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Evaluating the effectiveness of Local Adaptation Plans of Action (LAPAs) in reducing climate

change vulnerability using the Livelihood Vulnerability Index: A case from Western Nepal

by

Subash Pandey

A thesis

submitted in partial fulfilment

of the requirements for the degree of

Master in Sociology in Department of Sociology, Social Work, and Criminology

Idaho State University

August 2021

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Subash Pandey find it satisfactory and recommend that it be accepted.

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MS 8114

RE: Study Number IRB-FY2021-89 : Assessing climate change impacts on smallholder farmers in LAPA-implemented and non-implemented areas using the Livelihood Vulnerability Index: The case from Western Nepal.

Dear Mr. Pandey:

Thank you for your responses to a previous review of the study listed above. These responses are eligible for expedited review under OHRP (DHHS) and FDA guidelines. This is to confirm that I have approved your application.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

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Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

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List of Abbreviations

ASHA	Adaptation of Small holders in Hilly areas
CBS	Central Bureau of Statistics
CCERD	International Convention on the Elimination of all forms of Racial Discrimination
CDM	Clean Development Mechanism
CFUGs	Community Forest User Groups
COP	Conference of Parties
DFO	Divisional Forest Office
EU	European Union
GON	Government of Nepal
ICCPR	International Covenant on Civil and Political Rights
IFAD	International Fund for Agriculture Development
INGO	International Non-Governmental Organization
IPCC	Intergovernmental Panel on Climate Change
LAPA	Local Adaptation Plan of Action
LDCF	Least Developed Countries Fund
LRMP	Land Resource Mapping Project
LVI	Livelihood Vulnerability Index
MoALD	Ministry of Agriculture and Livestock Development
MoFE	Ministry of Forest and Environment
MoF	Ministry of Finance
MoE	Ministry of Environment
MSFP	Multi-Stakeholder Forestry Program

MoSTE	Ministry of Science, Technology and Environment
NAPA	National Adaptation Program of Action
NCCSP	Nepal Climate Change Support Program
NGO	Non-Governmental Organization
UNDP	United Nation Development Program
UNFCCC	United Nation Framework Convention on Climate Change
WWF	Worldwide Fund

Evaluating the effectiveness of Local Adaptation Plans of Action (LAPAs) in reducing climate

change vulnerability using the Livelihood Vulnerability Index: A case from Western Nepal

Thesis Abstract-Idaho State University (2021)

Like other developing countries, Nepal developed National Adaptation Plan of Action (NAPA)

to tackle the impacts of climate change. Local Adaptation Plan of Action (LAPA) is designed

during NAPA formulation to come up with locally suitable strategies. This study uses Livelihood

Vulnerability Index (LVI) to assess the effectiveness of LAPA by comparing the LVI value in

LAPA implemented and non-implemented community as well as between Brahmin and Dalit

group. We conducted face-to-face survey with 80 households and 11 in-depth interviews to

understand the people's knowledge and experience on LAPA planning and implementation

process. LVI was calculated for nine major components which were identified based on literature

review, namely, Livelihood strategies, socio-demographic profile, social network, food, water,

health, infrastructure, natural disasters, and climate variability. Despite the intervention of

adaptation activities, the overall LVI value shows that LAPA implemented community is slightly

vulnerable than LAPA non-implemented community.

Keywords: climate change, adaptation, LAPA, LVI, vulnerability

CHAPTER ONE: Introduction

Climate change is a global phenomenon with diverse expected impacts depending on the political, economic, social, and environmental context of the locality (Adger et al., 2004; Gentle et al., 2014). Research on these differential impacts of climate change have found several factors that increase vulnerability, including dependence on natural resources for one's livelihood (Agrawal & Perrin, 2008), living in developing countries (World Bank, 2009) and/or geographically remote areas (Deressa et al., 2009; Kohler et al., 2010), and being poor (Adger et al., 2003).

During the last two decades of the 20th century, global climate policy was entirely focused on mitigation of climate change (Biesbroek et al., 2010). Mitigation, which involves reducing the impact of climate change by reducing the emissions of greenhouse gases (GHGs), has been the primary political approach and is recognized by the United Nations Framework Convention on Climate Change (UNFCCC) (Farbotko & Lazrus, 2012; Huq et al., 2004). However, the Inter-Governmental Panel on Climate Change (IPCC) reports predict that even with strong global emissions reductions and mitigation efforts in place, the impacts of climate change are inevitable (IPCC, 2007; IPCC, 2014). These same reports state the importance of climate change adaptation along with mitigation. The IPCC defines climate change adaptation as "the process of adjustment to actual or expected climate and its effects." In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities resulting from a changing climate (Adger et al., 2004). With increasing impacts of climate change, many countries in the world, including many European Union member nations, started to develop a National Adaptation Strategy (Biesbroek et al., 2010). The Conference of Parties (COP 7) held in

2001 in Marrakesh, Morocco made a landmark decision to assist developing countries with climate change adaptation (Silwal, 2016). Adaptation to climate change therefore emerged as an important agenda not only to reduce negative impacts of climate change but also to make sure that achievements made in reducing poverty are not diminished by changing climate (Huq et.al. 2004; Saito, 2013, especially in poor countries (Silwal et al., 2019). Since then, multiple internationally funded adaptation interventions have been implemented to reduce climate change vulnerability all over the world (Eriksen et al., 2021).

Adaptation to climate change is particularly important for a developing country like Nepal where extreme climate events like drought and water scarcity are likely to become more frequent and more severe as climate change advances (IPCC, 2014). The impacts of drought, water scarcity, and erratic rainfall will likely be severe in Nepal because 28.6% of total population is multidimensionally poor (expands the poverty beyond income and consumption level), and around 84% of people live in rural areas and have livelihoods primarily dependent on subsistence farming (Gerlitz et al., 2018). Climate change modeling for Nepal shows that the average annual precipitation is likely to rise by 2-6% in the short term (2030) and 8-12% in the long term (2050), whereas mean annual temperatures are predicted to rise by 0.9-1.1 degree Celsius in the short term (2030) and 1.3-1.8 degree Celsius in the long term (2050) (MoFE, 2019). These changes are predicted to have serious impacts on different economic and environmental sectors, such as water, energy, biodiversity, agriculture, and livelihoods (MoFE, 2019). Of these, households that depend on natural resources or agriculture for their livelihoods are expected to be the most vulnerable (Gentle & Maraseni, 2012). For instance, resource-dependent people, female-headed households, farmers from geographically remote areas, and people of low socioeconomic status are likely to be disproportionately impacted by climate

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change (Gentle et al., 2014; Pandey & Bardsley, 2015). Moreover, the likely negative impact on agriculture will have important repercussions on the livelihood of smallholders as agriculture alone accounts for 35% of gross domestic product (GDP) and provides employment opportunities to about 70% of Nepal's population (MoAD, 2012). Therefore, adaptation practices are very important for helping local communities adapt to extreme events and climatic variations (Adger, 2003).

In an effort to address the "growing urgency" to adapt to climate change, Nepal developed a National Adaptation Plan of Action (NAPA) in 2010 and a Climate Change Policy in 2011 (Ojha et al., 2016, p.2). To address climate change at the local level, the government of Nepal came up with an innovative plan in 2011 to facilitate the adaptation process locally by adopting Local Adaptation Plans of Action (LAPAs) (Regmi et al., 2016b), demonstrating the importance Nepali government officials give to climate change adaptation (Regmi et al., 2016a). The concept of LAPA was developed by Nepali stakeholders during the National Adaptation Program of Action (NAPA) development process (Regmi et al., 2016a) with the goal of assessing site-specific climate vulnerabilities and developing community-based adaptation plans (MoE, 2011; Ayers, 2011). National Adaptation Program of Action identifies six thematic areas – agriculture, forests, health, water resources, human settlement and disaster – to focus on in order to increase adaptive capacity (MoE, 2010). In a time when autonomous adaptations (adaptation actions that are internally initiated by individuals within a community without any support from outside) being implemented by farmers are not sufficient in maintaining their farm productivity (Khanal et al., 2019; Gentle and Maraseni, 2012, Manadhar et al., 2011), the LAPA offers a way to bridge the gap between autonomous adaptation and planned adaptation (Watts, 2012). Planned adaptation which is generally initiated outside the community is also considered

highly efficient and better overall for addressing the impacts of climate change compared to autonomous adaptation (Burnham and Ma, 2016).

However, planned adaptation intervention like LAPA has been criticized for reinforcing the vulnerability rather than reducing it. Existing social inequalities based on caste, class, gender and power differentials lead to elite capture of the resources (Nightingale, 2017; Ojha et al., 2016). I experienced this firsthand when I worked for three years in Nepal at grass root level before continuing my graduate study. I briefly worked as a consultant for Kathmandu based consulting organization soon after the completion of my undergraduate degree in 2016 and went to Dhading district to support the communities in their preparation for the LAPA plan for two Village Development Committees (VDC)[1] which were supported by the HariyoBan program implemented by the World Wildlife Fund (WWF), Nepal. Unfortunately, those plans were not implemented because of lack of budget. After that I worked as a Livelihood and Resource Management Officer for an INGO where I worked with community-based organizations like the Community Forest User Groups (CFUGs) – a farmers' group and cooperative for the implementation of project activities. I was particularly involved in awareness-raising and capacity-enhancement for farming communities, which was part of supporting adaptation to climate-induced changes in the agricultural system as a whole. During that period, I got to experience firsthand how the project activities meant for poor and vulnerable people were not benefitting them because of existing unequal power relations and various other socio-economic reasons. For example, we provided 10,000 NPR (~$100 USD) to support poor farmers in rebuilding their goat shelters lost to the devastating earthquake that struck Nepal in 2015. But

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[1] New local government unit (LGU) was set up based on new governance system under the Federal Republic System in 2017. VDC was the most appropriate LGU and was recognized as the LAPA unit for adaptation planning and intervention before 2017. But with new administrative setup, wards of rural municipalities and municipalities became the LGU for LAPA process (VDC~ new wards of rural municipalities).

this money was not enough to rebuild the goat shelters as recommended by the organization (which required the platform be 10 feet above the ground with provision for proper ventilation and should be constructed from timber and not bamboo). This rule deprived poorer households from benefiting from the recovery efforts even though it was these households for whom the project was designed. Another obstacle was political: beneficiaries for goat shelter assistance were selected with the help of ward offices and community reconstruction committees and with random field verification. This led to the exclusion of the most deserving beneficiaries because of community representatives preferring "Aafno Manche" (favoring one's own people, or nepotism). Being interested in climate change and specifically in the social vulnerability to climate change, coupled with the above experiences, led me to question the planning process and the adaptation interventions of the LAPA.

Implementation of LAPA in Nepal has gained widespread attention as Nepal is the first country to come up with locally suitable adaptation strategies based on the NAPA. Nepal has been implementing LAPA in different districts of western Nepal with the involvement of both governmental and non-governmental organizations since 2013. Because I also participated as a facilitator for the preparation of the LAPA, I am particularly interested in studying whether these plans have achieved their intended objectives. This is a timely study to assess the effectiveness of LAPA because in the 2015 Paris Agreement, in which developed countries promised $100 billion USD per year starting in 2020 to promote adaptation capacities among poor people in developing countries. Nepal will also receive an increasing amount of money in the future from the World Bank, UNFCCC and FAO to increase its adaptive capacity, especially to preserve natural resources and strengthen farming communities. Therefore, the main aim of this research is not only to produce policy-relevant knowledge but also to contribute to the academic literature

on effectiveness of adaptation in reducing climate change vulnerability by analyzing the climate change adaptation interventions in the context of Nepal.

1.1 Problem Statement

As Nepal is pioneering LAPAs and has implemented more than 400 specific LAPAs, it is very important to understand if these local adaptation planning efforts have achieved their intended objectives of mainstreaming climate change adaptation into the local development process and increasing the adaptive capacity of poor and vulnerable households (MoE, 2011). Broadly, LAPA is seen as an important effort in bringing climate science down to the community level and enhancing community representation in adaptation processes (Ayers, 2011).

However, LAPA has also been criticized for being driven by aid agencies with little involvement from local political decision makers (Ojha et al., 2016). For example, a national framework for LAPA was developed with the support of donor projects, consultants and I/NGOs working in the field of climate change in Nepal and some have argued that LAPA documents did not address "either the robust local-scale science or processes of political articulation at the local level" in its plan (Nagoda & Nightingale, 2017). Additionally, many LAPA documents were developed in the absence of locally elected governments (Ojha et al., 2016), raising questions about the ownership of the plan by the local governments which were elected in 2017 (after a gap of 20 years due to…?) and the potential success of mainstreaming adaptation to climate change into local development plans. Maharjan & Maharjan (2016), in their systematic review of the research on climate change in Nepal, state that Nepal has a very short history in attempting to develop climate policy and very limited research has been conducted to evaluate the effectiveness of the climate change policies. Within that limited study of climate change policies, many researchers have focused on the analysis of planning approaches of LAPA and little is

known on the outcome of the implemented activities (Nagoda and Nightingale 2017; Silwal et al., 2019). However, it is the implemented activities that determine the effectiveness of the planning approach and plans. Therefore, an evaluation of the adaptation activities identified in the LAPA plan is crucial to understand whether the LAPA plan reduces climate vulnerability or not (Silwal et al., 2019).

When Nepal started to implement LAPA, three big programs involved in the process of planning and implementation were introduced: The National Climate Change Support Program (NCCSP), the Multi-stakeholder Forestry Program (MSFP) and the Hiriyoban Program. The MSFP and Hariyoban programs were implemented through forest-based organizations and their focus was on bio-physical impacts of climate change, for instance minimizing biodiversity loss; enhancing forest health to sequester more carbon; and reducing forest wildfire, whereas NCCSP entirely focused on reducing climate change vulnerabilities of poor households through livelihood improvement (Silwal, 2016). In this thesis, I evaluate LAPA implemented through the Adaptation of Smallholders in Hilly Areas (ASHA) project, which is similar to NCCSP and focuses on reducing vulnerability and improving the livelihoods of poor households.

1.2 Research Objectives

There is no strong baseline data on exposure, sensitivity and adaptive capacity of the communities in the LAPA plan for "before" and "after" comparison. Therefore, drawing upon Hahn et al., (2009) (see 3.5.3 in methods section for longer explanation), this study uses the analytical utility of the Livelihood Vulnerability Index (LVI) to evaluate the effectiveness of the LAPA by comparing LVI values between LAPA-implemented and non-implemented communities. To achieve this objective, I address the following research questions:

1. How does the Livelihood Vulnerability Index vary in LAPA implemented and non-implemented communities in the West-Rukum District?

2. How does the Livelihood Vulnerability Index vary among Dalit and Brahmin groups?

3. How do farmers of different socio-economic status benefit from the implementation of LAPA activities?

   2.1. How and why do some farmers benefit more from the LAPA than others?

1.3 Thesis Outline

This thesis is presented in seven chapters including the introduction. The second chapter focuses on the literature review that covers the relevant material with a focus on Nepal, as well as the global context of climate change and the theoretical perspectives that guide which survey and in-depth interview questions were included. Chapter three outlines the study area and methodologies adopted for this study, including sampling, data collection, and data analysis procedures. Chapter four presents the results from the survey and interviews that were collected using the methods described. Chapter five presents the discussion of the results. And the final chapter six presents the summary and conclusions drawn from this research, its implication for policymaking, as well as its limitations and recommendations for future research.

CHAPTER TWO: Literature Review

2.1 Global context in climate change

Global temperatures have risen continuously since the Industrial Revolution, increasing by an average of 0.85°C in the last century. Even with the best-case scenario, if countries reduce their emissions as promised in the Paris agreement, global average temperatures are expected to rise by 1.5°C above 1990 levels; worst-case scenarios predict average increases of around 4.8°C by the end of this century (IPCC, 2014). Erratic rainfall that includes increases in some parts of the world and decreased precipitation in other parts, along with longer dry spells and higher risks of drought are some of the extreme climate events and climatic variability that have been recorded (IPCC, 2007b). Irregular precipitation influenced by changing hydrological cycles, a rising sea level as a result of unnatural glacial melting, and increasing numbers of cyclones and heatwaves are the consequential impacts of rising temperatures (IPCC 2007b, Sherwood et al., 2010). Research also finds global temperatures will rise steadily in the coming decades even if the emissions of Greenhouse Gases (GHGs) are reduced to zero today because of the already accumulated GHGs in the atmosphere (Stern, 2006). The most dangerous impacts of climate change are related to water: for instance, storms, cyclones, floods and drought (Stern, 2006), as these would directly impact the productivity in agricultural sectors, increase the incidence of vector-borne diseases like malaria, typhoid and diarrhea, and displace people from many small Pacific islands (Farbokta and Lazrus, 2010; Shahid, 2010). Data from the Human Development Report show that 326 major disasters related to climate change have been reported every single year from 2000 to 2004. For instance, the heatwave that struck Europe in 2003, multiple tropical cyclones in Japan in 2005, and Hurricane Katrina in the U.S. in 2005 have all been linked to climate change. Moreover, 68 million and 40 million people were impacted by the floods in East

Asia and South Asia respectively. Similarly, 2 million people were affected by the drought in Sub-Saharan Africa within the same period (UNDP, 2007).

Various studies show that the sectors most impacted by the changing climate will be agriculture, fisheries, food systems, and forests, which will impact the livelihoods of millions of people in developing countries, particularly those who rely entirely on these resources for their livelihoods (Adger et al., 2003; Gentle and Maraseni, 2011). Moreover, the impact of climate change will be exacerbated due to the lack of necessary economic, social and technological capacity to adapt to the changes (Adger, 2006; Mertz et al., 2009).

The 2020 Global Multidimensional Poverty Index (MPI) shows that 1.3 billion people – or about 22% of the global population – earn less than U.S. $1.90/day. The majority of these populations live in South Asia and Sub-Saharan Africa and are very vulnerable to the climate crisis (UNDP, 2007; UNDP, 2020). In the next section, I will discuss about the relationship between natural resources (agricultural and forest), people and climate change.

2.1.1 Agriculture and climate change

The variability in climate directly impacts agricultural production as the production depends on different climatic parameters like temperature and rainfall (Khanal, 2018). There are multiple climatic factors that affect agriculture; for example, changes in temperature and rainfall and repeatedly occurring extreme climatic events like floods and droughts affect the health of the soil and water cycle and in turn impact agricultural production (Khanal, 2018). Climate change can impact the agricultural production in two ways: increasing concentrations of carbon dioxide (CO_2) in the atmosphere can increase agricultural yields due to higher rates of photosynthesis and longer growing seasons and the emergence of new areas to grow crops, especially in the Northern hemisphere. In contrast, increased CO_2 concentration in the atmosphere in the lower

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latitudes is expected to increase pest and weed infestations in crops and potentially introduce new invasive, exotic species (Rosenzweig et al., 2001).

