

MASTER'S THESIS

Citizen's Engagement in Drought Adaptation Practises, Dhuseni, Nepal

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I confirm that the work is self-prepared and that references/source references to all sources used in the work are provided, cf. Regulation relating to academic studies and examinations at the Western Norway University of Applied Sciences (HVL), § 12-1.



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Applied Sciences

Citizen's Engagement in Drought Adaptation Practises in Dhuseni,
Nepal

Master thesis in Climate Change Management

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Abstract

Nepal is one of the most vulnerable countries in terms of climate change. Climate change is impacting the livelihood of people in all the sectors in Nepal especially in the rural areas in the mid hills. The mid hills regions have a difficult and uneven topography for agriculture and the extreme drought situations have created serious issues in agriculture. Rural populations in mid hills are engaged in agriculture as the major source of livelihood in the rural areas. Therefore, the study was conducted in the rural mid hill village of Nepal (i.e., Dhuseni). The study had the following research questions to find out: 1) the adaptation activities carried out in Dhuseni, 2) the factors that were determining the adaptation actions and practises and 3) the challenges for implementation status of local adaptation policy and plan of action (LAPA). A questionnaire survey was carried out where altogether 50 respondents participated in the survey, along with 5 key informant interviews. From the survey, it was evident that villagers had been facing an extreme drought situation recently and they had adapted to the situations as per their capacity such as using drought resistance crops, building water canals, migration, etc. Adaptation practises were found to be a gendered process in the village; factors such as gender, education and income and public support were found to be determining the adaptation actions/practises in the village. LAPA is a local adaptation plan and policy formulated in the village, which is a guiding document for climate change adaptation in in climate vulnerable communities. Even though LAPA plans and policies extraordinary are considered extraordinary with its inclusive and participatory approaches; it was found that the villagers were not given access to all the adaptation services as mentioned in LAPA. Due to political influence, limited capacity of the local government, LAPA implementation was found to be ineffective in the village. Although the villagers are adapting to their capacity, the adaptation practises could become more effective with active involvement and support from local government. Therefore, the involvement of citizen in climate adaptation action/practises plays important roles in the rural villages for the effective and transformative climate action. This study found that the engagement of citizen is not sufficiently taken into consideration in LAPA implementation.

Samandrag på norsk

Nepal er blant landene som er mest sårbare for klimaendringer. Klimaendringer påvirker livene til alle nepalere, men særlig blir folk i de rurale fjellområdene sentralt i landet sterkt påvirket. Denne regionen har en utfordrende og diversifisert topografi som gjør landbruk krevende, og ekstreme tørkeperioder byr på store utfordringer. Befolkningen i området lever i hovedsak av nettopp landbruk. Dette var bakgrunnen for min studie av landsbyen Dhuseni. Studien fokuserte på: 1) Klimatilpasningsaktiviteter i Dhuseni, 2) faktorer som påvirker aktiviteter og praksiser rundt klimatilpassing, og 3) utfordringer knyttet til implementering av lokal klimatilpassingspolitikk og -aktiviteter (LAPA-programmet). Et spørreskjema ble distribuert til 50 respondenter og fem nøkkelinformantintervju ble gjennomført. Fra spørreundersøkelsen kom det frem at innbyggerne i Dhuseni nylig har opplevd ekstrem tørke, og at de for å tilpasse seg dette har tatt i bruk tørke-resistente avlinger og bygd vanningskanaler, men også at migrasjonen har økt. Studien finner at klimatilpassingspraksisene er påvirket av kjønnsroller, der faktorer som kjønn, utdanning, inntekt og offentlig støtte trer frem som viktige forklaringer på klimatilpassingspraksisene i landsbyen. LAPA er det lokale politiske grepet for klimatilpassing i Dhuseni, og er et styrende dokument for klimatilpassing i sårbare lokalsamfunn. Selv om planer og politikk knyttet til LAPA er ansett å være et godt eksempel på politikkutforming gjennom å være inkluderende og deltakende, fant denne studien at landsbybeboerne ikke hadde tilgang til alle tjenestene dekket av LAPA. På grunn av politisk påvirkning og begrenset kapasitet hos lokale myndigheter fant studien at implementering av LAPA var utfordrende i landsbyen. Selv om innbyggerne tilpasser seg etter beste evne kan klimatilpassingspraksisene bli mer effektive gjennom mer aktiv involvering og oppfølging av lokale myndigheter. Studien argumenterer derfor for at involvering av innbyggere i rurale landsbyer spiller en nøkkelrolle for å lykkes med klimatilpassing og omstilling. Videre fant studien fant at i tilfellet LAPA er ikke innbyggerne tilstrekkelig involvert i arbeidet med å endre praksisene i landbruket i området.

Acronyms and Abbreviations

| | |
|---------|--|
| CBS | Central Bureau of Statistics |
| CDRM | Chauri Deurali Rural Municipality |
| CSA | Climate Smart Agriculture |
| FAO | Food and Agricultural Organisation |
| GISTEMP | GISS Surface Temperature Analysis |
| GON | Government of Nepal |
| ICIMOD | International Centre for Integrated Mountain Development |
| IPCC | Intergovernmental Panel on Climate Change |
| LAPA | Local Adaptation Plan of Action |
| LDC | Least Developing Countries |
| MOE | Ministry of Environment |
| MOFE | Ministry of Forestry and Environment |
| NAPA | National Adaptation Programme of Action |
| NAP | National Adaptation Plan |
| UNDRR | United Nation Disaster Risk Reduction |
| UNFCCC | United Nations Framework Convention on Climate Change |

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1. Introduction

Climate change is an unavoidable threat to our society (Coşofreţ & Bouriaud, 2019). Climate change has caused Nepal to face regular droughts, severe floods, landslides, and a variety of consequences on agricultural crops. Climate changes such as temperature, solar radiation, and precipitation can affect crop productivity. Despite several efforts to mitigate the effects of climate change, Nepalese agriculture continues to face challenges (Malla, 2008). Several concerns and experiences of a changing climate have led to the development of adaptation strategies (Adger, et al., 2011). IPCC (2022) defines adaptation in natural systems as, “the process of adjustment to actual climate and its effects”. Adaptation has a significant role in plummeting exposure and vulnerability to climate change (IPCC, 2022). However, the roles of citizens have been overlooked in climate adaptation (Hegger, et al., 2017). Citizen’s adaptation actions can be both proactive and reactive, they can be economic, social, or physical, or ecological (Brink & Wamsler, 2019). Irrespective of the national and local capacities to adapting to climate hazards (Hegger, et al., 2017), there is a crucial need for the engagement of people in adaptation activities (Brink & Wamsler, 2019).

The Sixth Assessment Report (AR6) of the IPCC has highlighted that there has been a faster increase in the global surface temperature since 1970 than in any other 50-year period over at least 2000 years. In the most recent decade (2011–2020), the global surface temperature was found to be 1.09 °C higher than in 1850–1900, 0.99°C (Masson-Delmotte, et al., 2021). Climate change is projected to have direct consequences on natural and human systems, including changes in temperature and precipitation variability, as well as the frequency and amplitude of extreme weather events (Masson-Delmotte, et al., 2021). Climate change is impacting several sectors of the environment, agriculture being severely impacted (FAO, 2022). Changing rainfall patterns, drought, flooding, and the geographical dispersion of pests and diseases are all direct and indirect effects of climate change on agricultural output (FAO, 2022). Among all the climate hazards, drought is identified to exacerbate the agricultural activities (Dongol & Joshi, 2017). Droughts have important consequences in both industrialized and non-industrialized countries, as their incidence, intensity, and duration are increasingly impacting agriculture (Alimullah, 2015). Whilst the major impacts of drought have been felt in the countries where people depend on agriculture for their livelihoods, especially in the rural areas (Curran & Meijer-Ironse, 2014; Alimullah, 2015).

Depending on regional variation and time, climate change has different levels of impacts on different communities and sometimes with the status of development as well (Poudel, et al., 2020). Vulnerability assessment, which is the state of susceptibility to harm from exposure to environmental change, is the first step in identifying adaptation (Adger, 2006) where socioeconomic status, resource consumption, and other factors all influence susceptibility. Several studies have identified several vulnerable groups

in: developing countries (Ayers & Huq, 2009), households that rely on natural resources for their livelihoods (Paavola & Adger, 2005), societies that are in geographically difficult locations (Kohler, et al., 2010), poor and disadvantaged families (Chapagain & Gentle, 2015), and females within the society and gender inequalities in the households (Terry, 2009).

Households whose livelihoods are reliant on natural resources for subsistence agriculture have been identified as the furthestmost susceptible communities in Nepal (Gentle & Maraseni, 2012; Poudel, et al., 2020). Rural communities are heavily dependent on agriculture for their livelihood and are mostly impacted by climate hazards. Dhuseni is a rural village and lies in the one of the most climate vulnerable districts of Nepal. Very few research has been conducted in Dhuseni. Dhuseni is a village in the mid-hills of Nepal under risks of several climate hazards such as drought, landslides, soil erosion, etc. where agriculture is a main source of livelihood. The annual mean minimum temperature is increasing, creating impacts on the agriculture sector with prolonged droughts, delay in monsoon, hailstorm, heavy rainfall (Giri & Dahal, 2021). Most of the land is left barren and uncultivated in the village which can induce several other natural disasters such as soil erosion and landslides in monsoon seasons (Sugden, et al., 2014). This study presents the scenario of citizen's participation in climate adaptation activities focusing – with a focus on the role of socio-economic factors and local policies on climate adaptation activities. The study emphasises on agricultural drought as a major climate hazard because agriculture is the main source of livelihood and in Dhuseni, Nepal.

The main purpose of the research was to find out citizen's engagement in adaptation practises in response to drought. The general objective of this research was to a) explore the people's level of understanding of climate change (especially droughts) and its impact in agriculture, b) the different kind of adaptation practises that are being implemented and c) to investigate the role of LAPA in their adaptation practises. To achieve these objectives the research has following research questions:

1. What are the climate change adaptation practises followed by people in Dhuseni?
2. What are the factors that determine the climate change adaptation actions and practises?
3. What is the status/challenges of LAPA program implementation in the village?

2. Background

2.1 Climate change

Climate change is a serious, critical, and unquestionably long-term global problem. According to the IPCC (2013), if humanity continues to consume fossil fuels at its current rate, the earth's average temperature would rise by 6.4 degrees Celsius and sea level will rise by 59 centimetres by the end of the twenty-first century. Climate change, according to GISTEMP, is a process caused by greenhouse gas emissions from gas burning, deforestation, urbanisation, and industrialisation, which results in variations in solar energy, temperature, and precipitation. Climate change poses a serious threat to many organisms around the world since it affects many ecosystems, including freshwater habitat, oceans, forests, and various flora. Climate change has an impact on water supplies and agriculture, as well as geological processes like landslides, floods, and desertification, as well as food safety and human health in the long run (Malla, 2008).

South Asia is one of the most vulnerable regions globally to several direct and indirect effects of climate change including temperature rise, sea level increase, etc. (Masson-Delmotte, et al., 2021). The South Asia region ranges from Bhutan and Nepal's high Himalayan peaks to Bangladesh's arable delta and India's peninsula, and captivating islands of Sri Lanka and the Maldives in the Indian ocean. Climatic zones are as diverse as its physical environment, the region is suffering a range of climate change effects, like glacial melt, forest fires, increasing sea levels, mountain and coastal soil erosion, and saline water intrusion (Masson-Delmotte, et al., 2021). In recent years, unusual monsoon patterns and numerous and strong storms have exacerbated natural disasters and climate change implications. More than 600 million absolute poor people live in the region, accounting for more than half of the world's total poor and rely on climate-sensitive sectors such as agriculture, forestry, and traditional fishing for much of their daily requirements. With global climate change expected to last well into the next century, South Asia's topography, high population density, and extreme poverty will continue to render it particularly vulnerable. As natural disasters escalate and migration increases, human health, biodiversity, agricultural production, food security, water, energy, and coastal settlements will be jeopardised, putting increased burden on major cities (ADB, 2020).

Changing rain fall patterns, drought, flooding, and the geographical dispersion of pests and diseases are all direct and indirect effects of climate change on agricultural output (FAO, 2022). Among all the impacts, drought is considered as one of the major climate change hazards that has been impacting agriculture production and livelihood of the people (Chapagain & Gentle, 2015; FAO, 2022). Every year drought affects an estimated 55 million people worldwide, posing serious threat to peoples' livelihoods, and mortalities and instigating mass migration (WHO, 2022). Drought is a slowly evolving phenomenon with long periods of dry weather in the natural climate cycle that can take place in every part of the world, marked by a lack of precipitation and resulting in water deficit (WHO, 2022).

According to the FAO (2018) report, drought is a key contributor to worldwide food and water insecurity reducing agricultural production and food and water excess. The effects of drought are different from location to location. Drought has soared the mobility of agrarian societies from rural to urban areas particularly in the developing countries (Curran & Meijer-Ironse, 2014; Alimullah, 2015).

2.2 Nepal and climate change

Nepal is a landlocked country occupying 0.3% of the total area of Asia and 0.03% of the world. Surrounded by China to its north and India to the east, west, and south, it extends 885 km from east to west and 193 km from north to south (MOE, 2010). Based on the National Population Census 2011, Nepal had a total population of about 26.5 million, with an annual population growth rate of about 1.35%. Nepal is diverse in terms of landscape, topography, altitude, and temperature. The Terai, Hills, and Mountain areas form the three agro-ecological zones in Nepal, covering its agricultural land (World Bank, 2011). The terai/plains region covers 17% of the total land, while the hilly and mountain regions occupy 68% and 15% of the total land of Nepal. The hilly region has more farmlands and has a suitable environment for farming. The Mid-Hills region accounts for roughly 43% of the population of Nepal (CBS, 2011)¹. About 80 percent people live in rural areas and 66 percent of people depend on agriculture for their livelihood (UNDP, 2009; MOE, 2010; Chapagain & Gentle, 2015).

