

Women and Water: Adaptation Practices to Climate Variability
in the Sikkim Himalaya

A Dissertation Submitted

To

Sikkim University



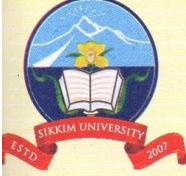
In Partial Fulfilment of the Requirement for the
Degree of Master of Philosophy

By

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DEPARTMENT OF GEOGRAPHY

SIKKIM UNIVERSITY

[A Central University established by an Act of Parliament of India, 2007]

Declaration

I hereby declare that this dissertation entitled "**Women and Water: Adaptation Practices to Climate Variability in the Sikkim Himalaya**" was carried out by me. The work that I am submitting has not been awarded any degree prior to this, by any other University or Institute.

This is submitted in partial fulfillment of the requirement for the award of the **Degree of Master of Philosophy**, to the Department of Geography, School of Human Sciences, Sikkim University.

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“Women and Water: Adaptation Practices to Climate Variability in the Sikkim Himalaya”

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Abbreviations

BAU	Block Administrative Unit
BFE	Barefoot Engineer
COP	Conference of the Parties
DFID	The Department of International Development
ENB	Earth Negotiations Bulletin
FGD	Focus Group Discussion
GWA	Gender and Water Alliance
GPU	Gram Panchayat Unit
HBF	Heinrich Boll Foundation
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
IDS	Institute for Development Studies
INCCA	Indian Network for Climate Change Assessment
IPCC	Intergovernmental Panel on Climate Change
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
NGO	Non Governmental Organization
OXFAM	Oxford Committee for Famine Relief
PHSC	Primary Health Sub Centre
PRA	Participatory Rural Appraisal
RMDD	Rural Management and Development Department
SD	Sustainable Development
SHG	Self Help Group
SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
UK	United Kingdom

UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Program
VAC	Village Administrative Centre
WCED	World Commission on Environment and Development
WCS	World Conservation Strategy
WHO	World Health Organization

Chapter 1

Introduction

1.1 Background:

How do women adapt to water scarcity caused by climate variability? What can we learn from it? The purpose of this study is to document the dynamics of adaptation practices related to sustainable usage of water engaged by women in their everyday life in a mountain socio-ecological system. Such system represents the ensemble of resource-use practices, natural settings, institutional practices, and social landscape. These are entwined through myriad webs of networks of exchange and flows that produces the system. Mountain communities across the Himalayas had been experiencing ecological changes causing extreme stress on natural resources like water. However, such changes have been aggravated and intensified due to increased climate variability and rapid urbanization, infrastructure development, and population growth.

Climate changes, which have become more evident in the recent past, have received wider attention across the world. It has not only hit the daily headlines and our everyday conversation but also academic research. Out of the multiple issues of resource-use and their associated inter-linkages, the impact of such climatic changes on the water resources across the world has also drawn wider attention. Water being essential to the sustenance of life intermittently connected with the fragile ecologies, mountain ecologies, and its challenges in this changed scenario have been further stressed. And throughout the Hindu Kush Himalayan region impact of climate change are being felt most prominently around water issues, which is an important asset for sustaining livelihoods in this region (Sharma, et al. 2009).

Availability of water is a major concern of people in the world; it is as obvious as the concentration of fresh water is only around 2.5 % around the world (UNFCCC 2011) and the world populations are increasing gradually putting more stress on a water resource. Basically, mountains are the fresh water providers to the world which considered as water tower of the world, but it is also among the most sensitive to climate change (Kohler and Maselli 2009). Talking about the South Asia, the effect on climate variability is more in the Hindu Kush Himalayan region where it is warming about three times faster than the globe average (ICIMOD 2015). This region broadly crosses the eight countries -Afghanistan, Bangladesh, Bhutan, China, India, Nepal, Myanmar, and Pakistan (Sandhu and Sandhu 2015). It is known as the 'Third Pole', 'Roof of the World' and also 'Water Towers of Asia' (Tiwari 2013).

Similarly, Himalaya being part of broad HKH region is facing the impact of climate variability in unprecedented rate and estimate that it increases the pressure on natural resources which widely affect the availability and access to water resources (ICIMOD 2015). The Himalayas are witnessing water-stress, the Sikkim Himalaya, located in the eastern part of it also experiencing changes due to climate variability.

Recent studies focusing on Sikkim Himalaya shows increasing trend of maximum temperature annually, which is highest in all the state of India i.e. $+0.07^{\circ}\text{C}$ per year, and for rainfall, it shows decreasing trend. As per the seasonal Climate Change trends, the study shows significant increasing in winter maximum temperature that is $+0.08^{\circ}\text{C}$ per year and the winter rainfall has decreased. Average summer mean maximum and minimum temperature in Sikkim have increased by $+0.30^{\circ}\text{C}$ per year and $+0.07^{\circ}\text{C}$ per year respectively but summer mean rainfall trends have decreased (Rathore, Attri and

Jaswal 2013). INCCA (2010) reports that the number of cold days is decreasing in North-Eastern India with a substantial decrease in rainfall in the winter month of January and February. Another study which was conducted by Government of Sikkim analyzed five-year Climate Variability from 2006 – 2010 where Seetharam (2012) reveals that there is a marked decrease in rainfall in almost all season.

Although climate change has drawn wider attention and its impacts are acknowledged globally, this very issue has remained a contested one. There are having been wider divides and gulfs between opinions around the world, there are many people who do believe that climate change is going on and they are trying to bring the changes in policy and in behavior to overcome the condition and there are another group of people in the world, who seems to be little concerned about climate change and very little likely to take any action, or to support policies, that can counter such change (Patchen 2006).

This latter group includes those who view that the changes are part of normal cycles of weather changes and, therefore, as requiring no additional actions. Yet regardless of the fact regardless of the scientific veracity of the evidence, and the fundamentalism inherent in the debate, it is clear that climate variation is having major consequences for people across the world and, in particular, for the poorest of the poor (Tierney 2009), the majority of whom are women (Moghadam 2005).

One of the crucial issues which have been consistently ignored in climate change studies is the question of gender. It is now widely realized that gender issues have not been considered in wider climate change discourses and initiatives. Due to the gendered roles and responsibilities as well as status and identities of women and men in the household and communities, climate change will have a differential impact on women

and men and many studies point this out. What is worth noticing here that the international responses to the implications of climate change has largely focused on mitigation initiatives (the reduction of greenhouse gases) and, has directed less attention to adaptation strategies (assistance with adapting to the adverse impacts of climate change on food, livelihood, and human security). Predominant approaches and policy responses have focused on scientific and technological measures to tackle climate change problems (Masika 2002).

Adaptation to climate variability is intricately linked to issue of gender due to the gender roles and relations, women and men have different knowledge, capacities, and access to resources. In the context of water resources, women across the world especially developing societies are at its helm of affairs (Sandys 2005). Women being a major agency crucial for water security within the household, critical understandings of such adaptation practices have become crucial.

It is seen that most of the strategies are made focusing only about women's vulnerability, where very little details can be found on women as agents who can bring some change and adapt to the situation by their own (Smyth 2009). Irrespective of the fact whether policies geared towards tackling complexities of changing climate are being effective or not or to what extent, women are found negotiating such changes in their everyday lives across the world, especially in regions challenged by climatic variability. In this regard, the issue of women's coping, adaptation and, resilience has drawn critical attention to academic research drawing upon gender, water, and climatic variability.

1.2 Contextual Literatures:

Studies on climate variability have accumulated over the period of time. These studies can be classified into two major genres—1) techno-scientific: the majority of which involves modeling of the dynamics of systemic changes in climate 2) non-techno scientific: the majority of which focuses on the societal, economic and political dynamics of climate variability. For the purpose of this study, an attempt is made to explore and examine the latter category of literature that has emerged recently as this literature gives the conceptual backdrop, understanding, and dynamics of the topic of the study.

Within this non-techno scientific: social, political dynamics of climate variability, its focus on women, mountainous region, and water resources, this review is limited to this scope. It attempts to scratch the surface of a vast genre of studies under the issues of climate variability and gender to extract the larger issues and their linkages. In this context, it remained more of an explorative than in-depth one.

1.2.1 Is Climate Variability Impacting Water Resources?

Water is vital to all form of life on earth, from the simplest of a living organism to the most complex of human systems. Water is the primary medium through which climate change influences Earth's ecosystem and thus the livelihood and well-being of societies. Higher temperatures and changes in extreme weather conditions are projected to affect availability and distribution of rainfall, snowmelt, river flows, and groundwater, and further, deteriorate water quality (UNWater 2016).

It was the Stockholm Conference¹ which recognized the fact that water is precious, its management is urgent. This conference was the first attempt to count comprehensive approach to water, including all aspects of environmental protection. Another important conference on water issue held in Mar del Plata, Argentina in March 1977 where main concern was the basic needs of water (Gleick 1996).

Water is being the first to discuss in climate variability issues as it leads notable impacts on its availability and quality around the world as every year the world faces effects of droughts and floods. Change in the pattern of Climate leads to the melting of glacial because of rising temperature, where ICIMOD (2009) reports that in Asia, climate change induced glacial melt could seriously affect half a billion people in the Himalayan region overall who all depend on glacial melt for their water supply.

It is not only the Himalayan region but also effect can be felt other parts too where ICIMOD (2009) reports that mountain regions provide more than 50% of the global river runoff, and more than one-sixth of the Earth's population relies on glaciers and seasonal snow for its water supply. The effects of climatic change are of tremendous importance to the often densely populated lowland regions that depend on mountain water for their domestic, agricultural, and industrial needs. The effect is more on food production and economic growth.

Similarly, Sikkim has witnessed changes in climate which is facing intense problem due to water scarcity. Barua, Katyaiani and Mili (2012) highlights that rainfall patterns have become erratic in this region, monsoons are usually late and in general

¹. The United Nations Conference on the Human Environment in Stockholm, June 5-16, 1972. It represented a first taking stock of the global human impact on the environment, an attempt at forging a basic common outlook on how to address the challenge of preserving and enhancing the human environment

torrential rainfall has replaced the monsoon drizzle which results in the drying up of springs. This has a serious implication on the livelihood of most people as the rural households in the region depends on spring water for both domestic and as well as for livelihood. Springs are the most obvious attributes of Himalayan geo-hydrology and the source of domestic and drinking water to the hill folks (Khawas, Sustainable development and management of water resource in mountain ecosystem: Some examples from Sikkim Himalaya 2004). People of Sikkim are facing a serious problem of climate change as their cropping pattern are effected, because of increasing temperature, there is a loss of green vegetables in many higher altitudes, they are experiencing warmer weather pattern too, springs are drying up due to less rainfall (Khawas 2011).

An examination of these studies involving various international bodies and individual ones widely establish the fact climate variability has greatly affected the water resources across the globe. Most importantly, studies focusing on the Himalayan region captures the wider implications of such variability on the population.

1.2.2 Is Climate Variability Gender Neutral?

In the previous section, we explored studies on climate variability especially those pertaining to the mountainous regions. However, the majority of these studies have failed to capture the issue from the perspective of gender. Most of these are dispassionate and techno-scientific in nature. In recent years, numerous studies have emerged adopting the analytical framework of gender.

Gender is a complex phenomenon which is more social than natural or biological (Holmes 2007). Gender is what individuals conceive of their roles as males and females, largely sanctioned and ascribed by societal strictures. In other words, gender refers to

how societies set the behavioral, social and cultural rules for being a man or a woman (Raju and Lahiri-Dutta, *Doing Gender, Doing Geography: Emerging Research in India* 2011). Gender refers to the array of socially constructed roles and relationships, personality traits, attitudes, behaviors, values, relative power and influence that society ascribes to the two sexes on a differential basis (Esplen and Jolly 2006).

Gender issues related to climate can be traced back in Fourth World Conference on Women in 1995 in Beijing Declaration² where importance is given to the gender perspective in all environmental policies and programs (ENB 1995). But it was only after COP 13, held in Bali, that produced the Bali Action Plan feminists first expressed their public concerns about the lack of attention to gendered consequences and produced papers on gender and climate change (Hemmati and Röhr 2009).

Although, there is some attention on the contribution of women in environment conservation but Bathge (2010) reveals that the discourse on climate change does not pay adequate attention to women, either at the local project level nor in international negotiations they usually are unable to raise their voice. Prescott (2014) emphasis on the same issues and highlights that in developing countries, gender, and sex-related differences appear to be much more pronounced which is worse for rural women, and there are three primary factors of gender-based vulnerability which can be seen to climate change, these are unequal access to resources; unequal opportunities to change or improve their livelihoods; and exclusion from decision-making. Lane and McNaught (2009) noted that before and during climate disasters women are more likely to be

² The Beijing Declaration was a resolution adopted by the UN at the end of the Fourth World Conference on Women on 15 September 1995. The resolution adopted to promulgate a set of principles concerning the equality of men and women

responsible for the practical preparation of the household, taking care of family members, storing food and water, and protecting family belongings.

This has been especially the case for women in both rural and urban areas in comparison to the man who is found to end up with spending more working time while taking care of domestic chores and collecting water. Studies show that in some mountain regions in India women undertake 4.6 to 5.7 times the agricultural work that men carry out, while in Nepal, it is even more - women carry out 6.3 to 6.6 times the agricultural work that men carry (Lama 2010). So with the likelihood of more ecological destruction caused by climate variability in the future with resources become scarce such as water, firewood etc. the burden on women's lives, especially in the developing world, has spiraled up in recent years.

Thus, the first form of impact of climate change to women relates to labor and workload as this increases because distances travelled by women to access natural resources (such as water, fuel wood, fodder, food, pastures, medicinal plants, fuel, and crops) increases and cropping schedules get affected due to changing climate conditions (Bhattarai, Beilin and Ford 2015). Dankelman, et al. (2008) reveals that women were more severely affected by water shortages than men, largely due to their role as water collectors for the household. The women had to travel farther in search of water, as well as spend more time checking different wells for water availability. Most importantly, this disproportionate burden on the parts of women bears serious consequences to issues like poverty, inequality, health and well-being especially those residing in the climate-affected areas.

Hannan (2011) further explains that an increase in women's workload and burdens as a result of climate change may mean that they have to forego opportunities that are important for their economic empowerment, such as education or training and income-generating activities. In some cases, women are forced to take their daughters from school to assist them with work on the farm or in the household, which has long-term detrimental effects on the empowerment of these girls (Hannan 2011). As a result, women are more vulnerable to the changing climate (Romero, Belemvire and Saulière 2011).

Mitchell, Tanner and Lussier (2007) argues that it is the unequal position of women in society which make them more vulnerable, they emphasize that women have less access to money, land, food, protection from violence, education or healthcare. Women are more dependent on natural resources because of that they are more impacted by climate shocks and they even do not possess enough resource to protect their lives (Romero, Belemvire and Saulière 2011).

Above studies reveals that though women are the one who looks over the household chores and takes care of their family and manages the belongings during the climate change disaster but their contributions are not counted, women, in general, are being neglected in the climate change discourse. And their position in society is one of the reasons which make them more vulnerable.

1.2.3 Can We Learn from Women's Practices?

Historically, irrespective of the importance and recognition of the issue gained by climate variability across the globe, women had been found struggling and resisting ecological destruction. Many ecological movements focusing on the conservation of natural

resources have emerged from the traditional values and ethos that they have nurtured as the caretaker of nature. For instance, the Chipko Movement was initiated and fostered by the women in Uttarakhand, India.

Dankelman (2010) narrates about the Bishnoi community in Rajasthan, India. They are known as environmental conservationists in the Thar Desert. The story goes that in 1730 the King of Jodhpur ordered his soldiers to fell trees in a Bishnoi village for construction work, but a woman named Amrita Devi organized the villagers to protect the trees with their own bodies. In the Khejadli Massacre, Amrita Devi died along with the villagers protecting the khejri trees (*Prosopis cineraria*). When Maharaja came to know about the massacre, he ordered to stop the tree-felling. Another is the Chipko Movement in India which is mentioned above, is another such example, led by rural indigenous women saving trees and thwarting commercial loggers, destroying forests and forest livelihoods (Resurrección 2013).

The gender division of roles and responsibilities make women the ones who look after the every single task of household, from cooking to paying bills, during and after extreme events of climate change cost of electricity, fresh food, and petrol prices cause financial strain on women. Usually, women are blamed if the household falls behind in paying the bills moreover women are being blamed for increasing electricity bills (Mckinnon 2013). They cannot voice against this as women as a group is less powerful than man (Nelson 2002). Less power means they are with low income or no income usually lack of savings and do not have enough resources to cope with disaster. This inferior economic position makes them particularly vulnerable to the negative impacts of climate change.

However, women are aware of this and there are numerous studies to show women are adapting to these changes and impacts. There are instances of women in various parts of Nepal conserving water springs in ecologically sensitive areas through participation in community forestry where they have banned harvesting of timber from trees that are at the stage of extinction, practicing multiple cropping/ intercropping in the same plot by planting legumes with cereals like maize, doing homestead gardening and off-seasonal vegetables cultivation in small greenhouses, selling surplus milk and vegetables as to generate extra income, selling off livestock to ensure cash deposits to cover the loss of crops and assets, resorting to alternative energy technologies such as biogas, improved cooking stove, (Gurung and Bhandari 2009, Mitchell, Tanner and Lussier 2007).

In India, women from Sikkim have begun to domesticate wild cardamom which is more disease resistant than the cardamom species that had failed in previous years, others are resorting to traditional seed saving practices, conserving *in situ* genetic resources and community exchange between communities, and are cultivation dry-land paddy instead of wet-paddy after facing water shortages (Dhakal 2012).

The issue of adaptation and gender is limited to only local level though the issues of gender and climate change has been gradually increasing but most of the time women are considered as the victim or most vulnerable to climate change (Skinner 2011). Women generally possess a strong body of knowledge and expertise regarding their surroundings that have accumulated over time through their active involvement in resource management can be used in climate change mitigation, disaster risk reduction and adaptation strategies (Baten and Khan 2010). Women are not just victims but active

agents of change and possess unique knowledge and skills that should be acknowledged and tapped into to develop resilience (Nellemann, Verma and Hislop 2011).

The IPCC's officially used the operational definition for adaptation: It refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change (IPCC 2001).

Women and men both have unique and valuable local knowledge. But often Women farmers are overwhelmingly left out of many forms of communication (McOmber, et al. 2013). But now women's role is taking on new forms under the pressure of climate change, they are showing interest in new income-creating activities and this income helps women to break down men's power to make decisions concerning household money and resources (Rodenberg 2009). Women's activities are strongly interlinked with the services provided by local ecological systems. Their reliance on natural resources increases women's ability to acquire and disseminate knowledge and information about ecosystems (H.D Joudi 2011).

To draw in some conclusive points from studies discussed in this section: women are found to be disproportionately affected by climate variability making them more vulnerable, but many have argued that one needs to go beyond the frame of "victimhood" in order make climate variability more gender inclusive; and women do possess valuable knowledge and skills about managing their environments, and the ability to cope with the everyday changes brought about by climate and other drivers of change. These are

reflected in the recent studies attempting to understand the multiple adaptability practices that women are engaged in their everyday life.

Although highlighted by few studies about the potentialities about learning from these practices, it is yet to become a mainstream focus of studies on climate variability and water resources. Women themselves have to understand the fact that they are contributing their knowledge, their effort to overcome the worst situation led to climate change.

