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Climate Change Instability and Gender Vulnerability in Nepal: A Case Study on the Himalayan Region

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Climate Change Instability and Gender Vulnerability in Nepal: A Case Study on the Himalayan Region

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Jude Fernando, Chief Instructor

Abstract

Climate Change Instability and Gender Vulnerability in Nepal: A Case Study on the Himalayan Region

Akriti Sharma

For the past decade, low-income developing countries have and will continue to remain on the frontline for the consequences of human induced climate change. While climate change is expected to have universal negative impacts on the health, well-being and the livelihoods of people, it is expected to specifically affect women from low-income developing countries where poverty and gender inequality are both still very prevalent. A closer look at previous research reveals that women, specifically in the Himalayan region of Nepal are more vulnerable due to the already challenging terrain in which they live in. This paper analyzes the vulnerability of women in Nepal based on their roles in society and as effects of migration and the agriculture industry. It is therefore necessary to realize that climate change is not a gender-neutral occurrence and it has become very important, especially for developing countries, to identify gender sensitive strategies that can respond to the needs for women and reduce their vulnerability.

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I. Introduction

Climate change has proven to be one of the most pressing global challenges that our planet faces today. However, there is a stark difference in the vulnerability of populations from industrialized and developing countries. For the past decade, low-income developing countries have and will continue to remain on the frontline for the consequences of human induced climate change. While climate change is expected to have universal negative impacts on the health, well-being and the livelihood of people, it is projected to specifically affect those from low-income developing countries. Over the next century, populations in these countries are expected to endure gradual sea level rise, stronger cyclones, warmer days and nights, erratic and unpredictable rains and more intense and prolonged heat waves (Vidal, 2013.) More often than not, the majority of the poorest in these countries tend to be women, as they have relatively poor and lower access to necessary resources. As a result, their ability to respond to and adapt to the effects of climate change is highly limited. It is therefore necessary to identify such populations so that they can be provided with the necessary resources to adapt, so that their communities can develop and flourish.

This paper analyzes and discusses the impact of climate change on gender roles within the agricultural sector in the Himalayas or Mountainous region in Nepal. It is hypothesized that women in the Himalayan region are more vulnerable to climate change in Nepal, due to the challenging terrain and already difficult lifestyle. As Nepal is

geographically very diverse, it is necessary for the development planners to take the cultural and topographical differences into account while making adaptation policies that will help each region flourish, ultimately contributing to the overall development of the country.

Previous research has shown that climate change has diverse effects on various aspects of our lives; it also has the ability to precipitate chain reactions within communities and ecosystems alike (Mainlay et al, 2012.) Delayed rainfall in the Himalayan region and a change in weather patterns disrupts cropping patterns, introducing new vector infestations, which in turn negatively affect community health, livelihood and the incomes of families. According to the World Health Organization, climate change will cost health sectors around the world an estimated annual 2-4 billion USD by the year 2030 (WHO, 2015.) The paper explains how climate change will worsen already existing climate sensitive illnesses in developing countries, including diarrheal diseases, malaria and dengue that will adversely affect agricultural families in previously cooler environments. As these countries already lack the necessary resources to combat these issues, an increase in illness will intensify the vulnerability to climate change.

This research paper highlights various cases in Nepal that contribute to our knowledge about the circumstances in similar developing countries. Researches at Tribhuvan University in Nepal point out that the agriculture sector in most developing countries is primarily the first place in exploring and understanding the effects of climate change in developing countries, because of its significance in the Gross Domestic Product, employment and food consumption per household (Shrestha et al, 2010.) The article

discusses how since farmers must constantly change their practices and inputs like locally-suitable seeds, it can be hard to adapt and this may have a negative effect on productivity.

In terms of research methodology, this paper does not follow any particular format that has previously been developed or used in the researches and papers discussed above. This paper focuses on Nepal and uses secondary data that was gathered no earlier than 2005. The purpose of this is to ensure validity of the research as well as to use data that reflects the most recent occurrences in Nepal that were directly impacted by climate change.

The empirical results of this paper indicate that women in the Himalayan region of Nepal are more vulnerable to the effects of climate change due to the instability of their lifestyles. Furthermore, the results show us how women in Nepal are more vulnerable to the effects of climate change than the men in this region, primarily because they make up the poorest majority of the population and are more dependent on agricultural and natural resources for their livelihoods.

The rest of the paper is organized as follows: Section II provides a review of the current literature on the link between climate change and gender in developing countries with a focus on Nepal. Section III discusses the methodology used for collecting the research in this paper. Section IV is an overview of Nepal and the specific effects of climate change on the Himalayan Region. Section V analyses and discusses the gathered secondary data and section VI concludes the paper.