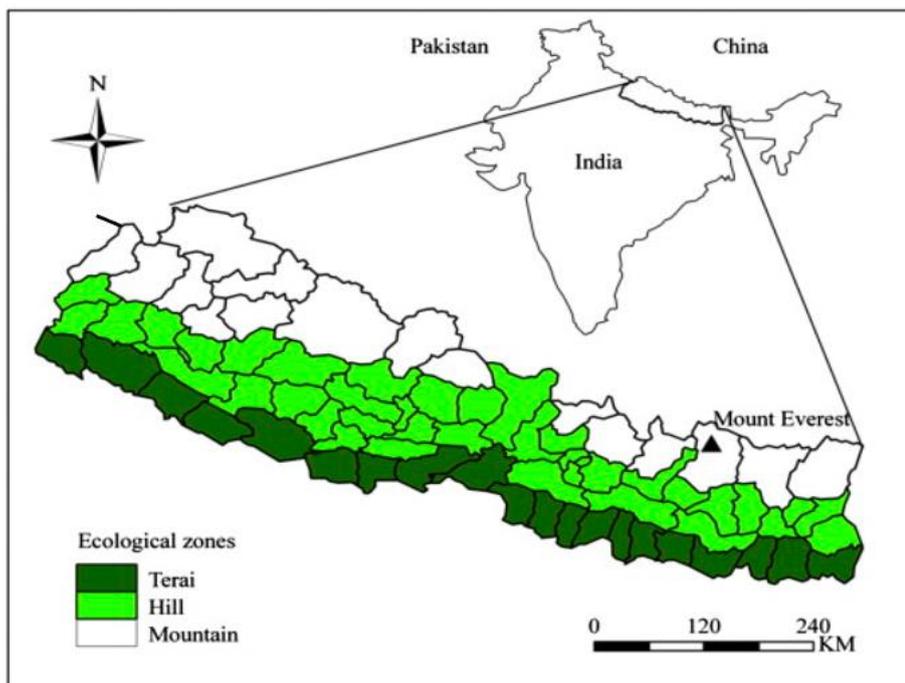


Figure 1 Map of Nepal with ecological regions

Source: (GON, 2022)

¹ The latest census results are not published yet so CBS,2011 data was used for the study

Nepal is fourth most vulnerable countries to climate change (EnLIFT, 2013), with temperatures rising faster than the global average in recent years. While the global mean surface temperature rose by 0.6 degrees Celsius between 1975 and 2005, Nepal's temperature rose by 1.5 degrees Celsius (0.06 degrees Celsius each year) during the same period, from 1982 to 2006 (Shrestha et. al., 2012). Precipitation and rainfall patterns are getting more irregular as well. As a result, average monthly rainfall has decreased by 3.7 mm (3.2 percent) over the last decade, -3.2% per month, per decade (MOE, 2010). Drought has become an outcome because of these conditions, particularly in the rain-fed hill farming system, where people rely on summer and winter rainfall for their primary agricultural activity (Ghimire, et.al., 2010). Furthermore, by the 2060s, the mean annual temperature is expected to rise by 1.3°C to 3.8°C , and by the 2090s, it is expected to rise by 1.8°C to 5.8°C , with annual precipitation reductions ranging from 10% to 20% across the country (MOE, 2010).

Agriculture is still a major source of income for those living in rural areas, with more than two-thirds of rural people relying on it (Chapagain & Gentle, 2015). Crops and livestock farming, in various combinations, provide a substantial source of income in rural communities. Nepal's agriculture sector contributes for over a third of the country's GDP (Chapagain & Gentle, 2015). Sixty percent of cropland in Nepal is rain-fed, with no alternative irrigation, and more than half of Nepalese farmers are smallholders, growing less than 0.5 hectares (Chapagain & Gentle, 2015; CBS, 2011). This demonstrates a decreasing trend in agricultural employment and increasing importance of non-farm work for income security.

Droughts has been experienced in Nepal in 1972, 1977, 1982, and 1992. Similarly, the country has endured numerous dry periods since 2002, particularly in the years 2002 and 2004–2006, both in the dry and wet monsoons (Joshi & Joshi, 2019). Moreover, from November 2008 to February 2009, the country had received less than half of its usual precipitation, making 2008–2009 as a worst winter drought on record(Joshi & Joshi, 2019). Frequent drought events were also noted in the years 2012, 2013, and 2015. Droughts in Nepal have wreaked havoc on the hill farming system, particularly in terms of crop output and the livelihoods of those who rely on it (Adhikari, 2018). Droughts are most common between the end of March to through June, which coincides with the start of monsoon season in many parts of the country. The majority of Nepal's agricultural terrain is made up of bari land (rain-fed step terraces in the Mid-Hills), where agricultural production is critical for food security. The moderate monsoonal climate of the Mid-Hills is characterised by more than 80% of precipitation falling during the summer monsoon season (Biggs, et al., 2013). Some parts of the Trans-Himalayan region, on the other hand, remain exceedingly dry all year. Droughts are also more prevalent in Nepal's lowlands and western hills. Drought is a risk in steep hills and mountainous areas in Nepal's far and midwestern regions (MOE, 2010).

Climate change is widely acknowledged to be disproportionately affecting Nepal, given its small size and small contribution to greenhouse gas emissions. Nepal, however, cannot avoid the fast-expanding influence of climate and global changes due to its placement between two quickly growing countries, India and China. Some of the effects Nepal has experienced in recent years include fast disappearing glaciers (average retreat of more than 30 m/year), quick temperature rise ($>0.06^{\circ}\text{C}$), irregular rainfall, and an increase in the frequency of extreme occurrences such as floods and drought-like situations (Karki, et al., 2009).

Nepal must prepare to mitigate these effects or try to adapt to them, to reduce their impact on the lives and livelihoods of its people especially in the rural areas. Nepal is mostly a mountainous country, and current evidence suggest that the mountain regions are more vulnerable because of rising temperatures and rapid altitude changes over short distances. These frightening trends affect not just Nepal's major economic sectors such as agriculture, tourism, and energy, but also the health, safety, and well-being of Nepalis (Karki, et al., 2009). Nepal is a susceptible country in terms of climate change therefore policies are very important to combat with climate change issues.

2.3 Climate policies In Nepal

Climate change is already posing a threat to human survival, and we must do everything we can to avoid it becoming catastrophic. Adaptation and Mitigation is a widely accepted method for limiting the worst effects of climate change. Adaptation should be a top concern for a developing country like Nepal (Karki, et al., 2009). Policies, methods, and guidelines have a direct impact on farmers' ability to adapt to climate change, particularly women from various economic and social categories. Sub sectoral policies, regulations, and plans are important tools for the government to implement these policies and strategies. The Nepalese government has developed several policies, strategies, programs, and plans to address climate change, however these policies do not adequately address the interconnections between climate change and migration in Nepal. In Nepal, policymaking is more geared toward safeguarding people from natural calamities (UNDRR, 2019). The government ratified the Kyoto Protocol in 2005, recognizing funding opportunities through the LDC fund and Clean Development Mechanism. Specific disaster risk reduction (DRR) objectives were set. Eventually, Nepal adopted climate change adaptation as a new policy paradigm in 2009. Policy goals began to emphasise the importance of adaptation for all development sectors, and adaptation implementation from the local level (Sherpa & Bastakot, 2021).

Nepal's Climate Change Policy was developed in 2011, and it provides the country's broad policy direction on climate change (MoFE, 2019). This policy emphasises on climate justice and interrelation between nature conservation and management, human development, and sustainability. The policy discourses both on mitigation and adaptation, converging on adaptation and resilience for locals according to the significances identified in National Adaptation Programme of Action (NAPA) (MOE, 2010). The government of Nepal has prepared national and local level plans for adaptation and

mitigation in response to climate change namely National Adaptation Programme of Action (NAPA) and Local Adaptation Plan for Action (LAPA) (GoN, 2011).

Nepal is currently drafting National Adaptation Plan (NAP) to recognize short and long-term adaptation requirements by reducing climate vulnerabilities. NAP's two main goals are to minimise vulnerability to climate change impacts by enhancing resilience and adaptive capacity, as well as to combine climate change adaptation into new and existing policies, programs, activities, and strategic initiatives across all sectors and authorities (MoFE, 2018). The thematic areas of NAP and crosscutting issues are:

- Agriculture and food security.
- Water resources and energy.
- Water, Public health and water, sanitation, and hygiene.
- Urban Settlements and infrastructure; Forests and Biodiversity.
- Climate-induced disasters; Tourism, natural, and cultural heritage.
- Gender and social inclusion.
- Livelihoods and governance.

Agriculture is recognized as one of the most vulnerable sectors to the changing climate and the government has constantly emphasised on agriculture and food production over the last few years (GoN, 2011). The policies formulated during the last decade demonstrate increasing acknowledgment of climate change impacts in agriculture and include strategies for climate change adaptation and mitigation. There are total of 20 policies, strategies, and guidelines, including 15 agricultural policies and five climate change policies. Fourteen of the twenty policies acknowledge the influence of climate change on agriculture, but only nine provide adaptation mechanisms (Paudyal, et al., 2019). CCADRMA - Climate Change Adaptation and Disaster Risk Management in Agriculture: Priority framework for action (2011–2020), and Environment Friendly Local Government Framework (EFLGF) 2013, are the new policies created after the development of NAPA and LAPA (Paudyal, et al., 2019). There are also several government and non-governmental bodies working at local and national level to assist with several climate related issues. LAPA is the most effective policy that has been launched for all the climate change susceptible areas in Nepal. Therefore, this study will analyse LAPA and local Disaster Risk Reduction Plan which have been officially initiated in the study site.

Local Adaptation Plans for Action (LAPAs) was created outlining a strategy for "delivering adaptation solutions to the most climate-vulnerable localities" (GoN, 2011). The main themes of LAPA are: 1) Agriculture, 2) Forestry, 3) Health, 4) Water and sanitation, 5) Watersheds, 6) Microfinance, 7) Education, 8) Infrastructure, 9) Disasters. The LAPA framework seeks to ensure that strategies to incorporating climate change adaptation and adaptive capacity into development endeavours are bottom-up, comprehensive, responsive, and adaptable. LAPA have seven steps for climate adaptation (Figure 1) that includes sensitization, vulnerability and adaptation evaluation, and prioritisation of

adaptation alternatives, resulting in the development of LAPA that is then assimilated into local planning for effective implementation. Climate vulnerability assessments are used in LAPA process, to categorise the villages, municipalities and livelihoods that are at the risk of climate change. There is also a manual which was developed to assist and support the development of LAPAs (MoFE, 2018).

As shown in figure 1 below, LAPA process has several steps. Step 1 is involved in raising awareness among stakeholders at household, community, village, municipality, district and national level and the addresses the impacts of climate change so that climate change adaptation can be incorporated in planning. Step 2 identifies the most vulnerable communities, reasons behind their vulnerability and seeks the approaches/ adaptation measures to reduce their vulnerability. Followed by the prioritisation of significant and cost-effective adaptation actions for implementation in step 3. Step 4 forms a roadmap showing adaptation pathways with the achievements, targets, and their monitoring. Step 5 leads to the inclusion of climate adaptation and resilience into sectoral and cross-sectoral development plans, along with the integration of identified adaptation actions into public, private and NGO planning processes. Step 6 is more focused on implementation of LAPA both at local and institutional level. Followed by a final step of monitoring and assessment which is done in all the stages throughout LAPA planning and implementation process.

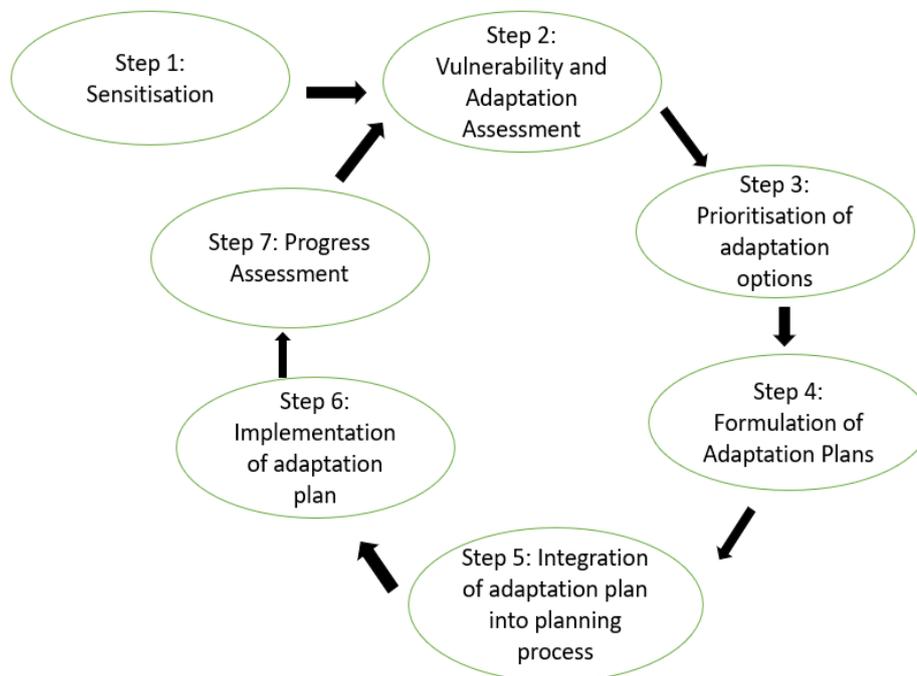


Figure 2 LAPA steps in climate adaptation

Source: GoN, 2011

Throughout all these stages LAPA has clearly identified the vital role of the vulnerable communities, local people and the institution involved in LAPA process. People play a significant role in the planning, formulation, and implementation process. For the effective implementation of adaptation actions, equal participation and contribution of local people and institutional support is required. LAPA has explicitly stated the roles of stakeholders and the institutions responsibility in climate adaptation actions. Although this study specifically interests in step 6: implementation of LAPA. The empirical focus is towards assessing potential discrepancies between implementation of LAPA and adaptation practises in the study area.