Multiple studies have shown the impacts of a changing climate on agricultural production. Global as well as regional climate change modeling shows that even a small increase in temperature will impact the production of major cereal crops like wheat, rice and maize globally (Morton, 2007). For instance, the global analysis done by Lovell & Field (2007) showed that the production of barley, maize and wheat declined due to rising temperatures. One of the major staple crops in South and East Asia is rice and rice yields are predicted to decline by 3.8% compared to 2000 levels due to uncertain future climate change (Murdiyarso, 2000). Similarly, the production of major crops in South Asia and Africa – wheat, maize, sorghum, millet, barley, rice, cassava and sugarcane – are expected to decrease by around 8% by 2050 (Knox et. al., 2012) and Bandara and Cai (2014) show that cereal grains, wheat and rice yields are likely to decline by 7%, 11% and 4% respectively by the end of 2030. The analysis of long-term data from 1976-2006 show a negative relationship between rising temperature and the production of maize and soybeans in the northern United States (Kucharik & Serbin, 2008). Increasing incidences of pest and disease outbreaks, floods and droughts, declined efficiency in the use of water and nutrients, as well as topsoil erosion are some other impacts of the changing climate (Asplund et al., 2014; Morton, 2007; Nelson et al., 2009). These shifts will have negative impacts not only on global food security but also on global sustainability because of declining global agricultural productivity (Lal et al., 2011). Ultimately, these impacts on agricultural productivity and the livelihoods of millions of people will be exacerbated in the absence of suitable adaptation strategies to a changing climate (Adger, 2003; Kurukulasuriya & Rosenthal, 2013).

2.1.2 Global response to climate change

The UNFCCC, which was adopted from the Earth Summit in 1992, and the Intergovernmental Panel on Climate Change (IPCC), which was established in 1988 by the World Meteorological Organization, along with the United Nations Environment Program (UNEP) for the scientific assessment of climate change are the most important bodies developed so far to understand and tackle the impacts of climate change globally. During the last decade of the 20th century, the main objective of the UNFCCC was to focus on mitigation to reduce the amount of GHG emissions and stabilize the concentration of GHGs in the atmosphere (Schipper, 2006). However, there were no specific targets on reductions of GHGs and many environmental scientists were not satisfied. To come up with specific mechanisms to reduce GHG emissions, the Kyoto Protocol was developed at the Third Conference of Parties (COP) in 1997 in Kyoto, Japan. Emissions trading Schemes (ETS), Clean Development Mechanisms (CDM) and Joint Implementations (JI) were three mechanisms developed with specific targets to be met by sometime between 2009 and 2012. Nonetheless, the Kyoto Protocol went into limbo when the then highest GHG-producing country, The United States, refused to ratify the Kyoto agreement because it did not require the emerging economies like China and India to limit their emissions.

The main agenda of international negotiations up to the end of the 20th century was focused on mitigation more than adaptation (Biesbroek et al., 2010). However, the third assessment report prepared by the IPCC in 2001 highlighted the need for adaptation along with mitigation. Following recommendations from the IPCC, at the seventh Conference of Parties (COP 7) in 2001 the UNFCCC developed a strategic plan to support developing countries adapt to the changing climate. In particular, a fund called the Least Developed Countries Fund (LDCF) was established with the objective of assisting the least developed Countries (LDCs) in preparing and

implementing National Adaptation Programs of Action (NAPAs) (Silwal, 2018). The objective, as stated by the UNFCCC (2002), was to meet the immediate needs of climate vulnerable countries and to build the necessary adaptation strategies to combat the negative projected impacts of climate change in the future. The UNFCCC also developed the LDC expert group to help highly vulnerable countries in their preparation of their NAPAs (Silwal, 2016). By 2013, fifty Least Developed Countries had prepared and submitted their NAPAs to the UNFCCC, including Nepal, which developed and submitted its NAPA in 2010 (Silwal, 2016).

2.2 Climate change and its context in Nepal

2.2.1 General Introduction of Nepal

Nepal is a small landlocked mountainous country that covers an area of 157, 181 square kilometers and is rich in biophysical, climatic and socio-economic diversity. With the adoption of a new constitution in 2015, Nepal embraced the federal structure that divides country into seven provinces with 753 local government units known as rural municipalities or just municipalities, each of which has its own legislative, judicial, and executive powers (Dahal et.al., 2020).

The country's biophysical and climatic variation is highlighted by its variation in altitude, which goes from 60 meters above sea level to the top of the world (8,848 meters above sea level), within the 193-kilometer width of the country. Nepal consists of three agro-ecological zones, and they are Terai, the Hill and the Mountain (LRMP, 1986). These agro-ecological zones are unique in the climatic conditions that determines their variations in agricultural production and production capacity as well. The climate of southern part (Terai) is very humid with alluvial and fertile soil with high agricultural productivity. The Terai accounts for only 23% of the total land area of the country but consists of 38% of the total cultivated area (Khanal, 2018). Wheat,

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rice, maize and mustard are the commonly grown crops in this region. The social-economic status of this region is better than other regions of the country because of productive land, better access to roads and employment opportunities from the big industries. The middle mountain and high mountain are broadly called the hilly region whose altitude varies from 500-2500 meters? above mean sea level. This region accounts 42% of the total land area however constitutes only 15% of the total cultivated area. The geography of this region is made up of slopped lands with numerous valleys. The dominant crops grown in this region are maize and rice, finger millet and legumes. The rice is grown in "Khet" (Irrigated land) and maize is grown in "Bari (Drylands).

The mountain region lies in the northern part of the country and accounts for 35% of the total land area but only 4% of the cultivated land (FAO, 2011). The elevation of this region ranges from 2,500-8,848 above mean sea level. The geography of this region is very remote and hardly accessible by the roads and is made up of steeply sloped lands and snow-clad mountains. The commonly grown crops are barley, buckwheat and potato, and livestock like yak and mountain goat, all of which are the main sources of food (and livelihoods) for the people (FAO, 2011). The main features of country's three agro-ecological zones are shown in Table 1.

Table 1. Main features of three ecological regions of Nepal.

Characteristics	Terai	Hill	Mountain	All Nepal
Elevation(meter)	60-500	500-2500	2500-8848	60-8848
Climatic range	Tropical to sub-tropical	Sub-tropical to temperate	Temperate to arctic	Tropical to arctic
Mean annual temperature	20-25°C	10-20°C	<3-10°C	15°C
Average annual precipitation(millimeter)	1,100-3,000	275-2,300	150-200	1,800
Total area(km^2)	34,019(23%)	61,345(42%)	51,817(35%)	147,181(100%)
Cultivated land (thousands of hectare)	1,299(38%)	904(15%)	208(4%)	2,441
Major cropping pattern	**Irrigated lands:** rice, wheat, legumes, mustard, vegetables **Drylands:** Maize, mustard, legumes, lentils	**Irrigated lands**: rice, wheat, lentil, potato **Drylands**: Maize, finger millet, wheat, mustard	Potato, buckwheat, barley	

(Source: Khanal, 2018)

The economic development of Nepal highly depends on the agricultural sector as this provides livelihoods to about 60% of the total population and contributes 32.4% to the country's GDP (MoALD, 2018; Dahal. 2020). However, the growth of agriculture has been very discouraging in recent decades (MoF, 2014). The data shows that Nepal was self-sufficient with respect to agricultural production and met its national demand prior to 1980. But with increasing rates of youth migrating to foreign countries for employment and lack of labor within the country has compelled this once self-sufficient country to rely on imported foods from India, Bangladesh, and other South Asian countries. Nepal's productivity of major staple crops like rice, maize, and wheat has dropped in comparison to other South Asian countries (Joshi et al., 2012).

Along with other socio-economic factors, biophysical factors also contribute to low agricultural productivity in Nepal. Agricultural in Nepal relies heavily on rainfall and thus is vulnerable to weather-related stress, for instance erratic rainfall and drought, resulting in highly variable agricultural production. Additionally, low or early onset of the monsoon similarly devastates agricultural production in Nepal (MoALD, 2019). Overall, timely rainfall is crucial for agricultural production as only 54% of the cultivated land is irrigated (Khanal, 2018).

2.2.2 Climate Change Adaptation Initiatives in Nepal

Nepal has been working to combat climate change since 1992. Nepal ratified the UNFCCC in 1992, the Kyoto Protocol in 2005, and the Paris agreement in 2016 to show its commitment to tackling climate change. However, Nepal has also progressed beyond ratifying these international treaties, developing its own domestic adaption policies, as well (Khanal, 2018). Examples of these include the NAPA in 2010, a national climate change policy in 2011, and the LAPA framework in 2011 (Regmi et al., 2016a).

2.2.2.1 NAPA in Nepal

The NAPA was developed as a strategic policy tool to assess climatic vulnerability and to respond systematically to climate change by identifying appropriate adaptation measures. When the UNFCCC decided to financially support the Least Developed Countries to prepare NAPA, Nepal began developing NAPA through its Ministry of Science Technology and Environment. The NAPA document included six thematic working groups – agriculture and food security, forests and biodiversity, water resources and energy, climate induced disasters, public health and urban settlements, and infrastructure (MoE, 2010) – and was developed to ensure Nepal's eligibility for funding from the UNFCCC (Ojha et al., 2016). The six thematic working areas served as a basis for the development of an adaptation strategy thataims to help ensure funding

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for implementation of adaptation activities from "various global, multilateral and bilateral sources" (GON, 2010).

The NAPA aims to mainstream climate change adaptation into the national level development agenda, which is anticipated to contribute to poverty alleviation, diversification of livelihood, and enhancement of community resilience in the face of climate-related stress (GON, 2010). During the NAPA preparation process, actors working in the field of climate change realized the necessity of Local Adaptation Plans of Action for the effective implementation of NAPA (GON, 2011). Therefore, the LAPA preparation process was started in Nepal in 2012 in different areas of Nepal with financial support from the Global Environment Facility (GEF).

2.2.2.2 LAPA in Nepal

After the development of NAPA, LAPA was developed with the goal of assessing site-specific climate vulnerabilities and implementing NAPA's priorities (MoE, 2011). The LAPAs were designed to enable communities to understand changing climatic conditions and then develop adaptation priorities and implement them (Regmi and Karki, 2010). Chaudhary et al. (2014) states that the LAPAs help in identifying local adaptation needs and focusing on reducing local climatic risks and vulnerabilities, thus supporting the key thematic working areas identified in NAPA. Development of the LAPA framework followed a series of procedures that included "climate change sensitization, climate variability and adaptation assessment, prioritization of adaptation options, integration of adaptation priorities into a wider planning process, implementation of local adaptation plans and assessment of their progress" (MoE, 2011).

The LAPA has been implemented in 14 districts (out of 77 total in Nepal), including the proposed study area for this research (Regmi et al., 2016b). The LAPA initiative in Nepal was started as pilot project in 10 districts with the help of 8 national non-governmental organizations

and then scaled up to reach these 14 districts in the mid and far western regions of Nepal (Regmi et al., 2016b). The districts were selected based on their climate change vulnerability index that includes adaptive capacity, sensitivity and exposure of the particular district to climate change. (GON, 2011). Within the district, wards of municipalities are the smallest administrative unit recognized for the development planning, and the most vulnerable municipalities and wards within each district were selected for LAPA implementation (Maharajan, 2019).

Implementation of LAPA shows the active interests of Government of Nepal in reducing climate change impacts through planned adaptation. Some of the barriers identified for adapting to climate change at the community level in Nepal are lack of irrigation facilities, limited access to information and opportunities to enhance environmental awareness, insufficient knowledge of new crop varieties and training in organic farming, lack of well-organized social groups, and insufficient credit facilities (Biggs et al. 2013; Gentle and Maraseni, 2012). In the absence of external support, individuals in the communities might adapt to climate change autonomously using short-term responses to extreme climate events which might prove to be a maladaptation in the long run (Raymond and Robinson, 2013). In this scenario, implementation of LAPA is likely to help to fill the gap between autonomous and planned adaptation, thus reducing the risk of maladaptation (Regmi et al., 2016a).

However, LAPAs have been criticized for following a top-down governance approach and being overly technocratic and externally influenced by donor agendas (Nightingale, 2016; Ojha et al, 2016; and Regmi et al., 2016a). It has also been argued that the LAPA efforts failed to incorporate the voices of vulnerable people and that "LAPA documents are actually cut and paste versions of generic template provided by donor projects, as local NGOs and consultants aim to maximize targets tied to the aid money" (Ojha et al., 2016, p 12). In this research, I examine

these critiques by quantitively evaluating the effectiveness of LAPA in reducing climate change

vulnerability and assessing the extent to which the existing LAPAs have impacted the

communities and households in which they have been implemented.

2.3 History of Caste System in Nepal

Many previous studies have shown that planned adaptation planning in Nepal has

reinforced the existing vulnerability rather than reducing it because the adaptation plan like

LAPA does not address the existing inequities based on caste, class and gender and also does not

address the power differential that exists between different groups. But what is still unknown is

which particular components, for instance social network, infrastructure, livelihood strategies,

food or water contribute the most to vulnerability. This study would compare the value of

different components between Brahmin and Dalit groups which would help to identify where to

focus on beyond addressing existing social inequalities on LAPA Plan to reduce the climate

vulnerability of Dalit group. Here, I will briefly discuss about the history of caste system in

Nepal and their current socio-economic coditions.

The concept of the caste system supposedly entered Nepal for the first time in the

Licchavi dynasty (300-450 A.D). The Licchavis, specifically, the Guptas identified themselves

as Kshatriyas (Chhetri) and brought Brahman from the southern part of Nepal or India as their

personal priests (Bista, 1994). This was the introduction of the caste system, though at that time

the designations of "Brahman" and "Chhetri" were the only categories and overall did not impact

the social organization of society (Bista, 1994, p.35). However, over time there were multiple

historical events that legitimized the caste system in Nepal and shifted the structure of society

towards the practice of caste-based discrimination. One of these events was the development of

the Muluki Ain (the National Civil Code) introduced during the Rana regime in 1854 by the

Rana Prime Minister, Junga Bahadur Rana. This National Civil Code divided the society into "four-fold caste hierarchy based on division of labor as follows: Brahmin (priests and leaders), Chhetri (rulers and warriors), Vaisyas (merchants and traders) and Sudra or Dalit (servant and labors)" (Bhattachan et.al, 2009, p.2; Kharel, 2010). Today, while the officially sanctioned caste system is no longer part of national policy, caste-based prejudice and discrimination and their historic effects linger on.

2.3.1 Status of Dalit in Nepal

The 2011 census in Nepal showed that the number of people of Dalit heritage comprise 13.6 percent of the country's total population, or 3.6 million people (CBS, 2011). Around half of the Dalit population live below the poverty line (defined as those who earn less than $ 1.90 a day). The majority of Dalit people are either landless or have very unproductive land, and their life expectancies, literacy rates, per capita income, educational attainment and human development indices are lower than the national average (World Bank, 2006). Different terms have been used by academicians, governments, and international aid agencies to characterize Dalits, including untouchable, low caste, downtrodden, exploited, excluded, marginalized and disadvantaged (Bhattachan et.al, 2009, p.3). However today, the term Dalit is used to fight against inequality and should be used as long as discrimination based on caste exists in the country; the term should also be accepted universally to secure Dalit Rights (World Bank, 2006). The National Dalit Commission in Nepal has identified 22 Dalit castes, out of which 5 are from the hilly regions and 17 are from the southern plain region (Terai) (Bhattachan et al., 2009).

Table 2. Socioeconomic Conditions of the Dalit

Socioeconomic Condition	Dalit Group	National Average
Poverty	42%	23.80%
Literacy	49%	59%
Life Expectancy	67.17 years	68.8 years
Professional and technical employment	1.40%	6.10%
Human Development Index	Hill Dalit: 0.446 Terai Dalit: 0.400	0.49
Landlessness (Possession of Agricultural Land)	Hill Dalit :15% Terai Dalit: 55.1%	22.10%
Population living in good house	11.10%	28%
Population using latrine	Hill Dalit: 30.6% Terai Dalit: 5.5%	41.70%
Population using LP Gas/Biogas	Hill Dalit: 15.4% Terai Dalit: 13.3%	23.4%

Source: (Asian Dalit Rights Forum, 2015)

Some progress has been made to eliminate this caste-based discrimination at the national level. For instance, the Government of Nepal established the National Dalit Commission in 2002 with the aim of formulating polices to eliminate caste-based discrimination. Similarly, the government of Nepal passed the Caste-based Discrimination and Untouchability Act of 2011 and the Nepal Excluded, Oppressed, and Dalit Class Development Committee with the objective of promoting and protecting the rights of Dalit people (Gandhari, 2013, p. 18). Moreover, Nepal has signed the International Covenant on Civil and Political Rights (ICCPR) and the International Convention on the Elimination of all forms of Racial Discrimination (ICERD). To ensure political representation and representation in bureaucratic bodies, the Government of Nepal has mandated quotas for Dalits in many employment and education sectors and local elected government bodies (Gandhari, 2013). However, the caste system was legally abolished in 1963 by King Mahendra and caste-based discrimination was criminalized, especially

untouchability, but such discrimination continues at grassroot levels, especially in rural parts of the country (Bhattachan et.al, 2009).

2.4 Theoretical Framework

2.4.1 Vulnerability

The term vulnerability was originally derived from the field of geography and disciplines in which natural hazards are examined (Füssel, 2007). This concept, however, has been gradually adapted as a research framework in various disciplines, such as anthropology, environmental sociology, ecology, economics, development, and poverty (Adger, 2006). As a result, there are multiple definitions of vulnerability with limited consensus on the meaning of the term (Pandey and Bardsley, 2015). For example, the risk-hazard framework conceptualizes vulnerability as the interaction between external physical hazards and/or disasters and their negative impact on regional systems (Burton, 1997). However, Newell et al. (2005) defined vulnerability as the exposure of individuals or groups to stressors that impact their livelihoods and which can be initiated by socio-economic, political, or environmental change, combined with limited structures and adaptation assets to overcome those stressors (Chambers, 2006).

In the context of climate change, the concept of vulnerability has typically been understood as the state of susceptibility of individuals or groups to exposure to external stressors; for instance, environmental and social change that leaves individuals and/or communities with an inadequate capacity to adapt (Brooks 2003; Pandey and Bardsley, 2015). The IPCC has developed a holistic approach to studying climate change vulnerability which takes ecological, biophysical and social vulnerability into account (Gentle et al., 2014). According to the IPCC, vulnerability is "a function of the character, magnitude, and rate of climatic variation to which a system is exposed, its sensitivity, and its adaptive capacity" (IPCC 2014, p. 995). Explaining

further the definition given by IPCC, sensitivity refers to the degree to which the systems are impacted by the exposure – for example, with respect to water, food and healthcare. Exposure means the duration and magnitude of climate-induced disasters and variability; for instance, the extreme rainfall and temperatures to which a system is exposed that often lead to drought, flooding, and landslides. And adaptive capacity refers to the capacity of the system to overcome these stressors, mainly through diversified livelihoods and socioeconomic assets (Gentle et al., 2014). Adger (1999) and Gentle et al. (2014) argue that exposure is mainly defined by geographical location rather than the characteristics of the individual and society, whereas adaptive capacity depends on socio-economic factors such as income level, gender, and ethnicity (Ribot, 2010).

Therefore, the definition of vulnerability to be used in this research refers to household exposure to the stressors caused by both climatic as well as non-climatic factors that may affect a household's livelihood and well-being, and the capacity to potentially overcome these impacts (Adger, 2000; Pandey and Bardsley, 2015). Various methods and tools have been developed to analyze and quantify livelihood vulnerability and adaptation strategies (Gentle et al., 2014). Many of the analyses are based on the IPCC's definition of vulnerability, i.e., a function of sensitivity, exposure and adaptive capacity (Ebi et al., 2006; Hahn et al., 2009; Panthi et al., 2016). Here, I use the approach developed by Hahn et al (2009).