1.3 Aims and Objectives:

Adverse changes in climate are likely to exacerbate the problems of developing countries. As the majority of the ecological destabilization or destruction is concentrated in the developing countries such events seem to bear serious social and economic implications. Among others, resources water is considered one of the most crucial ones to have serious impacts on the lives of the communities across the world. A reflection on the discussion on the literature review section reveals the fact that the mountainous regions being sensitive to the ecological changes have become hotspots of water scarcity. In this context, the Himalayan region with its increasingly depleting water resources due to climate variability pose serious consequences especially to the population catered by its ecosystem services.

The literature shows that the majority of climate variability studies seem to be limited by their techno-scientific frame. These studies have mostly advocated technical mitigation initiatives like reduction of greenhouse effect etc. Such macro scale meta-narratives have constructed climate variability as a technical issue to be tackled with so-called proper “scientific” knowledge. Somehow, this global meta-narrative which is

reproduced endlessly in scientific studies, policy initiatives and international collaborations of political action has evaporated the “human face” of the crisis. In recent years, as we have observed in our brief literature review, gender issues have not been considered in wider-climate variability discourses and initiatives. As understood from our discussion, we could realize that the adoption of gender lens has emerged as a critique to such international responses that displays scant regard for the implications of climate variability outcomes and threats to the marginalized sections of the society especially women.

Various studies, some which we have reviewed in our literature that attempts to capture the impact of climate variability on women’s lives have revealed the fact, especially the poor rural women in developing countries, are more vulnerable. This has been found to truer in the case of the increasing distress caused on the water resources due to climate variability. These studies discuss vulnerability to the harmful risks of climate variability and demonstrate why these areas need to be considered and integrated into climate variability interventions.

On the other hand, a section of studies advocates going beyond “victimhood” perspective in order to focus and capture women as change agents. Adaptation studies across the world in this context that focuses on women’s adaptive capacities to absorb and recover from the ecological shocks. Taking intersectional approaches these studies critically examines how social and economic factors inform the capacity to cope and adapt in the aftermath of climate variability. These studies helped us to understand complex interconnections and socio-ecological systems and its larger outcomes. These studies have further re-established the fact that a focus on technical solutions to climate

variability problems has ignored the social and political aspects of finding appropriate solutions.

This study is framed on the premise derived from our understanding of the studies that we have discussed in a contextual manner. Taking a clue from the emerging ecological crisis of climate variability, it adopts “water resources” as a crucial point to understand such impacts. The study focuses on the mountainous region of Sikkim Himalaya. A brief gloss over literature focusing on Himalayan region reveals the fact, that this segment of Himalaya has had less attention. More importantly, whatever scant studies are available they have mostly focused on the macro environmental causalities of factors like glaciers etc. Studies of climate variability focusing on water resources and human dimensions have not made enough strides in academic research.

As understood from our discussion that human adaptation studies have now emerged as a tool to study various dimensions of climate variability and its impacts. Speaking of Geography as a discipline, geographers have traditionally have been studying the impacts of natural disasters on people's (vulnerability approach) from a rather technical approach (e.g., cost-benefit analysis). Apart from the techno-scientific focus, studies on women again are less visible and talked about. This study takes on the gendered critique of climate variability studies that focuses on the women of the mountainous region.

There is a common myth among tribal societies in the mountainous region that they are better off because societies in this region are less patriarchal and women enjoy more freedom in all spheres of life. This is being especially portrayed about Sikkimese women. Going by this commonly held notion about Sikkimese women, the crucial

question that arises here is does it imply that they are in a better position to deal with effects of water scarcity? How are they coping and adapting to the severe water scarcity? How are these adaptive practices interlinked with their social positions? How are they negotiating with the power relations for securing sustainable livelihood? What can we learn from their practices?

Another related issue that majority of climate variability tend to focus on macro or systemic change rather focusing on the “micro”. This study, therefore, attempts to fill this gap among the studies in Himalaya region especially Sikkim. Thus, it focuses on those “micro” practices that Sikkimese women engage in their everyday life to cope, adapt or tackle and strategize actions for ensuing a sustainable livelihood. Throughout the study coping and adaptation has been used synonymously as long-term coping strategies can be said as adaptation though there is difference where Davies (1993) work noted that Short-term responses to a decline in food availability and income in abnormal years are defined as coping or coping strategies, while longer-term or permanent changes in the ways in which food and income are acquired are defined as adapting or adaptation strategies.

These micro practices performed by women hold the clue to developing gender responsive policies, which can be drawn by engaging them in a collective manner in the proposed research. Therefore, the major objectives of this study are as follows:

- To analyze the impact of climate variability on women with particular reference to water resources.
- To examine women’s coping strategies in managing water crisis in Sikkim Himalaya.

1.4 Approaches and Methodology:

This study takes a qualitative methodology because of its exploratory and descriptive nature; it is an effort to understand the impact of climate variability from the perspective of women and to acquire their knowledge of adaptation during a critical moment. This study will try to look into the reason ‘why’ behind what women say and will highlight on the process - how as well as what process made them say that. Qualitative methods are participatory in nature and seek to understand the reality of the situation from the actors’ point of view; in addition, a qualitative study implies an in-depth study that utilizes a variety of data collection techniques, which envisage wholeness of data (Kane 1995).

To explore the perception of women, I use tools of Participatory Rural Appraisal (PRA), with Participator observation and informal interviews. PRA emphasis on empowering local people to assume an active role in analyzing their own living conditions, problems, and potentials in order to seek a change of their situation. During the 1980s, PRA was firstly developed in India and Kenya, mainly supported by NGOs operating at the grass-roots level.

The tools of PRA have expanded over the years. For the study, I have used the four Tools-

1. Resource map, 2. Seasonal calendar 3. Focus Group Discussion, 4. Participant Observation with informal interviews and discussions.

Resource map – The study uses collective generation of Resource Mapping. This is done to learn about the village and its resources and it also gives useful information about local perception of resources and how they use it. This tool helps to acquire

knowledge about the natural capital and physical capital and what are the priorities of women in that particular village. This map also captures the information on social capital like institutions, social organizations, government bodies, and schools. This can be said resource cum social map.

Seasonal Calendar – Seasonal calendar was used in PRA to acquire the knowledge about the changes in climatic pattern, in my study the purpose is to learn about the changes in livelihoods over the year and to show the seasonality of water and related resources. This tool also reveals variability of climate, in which month or season women face the most problem in terms of the water resource.

The above tools are used to generate gendered data on perception and assessment of physical resources and effect of climate variability. Therefore collective mapping is done in cascading manner. First, the female member is separately asked to map, followed by men and finally a common map produced together by both groups.

Focus Group Discussion- This was conducted with the members of water user's, which was divided into five: 2 men's groups. 2 women's group and one common group. The groups were made as follows:

Male group

- Young male group
- Elder male group

Female group

- Young female group
- Elder female group

One joint group with both men and women.

The selection is based on the fact that it is important to understand whether knowledge is gendered in terms of climate variability and change among the elderly women and men and young generation. The key focus of interviews and discussions during FGDs is to acquire a local perception of climate variability and its impact on water resources and women's coping mechanism.

Apart from these, the study engages participant observation this method is of observing social phenomena while being part of a research setting (Braun 2015). In this case living in communities which are directly affected by the water scarcity and participating in the daily routine of living in a household and village. Informal interviews are conversations or discussions that take place in the course of doing research and that provide the way to gather information and understanding from villagers who are participants over the time. Experience and data which I gathered through participant observation and through informal interviews facilitated me for deeper engagement with, and understanding of, the research setting.

Interviews are conducted in Nepali language and some were recorded with their permission and then transcribed and translated in English. From these methods I have to generate themes- it is used as an attribute, descriptor, element, and concept, as an implicit topic that organizes a group of repeating ideas. It contains codes that have a common point of reference and has a high degree of generality that unifies ideas regarding the subject (Vaismoradi, et al. 2016). Coding is an interpretive activity and therefore it is possible that two researchers will attribute two different codes to the same data. This is a method to organize the data so that underlying messages portrayed by the data may become clearer to the researcher (Theron 2015). Finally, I have used descriptive content

analysis / Qualitative content Analysis, which is a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns (Hsieh and Shannon 2005).

Fig 1. Mapping Exercise and Focus Group Discussion at a village level
(Between 1-2 hours)

Objectives	Methods
<ul style="list-style-type: none"> • To know the livelihood activities • To identify stresses 	Seasonal Calendar
<ul style="list-style-type: none"> • Get to know the physical resources and social institution • Location of different water sources 	Resource Mapping
<ul style="list-style-type: none"> • To know the perception of the climate variability and water scarcity in Mellidara 	Young male group discussion
<ul style="list-style-type: none"> • Same as above 	Elder male group discussion
<ul style="list-style-type: none"> • To know the problem facing by them during the water scarcity period and how they adapt the situation 	Young female group discussion
<ul style="list-style-type: none"> • Same as above 	Elder female group discussion
<ul style="list-style-type: none"> • To acquire the knowledge of problem of water scarcity and adaptation practices together and to get the different views 	Male and female mix group discussion
<ul style="list-style-type: none"> • To know the villagers experience during the period of water scarcity and to observe and realize the situation by living with them 	Participant observation and Informal Interviews

1.5 Limitations and Plan of the Study:

This study has faced many challenges, first, it took much time to convince women to talk and share their perception as most of them were busy with their household chores and asking time from them is a difficult task. Second, those who agree to share their views came just for few minutes and they left while discussing the issues. Third, some information is not matching with the government documents available. Fourth this area is not homogeneous so women from a different part of the village have a different story to share related to water issues. Fifth it was hard to find out the key cause of livelihood change as the aspects of climate variability and other social issues are intertwined in complex ways.

This study is organized into five chapters. Chapter one is the introductory chapter giving the background of climate change, gender and water, literature review and aims and objectives of the study. Chapter two gives the theoretical framework that is a sustainable livelihood. In Chapter three I provide an impact of climate variability, including water scarcity in the life of women, dynamics of livelihood change and present the village study area of Mellidara, South Sikkim. Chapter four; I describe the role of women in the face of change in adapting practices. Chapter five is the conclusion. A glossary of local terms can be found at the end of this dissertation.



PLATE 1.1: View of Mellidara Village from the Tarey Bhir (Photo – Rashmita Sarkar, January, 2017)



PLATE 1.2: View of ridge called Tarey Bhir from the village Mellidara (Photo- Rashmita Sarkar, April 2016)



PLATE 1.3: Local Dhara during month of April with very less water available in it (Photo- Rashmita Sarkar, April 2016)



PLATE 1.4: Local Dhara during the month of July with abundant water (Photo- Rashmita Sarkar, July 2016)



PLATE 1.5: Land left barren without cultivation due to water scarcity (Photo- Rashmita Sarkar, April 2016)

Chapter 2

Sustainable Livelihood Framework: Issues and Debates

2.1 Introduction

This chapter discusses the theoretical framework adopted for the study i.e. Sustainable Livelihood Framework. A sustainable livelihoods approach is an analytical tool which is used to identify the components affects a community's capacity to strengthen their livelihoods; it is a holistic method of addressing issues that center the discussion on people's livelihoods (Hanstad, Nielsen and Brown 2004). The term sustainable has its history from the 1980s when the International Union for Conservation of Resources presented the World Conservation Strategy (WCS) with the overall aim of achieving Sustainable Development through the conservation of living resources (Lele 1991).

The concept of Sustainable Development gain its popularity in 1983 when UN General Assembly created the World Commission on Environment and Development which was later known as the Brundtland Commission³, named after its Chair, Gro Harlem Brundtland, then Prime Minister of Norway and later head of the World Health Organization(WHO). In 1987, the Commission Published the Brundtland Report, where Sustainable Development was defined as- “Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Paul 2008).

³. Commission was created by the United Nations in 1983 to reflect about ways to save the human environment and natural resources and prevent deterioration of economic and social development.

The concept of livelihood is about individuals, households, or groups making a living, attempting to meet their various consumption and economic necessities, coping with uncertainties, and responding to new opportunities (Haan and Zoomers 2003).

Livelihoods are the means people use to support themselves, to survive, and to prosper. Livelihoods are an outcome of how and why people organize to transform the environment to meet their needs through technology, labor, power, knowledge, and social relations. Livelihoods are also shaped by the broader economic and political systems within which they operate (Vincent 2001).

This concept of Sustainable and the concept of livelihood become one of the major topics of discussion during the 1990s in the development process which is been elaborated in next section.

2.2 Sustainable Livelihoods approach

Sustainable Livelihoods approach is people-centered. This approach is to counter the earlier livelihood approach which only uses the quantitative indicators of poverty, it emerge at the beginning of the 1990s and highlighted in the research of Robert Chamber and Gordon Conway, later Sustainable Livelihoods became an important theme in the UK's development policy, where initiatives were taken by DFID for various research projects Haan (2008). The aim of this approach is to include people who themselves have to be key actors in identifying the important aspects of their own livelihoods and motivate them to be actively involved in planning and implementation of policies and interventions practice (Petersen and Pedersen 2010).

Arce (2003) explores how the theoretical roots of the sustainable livelihoods approach represented a shift away from the nation-state orientation of prior community

development efforts, which focused on modernization and political control, through advocating for the analysis of the realities of poor and marginalized people from their own perspective. Sustainable livelihoods are a concept which has evolved more from open - ended fieldwork than from the close concerns of surveys and statistics. This approach is based on a micro leveled focus, concentrating on small communities and single households (Lax and Krug 2013).

The well-known definition of a sustainable livelihood is given by Chambers and Conway (1992) and later modified by World Commission on Environment and Development (WCED):

“A livelihood comprises the capabilities, assets, and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets and while not undermining the natural resource base”.

The aim of livelihoods approach is to understand ‘how different people in different places live’, how and why people make the choices that they do, it is simple: observe the world and try to understand things from local perspectives (Scoones, 2009). It aims to achieve a better understanding of needs and conditions at the local level and to address challenges posed by the ‘real’, ‘complex’ world. In simple terms, a livelihood comprises the capabilities, assets, and activities required for gaining a living (Wiesmann, et al. 2011). The framework places people rather than resources, facilities or organizations at the center of its analysis and emphasizes that socio-economic development entails participatory and sustainable methodologies (Carney 2002).

Sustainable Livelihood Approach allows an understanding of livelihood change as livelihood portfolios shift in response to the capacity of households to generate new strategies in response to needs and opportunities, and how these are influenced by the changing vulnerability context and transforming structures and processes (Farrington, Ramasut and Walker 2002).

2.3 The Sustainable Livelihood Framework:

Sustainable Livelihood Framework is for a better understanding of livelihoods. This framework is a way of understanding how households derive their livelihoods, how they use assets, capabilities, and activities for sustaining livelihoods.

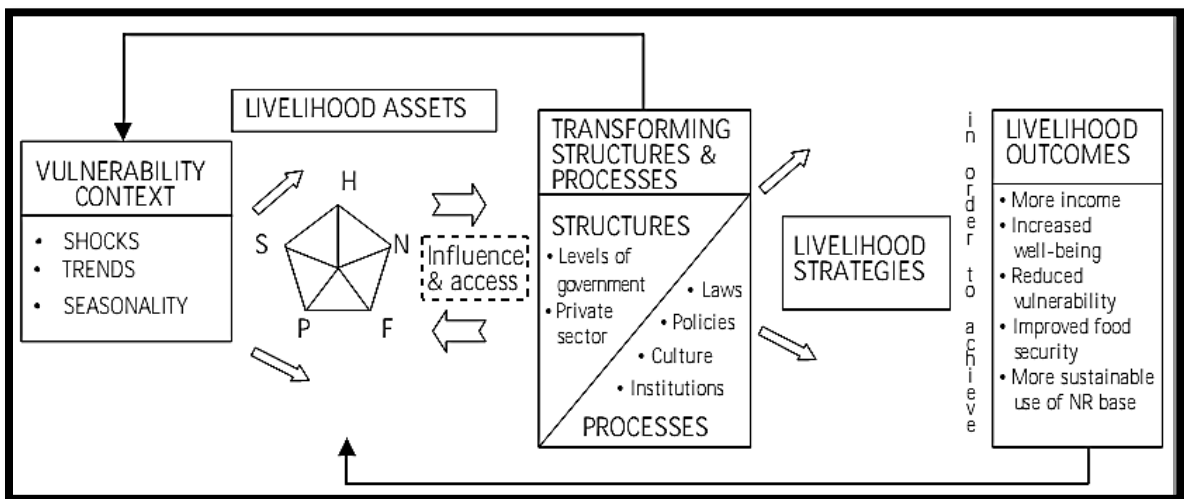
Household assets refer to the resources that households own or have access to for gaining a livelihood. And capabilities are the combined knowledge, skills, state of health and ability to labor or command the labor of a household. Household strategies are the ways in which households deploy assets, use their capabilities in order to meet households' objectives, and are often based on past experience (Misra, et al. 2014). SLF is an analysis of peoples' current livelihood and what is needed for an 'enhancement'. The SLF could also result in recommendations that people themselves may be able to put into practice rather than be dependent upon the actions of outsiders (Morse and McNamara 2013).

According to Bebbington (1999) one part of the framework would form livelihoods by enhancing capital (natural, produced, human, social and cultural) that are the resources or inputs that make livelihood strategies meaningful and viable. The second part of the framework focuses on household and intrahousehold level forms of engagement with the market, state and civil society actors and relationships, and the

implications of these engagements for the distribution and transformation of assets. This focuses attention on the assets that poor men and women use and the strategies that they employ to make a living (Farrington, Ramasut and Walker, 2002).

The Sustainable Livelihoods Framework (SLF) simplifies the complex holistic reality into a simple analytical tool which is used to understand livelihood strategies and their interaction with processes, institutions, and policies (Tincani 2012). Well explained SLF is given below it is widely used as DFID’s Sustainable Livelihoods Framework (DFID 1999) –

Fig. No. 2.1 Sustainable Livelihood Framework



Note- The arrows within the framework are used as to show a variety of different types of relationships, all of which are highly dynamic. None of the arrows imply direct causality, though all imply a certain level of influence.

Source- DFID 2009
<http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf> (accessed 24th August 2016)

The livelihoods framework is not to depict the realities rather it is to capture the complexity of livelihoods, understanding influences on poverty and identifying where interventions can best be made. The assumption is that people pursue a range of

livelihood outcomes (health, income, reduced vulnerability, etc.) by drawing on a range of assets to pursue a variety of activities by their own preferences and priorities (Farrington, Carney, et al. 1992). This framework does not specify particular methods and techniques that have to be applied to explore the capitals, institutions, vulnerability etc. In practice, the process of ‘doing’ an SLA could utilize a disparate range of methods including standard techniques based upon observation, focus groups and interviewing (Morse and McNamara 2013).

Scoones (1998) noted that framework can be applied to a range of different scales – from an individual to the household, to household cluster, to extended kin grouping, to the village, region or even nation, with sustainable livelihood outcomes assessed at different levels. The framework is composed of black boxes that represent the elements of the livelihood frameworks. This includes the types of assets capitals, human, and natural, financial, social and physical those are discussed below (DFID 1999).

2.4 Elements of the framework

The sustainable framework has been illustrated with a model that makes it easier to understand the different components and their interrelatedness. The five basic types of asset are capitals, human, natural, financial, social and physical these elements are-

Assets- The sustainable livelihoods framework is built on the belief that people need assets to achieve a positive livelihood outcome. People have a different kind of assets that they combine, to help them achieve the livelihoods that they seek (Petersen and Pedersen 2010). According to Lakwo (2006) ‘asset’ is used synonymously with capital and resources in the livelihood issue but there is variation when people use the asset while classification among different people. He highlights assets are not only

classified into a human, natural, physical, financial, and social but there is a cluster of political issues which plays a vital link between individuals and their wider community.