3.Theory

3.1 Citizen engagement in adaptation

Citizen engagement is itself a participatory approach. In climate adaptation, citizen engagement is a process where people are involved in individual or community level adaptation activities, policy making and governance. It is essential for implementing climate mitigation and adaptation measures on private property, as well as ensuring legitimate and just government action and long-term climate action implementation (Wamsler & Brink, 2014; Wamsler & Raggars, 2018). Citizen engagement can range from citizens participating in government decision-making to citizens participating in the co-design of policies and strategies, as well as the co-production of climate goods and services (Wamsler, 2017). But this study is inclined mostly towards citizens participation in climate adaptation practises. Although citizen-led initiatives are on the rise and represent a potentially promising governance mode to mitigate and adapt to climate change, the involvement of citizens in climate action is still low. We still have limited knowledge regarding the opportunities and limitations of citizen initiatives for climate action.

Citizens are a vital member of society, who play a key role in advocating for and assisting in the development of more transparent, responsible, and effective public institutions, as well as contributing innovative solutions to complicated development concerns (WorldBank, 2022). World Bank defines “Citizen engagement as a two-way interaction between citizens and government or the private sector”. Citizen engagement is considered as an umbrella concept which incorporates different modes of interaction from and with people, ranging from informing and listening to implementing collaboratively accepted solutions through discourse, debate, and analysis. Citizen’s engagement can help governments achieve better development results by establishing ties between citizen participation and improved public service delivery, public financial management, governance, social inclusion, and empowerment, according to growing evidence (WorldBank, 2022). Although citizen engagement can be from community level, individual level, this study is focused on the individual level participation in climate adaptation as a citizen engagement activity rather than involvement in policy making.

However, evidence suggests that citizen engagement outcomes are context specific and are dependent on both the government's and individuals' capacity and willingness to collaborate (Brink & Wamsler, 2019; Hügel & Davies, 2020; WorldBank, 2022). The opportunities and scope for effective citizen engagement are shaped by social, political, economic, environmental, cultural, geographic, and other factors, such as gender dynamics (WorldBank, 2022). There are very few studies done on actual practises of climate change adaptation and the aspects that encourage citizen’s participation in and for adaptation (Brink & Wamsler, 2019; Hegger, et al., 2017). The non-material elements such as emotions, values, beliefs, and the material aspects such as available resources, knowledge, public support plays a crucial role in shaping the citizen’s engagement in adaptation (Wamsler, 2018). The cultural theory

supports that there are material and non-material aspects which influences citizen engagement and climate adaptation which is further explained in the following section.

3.2 Cultural theory

Several approaches have been applied in climate change adaptation studies namely cultural theory and theory of psychology. Citizen participation and engagement activities corresponds to cultures and behaviour (Rippl, 2002; Adger, et al., 2011). Cultures are dynamic and responsive, and the concept of climate change shapes them. As a result, culture and its analysis are critical to comprehending the origins, implications, and human responses to climate change (Adger, et al., 2011). In the sphere of risk analysis, social and cultural aspects are becoming increasingly significant (Rippl, 2002). Therefore, the Cultural theory (CT) of Douglas and Wildavsky is used as framework for analysis because this theory provides a direct linkage to environmental risk and policy (Brink & Wamsler, 2019). The cultural theory is identified as one of the most persuasive strategies to analyse the impacts of social and cultural influences on risk perception (Marris, et al., 1998). Therefore, this theory is used to investigate factors influencing citizen's engagement in climate adaptation practises.

This cultural theory explains how different social organisations and institutional cultures define risks and how those distinct conceptions create different "voices" in several discussion forums regarding climate change risks and responses (McNeeley & Lazrus, 2014). According to cultural theory, risk framing is guided by distinct sorts of worldviews which are a set of values and beliefs on how society should be structured. Using two central dimensions of sociality: control(grid) and social commitment (group), four competing worldviews (egalitarianism, hierarchism, individualism, and fatalism) are identified by CTR (Douglas & Wildavsky, 1982; Rippl, 2002). These worldviews serve as culturally informed categorization, allowing people to "choose awareness of certain threats to adapt to a specific way of life." Each worldview is made up of a distinct behavioural pattern (social interactions pattern) and a justification cosmology (or cultural bias). The social structure, social ties, and acts are all part of the behavioural pattern while cosmology includes the cognitive factors such as attitudes and values (Douglas & Wildavsky, 1982). Grid-group analysis approaches ideas and values by exhibiting and shaping the experience of belonging to a social organisation as well as social differentiation within it (Rippl, 2002).

According to the cultural theory by Douglas and Wildavsky, all the four worldviews have different risk perception, the need for responsive environmental behaviour, preferences of certain policy options and social order. This theory can be applied to a group of people, society, and individuals. People with hierarchical views are assumed to tolerate risks if the dangers are justified by governmental authorities or experts. However, they are afraid about threats to the social order. Egalitarians are considered to resist risks that will have irreversible consequences for many people or future generations. They are

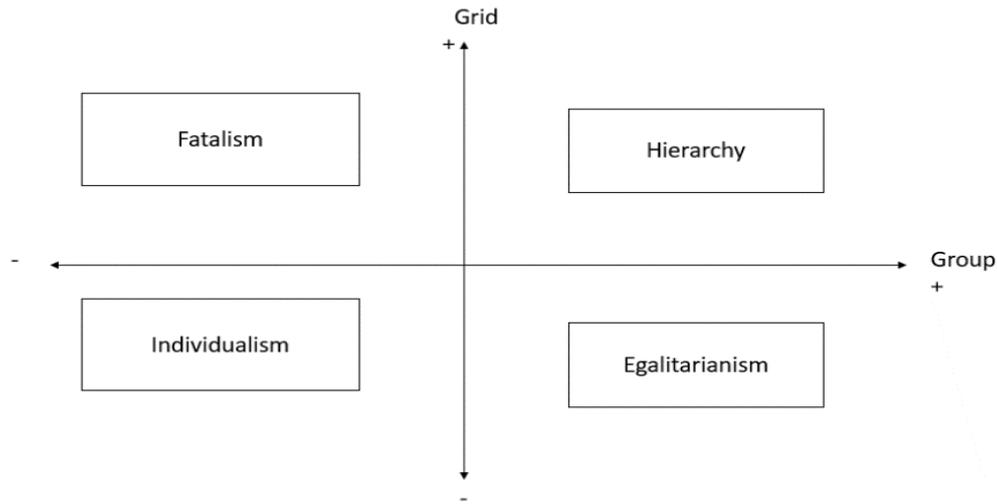


Figure 3 Typology ways of life using group-grid dimension

wary of risks imposed on them by the judgments of a small group of experts or government officials. Fatalists have a high preference for socially imposed classifications but lack a sense of group identity. They strive not to know and not to be concerned about matters over which they believe they have no control. Individualists regard danger as an opportunity. For example, new technologies are seen as opportunities rather than threats. They are afraid of dangers that may limit their independence (Rippl, 2002).

Culture is recognized as the symbols which express meaning, including principles, art and stories that forms behaviours and viewpoint in individuals from which different responsive strategies are developed and implemented. Thus, this study focuses on climate related hazards and cultural dimensions of adaptation responses, accepting the role of culture in adaptation. Culture has both non-material aspects (emotion, values, beliefs) and material aspect (age, gender, education, income, public support) (Adger, et al., 2011; Brink & Wamsler, 2019): which plays a crucial role in shaping the citizen's engagement in adaptation (Wamsler, 2018). The different worldviews will serve as a basis for the identification of factors behind adaptation practises. The worldviews/ways of life also determines the policy options that are being considered during adaptation practises. Therefore, the scope of this study is inclined to non-material aspects (motivation) and material aspects (gender, education and income and public support) that play important roles in determining citizen's engagement in climate adaptation and are also at risk from climate change.

4. Methods

4.1 Study area

Kavrepalanchok is one of the most vulnerable districts in terms of climate change (EnLIFT, 2013). The research was conducted in rural village in Chauuri Deurali Rural Municipality in Kavrepalanchok which is situated in the Bagmati province in the central part of Nepal. Dhuseni village lies on the mid-hills of Nepal at an altitude of 1600 metres above the sea level. Dhuseni village is 170km east from the Kathmandu valley. This district has a temperate climate throughout the year.

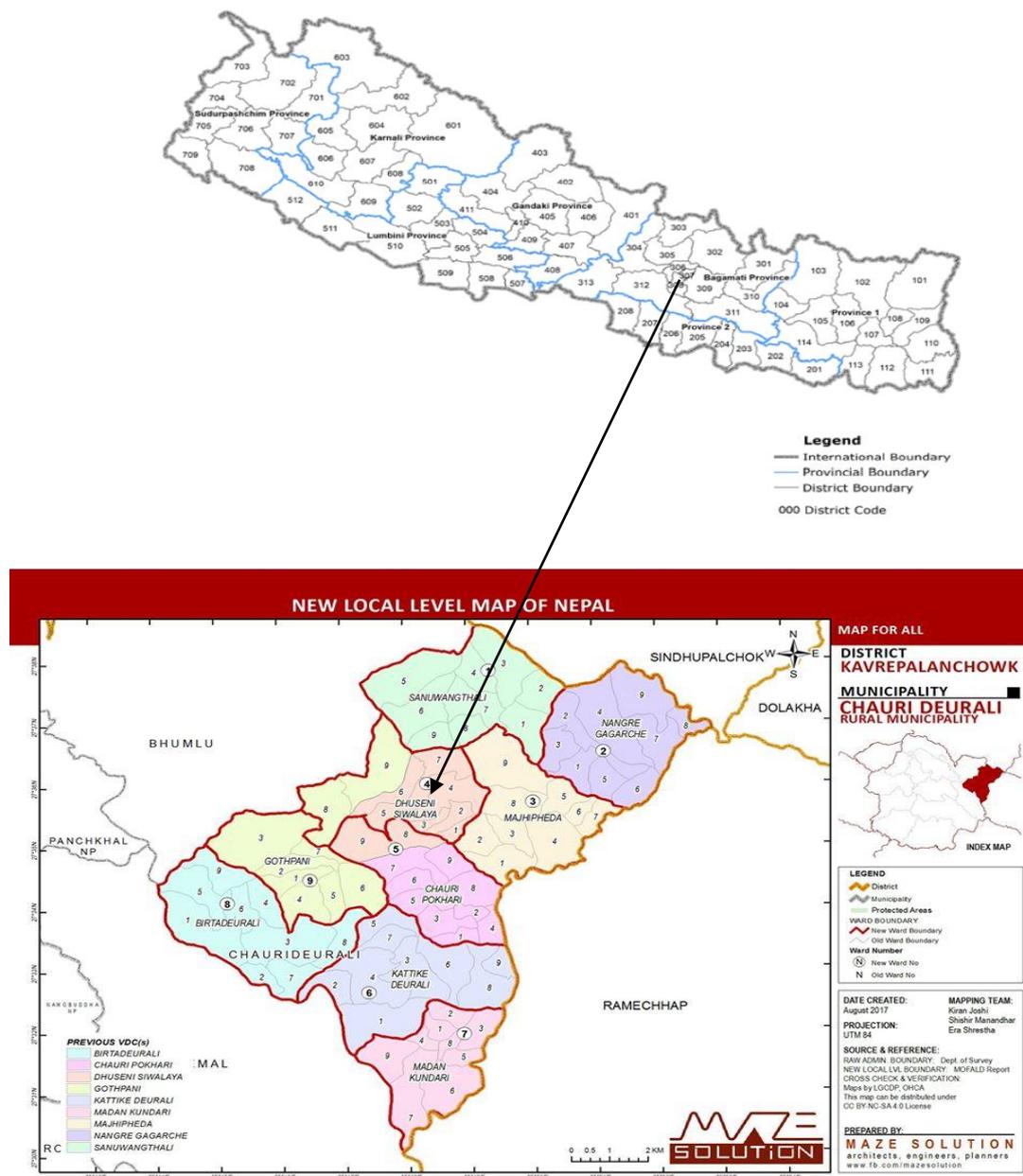


Figure 4 Map of Nepal with the study site

Source: (GON, 2022)

The district occupies 1404 ha. land, of which approximately 43.8 percent is estimated as the arable land. Rest of the land is distributed as forest, water bodies, rock, cliffs, or pastureland. Of the total available arable land 78.6percent are being used as the land under cultivation. Rivers/ Water bodies, forest vegetation are the major natural resources of the districts. Due to enriched natural resources the district has high potential for tourism. The district is divided six municipalities and seven rural municipalities.

According to the National Population Census 2011, the total population of Dhuseni village is 1716 with 940 and 776 number of females and males respectively. There are a total of 366 households in the village (CBS, 2011). There is a sharp decline in the rural population in the district (as shown in Table 1). Chauhari Deurali Rural Municipality comprises of higher number of females than males. Moreover, CDRM has been recorded to have greater decline (-2.64%) in population in the overall Kavrepalanchok district. The houses are headed by males more than females. Males of age group 40-49 years and females of age group 30-39 years are found to be the head of the family.