II. Literature Review

The Intergovernmental Panel on Climate Change defines climate change as “*A statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2016.)*” Although climate change is a universal phenomenon, it tends to affect various countries differently. In recent years, studies and economic analyses have shown that particular developing countries can be hit harder by the changing climatic conditions than others. A change in water availability changes the living conditions for the rural poor, as a majority of the rural areas depend heavily on agriculture for their livelihoods (Suwal, 2016.) This is because agriculture is a water dependent activity, and a limited cultivation not only cuts farmers profits but also creates a risk of global food security.

The IPCC defines vulnerability to climate change as “*The extent to which climate change may damage or harm a system.*” It also states that vulnerability “*depends not only on a system’s sensitivity, but also on its ability to adapt to new climatic conditions*” (IPCC, 2016.) Under this framework, a highly vulnerable system would be one that is highly sensitive to modest changes in climate, where the sensitivity includes the potential for substantial harmful effects, and one for which the ability to adapt is severely constrained.

Research shows that low-income populations that are often concentrated in small areas are expected to be the most vulnerable to climate change in industrialized or

developing countries. This is in part due to the communities' lack of resources and capacity to respond in a timely manner (Shrestha et al, 2010.) Furthermore, several studies show that agricultural productivity is highly sensitive to the effects of global climate change, and has the potential to cause severe detrimental effects. While the destructive impacts of climate change are already felt in many countries across the globe, women in low income developing countries face major social, economic and political barriers that limit their coping capacity. Additionally, research shows that women are more vulnerable to the effects of climate change than men-primarily because they make up a majority of the world's poorest population and are more dependent for their livelihood on natural resources that are threatened by climate change (UNDP, 2010.) Therefore, even though the notion of female parity is still a budding concept in many parts of the developing portions of the world, it is necessary to tackle gender inequality and come up with gender sensitive responses to the effects of climate change to boost the overall economic development of societies. The following articles discuss the relation between climate change and gender and support my hypothesis that women are disproportionately vulnerable to climate change.

Today, the effects of climate change are felt globally. There are erratic monsoon seasons affecting agricultural productivity in South Asia, increased extreme weather events such as hurricanes and snow blizzards affecting the United States, and prolonged and more intense heat waves hitting European countries. Droughts, floods, wildfires and hurricanes have already cause multibillion dollar losses, and these extreme weather events are expected to become more frequent and more devastating as the climate continues to change

in the years to come (NRDC, 2010.) Globally, the price of climate change is predicted to reach billions of dollars. This price includes the cost of treating the ill, building infrastructure, energy sector costs and water costs just to name a few. During the 20th century, there were a total of over 7.5 million deaths per year where approximately 90,000 deaths were related to climate change events (WHO, 2015.) This number has drastically raised today, but is expected to continue to rise if not dealt with properly. Furthermore, it is important to note, that on a global scale, women's lives are most at stake.

According to the UNDP resource guide on Gender and Climate change, "*depending on social categories such as gender, age, economic level and ethnic groups, climate change has and will have different effects* (2009.)" According to the article, we see that many women in sub-Saharan Africa must spend more and more hours walking in search of water, while in Switzerland, a lack of snow in the recent winters has affected mountain shelters, affecting family homes. As we see, there are a number of threats and risks that climate change brings, that increase an individual's vulnerability regardless of where they live. However, while individuals and families are constantly exposed to various risks that threaten the quality of life, and even though the economic costs of climate events affect everyone, climate change risks are not equally distributed.

Climate change will lead to less secure means of subsistence, more vulnerability to hunger and poverty and more environmental degradation, meaning it will affect the poorest and most vulnerable of developing countries (UNDP, 2010.) The United Nations Women Watch published in 2009, that women and men in rural areas in developing countries are especially vulnerable when they are highly dependent on local natural resources for their

livelihood (UNDP, 2009.) However, the article points out that women in particular, who are often charged with the responsibility to secure water, food and fuel for cooking and heating, face the greatest challenges. The article discusses “*because of an unequal access to resources and to decision-making processes, limited mobility*” women in rural areas are placed in a position where they are disproportionately affected by climate change. Similar to this article is one put forth by the World Food Organization that analyzed agricultural communities. Women continue to be the backbone of development in rural and national economies and according to the World Farmers’ Organization, “*Women make up 43% of the world’s agricultural labor force, which rises to 70% in some countries* (MuGeDe, 2013.)” Despite these statistics, women tend to have little to no access or control over all the land and productive resources. As previously mentioned, some authors also argue that women in the developing world are disproportionately affected by climate change because they are relatively poor and have lower access to necessary resources (Mainlay et al, 2012.) Women tend to be living in high levels of poverty and are plagued by illiteracy, which limits their access to information and resources that can help them adapt to changing climates. This further hinders their involvement in the process of planning and implementing programs and policies designed in principle to aid them. By far, women continue to be relegated to menial tasks such as weeding, and in most cases do not have access to technical skills that can help them grow more and higher quality crops. This not only affects their subsistence but hinders their ability to potentially switch to commercial agriculture too. It is not only important, but absolutely vital to realize and accept the

contribution that rural women make in agriculture as an attribute of gender relations and economic development within a nation.

