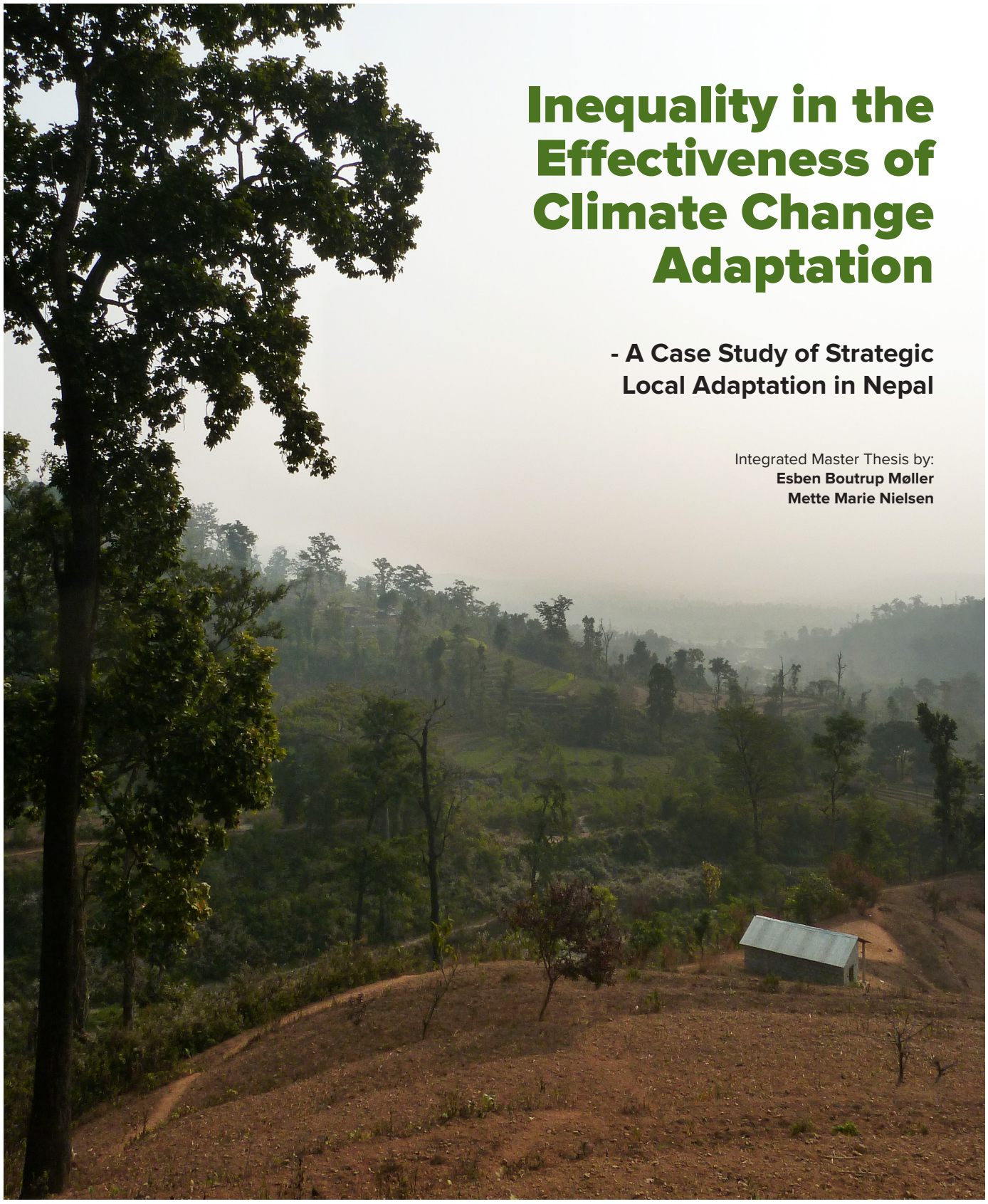

Inequality in the Effectiveness of Climate Change Adaptation

- A Case Study of Strategic Local Adaptation in Nepal

Integrated Master Thesis by:
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Front-page photo: Beldanda in the foreground and Bharlang in the background

Abstract

The need for adaptation to climate change impacts have led to an increased focus on strategic adaptation targeted at community level, which has become one of the new drivers for change within the developing sector. Although community-based adaptation approaches have become popular there is, however, a lack of empirical based research showing the effectiveness of such adaptation measures. Critiques have been raised that strategic adaptation interventions, tends to give priority to technical-, skills- and asset based solutions. Thereby they do not adequately address the underlying societal structures which makes it difficult for the most vulnerable groups to build the adaptive capacity needed in order to adapt.

Through a case study in two rural villages in Nepal, this study investigates the reasons why some households have difficulties in making use of the adaptation measures provided through strategic interventions while others, who are equally exposed, have used the same measures to effectively decrease their vulnerability.

By operationalization of a theoretical model which captures respectively the societal and the environmental aspects of vulnerability, and empirical findings based on 43 qualitative interviews, we can conclude that increased availability of tangible and intangible resources is vital for adaptation among the households. The availability of such resources does, however, not alone enable all households to adapt. The case study shows that even though all the investigated households wish to improve their farming, only some have created a higher absorbing capacity by introducing commercial scale vegetable production in a season where the lands traditionally used to be kept barren.

Information, knowledge and especially well-functioning relations are the main aspects, which divide those households that have adapted from those which have not. The reasons behind is that some households have not been able to build relations and seek farming related knowledge from those households, which have already adapted, or from training venues. The barriers are mainly due to ethnic marginalization and local inequality in power-sharing, which have not been targeted by the strategic interventions. We conclude that community-based adaptation strategies must give a higher priority to breaking down these barriers in order to support the social processes which make the most vulnerable groups capable of utilising tangible and intangible resources to adapt to climate change and improve their living conditions.

