a problem that affected the entire village/neighborhood, for instance, livestock disease, crop disease, water shortage, or violence, who do you think would work together to deal with the situation? (*see the table below & answer*)

No	Networks and mutual support group organization	1 = Yes 0 = No
1	Each person/household would deal with the problem individually (<i>if yes, skip the questions below</i>)	
2	Neighbors among themselves	
3	Local government/peasant association leaders	
4	All community leaders acting together	
5	The entire village/neighborhood	
6	Other, specify	

5.6

Differences often exist between people living in the same village/neighborhood. To what

extent do differences such as the following tend to divide people in your village/neighborhood?

Code	A possible source of exclusion	1 = Not at all 2 = Somewhat 3 = Very much
1	Differences in education	
2	Differences in wealth/material possession	
3	Differences in landholdings	
4	Differences in social status	
5	Differences between men & women	
6	Differences between younger & older generations	
7	Differences between long-time inhabitants & new settlers	
8	Differences in political party affiliation	
9	Differences in religious beliefs	
10	Differences in ethnic background	
11	Other differences, specify	

5.7. Do these differences cause problems?

1 = Yes 0 = No

5.8. If yes, how are these problems usually managed? (*check all that apply*)

No	Handling mechanisms	Check
1	People work it out between themselves	
2	Family/household members intervene	
3	Neighbors intervene	
4	Elderly people mediate	
5	Community leaders mediate	
7	Judicial leaders mediate	
8	Other, specify	

5.9 How often in the past year have you joined together with others in the village/neighborhood to address a common issue, development, or other socioeconomic issue?

1 = Never 2 = Once 3 = A couple of times 4 = Frequently

5.10 If your household suffered an economic loss, say crop failure or death of livestock, whom do you think would assist you financially? (circle the first three mentioned)

1 = No one would help 2 = Family 3 = Neighbors 4 = Friends 5 = Religious leader or group 6 = Community leader 7 = Police 8 = Political leader 9 = Mutual support group to which you belong 10 = Assistance organization to which you do not belong 11. Other, specify _____

5.11. Do you think that people in your community generally trust one another in matters of lending and borrowing?

1 = Do trust 0 = Do not trust

5.12 Do you think over the last few years this level of trust has gotten better, gotten worse, or stayed about the same?

1 = Worse 2 = The same 3 = Better

5.13 In your opinion, is this village/neighborhood generally peaceful or conflictive?

1 = Peaceful 2 = Conflictive

5.14 Are the relationships among people in this village/neighborhood generally harmonious or disagreeable?

1 = Harmonious 2 = Disagreeable

5.15. Do you think the neighborhood social networks are strong in your community?

1 = Yes 0 = No

5.16. Do you get the support of the community in cases you needed their support?

1 = Yes 0 = No

5.17. Is there a tradition of cooperation to conduct farming activities in your community?

1 = Yes 0 = No

5.18. How do you assess your access to credit and saving schemes?

1 = I need but have no access 2 = I use credit only for subsistence purposes

3 = I use credit for productive investments 4 = I use credit for both productive investment and subsistence purposes

5 = I don't need credit

6. Institutions and Entitlement

6.1 What are the most important formal local organizations that your livelihood depends on? *(check all that apply and rank them in order of importance)*

Code	Formal local organizations	Check	Rank
1	Local administration		
2	Agricultural organization		
3	Credit and savings		
4	Health center/health post		
5	Veterinary health centers		
6	Other, please specify		

6.2 What are the most important informal local organizations that your livelihood depends on? *(Check all that applies and rank them)*

Code	Informal local Organizations	Check	Rank
1	Social networks		
2	Community networks		
3	Market access and arrangements		
4	Community-Based Organizations		
5	Women 's support groups		
6	Others, please specify		

6.3 Which local institutions are relied upon for livelihood support, particularly during times of climate hazard? *(Check all that apply and rank them in order of importance)*

Code	Local institutions	Check	Rank
1	Relatives support		
2	Neighbors support		
3	Marriage ties		
4	Community support		
6	Local farmer associations		

6.4. Are all households able to equitably access the support provided by local institutions in times of climate hazard?

1 = Don't know 2 = No 1 = Yes

6.5 Which type of local institution regulates access to woodland resources during times of climate hazard?

0 = N/A 1 = Formal 2 = Informal 3 = Both formal and informal institutions

6.6. Who lacks equitable access to key resources during times of climate hazard?

0 = N/A 1 = Rich farmers 2 = Poor farmers 3 = Households living far from the resources

4 = Women 5 = Others, please specify _____

6.7. Do local institutions play a role in informing adaptation strategies for households in response to climate change?

1 = Yes 0 = No

6.8. Are there local rules and norms that prevent certain social groups such as women from undergoing adaptation strategies considering climate change?