Nepal is a low-income developing country that has yet to see improvement in economic development and gender relations. Like many of its South Asian counterparts, Nepal is considered to be primarily an agrarian society. According to the World Bank, Nepal continues to be one of the poorest countries in the world, with 25.5% of the population living below the international poverty line of \$1.25 per day (ADB, 2015.) From a gender perspective, while women's literacy rates and their involvement in the job markets in Nepal have increased, women still have little to no say in household financial or decision matters. Women in Nepal are still subject to gender discrimination that is prevalent because of culture and tradition (Mainlay et al, 2012.) et al, Despite the fact that there have been a variety of different programs introduced to address women's developmental needs in Nepal, these efforts have not effectively focused on their vulnerability.

As Behnassi et al (2014) points out, agriculture and food systems have a major impact on humanity, notably through the process of development with which it is intimately associated. The Intergovernmental Panel on Climate Change (IPCC) has carried out extensive studies over the years, assessing and discussing the unequal distribution of risk and vulnerability to climate change. According to the Intergovernmental Panel on Climate Change, *“Agriculture is one of the sectors that is most susceptible to climate change, so countries with a large portion of the economy in agriculture face a larger exposure to climate change than countries with a lower share, and these shares vary*

widely (IPCC, 2012.) ” Low income countries, like Nepal that are heavily dependent on agriculture are more therefore likely to be severely impacted by the impacts of climate change.

However, vulnerability to climate change depends not only on natural elements, but also on other factors such as social, economic and cultural aspects. This in turn can also impact people’s behavior, relationships and power (ICIMOD, 2009). In Asian countries like Nepal other factors such as poverty, ethnicity, caste and gender can also alter people’s resilience to climate change. Previous research has shown that susceptibility to climate change tends to differ across countries, regions, economic sectors and social groups. Today, it is well known that poorer communities and regions are more than often affected hardest by the effects of climate change. This is because poor, rural communities are natural resource dependent or agriculture based societies. As a result, climate change affects not only the environment and ecosystem, but also the entire foundation upon which these people’s lives depend. Furthermore, women in low-income level countries tend to have a limited access to basic resources making them more susceptible to climate change. While climate change has specific impacts throughout the various terrains of a very geographically diverse Nepal, the Himalayas are affected heavily due to changes in precipitation patterns that have resulted in more rain than snow accompanied by the melting of glaciers, altering its fragile ecosystems. The question still remains though whether women in these developing countries are more vulnerable because of their socio economic status or because of their gender.

Men and women are affected differently by climate change, largely because of their differing roles within communities. This is pronounced in Nepal, where while both genders are vulnerable to climate change, their experience of the phenomenon is different along with their ability to cope and adapt because of the difference in their lifestyles (Mainlay et al, 2012.) As the ICIMOD report points out, “*Gender inequality is manifested as limited access to resources and information, and exclusion from decision making and is among the factors that limit women’s capacity to cope with the changing environment (2009.)*” Women, specifically in the Himalayan region of Nepal lack access to better-sheltered homes, pest resistant crops or information on how to protect agricultural produce from flooding. As a result, they lose their source of income, which intensifies their vulnerability on top of the already diminished adaptive capacity that they have.

Climate change is not a gender-neutral occurrence and it has become very important, especially for developing countries, to identify gender sensitive strategies that can respond to the needs for women and reduce their vulnerability. For a country like Nepal to reach its maximum potential in economic or intellectual terms, it is vital that both genders are involved and capable in these fields. However, we find that even though women make up more than 50 % of the global population, they are not given the same opportunities. As a result, women become more susceptible to health issues, illiteracy and in this case, an increased vulnerability to climate change. Women are more often than not, underrepresented in decision making processes, which in turn constrain their ability to meaningfully participate in decisions on adaptation. The argument is that women can possibly play a highly influential role in natural resource management if given the

opportunity because of their extensive knowledge and expertise on the subjects (UNWomenWatch, 2009.) One article quotes that, “*Women’s activities in food production, community management, natural-resource and biodiversity management, education of children and family care place them at the center of development. They are the collectors of fuel and water for their families, and users of energy to prepare the food and care for the sick. In developing countries, they engage substantially in agricultural production, both paid and unpaid* (Senay, 2013.)” Women are thus in a position to contribute to various livelihood strategies adapted to changing environmental realities. It is highly important for us to recognize and support this and it is not only essential for the needs of women but also for socio-economic development of the country.