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Abbreviations

ACCRA - Africa Climate Change Resilience Alliance
CADP-N - The Climate Adaptation Design and Piloting Project- Nepal
CAPA - Community Action Plan for Adaptation
CO_2 - Carbon Dioxide
DDC - District Development Committee
DFID - Department for International Development
FORWARD- Forum for Rural Welfare and Agricultural Reform for Development
HH - Household
IDSN - International Dalit Solidarity Network
IIED- International Institute for Environment and Development
IISD - International Institute for Sustainable Development
IPCC - The Intergovernmental Panel on Climate Change
INGO - International Non Governmental Organisation
LAC - Local Adaptive Capacity Framework
LAPA - Local Action Plan for Adaptation
NAPA - National Action Plan for Adaptation
n.d.a. No Data Available
NGO - Non Governmental Organisation
ODI - the Overseas Development Institute
ppm - Parts per million
RRN - Rural Reconstruction Nepal
SRAM - Sustainable Resource Allocation and Management Nepal
SRES - Special Report on Emissions Scenarios
UN - United Nations
UNDP - United Nations Development Programme
VDC - Village Development Committee
WB - The World Bank

1. Chapter

INTRODUCTION TO THE PROBLEM

1.1 Identification of the problem

The global climate is changing in a pace that continues to surprise the scientists and others concerned with the issue. In spring 2013 a climate change threshold was crossed with the first registration of a daily mean concentration level of CO_2 above 400 parts per million (ppm[1]) at several measurement stations[2] of the World Meteorological Organization's Global Atmosphere Watch network (World Metrological Organization, 2013). Radiative forcing caused by greenhouse gases has increased 30 % between 1990 and 2011, and there is a significant consensus among peer-reviewed research articles[3] that the level of climate change faced today is anthropogenic (ibid. ; Cook et al., 2013). The increased atmospheric heating and impacts from it are affecting living conditions around the globe either directly by changed rainfall patterns and increased temperatures, or indirectly by exacerbating other changes like agricultural yield, new disease patterns, conflicts over natural resources and migration (Jones et al., 2011). Models for predictions of future climate change show that the trend of accelerating change will continue, and thresholds representing significant tipping points of change might be passed within this century (IPCC, 2007a).

Impacts from climate change have become an issue of concern in many sectors; one of them is the development sector. The Intergovernmental Panel on Climate Change (IPCC) and the United Nations High-Level Panel on the Post-2015[4] development agenda among others address that climate change is a serious threat towards hard gained developments among poor and vulnerable people, since improved trends on for example food security, poverty, health and access to natural resources can transform into an negative trend due to climatic changes (UN, 2013 ; IPCC, 2007, Abeygunawardena et al., 2002). The awareness has resulted in implementation of climate change as an issue of concern in development policies, plans, and frameworks, especially in the field of combined social environmental approaches (Bhandari, 2013 ; Care, 2009 & 2012 ; Ensor, 2011).

[1] The preindustrial level is considered to have been 280 parts per million (World Metrological Organization, 2013).

[2] A level above 400 ppm was as well observed in the spring 2012 in several arctic stations, but it has been given much attention that the threshold is now also registered at stations close to Equator (World Metrological Organization, 2013).

[3] Cook et. al. found that 97,1 % among 4000 peer-reviewed studies from the period 1991-2011 there is agreement that the current climate change is anthropogenic (Cook et. al, 2013).

[4] Referring to the termination of the United Nations Millennium Development Goals.

1.1.1 Adaptation as a strategy to meet the climate challenges

Mitigation measures are being undertaken in order to try to avoid too dramatic changes and related impacts on ecosystems and human conditions, but it is recognised that change is now happening at a rate where mitigation will at best only slow down the trend. Thus, adaptation has entered the climate change discussions as a central concept of consideration (Jones et al. 2011 ; IPCC, 2007 ; Adger et al., 2005). This is happening, not least within the development sector where adaptation to climate change and related uncertainties have come into focus and been implemented within frameworks and strategies combining development and adaptation (Care, 2012 ; Ensor, 2011 ; Jones et al. 2011 ; Sekine et. al., 2009).
IPCC have described adaptation as the process of adjustments to actual or expected climate and its effects in order to moderate harm or exploit potential benefits (IPCC, 2012). However, to create such a process is a difficult task because the situation of complexity and uncertainty, which is a general condition for planning in socio-environmental issues, is only increased with the impacts from climate change (Chambers 2010 ; Care, 2012 ; Østergaard, 2012 ; Ensor, 2011). Because of the condition of long-term trends of uncertainty, especially regarding impacts at regional and local level, adaptation planning cannot rely on command and control approaches. Instead adaptation must enhance the capacity of vulnerable people to cope with, adapt to, shape change and learn to live with uncertainty and surprise (Ensor, 2011). Beside the condition of uncertainty we also have to recognise that today's challenges are only a foretaste of many decades of change rather than a new equilibrium climate. In this optic the process of adaptation becomes a process without an ending point. Rather than to create one specific development outcome, strategic adaptation is more about creating opportunities and building capacity to exploit these in a sustainable way (Ensor, 2011 ; Jones et al., 2011).