2.4.2 Concept of Livelihood Vulnerability Index

The Sustainable Livelihood Approach developed by Chambers and Conway (1992) looks at five types of household assets: social, natural, financial, human, and physical capital. This approach has been extensively used in designing development programs at the community level (United Nations General Assembly, 1997). The sustainable livelihoods approach has been

successfully used in assessing the capability of households to survive socio-economic disruptions like civil war or epidemics (Chambers and Conway, 1992). However, Hahn et al. (2009) argued that sustainable livelihood approaches have limited capacity to address the issues of sensitivity and adaptive capacity to climate change, and also fail to integrate climate exposure in order to completely evaluate livelihood risks arising from a changing climate. Thus, to improve upon this approach, Hahn et al. (2009) used the concept of sustainable livelihoods and integrated climate exposure components to develop the Livelihood Vulnerability Index (LVI) as a composite index.

This research uses the concept of the LVI developed by Hahn et al. (2009) to assess the impacts of climate change on smallholder farmers in two wards of two different rural municipalities (one in which a LAPA has been implemented and another in which it has not) of the West-Rukum district in Nepal. This vulnerability index is calculated using nine major components as described in table 3 This index was originally developed by Hahn et al. (2009) and has been applied in diverse contexts. For example, Shah et al. (2013) applied the LVI in the wetland communities of Trinidad and Tobago; Baffoe and Matsuda (2018) applied this index in rural households of Ghana; and Panthi et al. (2015) applied this approach on mixed agro-livestock smallholders in Nepal. This approach has since been modified by different researchers to make it more relevant in their local contexts. For example, Panthi et al. (2015) replaced some of the sub-components to make them more relevant to smallholder famers in Nepal, and Baffoe and Matsuda (2018) added institutional influence into the framework for Ghana.

2.4.3 Livelihood vulnerability index: IPCC framework approach (LVI-IPCC)

In addition to LVI, this research applied an alternative method developed by Hahn et al. (2009) for measuring the LVI that takes into account the IPCC vulnerability definition which highlights exposure, adaptive capacity and sensitivity. Socio-demographic profile, livelihood

strategy, social network, and infrastructure will be classified under 'adaptive capacity'; climate variability and natural disasters under 'exposure'; and water, food and health sectors under 'sensitivity'.

The same sub-components which are used to calculate the LVI to will be used to calculate the LVI-IPCC. This differs from the LVI in that this index merges major components into different categories like exposure, sensitivity and adaptive capacity.

$$CF_c = \frac{\sum_{i=1}^{n} W_{mi} M_{ci}}{\sum_{n=1}^{n} W_{mi}}$$

Here, CF_c is one of the contributing factors to the LVI-IPCC (either exposure or sensitivity or adaptive capacity) for community c, W_{mi} represents the relative weight of one of the major components, and M_{ci} is the major component for community c indexed by i. After calculating the contributing factors, exposure, sensitivity and adaptive capacity, the vulnerability will be calculated using the following formula:

LVI-IPCC = (exposure - adaptive capacity) * sensitivity

Table 3. Major components and subcomponents, information sources and their functional relationship with vulnerability (adopted from Hahn et al., 2009 and modified by Panthi et al. 2015)

Vulnerability factors	Major components	Sub-components	Data source	Functional relationship
Adaptive capacity	Socio-demographic profile	Percentage of dependent people	Survey	Higher percentage reflects less capacity to adapt
		Percentage of female headed households	Survey	Women headed HHs typically have less adaptive capacity
		Percentage of HHs where head of household has not attended school	Survey	Education makes people more aware and able to adjust to environmental change
		Percentage of HHs not knowing the term climate change	Survey	People knowing the term climate change are more aware of its negative impact and adopt adaptation strategies
	Livelihood strategies	Percentage of households with family members not working in different community/country	Survey	Income diversification increases adaptive capacity
		Percentage of households who depend entirely on agriculture for their livelihood	Survey	Income diversification increases adaptive capacity
		Average agricultural livelihood Diversity Index	Survey	HHs that farms, raises animals, and collect natural resources have high adaptive capacity
		Average livestock Diversity Index	Survey	HHs that raise different types of animals have high adaptive capacity
	Social network	Percentage of households not having any form of communication (Mobile/TV/Radio)	Survey	Communication and media make people aware of hazard occurrence and preparation
		Percentage of households that have not visited a local government office for help (e.g., Veterinary, agriculture and forestry)	Survey	The services enhance adaptive capacity
		Percentage of households that have not visited local market or local government to purchase seed/seedlings	Survey	The services enhance adaptive capacity
		Percentage of households who are not member of any organization (Agricultural group/Forest User Group/Cooperative)	Survey	Access to finance(cooperative) and information sharing increase adaptive capacity
		Percentage of households who have not lent money to relatives in the past year	Survey	High amount of borrowing indicates financial stress, less capacity to adapt
	Infrastructure	Percentage of households not having access to water from irrigation canal during dry season	Survey	Access to infrastructure increases adaptive capacity
		Percentage of HHs not adopting any technique to harvest rainwater to use during lean period	Survey	Access to infrastructure increases adaptive capacity
		Percentage of households not adopting any machinery to assist with labor in the farm	Survey	Access to infrastructure increases adaptive capacity
		Percentage of households not planting drought tolerant crop varieties	Survey	Access to infrastructure increases adaptive capacity
		Percentage of households not having access to farming inputs (e.g., pesticide and fertilizer)	Survey	Access to infrastructure increases adaptive capacity

Sensitivity	Health	Average time to reach to the nearest health facility	Survey	The shorter the time the less vulnerability
		Percentage of households with family members with chronic illness	Survey	Family with illness are sensitive to climate change
		Percentage of households where a family had to miss work or school in the last 2 weeks	Survey	Assess how illness impacts households, higher percentage represents higher sensitivity
	Food	Percentage of households entirely dependent on family farm for foods	Survey	High sensitivity because of limited supply of food
		Average number of months family struggle to find food	Survey	More months implies higher sensitivity
		Percentage of households that do not save seeds for next year	Survey	Seed not saving for next year implies higher sensitivity
		Percentage of households that sell crop to the local supplies	Survey	More selling means less sensitivity
		Average crop diversity Index	Survey	Diverse crop implies less sensitivity
	Water	Percentage of households that collect water from natural source	Survey	Family depending on natural water resource are more sensitive
		Percentage of households reporting conflict with other community members related to water	Survey	Assess the level of water scarcity in the community. Higher the conflict higher the sensitivity
		Average time to reach the nearest water source	Survey	Higher the time higher the sensitivity
		Percentage of households that do not have consistent water supply	Survey	Having consistent water supplies implies low sensitivity
Exposure	Natural Disaster	Average number of flood events in the past 5 years	Survey	More events imply higher exposure
		Average number of landslides events in the past 5 years	Survey	More events imply higher exposure
		Average number of drought events in the past 5 years	Survey	More events imply higher exposure
		Percentage of households that did not receive warning about the recent natural disasters before they occurred	Survey	More reflects higher exposure
		Percentage of households with an injury or death as a result of natural disasters in the past 5 years	Survey	More reflects higher exposure
	Climatic variability	Mean Standard deviation of the monthly average of average maximum daily temperature in 5 years (years: 2015-2019)	DHM	More variability implies higher exposure
		Mean Standard deviation of the monthly average of average minimum daily temperature in 5 years(years:2015-2019)	DHM	More variability implies higher exposure
		Mean standard deviation of monthly average precipitation (years: 2015-2019)	DHM	More variability implies higher exposure

2.4.4 Power

Power and politics influence individual, community, and institutional access to resources and decision-making. Power can determine the success or failure of climate change adaptation programs as well as efforts to reduce climate vulnerability (Adger and Kelly, 1999; Eriksen et al., 2011). Differential impacts of climate change have been noted by many scholars with poor and vulnerable households in the community being hardest hit by the climate change(Adger, 2003; Gentle and Maraseni, 2012).Furthermore, adaptation policies like LAPA developed to minimize the differential impacts are found to be exacerbating vulnerability due to unequal distribution of resources resulted from power differentials that exist in communities(Nightingale, 2017) Though the LAPAs require the participation of vulnerable people in the planning and identification of activities to be implemented, along with the decision-making process (Regmi et al., 2014), these LAPAs may still fail to sufficiently address the informal modes of power that result through gender discrimination and casteism and can influence the formal process of participation. Nagoda and Nightingale (2017) also highlights the influence of power in decision making in climate change adaptation planning process. One interviewee from a Dalit household stated "It is a waste of time (to go to these meetings), these people (high caste people) are not interested in listening to us. A female member of a user committee said, the men don't pay attention to the women anyway, so I would rather work on the fields than go to the meetings" (Nagoda and Nightingale, 2017: 89).

Though there are multiple concepts that provide a theoretical foundation to analyze power ((Lachapelle et al., 2004), this study uses the framework developed by Agrawal and Ribot (1999) and their tangible definition of power as "the ability to influence processes by which individuals create rules, make decisions, implement and ensure compliance, and adjudicate disputes" (Lachapelle et al., 2004).

How benefits will be shared largely depends on the interaction between "actors, power and accountability" (Ribot & Agrawal, 1999). Moreover, benefit sharing is also dependent on the social situation and related institutional arrangements in which power is exercised (Lachapelle et al., 2004). The unequal distribution of power which Agrawal and Gibson (1999) define as asymmetrical power distribution situations in which one group of actors control the context or "access to information and knowledge" for the others (Ostrom, 1997). Exploiting a power asymmetry may then result in a distributional advantage to the powerful people over those with less power (Lachapelle et al., 2004).. Gilmour and Fisher (1992) and Agrawal and Gibson (1999) suggest that asymmetry of power that exists through informal modes "make the poor worse off," thus allowing the "elite groups within the community to consolidate their own positions."(Agrawal and Gibson, 1999, p.639). This study uses the concept of power differential and asymmetry of power to determine how this power differential affects the outcome of the adaptation interventions.

2.5. Hypotheses

Based on the theoretical framework outlined above, I propose the following hypotheses:

1. The Livelihood Vulnerability Index (LVI) in LAPA implemented areas will be less than in LAPA non-implemented areas.

2. Elite and powerful people have benefitted most from the implementation of LAPA activities in their communities.

CHAPTER THREE: Methodology

3.1 Introduction

This chapter highlights the methodological approach used for this thesis. Specifically, I will describe the study area and my justification for selecting this particular area and summarize the techniques I adopted for data collection and data analysis Then I briefly discuss the ethical considerations that came up during the research process and how I chose to resolve them.

Researchers generally use two approaches to generate new knowledge, namely etic (deductive) or emic (inductive) approaches (Tracy, 2020). In inductive, emic approaches, researchers start with observing particular interactions without pre-set external theories; in other words, they "conceptualize general patterns from these observations, make tentative claims and draw conclusions that build theory or create an interesting story" (Tracy, 2019, p. 27). In deductive, etic approaches, on the other hand, researchers come up with a "broad or general theory," set a hypothesis or "make an educated guess" about the social world based on that theory and then collect data to test the hypothesis and use the "evidence gathered from that research to confirm or disconfirm the original theory" (Tracy, 2019, p. 7).

For this particular study, I chose to employ a deductive approach where I as the researcher came up with hypotheses based on previous similar studies and existing theory and collected data from the field to find support or lack of support for the theory in this particular context. First, to analyze the effectiveness of the LAPAs in reducing climate change vulnerability, I used a quantitative approach. Specifically, I collected quantitative survey data that was then used to calculate the livelihood vulnerability indices for two different communities – one in which a LAPA has been implemented and another which does not yet have an implemented LAPA). Similarly, to understand whether LAPA benefitted different socio-economic groups differently within the LAPA implemented communities, qualitative data were

collected which can provide "descriptive information from the experiences and knowledge of those people involved in the LAPA preparation and implementation process" (Silwal, 2018: 29). The qualitative approach was intended to supplement the quantitative data as it focused on hard-to-measure aspects of knowledge, personal experience, and the opinions and beliefs of the respondents, which particularly helps to answer the "why" and "how" parts of social research – in this case within the LAPA planning and implementation process and its impacts on households (Jackson et al., 2007).

Stokes (2017) defined research methods as a set of specific tools and techniques to gather data using specific research methodology. For this research, I used mixed-methods to collect data from the field: quantitative data from a household survey draw out correlations between variables, and those are then followed up with in-depth interviews (Nightingale, 2003).

Nepal was under lockdown due to COVID-19 from April-August 2020 followed by a partial lockdown which allowed the movement of only COVID negative people in private vehicles. Finally, after the long wait, my research assistant in Nepal was finally able to collect the field data I needed for my research project. These data were collected from October 1 to October 15, 2020 – a short period of time that was necessary in order to finish before Nepal's greatest festival, Dashain, began, since public health experts predicted that COVID-cases would surge after the festival, which falls in the last week of October.

3.2 Study Area

After the promulgation of a new constitution in 2015, Nepal adopted a new federal structure that divides the country into 77 districts and 753 local government units, out of which 460, 276, 11 and 6 are rural municipalities, municipalities, sub-metropolitan and metropolitan cities respectively (Dahal, 2020). The final project design report of the ASHA project (see section 4.4 for a detailed description) identified six districts as its working area (IFAD, 2014). But the new

federal structure divided Rukum into two districts: East-Rukum and West-Rukum. This study considers East and West-Rukum as separate two districts and hereafter considers seven districts as working areas of the ASHA project. For this study, West-Rukum and its two rural municipalities were selected for data collection.

West-Rukum is one of the seven districts where the International Fund for Agricultural Development has been supporting the Adaptation for Smallholders in Hilly Areas (ASHA) Project and where LAPA has been implemented as part of this project. Initially, I selected Jumla district to evaluate the LAPA implemented by Nepal Climate Change Support Program (NCCSP) from 2013-2017. However, due to the COVID-19 pandemic, I could not travel to Nepal myself and the research assistant I hired had poor connections with the local people and the district-level agencies in Jumla district. This made it very difficult to collect data in Jumla due to the health risks related to COVID-19 and the physical risks of roaming a community where local people met outsiders with suspicion, especially those coming from Kathmandu, the capital city, where COVID-19 was peaking during data collection.

As the primary researcher, when I was prohibited from traveling to Nepal, I decided to choose a research assistant from Nepal, and he helped select the West-Rukum district because he had colleagues from the Institute of Forestry (where I completed my undergraduate degree) who worked at the Divisional Forest Office (DFO). Colleagues from the DFO helped with field coordination for data collection within this short time period. This district was also a suitable study site choice because it had been working on LAPA planning and implementation since 2016, and implementation of those LAPA plans has been completed in some of its communities (it is still going on in a few others). Two communities from two different rural municipalities within the West-Rukum district were also selected for the study.

This district is also appropriate for this research due to its vulnerability categorization which is based on drought risk, flood and rainfall-temperature vulnerability indices. According to these measures, West-Rukum is classified as a "moderately vulnerable" district while in terms of adaptive capacity, socio-economic status, technology, and infrastructure adaptation capability indices, West-Rukum is categorized as having "low adaptive capability" (Ministry of Environment, 2010). This makes West-Rukum well-positioned for this research because of the presence of households with low adaptive capacity thus allowing me to evaluate the effectiveness of adaptation intervention in increasing adaptive capacity and decreasing climate vulnerability of the community using LVI.
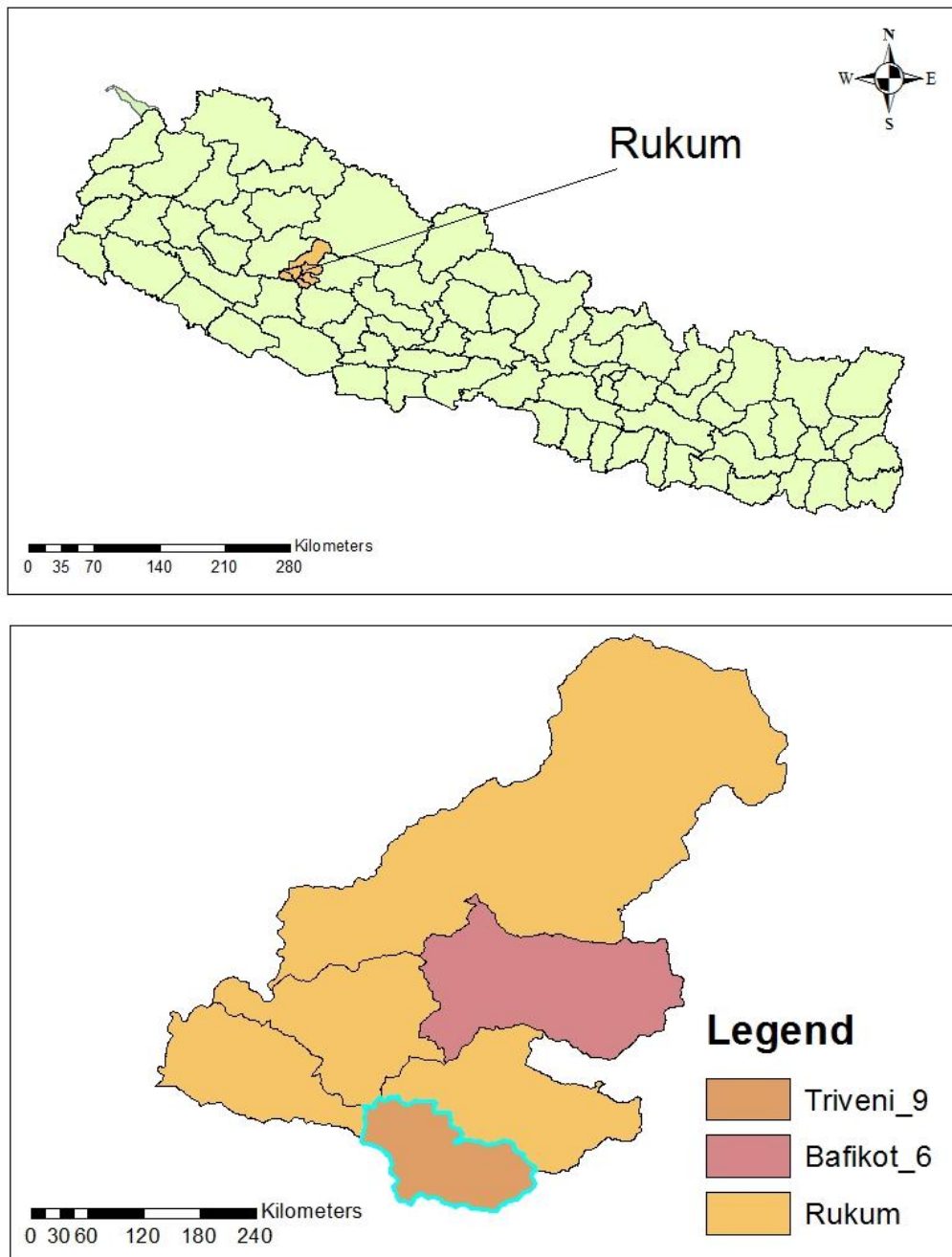
Figure 1. Map showing the study area; the upper one shows Rukum's location within Nepal and the lower one shows the two rural municipalities within Rukum district included in this study. Triveni is the LAPA-implemented community and Bafikot is the LAPA non-implemented community.

West-*Rukum*

West-Rukum is one of the most remote and underdeveloped districts in Nepal, with a human development index of 0.431 (Nepal's average is 0.490) and its highest poverty index of 39 (average is 31.12) (UNDP, 2014). The remoteness of the district is characterized by poor infrastructure, such as roads, schools, electricity, hospitals, and its limited access to financial services and markets. With respect to food and economic security, the majority of people in West-Rukum are dependent on subsistence agriculture and wage labor from seasonal migration to India for work. Aside from rice, other common crops are barley, potato, maize and millet (MoAD, 2015).