Assets are stocks of different types of capitals that can be used directly or indirectly to generate livelihoods. Assets are the main building units of people's livelihood and can give rise to a flow of output, possibly depleted as a consequence, or may be accumulated as a surplus to be invested in future productive activities (Ashley and Carney 1999).

Scoones (2009) noted that assets are given many priorities in combining with different portfolios which emerge over time for different people in different places, and links the changes in natural capital especially the environment with social and economic aspects, he cited example of IDS, this studies stressed in particular, the idea of institutions and organizations as mediating livelihood strategies and pathways. These were socio-cultural and political processes which explained how and why diverse asset inputs linked to strategies and outcomes. There were subject to power and politics and questions of rights, access, and governance.

In SL framework, a livelihood is defined as 'the activities, the assets, and the access that jointly determine the living gained by an individual or household'. Rural livelihood diversification is then defined as 'the process by which households construct a diverse portfolio of activities and social support capabilities for survival and in order to improve their standard of living' (Ellis 1999). People require a range of assets to achieve positive livelihood outcomes; no single category of assets on its own is sufficient to yield the varied livelihood outcomes that people seek. The assets on this approach are therefore

utilized synergistically to pursue the different livelihood people aspire (Elizabeth 2006). The main resources that compose the livelihood asset are defined below-

Natural capital – It is formed from natural resource stocks, which give rise to resource flows and services (e.g., nutrient cycling and erosion protection) that are useful for livelihoods. Examples of natural capital include land, trees, water, the atmosphere and biodiversity (Bennett and Franzel 2009).

Physical capital - is a tool and equipment that people need to be productive along with the basic infrastructure needed to function – e.g. affordable transport and energy, decent housing and access to information (May, et al. 2009).

Social capital- it is the social resources such as networks, social claims, social relations, affiliations, and associations. The social resources are drawn when pursuing different livelihood strategies requiring coordinated actions. Those are not though only simply resources but assets that give people the capability to be, to act and the power to reproduce, challenge or change the rules that govern the control. Social structures can be more “horizontal” when based on relationships of trust and shared values or more ”vertical” when based on authority relations (Muntrakis 2014).

Human capital- which provides the knowledge and educational environments by which decisions can be made on gaining access and lessons can be learned (Nicol 2000). Financial resources are savings, access to credit, bank loans, remittances, pensions, etc. (Hatibu, et al. 2000).

The vulnerability context of poor people’s livelihoods is usually influenced by external factors outside their direct control and is dependent on wider policies, institutions, and processes. To support people to be more resilient to the negative effects

of trends, shocks, and seasonality, development policy-makers and practitioners can support people's access to assets and help ensure that critical policies, institutions, and processes are responsive to the needs of the poor (Haidar 2009).

Transforming structure and process- It includes the institutions, organizations, and policies that frame the livelihoods of the poor, and they are found on all levels – from the household to the international level. Examples of processes are international agreements, ownership rights and laws to secure the rights of the individuals, whereas structures might be the existence of ministries, banks that give credit to the farmers or self-help groups in the local community (Petersen and Pedersen 2010).

Livelihood strategies may include agriculture intensification, migration, nonfarm activities, and farm diversification. For some, diversification is pursued as a survival mechanism, but for others, it is a strategy for income and asset accumulation (Houweling 2009).

Livelihood outcomes- Haidar (2009) noted that Livelihood outcomes are the goals to which people aspire, the results of pursuing their livelihood strategies. Livelihoods approaches stress the importance of understanding and supporting poor people's efforts to achieve these goals.

2.5 Critique the Sustainable Livelihoods Approach

The Sustainable Livelihood Approach has been criticized for being too vague both for academic and policy purposes, though arguably it was never intended as a universal theory, instead encouraging the practitioner to carefully define each component in the local context, thus reflecting the participatory ethos of the SLF (Tincani 2012).

Ellis (1999) warns that where livelihoods approaches have been elevated to a panacea for all development concerns, they inevitably fall short, also recognized the limitations of using the household as a base for livelihood analysis. With a basis in the household, it is difficult to capture the separate and joint nature of resources, distribution, and consumption, within the household. Access to assets, mediated by gender as a social relation, is a defining attribute for individuals in the sense that it measures their options and constraints (Ellis 1999). Some livelihoods frameworks, such as the DFID framework have been criticized for giving insufficient details of ‘transforming structures and processes’ (Ashley and Carney 1999).

The major shortcoming of the livelihood approach is that its neglect of power relations. Political factors and power dynamics are not just important as the ‘context’, to livelihood construction, but shape the way individuals make decisions (Scoones 2009).

Kaag, et al. (2003) explore that in the framework only group of poor people and their actions and strategies are taken as the main entry point for analysis, there is the risk of adopting too narrow a view and of ignoring the context of structural constraints, such as power inequalities, Livelihood studies aim to be people-centered. This view has been increasingly criticized in the last few years. Thus, it has been stressed that for people to be considered as ‘whole’, it is necessary that their perceptions and ideas, their hopes and fears, their norms and values, etc. are all taken into account

In this regard, Ellis has cited the following example: Access to land as a most important natural resource when farming plays an important role in people's livelihoods. As for other assets, the ownership and control over land are not equal for women and men. Even though the picture is diverse, men are commonly the landholders. Not only

traditional customs keep women from owning land, in many countries the laws hinder women from inheriting land and land distribution programs tend to see the man as the head of the household and therefore only give land to males. Therefore, Ellis emphasizes the need for gender analysis to tackle this limitation (Ellis 1999).

Mosse(1994) noted that in SLF, the methodological approaches that are not gender-sensitive or do not focus specifically on women tend to misrepresent their livelihoods or silence their livelihoods. This problem often emanates from the fact that the framework privileges public events; and these focus on only certain types of knowledge which, by social definition, is generated by men and not by women. Sustainable Livelihood Frameworks broadens our understanding on how rural people in developing countries make a living. However, the framework lacks specificity on what ‘activities’ provide a means of living. Without a clear explanation of the activities, livelihood analysis can be best characterized as gender-insensitive because there is a high risk of overlooking certain non-market activities, such as women’s housework (Arku and Arku 2011).

Women are more heavily involved in agricultural work than men and have benefited less than men from the growth in non-farm employment. When women do set up enterprises they are generally in the informal sector and mainly low productivity household enterprises. A majority of women in agriculture work as dependent family workers (wives and daughters) while a majority of men work as the independent farmer. While land reform means that wives are generally co-owners of the family land in practice the majority of smallholder households continue to think that the “husband really owns the land”. Husbands continue to make the main decisions in households and control

the family finances. Women work significantly longer hours than men when reproductive work domestic work is taken account of (Abbott, Mutesi and Norris 2015).

To fill the gap of SLF many scholars have work on the gender issues and give a new name called Gendered Sustainable Livelihood Framework to dictate men's and especially women's roles and influences their livelihood strategies (Hoeve and Koppen 2005).

The concept of gender analysis arose from the need to mainstream women's interests while at the same time acknowledging that women could not be treated as a homogeneous group. It was realized that women's needs were better understood when viewed in relation to men's needs and roles and to their social, cultural, political, and economic context. Gender analysis thus takes into account women's roles in the production, reproduction, and management of community and other activities. Changes in one may produce beneficial or detrimental effects in others

Gender plays an important role as Masika and Joeke (1996) reveals that Gender differentiation in capacity to cope operates at many different levels. It reflects and amplifies gender differentiation in structures of asset ownership and entitlements and in the structure of dependent relationships. It also varies with the intensity and duration of the crisis. Niehof (2004) argues that woman's roles in the subsistence and reproduction of the home mean that their ability to take risks and behave opportunistically is different than that of men. Because of their different roles in the livelihood system, men and women will deal differently with risk. Men's and women's different attitudes to risk are likely to influence the choices they make in taking up diverse livelihood activities.

The Gendered Livelihood Strategies denote the range and combination of activities and choices that men and women make and undertake in order to achieve their livelihood goals. Gendered livelihood strategies are greatly varied across sectors, between gender, within households, and over time. This is also a dynamic process where many different factors exist that affect choice of livelihood strategy. The more choice and flexibility present in livelihood strategies of men and women or, in other words, their access to different levels and combinations of assets, the greater their ability to withstand, or adapt to, the shocks and stresses of the Vulnerability Context (Phuong 2012).

Livelihoods analysis often takes place at the household level and tends to subsume people into homogenous groups. However, people have different capabilities, differential access to resources and interact differently with institutions. Gender - meaning social/cultural, as opposed to biological differences between males and females - is a key axis of difference (Hazell 2010).

This study aims to draw insights from livelihoods framework and gender analysis, for assessment of the linkages between gender, especially women's role, climate variability water, and livelihoods. It is relevant to this study because it is people-centered as the focus is on women and its role to adapt the situation of climate variability. And seeks to gain a correct understanding of access and power (assets or capital endowments) and how they convert these into positive livelihood outcomes.

In terms of my research, Sustainable livelihood Framework will fit in this manner- Five livelihood Capitals

- Natural capital- the natural resources from which the livelihoods of the people are derived, particularly focusing on women taking water resources as the main area corresponding to agriculture field and forest.
- Social capital- the networks and relationships that exist within the village like social organizations, savings and credit groups, self-help groups and others.
- Human capital- the skills, knowledge, ability to labor and good health of women to pursue livelihood strategies
- Physical Capital- the basic infrastructure like availability of water resources, reservoir tanks, connectivity of pipelines to households.
- Financial Capital- Cash, savings, supplies of credit, capital assets like cattle, livestock which can convert into cash.

Livelihood strategies are the range and combination of activities and choices that women undertake to achieve their livelihoods. The Vulnerability context encompasses the impact of climatic variability on water resources which affect the livelihood. Policies, institutions and process concerns participation, power, authority, governance, laws, policies, public services and social relations which are influenced by roles played by gender, caste and class. Lastly, livelihood outcomes are the achievement of objectives which is set by women.

The sustainable livelihoods framework (SLA) helps to integrate the social and climatic dimensions of vulnerability and adaptation (O'Brien, et al. 2004). I frame my research and arguments within the SLA through the vulnerability context, livelihood context, and institutional context.

My argument is that livelihood, the vulnerability affects, impacts of climate variability, people's adaptation their views and their adaptation practices are closely intertwined with gender and wider social relations. I situate this argument through a gender-analytical framework that sees gender as a social and cultural construction.

To define my research question, this mainly focuses on the adaptation and includes the vulnerability, the livelihood, and the institutional contexts. I have focused on the household and the community as an institutional context, which puts gender relations at front. The analysis starts with household and goes beyond it and explores the community, also exploring the interlinkages between them.



PLATE 2.1: Indoor kitchen in Mellidara (Photo- Rashmita Sarkar, January 2017)



PLATE 2.2: Outside fireplace in Mellidara(Photo- Rashmita Sarkar, April 2017)

Chapter 3

Climate Variability, Water Scarcity, and Vulnerability: Listening to Women in Mellidara, Sikkim

Women tend to overlook their problems that they encounter in their daily lives.. Rather they try to locate their problems in the sphere of their domestic demands posed by their husbands and children

Chandra Tamang, 29 years, Mellidara

Chandra Tamang, a young Tamang women, and mother of two were patiently waiting for her gagri to fill from the trickling flow of water coming out of dhara. There are other women too; while she waited for her gagri to be filled she took the opportunity to have a chit chat. She was explaining to me as for why women do not consider their problem this is because they don't realize since their mind is preoccupied with their husbands and children which they think as their prime responsibility. I could feel the anxieties and stress beneath when she urged that she has so many chores to take care off. Like Chandra, the lives of womenfolk have become increasingly difficult as the water sources in Mellidara have become erratic.

Studies across the world have established the fact that Change in climate affects women differently. The impacts of anthropogenic changes to the global climate affect men and women not only differently, but women due to their societal and gender roles and rights are often affected disproportionately worse (HBF 2011). The impacts of climate change are and will be differently distributed among different regions, generations, age, social classes, income groups, occupations, and sexes and mostly women are considered as the subject of vulnerabilities (Smyth 2009).

Under conditions of water scarcity and stress women and girls are forced to walk for longer distances to collect water creating, even more, the strain on their work burden

(Dixit, et al. 2009). But despite this not only is their work largely unacknowledged but the domestic water needs, which is women's responsibility, is given low priority, as compared to that of agriculture especially if the crops are income generating. Again, due to the longer time for women and girls to collect water in conditions of water scarcity, girls get less chance of attending school and women miss the chance of accessing wage employment, which means reinforcement of their poverty and disempowerment (Cap-Net, GWA and UNDP 2006).

This chapter is based on the fieldwork spread across the summer and winter of 2016 in Mellidara. I choose this village for my study because it faces water problem in every winter season mostly from November till May. According to the villagers, the water levels are fallen down, for them the reason is low rainfall or changing weather pattern. People are facing acute water problem and managing water even for basic needs becomes hard for them. Mellidara falls in South Sikkim which is historically been a dry region but variation in climate had worsened the situation as their only source of water is natural spring which is gradually drying up.

Here participatory technique like PRA has been used, it attempts to capture the multiple impacts of climate variability in the study area. Within this, it specifically focuses on the implications of such impacts on the lives of womenfolk in Mellidara. The chapter is weaved around the narratives of women emerging out fieldwork and making sense of those in terms of understanding how erratic nature of water availability have bearings on their lives. Before we go for a deeper discussion, the first imperative is to get a sense of the study area.

3.1 Introducing Mellidara:

Mellidara Paiyong GPU falls under Sumbuk block in South Sikkim which is a drought-prone area in terms of rainfall and water resources availability. Villages in Sikkim are referred as wards and each ward generally constitutes of 100 – 300 households; each household has an average of 6 members in the surveyed villages. A cluster of 4 -5 wards make a Gram Panchayat Unit (GPU) and a group of 4-5 GPUs makes a Block Administrative Unit (BAU). Mellidara is one of the six wards/villages which falls under the Mellidara Paiyong GPU and called as Mellidara ward. It is well connected with the Siliguri and Gangtok via Melli and Namchi is also one of the nearest towns.

3.1.1 Physical Setting

The GPU is located in the latitude 27°55.48" and longitudes 88°20.165" between the altitudinal ranges of 300 to 3000 feet. The average annual rainfall of the area is 1250 mm. Landslides and sinking areas dot some areas in the GPU. The total area of Melidara is 899.91 acre. The major rock types found in the GPU are mainly of Gorubathan formation such as interbanded phyllite and quartzite, biotite phyllite, pyritiferous black slate, mica schists and Chlorite quartzite. The springs and streams provide the source for the water. Depending on the flow of the spring they are called *Khola* or *dhara*.

Mellidara village is demarcated by two kholas Hee Khola and Khani khola (usually means river in local language). Hee Khola flows from north to south in the western part of the village and Khani Khola flows from north to south in the eastern part and at the center, there is village Mellidara which is surrounded by Tarey Bhir (3 km long ridge). Khani Khola is the main source of water for the people of Mellidara and they also use water from the springs located within the village. There are Rimchimey dhara, Bhote

dahara and devithan dhara, source of water especially the river are connected to the household through the pipelines, water are being collected in the large reservoir tank and then supplied to the different individuals, but they do not possess tank individually they have to share among themselves, sometimes 1 tank is there for 17 or 18 households, there are 11 number of such tanks present in the village.

3.1.2 The Social Landscape

Socially, the village is divided in small sub-village which is small in area and is according to the communities residing there, if the majority of one community, for example, Rai is maximum in particular place then the area is called as the Rai Gaon. A major community group of the village is Tamang, Rai, Pradhan, Chettri, Sharma, and Mangars. Rai are the major social group in Mellidara village, which is further divided into Rimchimey, Nechali, Dungmali etc. The total population of Mellidara is 722, where female are 359 and male are 363, their main occupation is agriculture and poultry farming.

Table 3.1. Population of Mellidara

	Total	Male	Female
Population	722	363	359

Source- Village Administrative Center, Mellidara

Table.3.2. Major Occupation (agricultural and livestock farming)

Agriculture and livestock farming	Products
Khet	Maize and paddy
Sukha bari	Maize, ginger pulses
Suntola bagan	Orange
Alaichi bari	Cardamom
Bans ghari and jungle	Bamboo and trees
Kothe bari	Kitchen gaden
Modern farming	Floriculture and greenhouse
Livestock rearing	Meat, dairy, and milk

Source- Village Administrative Center, Mellidara

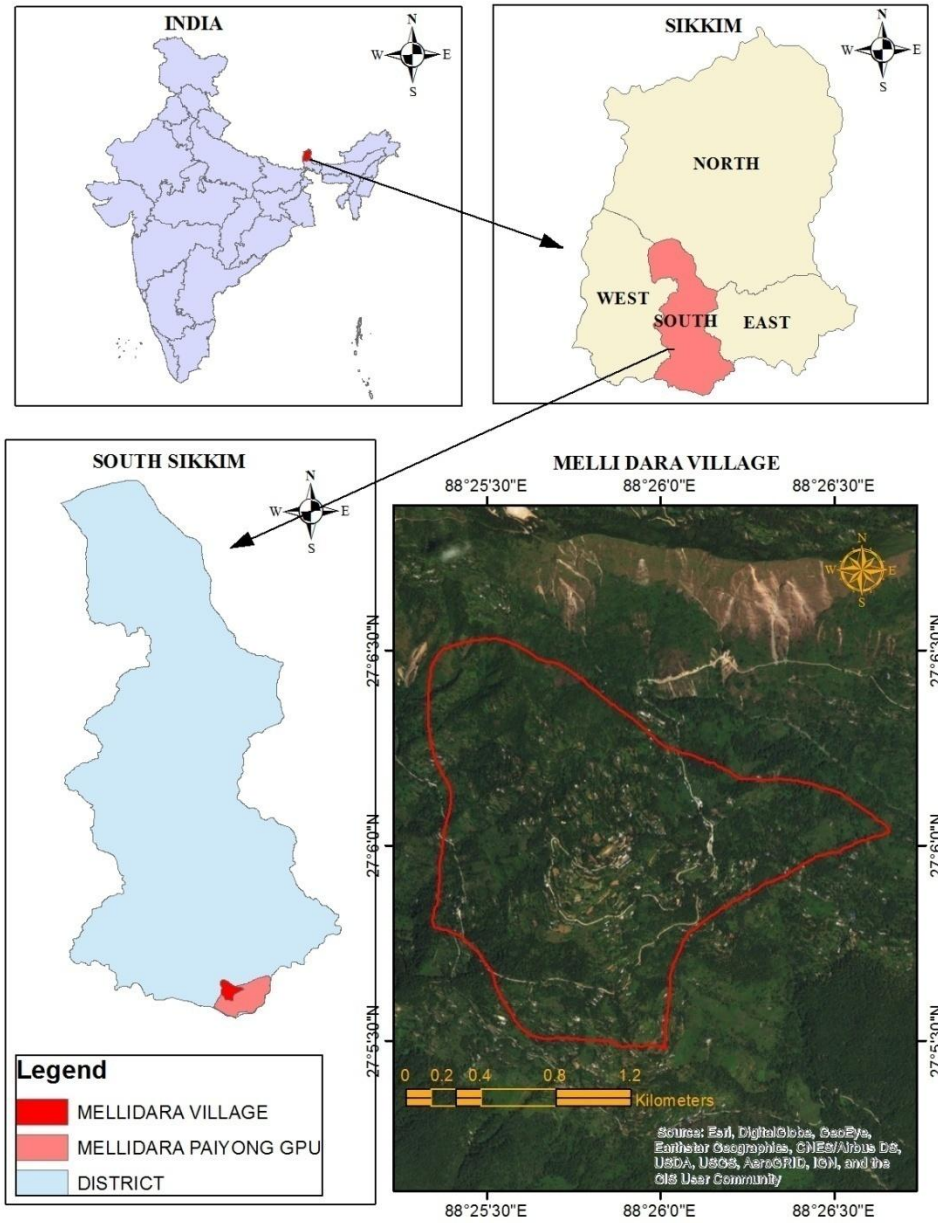
Table.3.3.Social groups of Mellidara and Number of household

Sr.no	Social group	Number of households
1.	Katushe dara	4
2.	Nechali Gaon	8
3.	Upper Rimchimey	8
4.	Rimchimey	8
5.	Mangar Gaon	7
6.	Dungmali dara	5
7.	Chettri Gaon	17
8.	Pradhan gaon	18
9.	Tamang Gaon	26
10.	Sharma Gaon	8
11.	School dara	17

Source- Field study generated through PRA

Fig.3.1.Map Showing Study Area

LOCATION OF THE STUDY AREA



3.2: Impacts of Climate Variability on Natural Resource Base

In the study of Sikkim Himalaya, there has always been a strong emphasis on everything terrestrial with a concomitant neglect of aquatic aspects. Given the fact that water in its many forms is of critical importance in the region, this is a remarkable oversight. Water, particularly in the form of rain, rivers, lakes, and its myriad *dharas* that intersperse its mountainous landscape, heavily influences (and has done so in the past) the fortunes of the region, well-being, and religious cosmology. Clean and sparkling water from *dharas* has been a life-giving force for people in Sikkim Himalaya. It produces good drinking water and has enabled the people to take care of their daily domestic requirements.