A common trend among Non-Governmental Organisations (NGOs) and development institutions is to put a special focus on rural, resource dependent communities and most vulnerable groups when implementing adaptation strategies (Ensor, 2011; Care, 2012, Bhandari, 2013; Ghimire, 2013). 'Most vulnerable' is of course a relative concept and we use it as referring to those groups within a society that are the most sensitive and least able to adapt to the changing climate and development pressures (modified from Jones et al., 2011). Community-based climate change adaptation (hereafter community-based adaptation) is an umbrella term for frameworks and toolboxes, designed to guide the practical implementation of adaptation strategies, and have become a prevalent strategy among NGO's[5]. The adaptation strategies based on local community scale are carried out as what we will call *social adaptation*, which means adaptation having as much focus on the human living conditions as on the

[5] As an example, more than 250 NGO's and experts attended the 7th conference on Community-based Adaptation to climate change hold in Dhaka, Bangladesh April 2013 (IIED, homepage).

ecosystems. There is an aim of sustainable relations between humans and the ecosystems but the emphasis is on humans (Bhandari, 2013 and 2013a ; Care, 2012 ; Jones et. al. 2011). Social adaptation in a development optic is not about returning a system to equilibrium or status quo after a shock or change, but about increasing wellbeing while securing a stronger capacity to meet change. The concept *transformational adaptation* is sometimes used for this to distinguish from the way the concept of adaptation is understood within biology[6] (Jones et. al., 2011, Ensor, 2011). The use of the concept adaptation in this thesis refers to social, transformational adaptation.

The community-based adaptation strategies emphasise bottom-up processes where the community (citizens, groups and local institutions)[7] are considered the main entity of focus. There is a clear participatory intention where the local communities are typically supported to track their own history of climate related hazards and identify their own state of vulnerability and possibilities for action through Participatory Rural Appraisal Tools (e.g. resource mappings, historical timelines, vulnerability matrixes, service provider maps, adaptation plans[8] etc.) (Bhandari, 2013 ; Care, 2012 ; Sekine et. al., 2009)

Beside the participatory ambitions, the frameworks for these adaptation approaches do often give a special focus to 'most vulnerable' groups. These groups are often also poor and/or marginalised[9]. However, being poor is not always the same as being vulnerable and vice versa (Bruun and Casse, 2013 ; Ensor, 2011). The fact that development agents undertake a special focus on most vulnerable groups reflects awareness on the risk of reproducing inequality and exclusion of those who do not traditionally have the same assets and influence as other groups in the society. However, criticism has been raised with the argument that many community-based adaptation approaches do not thoroughly take the specific structural and local political, economic and social conditions into consideration before interventions are initiated. If the approaches do mainly focus on how to deal with the physical challenges, for example by implementing infrastructure, new technologies and skills training only, they miss how important aspects of power, position, cultural beliefs and self-perceptions are for adaptation. The critics contend that a too narrow focus on 'technical

[6] An example of a used theoretical model originating from biology and eco-system science, but today also used within social science is 'the adaptive cycle' that describe adaptation within a system as a cyclic process of a) growth and exploitation, b) conservation, c) release and d) reorganisation/ renewal, which means returning to equilibrium. The level of resilience within the system is defined by its ability to restore or bounce back to a state of balance (Resilience Alliance, homepage).

[7] When using the concept *community* we recognise that the term has many different meanings depending on scientific discipline and ontology (Sekine et. al., 2013). In this thesis we want to avoid an interpretation of a community as being a homogenous group or a fellowship with same conditions and visions. We use the term only to define a group of people or households living in the same settlement at a local level. This we also call village in the case context.

[8] Known as Community Adaptation Plans of Action (CAPs or CAPAs) (Bhandari, 2013)

[9] The groups identified to be most vulnerable in the study area of this study will be presented in chapter 4, section 2.

fixes'[10] can hinder adaptation from happening or create maladaptation, especially for the most vulnerable groups (Levine et al., 2012 ; Jones et. al., 2011 ; Ensor, 2011 ; Blaikie et al., 2003). We will elaborate more on these critics in paragraph 1.2.

The idea that there is an urgent need for adaptation in developing communities means that planned adaptation has become one of the new drivers for change within the developing sector (Pain, 2013). Although the community-based adaptation approaches have become popular within the development sector, there is a lack of research showing their effectiveness[11] and success of adaptation (Ibid. ; Christoplos, 2012 ; Hernø, 2012 ; Jones, 2011a ; Ensor, 2011 and Sekine et al., 2009). Lindsay Jones from the Overseas Development Institute suggests that the lack of knowledge is due to the fact that assessing adaptation and understanding the processes that shapes it is very complex (Jones, 2011a). However, the lack of knowledge nursed our curiosity and became our first criteria of relevance for the study presented within this thesis.

1.1.2. Nepal as a case

We found Nepal to be a good case for further studies of the effectiveness and success with adaptation.

The first condition for our choice of Nepal as a case is that the country is already widely impacted from climate change and vulnerable to impacts from it. The Nepali economy is mainly agrarian and nearly 80 % of the population is gaining their livelihood from agriculture. Consequently there is a high direct dependency on the climatic conditions and natural resources (Maskey, 2013).

The country is struggling with many challenges as political instability, fast population growth, poverty[12], caste- and ethnic-discrimination and degradation of natural resources (UNDP, 2009). The impacts from climate change cannot be isolated from the above mentioned challenges, but the climatic changes are observed to intensify many of the existing problems. Experienced impacts from change in climate are reported in terms of decline in food-security, new diseases for humans, livestock and crops, increased risk of flooding and landslides, which influences human security, water supplies and infrastructure, and prolonged droughts, which impacts crops and water supplies. The groups who are already discriminated and marginalised are experiencing the worst increase in vulnerability (NAPA[13], 2010 ; Paudel, 2011).

[10] Including training and advocacy to ease the implementation of new techniques, methods and infrastructures.
[11] For a definition on effectiveness of adaptation please refer to paragraph 1.1.3.
[12] The Nepali population consists of approximately 29.8 million people, with a population growth rate on estimated 1,76 percent (indexmundi.com[12]). More than 70 percent of the population lives below 2 USD per day (NAPA, 2010:ix)
[13] Referring to the National Adaptation Programme of Action (NAPA) to Climate Change.