3.3 Ethical Approval

The Institutional Board Review (IRB) at Idaho State University approved the field survey questionnaire and instruments after review of the necessary ethical requirements for conducting research on human subjects. All research respondents that participated in either the in-depth interviews and/or the survey were promised anonymity, so all identifying information was removed before analysis. The data is stored in researcher's computer with password protection. I removed the name of the respondents for anonymity and labeled their name as V1, V2, V3 and V4(representing different vulnerability status) along with different codes for castes for the analysis of the data. The IRB approval and consent form are presented in Appendix 2.

3.4 Research Method

3.4.1 Interviews

Interviews are the most commonly used data collection techniques for qualitative research. I developed an open-ended questionnaire to collect information about respondents' experiences and knowledge about the LAPA planning and implementation processes (for the full questionnaire, see Appendix 1.2), and my research assistant conducted the interviews with

beneficiaries of LAPA, representatives from the LAPA team and DFO, and the ward chairperson. We used a purposive sampling method to identify respondents for the interviews from a list of the 450 households in that community according to the official LAPA lists, and then divided them into four different vulnerability categories (coded as V1 (least vulnerable), V2, V3, V4 (most vulnerable) based on their assets (type and size of land), annual household income, and exposure to disasters. For this study, households coded V1 or V2 were then categorized as non-vulnerable (or less vulnerable) and households coded V3 or V4 are categorized as vulnerable households. We then interviewed 11 participants in different vulnerability categories and with different leadership positions as shown in Table 4.

Table 4. Participants for in-depth interview

Respondent Category	Affiliation	Number of participants
Vulnerable	LAPA Beneficiaries	4
Non-vulnerable	LAPA Beneficiaries	4
LAPA Coordinator	ASHA Project	1
DFO Representative	DFO	1
Ward chairperson	Local Level Government	1

3.4.2 Household Survey

We also employed a household survey (see Appendix 1.1 for full list of questions) to collect quantitative data to estimate the livelihood vulnerability index of each community. The LAPAs categorize households into four different vulnerability groups (as mentioned in the Interview section, 3.5.1). We used stratified random sampling to ensure equal representation among people from different vulnerability groups in the survey. The survey was conducted face-to-face that allowed researcher to read the body languages of respondents. In total, the survey includes 80 respondents: 40 from non-LAPA implemented communities and 40 from LAPA implemented communities. The survey focused on collecting data on diverse issues pertinent to

the operation of livelihood activities based on the livelihood vulnerability framework provided

by Hahn et al. (2009) and modified by Panthi et al. (2015). Specifically, we collected data on

nine broad components, including a socio-demographic profile of each household and its

associated livelihood strategies, along with measures of infrastructure, health, water, food, social

networks, natural disasters, and climate variability for each community.

3.4.3 Livelihood Vulnerability Index

We used the same mathematical approach developed by Hahn et al. (2009) to construct

LVIs for the households and communities. The LVI uses a simple approach of applying equal

weights to all major nine components (fully described in the Theoretical Framework section,

2.3.1). Each sub-component is measured on a different scale, so it becomes important to

standardize each as an index for comparability, which in this research we do using the same

technique employed by UNDP (2007) in constructing the Human Development Index with the

equation:

$$index_c = \frac{s_c - s_{min}}{s_{max} - s_{min}}$$

Where s_c represents the original sub-component for the community c, and s_{min} and s_{max} are the

minimum and maximum values, respectively, for each sub-component determined using data

from the survey for each community.

After each is standardized, the subcomponents are averaged using the equation below to

calculate the value of each major component:

$$M_c = \frac{\sum_{i=1}^{n} index_c \, i}{n}$$

In this equation, M_c is one of the nine major components for community c, the $s_c i$ represents the

sub-components, indexed by i, that make up the major component. Finally, the value for each

main component is averaged to get the value of the LVI.

$$LVI_c = \frac{\sum_{i=1}^{8} W_{mi} \, M_{ci}}{\sum_{i=1}^{8} W_{mi}}$$

3.4.4 Document Analysis

Beyond the data collected from the interviews and household survey, I also analyzed multiple documents prepared by the Government of Nepal, as well as the ASHA project, in order to triangulate the data. One of the key documents analyzed for this research was the Local Adaptation Plan of Action (LAPA) of ward number 9 of Triveni rural municipality. Similarly, I reviewed further policy documents related to the National Adaptation Program of Action (NAPA) (2010), the LAPA framework (2011) and the Climate change Policy (2011) to understand the Nepali government's adaptation strategies and policy priorities for tackling climate change.

3.5 Data Analysis

3.5.1 Quantitative data analysis

Data from the household survey was first checked in MS Excel and the LVI and LVI-IPCC were calculated using Excel. I then used Student's t-tests to assess whether any of the sub-components and/or major components differed between the LAPA implemented and non-implemented communities, as well as between the socio-ethnic Brahmin and Dalit groups.

3.5.2 Qualitative data analysis

For qualitative analysis, the researcher needs to have interpretive skills to extract the important meanings and evidence from the qualitative data (Yin, 2003). In this study, I began analyzing the collected data from the field by first translating and then transcribing it for the analysis using the qualitative data analysis software Atlas.ti. These qualitative data met the objective of research question two, i.e., how households with different socio-economic status

benefitted from the implementation of LAPA. I started with "primary cycle coding" or "line-by-line coding" where I assigned suitable words that can better reflect the meaning of that sentence or phrase (Tracy, 2020, p.219). And in secondary-cycle coding, I again carefully examined the codes that I identified in primary-cycle coding to develop concepts or themes. After organizing and synthesizing codes from the primary-cycle coding, I developed key themes like participation, decision making, benefits from adaptation interventions and satisfaction towards LAPA which are very relevant for the objective of this research. I then selected relevant quotes from the interviewees to cite in the results and discussion sections, which help to support or contradict the roles of poor and vulnerable households in LAPA planning and implementation process, specifically to analyze the theory of power highlighted in the theoretical framework section.

CHAPTER FOUR: Results

4.1 Introduction

In this chapter I will discuss the LAPA planning and implementation processes carried out in West-Rukum District. In addition, I will discuss the effectiveness of LAPA in reducing climate change vulnerability in the LAPA-implemented community (hereafter represented as Triveni) compared to the non-LAPA-implemented community (hereafter represented as Bafikot). Additionally, I analyze socio-cultural vulnerability status using average LVI measures associated with different castes. Findings are based on the household survey conducted with 81 households in two different communities in West-Rukum District.

4.2 Institutional arrangement for adaptation planning

Different Ministries, along with multiple donor organizations, have been involved in the LAPA planning process in Nepal. I will discuss the different institutions at various scales and their role in the planning and implementation of LAPA.

The Ministry of Science, Technology and Environment (MoSTE) was the first national level institution responsible for leading the overall climate change adaptation activities in Nepal (Silwal, 2016). Around 100 LAPAs were implemented in six western districts of Nepal under the leadership of MoSTE between 2011 and 2016. Similarly, around 200 LAPAs are currently being implemented under the project Adaptation for Smallholder in Hilly Areas (ASHA) in another seven western districts of Nepal. ASHA was implemented under the leadership of the Ministry of Forest and Soil Conservation with financial support from the International Fund for Agricultural Development (IFAD). For this research, I analyzed one of the 200 LAPAs implemented under the ASHA project to evaluate the effectiveness of the LAPA in reducing climate change vulnerability in communities.

Different institutions with specific roles and responsibilities have been established for the effective implementation of the ASHA project. For example, the Project Steering Committee (PSC) is set up at the national level and is chaired by the secretary of the Ministry of Forest and Environment (MOFE), which oversees the implementation of various projects.
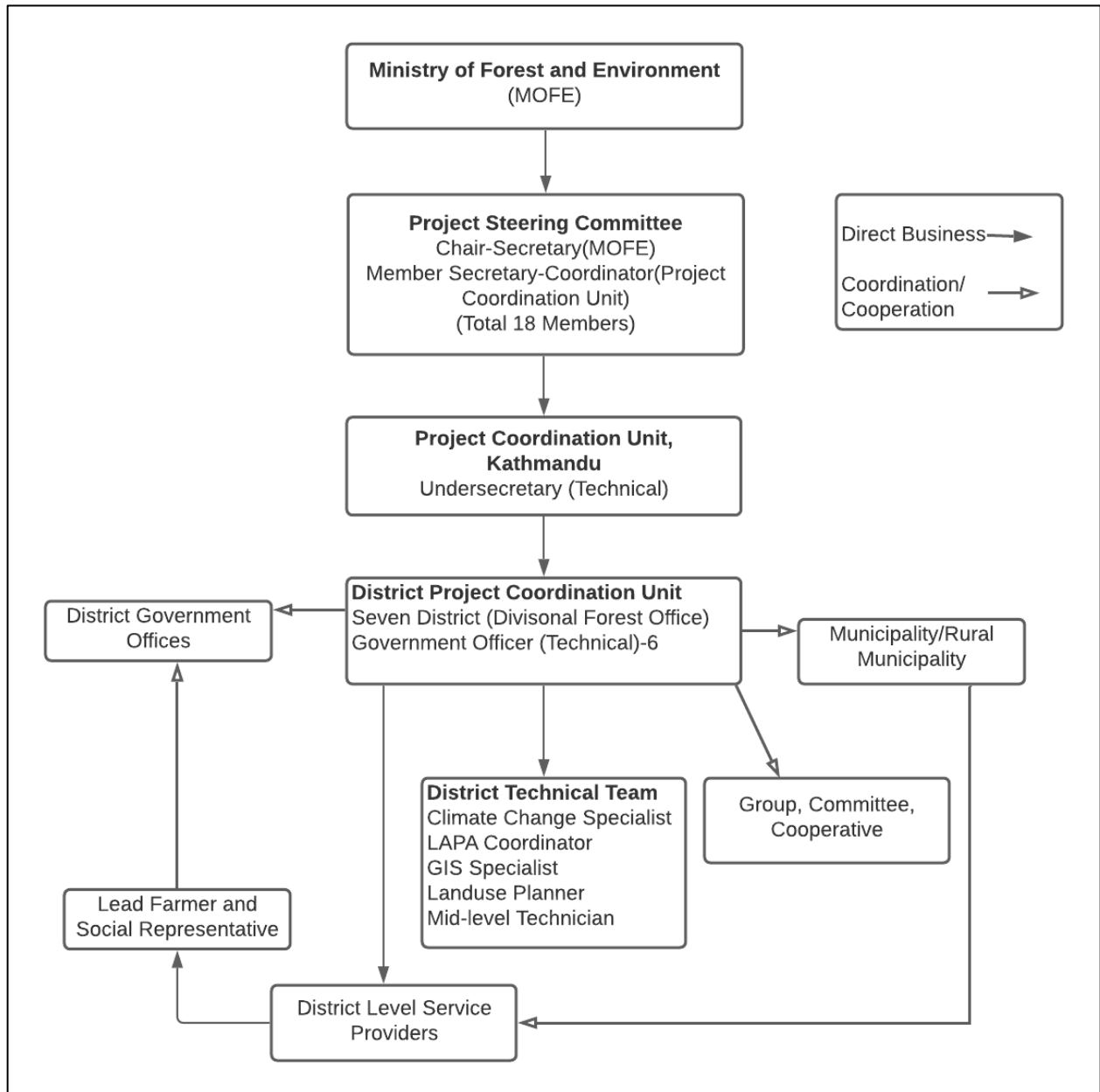
Figure 2. Institutional arrangement for the implementation of the LAPA associated with the ASHA Project (Source: https://asha.gov.np/about-project/who-we-are/)

LAPA is the first plan developed by the Government of Nepal to tackle the issues of

climate change at the local level. As per the Government of Nepal, LAPA "should be prepared

and implemented taking into consideration the sector and location, resource availability and

distribution system, community access to public services and facilities, and region and areas

affected by climate change" (GON, 2011, p.1). In contrast, NAPA was designed at the local level

to help the formulation of local adaptation plans that meet the basic adaptation needs of climate

vulnerable communities; it also seeks to integrate these policies at the local level.

As identified in its framework, the preparation of LAPA involves seven major steps.

LAPA starts with the sensitization process which aims to raise awareness of each community's

people on the issues of climate change and its likely impacts, and then identifies potential local

solutions to those impacts and some potential institutions that may aid in implementation. The

second step, "vulnerability and adaptation assessment" is the most important step and aims to

identify the most climate vulnerable households, settlements, and communities within the VDC.

In this phase, each household is divided into one of the four vulnerable categories, V1, V2, V3,

and V4 based on their income, amount of land, involvement in other business beyond

agriculture, and exposure to natural hazards like floods, landslides and drought. V1 means the

least vulnerable and V4 represents the most vulnerable household to climate change in the

community. And the next step is to identify the adaptation activities and prioritize them based on

the "urgency and the social, environmental, technological and economic costs and benefits"

(Silwal, 2016, p.42). The fourth step is the formulation of a LAPA plan and is based on the

prioritized adaptation activities identified in step three. Then, LAPA is integrated at the local

level – that is, at the development planning of a Rural Municipality. Implementation of

adaptation activities is the sixth step, which is done in coordination with other local level

stakeholders and service providers. The final step is the assessment of the implemented activities in reducing climate change vulnerability through monitoring and evaluation.

The ASHA project is helping in the preparation of 200 LAPAs in seven different districts. The specific goal for the whole project is to reach 100,000 direct beneficiaries and the outcomes from the project are expected to benefit 100,000 households by adopting at least one climate resilient agriculture practice; 25,000 households by adopting improved livestock rearing practices; 22,000 households adopting efficient water use techniques; and 7,500 households using renewable energy technologies (IFAD, 2014). However, there is no specific goal and expected outcome for each LAPA and hence this study utilizes LVI to evaluate the effectiveness of LAPA by comparing the LVI values between two different communities.
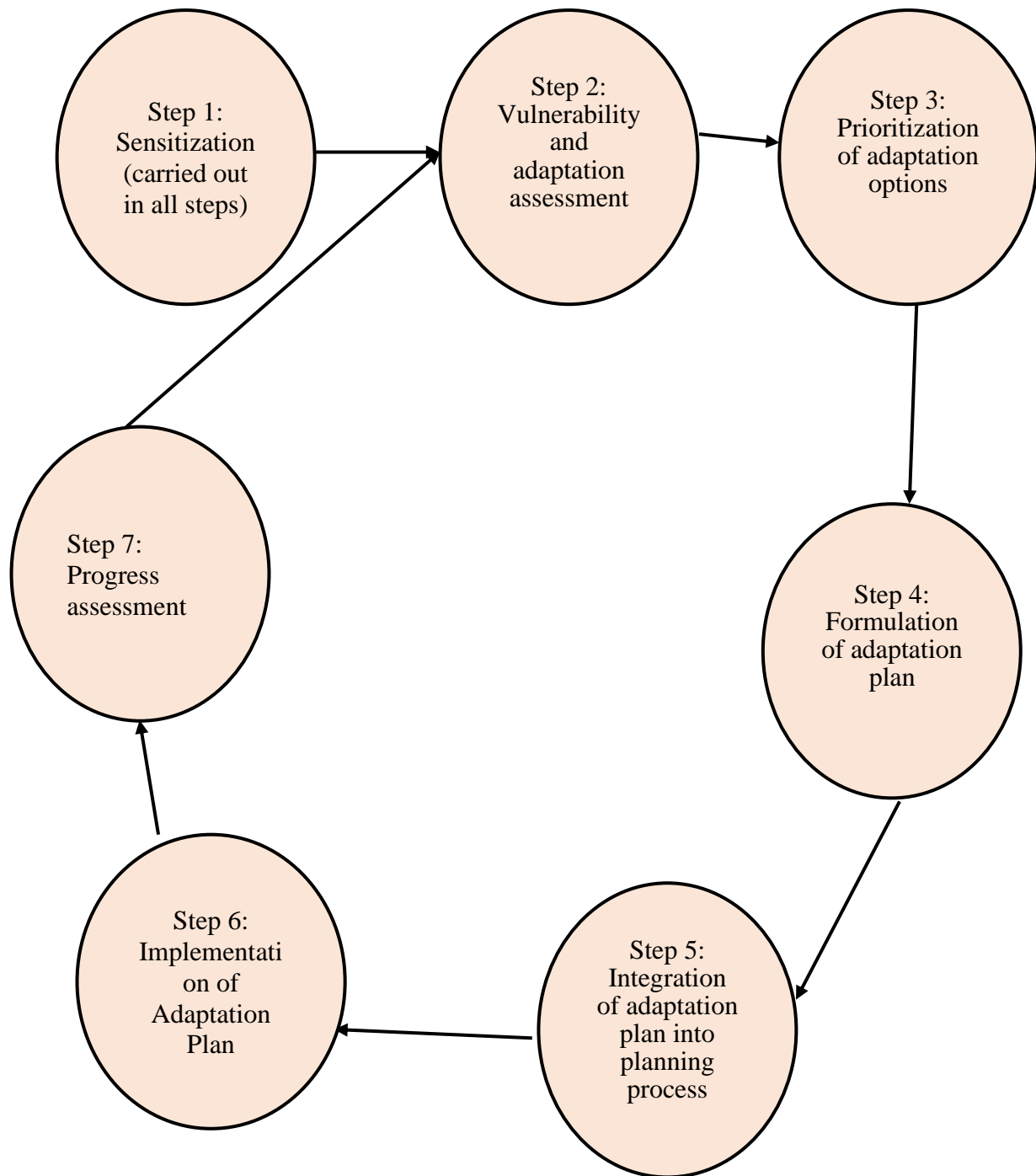
Figure 3. Steps of LAPA Preparation Process (GoN, 2011).

4.3 The Adaptation for Smallholders in Hilly Areas

  For this research, the LAPA prepared for Triveni by the ASHA project is evaluated for its effectiveness to reduce climate change vulnerability. The ASHA project implements climate change adaptation intervention in line with the National Adaptation Programme of Action (NAPA) in seven mid-western districts of Nepal, namely, Dailekh, Kalikot, Slayan, West Rukum, East Rukum, Jajarkot and Rolpa district. The ASHA project is guided by the Climate Change Policy (2011) and the National Framework on LAPA (2011) developed by the Government of Nepal. The intended objectives of the ASHA project are not only to ensure that planned adaptation activities are implemented to reduce the climate vulnerability of poor people in Nepal, but also to enhance the capacity of the government and non-government institutions to implement Nepal's Climate Change Policy (2011).

The ASHA project entered into force on 26 February 2015 with the objective of benefitting 100,000 households in 6 years, or by September 2021. The start-up phase began in 2016 with a pilot project in two districts and was later scaled up to four districts. Each LAPA has a fixed term of three years to be completed (IFAD, 2016). The project identified six districts based on the vulnerability index developed in NAPA where all 76 districts of Nepal have been categorized into five different vulnerability categories: very high, high, moderate, low, and very low. The MoFE is responsible for the overall implementation of the ASHA project in coordination with different Federal Ministries. The Project Coordination Unit at the national level (looked over by undersecretary at MoFE) which is under the project Steering Committee is responsible for overall supervision and operation of the project.

  Similarly, at the district level, the Divisional Forest Office is responsible for the implementation of LAPA in each Rural Municipality in close collaboration and coordination with other district level government offices. Six LAPAs have been prepared in two rural

municipalities of Rukum-West district. These rural municipalities were selected based on vulnerability mapping, which ranked the rural municipalities in four vulnerability categories: very high, high, medium and low. For this research, Ward-9 of Triveni rural municipality was selected which was categorized as "very high" vulnerability to analyze the effectiveness of LAPA in reducing that vulnerability.