Table 1: Population Composition of the district and municipality

| | Total Population | Male Population (%) | Female Population (%) | Population growth rate (%) | Total Household | Males headed household (%) | Females headed household (%) |
|----------|-------------------------|----------------------------|------------------------------|-----------------------------------|------------------------|-----------------------------------|-------------------------------------|
| District | 381,937 | 47.89 | 52.10 | -1.1 | 80,720 | 78.72 | 21.28 |
| CDRM | 21499 | 45.63 | 54.36 | -2.64 | 4,664 | 73.99 | 26.01 |

Source: GoN, 2017

As seen in Table 2, the district has an overall 69.8% percent literacy rate, where male's literacy rate is higher as compared to females) (GoN, 2017). And Chauhari Deurali Rural Municipality has a literacy rate of 58.63% on average with a greater number of educated males than females.

Table 2: Population aged 5 years and above by literacy status

| S. No. | Sex | Population aged 5years & above | Can read only and both read and write | Literacy % in district | Literacy % in CDRM |
|---------------|------------|---|--|-------------------------------|---------------------------|
| 1 | Male | 182936 | 138885 | 75.59 | 68.18 |
| 2 | Female | 199001 | 121231 | 60.92 | 50.82 |
| 3 | Overall | 381937 | 260116 | 69.8 | 58.63 |

Source: GoN, 2017

4.2 Research design

Culture and place studies draw on a variety of theories and approaches, ranging from anthropology to geography and human ecology (Adger, et al., 2011). Based on the cultural theory of Douglas and Wildavsky, material and non-material aspects were considered for while developing questionnaires

(Annex I). A set of questionnaires were prepared accordingly with integration of questions regarding the reason behind motivation, the roles of incomes in adaptation activities and the support received from the local government and so on. Both qualitative and descriptive quantitative method are applied in the study. The questionnaire survey, in-depth interview, and field observation (Adger, et al., 2011) were the major tools used for this study. For the selection of respondents, random sampling method was used because the village has the households at the distant locations (GON, National Population Census, 2011). Out of 1716 people, 50 respondents were selected randomly because there is total 366 households (CBS, 2011) in the ward and most of the household have been reported to move to the closer towns and cities for employment and studies. Therefore, most of the respondents are females and old-aged people (CDRM, 2021).

Both primary and secondary data were used for the study purpose. The primary data was obtained through the questionnaires, interviews and discussions with the concerned officials, experts, and local people. Also, in depth interviews were conducted with various stakeholders of the selected study area including local people, leaders, and government officials. Relevant questionnaires on climate adaptation activities were generated to understand the level of engagement of people in climate adaptation. While for the secondary data, different governmental documents were analysed, several literatures were reviewed.

4.3 Surveys and Interview selection

The head of the household involved in agriculture was selected for the survey based on the selection procedure. The household head (age 25 years and above) was selected irrespective of sex. However, if the household head was not available, then the next most senior member of the household was invited to be interviewed. The surveys were conducted in April 2022 at a location convenient to the participants. Based on the questionnaire, participants were asked to describe their experience of change in climate and its impact on their agricultural practises over the last 30 years. The adaptation-related questions were left open-ended. Moreover, they were asked to describe any coping or adaptation measures they followed to overcome these impacts. Each interview lasted between 30–45 minutes, and answers were recorded on the questionnaire sheet by the interviewer and transcribed as soon as possible thereafter. Also, sound recordings of the interviews were done for reliable information and as an alternative to paper-based survey so that information could be retrieved if lost during research period.

Key informant interviews were also conducted at the municipality levels through the purposive sampling of experts knowledgeable of the issues related to the research. Accordingly, private organisations (both national and international) and government departments whose work involved climate change, agriculture and food security and the relevant officials consulted. A total of 5 key informants were interviewed including three officials from municipal government departments, one from non-governmental organisations, one teacher and one leader of the village.

4.4 Data analysis

The data analysis was started by transcribing the audio recordings and through reading of information collected in paper survey and field notes. Verbal, pictorial, and numerical data gathered were first translated from Nepali to English. Those translated field notes were organised and re-read. Different codes were formed for the question regarding motivation for adaptation using NVivo. The codes were formed accordingly to the answers recorded from the respondents as shown in table 5. From the codes, descriptions and themes were identified and connections were established with the thematic areas. Finally, interpretation was done using narrative data analysis under qualitative process.

To find the roles of the material aspects (gender, income and education and public support) in citizen's engagement in adaptation activities, the data analysis combined descriptive statistics (tables, illustrative graphs, etc.) and qualitative content analysis of free-text answers. People's risk-reduction and adaptation activities were evaluated using a checklist of six common actions as mentioned in Local disaster risk reduction plan (CDRM, 2021).

4.5 Ethical consideration

Participants were provided with an information sheet outlining the details about the study. Interviews were conducted in the native Nepali language to ensure the respondents had an adequate understanding of the questions. Participation was voluntary, and respondents were free to withdraw from the study at any time if they chose to do so. Before each interview, participants completed the approved ethical consent process, with the researcher explaining the purpose of this and its significance to the participants. The identity of participants is not disclosed, maintaining the anonymity and confidentiality of respondents.

5. Results

This chapter includes the data presentation to understand the citizen engagement in climate change adaptation. Chapter 5 represents an overview of people's response towards climate change and drought impacts on agriculture (5.1), adaptation practises (5.2), motivation for adaptation (5.3) and public support (5.4). The results are interpreted according to the questionnaires (Annex I).

5.1 Changes in natural environment in Dhuseni

Agricultural systems are currently undergoing rapid transformations because of socioeconomic development, technological advances, growing populations, economic opportunity, changing commodity demand, and the need for sustainability in the face of global environmental change (FAO, 2016; UN, 2017). Present and projected agricultural systems are burdened by climate change, which has jeopardised the capabilities to ensure global food security, poverty eradication, and sustainable development (Masson-Delmotte, et al., 2021; FAO, 2022). The greatest significant burden in agriculture is the increased unpredictability of weather patterns. This encompasses major weather occurrences such as droughts, floods, and cyclones, as well as more subtle changes such as monsoon onset and rainfall frequency. Table 3 summarises the important findings on respondent's views of drought as a climate change and its impacts on agriculture in Dhuseni.

Table 3: Summary of people's responses on climate change that is impacting agriculture

| Aspect | Impacts in the study area |
|-------------------------|---|
| Temperature | Uncertain, more accentuated extremes, warmer and shorter winters; Heat waves affecting livestock farming |
| Annual Precipitation | Significant reduction in amount and duration, more intense events, erratic |
| Winter Precipitation | Decrease in snowfall at higher elevations, visibly rising snow lines on distant mountains; less or no winter rain |
| Onset of Monsoon | Delayed, more unpredictable |
| Water level | Lower, some springs are dry |
| Dry season | Longer more intense |
| Crop pests and diseases | Significant increase, Observed new pests |
| Soil quality | Dry and fragmentation of cultivable land |

People have varied perspectives on climate change. Some people are aware of climate change, while others believe they are aware but lack sufficient understanding, while yet others are ignorant of climate

change. In this study, household survey was carried out to find the engagement of citizens in climate adaptation and respondents shared their perspectives on local climate change and its impact on their lives. They are, however, unsure about climate change and its consequences. Only 7 had not heard of climate change or global warming, according to their perceptions and experiences, while 43 people had directly heard about it.

Respondents reported that the water availability was significantly reduced in the village. Droughts have exacerbated the declining water levels which can pose a serious problem of frequent landslides and mass movements in the hills (Sugden, et al., 2014). They believed that rainfall quantity and duration had decreased significantly over the previous 5–10 years, with a greater loss in the west than in the east, and that precipitation events had become more irregular. Winter rains have been infrequent or non-existent in recent years, and snowfall had reduced dramatically or disappeared entirely in many regions at higher elevations over the previous 5–10 years. The onset of the monsoon was continuously delayed, the monsoon was more unpredictable, the dry season was longer and more intense, and water levels in springs and groundwater sources had plummeted. New dry periods were frequent, especially during the rainy season, resulting in lower yields. Many respondents believed that there was growth in number of hot days, with mild winters and rising temperatures at higher elevations. They claimed that temperature extremes are also becoming more common, affecting both winter and summer agriculture, which was supported by a study done by Sugden, et al (2014). In addition to changing climatic circumstances, several respondents across the whole research area reported increased crop pest and disease occurrences.

There was no difference in perception of climate change among different social groups in the village. Younger women, who had moved to the village through marriage and thus lacked the necessary time horizon, often found it more difficult to assess differences in climatic conditions. The elderly found it easiest to report on change, and many emphasised the rise in temperature since their childhood. The reasons for the shifts in weather patterns were unknown to the respondents. Many others cited environmental factors such as widespread deforestation and population growth as contributing factors to increased pollution and climate change. Some saw the observed changes as a punishment from the gods, who had become enraged. A 72-year-old Dhuseni farmer said, *'Earlier, everything was balanced, the world is turned upside down these days, and the gods are cruel to us'*.

Droughts are growing more common, which is making agriculture less stable and have serious consequences in crop output, food security, and the general life of people who rely on these resources (Ghimire, Shivakoti, & Perret, 2010). Majority of the respondents in Dhuseni were identified to be practising agriculture as a major livelihood strategy. All the respondents stated that they have been facing serious drought issues such as dry and fragmentation of agricultural land, scarcity of water for irrigation in the fields, strong winds and irregular rainfall patterns, appearances of pest and diseases,

heat waves affecting livestock, and forest fire. Farmers in the hills, particularly marginal and poor farmers, as well as women with limited availability of resources and livelihood alternatives, are most adversely affected and at-risk. As a result, agriculture and agricultural communities are among the most vulnerable sectors to climatic and non-climatic stresses (Chapagain & Gentle, 2015). Out of the total respondents, 3 respondents confirmed to have experienced forest fires due to drought in the village. Ward chairman of Dhuseni, Mr. Suresh Kumar Lama confirmed that there were incidences of wildfires in the village due to the prolonged dry period therefore, prescribed burning is adopted. He also stated that there are several wild animals coming into the village from the nearby forest, to avoid the encounter with wild animals prescribed burning is carried out.

During a key informant interview, village ward chairman, Mr. Lama mentioned the crop productivity scenario in the village. He said -:

“In recent year, the production rate of cereal crops such as rice, maize, and wheat are increased marginally in comparison to the preceding year. The local people were dissatisfied with the production of local varieties in many sectors of production, so they had switched to alternative cereal crops. Therefore, most farmers utilised improved seeds, chemical fertilisers, and pesticides, and because of high productivity. At higher air temperatures during the ripening stage, the crop ripens faster, resulting in smaller grain size and lower yield. So, crops require an ideal air temperature to grow, and they cannot tolerate high temperatures in the air, soil, or water. High temperatures also cause several issues in agriculture, including shortened agricultural harvesting times, shortened seed germination times, and an increase in pest and disease populations. There is also a great concern with cereal crop production that is not being addressed. Agricultural plants face a variety of challenges from drought, including rain deficits, excessive rain, frost. As a result, the crops production is influenced by climate factors in Dhuseni”.

It was found that most of the respondents believed that climate change had a direct influence on agriculture. Based on field survey and key informant interviews, slight changes in the environmental characteristics in the study area are being observed. There is decrease in cold and frosty days with shift in rainy season and increasing number of warm days. These variables are found to have significant impact on the agricultural system in the study area. According to the respondents, the agricultural production system is rapidly changing in Dhuseni.

5.2 Adaptation practises

To live in harsh and changing climate conditions, Nepali people have created a variety of independent adaption mechanisms over time (ICIMOD, 2010). Farmers have been adapting to drought in Nepal by using hybrid crops for the agriculture. A shift in conventional farming practises and farmers' innovations are a significant factor in local adaptation to climate change. In accordance to cope with the agricultural losses, local farmers have been found to be dedicated in observing and experimenting

in the field. However, as the rate of climate change accelerates, adaptation becomes more difficult for rural populations, particularly those who rely totally on the environment for their livelihood (ICIMOD, 2010; Poudel et.al., 2020).

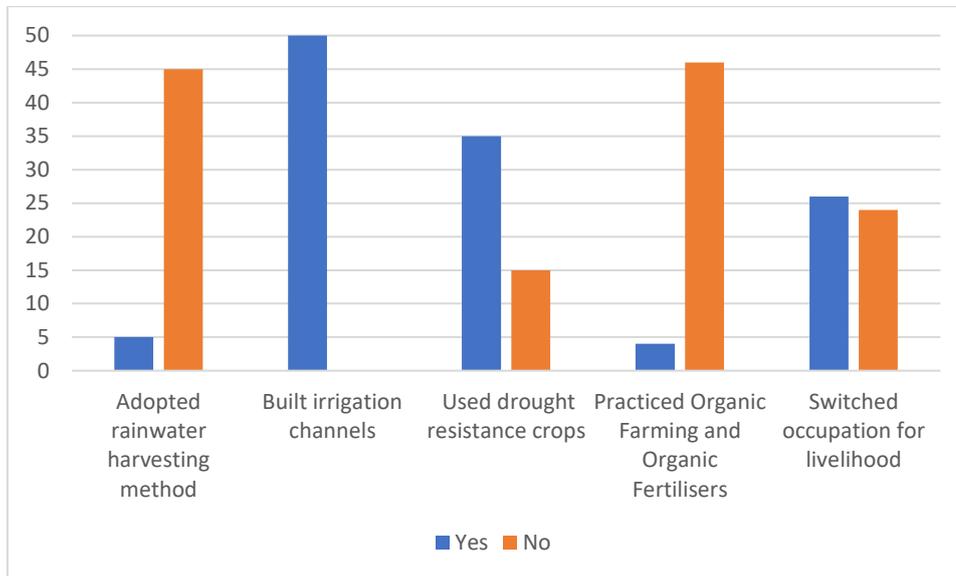


Figure 5 Adaptation activities followed in response to drought

Most of the respondents stated that irrigation was the important factor for good production in agriculture, so they were motivated to build the irrigation channels for their fields for their subsistence agriculture. Along with that majority of the respondents were found to be using drought resistance crops and very few were practising organic farming and fertilisers and water harvesting method. And surprisingly half of the respondent's household members had impelled them to switch their occupation for livelihood. Women and men responses were slightly similar, except for the interest of women in adapting drought resistance crops while men were more interested in switching occupation for their livelihood.