The second condition for our choice of Nepal as a case is that the Nepali government, international and national (I)NGO's and international development institutions[14] have had focus on adaptation as a development strategy for the country throughout the last decade (Paudel et al. , 2013). Climate change is by the Nepali government recognised as an environmental issue but at the same time highlighted as a crucial issue for development (LAPA Manual[15], 2011 ; Climate Change Policy, 2011 ; NAPA, 2010).

Climate Change in Nepal

Nepal is situated in a region that has experienced a higher average increase in temperature over the last century than the global mean[16], and precipitation varies greatly within time and space due to the monsoon from the Indian Ocean (Maskey, 2013 ; NAPA, 2010). The predicted rise in temperature up to 2100 is between 3.5˚ and 5.5˚ degrees Celsius for the Indian subcontinent and even more for the Tibetan plateau (SRES B2 and General and Regional Circulated Models in NAPA, 2010 ; Paudel, 2011). The predictions on precipitation are more unstable, but an increase in number and intensity of erratic rainfalls before and after the monsoon are experienced and expected [17](NAPA 2010). Rainfall patterns are experienced as inconsistent with a change towards higher intensity and less number of days with rains, which leads to drought in some periods and heavy rainfall in other (Maskey, 2013 ; Paudel, 2011).

Adaptation strategies in Nepal

The Nepali government has strategically used the country's high vulnerability[18] to climate change to attract international funds for adaptation and development (Pain, 2013 ; Byg, 2012 ; NAPA 2010). Several development projects and programmes have been carried out during the last decade throughout Nepal under the heading of community-based adaptation (Bhandari, 2013 ; Paudel et al.,2013 ; Chaudhary et al., 2012 ; CADP-N[19], 2011) It is popular to use bottom-up guided planning within natural recourse management and development projects and programmes within the country (Dhungana, 2013). The international and na-

[14] United Nations (UN), The Department for International Development (DFID), International Institute for Environment and Development (IIED) among others.

[15] Referring to Local Adaptation Plan of Action (LAPA).

[16] With great local variations the annual mean temperature over Nepal increased steadily at a linear rate of 0.40C per decade from 1975 to 2005 compared to a global average raise of 0.130C per decade between 1956-2005 (Maskey, 2013 and IPCC, 2007).

[17] During the winter months precipitation is not predicted to increase, except in the Eastern Nepal where predictions expect between 5-10 % increase, and during summer months the increase is predicted to be 15-20% for the whole country.

[18] Some sources rank Nepal to be the fourth most vulnerable country to climate change over the coming 30 years (Maplecroft, homepage), and this number have been used actively by the Nepali government in trying to attract international donor money for adaptation (Byg, 2012).

[19] The Climate Adaptation Design and Piloting Project- Nepal (CADP-N) was carried out in ten pilot projects using the LAPA framework for implementation.

tional NGO's have, simultaneously with their implementation of projects, been advocating actively for policies and guidelines on local adaptation as they have a strategic interest in attracting international funds for this. The NGO sector in Nepal is powerful because it handles many of the social services that the fragile state has not been able to carry out for decades (Dhungana, 2013 ; Pain, 2013). As an example, the (I)NGO's facilitated the processes that led to the three recent policies; The National Adaptation Plan for Action (NAPA, 2010), the Climate Change Policy (2011) and the Local Action Plan for Adaptation (LAPA Manual, 2011). While the NGO's have implemented community-based adaptation projects for a while[20], there is still no guidelines on how the local government bodies shall implement the Local Adaptation Plan for Action (Dhungana, 2013 ; Lamichhane, 2013).

1.1.3. Effectiveness of strategic adaptation in Bharlang and Beldanda

Before we continue with the identification of the problem we will shortly describe our use of the term effectiveness of adaptation at two levels. We use the term to describe how effective programmes that use certain strategies have proven to be in creating adaptation to climate change for a specified group of people. We also use the term to describe how effective the individual households in our study area[21] have been in adapting to climate change. Effectiveness of adaptation shall be measured in decreased vulnerability (please refer to chapter 2 for an extensive definition on vulnerability). However, since the complex character of vulnerability is case and time specific, the criteria that define the effectiveness of adaptation depends on the context investigated.

Kabilash Village Development Committee (hereafter VDC, which is defining both an area and a local government body, best comparable with a Danish municipality) in Nepal covers a rural society where community-based adaptation strategies have been used in an attempt to decrease the vulnerability to climate change and local, natural resource degradation. In the area there has been a long-term trend of change in precipitation and temperature (Maskey, 2013). These changes have affected the agricultural production which is vital for the local livelihoods (ibid. ; Bhandari, 2013). Combined with deforestation, erosion and siltation the situation turned into critical disasters in 2001 and 2004 where flooding caused approximately twenty human deaths[22] and severe damage to local lands, houses and infrastructure. The citizens gave up continuing their livelihood in the area and turned to the central government for help to get resettled. This did not happen because the development NGO Practical Action Nepal in cooperation with local authorities convinced people that through stra-

[20] Practical Action was among the first NGO's to address climate change adaptation as a special issue with their project in Kabilash VDC initiated in 2003. Since then Care, WWF, the UN and a range of national NGO's have also carried out projects and programmes on community-based climate adaptation (Bhandari, 2013 ; Dhunagana, 2013; Paudel et al.,2013 ; Chaudhary et al., 2012 ; CADP-N, 2011).
[21] The study area for this thesis is the two villages Bharlang and Beldanda, Kabilash VDC, Chitwan, Nepal.
[22] Our different sources have given slightly different numbers on this matter.

tegic adaptation measures they could together turn the area into a prosperous place to live. A ten years strategy for adaptation was formulated in cooperation with the local government body, the VDC[23] (Bhandari, 2013 ; Khadka, 2013).