The LAPA of Ward-9 of Triveni Rural Municipality was implemented from 2017 - 2020. The timeline for the LAPA planning process is shown in Figure 4.

LAPA Preparation Phase

2015 ○ Launch of ASHA Project

2016 ○ Agreement with Consultant for the preparation of LAPA

LAPA preparation in Triveni Rural Municipality with the technical support of LDG Foundation Private Limited

2017 ○ District level stakeholder's meeting (including district level government agencies, NGOs, and political representative) for the selection of Rural Municipalities

2017 ○ Vulnerability assessment in ward 9 of Triveni Rural Municipality with support of LDG Foundation (June 2017)

2017 ○ 3 days LAPA planning workshop at ward 9 of Triveni Rural Municipality

2017 ○ 3 year LAPA document (July 2017-June 2020) prepared by LDG Foundation and submitted to DFO

LAPA implementation through government (Divisional Forest Office) and different community based organizations

LAPA Implementation Phase

2017 ○ Identification of different service providers and community based organizations for implementation of LAPA

2017 ○ Year I implementation: July 2017-June 2018 (4 activities implemented)

2018 ○ Year II implementation: July 2018-June 2019 (16 activities implemented)

2019 ○ Year III implementation: July 2019-June 2020 (18 activities implemented)

2020 ○ LAPA term ends but 4 activities from 2019 continued in 2020 (July 2020)

Triveni Rural Municipality Ward-9

Figure 4. Timeline showing the LAPA planning and implementation phase in Ward-9, Triveni Rural Municipality.

4.4 Results from the Survey

4.4.1 Social Characteristics of the Respondents

The majority of the respondents were male, which accounted for 83% of the total respondents. This may have been because, as the survey was conducted during a peak time of COVID-19 in Nepal, many males who normally worked outside of their communities had temporarily returned back to their villages. Out of the 80 respondents, 43 belong to the Brahmin/Chhetri/Thakuri, 19 are Janajati, and 18 belong to Dalit caste. Around 21% of the respondents were illiterate, which means they have not received any formal education; around 34% of the respondents completed their intermediate level which is equivalent to high school in the US. With respect to age, 80% of the respondents were between age group 20 and 60, with an overall age range of 17 and 78.

Table 5. Descriptive statistics for sample of respondents

Variable	Measure	Number	Percentage
Gender	Female	14	17
	Male	66	83
Caste/Ethnicity	Brahmin/Chhetri/Thakuri	43	54
	Janajati	19	24
	Dalit	18	22
Education	Illiterate	17	21
	Literate	20	25
	Intermediate (High School)	34	43
	Bachelor's	8	10
	Master's	1	1
Age Group	20-60	64	80
	> 60	16	20

4.4.2 Livelihood Vulnerability Index (LVI) between LAPA-implemented (Triveni) and Non-implemented (Bafikot) Communities

The LVI value ranges from 0 to1 where 0 means least vulnerable and 1 represents the most vulnerable for each component and sub-component. The overall Livelihood Vulnerability analysis shows that Triveni -- the LAPA implemented community -- is slightly more vulnerable (LVI=.389) than Bafikot (LVI= 0.377). Triveni is found to be vulnerable in many of the major LVI components, including socio-demographic profile (0.301), livelihood strategies (0.335), infrastructure (0.815), and health (0.3111). Similarly, Triveni is less vulnerable to social networks (0.36), food (0.432) and natural disasters (0.315) in comparison to the non-LAPA community. However, the two communities are equally vulnerable with respect to water (0.16) and climatic variability (0.524). The result for the sub-components and major components are presented in Table 6 and Figure 9, respectively.

Table 6. Indexed components, sub-components, and overall LVI for Triveni and Bafikot

Major component[2]	Triveni	Bafikot
Socio-demographic profile	**0.30**	**0.28**
Percentage of dependent people	0.55*	0.66*
Percentage of female headed households	0.12	0.14
Percentage of HHs where head of household has not attended school	0.30	0.19
Percentage of HHs not knowing the term climate change	0.22	0.14
Livelihood Strategies	**0.33**	**0.25**
Percentage of households with family members not working in different community/country	0.70	0.56
Percentage of households who depend entirely on agriculture for their livelihood	0.45*	0.14*
Average agricultural livelihood Diversity Index	0.05	0.09
Average livestock Diversity Index	0.13	0.20
Social Networks	**0.36**	**0.41**
Percentage of households not having any form of communication (Mobile/TV/Radio)	0.00	0.00
Percentage of households that have not visited a local government office for help (e.g., Veterinary, agriculture and forestry)	0.47	0.52
Percentage of households that have not visited local market or local government to purchase seed/seedlings	0.22	0.34
Percentage of households who are not member of any organization (Agricultural group/Forest User Group/Cooperative)	0.40	0.51
Percentage of households who have not lent money to relatives in the past year	0.70	0.70
Infrastructure	**0.81**	**0.76**
Percentage of households not having access to water from irrigation canal during dry season	0.70	0.56

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[2] Bold and Italic represent major components followed by their respective sub-components

Percentage of HHs not adopting any technique to harvest rainwater to use during lean period	0.97	1.00
Percentage of households not adopting any machinery to assist with labor in the farm	1.00	1.00
Percentage of households not planting drought tolerant crop varieties	0.70*	0.51*
Percentage of households not having access to farming inputs (e.g., pesticide and fertilizer)	0.70	0.75
Health	**0.31**	**0.18**
Average time to reach to the nearest health facility	0.53*	0.26*
Percentage of households with family members with chronic illness	0.37	0.29
Percentage of households where a family had to miss work or school in the last 2 weeks	0.02	0.00
Food	**0.43**	**0.44**
Percentage of households entirely dependent on family farm for foods	0.57	0.34
Average number of months family struggle to find food	0.41*	0.54*
Percentage of households that do not save seeds for next year	0.20	0.14
Percentage of households that sell crop to the local supplies	0.62*	0.95*
Average crop diversity Index	0.34*	0.25*
Water	**0.16**	**0.16**
Percentage of households that collect water from natural source	0.30	0.17
Percentage of households reporting conflict with other community members related to water	0.20	0.39
Average time to reach the nearest water source	0.09	0.05
Percentage of households that do not have consistent water supply	0.07	0.02
Natural Disaster	**0.31**	**0.40**
Average number of flood events in the past 5 years	0.29	0.29
Average number of landslides events in the past 5 years	0.19	0.24
Average number of drought events in the past 5 years	0.48	0.55
Percentage of households that did not receive warning about the recent natural disasters before they occurred	0.57*	0.95*

Percentage of households with an injury or death as a result of natural disasters in the past 5 years	0.03	0.00
Climatic Variability	**0.52**	**0.52**
Mean Standard deviation of the monthly average of average maximum daily temperature in 5 years (years: 2015-2019)	0.40	0.40
Mean Standard deviation of the monthly average of average minimum daily temperature in 5 years(years:2015-2019)	0.61	0.61
Mean standard deviation of monthly average precipitation (years: 2015-2019)	0.55	0.54

Overall LVI

LVI: Triveni **0.39**

LVI: Bafikot **0.38**

[*] represents statistical significance at $p < .05$.

4.4.3 LVI-IPCC: Triveni versus Bafikot

The overall LVI-IPCC scores, which vary from -1 to 1, indicate that Triveni is more vulnerable than Bafikot. LVI-IPCC is calculated using adaptive capacity, exposure and sensitivity. The LVI-IPCC analysis shows that Bafikot has more adaptive capacity (0.612) than LAPA implemented community (0.532). Accounting for water, food and health, the result indicates that Triveni (0.314) is more sensitive to changing climate than Bafikot (0.286). However, it is found that Bafikot (0.45) is more exposed to climate change than Triveni (0.393). And the overall LVI-IPCC result shows that Triveni (-0.043) is slightly more vulnerable than Bafikot (-0.046).

A vulnerability triangle diagram and table that shows the value of adaptive capacity, exposure and sensitivity are presented in Table 7:

Table 7. LVI-IPCC contributing factors in Triveni and Bafikot

Contributing Factors	LAPA-implemented Community	LAPA non-implemented Community
Adaptive Capacity	0.532	0.612
Sensitivity	0.314	0.286
Exposure	0.393	0.45
Overall LVI-IPCC	-0.043	-0.046

4.4.4 Livelihood Vulnerability Index (LVI) between Brahmin and Dalit (based on caste hierarchy)

The overall analysis of the Livelihood Vulnerability Index shows that Dalit (O.445) is more vulnerable than the Brahmin (0.332). Dalits are vulnerable to all major components except to livelihood strategies and natural disasters in comparison to Brahmin. Dalit are highly vulnerable to socio-demographic profile (0.430), social networks (0.471), Infrastructure (0.871), health

(0.243), food (0.642) and water (0.251). Out of the 35 different sub-components, Dalit

households are only doing well on two of the subcomponents of livelihood strategies: X and Y.

And the statistical analysis shows that the two different caste groups are significantly different

with respect to socio-demographic profiles, livelihood strategies, social networks, and access to

food. The analysis also show the Dalit are more vulnerable regarding infrastructure, health and

water than Brahmin, though these components are not statistically significant. The result for sub-

components and major components for both Dalit and Brahmin are presented in Table 8.

Table 8. Results from a Household Survey on Relative Vulnerability to Climate Change among Brahmin and Dalit Caste Groups

Major Component[3]	Dalit	Brahmin
Socio-demographic Profile	*0.43**	*0.17**
Dependency Percentage	0.66	0.61
Percent of female-headed Households	0.11	0.09
Percentage of HHs where head of household has not attended school	0.52*	0.00*
Percent of HHs not knowing the term climate change	0.41*	0.00*
Livelihood Strategies	*0.19**	*0.31**
Percent of Households with family members working in different community/country	0.25*	0.81*
Percent of Households who depend entirely on agriculture for their livelihood	0.29	0.36
Average agricultural livelihood Diversity Index	0.04	0.00
Average livestock diversity index	0.19*	0.04*
Social Networks	*0.47**	*0.26**
Percent of Households not having any form of communication	0.00	0.00
Percent of HHs that have not visited a local government office for help (e.g. Veterinary, agriculture, Forestry)	0.58*	0.27*

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[3] Bold and Italic represent major components followed by their respective sub-components

Percent of HHs that have not visited local market or local government to purchase seed/seedlings	0.53*	0.18*
Percent of Households who are not member of any organization (Agricultural group/Forest User Group/Cooperative)	0.53*	0.27*
Percent of HH who have not lent money to relatives in the past year	0.71	0.56
Infrastructure	*0.87*	*0.71*
Percent of HHs not having access to water from irrigation canal during dry season	0.82*	0.64*
Percent of HHs not adopting any technique to harvest rainwater to use during lean period	1.00	1.00
Percent of HHs not adopting any machinery to assist with labor in the farm	1.00	1.00
Percent of HHs not planting drought tolerant crop varieties	0.71*	0.36*
Percent of HHs not having access to framing inputs (e.g., pesticide and fertilizer)	0.82*	0.55*
Health	*0.24*	*0.19*
Average time to reach to the nearest health facility	0.15*	0.31*
Percent of HHs with family members with chronic illness	0.58*	0.27*
Percent of HHs where a family member had to miss work or school in the last 2 weeks	0.00	0.00
Food	*0.64**	*0.33**
Percent of Households entirely dependent on family farm for foods	0.88*	0.36*
Average number of months family struggle to find food	0.69*	0.33*
Percent of HHs that do not save seeds for next year	0.41*	0.09*
Percent of HHs that do not sell crop to the local supplies	0.94*	0.55*
Average Crop Diversity Index	0.29	0.30
Water	*0.25*	*0.15*
Percent of HHs that collect water from natural resource	0.29*	0.09*
Percent of HHs reporting conflict with other community members related to water	0.47	0.36
Average time to reach the nearest water source	0.12	0.04

Percent of HHs that do not have consistent water supply	0.12	0.09
Natural Disasters	*0.38*	*0.39*
Average number of flood events in the past 5 years	0.21	0.37
Average number of landslides events in the past 5 years	0.08^*	0.35^*
Average number of drought events in the past 5 years	0.79^*	0.45^*
Percent of HHs that did not receive warning about the recent natural disasters before they occurred	0.82	0.82
Percent of HHs with an injury or death as a result of natural disasters in the past 5 years	0.00	0.00
Climate Variability	*0.52*	*0.52*
Mean Standard deviation of the monthly average of average maximum daily temperature in 5 years	0.40	0.40
Mean standard deviation of the monthly average of the average minimum daily temperature in 5 years	0.62	0.62
Mean standard deviation of monthly average precipitation	0.55	0.55

Overall LVI

LVI: Dalit **0.445**

LVI: Brahmin **0.332**

*represents statistical significance at $p < .05$.

4.4.5 LVI-IPCC: Brahmin Versus Dalit group

The LVI-IPCC indicates similar results to the LVI, finding that Dalit are more vulnerable than Brahmin (LVI-IPCC Dalit: -0.022 and Brahmin: -0.042). The value for different aspects of vulnerability, adaptive capacity, sensitivity, and exposure, is presented in the table below. The analysis shows that Brahmin have much higher adaptive capacity (0.625) than the Dalit (0.488). Similarly, when accounting for water, food and health, the results indicate that Dalit people are more sensitive (0.411) to climate change than the Brahmin (0.23). However, both Brahmin and

Dalit are almost equally exposed to changing climate with the exposure value 0.434 and 0.445, respectively.

A vulnerability triangle diagram and table that shows the value of adaptive capacity, exposure and sensitivity are presented in table 9.

Table 9. LVI-IPCC contributing factors among Dalit and Brahmin group

Contributing Factors	Brahmin	Dalit
Adaptive Capacity	0.625	0.488
Sensitivity	0.234	0.411
Exposure	0.445	0.434
Overall LVI-IPCC	-0.042	-0.022

4.4.6 Households' perceptions on the LAPA planning and implementation process

Households' perception of the LAPA planning and implementation processes were carried out, focusing on themes like participation, benefits of LAPA to the households, and households' satisfaction of the outcome of the LAPA. This includes responses only from 40 households in one LAPA implemented community. Out of the 40 households, 20 are categorized as vulnerable and 20 non-vulnerable.
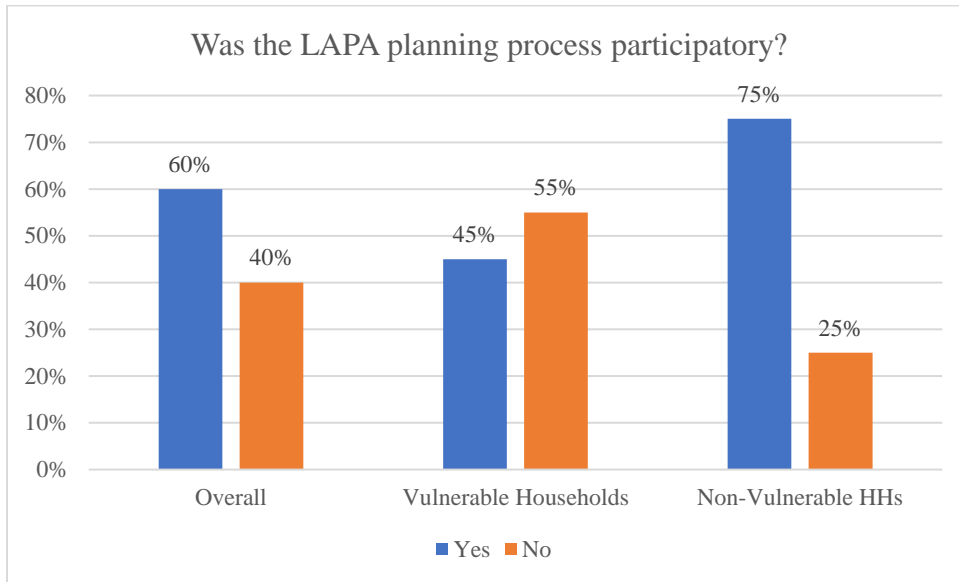
Figure 5. Respondents' perceptions of LAPA planning and implementation process

In total, 60% of the respondents said the planning process was participatory whereas 40% said the planning process was not participatory. In contrast, 75% of the non-vulnerable respondents said participatory planning process was followed but only 45% of the vulnerable respondent said the planning process was participatory.

The qualitative data analysis shows that poor people, especially older one, are not interested in participating in the community meeting for LAPA planning process. Past experiences from CFUG's meeting discourage poor and vulnerable people from participating at meeting held at their community because elite people would not care what they have to say. When asked about the participatory planning processes of LAPA, one 51-year-old woman respondent from the vulnerable category said:

> "I was not involved in this LAPA program. My son and daughter-in-law took part in all of the meetings related to LAPA, and I don't know whether it was participatory or not. I was not interested in attending these meetings. You know I used to participate in the CFUG's meeting but just to participate and would not participate in decision-making process. My son and daughter-in-law are educated, and I thought they would speak on our behalf more than myself."

Ojha et al (2016; p.12) argue that LAPA plans are "cut and paste versions of generic templates provided by donor projects". The amounts of money NGOs or Consultants would make is tied to the number of LAPAs they would prepare. This has led the NGOs and consultants to focus on quantity over the quality of LAPA (Ojha et al., 2016). This study also shows the NGOs staff were more active than the community people in planning process. This argument is supported by response from female respondent of the non-vulnerable category who shared:

> "I don't remember clearly when this meeting was organized. I think it was two years ago. People from LAPA formed a committee and organized a meeting. They gathered 10-15 people from different wards of the village, and they told us about their agenda. People from ASHA project would speak and ask us questions and we would answer. I was secretary of the sugarcane farming committee and treasurer in another sewing and tailoring committee. I don't really remember the planning process. I guess I forgot (nervous laughter)......"