To adapt to the effects of climate change on agriculture, farmers have used several strategies and technology. Modifying crop kinds, using enhanced cereal crop seeds, changing cropping patterns, implementing intercropping systems, terracing sloping fields to prevent landslides and erosion, and using chemical fertilisers and pesticides are all examples of these measures. Imported enhanced varieties have a high yield potential but are more susceptible to environmental stresses including wind, hail, and rain. For high productivity per unit area, farmers in this municipality prefer enhanced rice, maize, and wheat types. In comparison to local seeds, the enhanced seed has a high output potential.

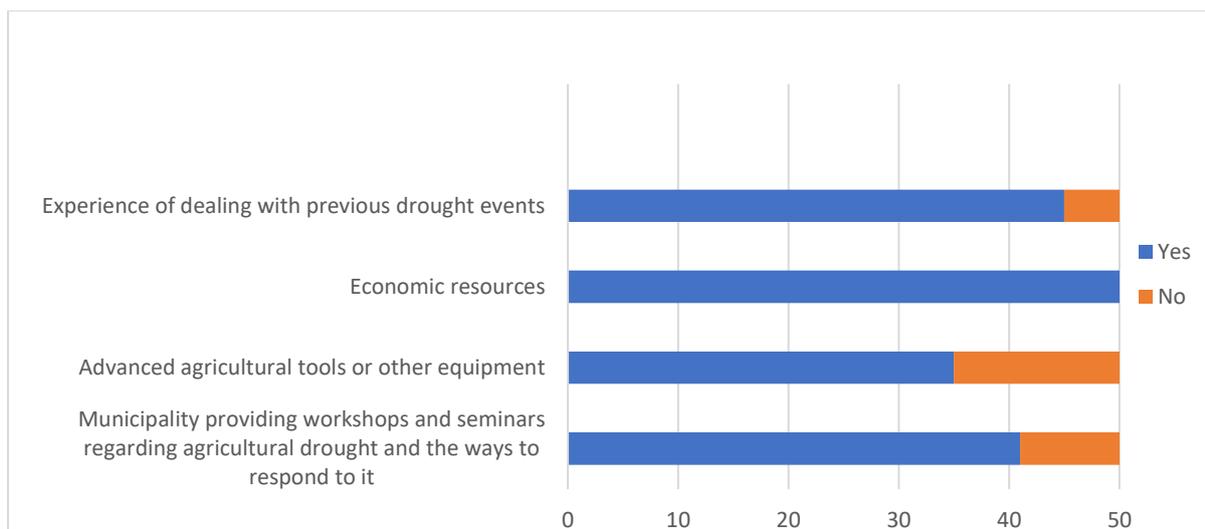


Figure 6 Resources required to deal with drought events

When respondents were asked about the resources/adaptive capacity required to deal with drought events, most of the respondents said that the previous experience of dealing with drought events can be helpful in increasing the adaptive capacity. Moreover, they expressed that back in the ancient times people used various techniques to adapt against extreme weathers and pests and so on. For example, 75-year-old man said *“I remember my father used to adopt intercropping method during dry seasons to increase productivity. He also used firewood ashes as fertilisers in the field which was a natural pesticide for pests and a soil loosening agent.”*

For a variety of complex causes, women's potential to adjust to climate stress has been found to be less than men's (Joshi, et al., 2017). Women in South Asia confront several legal and cultural obstacles when it comes to owning or inheriting property. Women's bargaining power in the sale of their land's production is limited by the tendency for land to be registered in the male name, and women-owned holdings are often too small for many productivity-enhancing or climate-smart technology. Lack of land also limits women's access to agricultural services (which require landownership certificates) and makes them more reliant on common-property-resource-dependent occupations like livestock-rearing, which are frequently vulnerable to climate change. Access to money, lower levels of education, and more limited social networks and market access are all challenges for women's adaptation to climate change, all of which limit their ability to shift into new livelihood activities (Sugden, et al., 2014).

Table 4: Adaptation activities in response to drought hazards

| S.N. | Hazard | General response from households | | Anticipated response with increase in income |
|------|--|---|---|---|
| | | Females | Males | |
| 1 | Dry and fragmentation of agricultural land | Intensive labour practises for making the cultivable | Renting the agricultural tools from friends or municipality | Use of modern agricultural tools and machinery for ploughing the dry fields. Get the suitable products to make land arable |
| 2 | Scarcity of water for irrigation in the fields | Build irrigation channels | Build irrigation channels | Build irrigation channels and rainwater harvesting methods |
| 3 | Strong winds and irregular rainfall patterns | Wait for the weather to change and harvest the leftover crops | Receive information from weather forecasts beforehand | Weather related information beforehand; Wind proof tunnels for farming |
| 4 | Appearances of pest and diseases | Use of organic fertilisers | Use of organic fertilisers | Use of chemical fertilisers |
| 5 | Heat waves affecting livestock farming | Ventilation systems | Ventilation system | Ventilation and cooling systems |

Respondents were asked open questions about their adaptation action in response to the hazards, both men and women had different ways of adapting to different hazards. Given the condition at increased income source, the households came up with better adaptation techniques and modern technologies for adaptation as in Table 4. Since most of the households are poor and middle-class households they were still adapting to the impacts of climate as per their capacity. All the households considered economic resources as an important resource to build adaptive capacity. Most of the household also expressed that they would adopt differently and more effectively if their economic condition is uplifted. The significant proportion of hill farmers are impoverished and unable to cope with crop damage and livestock failure due to a lack of assets and access to services and facilities (Ghimire et.al., 2010). Likewise, the poor families highlighted economic resources to be the most important one. A respondent stated-

“I’m a poor farmer, I have four kids and it is difficult to sustain our livelihood just from agriculture. If I could get economic assistance that would help get drought resistance crops, organic fertilisers and modern equipment and tools for agriculture.”

Some respondents also said that advanced agricultural tools or other equipment could boost their adaptive capacity. Most of the respondents pointed out the need for modern agriculture techniques like

construction of tunnels, greenhouse farming to increase the productivity. They also reported the need of regular soil test to identify the soil and productivity conditions. Women respondents also addressed the importance of municipal workshops and seminars regarding agricultural drought, its impacts and solutions.

5.3 Motivation for adaptation

The respondents were asked open question regarding the motivation for adaptation in the village. Free text answer provided additional qualitative details about what people found motivating. These answers were coded into four different types: economic, ecological, social and others as in Table 5. Most of the respondents were driven by socio-economic (employment and income opportunities, financial benefits) motivational factors more than climate change mitigation (preventing other climatic hazards) factors. Out of 50 respondents, 45 stated clearly their motivation was for their livelihood enhancement and 5 others were a little concerned about the climate.

Table 5: Motivation types and factors expressed by respondents

| Motivation type | Motivational factor |
|-----------------|---|
| Economic | Incentives for adaptation; Employment and income generating opportunities; credits and loans from local banks |
| Ecological | Risk reduction: To avoid the risks associated with drought such as forest fires, soil erosion, landslides |
| Social | Family members and society, social network |
| Others | Place attachment |

Most of the male respondents mentioned about the incentives that was motivating them to adapt to the changing environment. Employment and income generating opportunities, credits, and loans from the banks for the enhancement of their agricultural and other alternative livelihood practises were found to be more common motivation for adaptation in the village. While females were mostly motivated by social factors such as family, members, society, and social network. One of the respondents clarified that her family is motivating her to be engaged in adaptation activities. As per Bimala Tamang *“We are a poor family so my husband and sons have moved to cities for better opportunities. Therefore, I’m bound to take care of my in-laws and farmlands in the village.”*

All the respondents stated that they were motivated for adaptation to reduce their individual risk level. Since the village is at risk of soil erosion, forest fires and landslides, they were motivated to reduce individual risk level so that it would not impact their livelihood. They considered their motivation linked to reactive adaptation such as *“I would take every measure required to save my planted crops from*

extreme weather events rather than see my crops being destroyed” or proactive thinking, e.g.,” I would rather prepare myself for extreme drought events by harvesting rainwater and utilise it during dry periods”.

Some of the respondents depicted the place attachment as a motivation factor to take adaptation initiatives and continue agriculture practises. Mr. Badri Gautam, a leader in the village, 58 years old man has been a great example for practising adaptation for agricultural activities. He has set a perfect example for reactive and proactive adaptation of drought in the village. He lives with wife in the village while all his five kids are married and have moved to cities for better livelihood and opportunities. But Mr. Gautam stands by his land and says, “Agriculture is my identity, and I will always be engaged in agriculture my entire life.” He has adopted tunnel farming system to protect his crops from extreme temperatures and irregular rainfall.

Most of the people spoke about losing interest in agriculture and migrating to different cities for sustaining their livelihoods. Mostly males and youths are losing interest in agriculture due to less production and economic losses so old-aged people and women are found prominent in the village and are motivated to farm for their livelihood. Villagers have been impacted severely by climate change impacts.

5.4 Public Support

According to the CDRM 2021, following public supports are listed to be accessed to the farmers in the Municipality: Incentive for productivity losses to the farmers, Information or Early warnings regarding extreme weather events, Trainings on building advance irrigation canals and systems, Training on construction of conservation pond, Distribution of drought resistance crops, Trainings on Organic Farming, Channelised market for agricultural products, Soil test and pest control measures.

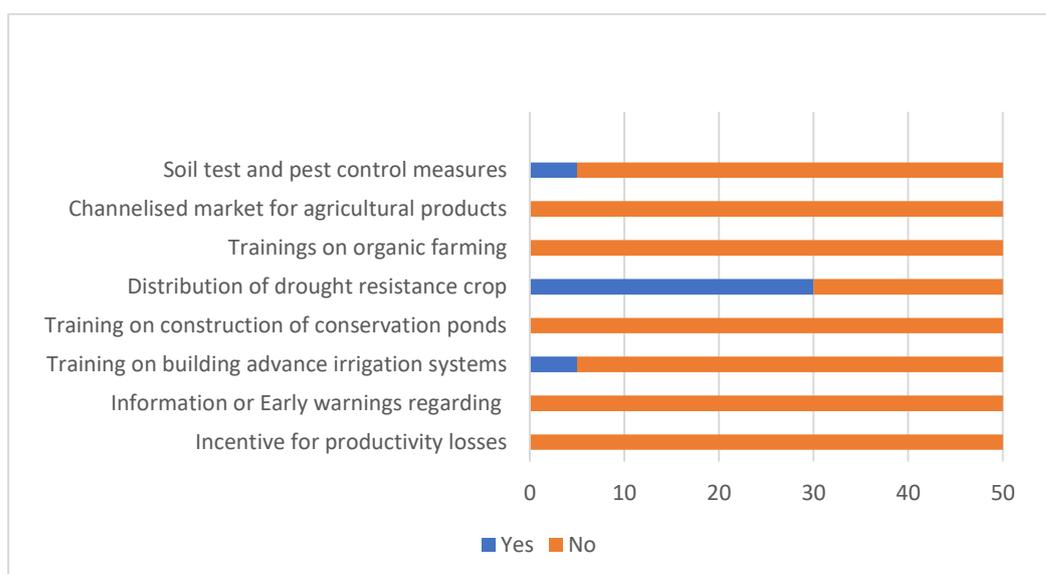


Figure 7 Public support received in the municipality

All the respondents in the study area reported that they have not been receiving any incentives for productivity losses due to drought. They also continuously complained that national and local bodies have failed to provide them information on early warnings regarding drought periods and extreme weather. For e.g. *“Due to lack of early warning systems, we always suffer from crop loss because of changing climate erratic rainfall during harvest season. Public authorities should provide us information beforehand so that we could harvest the yields.”* They have neither received training on construction of conservation ponds, nor training on organic farming. They were discouraged to work in the agriculture field because they didn't have market for their products. The local body has announced to provide channelised marketing for the agricultural products yet there is no evidence for such provision.

Two municipal workers, a leader of the village and two wealthier houses, confirmed that they have been given training on building advance irrigation systems and they have been offered for soil test while rest of the respondents had never heard about it. Some people agreed that they have been provided some incentives for drought resistance crops, but they didn't seem happy with the drought resistance crops. They said those genetically modified crops required a lot of chemical fertilisers which are expensive for them. At the end, investment is more than output which is not cost-efficient to the farmers.

While ward chairman- Suresh Lama confirmed about the provision of drought resistance crops, incentives for modern agricultural tools, soil test programs. He also mentioned one of the important measures that is being carried out in the village i.e.,” recharge ponds in the village”. He explained that recharge ponds were constructed in the hills to store the excess rainwater during rainy seasons and access the water to the villagers during dry season. Furthermore, lifting irrigation practises are being adopted in the village. Also soil test programs are available at rural municipal offices, where people can test the soil and find solutions for increasing the soil productivity. Mr. Tamang also added that afforestation programs are being launched regularly in the village as the villagers have been migrating from the village leaving majority of the land barren and uncultivated.

To summarise Chapter 5, it is seen that most of the respondents have clear perception on climate change and drought which has been encouraging them to conduct several adaptation practises. Several adaptation practises against drought are being carried out in the village as per their capacity. Rainwater harvesting, irrigation channels, use of drought resistance crops, use of organic fertilisers and pesticides, switching occupation, etc were seen as a popular adaptation strategies/practises. And multiple motivational factors such as economic, ecological, social, and other factors are powering the respondents for adaptation practises. Also, a limited public support for drought was observed from the interactions with the respondents.