1 = Don't know 2 = No 1 = Yes

6.9 Is decision-making within local institutions participatory including women, youth, and marginal groups?

1 = Don't know 2 = No 1 = Yes

7. Knowledge and information

7.1. What kind of climate-related information & knowledge do you use to guide your livelihood practices?

0 = N/A 1 = Indigenous farmer knowledge of rainfall timing/seasonality
2 = Radio/television broadcasts of weather patterns 3 = Drought and flood early warning systems
4 = Climate impact data by government offices 5. other, please specify _____

7.2 If you are using climate-related information from formal sources, are they delivered in a timely and appropriate manner to help you make the right decision?

1 = Yes 0 = No

7.3. Which source of information do you trust more to guide your livelihood practices?

1 = Traditional climate information 2 = Formal climate information such as those from meteorology and extension agents 3. I don't trust any of them

7.4 Who provides you with the knowledge and information on appropriate adaptation strategies relevant to your livelihood and area?

0 = N/A 1 = Extension agents 2 = District officers 3 = Local councils
4 = Other, specify

7.5. Do you think that the knowledge and information you are provided are adequate?

1 = Yes 0 = No

7.6 Are their systems in place for data gathering, information analysis, and dissemination in relation to climate hazards relevant to your area?

1 = Don't know 2 = No 1 = Yes

8. Innovation

8.1 Have you adopted new practices because of noticeable climate-related changes?

1 = Yes 0 = No

8.2. If yes, what positive effects have any new practices had on the livelihood of the household?

0 = None 1 = Improved household income 2 = Enabled to overcome the adverse effects of climate change such as drought 3 = Improved social relations 4 = Improved the natural resource base 5 = Decreased dependency on forest

8.3. If yes, what negative effects have any new practices had on the livelihood of the household?

0 = None 1 = Resulted in the loss of assets 2 = Depleted the natural resource base 3 = Spoiled social relations 4 = easy decay

8.5. Are there mechanisms in place to accommodate for, and promote the sharing of risk and innovation within the community?

1 = Yes 0 = No

8.6. What are the ideal conditions needed in order to foster innovative action, diversification, and try new practices within each livelihood?

1 = Local farmer networks and Indigenous knowledge 2 = Sharing of suitable crop/livestock varieties 3 = No conflict 4. Other, specify _____

8.4. How strongly do agree or disagree with the statements below?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am likely to adopt new practices to adapt to the impacts of climate change					
I am likely to take risks and exploit new opportunities					
I am willing to adjust to the impacts of climate change					
I am able to adjust to the impacts of climate change					
I have access to new and improved technology					

9. Flexible and forward-looking decision-making

9.1 Check one of the choices given for the following questions that are made regarding decision-making and governance at the local level.

Code	Issues of decision-making & governance	0 = Don't know 1 = No 2 = Yes
1	Do formal organizations have access to relevant climate information in guiding policy and decision-making?	
2	Do local organizations have the capacity to deal with a range of climate-related hazards?	
3	Do formal organizations provide support to you in adapting to any observed changes in climate?	
4	Have formal organizations developed plans to help you deal with climate-related hazards?	

5	Are formal organizations learning from past climate-related events and incorporating them within their decision-making processes?	
6	Are the right measures put in place by local organizations to accommodate for climate-related uncertainty and future potential new hazards?	
7	Are formal organizations flexible in their decision-making processes in responding to new threats posed by climate-related changes?	
8	Are there systems in place for reviewing and adjusting priorities over time?	
9	Is decision-making by local organizations regarding climate change transparent to the household?	
10	Are there land use regulations that protect natural resources particularly woodlands while allowing moderate use?	

III. Socio-demographic characteristics

What is your age: _____

Family size: _____

Number of children in household: _____

Family type

1 = Joint 2 = Nuclear

Who is the head of your household?

1 = Self 2 = Husband 3 = Daughter/son 4 = Sister/brother 5 =
Mother-in-law 6 = Father-in-law 7 = Other relative

What is the household head's education?

1 = No education 2 = Some school 3 = High school graduate/GED
4 = Some college 5 = Bachelor's degree 6 = Graduate work or graduate degree

The primary occupation of the head of the household is?

1 = Farmer 2 = Business 3 = Labor 4 = Salaried job (office)
5 = Job abroad 6 = Non-farm skilled job 7 = Other, please specify _____

What is your marital status?

1 = Married 2 = Single 3 = Divorced/separated 4 = Widowed

If married, is the husband away in employment?

1 = Yes 0 = No

Approx. income in last year: [Rupees]

Religion: _____