When we first came to the area, in the beginning of 2013, additionally three NGO's[24] had been implementing projects since Practical Action left the area in 2007. The watersheds were now plotted with check-dams and speed-breakers, water tanks and pipe-systems had been built for irrigation and skill trainings given in order to enable people to comply with change in precipitation patterns, and to produce vegetables on commercial scale during the dry winter months.

At our very first visit to the area one specific observation cached our attention. There seemed to be a distinct difference in the use of the provided irrigation facilities. We saw that people living in the hilltop settlement area called Bharlang had irrigation pipes running down to their fields which were luxuriant with tomatoes, beans and hedges. Twenty-thirty minutes' walk from Bharlang, on the hilltop named Beldanda, they had also gotten two water-tanks, but only very few pipes[25] where running to the fields, and almost every field was completely barren and dry. Despite the remarkable difference in the production on the fields, the first observations also revealed significant difference in living standard between the two neighbouring communities.

The households[26] in the two villages of Bharlang and Beldanda are located with almost equal geographical features. They are exposed[27] to the same climate changes and natural hazards, they have been involved under the same project interventions and they live under the same governance structure. In Beldanda it seemed like many of the citizens had not been able to benefit from the support given in order to decrease their vulnerability. Maybe they actually had to some extent, but we could observe a poor situation of wellbeing and livelihood foundation compared to what we had seen in Bharlang and other surrounding villages. We were puzzled by the apparent difference in living conditions we found.

Beside the apparent difference in the current living conditions, the households were exposed differently to the impacts from flooding, landslides and erosions depending on their location, which made them differently vulnerable to these hazards. We have therefore chosen to focus on the difference in adaptation to changes where they are likewise exposed, namely change in precipitation patterns and temperature.

[23] This ten years strategy has primarily been used to attract NGO's who could help implement the measures, and thus, most of the NGO's activities, which we will mention further down the report, confirm the objectives of the plan. The plan was implemented within eight years (Khadka, 2013).

[24] The three are: SRAM Nepal, Rural Reconstruction Nepal, and FORWARD Nepal.

[25] There are differences in which pipes the different households have. It will be elaborated on in paragraph 4.3.2.

[26] Please refer to chapter 3for an argumentation on why we focus on households.

[27] This is a general notion. In the analysis of current living conditions among the selected households, we argue how we have tried to neutralise the exposure factor.

All[28] the investigated households of Bharlang and Beldanda cultivate land. Agricultural production is the main income source of most households, while all households are dependent on the local agricultural production. Besides this, they are also equally exposed to impacts from climate change within farming of their lands. Because of this, we have delimited our thesis to focus on adaptation in the agricultural production[29]. This means that when we include erratic rainfall as a hazard, it does not imply the damage that such rainfall can cause to the houses or other physical assets that do not directly relate to the agricultural production.
Equal exposure between households, however, does not mean equal vulnerability, but even though the households did not have equal conditions before the strategic adaptation approaches was implemented the difference in how people had acted and changed their situation since seemed to be remarkable. This raised the following question: Why do people, who live side by side under same geographical and climatic conditions, so differently benefit from and adapt to activities that potentially can decrease their vulnerability to climate change?

The inequality[30] we found in effectiveness of adaptation between households in Bharlang and Beldanda made the foundation for the second criteria of relevance of this thesis. Through our findings and analysis we want to provide a basis for a better understanding of why community-based framework approaches for adaptation does not necessarily make vulnerable people able to release the pressure from the conditions that makes them vulnerable. We thus seek to understand the reasons behind the inequality in effectiveness of adaptation among the households. This has been done with a combination of investigating the abstract concepts from our theoretical framework[31], and by concretizing these with the specific factors of importance for adaptation found in the empirics from our case study of Bharlang and Beldanda.
With our findings on the reasons behind inequality in effectiveness of adaptation, and the critiques of the current used framework approaches, we will discuss how the community-based adaptation strategy can be developed further in order sharpen the focus on factors and processes that will make adaptation of the most vulnerable groups more likely.

1.1.4. Problem statement

Why is there inequality in the effectiveness of adaptation among the households in Bharlang and Beldanda, and how can the explanations be used to target strategic climate adaptation better at most vulnerable groups?

[28] Except one household (i.e. Mamata Chepang)
[29] Not including livestock raising.
[30] In paragraph 4.2., we validate that there is an inequality in the effectiveness of adaptation among the investigated households.
[31] The theoretical framework is presented in chapter 2.

1.1.5. Research questions and structure of the study

The following research questions guide the process of the thesis:

- *How is the current practice of community-based adaptation, and which critiques have been raised against it?*
- *Which climate change impacts are found in the study area, and which political and social preconditions influence on the households' ability to adapt to these?*
- *What is the disparity between the current living conditions among the selected households in Bharlang and Beldanda, and which factors can show the effectiveness of adaptation among the households?*
- *To which extent can inequality in the households' access to, and control over resources explain their effectiveness of adaptation?*
- *To which extend can the adaptive capacity[32] of the households explain their effectiveness of adaptation?*
- *How can the findings from our study of adaptation in Bharlang and Beldanda give perspectives to a further development of community-based climate adaptation?*

The study of these questions will be presented with the following progression:

i) THE PROBLEM OF INEQUALITY IN ADAPTATION
At first we show that reproduction of inequality is a well-known phenomenon within the domain of environmental management, and several critiques have been raised that the current community-based adaptation approaches do not solve the root of this problem. We will elaborate on the community-based adaptation strategies NGO's and the Nepali government uses and present the approaches that have been implemented in Bharlang and Beldanda. The aim of this first section is to validate the problem of inequality within adaptation and to present the characteristics of the current community-based adaptation approaches.

ii) THEORETICAL FRAME
Part of our approach has been to establish a theoretical frame which could provide basis for the analysis of our contextual data gathered in Nepal. We found useful theoretical inspiration in respectively a rather structuralistic understanding of vulnerability by Blaikie et al. (2003) and in Ensor's writings on adaptive capacity which are of a more actor oriented perspective (Ensor, 2011). As none of the perspectives could explain all factors and dynamics we found in the case, we have used elements from respectively the structuralistic and the actor perspective to create our own theoretical model, showing five aspects of vulnerability, which we have used to explain our findings.

iiv) METHODOLOGY AND DELIMITATIONS

[32] For a definition of adaptive capacity see paragraph 1.2.2.