Similarly, a larger portion of mountain agriculture being rain-fed, rainfall is intricately related to the livelihood of people in the Sikkim Himalaya as it recharges the *dhara*. This section briefly deals with the perceived sense of people about climate variability and its subsequent impact on the natural capital in Mellidara.

3.2.1 Erratic Rainfall and Perceived Climate Variability

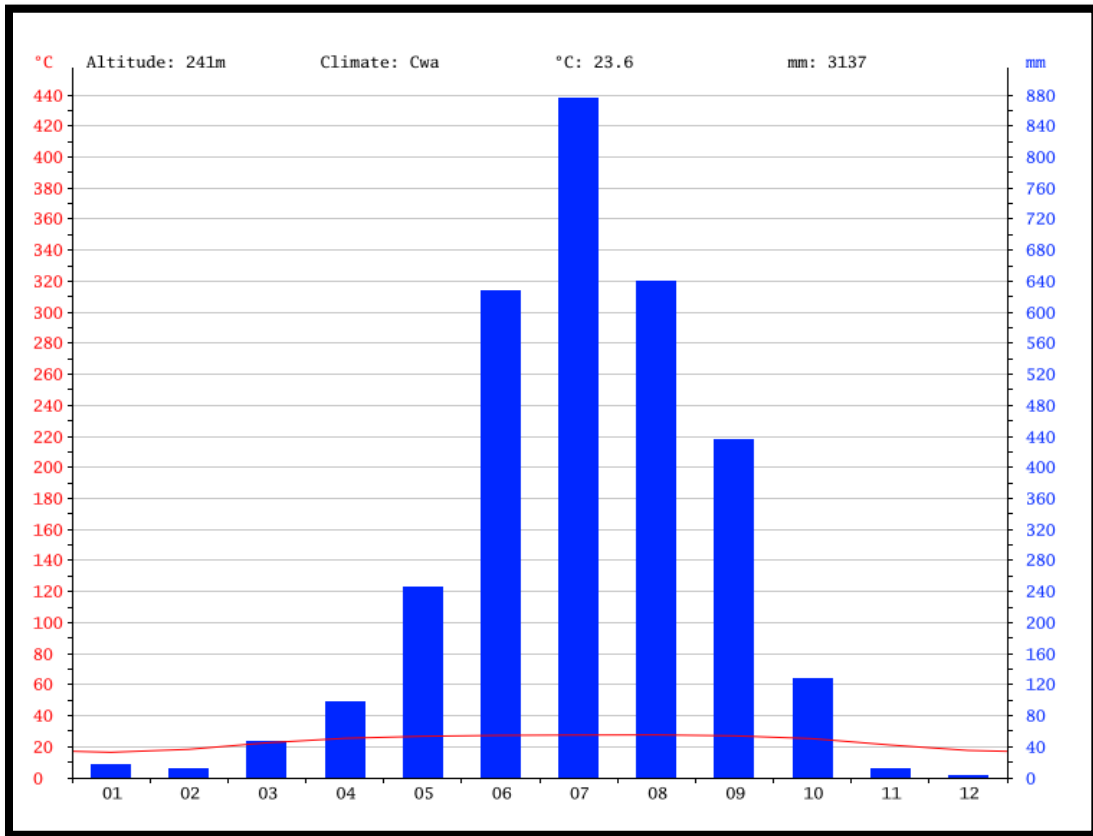
The climate in Mellidara is warm and temperate. In winter, there is much less rainfall than in summer. The driest month is December, with 3 mm of rain which largely affects the water availability in streams and springs. Extreme dryness during the lean season results in the drying up/decline in the volume of water in the springs, in turn affecting the crop cultivation/production. Most precipitation falls in July, with an average of 875 mm (figure.3.2). The climatic/environmental conditions in Mellidara have been altering over the years. August is the warmest month of the year. The temperature in August averages 27.6 °C. In January, the average temperature is 16.4°C (figure.3.3).

Taking south Sikkim as a whole climate here is generally cool throughout the year. It is very cold during winter months. Summer starts at the end of March and lasts up to the middle of August (figure.3.4). Monsoon generally sets at the end of June and continuing up to September (figure.3.5). Maximum rainfall takes place during the month of June to September. The average annual rainfall is 3580 mm. but one cannot say that this pattern of climate is stagnant because data collected from the State meteorological Centre at Gangtok reveals that the climate of Sikkim over the year has very dynamic in nature, here presented climatic graph of overall Sikkim from the period of 2006 to 2015 wherein rainfall pattern one can see the variation within the period of nine years (figure 3.7. and figure3.8.).

Besides rainfall, the temperature in Sikkim (figure.3.6.) is also facing changes over the years and those changes are not minute, people can feel the changes and recall their experiences related to climate. Every individual from the Sikkim has their own stories to tell which is related to the variation in climate. One can first start with visual experience, the snowfall in and around Gangtok area which generally began to appear in the month of November and December on the mountain tops but now we hardly came across any view of snow during this month.

Variation of climatic patterns has alters the livelihood of Sikkim and these changes are visible especially in the rural area where it mostly affects those who entirely depend on the climate for their cultivation.

Figure.3.2. Climate Graph Melli

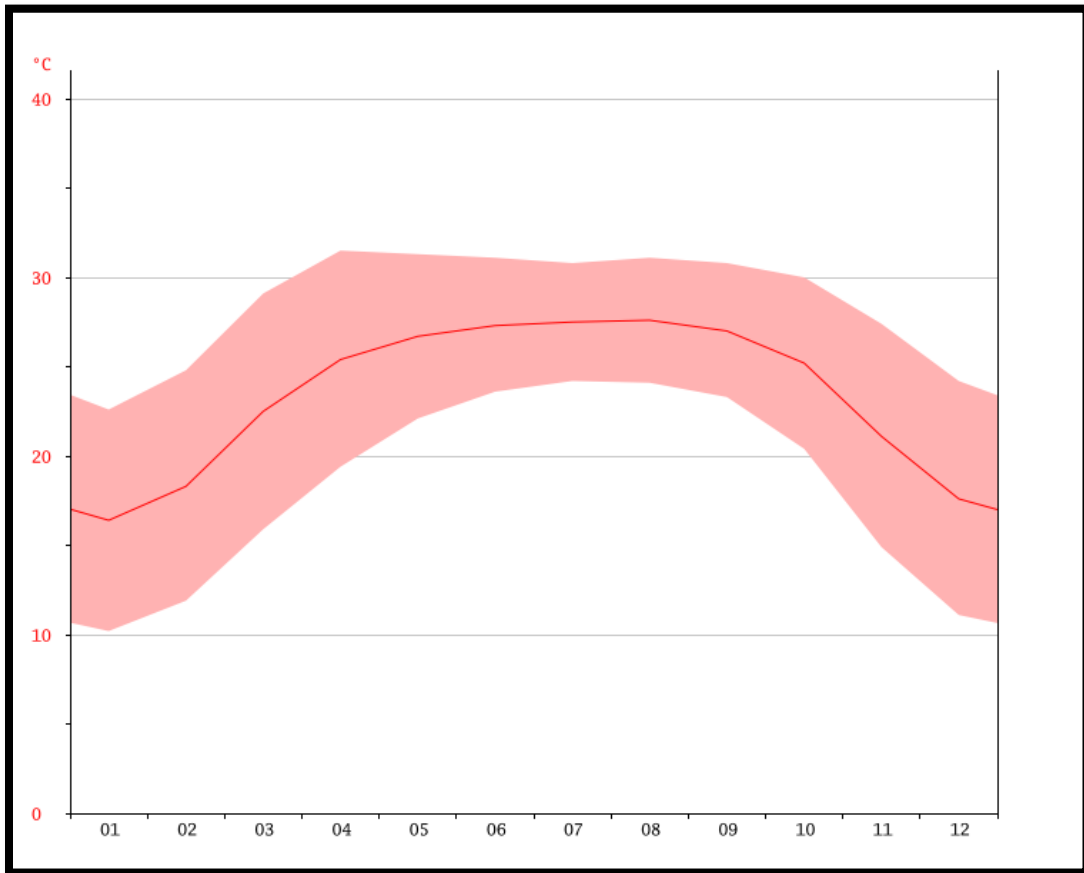


Source - <https://en.climate-data.org/location/57310/>

Accessed- 16th January 2017

Note- 1 to 12 represent the months of the year

Figure.3.3.Temperature Graph Melli

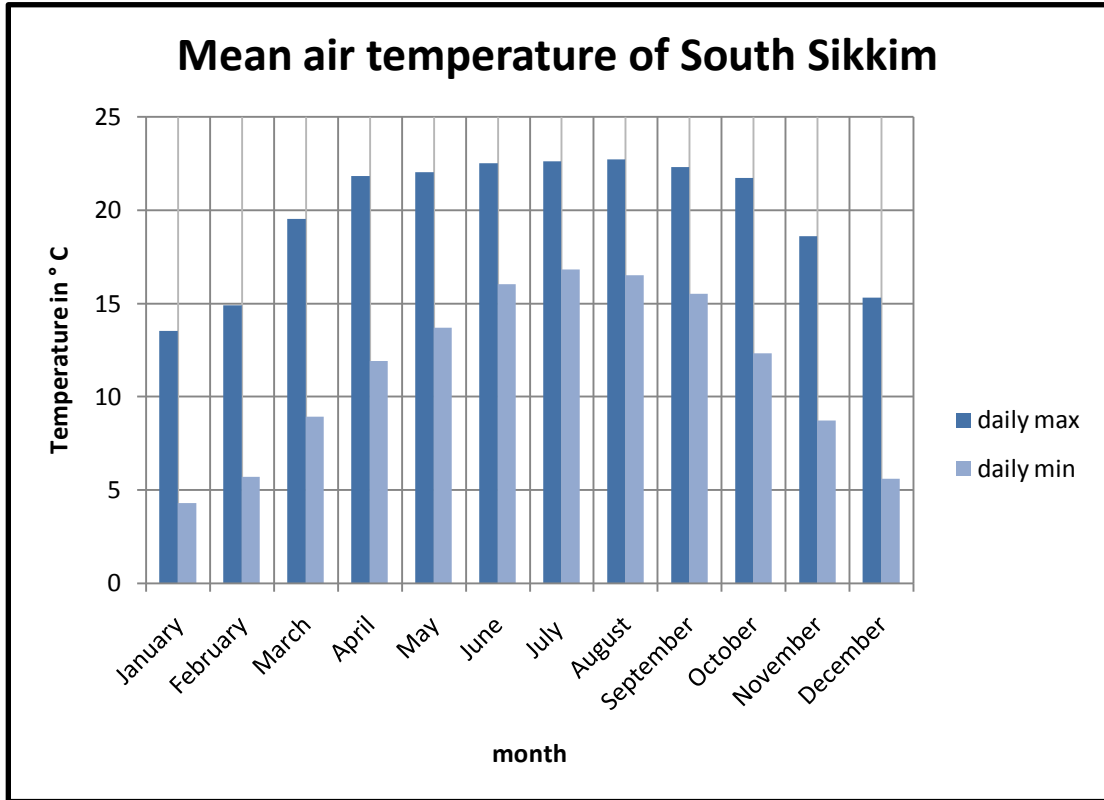


Source - <https://en.climate-data.org/location/57310/>

Accessed- 16th January 2017

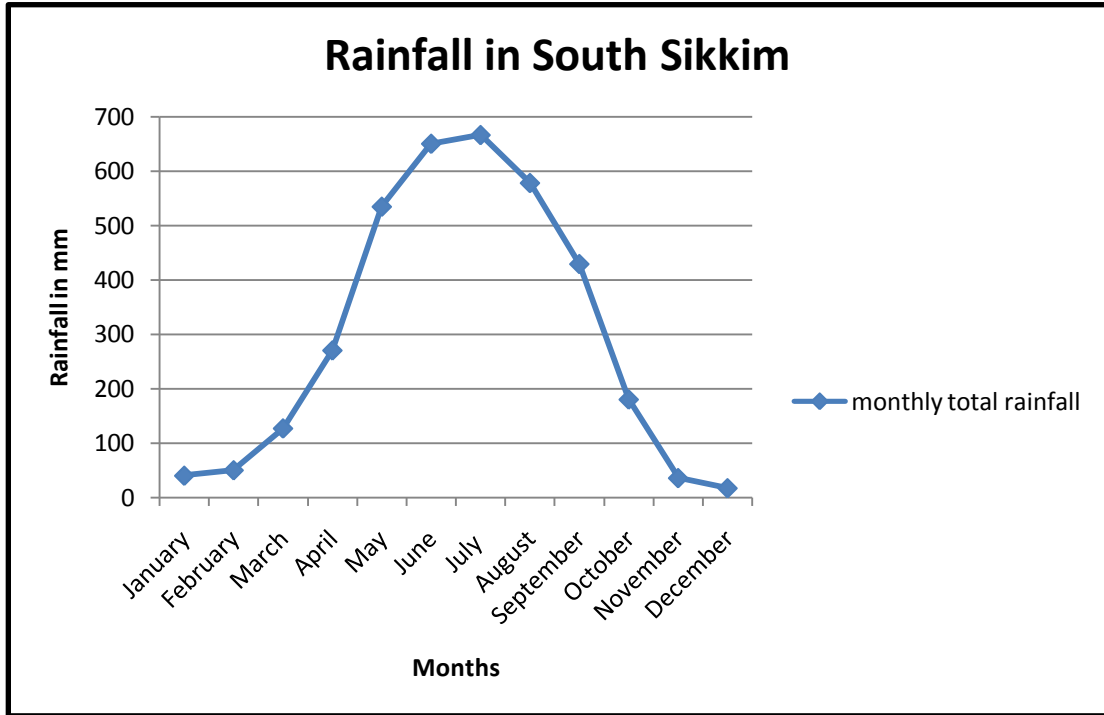
Note- 1 to 12 represent the months of the year

Figure.3.4. Average Annual Temperature of South Sikkim



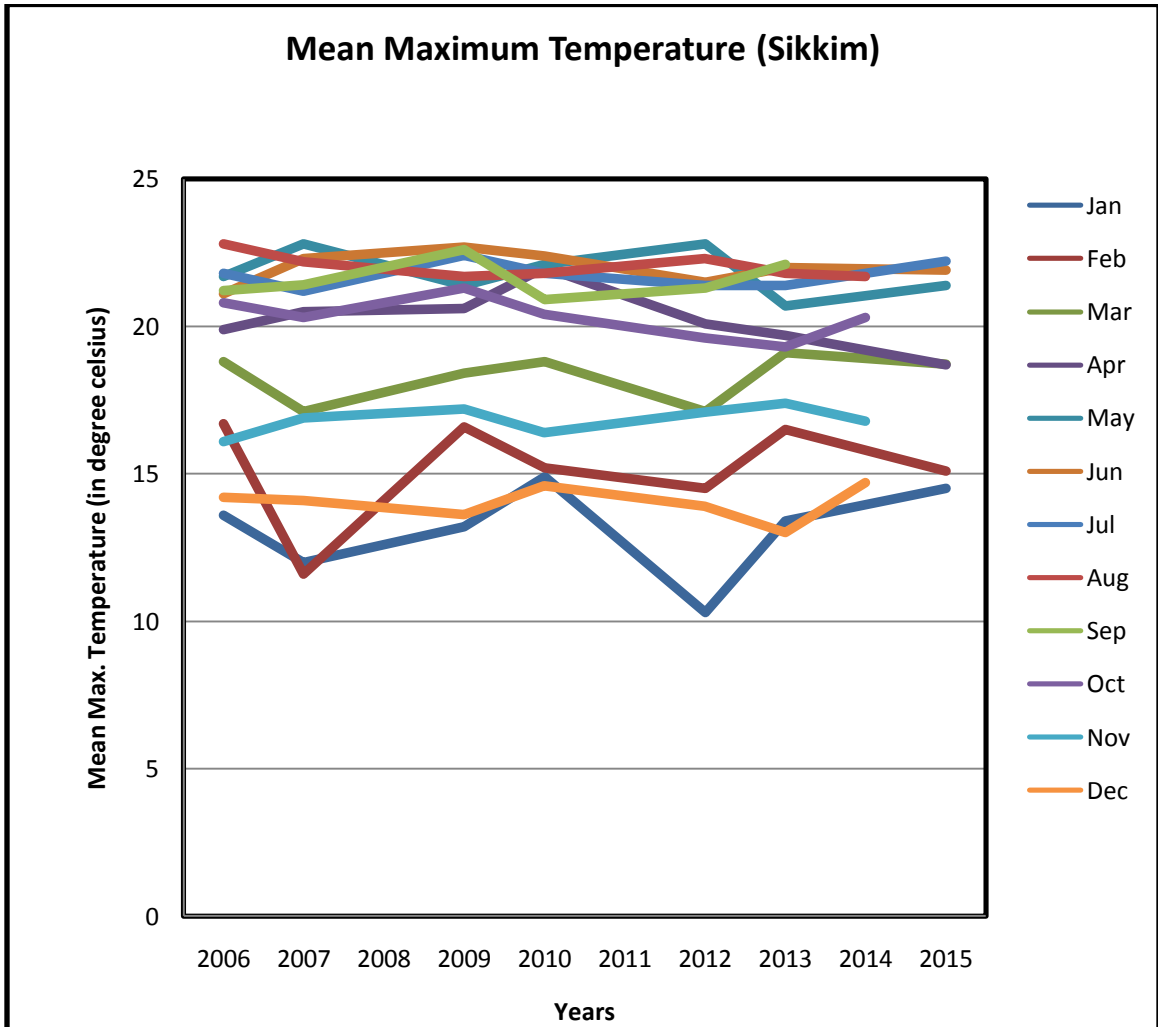
Source - State meteorological centre at Gangtok, Sikkim