The involvement and influence of local elite people in categorizing households in different vulnerability category also raises question on fair participatory process. Nightingale (2017) sees this categorization in different vulnerability groups through the lens of party politics. Representative from different political parties would want to categorize their own people as vulnerable one so that they would benefit from adaptation intervention. Nightingale (2017) argues this as a vote buying for future elections. This is supported by the remarks of male respondent from the non-vulnerable category who is now a locally elected representative (but participated as political representative then) shared:

> "At that time, I participated in all those meeting as a health worker and politician. While making LAPA, what Uday Sir (from ASHA project) said was…let's say…he stated the objectives to include the groups that are poor and left behind in all sectors. From every village, we make a core team that includes members and president of existing local institutions and explain them about the necessity and objective of LAPA. This core team helped to determine what kind of people will be put into which category. We categorized

the people based on their income, agricultural productivity, the amount of land they have, the business they are doing currently, and the number of people in the family. In an unbiased way, we tried to reduce vulnerability to disaster, helped people in need, helped to enhance their capacity to earn money."
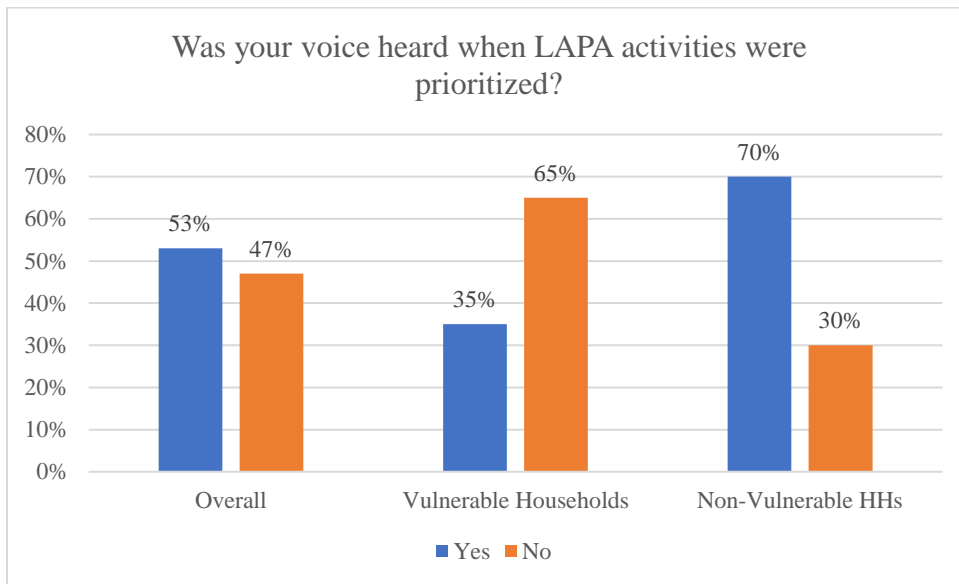
Figure 6. Respondent's perception on their voice heard during LAPA planning and implementation process

Out of the total respondents, 53% said their voice was heard when LAPA activities were being prioritized, while 47% respondent said their voice was not heard during prioritization of activities. The percentage of non-vulnerable and vulnerable respondents who reported their voice being heard are 70% and 35% respectively – a difference that was statistically significant. Similarly, 65% of vulnerable respondents said their voice was not heard, while only 30% of the non-vulnerable respondents reported their voice was not heard when activities were prioritized for implementation.
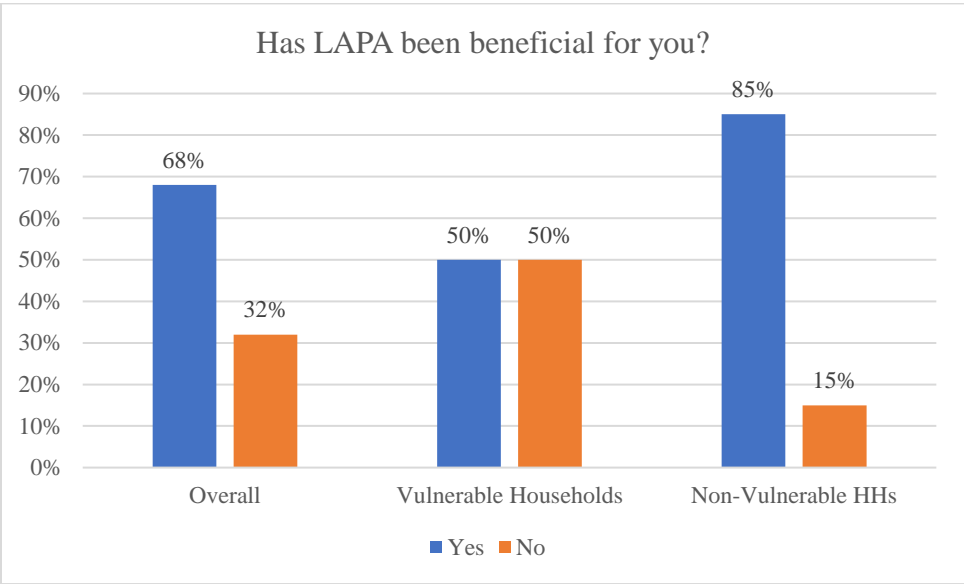
Figure 7. Respondent's perception on LAPA's usefulness in reducing climate vulnerability

Sixty-eight % of respondents said the implemented activities have been beneficial for them to adapt to the changing climate, and 32% of the respondents reported those activities were not useful for them. Interestingly, only 50% of the vulnerable respondents said the activities were useful to adapt to climate change whereas 85% of the non-vulnerable respondent said those activities helped them to reduce the climate change vulnerability. Vulnerable Households, especially Dalits, benefitted from tailoring and iron-smith training whereas non-vulnerable households benefitted from irrigation canal which ensures regular irrigation even during dry season and diversification of vegetable farming which they could relate directly to climate change. This might have led to different responses regarding the role of LAPA in reducing climate change vulnerability.

The introduction of new cash crops suitable for local climate makes sense because this would help to diversify the livelihood and would act as insurance when local crops fail to grow properly in changing climate. Similarly, construction of irrigation canal is very beneficial where majority of people depend on rainfed agricultural production. But the question is who is benefitting from

these adaptation interventions. One 54-year-old respondent from the non-vulnerable category said:

> "LAPA brought programs in our village like commercial ginger and turmeric farming which they (LAPA coordinator of ASHA project) said is suitable for the climate of our village. But only limited number of people were benefitted from this commercial farming. Before LAPA, Shyam (who lives in the same community) would not grow seasonal vegetables, but after receiving help from LAPA, he started growing seasonal vegetables. And I got service from him though not directly from the LAPA. We could buy at least vegetables from him now."

This supports the finding of Eriksen et al (2021) where they argue how the adaptation interventions implemented to benefit the disadvantaged and the most vulnerable one is benefitting the local elite because of the elite capture of resources. The rich, powerful and influential community members siphoned the resources for their own benefits. This has resulted in the increment of vulnerability rather than reducing it (Eriksen et al., 2021).

Similarly, another 60-year-old female respondent from the vulnerable category shared:

> "LAPA brought lot of improvements in our village. Before this, our village had drinking water problems. The LAPA plan brought "One house, One Tap" program which really solved our drinking water problem. And ummm…..those who were categorized under vulnerable category received goats and households who were not categorized as vulnerable received drum and tunnel for seasonal vegetable farming. And I am happy because people in our village started growing off-season vegetable farming and I got to observe and learn how other people are doing it."
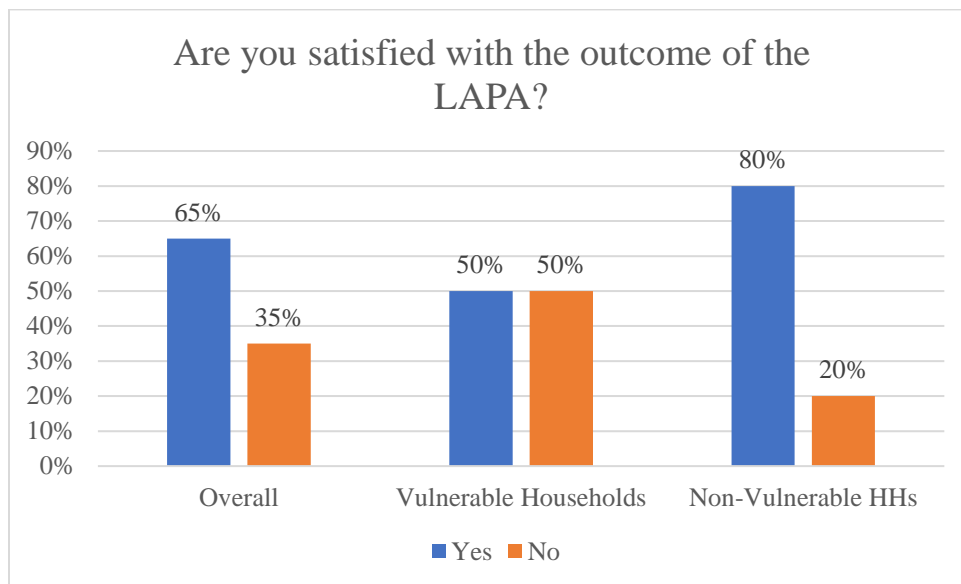
Figure 8. Respondent's perception on outcome of the LAPA

Out of the total respondents, 65% said that they are satisfied with the outcome of the

LAPA and 35% said they are not. However, 80% of the non-vulnerable respondents said they are

satisfied with the outcome of the LAPA but only 50% of the vulnerable households reported that

they are satisfied with the outcome of the LAPA and the difference in responses is statistically

significant.

One male respondent of 45 years old from the non-vulnerable category shared:

> "LAPA people provided us training on commercial farming. They supported us with
> seasonal vegetable farming, herb, turmeric, ginger and sugarcane farming. I myself have
> planted sugarcane on my land where I used to grow corn. I planted sugarcane last year
> and it's growing well. But they did not teach anything about where to sell the products
> and the organization must help us. The situation for marketing the product in our village
> is not easy and we do not have reliable medium to sell our products in the nearest town. I
> don't know where to sell my sugarcane. I don't know who will help us once the LAPA
> term ended."

One male respondent from the non-vulnerable category who participated in LAPA as a political

representative and is now locally elected government representative shared:

"I am 100% satisfied with this LAPA program. My only grievance is ….the lack of abundant budget for us. Although there is a local government, but we can't separate enough budget to reduce climate vulnerability as we have other developmental priorities right now. Because we have 450 households in this ward, the budget we received was not enough to support all the households. But if you look at the sugarcane farm, farmers received 5000 last time and again received 10,000. Last time there were four sugarcane farmers, and if they sell, it will be worth around 100,000. There were also some problems in the implementation like people not taking the ownership of the activities. In future, when ward office implements such program, we give 50% support and beneficiaries have to add another 50% themselves. Like, if we are investing 50,000, we only give them after they added another 50,000. Doing this will increase the ownership and increase motivation among beneficiaries."

CHAPTER FIVE: Discussion

5.1 Vulnerability assessment between Triveni Vs Bafikot and Dalit Vs Brahmin group.

I selected two socially, economically and geographically similar rural municipalities for this study. The only significant difference between these two places is the fact that Bafikot has slightly better transportation facility than Triveni. Results of vulnerability assessment between Triveni and Bafikot showed that Triveni is slightly more vulnerable to climate change than Bafikot, despite the fact that Triveni had adaptation interventions through LAPA (Figure 9). Similarly, results of my vulnerability assessment between Dalits and Brahims showed that Dalits are vulnerable in all components except livelihood strategies that contribute to climate change vulnerability (Figure 10).
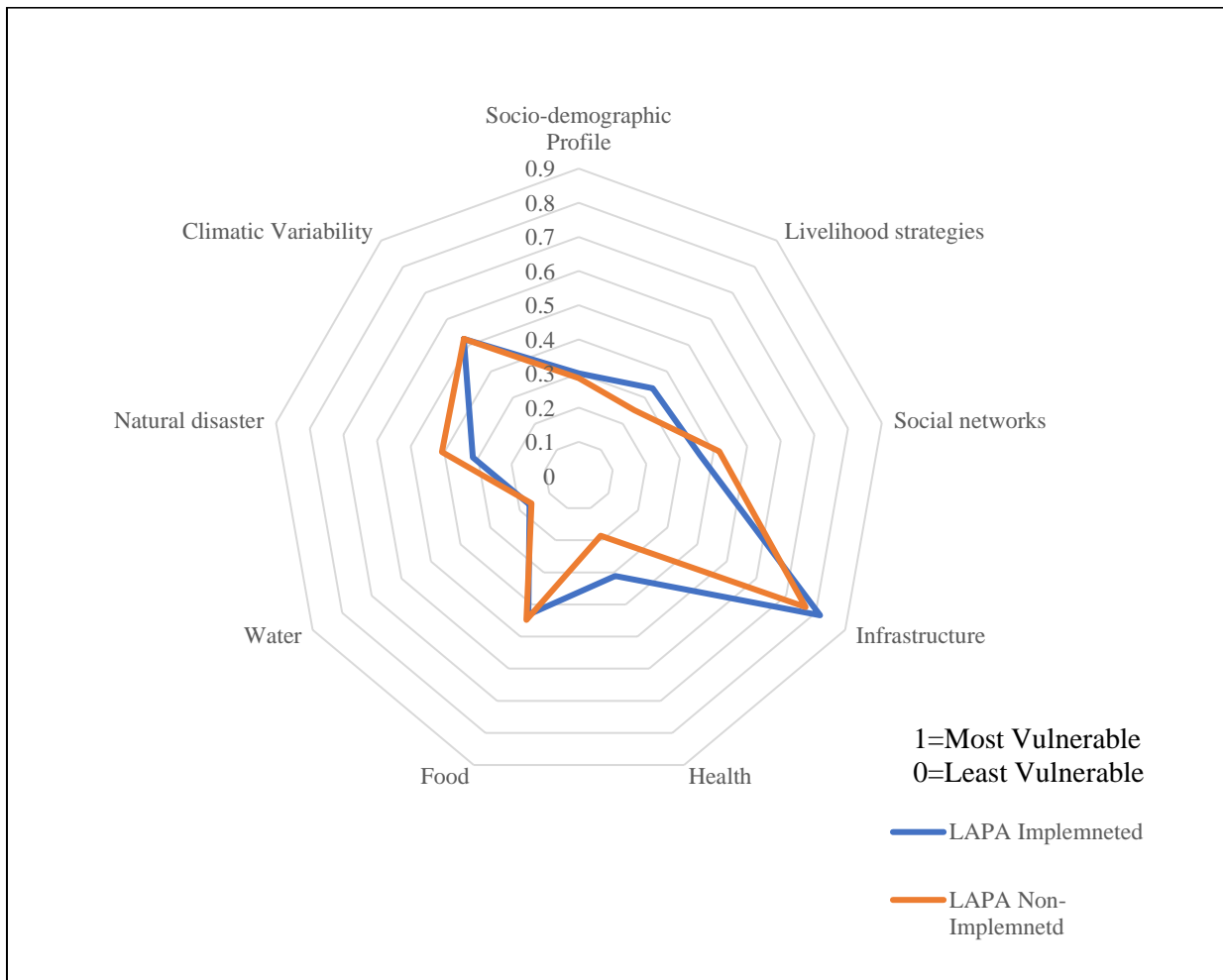
Figure 9. Vulnerability spider diagram of the major components of the Livelihood Vulnerability Index (LVI) for LAPA implemented and non-implemented communities
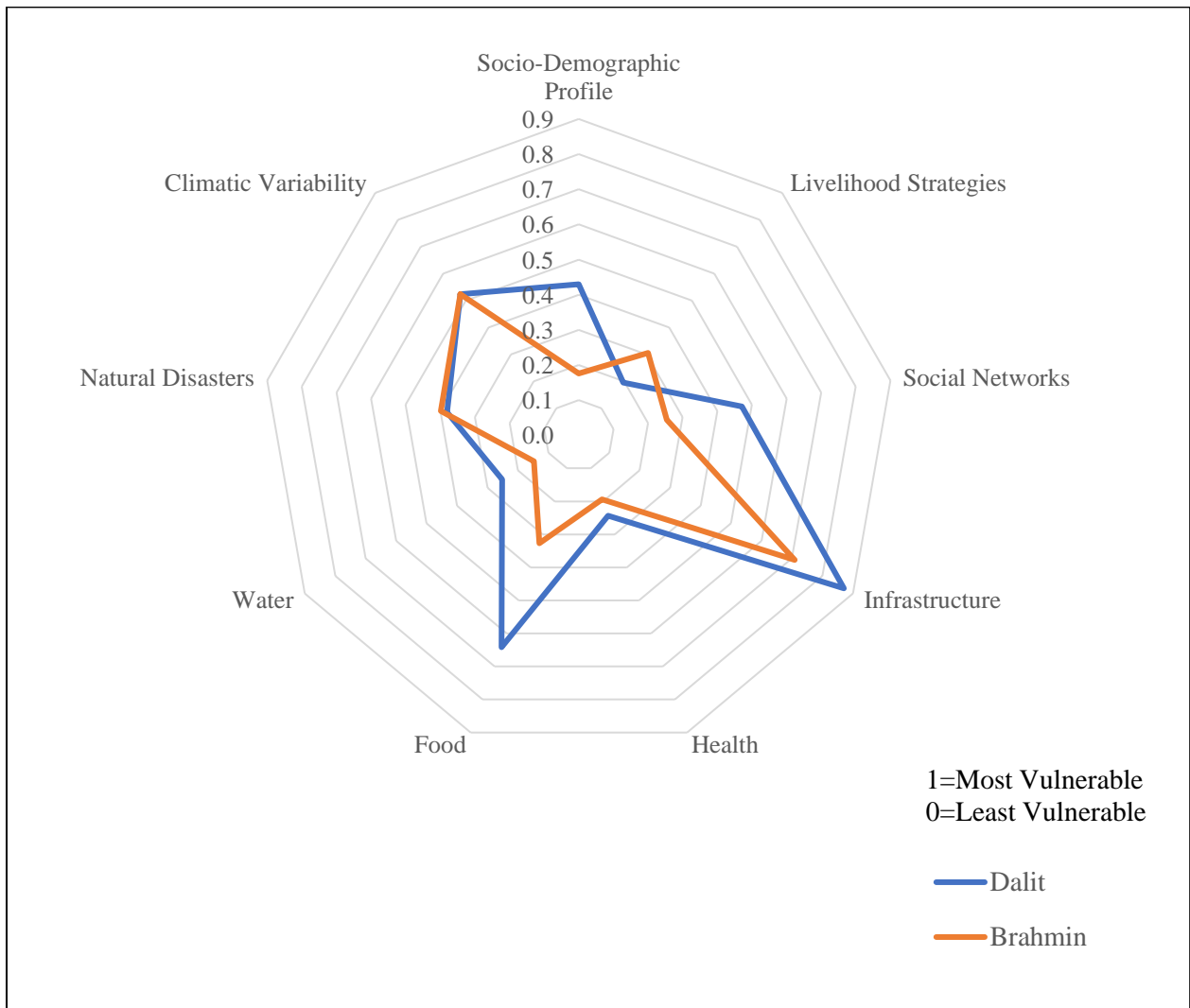
Figure 10. Vulnerability spider diagram of the major component of the Livelihood Vulnerability Index (LVI) for Brahmin and Dalit

The results showed that Triveni is vulnerable in major dimensions like socio-demographic profiles, livelihood strategies, and infrastructure which contribute the most to adaptive capacity. Infrastructure, food and climatic variability were found to be the major contributing factors to vulnerability in both communities. In Triveni, 30% of the respondent were illiterate as compared to 8% in Bafikot. Despite continuous efforts to make people aware about the negative impacts of climate change through LAPA in Triveni, a higher percentage of people (9%) did not know the meaning of climate change compared to Bafikot (6%).

Results based on caste showed that nearly 50% of Dalit respondents were illiterate (can't read and write) and 100% of Brahmin respondent were literate. Similarly, all Brahmin respondents (100%) reported knowing the term climate change, which means they likely know what impacts the changing climate might bring to their livelihoods, but only 41% of the respondents from the Dalit group understand the meaning of climate change. Previous research show farmers and community people are more likely to take adaptive action if they are aware of the changing climate, and this awareness also helps to increase the effectiveness of adaptation interventions. Additionally, educational attainment of the head of household is found to increase adaptative capacity (Hassan and Nhemachena, 2011; Maddison, 2006). In this case, Dalit people are less aware of climate change and have less education attainment, which might be the barrier in not adopting even locally available climate change adaptation techniques. This shows that the LAPA needs to focus on Dalit groups to increase climate change awareness when they run climate sensitization sessions as part of LAPA planning and implementation processes.

Similarly, livelihood strategies in Triveni are more vulnerable to than those in Bafikot. Twenty-seven percentage of respondents were found to be entirely dependent on either forest resources or agriculture for their income in the Bafikot, as compared to 45% respondents in the Triveni. Households in Bafikot had more diverse livelihoods as 56% of households work either in another community or country to earn money, while only 30% of households in Triveni work in different community or country. From the field visit, we found that majority of households in Bafikot and Dalit groups have at least one member from their household working in India or another community, many of them in daily labor jobs that provide a regular source of income for the households.