6. Discussion

Chapter 6 entails further discussion of explanations behind the adaptation practises, material aspects that influences climate adaptation practises, and the challenges for implementation of LAPA in Dhuseni.

6.1 Explaining the adaptation practises

Culture and individual's experiences shapes human behaviour, and this study aimed at identifying human responses to climate adaptation activities. Based on the responses to drought adaptation activities (Rippl, 2002; Brink & Wamsler, 2019), the respondents were identified to be supportive of weak group of life with low social bonding and low degree of social regulation. According, to cultural theory, the weak group of life indicates individualistic worldview where individuals are positioned to react to different claims of environmental and technological risk and they consider to response accordingly (Douglas & Wildavsky, 1982). The people with individualistic views are self-serving, ambitious, and competitive nature. Most of the respondents were found to have individualistic view as they were considering drought risk as an opportunity to get financial incentives from the government to improve their current situation. They were seeking risk and new technologies as an opportunity rather than a threat and they were coping according to their capacity (Rippl, 2002). And the policy options with financial incentives and technology were appealing to the respondents.

Most of the respondents related their interest in adaptation because of the attachment to their environment and community. The place attachment was a major factor motivating the adaptation to most of the people. Citizen's adaptation action is not only driven by their own personal experiences of hazards (reactive adaptation) such as damages and losses but also driven by the past hazard experiences which inspires the people to act even when they are not at risk (proactive adaptation).

In addition, male respondents were more motivated by economic incentives, and they considered technical expertise as critical to their ability to adapt. Women, on the other hand, saw their social network as a more valuable resource, and expressed a greater willingness to adapt if it might improve ecological values on a local and global scale, as well as help other members of the community who were at risk. There is a high degree of differences in the roles of men and women in adaptation e.g., through education, income, land titles, responsibilities, and their influence on vulnerability. The result suggests that gender is not only responsible for determining the vulnerability and risk perception but also shapes the motivation and choices for adaptation (Brink & Wamsler, 2019).

6.2 Material aspects influencing Citizen's engagement in adaptation

Participation and involvement of people (gender, education, and income), and public support (local policies and plans) in climate adaptation activities in the field of agriculture are emphasised in this

study. Women and men function different activities in agriculture and climate adaptation. This gender division was found to be more interrelated with education and income in the village.

6.2.1 Gender

Gender, Education, and Income is found to be interlinked with each other and all these three aspects play great role in climate adaptation. In a disaster, women and men are affected differently as per their capacity levels which are outlined by gender roles and relations in a society (Drolet, et al., 2015). In most of the developing countries, women play a significant role in household chores and family whereas men are found to have major responsibility in economic activities. Gender is seen to be profoundly influencing the educational and income level in the rural areas where agriculture is main source of livelihood. Therefore, gender is shaping the adaptation activities and thus people's participation in adaptation is seen as a gendered process (Brink & Wamsler, 2019). Gender identity determines a woman's or man's function in the family and society throughout history. Women in Dhuseni play an important role in agricultural activities, alongside their men. In the absence of males, female household members are taking on more responsibilities in agricultural activities than they did previously. It is emerging within the male-dominated agricultural system, which not only increasing the workload of women but is also unfair and cruel to them. In this circumstance, women are progressively choosing to continue farming as best they can, by adopting less efficient farming practises and abandoning their farmland activities. As a result, food production is decreased, leading in food insecurity, primarily at the local level.

Men and women involved in agriculture have been identified to have distinct abilities to adapt to climate change, weather related shocks, where women are more affected than men from these climate stresses and shocks (Banerjee et.al., 2019). This has been characterised to women's limited accessibility to prompt and effective weather forecast information, finite number of choices for crop and livelihoods, lack of a self-reliant income source, financial assistance for better investment, and a dearth of decision-making power to implement adaptation measures in South Asian countries (Sugden, et al., 2014). Women are restrained in decision making for adaptation because of the obligations in their household work and society (Resurrección, et al., 2019), cultural and social values, limited accessibility to the information and institutional barriers (Curran & Meijer-Ironse, 2014). These factors make women more vulnerable to hazards with low adaptive capacity. Women might have less adaptive capacity even at a community with high level of adaptive capacity (Banerjee, et.al., 2019). Therefore, gender has influenced the educational status and income level in the village to a great extent which are important aspects in adaptation activities. Some of the observed scenarios are explained below:

6.2.2 Education

According to World Bank (2018), the literacy rate of Nepal is 67.91 percent, where 78.89 percent of male and 58.72 percent of female are educated. Females still do not have much access to education as compared to males. And especially in the rural area, females are bound to perform household chores and works so they are always deprived of education. Since higher number of males have been actively involved in agriculture when they migrate, there is a shortage for agriculture labour (Khanal et. al., 2019). Therefore, the women left behind could not handle the workload of managing domestic tasks, family responsibilities, and agricultural areas without the male members of the family present (Chapagain & Gentle 2015; Sherpa & Bastakot, 2021). The limited knowledge on agricultural activity, climate adaptation practises make the women more vulnerable than men.

Literacy rate in the village is increasing but is still less in females as compared with the males. The differential treatment between sons and daughters in education is popular which has created a major gender gap in literacy. The gender disparity is popular in rural areas as rural livelihood depend on agriculture and livestock rearing, girls are required to work in home in absence of their mothers while boys have access to formal education (OxfamInternational, 2009). Changing climate was also found to affect girls' education by increasing their labour burden to gather wood and collect water when resources become scarce. This had triggered school dropouts in village (OxfamInternational, 2009). Another statistic from the Nepal Living Standards Survey shows that 31 percent of rural girls (ages 6-24 years) do not attend school at all, with the reason given as 'help at home,' compared to 13 percent of rural boys for the same reason. Climate change also has an impact on women's education through a complex interaction with existing social norms. In the rural areas, educational levels of girls are largely driven by social norms.

With higher education and knowledge, men have easy access to information and technologies than women. Several studies found that education positively and significantly affects the adoption of technology. This difference between the education status affects the adaptation activities of the entire household. The male headed households had access to information, new technologies and take risky businesses and therefore they adopted new and efficient climate change adaptation practises than female-headed households (Joshi et.al., 2017). Women farmers were also active in decision-making on various agricultural activities due to their high level of participation in agriculture. But women were mostly involved in decision making in pre-harvesting actions such as planting, sowing, and weeding while men, on the other hand, were the primary decision-makers in areas such as technology adoption. Most of the household had at least one male migrant where women are more involved in the decision-making process in these families.

According to interviews and conversations, migration increased work strain for women farmers, due to several tasks such as irrigation and pest control. Furthermore, climatic threats exacerbated this labour

burden, particularly in cases of water scarcity or increasing pests. During the discussion, women also mentioned their disadvantages over men, such as limited access to property, less resources and privileges, and limited access to information and services. Their access to information through community events was limited due to social conventions and home workload. They discovered that information distributed via mobile phones and mass media such as television and radio was more accessible to them.

The links between education and women's ability to use livelihood diversification as a coping and adaptation strategy in the face of climate change are not difficult to see. Lower levels of education reduce the capacity of women to access information (e.g., about their legal rights to hold land titles) and limit their means to interpret that information. Uneducated women and girls have also more limited access to resources such as credit or knowledge of new technologies and have a reduced ability to make their voice heard in decision making over resources management at home and in the community. This can affect their capacity to understand and to act on information concerning climate risks and adaptation options (Sugden, et al., 2014). Men's and women's education and literacy levels were found to affect their access to information on the weather in developing countries (World Bank 2010). A study found that adopting hybrid seeds requires knowledge and skills that are often lacking in poor, remote and marginalised communities. Since women are less likely to have an education and have limited access to information, their engagement in activities like this, which might contribute to improving their safety, capacity, and well-being, is curtailed (Sugden, et al., 2014).

6.2.3 Income

Men were largely engaged in commercial and public-sector livelihood activities, whereas women play a disproportionate role in non-market livelihood activities (Joshi, paa et al., 2017). In rural Nepal, women perform a comparatively more agricultural labour which is unpaid, casual, and limited to the home and farm, and thus receives no economic recognition. As a result, women often have fewer opportunities to work for money outside the home. Perhaps more importantly, women frequently have little control over agricultural income. Men on the other hand are quite likely to find out alternative sources of income while women are limited with vegetable production, livestock rearing as their major source of income.

Adapting to climate change through investment in new technologies or changing agricultural practises invariably requires capital. Women in Dhuseni, however, have limited access to financial resources. As noted above, women have far more limited access to income within the household due to lack of landownership, and limited involvement in the marketing of produce. Similarly, a study revealed that women in India, Bangladesh, and Nepal face constraints in accessing credit from banks – something which is essential for large-scale investments (Sugden, et al., 2014). The income received from non-agricultural sources such as remittances played a significant role with the probability to adoption. This

implies that the likelihood of adoption of climate change adaptation practises would be higher for households having some level of income from non-agricultural sources (in addition to agricultural sources) compared with the farmers deriving income only from agricultural sources. Non-farm income and farm size were considered to represent wealth in the village. It is assumed that adopting agricultural technologies entails enough financial resources (Joshi & Joshi, 2019). Farmers with bigger land holding size and income from non-agricultural sources had ability to purchase improved technologies and the capacity to bear the risks.

The division of labour is also essential for vulnerability in women because women and men frequently have separate control over different revenue sources. Individual incomes may be affected differently by climate change if a particular livelihood activity is harmed. Among the three ecological regions, women of hills and mountains work longer as compared to women of plains because of the topographical constraints. There is a wage discrimination in the village even though women had a higher proportional right in the decision-making than men (Acharya 2009). Women in nonfarm jobs frequently earn less than men, placing them at a great disadvantage to financial means and buffers to deal with climate change and disasters (FAO, 2016). This has a particularly negative impact on women in in village, as their personal income is generally limited compared to men's (Sugden, et al., 2014). Agriculture and natural resource-based livelihood activities are frequently the principal sources of personal cash income due to gender norms their participation in public sphere activities such as labour and trade is limited (Sugden et.al, 2014; Poudel et.al., 2020). Climate change has put these activities at jeopardy.

Gender plays a key role in the formation of social systems and norms in Nepal, through the distinction of the individual's rights and responsibilities within his or her physical boundaries, the family and household, and society. Gender ideologies continue to limit women's participation in public life in rural Nepal and other South Asian countries (Sugden, et al., 2014; Joshi & Joshi, 2019).

Furthermore, only two climate change policies acknowledge the gendered consequences of climate change in agriculture, and none of them provide any form of plan or strategy to address the issue (Paudyal, et al., 2019). Only two of the five climate change policies address gender issues, with only one proposing adaptation measures specifically for women. Climate Change Adaptation and Disaster Risk Management in Agriculture policy acknowledges women's contributions to agriculture and the challenges they face. Gender has also been integrated into crucial areas of the policy framework and assigned key tasks and monitoring indicators. Similarly, the NAPA recognizes agriculture's vulnerability as well as the sector's gendered impacts of climate change. However, gender integration remains limited to recognizing women as a vulnerable member of society and does not explicitly state any policy measure or initiative to improve women's vulnerability to climate change (Paudyal, et al., 2019). The National Adaption Program of Action (NAPA) and the Climate Change Adaptation and Disaster Risk Management in Agriculture Priority Framework, support initiatives to develop gender

sensitive climate change adaptation technology (Paudyal, et al., 2019). However, the policy is silent on the disproportionate impact of climate change on women farmers and, as a result, on gender-specific reactions respond to that impact (Paudyal, et al., 2019).

6.3 Implementation status of LAPA

LAPA has mentioned the importance of people's participation in each step of its process. Therefore, LAPA is not implemented successfully without the participation of people. There are several local level plans formulated for the village where government officials claim that the plans have been implemented accordingly while the people were not able to completely agree with that. Despite of the remarkable plans and the policies, the inefficient implementation of such plans and policies has deprived people from the benefits.

There is a high political influence in development plans in the village. Therefore, it is important to sensitise and build the capacity of local actors, including political party representatives, for successful implementation, development and mainstreaming of LAPA into local planning process. The climate adaptative capacity of community and local actors need to be strengthened across all sectors importantly education for effective and efficient LAPA.

There are limited resources available for implementation at local level for both the local government and community people. A lack of financial resources and technical know-how at the community level has posed a barrier to effective adaptation plan execution (Maharjan & Sapkota, 2011). Rural areas have always been impacted due to lack of sufficient resources. During an interview with a key informant from ward office, the official mentioned that there has always been a delay in the release of the national budget in the rural areas. This has an impact on local-level planning, which has an impact on the implementation of community-level plans. Based on their capacities, public, corporate, and civic organisations are helping to close the gap to some extent. The government, as well as various non-government and private sector organisations, are the most likely sources of funding. The most crucial factor is to make effective and intelligent use of the resources available.

Education is not easily accessible in the rural areas. People who are still residing in the village and are interested in agriculture should be provided with relevant trainings, workshops for better adaptation to the situations. Training and skill enhancement interventions, as well as developing community-based inventions, approaches, and introducing community-friendly and adaptive technologies, are all needed to strengthen technologies and capacities (Maharjan & Sapkota, 2011; Maharjan, 2019)

Even though people are engaged in adaptation activities, most of them are not aware about the local plans for climate change in the village. Local plans should be made accessible to local people so that they understand climate change related vulnerability and react/respond according to their capacities and resources available. Adaptation planning is shaped by local participation so the local communities and

rural people should be considered as partners and assets. Their local adaptive capacities should be built by supporting their sustainable livelihood. Some of the plans were economically not feasible to the people. Therefore, adaptation plans must be built on local capabilities – responses should leverage the resources, efforts and capabilities of local areas including indigenous knowledge systems, strengthen disaster preparedness and response. The weather station is far from the village therefore evidence-based planning is necessary. Climate change responses should be based on scientific evidence and should initially focus on delivering outcomes that are known to be intrinsically beneficial to rural communities. Investment in long term research is important for more effective ways to supports rural climate change.