Figure.3.5. Rainfall in South Sikkim



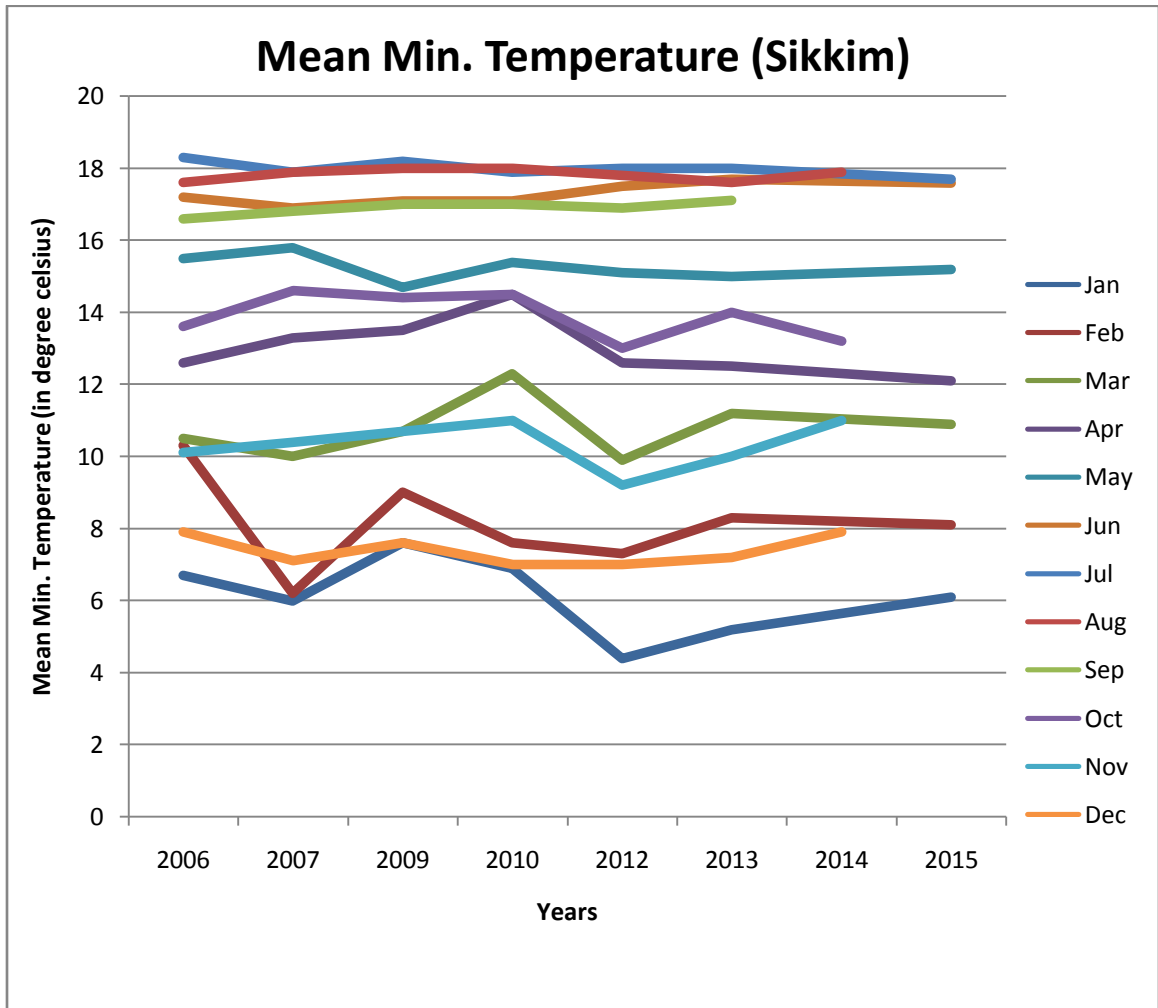
Source - State meteorological centre at Gangtok, Sikkim

Figure.3.6. Maximum Temperature in Sikkim



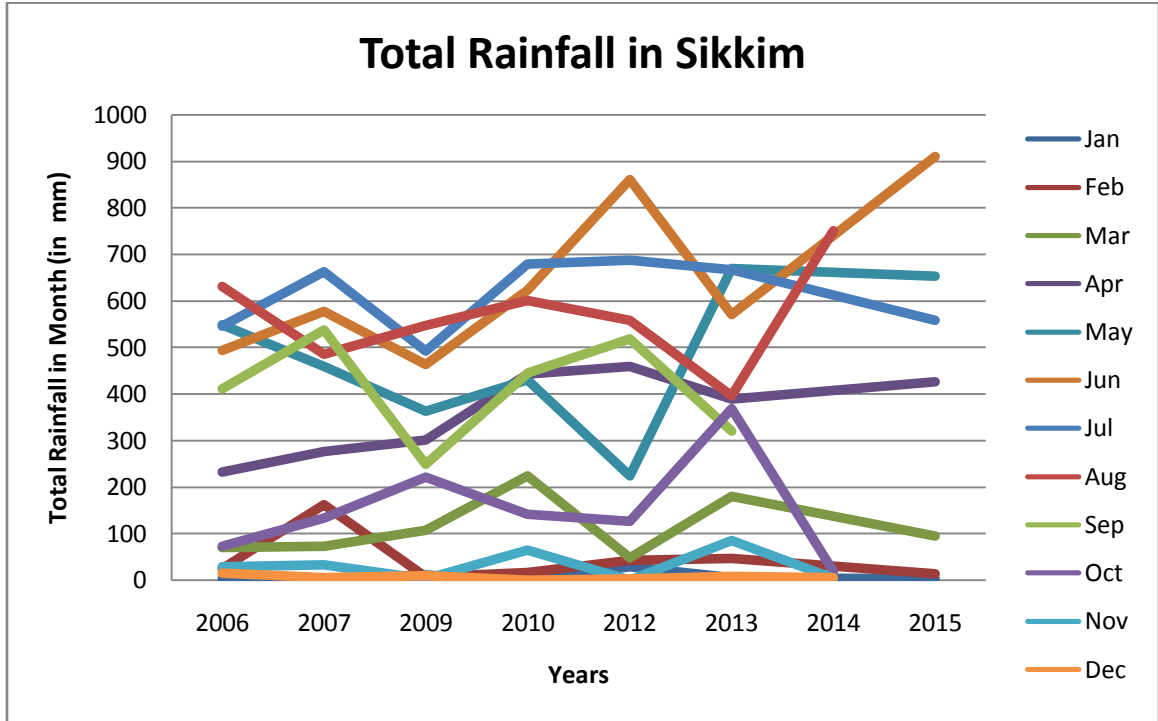
Source - State meteorological centre at Gangtok, Sikkim

Figure.3.7. Minimum Temperature in Sikkim



Source - State meteorological centre at Gangtok, Sikkim

Figure.3.8. Rainfall in Sikkim



Source - State meteorological centre at Gangtok, Sikkim

Above showing graphs present the climatic variation in the village Mellidara, South Sikkim and overall Sikkim focusing on the temperature and rainfall which fluctuates from day to day and vary from year to year. But as this study mainly talks about the perception, the data of climate variability is generated through PRA technique and for this weather and the seasonal calendar has generated a group of men and women from the village have participated and it held in the house of pipe fitter (locally called as a barefoot engineer).

Data which has been generated is cross-sectional data which present the past and present. Past here means a period of 10 years back and Present means a year of 2016, this is done to get the sense of change people feels in terms of climate.

Table.3.1. Weather Events and Seasonal Calendar

Weather Events		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	Past	*	*	**	**	**	**	***	***	**	**	*	*
	present	*	*	*	*	*	*	***	***	**	*	*	*
Warm Temperature	past	*	*	**	**	*	**	***	**	**	**	*	*
	present	**	**	***	***	***	***	***	*	***	***	**	**
Cold Temperature	Past	**	*	*	*	**	**	**	*	**	**	*	**
	present	***	**	**	*	*	*	*	*	*	**	**	***
Dry period	Past	**	*	*	*	*	*	*	*	*	*	**	**
	present	***	**	**	***	***	*	*	*	*	*	**	**
Storm	Past	*	**	**	*	*	*	*	*	*	*	*	*
	present	*	**	**	*	*	*	*	*	*	*	*	*
Land Slides	past	*	*	*	*	*	*	**	**	*	*	*	*
	present	*	*	*	*	*	*	**	**	**	*	*	*

Source- generated through PRA

NOTE- 'Past' here means ten years back approximately during 2006
 'Present' denote 2016

Intensity
 * Low
 ** Medium
 *** High

Major weather events discussed by the people of Mellidara is rainfall pattern, temperature and dry period. Ten years period has been discussed where it is highlighted that rainfall has decreased, there used to be a good amount of rainfall at past during the month of March, April, May, June and during October too after the monsoon season but at present only during the monsoon period rainfall appears.

Similarly, changes also noticed in the warm temperature, which has increased, villagers says that they use to feel summer from the month of May but at present summer starts from the month of March. Dry period has increased; usually, dry period occurs in the month of November and lasts until January, for three-month they used to suffer but at present, they suffer five months of the dry period which lasts from November until May.

From the information generated from villagers we can say that there is strong relation between dry period and spring water because in monsoon the springs got overflowed where villagers do not face water problem much though sometimes breakage of pipelines happens because of heavy rainfall, this issues usually solved by making pipelines but during winter all the springs and kholas dried up, perennial springs and khola give water in very low volume. Exact scientific reason between the rainfall and spring recharge has not discussed here, but it is observed that quantity of water generally decreased during the winter season or dry period.

Comparing the data generated from the villagers and the data extract from the meteorological centre Gangtok, they slightly differ, as per the meteorological data rainfall is very less from November to February in but as per the villagers of Mellidara dry period resides till April.

Dry period has increased; temperature has also increased, during this dry period, people faces the acute problem of collecting water because water is not available in their taps or connections which are from the reservoir tank. Villagers have to go to source for the collection of water which is not an easy task in the mountainous area, they have to make their way to the difficult path, walk through the high and low tracks.

Another issue related to the climate variability to the villagers is agriculture which is directly influenced by the rainfall pattern but discussing this with villagers they have this opinion that the reason behind decrease in agricultural productivity, one cannot blame climate change solely because changes in rainfall pattern or dry period, theses are among the few of other reasons which include organic farming, young generations who

do not want to work in agricultural field, wild animals and birds are increased in this village.

It is a condition of seasonal water scarcity, dry period of five months in a year which sometimes becomes less rainfall to no rainfall, this is something hard to imagine in a mountainous region where entire people sustain their life by doing agriculture. Where the only source of water is springs and the pathetic condition appears when not a single drop of water visible in the spring during the dry period. In next section, it is been discussed how agriculture are impacted due to the climate variability.

3.2.2 Impacts on Agriculture:

Mellidara is agricultural-based village, they sustain their life and earn money from agriculture but things have changed now they only grow crops and vegetables for themselves, not for sale or market, but these are among the few reasons because of which agriculture has gone down and they started for the poultry farming, piggery farming and opt to grow cash crops like cardamom.

Table 3.2 Seasonal Crop Calendar

	Jan	Feb	Mar	April	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Crops												
Maize		sown						harvest	harvest			
buckwheat									sown			harvest
paddy							sown				harvest	
Vegetables												
beans				sown			harvest					
potato					sown			harvest				
leaf vegetables	harvest								sown			
tomato	harvest							sown				
cabbage										sown		harvest
ladies finger				sown			harvest					
ginger			sown				harvest					

Source- Generated through PRA (Field Study)

Seasonal crop produced by the Mellidara people is maize, buckwheat, and paddy and vegetables grown by them are beans, potato, leafy vegetables like mustard, spinach, tomato, cabbage, ladies finger (okra) and ginger. The farmer Kumar Bhujel 56 years old from Tamang Gaon says –

When we visit Gangtok during March- April, while travelling we saw maize field grown up to 3-4 feet but in Mellidara during that time we hardly see maize grown up to 1-2 feet and somewhere within the village people sow seed during March and April because of unavailability of required shower, which is important for seeds to germinate.

Basically, he tried to explain that in Mellidara is really facing a bad impact due to climate change, which is hampering their overall development. Once it was famous for the oranges in Sikkim, sometimes called the Nagpur of Sikkim. Not only maize or Orange but people use to grow beans in tons and sold it to the market in Melli and Kalimpong. But the thing is not same now; all of the sudden seasonal variation in rainfall pattern and a shortage of water lead the life of people in Mellidara in another path, now they have witnessed the drastic change in the glorious story of Mellidara.

Once Mellidara was famous for *Kodoh* cultivation it is the cultivation of millet. But now they completely stop growing it. In winter they used to grow vegetables like beans, cauliflower, cabbage, spinach and used to earn profit but now because of water problem all the winter vegetables has stopped grown. Not only the winter vegetables but Mellidara village has lost its identity on growing pulses, which grown during the month of June- July. As per the local people, the rainfall pattern has changed as monsoon arrived very late which they wait for, to sow the paddy.

Impact of climate change on the people of Mellidara is really a matter of concern, variation in climate first lead to the scarcity of water due to irregular rainfall which also impacts on the cropping patterns, many crops has lost its identity from the Melidara, loss of crops impact the poor family because the only means to sustain life is agriculture to them. Because of their poor condition they cannot even opt for the alternatives to sustain their life. This leads to the difficult path for the people of Mellidara. And this dry period, water scarcity, loss of agriculture affects the women differently which has been discussed in the next section below.

3.3: Peeling Through Different Layers of Vulnerability: Potential Impacts on Women's Lives

Climate variability is a threat to human security in general. A key concern of present climate change discussion is to understand how these changes have adversely impacted women's lives. In the previous section, we have observed that climatic variability in Mellidara like erratic rainfall has significantly changed not only the water availability for drinking purpose but others also like its severe impact on agricultural practices, cropping patterns etc. This section mainly focuses how these climatic changes and its concomitant impact on the natural resource has made women vulnerable in Mellidara.

Overall observation brings a picture in broad view where it is clearly understood the hardship faced by the people in the Village of Mellidara, where the sufferings are counted as similar or equal for both men and women but in real it is not the same. Where Aguilar (2013) reveals that women and men experience climate change differently and their capacity to cope with it varies. Around the world, women compared with men, tend to have less access to the resources that would enhance their capacity to adapt to climate change—including land, credit, agricultural inputs, decision-making bodies, technology, and training services (Smyth 2009).

Climate change has different effects on women and men, due to gender relations and roles (Ahmed and Fajber 2009). Sultana (2014) reveals that women and men in differentiated positions in their abilities to respond to and cope with dramatic changes in socio-ecological relations. As per Boetto and McKinnon (2013) women are considerably worse than men on almost all socioeconomic indicators, including income, health, and employment. Women are among the most vulnerable to the harmful impacts of climate change (Buechler 2009). Moreover, Arora-Jonsson (2011) noted that women in the South

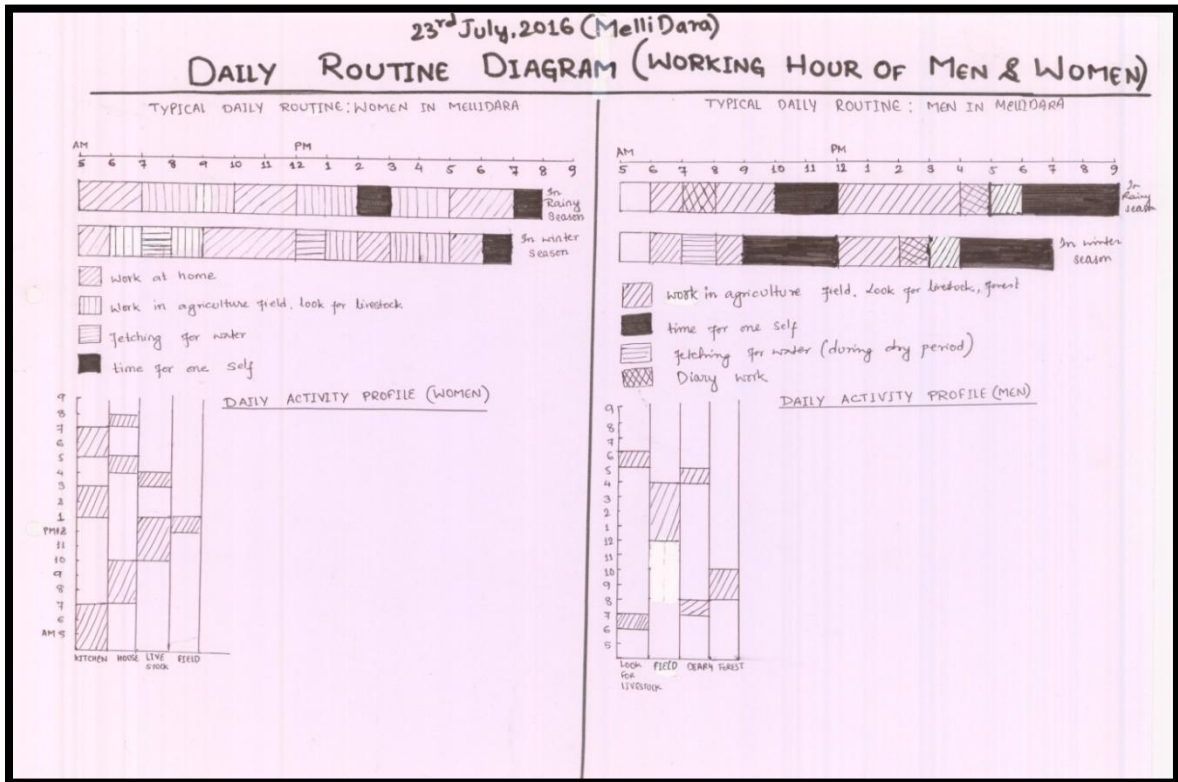
are extremely vulnerable to climate change. Here it can say that women too cannot be seen under similar category because they are determined by and depend on wealth, class, age, and other social and economic categories. Women's vulnerability is mostly linked to natural resource dependency and poverty (Djouidi and Brockhaus 2011).

As women are linked with the natural resources more compare to the men, this statement fits in the case of Mellidara too. They spend time on collecting water, growing crops, look after livestock, doing household chores, and look after the children. But women face double workload during the water crisis. As collecting water consume lots of time which further increase the load of their household work. Sometimes they had to suffer from mental stress as because of the water they had to face many days today conflicts in the society. Till now climate variability has been discussed in terms of technical but large part of literature has neglected this type of social issues regarding climate variability. Those social issues are discussed below.

3.3.1 Increased Working Time for Women:

Women mostly speak on the hardship they face during the dry period, because of work increased and do not get enough time for themselves. Below diagram shows the daily routine diagram of men and women.

Figure.3.11. Daily Routine Diagram (Working hour of Men and Women)



Source- field study (PRA)

Note- left side graph showing women's daily routine

Right side graph showing men's daily routine

Dark shaded color represents the free time (here graph shows men's free time is more compare to the women's)

Usually, during rainy and winter season time has been divided within 5 am to 9 pm because most of the villagers of Mellidara woke up at 5 am and went to sleep at 9 am but in winter sleeping time is little earlier compared to the summer seasons. I have divided the work of men and women separately, as per the women's work it is divided into-

- Work at home
- Work in agriculture field
- Fetching water and
- Time for oneself

And men work is divided into working in agriculture field, first is –

-Working in agriculture field live-stock

-dairy farm work

-Forest and

-Time for self.