A limiting factor with the current literature is the lack of data on glacial lakes in Nepal. I hope to contribute to the existing literature by highlighting the differences between the terrains in Nepal and the need for various adaptation policies according to topography. Also since I am specifically looking at Nepal, due to a lack of data from the past year, I could not take the April 25th 2015 earthquake into account. These numbers and data therefore represent a pre earthquake analysis of women’s conditions due to climate change, which have exponentially heightened since the earthquake.

III. Methodology

Data Collection

The general methodology for this paper was mostly review of existing literature on the topic and public records. Sources to date include the International Centre for Integrated Mountain Development Organization (ICIMOD), the United Nations Women's Watch and various academic journals.

The ICIMOD library is home to a comprehensive list of journal articles, reviews and personal statements from its study of the eight regional member countries of the Hindu Kush Himalaya Region. This database contains publications that focus on a broad range of issues that concern the development of the Himalayan regions. The topics range from climate change, ecosystems and the environment, gender to water and mountain livelihoods.

This paper mainly focuses on the intricate and important connection between gender and climate change in the Himalayas. The analysis of present literature was aided by the guideline for gender sensitive programming put forth by ICIMOD in 2009.

Determining areas of interest

Climate change and gender are two very broad topics that even within themselves encompass a wide and broader range of issues that are almost always interconnected. The Himalayas are known to be a rugged and very challenging terrain to live in, but it is also important to note that they have very fragile ecosystems that are especially vulnerable to

climate change. Similar to this, the Himalayan people are from a variety of ethnic groups with different cultures, religions and social structures; where gender roles can differ greatly from one region to another depending on the dominant culture within which people live. Based on all the available literature on mountain livelihoods. I chose to focus on male migration and agriculture within these two sectors because of their significance in the national context.

In recent decades men in these regions have been migrating to urban areas either within Nepal, or to neighboring countries like India, Pakistan or to the Middle East. As a result, women are left to take care of families and agricultural activities. The analysis provides a better understanding to how gender has impacted vulnerability to climate change in this region.

Additionally, Nepal, primarily being an agrarian economy, is heavily dependent on productivity for self-sustenance. Over 60 percent of the population in the Himalayan regions rely on agriculture for their livelihoods. Farmers here are already at a disadvantage because of the poor infrastructure, physical isolation and the high cost of food production and transportation. It is therefore crucial to study the implication of gender and climate change on the already low productivity rates of the difficult terrain.

IV. Overview of Nepal

Nepal is a low-income developing country in South Asia that is landlocked between eastern economic giants China and India. Agriculture is still Nepal's primary economic activity providing 37% of the Gross Domestic Product (THF, 2016.) A look at the country's land use patterns shows that only 20% of the country is arable land, 33% is forested and the remaining approximately 47% of land is mountainous (THF, 2016.) The country's primary crops are rice and wheat, 70% of the total population, the largest labor force, works in the agricultural sector. Thus, farming in Nepal is of major importance to the country's economy, employment options and food security.

Nepal is a very geographically diverse country, and can be divided into three distinct belts: the Mountains, Hills and Terai regions. The Terai region, that is low plains, produces an agricultural surplus which partially supplies the food-deficient areas across the country. The Hills region consists of hills that fall between 700 and 3,000 meters (Aryal et al, 2011.) The steepness of the hills in the south resulted in most of these areas being uninhabited and is considered to be partially responsible for the language and culture divide between the regional belts. The Mountain region, which is the focus of this paper, includes hills and peaks rising above 3,000 meters. The highest point is Mount Everest at 8,848 meters (Aryal et al, 2011.) As ICIMOD points out, “*Within a relatively small area [of the Himalayan Regions] can be found wetlands, forests and savannas [that are] rich with biodiversity but threatened by factors from pollution to climate change [and] population pressure* (2016.)” The mountain region has already been noted to be the most

challenging terrain to live in due to its physical isolation, fragile ecosystem and lack of infrastructure. The region is made up of steep hillsides where farmers have invested in paddy fields for agricultural productivity. The challenging slopes, the cold and harsh weather adds to the complexity of the ecological and cultural aspects of this region. It is therefore important to note how climate change has been affecting these regions in particular in the past decades.

Impacts of Climate Change

The Himalayan belt is being impacted by climate change in several ways. Recent years have shown trends where more precipitation has been falling as rain instead of snow and there has been a decrease in glacier surface areas that have subsequently led to the formation of glacial lakes. Furthermore, it has been projected that precipitation may also increase in the future in intensity leading to more flash floods and in places, landslides. Eventually, these predicted flash floods can result in major destruction within the fragile ecosystems. The impacts of climate change cause our natural and societal systems to become more vulnerable to natural hazards and there is an increased need to develop responses and adaptation methods that are able to better counter potential future disasters (ICIMOD, 2016.)