When the general character of the problem is substantiated the methodology of how we have approached the problem will be presented along with some general delimitations.

iv) ANALYSIS OF FINDINGS FROM BHARLANG AND BELDANDA
The analysis of findings from the case of Bharlang and Beldanda is structured into four sections.
In the first section an analysis of the structural, demographic and environmental conditions that influence the local vulnerability is carried out.
In second section we discuss and choose the parameters that are suitable to identify the absorbing capacity within the current living conditions among the local households and differences herein. The factors showing difference in current absorbing capacity are of interest as we need to know how the inequality in adaptation manifest, in order to identify the historical difference in adaptation actions. Consequently, we identify one adaptation action as the best suitable to show local inequality in effectiveness of adaptation.
In the third analytical section we analyse if difference in access to and control over tangible resources can give some of the explanations for inequality in effectiveness of adaptation.
In the fourth section, we identify eight factors of importance for adaptive capacity, including human and social resources and processes, and we analyse the explanatory strength of these in order to understand why some households have adapted within their farming practice while others have not.

v) DISCUSSION AND PERSPECTIVES
In this chapter we discuss how the findings of the case-study can inform the future design and implementation of strategic community-based adaptation interventions, and from there we raise a discussion on which identified barriers shall be addressed at the local level, and which are more appropriately addressed at meso and macro levels. There is also the question about which changes can be generated within a project or programmes' time limit.

vi) CONCLUSION

1.2. The problem of inequality in adaptation

In the introduction we established two criteria of relevance for this study. The first one is a general lack of empirical based research on the effectiveness of community-based adaptation. The second criterion of relevance originates from a wish to understand why some people have difficulties in making use of the adaptation measures provided through strategic interventions while others, who are equally exposed, have used the same measures to effectively decrease their vulnerability.

In this paragraph we will show that reproduction of inequality is a widespread problem in the domain of environmental management and adaptation. We will identify how current community-based adaptation approaches try to deal with this, and we will present the critiques that have been raised as to the inadequacy of these approaches.

1.2.1. Reproduction of inequality within the environmental domain

As will be shown in the analysis of the findings from Bharlang and Beldanda, it is those households which had the poorest living conditions who could also not extract many of the opportunities given within the strategic adaptation measures provided. This finding could be a single contextual coincidence but it seems not to be so.

In recent years an increased concern with inequality has emerged within the development society. An example is the current discussion on how much emphasis inequality should be given in the post-2015 development agenda (Engberg-Pedersen, 2013 ; Harland-Scott et. al., 2013 ; UN System Task Team, 2012). The discussion has been raised as remarkable progress in poverty reduction and increased social welfare have not benefitted the poor, excluded and deprived groups substantially. New studies have shown that high inequality impedes economic development and social stability because capital accumulation by the richest is not a guarantee for jobs and income among the poor. Rather, it creates frustration for those who have not benefitted (Engberg-Pedersen, 2013).

When we look at the domain of environmental management, Harland-Scott et al. in the Synthesis Report of Global Public Consultation on Inequalities (2013), highlights how structural factors reproduce inequality. First there is the issue of exposure, where environmental harm in form of hazards and risks are faced more intensively in poor and less influential local communities than in those who are better off. At the very local level climate change related hazards affects the weakest (elder, weaker, poorer and sick people) most. The exposure is uneven mainly because less privileged groups often live and work in less favourable geographical areas (Harland-Scott et al., 2013). When it comes to management, risk reduction and adaptation, winners and losers are created while resources are distributed or redistributed in a social-environmental context, especially when there is an integrated aim of livelihood development within the approach (Ensor, 2011). If the local relations and power patterns are not addressed, the winners are most likely to be those who already possess power and have privileged positions in utilizing natural resources, because they are best at mobilising for collective action or to take advantage of their links to decision making agents which secure their interests. If the actors behind strategic adaptation are not aware of this they face a risk of unwillingly supporting elite capture (Pain, 2013).

Ensor gives a handful of examples on studies that have underlined the inequality in benefits related to natural resource management and adaptation (Nelson, et al. 2007 ; Borrini-Feyerabend et al., 2007 ; Ribot, 2009 ; Moser, 2009).

In the few review studies that have been made on community-based adaptation processes, the same trend is found. The most vulnerable groups have difficulties in extracting benefits from adaptation measures and to build adaptive capacity, especially under the approaches focusing mainly on a strengthening of the asset base. The main arguments in the studies are that structural and institutional issues of power and entitlements along with issues of social capital are not given sufficient attention (Ibrahim and Ward, 2012 ; Jones et. al., 2011 ; Sekine et. al., 2009).

1.2.2. How do community-based adaptation frameworks address inequality today?

As mentioned in the introduction, many development agents engaged with adaptation do have a specific focus on most vulnerable groups. In order to analyse the effectiveness of community-based adaptation approaches ability to support most vulnerable groups in adapting, we need to get some insight in the internal discussions among practitioners and researchers working with the strategies and how the approaches for implementation are designed.