What we found that women and men both work simultaneously together but the resting time for men is higher than the women because whatever work which belongs to men is outside the house but women do all the work of the house and outside both. Whereas men come after finishing their work and takes rest saying that all day they had done so many works. But women of Mellidara gets only one hour of rest in winter season because they had to go to collect water from the source. As it is women who manage water at home, they know how much water they need. For this Dankamaya Pradhan, 63 years old lady says annoyingly

During the dry season it is very hard to manage water, a member of household helped to carry buckets at morning but only we the women knows how much we need water for household, we have to go collect water many times a day, we suffer a lot from this. I used to keep my babies at home and used to go to collect water from spring which is far from here. Water is what we need for everything, I cook fodder for livestock, and again there one needs water.

In the day to day life of women, water stress is causing serious problem Mrs. Ram Maya Rai, 35 years old married women says-

During water stress period we cannot able to send our children to school on time, we cannot handle our guest properly. We village women are in worst, you town women have so much free time but we never get enough time to rest. Every second we have something to do whether to cut grass for livestock or making fodder, we are not rich enough to keep workers for us as another part of this village. They have water, money everything but we poor has to look over entire thing by ourselves.

Women really face a great impact on time management because of the water stress; Mrs. Sunita Tamang 29years old lady adds

At morning I have to rush, first thing in your mind when you wake up is to look for water, without this, one cannot think about whole day, this is the only part where because of some reason water is not coming, so you have to go to others those have enough water, so at least they can provide you some, it takes lot of time to see and ask whether they can provide or not. And by the time we are at home, we saw our husbands are still sleeping, at least they can look over the children.

Women do not get a time for themselves because they had to manage water at home, go much time to the sources for this they are facing many health problems where Dilli Kumari Sharma, 66 years old says

Then I was strong and that time uses to carry gagri in doko, sometimes more than one gagri but now it's very hard to carry one

small bucket. At young age I used to carry two gagri together in doko because of that I suffer many problems later

It is natural that aged women suffer because of arthro problem but young women of Mellidara complains the same Sulakchana Rai 36years old says

Collecting water from the source is time-consuming, sometimes I have to wait for a long hour to fill my gagri because of that I stand for a long hour, plus carrying gagri cause joint pains and sometimes you fall down as its mountainous are these causes serious health issues.”

This section tries to explore the relationship between climate variability, water, and women focusing on time, emphasized on how women are facing problem in managing time in their day to day life, women says how men are less affected due to the climate variability compare to the women, men got enough time for themselves, roam around, visit other male members but women does not get enough time compare to them, women also claims that the rural women suffer more compare to the urban women, as they have more work to do in household like look over children, elders, and livestock.

3.3.2 Increasing Stress on Household and Women

Life of women in Mellidara mostly surrounds her household work, livestock and agricultural land. Agricultural land mainly located in and around the village farms or around the house, the productive land around the house is backyard gardens called the *kothe baari*, these gardens are completely looked over by the women and they decide what to grow there and what not. To grow vegetables there at their garden they ask help to other neighbor and help each other. For this Ganga Maya Pradhan 43 years, old lady says-

We stop to grow water vegetables here in our kothe baari as there is not enough water for drinking. Since we stopped kitchen garden, the interaction with our bainis is very less, I used to grow onion that time our is used to come to help me, we used to talk about various issues but now our relationship is not same as earlier. At household, we used to cook whatever we like to but now I ask my husband to buy vegetables for the households.

Similarly, in agricultural farming, rice is a major crop, it needs plenty of water from the beginning of sowing sapling and a good amount of shower to bear a grain, there was a time where they used to get a good amount of profit after selling the rice. Where Samita Pradhan 32 years old says

We used to keep our profit for various festivals specially dasai, where we buy a goat, where family member visits us, we serve them with mutton, mutton is what Nepali people prefer during festivals but as we don't get enough profit after cultivating, a celebration of dasai is also not as earlier.

Festivals are another big issue for the women because during this time they receive many guests as relatives who come to visit them, where one needs more water compare to usual day to day life, though the government has provided them tank to harvest water but this does not work for them. During the rainy season they have enough water for harvesting tank, which has been provided by government but those tanks are not big enough so that it can provide water during the dry season moreover water present in tank contain insects which led the water born diseases, tank which collects water is

only used for washing clothes, watering the plants and sanitation purposes. But it does not be used for drinking.

Where Chandra Tamang says-

Water tank is there but what is the use, we cannot receive enough rainwater to collect it, the sometimes little amount of water get stored which is not good for drinking, within one day's germs appears in the tank. During dry season we suffer from waterborne diseases which again increase our pressure.

Not only at household level but women are facing problem in their community and society level which is somehow hampering their social relation. In next section relationship between water stress and social relations are emphasized.

3.3.2 Water Stress and Increased Pressure on Social Relations

We heard much time that if war will ever happen in the world, most probable reason will be the water, similarly quarrel among the villagers becomes one of the major issues of concern, household of Mellidara is connected with the pipelines from the spring to the reserved tank and again the reserve tank to the households and it is the group of household which collect water from the same reserved tank, from where others also use, minimum eight to ten household gets drinking water from the single tank and when water dries up during the dry season, women really had to struggle to manage water at home.

From the reserved tank, households do not get the enough water so quarrel begins with the complaints that other households have used more water without thinking about the other. The problem lies in pipeline connectivity, which passes from the land of people

and the owner of land demand the more water claiming that pipeline passes through their land.

Where Dankamaya Pradhan, 63 years old says

Water is also the main issue of quarrel here with the neighborhood. They say we have used more water comparing to them, sometimes we do not have drinking water at home and we saw they water their vegetables, it is really annoying. A few days ago because of this quarrel, we call for panchayat because from our land some pipelines pass owned by others and from here few households collect water but the owner got annoyed.

A quarrel within the neighborhood is mostly solved by them but when the case is unmanageable then it reaches to the panchayats or village administrative centre. Mostly it is women who fight more among themselves for the water as men never came out to listen or judge on. Where Devika Tamang 25years old woman says smilingly

It is always women who want more water compare to men in the household, from morning till night. When some quarrels begin they never come to solve, they send us to fight with other women saying that we women fight today and again will forget that tomorrow and talk to one another as nothing has happened but for a man, it is hard to forget or forgive that soon.

Till now we know that water is universal solvent and without water we cannot survive and we cannot imagine life but with this study we cannot deny the fact that water is not just universal solvent but one of the important means to maintain social relation within small society and this can be applicable to macro level too.

Overall, this chapter deals with how effects of climate variability on water impacted on women. It starts with the introduction of the study area that is Mellidara, the people residing there and focusing on how climate variability effects on the natural resources especially water. The climate of Sikkim over the year is very dynamic; the pattern of temperature and rainfall has changed as per the villagers.

Because of this changed climate the only source of water that is springs are drying up and the situation gets worse especially in winter and dry season. This problem of water scarcity is hampering women in Mellidara in a different way- they are facing with increased workload in the day to day life. Sometimes they lost their free time in search to water and some time waiting for long hours to fill their water vessels.

Women are facing a different problem like not able to serve guest properly, not able to celebrate festivals, losing relationship within their neighborhood women, and increased social problem due to water scarcity. In wide view, this chapter generally tries to reveal the problem facing by women in Mellidara.



PLATE 3.1: Women filling gagri with water (Photo- Rashmita Sarkar, April 2016)



PLATE 3.2: Women carrying water in gagri and plastic vessel (Photo- Rashmita Sarkar, April 2016)



PLATE 3.3: Women returning home after collection of firewood (Photo- Rashmita Sarkar, January, 2017)



PLATE 3.4: Woman working in Kitchen (Rashmita Sarkar, July 2016)



PLATE 3.5: Woman showing the Gagri (Rashmita Sarkar, April 2016)



PLATE 3.6: Woman weeding the maize field (Rashmita Sarkar, April 2016)



PLATE 3.7: Woman feeding the chickens in poultry farm (Rashmita Sarkar, July 2016)



PLATE 3.8: Discussion with the women in Mellidara (Rashmita Satkar, July 2016)



PLATE 3.9: Discussion with the men in Mellidara (Rashmita Sarkar, July 2016)



PLATE 3.10: Discussion with the women and men in Mellidara together ((Photo- Rashmita Sarkar, July, 2016)



PLATE 3.11: Water harvesting tank provided by MGNREGA in Mellidara (Photo- Rashmita Sarkar, July, 2016)



PLATE 3.11: Collected water kept outside the house (Photo- Rashmita Sarkar, April 2016)

Chapter 4

Vulnerable Waterscapes and Adaptation: Learning from the Invisible Struggle of Women in Mellidara, Sikkim

For washing purpose I use rainwater..When I need more water I go to the dharas which are far away.. Sometimes I have to scold the members of my household as they do not realize the hardship of collecting water..I have to repeatedly ask and pursue them to use water it judiciously. I grew up in a place where there was no water crisis..But after moving here in the aftermath of marriage I have learned how to meet the needs of water for my household..When I do dishes I constantly remind myself about the value of every drop of water.

Dankmaya, 63 years, Mellidara

Listening to Dankmaya, one gets a glimpse of the everyday realities of women's struggle in Mellidara. Clad in *saree*, with a dignified demeanor of hill women she unfolds the domestic drudgeries that have been caused by the gradual drying up of water sources in the village. As learned from the discussion in the previous chapter, women in Mellidara are undergoing extreme stress on all fronts. However, the story doesn't merely end with their vulnerabilities. There is more to it than it meets the eye. Women are struggling but they are also finding ways to tackle the problems unleashed by erratic rainfall, drying up dharas, kholas etc. in Mellidara. Their consciousness and awareness of the gravity of the situation have pushed them not only to "think", "talk" and "share" about it but also "doing" to tackle the consequences. These, however, on the surface appears "invisible" restricted to their "micro-scale".

We have observed that in climate change research, there is a tendency to frame discussions of women around their vulnerabilities rather than focus on women's agency and the ways in which women's knowledge is critical to understanding environmental degradation and climate change and central to creating innovative adaptive strategies. There is a greater need to understand such strategies in all its complexities of the lived

social life. This chapter intends to explore all such complexities to make sense of women's struggle in the aftermath of the water crisis in Mellidara.

4.1 Gender Analysis and the Physical Environment:

Women and men relate to resources differently. This cannot be truer if we consider the question of water. In the discourses about water at the macro level, a different meaning of water emerges which signifies a commodity distantly related to the physical and biological needs of human beings. This notion of water dominates international discourses and informs our policy decision of climate variability that ignores intimate knowledge. This section briefly discusses the data emerging from my fieldwork in Mellidara showing how men and women are rooted and relate themselves differently to waterscapes of Mellidara.

4.1.1 Water and the Sacred World of Men

Perhaps, more than any other physical entity seasonal rainfall exerts an influence on communities and peoples in people's lives in Sikkim Himalaya. It creates an intricate and complex web of relationships that oscillate between disasters on the one hand and the timely need for rainfall on the other hand. When there is an adequate amount of rainfall people are happy and look forward to bumper crops. But when it is too much it causes landslides or if concentrated in the undesired months leading to drought-like conditions. Therefore, it is perhaps even more difficult to determine: sometimes an absence of a thing is less easily described than an excess of it. Again the waterscape is not merely a physical thing; it is rooted in the cultural moorings among the communities in Sikkim and mediated through its social structure.

While taking a stroll around the village Mr. Ratna (63 years old man, who is busy weeding in his maize field) a male member of the village informs me that that earlier they had *sawaney jhari*, *Phapare Jhari* and *Titey Jhari* , *Jhari* is shower in local language which comes in and around the month of July, August, and September, but all these *Jhari* and the related plants or crops are not available today. It's been 30-40 years that these *jhari* are not seen. According to him, these *Jharis* used to help to bring water in springs which they called *Mul Phutnu* which means the sudden burst water from the springs. And it helps agriculture and other allied purposes. However, this kind of rainfall has discontinued over the period and as a result, the springs have started drying up. In these days Ratna in the land he grows ginger, tomato, maize, and beans. To cultivate these he depends on *Nagal Dhara*⁴-- a nearby spring. Some spring are considered as *Devithan*⁵, once in a year they performed pooja there, it can be *Naag pooja* or *Sansari pooja*.

Like Nangal Dhara there are numerous springs that are considered as sacred. My curiosity to know more about led to information as to how water becomes a sacrosanct entity in Sikkimese society. To know about the detail of *Devithan* pooja performed in the spring one of my respondents suggested me to go the village *Pandit* of that village. The residence of the *Pandit* is a beautiful building with a playground in front of the house. One middle-aged petite woman wearing traditional jewelry and a red *saree* appeared and I exchanged greetings with her. From her attire, I could guess that she belongs to a well-to-do family. As we began our conversation an old gentleman appeared and he looked

⁴ . Name of spring from where they collect water.

⁵ . As per the belief, the particular spring is sacred and *Devithan* meaning- the place of mother goddess in Hindu religion.

exactly like *-pandit* tall fair complexion with his long white *kurta and dhoti*⁶ and *chandan*⁷ on his forehead.

It's been thirty years for octogenarian Devi Lal Sharma since he shifted from West Sikkim to *Mallidara* and ever since he has been performing *pooja*. Then we began our conversation and I came to know that they are not facing any acute problem, as their residence is located in the lower part –the Malli Gumpa Village. According to him, one cannot say that every source is a *Devithan*. One can perform *pooja* but every source is not places of Goddess, only *jhakri* and *pundits* can make it waterscape is *Devithan* and declare it so.

I witness *Sansari pooja* or *Naag Pooja*⁸, it is for rainfall or availability of water in spring, this *pooja* is done nearby source of water which is located far from the village these *pooja* is similar like the *pooja* which Hindus usually perform in their households where one needs *dhoop*, *diyo*, *achchyata*, *sweet*, *tilak*, *flowers*, but difference is here molded wheat to make a five faced⁹ snake is needed because villagers consider snake is related to water god , *pooja* also needs four pillars made out of banana trunk, inside that they write some chants and above that they put vessel which is full of water in the mouth of vessel they put coconut. By arranging all these, he performs the *pooja* by chanting *shlokas* and completed the *pooja* by performing *houm*¹⁰.

This experience of witnessing the performance of *Sansari pooja* arose several questions in me. I was struck with the fact that men perform the entire ceremony and I

⁶ . Indian traditional Attire

⁷ . Shaman

⁸ . Pooja done for the well being of people in community, in this case it is done for rainfall

⁹ .Because snake is consider as water god.

¹⁰ . first arrange a fire, second in a large bowl mix with wheat, paddy, rice, mustard, sesame and sesame oil or butter and individually take a small amount of this mixture and put it in fire chanting 'swaha' meaning 'to end' (to end evils, to end misfortune., to end bad luck, to end all obstacles and to end all problems)

could hardly spot women participating. Later after talking to a couple of women I came to know that the women are especially young menstruating ones, are not encouraged or allowed to be part of the ceremony as their bodies are considered as defiled and impure. On the other hand, the *Devithan* symbolizes the sacred imagination of waterscapes like *dharas* and *kholas* as sites of feminine power. Although, women are imagined by men as powerful feminine symbols but this very masculine imagination of the waterscapes becomes a site of exclusion of women.

4.1.2 Water and the Intimate World of Women

In the previous section, we understood the exclusion of women in the spiritual and religious moorings of waterscapes. It is further important to explore as to how water and gender are co-constructed. In order to explore the “gendered” sensibilities and worldview of men and women about physical resources in Mellidara, I conducted a PRA oriented “resources mapping” exercise. The exercise was done in three phases:

- Men were asked to draw a resource map of the Mellidara
- Then women were asked to draw a resource map of Mellidara
- Finally, both were combined into composite resource map

Many interesting observations emerged out of this exercise. This resource and the social map are generated from the three different groups’ one with the women’s group, second with the men’s group and third with the mixed group. This is to see whether there is any difference in the women and men’s thinking. Since the research will analyze data with the gender lens, it is important to know if there is any gender gap. The map (figure4.1.) showed that men’s knowledge is more about the administrative/political/government and social institutions like school, village administrative centre, Physical health sub-centre,

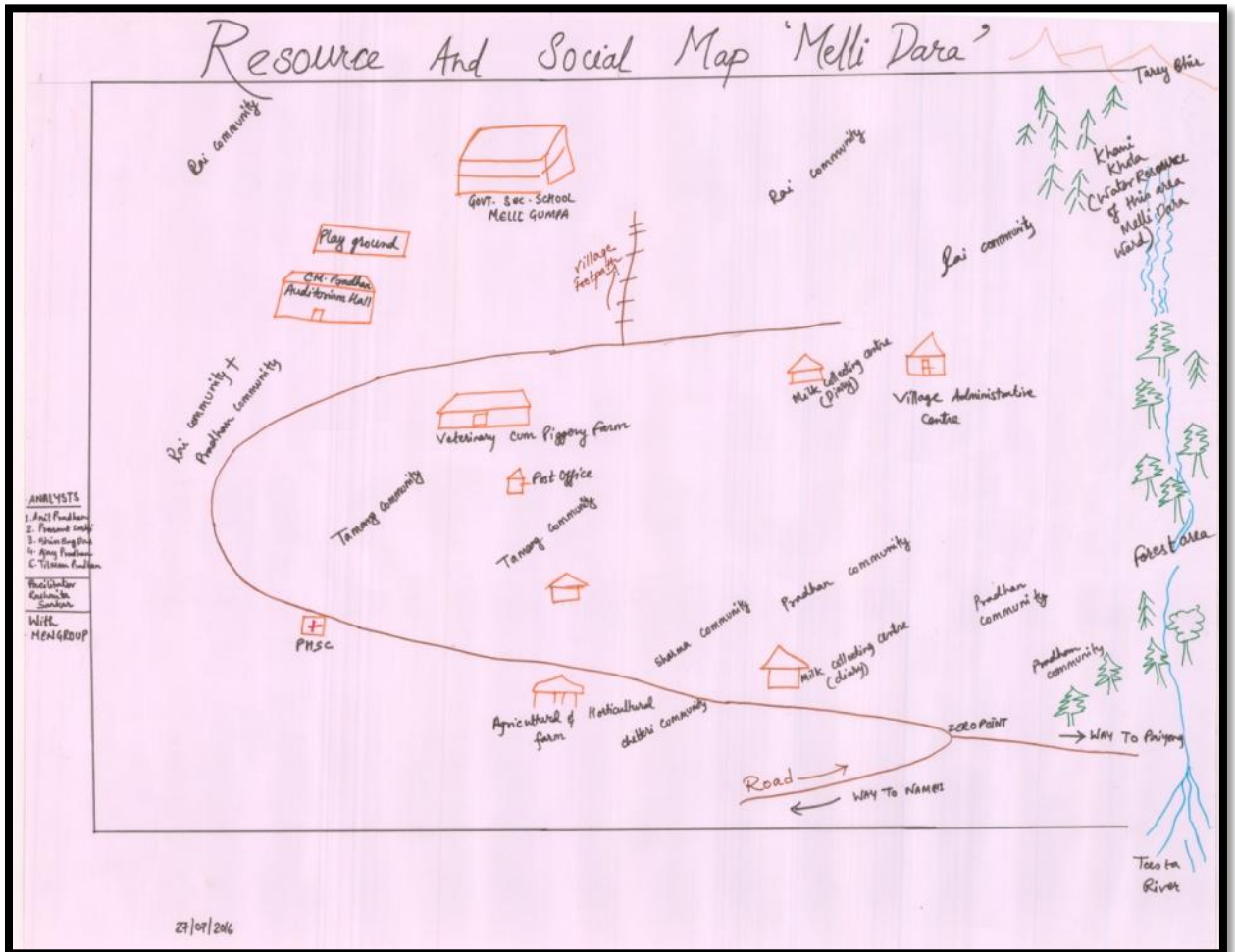
veterinary, piggery and agriculture farm, post office, wheat mill and milk collecting centre and they also marked forest covered area. This clearly reflects their role and responsibilities of the 'outside' work

As per the men of the village, the major issues of the area are the disposal of poultry excreta as there is no proper disposal centre. Since every household is doing poultry farming this mismanagement of having no disposal center has lead to a problem in the village. Although there has not been any intense problem till now, the men are concerned about the issue as they say "who knows what will happen later in future" as this occupation grows.