Climate change has been noted as the main factor behind the accelerated glacier retreat observed in the Himalayas (Aryal et al, 2011.) If climate change is expected to continue at the predicted rate, it is expected to cause major changes in the flow of freshwater in the Himalayas that will ultimately have dramatic impacts on not only

biodiversity and the ecosystems but people and their livelihoods too. According to a report by the WWF in Nepal, “*Glacier melting leads to an increase in water discharge, which is expected to increase the frequency of catastrophic flooding events such as glacier lake outburst floods* (2016.)” The article goes on to note that such events can have devastating consequences to infrastructure in the Himalayan region like bridges, dams, and powerhouses and on the communities living downstream. Furthermore, according to the article, “*In the long-term, there might be a 'tipping point' as glacier runoff begins to decrease with massive freshwater availability implications; perennial rivers could change into seasonal streams causing freshwater scarcity in the dry months.*” This phenomenon has already been noted in both the Hilly and Terai regions of Nepal, where rivers have become seasonal. These rivers dry out over the winter, only to be replenished for a short period of time during the monsoon season in the summer. This can have multiplied impacts on the Himalayan communities, as the region is not as arable and more difficult to adapt in.

Furthermore, precipitation patterns are expected to drastically change with longer and more erratic monsoon seasons. Glaciers in the Himalayan regions are expected to suffer a substantial ice loss, with the primary loss occurring in the Indus Basin. The Indus Basin covers an area of approximately 1 million kilometers square miles and includes China, India, Afghanistan and Pakistan, but the source of the water is in the Himalayas (CEH, 2016.) Here the snow and glacier melt during the warmer months, providing the main water input for the river system here as rainfall is low in this region.

As previously noted, communities living immediately downstream from glaciers are the most vulnerable to these changes. According to a report by ICIMOD, “*Mountain*

people are particularly affected by changes in glaciers through reduced reliability of local water resources and increased occurrence of hazards including glacial lake outburst floods (ICIMOD, 2016.)” Furthermore, the formation, growth and likely outburst of a glacial lake are phenomenon directly related to climate change (Aryal et al, 2011.) Despite the overall greater river flow projected within the basins of the Himalayan regions, higher variability in river flows and more water in pre-monsoon months are expected, which will lead to a higher incidence of unexpected floods and droughts. This is expected to greatly impact the livelihood security and agriculture of families that are dependent on the river for a source of water. As mentioned, the fact is that a majority of families in this region are heavily dependent on the riparian systems for their agricultural production.

Gender and the Himalayas

In order to understand why women are adversely affected by climate change in the Himalayan region it is important to recognize the relationship between poverty and gender inequality in Nepal. Poverty and gender inequality are highly correlated because mostly women who already suffer a lack of resources and prejudice in their societies, are in poverty. In cases of families under the poverty line, when choosing to educate one child over the other it was often found that they chose to educate the male child because he is expected to bring in a higher rate of return in the future. While the enrollment rate for male and female children is both high at 95% the completion rate for girls is a staggering 5% (Government speech, 2016.) This could be due to a combination of factors including the expectation that daughters will assume greater domestic workloads, as well as a lack of conducive environment for teenage girls to attend school. This stigma, irrespective of religion or ethnicity, is still very common amongst developing countries like Nepal. It carries into adulthood as well, where men are often sent abroad to earn more money for the house and women are left at home to continue with agricultural production. Often these carried over responsibilities contribute to an increased risk of health hazards to women as well.

In 2006, the World Economic Forum introduced the Global Gender Gap Index, that set a standard for national gender gaps on economic, political and education based criteria that provides country rankings for comparison across regions and income growth over time. According to this Index, Nepal was ranked at 126 out of a total of 135 countries in 2011 for the highest gender gap (Hausmann et. al, 2011.) Nepal yielded an overall score of

0.5888, ranking in the low-income global group, once again getting consistently low scores for political empowerment of women alongside health, education and economic participation since 2006 (Hausmann et. al, 2011.) A summary of statistics for Nepal is outlined below and these figures show that women in Nepal have lower literacy rates, lower job opportunities and are expected to not take leadership roles in public.

Nepal				
	Score	Female	Male	Female to Male Ratio
Economic Participation and Opportunity	0.461			
Literacy Rate	0.65			
Sex ratio at birth (female/male)	0.94	47	72	0.65
Health life expectancy	1	55	55	1
Political Empowerment	0.175			
Women in parliament	0.5	33	67	0.5
Years with female head of state	0	0	50	0

Table 1: Gender Gap Sub Indexes: Summary of Nepal

As noted, *“Living in the Himalayan region is a daily challenge: remoteness combined with the hard environment and limited infrastructure hampers mountain people's economic and social development.”* Mountain women are already subjected to the burden

of household chores and the steep terrain makes most of their daily activities, such as carrying water, fuelwood and fodder a bigger challenge than it would be otherwise. The issue is that women in Nepal in general, with this region in particular, lack the ability to voice their needs and therefore lack resources that would reduce their burden and build their resilience to the ongoing environmental changes in their regions.