Development of frameworks for characterising adaptation

First, it should be mentioned that there is only little agreement among the agents dealing with adaptation and development on what indicators can be used for adaptive capacity (Jones, 2011a). We have looked at Ensor and Jones' definitions of adaptive capacity, but we did not find a definition which we find suitable to explain how the term is used in this thesis. Therefore, we have chosen to make our own definition of adaptive capacity which is influenced by the author's writings on adaptive capacity[33]:

Adaptive capacity is the ability possessed by the actor to actively decrease his or hers vulnerability.

Early projects and studies on adaptive capacity have focused on measurements of change within capitals, most of them being inspired by the Sustainable Livelihood Frameworks definition of five types of resources, i.e. social, human, physical, natural and financial (DFID, 1999). Due to the lack of empirically based research on what characterises adaptation, the Africa Climate Change Resilience Alliance (ACCRA) consortium formed by a range of development agents and research institutions [34], have in the recent years worked at creating a stronger, evidence based framework for adaptation (Jones, 2011a ; ACCRA, n. d.). They have identified that processes are as important as change in resource base. ACCRA has made the Local Adaptive Capacity Framework (LAC) which express the idea that the five following aspects need to be considered when building adaptive capacity among most vulnerable

[33] Please refer to chapter 2, for Ensors arguments on adaptive capacity.

[34] The consortium if formed by Oxfam GB, the Overseas Development Institute (ODI), Save the Children Alliance, Care International and World Vision International and funded by DFID and the Climate and Development Knowledge Network (ACCRA, homepage).

groups: i) A diverse *asset base*; ii) appropriate and fair *institutions and entitlements*; iii) access to relevant *knowledge and information*; iv) an enabling environment that fosters *innovation*; and v) *flexible forward-looking governance and decision-making* processes (Jones, 2011a). The LAC framework reveals a focus on factors in a system that should be either plenty (assets and knowledge) or supportive and enabling (entitlements, institutions and governance) and it is implicit that there should be a focus on processes where these factors are strengthened. What we do not find in the LAC framework is mechanisms to address 'hidden' barriers of power, the strength of relations, cultural beliefs and self-perceptions. Examples of types of power not often addresses is that in a strategic adaptation process power is exercised by facilitators although they sometimes perceive themselves as being neutral, it is exercised internally between different positions in the targeted community, and it is exercised by external experts and others entering the local adaptation agenda. Then there is the issue of cultural beliefs which can be a barrier in the sense that they shape people's perceptions about which issues they can change or not (Ensor, 2011). The self-perception of the actor can likewise be either supportive or a barrier for actions of change. These issues will be discussed further in chapter 2 on the theoretical framework, and in the fourth section of chapter 4.

Current approaches for implementation of community-based adaptation

One thing is the frameworks which have a strong stake in shaping the understanding of adaptation among practitioners, but in order to understand current practice we should also take a closer look at the manuals and tool-boxes which guide implementation. For this purpose we have studied the most recent manuals for implementation of community-based adaptation published by the NGO Care. Care has for a decade worked with local development of Community-Based Adaptation Plans[35], and national level development of adaptation policies within Nepal (Paudel et al., 2013) [36]. We have also looked into the Local Action Plan of Adaptation (LAPA Manual, 2011) published by the Nepali government. Lastly we have investigated the approaches used by four different NGO's[37] for implementation of project activities in the case of Bharlang and Beldanda (Care, 2012 ; LAPA Manual, 2011 ; Bhandari, 2013 and 2013a ; Ghimire, 2013 ; Rawal , 2013 ; Piya, 2013).

Care and LAPA as examples

Common features from the manuals by Care and the policy manual from the government are: i) A bottom-up approach putting the household or the community as the main entity for identification of vulnerability and adaptation measures. ii) Descriptions that emphasise in-

[35] Most often referred to as CAPA's or CAP's.

[36] They are also engaged in several African countries with the Adaptation Learning Programme for Africa (Hernø, 2013 ; PECCN, homepage)

[37] They are Practical action Nepal, Rural Reconstruction Nepal, Forward Nepal and Sustainable Resource Allocation and Management (SRAM) Nepal.

clusion and prioritisation of marginalised, most vulnerable groups and of being gender sensitive. iii) Use of participatory tools to identify climate change impacts, prioritise adaptation measures and to identify internal resources within the local community, and need of external support. iv) Development of action plans for adaptation which is rooted in the community or any other local entity[38]. v) Implementation of local adaptation plans of action (Care, 2012 ; Care toolboxes, homepage ; LAPA Manual 2011 and LAPA 2011a).

The clear agenda in the manuals is to address impacts from climate change. This focus on problems induced from nature involves two weaknesses when we look at it from an inequality optic. The first is that the focus on impacts from climate and nature tends to steer the choice of solutions, i.e. adaptation measures, into the field of natural, technical, skills based and economic solutions. This inflicts a risk of ignoring the importance of social factors. Aspect that lacks attention are for example that some people, due to their position, their (lack of) relations, their self-perception, educational level or the like, may not have the capacity or surplus energy to engage in learning processes or make use of new technologies. The second weakness is that local stakeholders and local organisations may not recognise or have interest in addressing internal power-structures, internal dependencies and cultural behaviours, which can be significant barriers to adaptation. Thus these will not be addressed in the participatory processes of identifying problems and solutions. Local stakeholders may for example have an interest in keeping certain relations of dependency as they are although such issues can hinder successful adaptation for them or others. Also local stakeholders may not be aware of what a change in e.g. the interaction between different groups in the society can have of positive or negative effects for local adaptation.