This movement of people of mid-hills of western Nepal to India, especially for seasonal jobs, which is high among Dalit people is also reported by Sharma (2013). Similarly, the

percentage of respondents who depend entirely on agriculture for their livelihood is higher in the Brahmin group than the Dalit. An analysis of livelihood diversification of the fishing communities from South India shows that the poorest, most of whom are Dalit, are better able to adapt to environmental change because of their flexibility to involve in any type of menial jobs to earn money than people from the well-off group who have very rigid livelihoods (Coulthard, 2008). In this case, Dalit people work as day laborer either in agricultural field or construction which helps diversify their income, unlike Brahmin who have very rigid livelihood system.

Social networks and social bonding have been described as among the most important contributing factors to climate change adaptation (Adger, 2004). A social network is a set of people in a social structure that are connected to each other by one or more interdependency, for example financial exchange, kinship, friendship, values, norms, ideas, or trade (Armah et al. 2010). The result showed that households in the Triveni have slightly better social networking than in the Bafikot. I found that 100% of the households in both communities had either a radio, mobile phone or television as a means of communication. 48% of the respondents in Triveni have not visited a government office; for instance, the livestock, agriculture or forest offices in the past 12 months seeking services, as compared to 52% of the respondents in the Bafikot. Community based organizations like the Community Forest User Groups, agricultural groups, cooperatives, and/or farmer groups provide services only to their members, and services include access to natural and financial resources and information. The analysis showed that 60% of the households in Triveni are members of at least one of the community-based organizations compared to only 49% of the households in the Bafikot. From the household survey, we observed that many of the adaptation interventions in Triveni were implemented through community-based organizations, and new farmers groups and irrigation user groups were established for the promotion of commercial cash crops, like ginger and sugarcane, along with

construction and maintenance of irrigation canals. Additionally, LAPA coordinated with local

government agencies like livestock and agricultural service centers to provide training to people

on commercial cash crops and improved livestock rearing, which helped improve local farmers'

connections to local service-providing agencies. These LAPA activities helped to enhance the

social networking of people in Triveni compared to Bafikot.

Similarly, the result based on caste showed that 73% of respondents from Brahmin group

visited the government services seeking help whereas only 42% Dalits respondents received help

from these offices in the last two years. Similarly, 82% of the respondents from Brahmin groups

reported they have visited local market to purchase seed/seedlings but only 47% respondents

from Dalit group reported doing so. Communities which have low adaptive capacity and lack

necessary institutions, skills, resources and networks are labeled as "Powerless spectator"

(Fabricius et.al, 2007 :1). Dalit communities in this research seem to be "Powerless spectators"

who are less likely to be the members of community-based organizations like Community Forest

User Groups, agricultural groups and cooperatives. Dalits group visit government offices like

forestry, agriculture and veterinary offices very rarely.

Out of the nine major components, infrastructure was found to be the most contributing

component to overall vulnerability in all groups (Triveni vs Bafikot and Brahmin vs Dalit). Not a

single respondent from either group reported using any techniques to harvest rainwater during

lean or particularly dry periods, or machinery to assist in their farming. However, the results

showed that Bafikot has slightly better access to infrastructure that can help households adapt to

erratic rainfall and climate patterns compared to the Triveni. 70% percent of the households in

Triveni do not have access to irrigation during dry times and entirely depend on rainfall for their

agricultural activities, whereas only 56% of the households in the Bafikot do not have access to

water for irrigation during the dry season. Similarly, 98% of the respondents in the Triveni have

not adopted any water harvesting techniques that can be used during lean periods and none of the respondents have adopted such techniques in the Bafikot. Not a single household in either community was found to usemodern machinery to assist with farm labor. Field observations also showed that households still use traditional ploughing methods (oxen ploughing) and manual harvesting.

The result showed drought as the most recurring natural disaster event in both of the communities. However, 70% households have planted drought-tolerant crop varieties in the Triveni whereas only 51% households have done so in the Bafikot.

Timely rainfall is very essential for agricultural production in Nepal as only 54% of the cultivable land is irrigated (Khanal, 2018), and this shrinks to only 24% in Rukum district. This study shows that only 37% of the respondents from the Brahmin group and only 17% of Dalits have access to water from irrigation canals during the dry season. Similarly, Dalit households have very poor access to seeds for drought tolerant crop varieties (30%) and other necessary farming inputs like pesticides and fertilizer (17%), which are very important for increasing farm productivity. Brahmin households have a bit better access, with 64% reporting access to drought tolerant seeds and 56% reporting access to crucial pesticides and fertilizer.

Many interacting socio-ecological components determine the sensitivity of the systems. For instance, human capital and endowments interact with natural capital or biophysical endowments like soil, water, and minerals to determine the sensitivity of the particular system (Turner et al., 2003). Communities whose livelihoods are entirely dependent on natural resources, such as land, water, forest or pastureland are the most sensitive to changing climate. The result showed that 58% and 34% of households solely depend on the family farm for food in the Triveni and Bafikot, respectively. The remote part of western Nepal suffers from chronic food insecurity (Nagoda & Nightingale, 2017) and a changing climate is predicted to make this

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worse with erratic rainfall and other extreme weather events (IPCC, 2014). This study shows that food grown on the family farm is enough for only five months in Triveni whereas households in the Bafikot they get six months of food from farming. Furthermore, 80% and 85% of households save seeds to grow next year in the Triveni and Bafikot. The indexed value for food showed that the Triveni (0.43) is slightly better in terms of food security than the Bafikot (0.45).

Whereas the result from the analysis of Dalit Vs Brahmin shows that 88% of the Dalit respondents completely rely on their farm food for survival, only 36% of Brahmin are dependent entirely on food they farm themselves. The Dalit are also suffering from food insecurity because of poor land management and unequal distribution of productive land as many Dalits have what is called bari, which is non-irrigated land (Gautam & Anderson, 2017). As a result, despite the reality that the Dalit grow several more types of crops than the Brahmin group, our data reveal that food produced by Dalit households is sufficient only for an average of four months a year whereas Brahmin households food produced from their farm is sufficient for an average of eight months. Moreover, 60% of the respondents from Dalit households said they do not save seeds for the next year, while almost no Brahmin households reported not saving seeds. Many Dalit households have very unproductive lands with poor access to irrigation. To increase their food security, it is important to focus on improved variety of traditional crop species like millet and corn instead of introducing cash crops, like tomato and cauliflower, which demands productive land with good amount of water. But the adaptation interventions implemented to diversify livelihoods and incomes as part of LAPA include growing off-season vegetables and participating in commercial farming of crops like sugarcane, cardamom, and ginger. This suggests that due to their low risk-taking capacity and the absence of good quality lands, these adaptation interventions are either unattainable or do not suit the needs of Dalit households.

When it comes to health, Dalit groups are more vulnerable than Brahmin, but they are not statistically significant. The result showed that people from Dalit households are suffering from chronic illnesses like tuberculosis, asthma and paralysis in significantly higher numbers than the Brahmin group. Similarly, it takes an average of 30 minutes for Dalit households to reach the nearest health facility while the average time for Brahmin households to reach the nearest health facility is only 17 minutes. Climate change is likely to increase heat waves, higher precipitation, floods and waterlogging which is likely to impact the households at bottom of the socio-economic status hierarchy and thus cannot afford proper sanitation leading to diarrhea and other vector-borne diseases that are more likely to severely impact poor people (Shahid, 2010).

Springs and Kuwa (a natural water source) are still the main sources of drinking water for many households in the hilly part of Nepal. Water availability is predicted to be the biggest environmental problem resulting from climate change, mainly in the hills and mountainous part of Nepal (Dhakal et al., 2010). Irregular but high intensity rainfall that leads to high run-off and less filtration is causing water resources to dry up and deplete groundwater (Dhakal et al., 2010). But in this study, water is found to be the least vulnerable component in both Triveni vs Bafikot and Brahmin vs Dalit to the changing climate. This is because out of the 38 adaptation interventions implemented as part of LAPA, 23 were related to drinking water supplies that include the protection of the source, as well as the construction of storage tanks and the distribution of water through the "One House One Tap" program. However, the results of this research still reveal unequal access to water. Specifically, our data show that 29% of the Dalit households still collect water from natural resources but less than 1% of the households from the Brahmin group collect water from the natural resources. This shows that still many Dalit households are not benefitting from the "One House One Tap" program. Similarly, the average time to reach the nearest water source for Dalit households is 9 minutes but only 4 minutes for

the Brahmin households. Furthermore, 47% of the Dalit households reported conflict related to water with their neighbors whereas 36% of the Brahmin households said they had conflict with their neighbors about water in the last year.

The data analysis shows the insignificant difference between the Dalit and Brahmin households to natural disasters. Brahmin households reported higher number of floods, landslides and drought than Dalit households. The average number of floods, landslides and drought reported by Brahmin and Dalit are 4, 25, 3 and 2, 5, 2 respectively in the last five years. Both of the groups reported a higher number of landslides than any other type of natural disaster. This might have made the Brahmin group more likely to report a higher number of extreme events related to climate change.

CHAPTER SIX: Conclusion

6.1 Conclusion of the study

This study examined the effectiveness of LAPA in reducing vulnerability to climate change in one LAPA implemented community by comparing it to another community in which LAPA has not been implemented, and further analysis was done comparing vulnerability between two groups that hold different socio-economic and cultural status based on the caste system. Being the first country to come up with LAPA, Nepal is still learning from its implementation in the western part of the country. This study was designed to document the effectiveness of LAPA in reducing climate change vulnerability before the Government of Nepal implements the policy throughout the country. The values of the different sub-components and major components show that, for the LAPA non-implemented community in this study, it is slightly less vulnerable than the LAPA implemented community examined here.

A review study of the outcomes of adaptation interventions from all over the world that have been supported by different international organizations found that, though the interventions are developed with the best intentions, many have appeared to either "reinforce vulnerability or redistribute or create new source of vulnerability "(Eriksen et al., 2021). In the case of Nepal, adaptation interventions launched by the government with support from international organizations have often increased vulnerability rather than reducing it (Nagoda & Nightingale, 2017; Nightingale, 2017). Furthermore, this shows that adaptation interventions are likely to benefit powerful and elite groups because of existing unequal power relations between the various socio-economic groups in Nepal (Nagoda and Nightinagle, 2017; Nightingale, 2017). Similarly, the LAPA evaluated for this particular study shows that out of the 88 identified adaptation activities, 38 were prioritized for implementation. The majority of them targeted drinking water supply which benefitted both vulnerable and non-vulnerable groups. And the

results also showed that both the LAPA implemented community as well as Dalit households are less vulnerable when it comes to water access. Additionally, some of the adaptation strategies implemented were related to livelihood diversification designed to mainly target poor households, but this research found that they did not benefit these households. Introducing new crops like sugarcane, cardamom and ginger farming to support poor households seem irrelevant for households that do not have risk-taking capacity and could make them more vulnerable if the crops did not grow well in a changing climate. One prior study from another mountainous district in Nepal found an increasing trend of vegetable farming to sell crops in the local markets, but this is only possible for well-off households with irrigated land (Gentle and Maraseni, 2012). Similarly, three irrigation canals were constructed which benefit people who have "Khet" (irrigated land), while data from our survey shows that only 15% of households in the vulnerable category have "Khet" in contrast with 75% of non-vulnerable households.

This suggests that LAPA, which was developed to help the disadvantaged socio-economic groups and the households especially vulnerable to the impacts of climate change are not actually reaching them. Still, LAPA has been successful in mobilizing local institutions like CFUGs and farmer groups (Regmi et al., 2014). But working through community-based grassroots organizations does not necessarily ensure that the adaptation needs of the vulnerable and poor households are met. The existing grassroots organizations have issues recruiting vulnerable households for participation in decision-making processes. The LAPA plan evaluated for this study also shows that poor households' needs, and perspectives are not reflected in the LAPA planning and implementation process.

This seems to be because adaptation interventions ignore or miss existing social vulnerabilities, for instance their poor social-demographic profiles and low levels of social capital that expose these poor households to extreme climate events. From the LAPA plan

analyzed for this study, not a single activity was implemented that seemed to enhance the social capital of poor households. Climate change policies like LAPA base their analysis of vulnerability on technological and physical aspects like droughts, floods, loss of biodiversity, and forests. The LAPA plans seem to be donor-driven and highly technocratic in a way that blind the plan to existing social and political barriers that keep poor households away from accessing already-available resources at local levels (Ojha et al., 2016).

Thus, there is a need for an adaptation plan that can address the existing inequalities in these communities based on caste, gender and class discrimination (Sherpa, 2012). And, unless we address these inequalities that have been continuing for many centuries, pouring money in the name of clime change adaptation will be like "Pouring Water in the Sand" – we will keep on pumping money to no avail to poor households that do not benefit from the efforts.

Another conclusion is that the funding communities are getting is not enough to combat the negative impacts of climate change. In this particular case, the total estimated budget for the implementation of those 88 identified activities was $3 million USD, but the community had only $0.3 million USD. So, the community prioritized only 38 of the possible interventions that could be completed within the available budget. This finding of budget deficiency for adaptation intervention at local level is very crucial because the assessment of 112 climate change projects done by CARE shows that global adaptation finance between 2013-2017 found to be over-reported by 42%. For instance, The World Bank spent $328 million on Housing Reconstruction projects in Nepal after the 2015 earthquake but accounted for climate change adaptation (CARE, 2021). This is high time to correct this injustice and provide the adaptation funding the developed world promised in the 2015 Paris agreement which is $100 billion USD each year by 2020.

6.2 Limitations of the study

First, I conducted this study during the COVID-19. Nepal was going through a national lockdown during that time which allowed only a small window of time to conduct household survey and in-depth interview resulting in small sample size. Second, out of around 400 LAPAs that have been implemented in Nepal, we used one of them to understand effectiveness of adaptation interventions. This study gives the snapshot of LAPA effectiveness in reducing climate change vulnerability, however, it might not be useful in generalizing for overall Nepal. Third, this study utilizes livelihood Vulnerability Index to evaluate the effectiveness of the LAPA. One of the important objectives of LAPA is to mainstream it into local level planning processes which this index does not take into account.

6.3 Recommendation for the future research

As mentioned in the limitation section, this study only covers adaptation planning and implementation processes to evaluate the effectiveness of LAPA but does not cover institutional part of the adaptation intervention. The studies that analyze the mainstreaming of LAPA into local level planning process is very crucial. As the Local level government has focused on infrastructure development, for instance construction of roads, bridges and water supply, the study would help to understand the prioritization of climate change in their planning process at local level.

CHAPTER SEVEN: Question 3

My original research plan was to carry out data collection in another district, Jumla, where LAPA was implemented by Nepal Climate Change Support Program (NCCSP) At that time, I had planned to travel myself to Nepal for data collection, supported by a small research grant from the Center for Ecological Research and Education (CERE) at ISU. But due to COVID-19, I could not travel to Nepal. After not being able to travel to Nepal, I had to rely on research assistant from Nepal for data collection.

The COVID cases in Nepal peaked from June-September, and there was ongoing uncertainty whether I could collect data or not. The Government of Nepal had imposed restrictions on the movement of people and public transportation in Nepal. Even though the National government allowed people to move in private vehicles, local governments across the country had set up their own restrictions on the movement of people. I had also poor connection with the local people of Jumla and this made it harder to continue with Jumla as research location for data collection, especially since my research assistant lived in Kathmandu, the capital city of Nepal, where the number of daily COVID cases were recorded as the highest in the country in the month of September. How the people of Jumla would respond to someone coming from Kathmandu was highly uncertain, and there was also risk for my research assistant to go to a place where we had poor local connections. Furthermore, the greatest festival of Nepal, which runs a month long, Dashain and Tihar, falls in the month of October. Many people who live in cities and even from abroad return to their home to celebrate Dashain and Tihar with their family. Because of this, many public health officials in Nepal had predicted that Nepal would see the highest number of COVID cases after this festival and there was a possibility that the Government would impose further restrictions in the movement of people after the event concluded.

I had a small window period to collect the data before the festival. The only available option to collect the data in that short period was to change the research location from Jumla to another district where I had strong local connections. After consulting with my research assistant, we came up with West Rukum District where LAPA is implemented as part of an ASHA project with support from the of Ministry of Forest and Environment. I did my undergraduate in Forestry Science and have colleagues with whom I studied at the Divisional Forest Office (DFO) in West Rukum. The Divisional Forest Office is the district level agency that overlooks the implementation of LAPA all over the district.

I have three research questions for my thesis which are as follows:

- RQ1: How does the Livelihood Vulnerability Index (LVI) vary in LAPA implemented and non-implemented communities in the Rukum District?

- RQ2: How does the LVI vary among Dalit and Brahmin ethnocultural groups?

- RQ3: How do farmers of different socio-economic status benefit from the implementation of LAPA activities?

  - What household characteristics explain variation in which of them benefit most and least from the LAPA?

The data to answer the first and second research question came from the survey and the second from the in-depth interviews that were to accompany the administration of the survey in some cases. The LAPA plan divided the whole community into four different vulnerability groups, V1, V2, V3 and V4 based on their income, land size and their exposure to natural disasters. Households in V1 represent the least vulnerable households and V4 represent the most vulnerable households. But, for this research, I simplified the classification and have categorized V1 and V2 as non-vulnerable groups and V3 and V4 as vulnerable groups. Out of the 450 households in the community, 379 and 71 HHs have been categorized into vulnerable group and

non-vulnerable group respectively. There were 128 Dalit HHs in the community and 90% (115 HHs) of the Dalit HHs fall under vulnerable category. My initial plan was to ensure an equal number of representations from Dalit and other HHs from vulnerable category but due to biases occurred during data collection not a single Dalit HH is included for in-depth interview.

7.1 What went wrong in the Data Collection?

The Research Assistant (RA) I hired had recently completed his Master's in Science (M.S.) in Forest Economics with little exposure to qualitative research methodology. However, I planned for this and worked to orient him on how to collect qualitative data. Our original plan, which I suggested in order to have a chance to catch and address any problems with how the interviews were being executed, was for my RA to conduct one in-depth interview and review it with me to find out what went well and what did not before conducting the rest of the in-depth interviews. Unfortunately, we could not do that because the research location was in one of the remotest parts of Nepal with poor road and mobile network connection. So, I was in regular communication with my research assistant when he was at the district headquarter but once he left for the field for data collection, we could not communicate with each other. This then meant I could not provide feedback to him so that we could make any necessary course-corrections.

Another issue that ended up compromising our qualitative data collection is, as mentioned earlier, that I relied on my DFO colleagues who themselves have implemented the LAPA to do the interviews. I had suspicionsfrom the beginning that the staff from DFO would try to influence the data collection process for the purposes of getting good results about the effectiveness of LAPA from the research. Colleagues from the DFO hired the Social Mobilizer who was the lowest level staff who worked at the field level when LAPA was implemented. We decided to move forward with Social Mobilizer as they have good knowledge of the local place as well as the LAPA. I myself worked for an International Non-Governmental Organization for

almost three years in Nepal, and I had first-hand experience with how the field staff from our local partner organizations would cherry pick the respondents for in-depth interviews most of the time in order to obtain their preferred results. Originally, I chose the Jumla district where the LAPA term was already over in 2017. Project-based LAPA staff would have left the community or have little interest to influence data collection and thus would be less likely to be biased in data collection as researcher could independently reach to targeted respondents. But we had to change our research location because of COVID which meant this attempt to choose my district of study for methodological bias-reduction purposes ended up not being possible

I had also clearly told my research assistant that we needed to include at least 3-4 Dalit households for in-depth interviews as earlier research found an absence of meaningful participation of poor and Dalit households during decision-making processes, be it for Community Forest projects or regarding other Farmer Groups. For instance, in a prior study that included interviews one female Dalit interviewee said "It is a waste of time to go to those meetings, these people (upper caste and elite) are not interested to listening to us. The men don't pay attention to the women anyway, so I would rather work on the field than go to the meetings" (Nagoda and Nightingale, 2017: 89).