According to the UNDP, *“Recent studies have revealed that “not only is women’s participation important but also how they participate- and how much.”* The study reveals that women often show more concern for the environment and tend to support more pro-environmental policies. Furthermore women are also more likely to vote for pro-environmental leaders. Their greater involvement in politics and in nongovernmental organizations could result in environmental gains, with multiplier effects.

V. Analysis

Climate change is particularly harmful to low income developing countries, as it tends to have a direct impact on them. It affects their undiversified economic structures, poor infrastructure, fragile government and institutions, poor human development, and most importantly, their heavy reliance on agriculture. This case especially holds true for the landlocked country of Nepal where the effects of climate change intensify poverty and hinders economic growth. The population of Nepal as of 2013 was approximately 27.8 million, a majority of which live in rural areas in the Hills and Terai regions of the country (THF, 2016.) As the article by Aryal and Shrestha (2011) point out, there continues to be a huge disparity with regard to developmental infrastructure between urban and rural areas.

Climate change is already known to have detrimental effects on small underdeveloped countries that rely heavily on natural resources for their economy and livelihoods. Nepal is among these low-income developing countries in South Asia where poverty is widespread and the capacity of the population to cope with the impacts of climate change is extremely low. Nepal is landlocked, bordering China in the North and India on its east, west and southern sides. The Nepali source of water is mainly from the summer monsoon precipitation and the melting of the large reserve of snow and glaciers in the Himalayan highlands. However, recent studies have tracked very obvious evidences of significant warming. This can mostly be noticed in the Himalayan region, where it has been predicted that certain areas should expect up to a 5 degree Celsius change by 2050

(Aryal et al, 2011.) The average temperature increase across the mountainous region is expected to increase by about 1-2 degree Celsius by the year 2050 (Aryal et al, 2011.)

In recent years, the Nepali economy has taken a great toll. The decade long conflict between government forces and the Maoist party in Nepal cost the country thousands of rupees, and approximately 15,000 lives, of which 10,500 were estimated to be civilians (THF, 2016.) An additional 100,000 people were internally displaced because of the civil war and a lot of rural development activities were disrupted, worsening the situation in villages and rural areas (THF, 2016.) Additionally, high inflation rates and trade deficits within this decade worsened the already declining growth rates, leaving the rural areas highly underdeveloped in the early 2000s. The economy of the country took a turn for the worse when the devastating April 25th 2015 earthquake hit. It killed close to 9000 people, injured double the amount of individuals and is expected to cost the over country 7 billion USD to rebuild the country (THF, 2016.) The economic aftershocks of this earthquake are expected to stir the country for decades to come.

The Nepali Gross Domestic Product, while still heavily dependent on agriculture and remittances sent by migrant workers is very low. The tourism sector, accounting for only around 10% of the GDP with a similar percentage of short term jobs. Nepal is ranked 54 out of 81 countries in the world on the Global Hunger Index (ADB, 2015.) As a result, the economic state of the country is unable to support all the families moving into the urban cities looking for a better future. As is true with most developing countries, there has been a rapid increase in urbanization as people from rural areas move into the cities in the hope for better employment, educational and livelihood opportunities.

Nepal is still predominantly considered to be a patriarchal society, but because of the increasing trend of men leaving their homes, there has been a recent feminization of the agricultural industry. Senior female family members in the villages take on the leading role by being the household head when it comes to controlling resources, deciding on budgets and making planting and cropping decisions. Despite this, women's lives in rural Nepal are still based around their traditional roles of housekeeper.

Women here are already subjected to limited access to resources ranging from education, healthcare, local government to productive services. As a result, women continue to face many economic hurdles, political barriers and health hazards, falling further into a poverty trap. Based off of this, the women are more vulnerable to the effects of climate change than men. Here, we see how migration and agriculture in particular have affected women's vulnerability to climate change in Nepal.

Migration

Remittances sent by relatives working abroad have a vital role to play in the economic advancement of a community, and a country as a whole. Due to the inability of the Nepali economy to meet the demand of necessary jobs, a lot of people tend to immigrate to countries within the Asian continent and beyond. Nepal relies heavily on remittances sent by migrant workers and agriculture for its economy and as a result is very sensitive to climate variability. Climate change is expected to cause a wide variety of impacts on the environment of Nepal, with the most prominent impact being on water resources. This will directly affect agriculture, and the subsequent out migration of populations. Migration as a

response to climate change has been regarded as either a failure of the ability of families to adapt to climate change or as a rational component of adaptation to a severe environmental risk (ICIMOD, 2016.) A lot of rural communities in Nepal struggle to sustain themselves. Migration of family members provides a more fruitful source of income that allows families to meet the basic necessities, which in the long run become a vital component of an effective adaptation response.