6.4 Male migration as an emerging issue in the village

Gender division of labour is especially inequitable in Dhuseni and climate change has increased the burden of women. Labour migration is discovered to be profoundly gendered in Nepal, with women taking up shifting adaptation techniques in agriculture (which supports the narrative of "feminization of agriculture") (Sherpa & Bastakot, 2021). In addition to that, male-headed households have higher rates of mobility than female-headed households during drought periods (Gray & Mueller, 2012; Sherpa & Bastakot, 2021). Since higher number of males have been actively involved in agriculture when they migrate, there is a shortage for agriculture labour as the main impact of migration (Khanal et. al., 2019). Therefore, a major disadvantage of migration in a drought-stricken area is that the women left behind could not handle the workload of managing domestic tasks, family responsibilities, and agricultural areas without the male members of the family present (Chapagain & Gentle 2015; Sherpa & Bastakot, 2021), based on case studies from three different geographical locations in Nepal, explored that drought caused a drop in agricultural production and encouraged people to quit agriculture and embrace emigration for jobs.

In Nepal, male out-migration, is a key response to climate stress on agriculture for the most marginal producers, also result in gendered vulnerability (Chapagain & Gentle, 2015). While men's seasonal or permanent movement provide women more control over their income and domestic matters, it also makes them more vulnerable to shocks. Women-headed families, for example, that have grown in number because of male out-migration, are more vulnerable to natural catastrophes, due to the lack of family support networks. Similarly, female burden is frequently increased as they are forced to undertake the obligations of previous male farm labourers, particularly in impoverished households that cannot afford to employ labourers (Sugden, et al., 2014).

Migration has impacted agriculture production, as well as affected climate change adaptation in the village. Women are held back to perform all the household, farm activities which is found to affect the adaptive capacity of women. As women are busy in farm and non-farm activities they are deprived from the basic right to education, other income generating opportunities which is directly impacting their adaptive capacities.

During Covid-19 period, there was a rise in the number of villagers, as the people residing in the cities were greatly impacted and they had returned to their villages. There was an increase in the number of males in the village which had reduced the agricultural burden in the village. According to the Ward chairman, more people started to involve in agriculture and better adaptation measures were conducted. More number of youths were back in the village, and they had adopted new technologies to adopt the climatic hazards. Like as they started with drip irrigation method and shared the information with the neighbouring villages. Along with that they started to use machinery equipment for the dry lands, tunnel farming, farming of efficient and productive fruits and vegetables. Also, with the increase in the number of people in the village, the recharge ponds were constructed to reduce the problem of water scarcity for irrigation. Ward chairman added that Covid 19 period was a productive period for the agricultural expansion in the village.

7. Conclusion and recommendations

7.1 Conclusion

This research aimed at assessing the participation of citizens in the drought adaptation activities in agriculture through a questionnaire survey in rural area of Nepal through analysis of different material aspects like gender, education, income level and public support that affect adaptation. From the research, it is found that adaptation in agriculture is widely practised throughout the village even with low agriculture labour and intense droughts situations. People are aware about the climate change situations especially drought and so they are adapting several measures according to their capacities.

People are adapting according to their capacities and the resources available. Adaptation practises such as use of drought resistance crops and building of irrigation channels are popular in the village. Also, organic farming and use of organic fertilisers is increasing in the village. Likewise, migration is adopted widely as an adaptation against drought situation.

Adaptation is widely gendered in the village. Even other aspect like education and income level are influenced by gender. More women are seen as head of the house with the involvement in decision making process, budgeting money by her in all the functions of family and in agriculture. Women are comparatively more engaged in agricultural and adaptation activities than men but still the level of education is less in women. With low level of education, they lack the potential to increase their income level and thus adopt less efficient adaptation practises than men.

Migration for employment and opportunities are prevalent mostly in the village positioning women into vulnerable state for climate change and adaptation. With less manpower and low wages and inaccessibility to income generation activities the adaptive capacity of women is hindered. Therefore, for improving the livelihood, agriculture and adaptive capacity, gender equality and education is a must essential tool especially among women.

Although there are several plan and policies with the integration of gender and climate adaptation related issues in the policies, they have not been implemented effectively. Even though some of the policies and plan regarding climate adaptation in agriculture have been implemented, but it has not been implemented effectively. The villagers found the adaptation plans to be economically unfeasible to implement with inadequate support from local government. Due to the high political influence, lack of resources, the policies have been implemented less effectively. Therefore, there is a wide policy implementation gap between local level plans and people's adaptation in the village. Local government have plans for the village which include considerate number of incentives which are not sufficient as most villagers are agro-based poor families. With more investment and less production, people found adaptation activities to be expensive.

As a conclusion, there is an active participation of people in drought adaptation in Dhuseni village. Even with the less available resources people are invested in adapting so with advancement in LAPA the adaptation would be effective, and people would benefit from it. Dhuseni could become one of the most appropriate places for study and research provided there is enough time for the study. The way they are advancing a step forward even with limited resources for bringing creative changes and ideas in the field of agriculture to boost up their economy is appreciable. Stressing on people's level of participation and gender inclusiveness in almost every sector of decision-making process and adaptation activities, Dhuseni is rising as role model and inspiration to all other villages.

7.2 Recommendations

After the field visit and studying the society and status of people in the field of agricultural, following are the recommendations.

- Local government should plan for non-agriculture-based income generating opportunities to boost the economy so that they could afford for better adaptation methods.
- Knowledge development in women is required especially in rural areas. The adaptive capacity of the women can needed be strengthen with suitable adaptation plans.
- Employment in the village could attract the migrants to come back to village which can further improve the agriculture.
- It is difficult to conduct research in this area in a limited time. So, it would be beneficial to the prospective researchers to use extensive time for the research.
- Numerous conflicts were found this study area such as drying up of two big water ponds in the nearby village because of afforestation program by Nepal Australian Forestry Partnership, 2013. More academic research on this area would be knowledge enriching.

7.3 Limitation

The study is based on Kavrepalanchok district of the mid-hilly region particularly focusing in only one village due to time constrain therefore precise data and findings is lacking. The study was conducted based on the field visit of mere 5 days within specific area with 50 respondents. Thus, the findings cannot be generalised for the whole of the Kavrepalanchok district but can be generalized for small villages with similar structure and composition. Due to the limited time, the openness and trust issue of the respondents also became a limiting factor. On the methodological side, due to the smaller number of respondents, descriptive quantitative analysis of data was performed instead of performing correlation among the data.

Annexes

Annex I: Questionnaire

| Variable | Question |
|-----------------------------|---|
| Socio-Demographic structure | Male/Female |
| | Age: |
| | <p>What is your education status?</p> <ul style="list-style-type: none"> • Illiterate • Read and write • School level • University level <p>What is the main occupation of the household?</p> <ul style="list-style-type: none"> • Farming business • Other business • Institutional workers • Daily wage labor • Others(Specify)..... <p>What is the aggregate income of your household? Please Specify.....</p> |
| Hazard experience | <p>Which of the following climate hazards have you been facing these days?</p> <ul style="list-style-type: none"> • Drought • Flood • Landslides <p>Have you, or any other household member, experienced any of the following drought impacts?</p> <ul style="list-style-type: none"> • Dry and fragmentation of agricultural land • Scarcity of water for irrigation in the fields • Strong winds and irregular rainfall patterns • Appearances of pest and diseases • Forest and range fires • Heat waves affecting livestock farming • If Other (please specify) <p>What types of damages or losses have you experience from the droughts?</p> <p>productivity loss Market failure of the agriculture and livestock products loss of interest in agricultural activities Others(Please Specify)...</p> |
| Adaptation Action | <p>Have you practised any of the following adaptation actions in response to drought?</p> <ul style="list-style-type: none"> • Adopted rainwater harvesting method • Built irrigation channels • Used drought resistance crops • Practised Organic Farming and Organic Fertilizers • Switched occupation for livelihood • Adopted migration as adaptation <p>(Taken from local document)</p> |

| | |
|-------------------|---|
| Motivation | <p>What factors motivate you to take actions of your own to reduce the risk of damage from drought-related events in agriculture?</p> <ul style="list-style-type: none"> • Specify..... |
| Adaptive Capacity | <p>What type of resources do you think are most important for your capacity to deal with drought events?</p> <ul style="list-style-type: none"> • Municipality providing workshops and seminars regarding agricultural drought and the ways to respond to it • Advanced agricultural tools or other equipment • Economic resources • Experience of dealing with previous drought events yes • Technical or construction-related knowledge • If others (Please Specify) |
| Public support | <p>Have you or your household received any of the following support from municipality for drought adaptation?</p> <ul style="list-style-type: none"> • Incentive for productivity losses • Information or Early warnings regarding weather situations • Training on building advance irrigation systems • Training on construction of conservation ponds • Distribution of drought resistance crop • Trainings on organic farming • Channelized market for agricultural products • Soil test and pest control measures <p>(Taken from local document)</p> |

Annex II: NSD approval

NSD NORSK SENTER FOR FORSKNINGSDATA English ▾ Sanju Banjara ▾

[My page](#) / Citizen's engagement in Drought Adaptation Practices, Dhuseni, Nepal

Citizen's engagement in Drought Adaptation Practices, Dhuseni, Nepal [✎](#)

Nepal has been exposed to several climate hazards (MoFE, 2019), and has affected several livelihood sources and sectors impacting mainly agriculture, water, and forestry (Maharjan, 2019). However, the roles of citizens have been overlooked in climate adaptation (Hegger et.al., 2017). Local governments have limited capacities and mandates for adaptation, so they rely on civil society and private actors, such as citizens (Hegger et.al., 2017), this has highlighted the importance of citizen engagement in adaptation activities (Brink & Wamsler, 2019). The main purpose of to develop deeper knowledge, understanding, capabilities, and attitudes of human participation in climate change adaptation in response to drought in Nepal. This study will investigate the factors that influence drought adaptation practices and also find out the challenges for the implementation status of local adaptation policy and plan of action (LAPA).

Subject areas: Mathematics and natural sciences, Social sciences

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References

- ADB. (2020). *Climate Change in South Asia "Strong responses for building a sustainable future"*.
- Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, 16(3), 268-281.
doi:<https://doi.org/10.1016/j.gloenvcha.2006.02.006>
- Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2011). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*.
doi:<http://www.nature.com/doi/10.1038/nclimate1666>
- Adhikari, S. (2018). Drought Impact and Adaptation Strategies in the Mid-Hill Farming System of Western Nepal. *Environments*, 5(9), 101. doi:<https://doi.org/10.3390/environments5090101>
- Alimullah, M. M. (2015, March). Droughts in Asian Least Developed Countries: Vulnerability and sustainability. *Weather and Climate Extremes*, 7, 8-23.
doi:<https://doi.org/10.1016/j.wace.2014.06.003>
- Ayers, J. M., & Huq, S. (2009). The Value of Linking Mitigation and Adaptation: A Case Study of Bangladesh. *Environmental Management*, 43, 753-764. doi: <https://doi.org/10.1007/s00267-008-9223-2>
- Banerjee, S., Hussain, A., Tuladhar, S., & Mishra, A. (2019). Building capacities of women for climate change adaptation: Insights from migrant-sending households in Nepal. *Climatic Change*, 157, 587-609. doi:<https://doi.org/10.1007/s10584-019-02572-w>
- Biggs, E., Tompkins, E., Allen, J., Moon, C., & Allen, R. (2013). Agricultural adaptation to climate change: observations from the mid hills of Nepal. *Climate and Development*, 5(2), 165-173.
doi:<https://doi.org/10.1080/17565529.2013.789791>
- Brink, E., & Wamsler, C. (2019). Citizen engagement in climate adaptation surveyed: The role of values, worldview, gender, and place. *Journal of Cleaner Production*, 1342-1352.
doi:<https://doi.org/10.1016/j.jclepro.2018.10.164>
- CBS. (2011). *National Population and Housing Census 2011*. Government of Nepal. Retrieved from <https://censusnepal.cbs.gov.np/Home/Details?tpid=5&dcid=684d5923-cfd8-4e98-a309-3c2c463e644f&tfsid=1>
- CDRM. (2021). *The Annual Policy, Programmes and Budget*. Dhadkarkha Banjhyang, Kavrepalanchok: ChauriDeurali Rural Municipality, Government of Nepal. Retrieved from https://cdn.fbsbx.com/v/t59.2708-21/264165568_427356988936136_55174535992495816_n.pdf/Chauri-Daurali.pdf?_nc_cat=106&ccb=1-5&_nc_sid=0cab14&_nc_ohc=oBc59CI5stIAX-SoCSC&_nc_ht=cdn.fbsbx.com&oh=790880d45630b25772e491b14896def9&oe=61B117D8&dl=1
- Chapagain, B., & Gentle, P. (2015). Withdrawing from Agrarian Livelihoods: Environmental Migration in Nepal. *Journal of Mountain Science*, 12(1), 1-13. doi:10.1007/s11629-014-3017-1
- Coşofreţ, C., & Bouriaud, I. (2019). *Agricultural Food Engineering II Series*(12), 13-34.
doi:<https://doi.org/10.31926/but.fwiafe.2019.12.61.1.2>