Gradually, discussing all the social issues like lack of higher education, high rate of school drop-out in the age group of 25-30, then came to the issue of water, which seem very less priority. The men said because of improper management of water, the village is facing water problem and suggested that there is an urgent need for equal distribution of water in the village. Water Problem is seasonal in nature, in the rainy season they do not have to face problem but in winter and dry season people suffer a lot due to water scarcity and because of this quarrel and conflicts happen both within and outside the communities. But women mentions their main problem lies in collecting water, their first and foremost priority is water because without water they cannot imagine life. Though the men agree that water is mostly managed by women at home, they do not see or take interest to look over how water is being managed within the household; no doubt they help women to go to collect water but management part completely lies in the hands of women. Women, on the other hand, give importance to the springs and the river showing on the map (figure 4.2.) which is totally missing from the resource map made by the men,

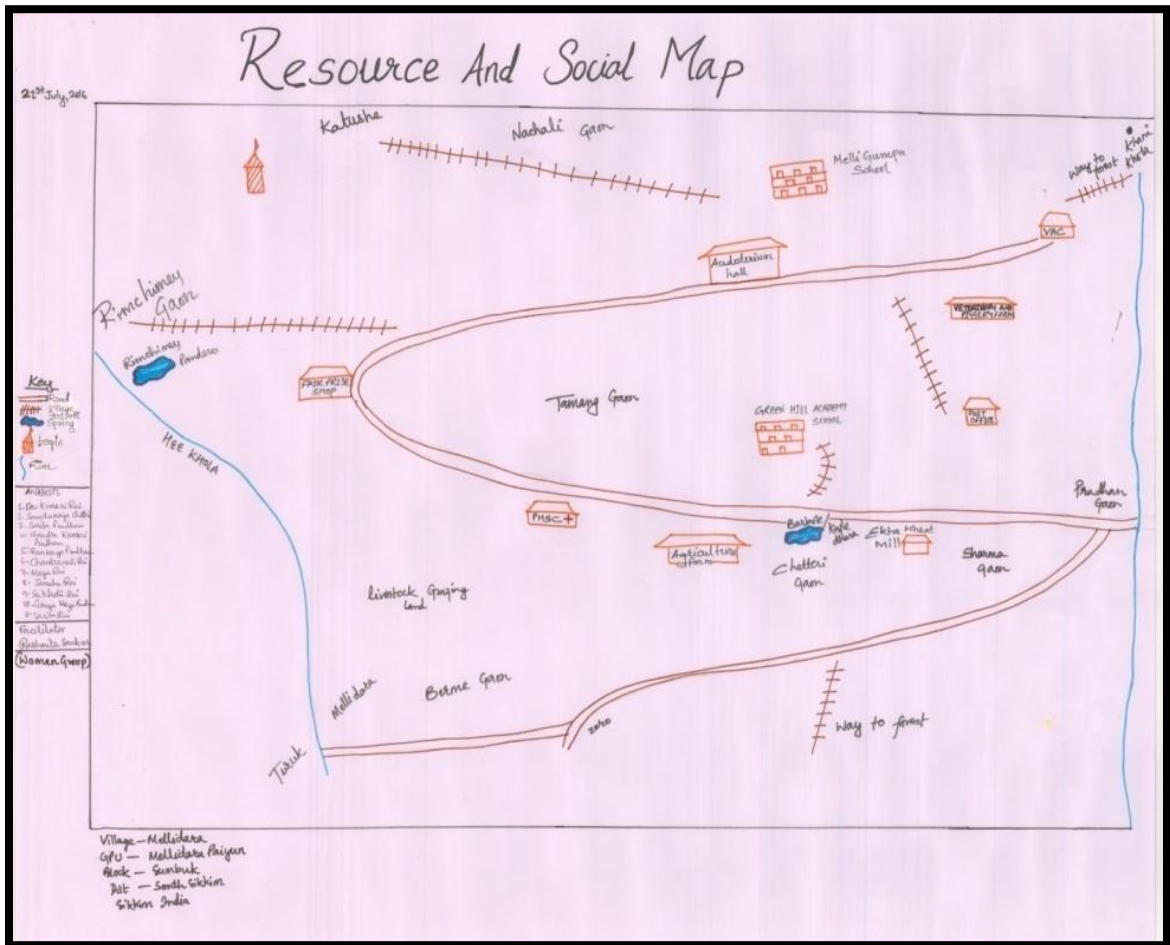
they also did not mark the fair prize shop, women also focused on the tracks or village footpath. Here too, we clearly see that the map reflects women's roles and responsibilities.

Figure.4.1. Map Made By Men in Mellidara



Source- field study (PRA) 27th July 2016 (Mellidara)

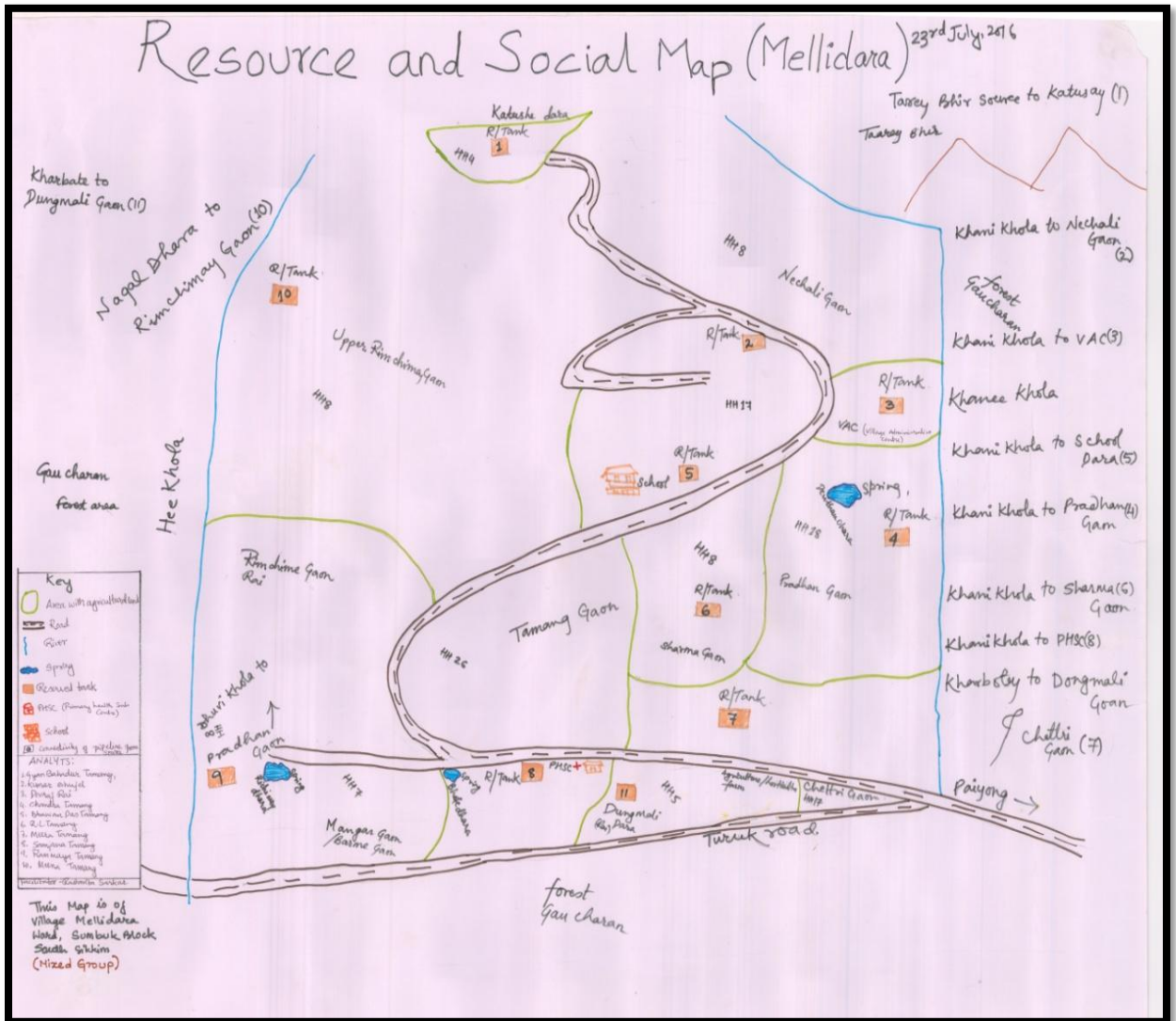
Figure.4.2. Map Made By Women in Mellidara



Source- field study (PRA) 21st July 2016 (Mellidara)

From the maps made by men and women of Mellidara and the description made by them reveals that issue of water is closely connected with women, whereas it is not same for men. Men are mostly concerned with the problem which is not related to water. But water is deeply rooted within the mindset of women, for them, everything is related to water, they cannot keep other issues separately. Their day starts with thinking about water and ends with it because they are the one who is managing it.

Figure.4.3. Map Made By Women in Mellidara



Source- field study (PRA), 23rd July 2016 (Mellidara)

4.2 Water Infrastructures and Exclusion of Women in Management

In the previous section, we saw that how the waterscapes of Mellidara are integrated with the worldviews of men and women that informs their everyday lived interactions and struggle. In this section, we attempt to understand the dynamics of water management at a micro-scale and how women are placed within the entire process. Further, we try to have a sense of the major players, how they are connected, the institutional arrangements, and power relations etc. that influence women's access to water.

4.2.1. Social Milieu and Women's Marginality

In order to understand how women are placed in the entire process, it is imperative to know how they are placed in the entire social milieu and how these are interconnected in terms of women's voice access to water management or their ability ensure water security. Mellidara is a microcosm of Sikkimese society. The majority of the community in the village falls under the Hindus belongs to Nepali Tamang, Rai, Pradhan, Chettri, Sharma, and Mangars, women in Mellidara belong to different castes, class, and communities and are spatially segregated in terms of their settlement.

Mapping of the social landscape is a technique to get a sense of the gendered worldview of it. As a part of this inquiry, apart from an exercise of mapping physical resource of Mellidara, PRA technique was applied to collect data from a group of men and women. They were asked to draw a map of the village social landscape, for instance, the spatial location of different communities, institutions providing social amenities like school, hospital etc.

This revealed that men's network is different from those of women. Men develop networks with workmates and people in social, political and economic institutions that they have to deal with. Their most significant exchanges consist of the information necessary to sustain their livelihoods, such as environmental connections and information about employment opportunities where they can secure other sources of income. Many men in the villages are involved in farmer's groups that help to improve farming through exchanging knowledge of new farming techniques, new crop varieties, etc. whereas women are engaged with the self-help group.

In Mellidara women still face restrictions on their social mobility and access to employment, but they do their best to help their husbands in income-earning strategies by doing poultry farming. Women also have the burden of the household work and the care of the children and provide social and economic support. In this patriarchal system, the husband is responsible for the household's maintenance. Women are trying to adapt to the changing reality by employing new strategies such as finding income-earning opportunities with the flexibility to accommodate their domestic responsibilities, seeking social and economic support from their social networks. But in the matter of water management they are excluded from the higher level and are confined to the household level, their perception is not valued in general

4.2.2 Exclusion of Women in Water Management

Water supply for household consumption is managed through a pipe which connect from the source to reserve tanks and which is again connected to the household this is been discussed in chapter3.

Unlike urban centers, the village community manages water connectivity in a collective way, which includes village level government institutions like village administrative centre from which panchayats are usually present, educated persons from village are being called, member from different communities, member from SHGs are present and one important person is fitter with a technical knowledge who maintains pipes/connectivity are present, they collectively call for Gram sabha and decisions are been taken. The role of fitter is most important in management and distribution of water; he is the one who looks over the pipelines and makes it when it gets damaged. Usually, fitter is selected in terms of their technical knowledge.

The water resources in the Mellidara is drying because of the absence of rainfall in the lean season, as there is sharp fall in the volume of water in the springs, streams and rivers/rivulets during this season, which affects the livelihood of people. Most of the springs have low discharge rates during the dry winter season owing to low rainfall which feeds the underground unconfined aquifers. As a result, there has been a change in agricultural pattern years.

There is also a dire need of a strong water governing body and awareness in the village. Several government agencies/departments (such as MG NREGA, RMDD, Soil Department, Horticulture Department) have developed water storage infrastructure, both at the household level and at the water sources in Mellidara. Nonetheless, there are several hamlets/ households in the village which are devoid of water storage medium, which makes them more vulnerable to water scarcity. In terms of water storage infrastructure (water reservoirs/ harvesting tanks), Tamang Gaon is the most vulnerable

within the village. However, in other wards too, most of the households do not have water storage medium in their houses.

Construction of water storage tanks at the household level is a major requirement to address the water scarcity in the lean season. They draw water from the nearest accessible source. This often leads to conflicts among the households for drinking water.

In the period when water resources are drying up and disappearing due to the impacts of climate change, globalization and other anthropogenic activities, sustainability of these resources are of paramount importance. Many government agencies are working towards ensuring the sustainability of these resources through the implementation of spring recharge/conservation program/projects/schemes.

Several government agencies have been working towards the conservation and protection of water sources in the village. The state Rural Management and Development Department is working towards ensuring the sustainability of these resources through the implementation of spring recharge/conservation program/projects/schemes. Afforestation activities in the catchments have been carried out by other agencies with the help of Panchayats and the local community. Though government provide tanks for them but many times voice of women get ignored, their real demand is water, not the tank where Chandrawati Rai 46 years old lady says

Providing rain harvesting tank is not a great idea, where you do not have water at all, and those water which is been collected sometimes are not good for a drink too. We approx 10- 12 households do not have our own water source; we use water from other individual's household.

Water is required for different activities. A number of factors like climate, culture, food habits, work and working conditions, level and type of development, number and volume of available water resources determine the consumption of water. However, the assessment of drinking water usage pattern in Mellidara indicates that water consumption is primarily supply driven. The volume of supply determines the consumption patterns in a household.

The entire structure is very informal and intimately depends on inter-household dynamics especially those communities who are powerful. Mr. Sharma is a farmer and he narrates that they used to own the spring but they are sharing the water with many other and for their own consumption which includes their household purpose, drinking and for their agricultural purpose, but one thing he said that they share water from their own spring but nobody pays for it.

It was only after the 1970s, people from the Government of Sikkim after the merger with India, came and identified this *dhara* owned by the Sharma Family and asked them to share this water to those who have water problem and also promise to provide compensation to the family, but till date they have not received any form of compensation. He told us that usually only their family used to take water from the spring but nowadays since the 1970s because it is used by many others sometimes they face water problem during the dry period.

He also said their family used to have orange orchards but now not a single orange tree is there, He asked us to visit their water source, and we immediately agreed, it is a 15-minute walk from his house, in the forest. I observed that in the source there is a plant called *dhokro* which blooms white flower and as per him these plants help to store

water inside the ground for longer time. He also points towards the opposite side and said there is another spring which is also owned by his family but the amount of water is very less as compared to earlier. There is tank provided by MGNREGA to collect water during the lean period of water shortage. He said that since they do not have any livestock or poultry farm they are able to manage water for themselves but those who have such farms, they really face serious water problem.

The scarcity of water is not a single reason to worry about in Mellidada, another issue is related to breakage of pipe and it is the Male members of the village who takes care of this technical part of the maintenance of the pipe and there is Bare Foot Engineer who takes care of this matter. We met Mr. Gyan Bahadur Tamang BFE of Mellidara, a middle-aged man who looks over the matter of pipe and connectivity. It is his duty to look over whose house is facing the problem of water. He keeps the record of water in the source, he keeps the record of the volume of water as per the minute and later submits to the members of the panchayat.

Thus we see that in all this process women feel helpless in terms of technical know-how of managing the pipes. Overall women of Mellidara are facing the problem as they are not included in any decision-making process to look over the water related issues. They say –

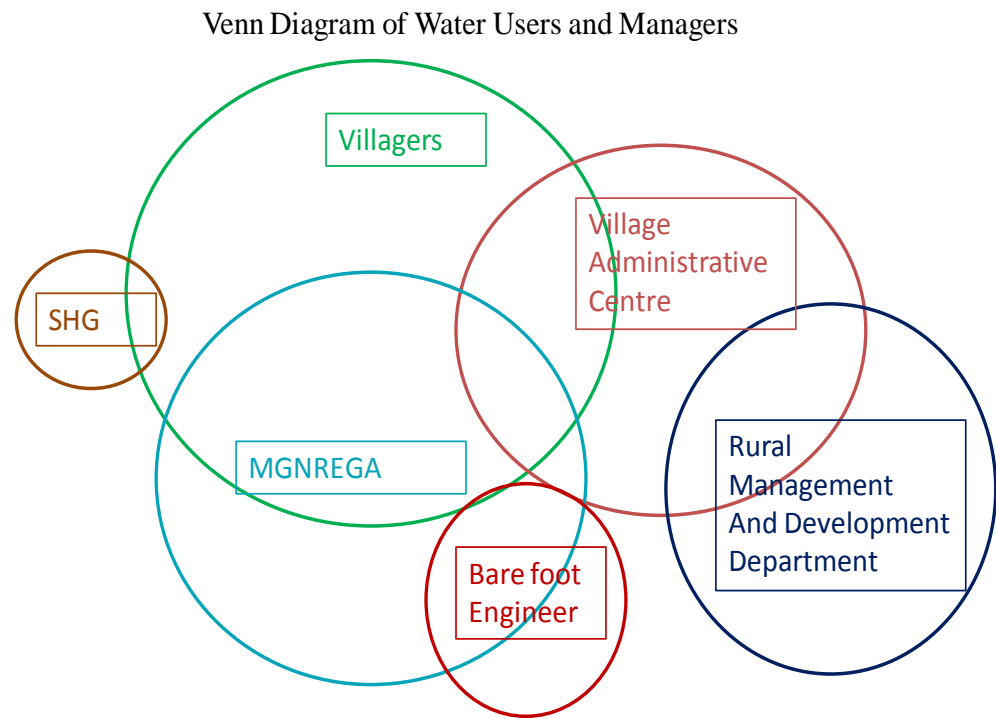
Women are the managers of water at home and they start their day thinking about water from early in the morning, when they do not get any water they assume that there must be a breakage in the pipeline or a problem of connectivity and it is their job to call the pipefitter or barefoot engineer to inform about that. These women then go with the

fitter to check where the breakage had happened by the time their husband do morning works.

Mellidara is agricultural-based village so both men and women farmers possess knowledge and experience that need to be taken into account in the design of adaptation strategies in smallholder agriculture which is mostly affected by the water scarcity. Women due to their generally weak position in society and family are usually not included in discussions and decision-making processes related to climate change or any other issue. Their limited access to information and resources such as land and credit further prevents them from developing their capacities.