In the recent decades, there have been rapid environmental and socio economic changes taking place across the Mountain regions in Nepal. Case studies have shown that labor migration in the mountain areas have a significant impact on reducing poverty in the region. One such study notes that while the remittances by individual migrants are low in volume, they nevertheless make a significant contribution to household income in many areas (Habermann, 2010.) Furthermore, according to this paper, Nepal is among three other countries in the South Asian region (India, Pakistan and Bangladesh) that have the highest inflow of remittances of any region in the world. For many of the mountain families in Nepal, these remittances are the major or in some cases, only source of income. A macroeconomic study done in the early 2000s shows that, on average, a 10 percent increase in per capita official international remittances leads to a 3.5 percent decline in the proportion of people living in poverty (Adams and Page, 2005.)

Today, remittances that are sent back to families in Nepal by migrant workers have become a vital source of income (Baxter, 2006.) Households receiving remittances tend to have better nutrition and improved access to essential information, health and education. The truth is that, internal and external migration is considered as a risk minimizing strategy

that provides families with a buffer against the impacts of environmental degradation (ICIMOD, 2016.) It has further supplemented the limited ways to locally earn a living and provide a source of income detached from the weaknesses of the local Nepali economy. A majority of the migrant workers who leave are men, leaving the women at home to take care of families and farmlands. This increasing trend in the past two decades is leading to a gradual feminization of agriculture, introducing female-friendly farming technologies and machinery. However, in a country where the main occupation is agricultural productivity, communities are compelled to depend on the monsoons for their rain-fed practices. The country is highly dependent on the Asian Monsoon system not only for agricultural practices, but for tourism and hydropower generation too.

On the contrary, migration has the potential to add physical and emotional burden on women. As the men in the families leave, the role of the household head shifts to the women. They have an additional responsibility, on top of those already put forth by society, to provide for their families. Women may take up multiple jobs to provide for their families and these are mostly low income jobs like working in the service or agriculture industries, as caterers, cleaners, maids, and farmers (Baxter, 2006.) While this does raise their budget, and provide better nutrition for the family, it is often seen that women provide for their children first, before themselves. According to the World Bank, putting earning into a woman's hands is an intelligent thing to do to increase quality of life. For example, studies show that in sub-Saharan Africa when income is in the hands of the mother, agricultural productivity could be raised by as much as 20 percent by allocating a larger share of the agricultural input to the women in the households. A separate study showed

how children of mothers who own land are significantly less likely to be severely underweight (Allendorf, 2007.) In Nepal, the engagement of women in managing natural resources such as community forests and water systems is noted to reverse environmental degradation, and bring about more resilient practices that safeguard natural resources as well as communities.

While these statistics are very optimistic, we must also remember that this takes a big toll on the health of these mothers. While general statistics show that women tend to outlive men, women living in low-income developing countries have a lower quality of life when compared to that of the men living within their communities. They are likely to suffer from increased nutritional problems too due to their low-income status.

As a result, according to a paper by Behnassi (2014) health problems like respiratory diseases are likely to increase [amongst women] as a result of climate change and increased temperatures add to the loss of lives. With longer working hours, may it be on the fields or indoors, out-migration of males for work places a heavy strain on women who already have limited awareness of health issues and access to health facilities. As previously mentioned, the average temperatures are expected to increase by 1-2 degree Celsius, altering the ecosystems in which these women work in. Precipitation changes means women's reliability on the monsoon will have to decrease, and this can lead to substantial losses as they depend so heavily on subsistence agriculture as we will see in the following section.

Agriculture

There is an overall increase in poverty rates because of the effects of the fluctuation of water accessibility, loss of biodiversity, the decline of agricultural yields, tourism (which is a vital source of foreign currency,) labor, capital, climate-related humanitarian disasters such as floods and droughts, increased occurrence of vector-borne diseases, weakened infrastructure, and political uncertainty because of disagreement of resources and the movement of people.

In Nepal, women bear the brunt of traditional domestic duties. This includes but is not limited to collecting water, collecting fuel wood, planting crops, harvesting and taking care of domestic animals. As the primary agricultural producers in a lot of households, women tend to work harder and longer in order to meet the family's requirements. If weather patterns are to change and the normalcy of events do not follow, women tend to put in more hours to produce the same results. For example, it was noted in Uganda, that during droughts, women who already walked 8 hours a day to fetch water would have to walk farther to meet the families needs (MuGeDe, 2013.) Similar to this, Nepali agriculture is heavily dependent on the monsoon season. As a result women's quality of life is also connected to the environment. According to a report by Kollmair, "*Many of the more than 200 million inhabitants of the [Himalayan] region still suffer from low incomes, lack of employment opportunities, lack of infrastructure, and lack of access to basic amenities (2012.)*" For the most part, researchers suggest that specific characteristics of mountains – poor accessibility, fragility, and marginality – have contributed to the impact of the changes. The people of this region are dependent on agriculture, which is heavily

dependence on good weather conditions. An ICIMOD article quotes a local, “*The biggest problem we face is food insecurity. If the weather was good, with timely rain and better food security, we would never opt to migrate. Why would we want to leave our families and travel to another place and work like animals (2016.)*” We see here, how climate change has a direct impact on the lives of these locals communities in the Himalayan region.