In my study, to meet the objective of my second research question and address this underrepresentation, my plan was to ensure equal numbers of participants from both the vulnerable and non-vulnerable groups in order to better understand what they have to say on the planning and implementation process of the LAPA and their perceived level of inclusion, and to specifically include a few Dalit households within the vulnerable group sample

When LAPA organizers categorized households in a community into different vulnerability groups, a few households with regular income sources and good productive lands were also classified into the most vulnerable group just because their houses are located near the

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river and in areas prone to landslides. And my research assistant had guided the social mobilizer actually selecting the respondents that he needed around eight households from each vulnerable category for in-depth interviews. At this point, the social mobilizer cherry picked the respondents to represent the vulnerable category that were the best off compared to others in that category and would say only good things about the LAPA. As a result, out of the eight respondents chosen to speak for the most vulnerable category, not a single Dalit household was included for an in-depth interview. In fact, out of those eight respondents, one was the president of the Community Forest User Group, another woman was the treasurer of the commercial farming group formed by the LAPA, and another woman was the secretary of the local co-operative. Clearly, these respondents do not accurately represent the most vulnerable households in the area and this significantly distorted the legitimacy of my qualitative data.

Other problems with the categorization of households into vulnerability groups were also revealed. For example, one of the respondents from the non-vulnerable group who participated as local politician in one of the LAPA meetings shared:

> We made a list of criteria like income, agricultural production, the amount of land, number of people in the family to categorize households into different vulnerable categories. We tried our best to omit any biases. But what happened is, for some people, due to a mistake from the computer-ummmm due to typing error, few households supposed to be in V1 was mistaken as V4 and vice-versa. We wrote a letter to the ward office that the particular household has been mistaken and requested to shift them to their correct category.

Similarly, another male respondent from the vulnerable category who is member of the one of the committees formed by the LAPA said:

> I was the member of the committee. I forgot the name, but it had five members and I was one of them. Following the guidelines brought by the representative of the ASHA, we

divided the households into four different categories. There were few households in V4

category, though by criteria, they would fall in either V1 or V2.

While going through the all the transcribed interviews and responses from the households

categorized as vulnerable, I was surprised to see all the positive comments about the LAPA. I do

not mean to say that LAPA was not beneficial for the community, but it was surprising to see

even vulnerable and poor people saying the LAPA was very participatory and that they are

satisfied with the outcome of the adaptation interventions. Many prior qualitative research

studies done on climate change in Nepal have found an absence of meaningful participation of

poor people and the elite capture of the adaptation intervention process (Nagoda and Nigtinagle,

2017; Ojha et al., 2016). I asked my research assistant why all the respondents were saying only

good thing about the LAPA and not a single negative comment, and he shared:

> The Social Mobilizer facilitated me in the data collection and social mobilizers
> themselves have implemented the LAPA. I guess respondents were afraid to say anything
> negative about the LAPA in front of the social mobilizer. They might fear about the
> exclusions in future programs if they commented anything negative about the LAPA.
> Another thing I see myself in the field is that some respondents labeled as V4 did not
> look like V4. They looked financially good, but they were categorized as V4 just because
> they live in landslide and flood prone areas.

In LAPA plans, two kinds of adaptation activities are identified. The first are related to

infrastructure, like irrigation canals, drinking water supplies, and other infrastructure that protect

communities from climate-related hazards like landslides and floods and secondary activities

related to livelihood diversification. The first set of activities are supposed to benefit both

vulnerable and non-vulnerable groups, whereas the second set of activities are only for poor and

vulnerable households and include assistance related to commercial farming, iron smithing,

sewing training, and improved livestock-rearing techniques. But it seems that the vulnerable

households are benefitting most from the first set of activities rather than the second set. One

woman from the vulnerable category who had not attended any of the LAPA meetings shared:

> I am really happy and satisfied with the LAPA as LAPA brought a lot of improvements
> in our village. Before LAPA, our village had drinking water problems but that is resolved
> now. Similarly, other people in our village had started growing vegetables and we got to
> observe how other people are doing it. Before this program, we were unaware about
> different methods of growing wheat, rice and vegetables.

Likewise, another woman from the vulnerable category, who is also the secretary of the sewing

and tailoring group formed by LAPA responded:

> We had to walk for 2 to 3 hours to fetch the water. In my maternal house, we had to walk
> for 3 to 4 hours. Now there is pipeline to our homes. The facilities are great now. They
> gave us what we lacked. They do things and provide services according to our needs.
> They also focus on marginalized and poor people.

7.2 Key findings for future qualitative data collection

- Do not depend on research assistants if you are collecting qualitative data. And this
  becomes an even bigger "NO" if your research assistant does not have prior experience
  with qualitative research methodology. As the author of one book on qualitative research
  methods advised: "The less structure the interview [contains], the more skill, expertise,
  and knowledge are required for the interview" (Tracy, 2020, p. 158). Ultimately, it is
  very important that the interviewer has good knowledge of the primary research questions
  of interest and of the "relevant literature" to effectively probe and dig further to get the
  necessary information and knowledge from respondents. Similarly, it is also important to
  understand the body language and emotions of participants beyond the words they say –
  something that demands "skills of empathy and relating" in the interviewer (Tracy, 2020,

p.158). Therefore, Tracy (2020) argues that interviews with open-ended questions are not suitable if one has to depend on a research assistant who is new to qualitative methods. One of the Professors from my Thesis research committee also recommended that I drop the qualitative part if the researcher (myself) was not able to travel to the field for data collection. As I have changed my major from Forestry and Wildlife science in my undergraduate education to Sociology for my Master's, I wanted to use a mixed method approach and would have really loved to utilize the qualitative research methodology skills I gained during my coursework. So, I decided to continue including the research question that was to be answered from the qualitative data, but that proved costly for me. For this research, I planned to use a deductive approach where I started with the theory of power dynamics and came up with the hypothesis that elite groups with strong socio-economic status will benefit more from the implementation of LAPA than the poor and vulnerable people. I then planned to conduct qualitative research to test the hypothesis with evidence collected to "confirm or disconfirm the original theory" (Tracy, 2020, p. 27).

But I learned that high-quality interviewing is like having "night-vision goggles" because ideally, the interviews "enable the researcher to stumble upon and further explore complex phenomenon that may otherwise be hidden or unseen" (Tracy, 2020; 156). I attempted to orient my research assistant about this theory and the kind of data needed to examine the theory. However, after reading the recorded and transcribed interviews I found that my research assistant was not able to dig further to collect the "why and how" I was really looking for, and instead focused on the "what" in most of the questions, resulting in data that could not answer the question I set out to explore.

For instance, here, the original question was:

Were you involved in the LAPA preparation process? If yes, what do you know about the process and what was your role? If not involved, why not?

And here is how the research assistant asked the question:

RA[4]: Were you involved in the LAPA preparation processes?

R[5]: Yes. It was some time ago.

RA: Do you know what is the LAPA planning and implementation process? What things did you do?

R: They helped marginalized group and provided training on sewing and tailoring.

Clearly, it seems that the respondent does not understand what the research assistant is trying to ask. When asked about their involvement in the LAPA planning and implementation process, rather than describing their role in the decision-making process the respondent explained what they got from LAPA and what they perceived it was intended to accomplish. And then, instead of further probing or trying to ask the question in another way to get a response to the actual research question I was interested in answering, my RA asked no follow up questions.

Similarly, with another respondent from the vulnerable category:

RA: Were you involved in the LAPA program?

R: Yes, my son was involved in this program.

RA: Before implementing the plans, the LAPA team from ASHA project might have done some research about the problems prevalent in your area. Do you have any idea how they identified and prioritized the problem?

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[4] RA=Research Assistant
[5] R=Respondent

R: I don't know about this much as my son and daughter in law took part in all of the meetings related to LAPA. My son and daughter in law did everything. I did not take much interest in attending the meetings.

Here, understanding why the respondent was not interested in attending the meetings would provide good insights for analyzing my research question, but instead my research assistant did not ask any follow up questions to understand the "why and how" I wanted to explore.

The next question asked by my research assistant was:

RA: Like to reduce the problems, they identified and prioritized the activities. While doing all that, did you have any role there?

R: I had the role of taking care of the chores to be precise. I had to prepare the meal for people who participated in the program. I had to take care of cleaning the goat shelters. The main task was showing the hospitality towards the participants of the program.

This respondent is from the vulnerable category and here again it seems that she could not understand the question asked by my research assistant. She was not aware of her role in the planning and decision-making process of LAPA. It might be because she has never participated in the decision-making process in the past and is not aware of any roles beyond her households' chores.

Furthermore, there is no in-depth answer to the question of "How were the adaptation activities were identified and prioritized in the plan?" For instance:

RA: While preparing LAPA, they have identified and prioritized the problems present in this village. How did they do that?

R: Yes, they formed a community and organized a meeting. They gathered 10-15 people from different wards of the village. People from ASHA would ask us questions and we would answer.

In LAPA planning, it is found that they have identified 88 activities to reduce the impacts of climate change in these communities. Based on the available budget, 38 activities were prioritized for implementation. The question regarding how each community's problems were identified and prioritized is thus a question that was designed to understand whose voices were counted when they revised the potential adaptation activities from 88 down to 38. But there is lack of in-depth explanation on how activities were reduced to 38 from 88 and voce of vulnerable HHs were heard or not during prioritization of activities.

I decided to collect qualitative data assuming that my research assistant had a taken one day course on qualitative research methodology and that my orientation would be sufficient to teach him how to help me collect the data I needed for my thesis. We had made a plan that I would review 2-3 in-depth interviews and provide him feedback to ensure that all the questions were properly asked. Unfortunately, the research location was so remote that I could not communicate with my research assistant once he left for the field and the plans, we had made to correct data collection problems and ensure high-quality interviews were not carried out.

- I heavily relied on colleagues from the DFO. I had to rely on them as there was no other way to collect the data. Due to COVID-19, there were risks associated with going to the field without having strong local connections. LAPAs were implemented in six different communities within the West-Rukum District but colleagues from the DFO selected the community where they have a strong presence and influence. I still remember my colleague from DFO saying, "We would identify the best LAPA implemented location

for data collection". He meant that out of the six communities, he intended to collect data where more positive impacts would likely be seen. My colleague was the district coordinator (who is the head and looks after overall LAPA activities) for West-Rukum District and he might have thought positive outcome from this study means he will be appreciated not only by the Donor (IFAD) but also his immediate senior at DFO which will help to move up in his long career in government service.

Additionally, the Social Mobilizer helped my research assistant reach suitable respondents that met our criteria. But the social mobilizer cherry picked the respondents in a way that significantly increased the likelihood they would say only positive things about the LAPA. Furthermore, in-depth interviews were conducted in the presence of social mobilizer. This might have led the respondents to say only positive things about the LAPA fearing that if they did not, they would be excluded from future programs.

7.3 Discussion and Conclusion

There are 450 households in the LAPA implemented community I studied for this project, and 128 of them are Dalit households. However, not a single Dalit household was included for an in-depth interview, showing that there was a bias in selecting the respondents for the interviews. Similarly, when deciding whether to introduce new crops, qualitative research shows that farmers make decisions to grow new crops when they observe the successful adoption of that crop by other low resistance farmers in the village. The low resistance farmers require minimal or no evidence of results to adopt new techniques (Bujold and Karak, 2021). Based on my own experience when I worked for an INGO, Catholic Relief Services, in Nepal, we targeted the lead farmers to promote best management practices in rice, maize, potato and off-season cauliflower. These lead farmers had huge risk-taking capacity and could bear loss if things went wrong.

But in the case of the LAPA implemented community in this research, new crops like cardamom and sugarcane and other vegetables were introduced, specifically targeting poor and vulnerable households. Most of the respondents from the vulnerable category who said they benefitted from the introduction of these new farming techniques were executive members of one of the committees formed by the LAPA, resulting in a biased sample that was unable to provide an accurate range of opinions about the LAPA's success. For example, we do not have responses from Dalit households who depend on daily labor wages and work in other fields for their livelihoods (Bista, 1994). In the end, how these Dalit farmers could have benefitted from the introduction of new crops and new farming techniques – a question I went into this research wanting to answer – is regrettably still unknown because of the biases in selecting respondents for the in-depth interview

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Appendix

1. List of questionnaires

1.1 List of questionnaires for in-depth interview

Community Information

Address: ………………………………..

Name of community: …………

Vulnerable Group: …………………………

Questions for LAPA Implemented location

1. Were you involved in the LAPA preparation process? If yes, what do you know about the process and what was your role? If not involved, why not?

2. Do you think LAPA is important for this village? Why?

3. How were the adaptation activities identified in the plan?

4. Are there any activities that you or community people used to practice before LAPA? Or any that you no longer practice because of LAPA?

5. What activities were implemented in your community as part of LAPA? (Probe: How did they support your livelihood? Do you understand climate change adaptation? How LAPA activities help you in this?).

Questions for both LAPA implemented and non-implemented location:

1. Do you know about climate change? How do you think climate change will affect you? How will you change your ways of doing things to live with the change?

2. How do you think is the role of agriculture, livestock and forest office? What services do you receive from them?

3. Do you know about any I/NGOs or Donor working in your village? What was their role? What is their role?

1.2 List of questionnaires for household survey

Household Survey Questionnaire

Respondent's information

Name of Respondent:…………………………………………………………………………………

Address:……………………………………………………………………………………………….

Name of community:………………………………………………………………………………..

Affiliation/occupation (if possible):…………. Education (Highest year of schooling)……………

Age:…………………… Sex:…………………………Caste/Ethnicity:……………………......

A. Socio-Demographic Profile

1. Who is the head of your house?

    a. Sex (   )   b. age (   )

2. Household members who are **not** involved in any income-generation work (dependents).

Number of Family members	**Number of dependent family members**

3. How many people in your house have not attended school?....................................

4. How many people in your house have worked in another community or country?...

5. Do you know the term climate change? Yes…….   No……….

B. Livelihood Strategies

6. How many members of your household work mainly in agriculture or forestry for income generation?

    a) If agriculture specify the number of people and approximate yearly income

    …………………………………..,…………………………….

    b) If forestry specify the number of people and approximate yearly income

    …………………………………..,…………………………….

7. How many members of your household are involved in activities other than forestry or agriculture as their main income-generating work?...

8. What types of livestock do you raise?...

    Buffalo ( ), Cows ( ), Goats ( ), Pigs (   ), Sheep (   ), Chickens (   )

9. Has your family ever- planted drought tolerant crop varieties?(Infrastructure)

10. Has your family benefitted from the livestock insurance service?(Social Network)

C). Social Networks

11. Do you have any of these forms of communication in your house? (please circle those you have)

  a. telephone   b. television   c. radio

12. In the past 12 months, has anyone in your household gone to a local government office/official for help (e.g., Veterinary, Housing, Agriculture)? If yes, please briefly describe the purpose, how many times, and whether your problem was resolved?

13. In the past 12 months, has anyone in your household gone to a local market or local government institution to purchase seed/seedlings or fodder? If yes, state the purpose and frequency and if they were able to purchase what they needed.

14. Are you or anyone in your household a member of any organization (Agricultural group/Forest User Group and Cooperative)? If yes, which organization, and what is your position?

15. Have you or anyone in your household borrowed money from relatives or friends in the past year?

    a. Yes   b. No

16. Have you or anyone in your household lent money to relatives or friends in the past year?

    a. Yes   b. No

D. Infrastructure

17. Do your family have access to water from irrigation canal during dry season?

18. Do your family adopt any technique to harvest rainwater to use during lean period?

19. Do your family use any machinery to assist with labor in the farm?

20. Do your family have access to farming inputs (e.g., pesticides and fertilizer)?

E. Health

21. How long does it take you to reach to your nearest health facility?...

22. Is anybody in your family chronically ill (sick very often)?

    a. Yes, (if yes, please specify)……………………………….   b. No

23. Has anyone in your household been so sick in the past two weeks they missed work or school?

    a. Yes   b. No

F. Food

24. Type of Land ownership

Cultivated	No cultivated	Rented in	Rented out	Rain-fed	Irrigated

25. Where does your family get most of its food?

      a.   Grow our own

      b.   Other, specify…….

26. Food sufficiency in your family? If yes

Below 6 months	6-12 months	More than 12 months

      a.   Yes, specify……………

      b.   No

27. Do you trade the food you grow with others for different food?

      a. Yes, specify (what do you trade for)   b. No

28. Does your family save seeds to grow the next year?

      a. Yes.   b. No

G. Water

29. Where do you collect your water from?

      a. Natural source   b. Tap   c. Kuwa d other specify…….

30. Have you had any conflicts with other community members in past year related to water?

      a. Yes   b. No

31. How much time does it take you take to reach the water source nearest your house?

32. Is your nearest water source regularly available?

      a. Yes   b. No (if not, why not?)……………………………………….

H. Institutional Influence

33. Has your family experienced any form of internal regulations/laws/restrictions in the course of

any of your livelihood pursuit? (How has it affected, ask more in open-ended way)

34. Has your family experienced any form of external regulations/laws/restriction in the course of any of your livelihood pursuit?

H. Natural Disasters

35. In the last five years has your household suffered from any of these hazards?

S.N.	**Hazard Type** (Codes) 1 = drought; 2 = too much rain and/or landslides; 3 = pests and/or diseases; 4 = frost and hailstorms; 5 = Invasive species 6. Flood 7. Other Specify	**How did you cope?** 1= reduce consumption; 2 = sell livestock; 3 = sell land and/or other assets; 4 = do extra labor/work; 5 = harvest, use or sell more forest products; 6 = get financial loan; 7 = spend cash savings; 8 = obtain assistance from others (friends, relatives, NGOs); 9 = other (specify)	**Year up to 5=1, more than 5=0**

36. Can you tell me about the number of floods in your area in the last 5 years? …………….

37. Can you tell me about the number of landslides in your area in the past 5 years?......................

38. Can you tell me about the number of droughts in your area in the past 5 years?

……………….

39. Did you receive a warning about the recent natural disasters(floods/landslides/drought) before they occurred?

   a) Yes   b) No

40. Has anyone in your family injured or died from any natural disasters in the past 5 years?

2. Consent Form

Informed Consent to Participate in an Interview for the "Assessing the Climate Change Impacts on Smallholder farmers in LAPA implemented and non-implemented area using the Livelihood Vulnerability Index: The case from Western Nepal" Project.

You are being asked to participate in an interview of beneficiary attitudes regarding the LAPA planning and implementation processes. This interview is part of the Masters' Thesis required for the partial fulfillment of my Masters' degree from the Idaho State University. The results from the interview will benefit the local government and non-governmental organizations to make LAPA more effective in the future. Your participation in the interview is voluntary. There is no penalty for not completing the interview. If you choose to complete the interview, it will take approximately one hour, and we will record the interview with your permission. You may quit the interview at any time. Your answers will be transcribed and any identifying information that will allow others to identify you will be removed before results are reported unless you provide written permission otherwise. We will also keep all data collected as part of this project on password-protected computers (for electronic files) in order to maintain participant confidentiality. If you have any questions, concerns or complaints about the interview or research, please contact Subash Pandey or you can call at +9779846051474.

Please sign and date below if you are 18 years or older, have read and understood this consent form, and you agree to voluntarily participate in this interview.

Signature_____

Name (Please print) _____

Date_____