Women often feel neglected, overlooked and not taken seriously when they try to make their contributions and share their knowledge. They are seen as wives of ‘farmer’s rather than the primary producers as farmers and seen as not able to produce and share important knowledge about agriculture. Society ignores the value of women’s knowledge by continuing to view the knowledge and practices of women as not countable. The section below highlights the importance of women’s knowledge and how they are dealing with the worst situation of water scarcity led by climate variability.

Fig 4.4. Venn Diagram of Water Users and Managers



Source- Field study (PRA) 26th July 2016 (Mellidara)

4.3 Adaptive Capacities and Micro Practices of Women: Enabling Water Security and Sustainable Livelihood

In the previous section, we learned about women's exclusion in the social and institutional milieu despite the fact that women are intimately related to waterscapes. In this section, we try to explore how women in Mellidara are struggling within the household and at the community level and what these struggles imply in terms of their resilience, capacities to adapt to the changed climatic circumstances prevailing after the emergence of the water scarcity.

4.3.1 Resilience Building—Making Best Use of “Hard” and “Soft” Skills

Mountain communities have always faced change but they now have to face it at a rate that has never been encountered before. Disenfranchised from their assets viz. environmental, socio-cultural, and economic traditional arrangements have eroded over the period of time under the influence of key exogenous process brought forth by water scarcity. Given this adverse situation, women are silently fighting the consequences of water crisis within the household and outside of it. One-way to tackle such situation on the part of women is applying simple and rational way to “use” water in the household in order to optimize whatever is available within the household. As mentioned in the quote by Denkamaya in the beginning of the chapter women are finding new ways to re-use the water to reduce the water demand at the household.

Women use different techniques to conserve water during difficult times, they keep waste water after washing vegetables and grains for the cattle and for watering the garden, they also use leftover water after washing clothes to clean their bathrooms. It is

true that men help them to carry water from the source but women know how hard it is to manage. Women do not allow wasting a single drop of water.

In Mellidara the water crisis has given rise to various sorts of uncertainties and anxieties among the communities. This has posed pressure on the inter-community relationship and networks. Quarrels and conflicts over water-sharing have significantly increased over the period. The response of the male members was to avoid it as they think that their involvement will further deteriorate the peace. So, they subsequently push the womenfolk of the household to tackle it. In a traditionally patrilineal and patrilocal society like in Mellidara, most households and inheritance are organized around the lineage of men. The customary and legal policies mark women and girls as legal minors throughout their lives. Women of any age need fathers, and subsequently husbands and sons to access the full rights of adulthood.

However, women in Mellidara have found a new way to deal with this socially tricky situation. Women in Sikkim refer to each other as *Bainis*—the Nepali word meaning sisters. Sisterhood in a social and cultural symbol of Sikkimese hill society is a symbol to derive the power to be “together” and solidarity. In the aftermath of the increasing water-related quarrel, the womenfolk in Mellidara have been tackling with their neighbors while sharing water from springs with increasing caution without dismantling the collective peace.

4.3.2 Motivating Community Labour and Ensuring Water Security

Although, women enjoy less power in terms of decision-making initiatives in the village level institutions, their enthusiasm, and participation in community program has been

crucial towards the management of the springs—the major source of water. Some examples of this is their participation in MGNREGA and Dhara Vikas

In Mellidara, Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) also plays an important role to uplift the changed environment of climate variability; most of the household has their tanks where the main purpose was to collect water and preserve it for the dry season.

The scheme of MGNREGA exists in Mellidara due to women, because a male member of the family does not prefer to work with this, the reason behind this is MGNREGA does not provide instant money to villagers, they delay it for many days. So basically women take part in the MGNREGA. This came as one of the alternatives to cope with the financial problem faced by the women member of the household. It is to be noted that the head of MGNREGA work is mostly always a male from the village area who guide the women workers.

Dhara Vikas is an innovative program to revive and maintain drying springs in the north-eastern state of Sikkim. A robust climate adaptation strategy for drought-prone districts, Dhara Vikas (meaning, spring-shed development) is helping to alleviate the problem of rural water scarcity by reducing surface runoff of rainwater and allowing more water to percolate down to recharge underground aquifers, which, in turn, ensures increased discharge from springs.

The job of Dhara Vikas is to dig the trenches which are the small rectangular structure of size length of six feet, breadth of three feet and depth of around two and a half feet constructed on sloping land. These trenches are constructed in Hill top forests. In Mellidara the hill-tops usually have a healthy forest cover, while the habitations are

located in the mid-hills. These hilltop forests function as the recharge area of perennial streams and springs located below.

The role of these hilltop forests is very crucial for ensuring rural water security in the villages below. With erratic rainfall patterns, with high intensity of rainfall concentrated in 4-5 months, less number of rainy days and longer winter droughts, the need for storing water when it is available in plenty is the need of the hour. Rainfall which is lost as surface run-off can be actually captured by artificial rainwater harvesting structures to supplement the groundwater recharge.

For this construction of trenches, the majority of women are engaged as here too men do not take part because of the payment issue. But this is one of the helpful methods of regaining the water in the springs, which ultimately will benefit to overcome the water scarcity problem, and for this reason, the women took part on it for the construction of pit or trenches and they took responsibly for cleaning it too.

4.3.3 Diversification of Livelihood Choice

Within the gendered economy, women are often the primary farmers and responsible for the social reproduction of the household, including food preparation, cooking, collecting water and fuel, and childcare, whereas men are involved in wage labor, farming and raising livestock. Money has a long been domain of contention within households and the gendered struggle to gain access to resources in a dynamic ongoing process.

Agriculture has been lost from Mellidara where it is limited to cultural practices only, now women do not prefer to cultivate paddy in their field because it does not bring

any profit, they suggest to their husband to opt for cash crops instead of traditional crops.

Where Chandra Tamang 29-year-old women adds

Our husbands do not agree with us and we have to convince and make them understand that instead of traditional crops it is wise to shift to cash crops because what we invest in cultivation, we do not get back, there is no profit at all.

Livelihood is hard to maintain in low production, this is the reason many has sought wage labor in urban centre opt driving to earn money, leaving their family in the village; this is sometimes hard to manage for women at home. Sometimes they need money urgently for buying stuff in home, that time they feel helpless. But because of their self-help group, they manage their household in urgency, or when their husbands are not around.

People in Mellidara not only opt for shifting of cropping pattern, or searching means of earning outside village but many parts of Mellidara has shifted to poultry farming where they are doing well, their standard of living has increased, seeing this change in living style many women in other part of the village has convinced their husband and opt for poultry farming where they earn better as compare to earlier agriculture farming.

Ratna Maya Rai 35 years old women says

Sometimes it is very hard to convince them, so we take help from SHGs and take loan going against our husband decisions and we start poultry farming when we gain profit, then they realized it.

Women are playing an important role in adapting the situation of water scarcity, they are using their knowledge to cope with it by reusing the water, they are the one who tackles the problem which usually generates due to water. They compromise with the delay of wages and work in MGNREGA thinking that at least they can help their family financially.

Women act so wisely and convince their husband to shift the cropping pattern and opt to those crops which bring profit. Many women convince their husband to opt for poultry farming instead to waiting for rain and cultivate field; with help of local Self Help Group they strengthen their weakness, they themselves become an agent of positive change by removing the concept of victimhood.



PLATE 4.1: Poultry farm ((Photo- Rashmita Sarkar, July 2016)



PLATE 4.2: Cattle farm ((Photo- Rashmita Sarkar, July 2016)



PLATE 4.3: Woman cutting grasses for Livestock ((Photo- Rashmita Sarkar, July, 2016)



PLATE 4.4: Villagers doing Sansari / Naag Pooja for rainfall in Mellidara (Photo- Rashmita Sarkar, July, 2016)



PLATE 4.5: Pipe connectivity from source (Khani Khola) to the village (Photo- Rashmita Sarkar, April, 2016)



PLATE 4.6: Completely Dried Spring (Photo- Rashmita Sarkar, April, 2016)

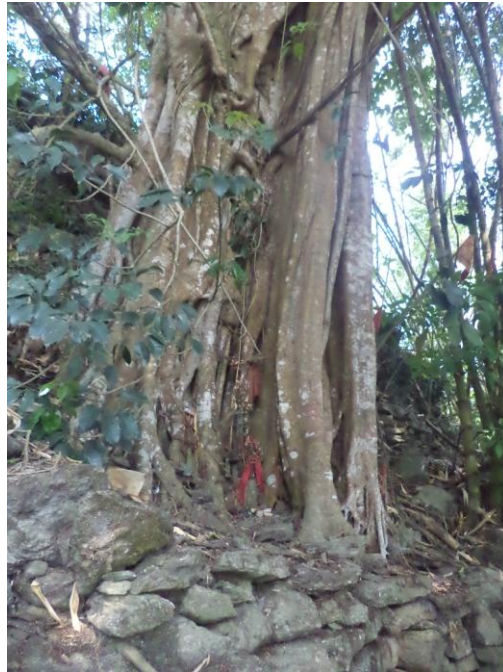


PLATE 4.7: Devithan in Mellidar (Photo- Rashmita Sarkar, April, 2016)

Chapter 5

Conclusions

To recap, this study attempts to understand how women are adapting to the various impacts of climatic variation, with a focus on water-related impacts. In order to establish this, the relationship between climate change, water and women has been discussed.

It was observed, both through field experiences and literature that while the link between women and water is well established and recognized, as is the impact of climate change on water resources, the subsequent impact of climatic variations on women through water has largely been ignored. Gender issues, as such, have largely been ignored in the wider climate variability discourse and related initiatives.

Most policy responses have focused on science and technology based mitigation measures, rather than adaptation, especially community-level adaptation, and very few of these strategies are made focusing on women's vulnerability.

The key water-related impacts in the study area arise from increased variations in climatic parameters such as rainfall. Longer dry periods have led to the drying up of springs. Changing weather patterns also interfere with the annual cropping patterns, forcing many respondents to abandon paddy cultivation, which was previously one of their major crops.

Impact on women revolves around their workload and social relations. Apart from an increased workload, especially as compared to men, their social ties have also suffered. Not being able to participate in their normal rituals interactions has decreased their interaction with other women. As neighbours, they no longer can help each other out with their kitchen gardens, and cannot celebrate festivals such as *dasai* as they'd like to.

There are increased instances of arguments between households. Not having a kitchen garden of their own also means they have to rely on their husbands to decide what to cook. All these factors have contributed to increased mental and physical stress and a decline in their quality of life.

Water scarcity impacted social relations between women within the neighborhood and village. It is harder for them now to manage the household activities and they spend more time doing household chores, which broadly reveal the concept of “public” and “private” spaces, where scholars explore how the women are bound by the ideologies of domesticity (Raju and Lahiri-Dutt, *Doing Gender, Doing Geography: Emerging Research in India* 2011). Despite this, the women of Sikkim enjoy certain rights as compared to other part of India, where a system of *chardiwari* is found, which means the mark of territory inhabited by women, and beyond this *chardiwari* is inhabited by men (Gazdar 2003).

But in the context of Sikkim too, we cannot ignore that the ideology of patriarchy is deeply rooted. This study reveals that both men and women work hard for their livelihoods but it is men who get more free time as compared to women during periods of water stress. Despite an increased burden in their day-to-day life, women still manage the household work without letting the family know that how hard it is. They suppress their hardships and prioritize their family.

The women of Mellidara consider water to be an integral part of their daily lives is undoubtable; dharas and other sources were completely absent from maps made by men, whereas they featured prominently in those made by groups of women. Despite this,

women are excluded, or do not participate in water-related social events such as the *Sansari Puja*.

Despite this, the respondents are determined to make the best of the situation, and have responded to the external changes by making adjustments to their daily lives, or adapting, while the men have failed to do so, at least at the household level of water usage.

Women now use water judiciously within the household, and reuse it wherever possible. This has, to some extent, helped deal with the shortage from the demand side. There are also a number of schemes such as Dhara Vikas, under MGNREGA, which are schemes targeted at water shortage through spring rejuvenation. There are few men who take seek work through MGNREGA, due to late payments. Most of the workers, therefore, are women, who believe that this scheme can bring them water, and wish to contribute to the household's earnings.

Lastly, women have also been instrumental in convincing their families to shift from traditional farming to more profitable cash crops and livestock and poultry farming. There have been instances where if the husbands have not agreed, the wives have taken it on themselves to start poultry farming with the help of SHGs. They have also taken the help of SHGs for other alternate means of income, and activities such as rain-water harvesting, to cope with water shortages.

Therefore, while women are often portrayed as the victims of climate change in literature or other narratives documenting impacts of climate change, the example of the women of Mellidara has shown that women also possess significant adaptive capacities, and of steering their families and communities towards more resilient livelihoods.

Despite this, their adaptive capacity remains unacknowledged, even by the women themselves, and their contributions remain invisible.

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Glossary of Local Terms

Baini – little sister, usually female younger siblings are called baini but in Mellidara society women from neighbor address each other as bainis.

Chandan – sandalwood paste, usually applied in forehead in Hindu religion Practice.

Dasai – It is the longest and the most auspicious festival (September / October)

Dhara – spring water, underground water that is held in the soil and in pervious rocks.

Dhoti – a garment worn by male Hindus, consisting of a piece of material tied around the waist and extending to cover most of the legs.

Doko – local basket made of bamboo with a strip to carry on the forehead.

Gagri – the water vessels that are used to store water

Jhakri – shaman, a local priest in the village who led religious and social cultural ceremonies. Villagers called them during sickness, death and birth.

Khola – river

Kodoh – millet

Kothe Baari – Kitchen garden

Pandit – a Hindu scholar learned in Sanskrit and Hindu philosophy and religion, typically also a practising priest.

Phapare jhari – rainfall which comes in *Bhadau* in Hindu calender during the last week of August, and which led the growth of *Phaper* which is edible plant grows wildly.

Pooja – a Hindu worship

Saree – a garment consisting of long length elaborately draped around the body.

Sawan – is name of month in Hindu calendar which falls on mid June to mid August, and *sawane jhari* refers to rainfall of first week of August.

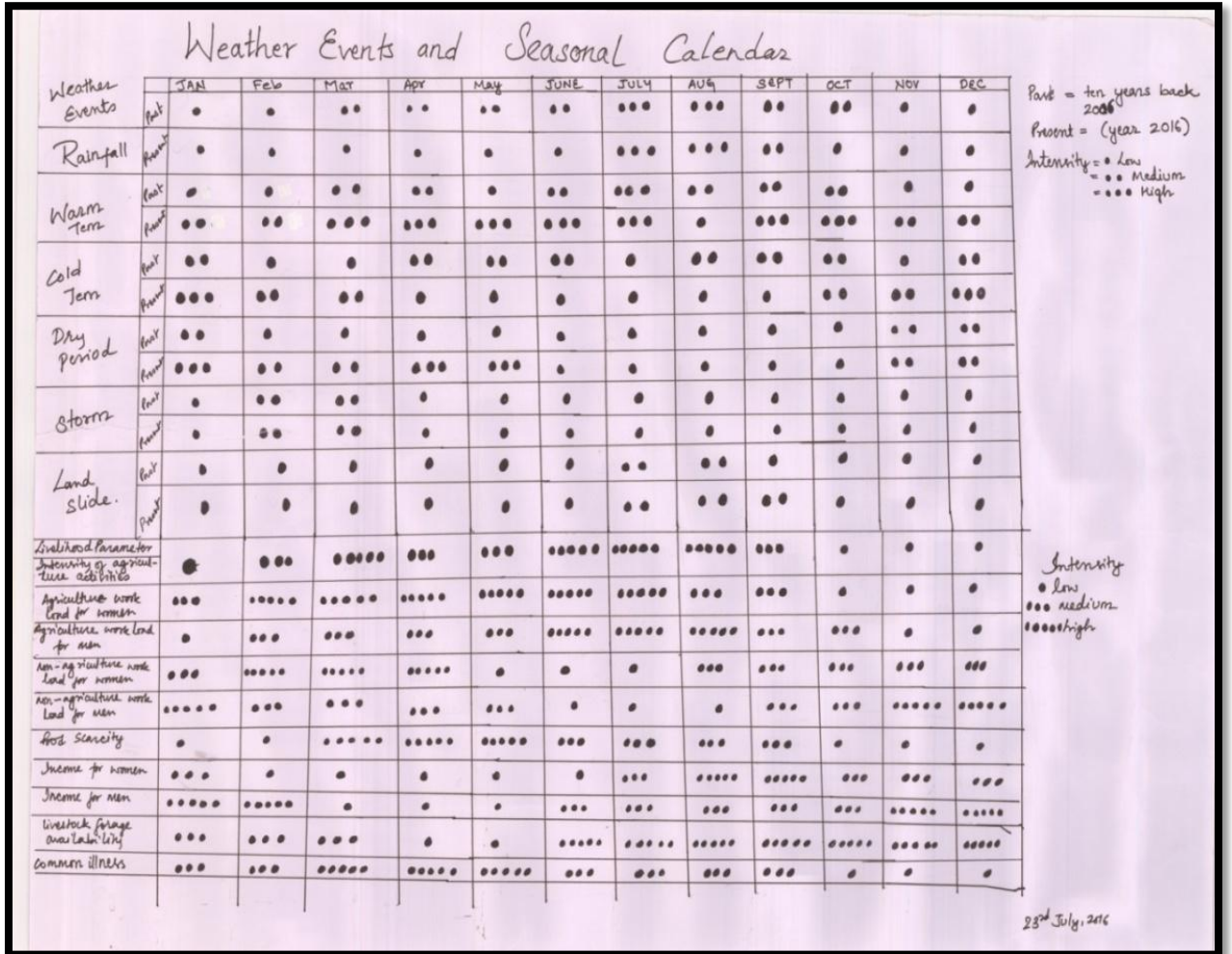
Shloka – holy chants in Hindu religion

Tarey Bhir – ridge or hilltop located just behind the Mellidara village.

Titey Jhari – refers with the rainfall which help to grow *Titeypati* which is a medicinal herb blooms during the 2nd week of September

APPENDIX-I

Weather and Seasonal Calendar, Map prepared by the Villagers of Mellidara during PRA



APPENDIX-II

Seasonal Crops Calendar, Map prepared by the Villagers of Mellidara during PRA



APPENDIX- III

Water Source Reading Report of Melli Dara

Sl. No.	Water Line	Avg. household member	discharge in 12hrs (Ltrs)	Daily Requirement in Ltrs.	Difference (Excess/Requirement)
1	Tamang Goan & VAC	210	4320	21000	-16680
2	School Dara	70	14400	7000	7400
3	Nechali Goan	125	10080	12500	-2420
4	Pradhan - Sharma Goan	45	10800	4500	6300
5	Agri - Horticulture	15	3600	1500	2100
6	Pradhan Goan	45	21600	4500	17100
8	Upper Paiyong	130	5040	13000	-7960
9	Dhobi Khola	30	86400	3000	83400

APPENDIX- IV

Research Time for the dissertation

Objectives	Methods	Timeline
Selecting the study site	<ul style="list-style-type: none"> contact with University and TMI research Institute 	End of March to April 2016
	<ul style="list-style-type: none"> village visits Pamphok, Nagi (Namthang Block) 	
	<ul style="list-style-type: none"> Sadam, Turuk, Mellidara (Sumbuk Block) 	
Collecting Data in Mellidara	<ul style="list-style-type: none"> Mapping exercise (PRA) 	End of April to October 2016
	<ul style="list-style-type: none"> participant observation 	
	<ul style="list-style-type: none"> focus group Discussion 	
Collecting analyzing data	<ul style="list-style-type: none"> interviews with women 	
	collecting secondary documents from Village Administrative Centre	October 2016 to 2017