The article further points out that Himalayan women know how to maximize the use of the natural resources of the fragile mountain ecosystem in which they live. However, with the recent changes in the weather patterns and temperatures, the normalcy of lives has altered and women are expected to promptly adapt. It is a lot more difficult for these women to do so, because they already lack access to proper education and resources. They must now learn about various climate resistant crops and be able to afford the seeds. With a lack of rainfall and decrease on the dependency of the monsoon season, women have to learn how to adopt irrigation facilities and adapt by investing in inputs such as drip irrigation systems. While this system is highly water efficient and enables commercial production, it is also very costly and women must find alternatives to raise funds.

The Himalayas in Nepal have always been considered as a popular destination for international tourism. It draws in people from all over the world with some of the highest peaks in the world, majestic landscape and rich cultural heritage. From a financial standpoint, tourism is a valuable means of income for the local people as it brings in foreign currency, business opportunities and multiple job opportunities. Today, tourism can even be considered as an adaptation strategy that can be harnessed to create additional

and alternative livelihood options as it has many potential benefits for poverty alleviation, social inclusion and environmental and biodiversity conservation. However, in recent decades, the haphazard increase in the tourism sector has led to serious socioeconomic and environmental consequences due to a lack of expertise in these areas.

VI. Conclusion

In Nepal, the anticipated changes in the monsoon patterns will greatly exacerbate the situation of the presence of poverty and inequalities of opportunities in the country. Additionally, the already existing problem of drought, forest fires and flooding will only be exemplified by the impacts of climate change. According to IPCC's 2007 Fourth Assessment Report, "*While temperatures are likely to go up in the [Himalayan] region, precipitation will be more erratic in the future implying increasing uncertainty (IPCC.)*" Living in the Himalayan region has already been noted to be challenging, with a scarcity of resources and locational isolation. Additionally, when the living situations are put at risk because of climatic changes, it puts a lot of stress on the women. The findings of this paper suggest that women have a heightened vulnerability to the instability of climatic conditions in the Himalayan region when compared to the men in the same region. This analysis and conclusion was drawn from the literature that showed a strong correlation between gender impacts and climate change based primarily on migration rates and the agriculture industry in Nepal.

As the findings of this paper suggest, women in low-income developing countries have been disproportionately affected by climate change. This is mostly because agriculture is vital to the livelihoods of rural women as both a means of growth and for food security. However, as the instability of climatic conditions increase, women must constantly adapt in order to supply the family with subsistence agriculture in addition to potentially producing products on a commercial scale. Women in Nepal are also

responsible for the traditional daily household chores including food production, household water supply and energy for heating. However, these tasks are likely to become more time consuming and difficult, as the impacts of climate change increase, if women have to travel farther to collect items. This proves to be an additional stressor for women, increasing their risk to health hazards and illnesses, and in turn increasing their vulnerability to climate change.

Similarly, out migration has affected women's vulnerability to climate change in Nepal. As male family members migrate out of the country to provide a more fruitful source of income for the family, it increases the load of responsibility for the women in the household. The eldest women take up their husbands' roles, may it be on the fields or by taking up other additional jobs. However these jobs usually have little pay and women take on multiple jobs to meet the needs of their families. Subsequently, these women are more likely to keep their daughters at home to take care of the domestic chores. As a result a lot of young girls do not complete school, as the low school completion rate for girls show, and this creates another generation of illiterate girls. This not only perpetuates women into the poverty trap, but also increases generational vulnerability for Nepali women. Women become more susceptible to health issues and are unable to cope with the constant weather changes that require them to adapt to various agricultural practices.

Overall we see that while there are several factors for women's increased vulnerability to climate change instability when compared to men, the main reason still is that women are comparatively poorer and lack access to essential information and resources that could otherwise benefit them or help them grow. Therefore, it is important

to remember that women are not only vulnerable to climate change, but are also emerging as vital stakeholders for sustainable change to counter the repercussions of male migration and household ability to adapt in the future. Women have advanced knowledge and expertise on the topic and can provide valuable input towards climate change mitigation policies.

No matter how climate change induced disasters are to affect Nepal, it is important to truly implement gender sensitive adaptation, planning and decision-making. In order to combat the detrimental effects of climate change in developing countries like Nepal, it is crucial to implement sustainable solutions at local, regional and national levels.

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