- Curran, S. R., & Meijer-Ironse, J. (2014). CLIMATE VARIABILITY, LAND OWNERSHIP AND MIGRATION: EVIDENCE FROM THAILAND ABOUT GENDER IMPACTS. *Washington journal of environmental law & policy*, 4(1), 34-74. Retrieved from 2160-4169 , 2160-4177
- Dongol, R., & Joshi, N. (2017). Severity of Climate Induced Drought and its Impacts on Migration: A study of Ramechhap District, Nepal. *Tropical Agricultural Research*, 29(2), 194-211. Retrieved from https://www.researchgate.net/publication/321307677_Severity_of_Climate_Induced_Drought_and_its_Impacts_on_Migration_A_study_of_Ramechhap_District_Nepal
- Douglas, M., & Wildavsky, A. (1982). *Mary Douglas and Aaron Wildavsky, Risk and Culture: An Essay on the Selection of Technical and Environmental Dangers*. Berkeley and London: Univ. of California Press.
- Drolet, J., Dominelli, L., Alston, M., Ersing, R., Mathbor, G., & Wu, H. (2015). Women rebuilding lives post-disaster: innovative community practises for building resilience and promoting sustainable development. *Gender & Development*, 433-438. doi:<https://doi.org/10.1080/13552074.2015.1096040>
- EnLIFT. (2013). *Research paper series on Agroforestry and Community Forestry in Nepal*. Retrieved from https://enliftnepal.org/wp-content/uploads/2019/08/22_RPS-Vol-2014-01-Site-Selection-Report.pdf
- FAO. (2016). *The state of food and agriculture: Climate change agriculture and food security*. Rome: Food and Agricultural Organization. Retrieved from <https://www.fao.org/3/i6030e/i6030e.pdf>
- FAO. (2022). *Food and Agricultural Organization of the United Nations*. Retrieved from <https://www.fao.org/climate-change/en/>
- Gentle , P., Thwaites, R., Race, D., & Alex, K. (2014). Differential impacts of climate change on communities in the middle hills region of Nepal. *Nat Hazards*, 74, 815-836. doi:<http://dx.doi.org/10.1007/s11069-014-1218-0>
- Gentle, P., & Maraseni, T. N. (2012). Climate change, poverty and livelihoods: Adaptation practises by rural mountain communities in Nepal. *Environmental Science & Policy*, 21, 24-34. doi:<https://doi.org/10.1016/j.envsci.2012.03.007>
- Ghimire, Y. N., Shivakoti, G. P., & Perret, S. R. (2010). Household-level vulnerability to drought in hill agriculture of Nepal: implications for adaptation planning. *International Journal of Sustainable Development & World Ecology*, 17(3), 225-230. doi: 10.1080/13504501003737500
- Giri, M., & Dahal, D. R. (2021). Impact of Climate Change on Agriculture in Kavre District, Nepal. *Journal of APF Command and Staff College*, 106-119. doi:<http://dx.doi.org/10.3126/japfcsc.v4i1.34141>
- GISTEMP, T. (2022). *GISS surface temperature analysis (GISTEMP)*. Retrieved from NASA Goddard Institute for Space Studies: <https://data.giss.nasa.gov/gistemp/>.
- GoN. (2011). *National Framework on Local Adaptation Plans for*. Singhadurbar, Kathmandu: Government of Nepal, Ministry of Environment. Retrieved from https://climate.mohp.gov.np/downloads/National_Framework_Local_Adaptation_Plan.pdf

- GON. (2011). *National Population Census*. Retrieved from <https://cbs.gov.np/>
- GoN. (2017). *District Profile Kavrepalanchok*. National Planning Commission. Dhulikhel, Kavrepalanchok: Government of Nepal. Retrieved from https://cbs.gov.np/wp-content/uploads/2018/12/District_Profile_kavrepalanchok_2074.pdf
- GON. (2022). *Ministry of Agriculture and Livestock Development*. Retrieved from Department of Agriculture: <http://www.doanepal.gov.np/ne/>
- Gray, C., & Mueller, V. (2012, January). Drought and Population Mobility in Rural Ethiopia. *World Development*, 40(1), 134-145. doi:10.1016/j.worlddev.2011.05.023
- Hegger, D. L., Mees, H. L., Driessen, P. P., & Runhaar, H. A. (2017). The Roles of Residents in Climate Adaptation: A systematic review in the case of the Netherlands. *Environmental Policy and Governance*, 336-350. doi:10.1002/eet.1766
- Hügel, S., & Davies, A. R. (2020). Public participation, engagement, and climate change adaptation: A review of the research literature. *WIREs Climate Change*. doi:<https://doi.org/10.1002/wcc.645>
- ICIMOD. (2010). *Rural Livelihoods and Adaptation to Climate Change in the Himalayas*. Retrieved from <https://lib.icimod.org/record/26912?msckid=fc4a9367c54b11ecbc35a7128cbbde59>
- IPCC. (2013). *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 1535.
- IPCC. (2022). *Climate Change 2022, Impacts, Adaptation and Vulnerability*. Germany. Retrieved from https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf
- Joshi, B., Ji, W., & Joshi, N. B. (2017). Farm households' perception on climate change and adaptation practises A case from mountain district of Nepal. *International Journal of Climate Change Strategies and Management*, 9(4), 433-445. doi:<http://dx.doi.org/10.1108/IJCCSM-07-2016-0099>
- Joshi, G. R., & Joshi, B. (2019). *Climate Change Impact on Agricultural Sector of Nepal: Implications for Adaptation and Resilience Building*.
- Karki, M., Mool, P., & Shrestha, A. (2009). Climate Change and its Increasing Impacts in Nepal. *The Initiative*, 3. doi:<https://doi.org/10.3126/init.v3i0.2425>
- Khanal, S., Paudel, R., & Kandel, B. P. (2019). Dimension of youth migration and its impact on agriculture production in Lamjung district in Nepal. *World Scientific News*, 253-260. Retrieved from WSN 116 (2019) 253-260 EISSN 2392-2192
- Kohler, T., Giger, M., Hurni, H., Ott, C., Wiesmann, U., Wymann, S., & Maselli, D. (2010). Mountains and Climate Change: A Global Concern. *Mountain Research and Development*, 30(1), 53-55. doi:<https://doi.org/10.1659/MRD-JOURNAL-D-09-00086.1>
- Maharjan, S. K. (2019). Local Adaptation Plan of Action Framework and process in the agriculture sector in Nepal. *International Journal of Conservation Science*, 10(2), 351-364. Retrieved from <https://www.researchgate.net/publication/334048478>

- Maharjan, S. K., & Sapkota, P. (2011). *Designing Local Adaptation Plans for Action for the Agriculture Sector*. Technical report. doi:<http://dx.doi.org/10.13140/RG.2.1.3274.1208>
- Malla, G. (2008). CLIMATE CHANGE AND ITS IMPACT ON NEPALESE AGRICULTURE . *The Journal of Agriculture and Environment*. doi:<https://doi.org/10.3126/aej.v9i0.2119>
- Marris, C., Langford, I. H., & O’Riordan, T. (1998). A Quantitative Test of the Cultural Theory of Risk Perceptions: Comparison with the Psychometric Paradigm. *Risk Analysis*, 18(5). doi:<https://doi.org/10.1023/b:rian.0000005937.60969.32>
- Masson-Delmotte, Zhai, V. P., Pirani, A., Connors, S., Péan, C., Berger, S., . . . Zhou, B. (2021). *Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Retrieved from https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf
- McNeeley, S. M., & Lazrus, H. (2014). The Cultural Theory of Risk for Climate Change Adaptation. *Weather Climate and Society*, 6(4), 506-519. doi:<https://doi.org/10.1175/WCAS-D-13-00027.1>
- MOE. (2010). *National Adaptation Program of Action to Climate*. Kathmandu, Nepal: Government of Nepal, Ministry of Environment. Retrieved from <https://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database/NEPAL%29%20National%20Adaptation%20Programme%20of%20Action%20%28NAPA%29%20to%20Climate%20Change.pdf>
- MoFE. (2018). *NEPAL’S NATIONAL ADAPTATION PLAN (NAP) PROCESS: REFLECTING ON LESSONS LEARNED AND THE WAY FORWARD*. Singhadurbar, Kathmandu, Nepal: Ministry of Environment, Government of Nepal. Retrieved from <https://napglobalnetwork.org/wp-content/uploads/2018/07/napgn-en-2018-nepal-nap-process.pdf>
- MoFE. (2019). *Climate Change scenarios for Nepal for National Adaptation Plan(NAP)*. Ministry of Forests and Nepal. Kathmandu: Government of Nepal. Retrieved from http://www.mofe.gov.np/downloadfile/MOFE_2019_Climate%20change%20scenarios%20for%20Nepal_NAP_1562647620.pdf
- OxfamInternational. (2009). *Even the Himalayas has stopped smiling: Climate change, poverty and adaptation in Nepal*. Lalitpur, Nepal: Oxfam Nepal.
- Paavola, J., & Adger, W. N. (2005). Institutional ecological economics. *Ecological Economics*, 53(3), 353-368. doi:<https://doi.org/10.1016/j.ecolecon.2004.09.017>
- Paudyal, B. R., Chanana, N., Khatri-Chhetri, A., Sherpa, L., Kadariya, I., & Aggarwal, P. (2019). Gender Integration in Climate Change and Agricultural Policies: The Case of Nepal. *Frontiers in Sustainable Food Systems*. doi:<https://doi.org/10.3389/fsufs.2019.00066>
- Poudel, S., Funakawa, S., Shinjo, H., & Mishra, B. (2020). Understanding households’ livelihood vulnerability to climate change in the Lamjung district of Nepal. *Environment, Development and Sustainability (2020)*, 22, 8159–8182. doi:<https://doi.org/10.1007/s10668-019-00566-3>
- Resurrección, B., Goodrich, C., Song, Y., Bastola, A., Prakash, A., Joshi, D., . . . Shah, S. (2019). Chapter 14: In the shadows of the Himalayan mountains: Persistent gender and social exclusion development. In: Wester P, Mishra A, Mukherji A, Shrestha AB (eds) *The Hindu Kush*

- Himalaya Assessment: Mountains, Climate Change, Sustainability and People. *Springer Nature*, 491-516. doi:https://doi.org/10.1007/978-3-319-92288-1_15
- Rippl, S. (2002). Cultural theory and risk perception: a proposal for better measurement. *Journal of Risk Research*, 5(2), 147-165. doi: 10.1080/13669870110042598
- Sherpa, L., & Bastakot, G. B. (2021). *Migration in Nepal through the lens of climate change*. Climate Action Network South Asia (CANSA). Retrieved from <https://policycommons.net/artifacts/2032735/migration-in-nepal-through-the-lens-of-climate-change/2785178/>
- Shrestha, U. B., Gautam, S., & Bawa, K. S. (2012). Widespread climate change in the Himalayas and associated changes in local ecosystems. 7(5). doi:<https://doi.org/10.1371/journal.pone.0036741>
- Sugden, F., de Silva, S., Clement, F., Maskey-Amatya, N., Ramesh, V., Philip, A., & Bharati, L. (2014). A framework to understand gender and structural vulnerability to climate change in the Ganges River Basin: lessons from Bangladesh, India and Nepal. Colombo, Sri Lanka: International Water Management Institute (IWMI). 50p. (IWMI Working Paper 159). doi:10.5337/2014.230
- Tamang, S., Paudel, K. P., & Shrestha, K. K. (2014). Feminization of Agriculture and its Implications for Food Security in Rural Nepal. *Journal of Forest and Livelihood*, 12(1). Retrieved from https://www.researchgate.net/publication/284869445_Feminization_of_agriculture_and_its_implications_for_food_security_in_rural_Nepal
- Terry, G. (2009). No climate justice without gender justice: An overview of the issues. *Gender and Development. Gender and Development; Climate changes and climate justice*, 17(1), 5-18. doi:<https://doi.org/10.1080/13552070802696839>
- UNDP. (2009). *United Nations Development Programme(2009) Nepal Human Development Report*. Kathmandu, Nepal.
- UNDRR. (2019). *Disaster Risk Reduction in Nepal Status report 2019*. Bangkok, Thailand: United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific. Retrieved from https://www.unisdr.org/files/68257_682306nepaldrmstatusreport.pdf
- UnitedNations. (2015a). *The World's Women 2015: Trends and Statistics*. Department of Economic and Social Affairs Statistics Division., New York, NY.
- UnitedNations. (2017). *World population prospects: The 2017 revision: Key findings and advance tables*. New York: Department of Economic and Social Affairs, Population Division. Retrieved from https://population.un.org/wpp/publications/Files/WPP2017_KeyFindings.pdf
- Wamsler, C. (2017). Stakeholder involvement in strategic adaptation planning: Transdisciplinarity and co-production at stake? *Environmental Science and Policy*, 75, 148-157. doi:<https://doi.org/10.1016/j.envsci.2017.03.016>
- Wamsler, C. (2018). Mind the gap: The role of mindfulness in adapting to increasing risk and climate change. *Sustainability Science*, 13, 1121-1135. doi:<https://doi.org/10.1007/s11625-017-0524-3>

- Wamsler, C., & Brink, E. (2014). Interfacing citizens' and institutions' practise and responsibilities for climate change adaptation. *Urban Climate*, 7, 64-91. doi:<https://doi.org/10.1016/j.uclim.2013.10.009>
- Wamsler, C., & Riggers, S. (2018). Principles for supporting city–citizen commoning for climate adaptation: From adaptation governance to sustainable transformation. *Environmental Science and Policy*, 85, 81-89. doi:<https://doi.org/10.1016/j.envsci.2018.03.021>
- WHO. (2022). *World Health Organisation*. Retrieved from <https://www.who.int/health-topics/drought>
- WorldBank. (2018). *The World Bank IBRD-ID*. Retrieved from <https://datatopics.worldbank.org/world-development-indicators/>
- WorldBank. (2022). *The World Bank*. Retrieved from <https://www.worldbank.org/en/topic/citizen-engagement#1>