Approaches for project implementation in Bharlang and Beldanda

We have come to know of four NGO's that have carried out activities in the study area since 2003. The four of them have used different approaches. Where Practical Action from the beginning defined their approach as community-based adaptation, Rural Reconstruction Nepal (RRN), Forum for Rural Welfare and Agricultural Reform for Development (FORWARD Nepal) and Sustainable Resource Allocation and Management Nepal (SRAM Nepal) have all used Disaster Risk Reduction and Sustainable Livelihood strategies as main frameworks for their approaches (Ghimire, 2013 ; Piya, 2013; Rawal, 2013 ; Bhandari, 2013). Except from Practical Action, the other organisations have not worked with a specific aim to lower vulnerability to climate change, but the activities from the sustainable livelihood framework have all potentially influenced the vulnerability among the households. The same can be said about Disaster Risk Reduction activities, but these activities were mostly focused on securing the watersheds, not on agriculture practice. We cannot distinguish the impacts on adapta-

[38] The plans are defined as Community Adaptation Plans for Action (CAPAs) or Local Adaptation Plans for Action (LAPAs).

tion from the different NGO activities, but we can investigate which activities that seemed to have influenced effectiveness of adaptation among the households.
We will analyse on the specific activities of relevance in chapter 4, and thus we do only discuss the general features of the implementation strategies in this paragraph.
All project interventions have been based on some sort of participatory involvement of the citizens in identifying needs, but still limited under the frameworks given, i.e. climate adaptation, sustainable livelihoods and disaster risk reduction. In this sense there has been a framing from external actors on which issues to address and which not. We could not be clearly informed about the extent of participation in the identification and implementation phases, but all NGOs have used a strategy of dialogue and decision making on general assemblies and in local groups. We have no data revealing whether special strategies of including those who do not necessarily speak up loudly have been used. Practical Action, RRN and SRAM have not had any specific focus on most vulnerable groups, but due to the staff who was responsible for implementation, they have prioritised people with most needs (Bhandari, 2013, 2013a ; Ghimire, 2013). FORWARD is an organisation of special interest in the ethnic group called Chepangs who is considered a highly marginalised group (Piya, 2013 ; Nepal Federation of Indigenous Nationalities, homepage). All the projects have been implemented in cooperation with local authorities.

Involvement of local residents from the beginning of the project processes has been a central element for all the NGO's. However, we find that they have designed the process of identifying problems, solutions and plans for implementation in a way, where they have been running a risk of creating elite capture. By initiating problem identification at general assembly where local residents are appointed to lead and shape the adaptation process, the NGO's risk that the local elite will dominate (Pain, 2013).

The NGO's have initiated a range of activities. We will here highlight some of the activities which are important for our investigation. The organisations have created mothers and fathers groups, which function as save and loan groups, but some of them also include information, knowledge-sharing, skills training and management. The NGO's have also provided goat rearing and vegetable training, new farming technologies, and they have provided pipes and tanks for drinking and irrigation purposes. Besides this, they have supported a change in the local forest management practice, and there has been an extensive work with watershed protection.

It should be justified that the participatory design and implementation practice of community-based adaptation approaches might often be successful in supporting change and adaptation among those who can extract the benefits from new opportunities and assets. The critique raised in this thesis is only levelled towards the issue of actually creating adaptation among most vulnerable groups. We do acknowledge that measures for including most vul-

nerable groups in successful adaptation may be more costly and time-consuming than what is the case in current practice (Ghimire, 2013 ; Hernø, 2012).

1.2.3 Focus on people and power versus 'neutral' systems

Levine et al. raises in their policy brief '*The relevance of 'Resilience*'? (2012) a warning that adaptation in development practice cannot address the 'real challenges' if not distinguishing human conditions from the 'value free' biological systems'.

> "*The resilience of eco-systems to shocks and stresses appears to be an empirical matter, as do the qualities of the eco-system which affect how well it 'absorbs' or 'recovers' from any disturbance. Analogies for these qualities have then been looked for in the resilience of human 'systems'.*
> (Levine et al., 2012: 1).

A biological system which is in imbalance e.g. because of a specie that due to some kind of external pressure has decreased in number, can be redressed by helping the species to grow in number and thus regenerate balance to the system. The author claims that this approach cannot be transferred to human systems because these include power relations and individuals' actions (Levine et al., 2012).

Levine et al. argue that frameworks and tool-box approaches for strategic adaptation focusing on resilient[39] *systems* are gaining increased influence in the development sector. The critique by the authors is that the measures for increased adaptation, which are built into these framework approaches, encompasses the supposed value-free, epistemic idea that when the social system is set out of balance by climate change, i.e. shocks and stresses, it can be fixed with strategies targeted directly at these imbalances and get back into balance.

Consequently, the most important social determinants of vulnerability, which are power, social positions and relations and inequalities, risk to be set aside in strategic adaptation processes, because they are not easily measured and because change herein is much more politically sensitive than implementation of e.g. watershed protection infrastructures or training in farming skills (Blaikie et al., 2003 ; Levine et al., 2012 ; Schipper, 2007). These factors are what Blaikie et al. defines as the root-causes, and others define as the underlying causes of vulnerability (Blaikie et al., 2003; Schipper, 2007 ; Care, 2012). We refer to these structural bound, underlying causes as root-causes. Blaikie et al. express the problem with a system based approach focusing too narrowly on 'hardware' and technical skills based solutions in this quote:

[39] Resilience is a concept often used to describe the positive outcome of adaptation, or the opposite state of vulnerability (Care, 2012 ; Jones et al., 2011 ; Ensor, 2011). As we found it easier to operationalize the concept vulnerability for empiric based analysis, we use this term and its sub-concepts instead of resilience (please refer to chapter 2).

"The ...danger is that a focus on the 'hardware' aspects of vulnerability will distract from the attention that needs to be given to the political and economic determinants of vulnerability: most people are vulnerable because they have inadequate livelihoods, which are not resilient in the face of shocks, and they are often poor. They are poor because they suffer specific relations of exploitation, unequal bargaining and discrimination within the political economy, and there may also be historical reasons why their homes and sources of livelihood are located in resource-poor areas."
(Blaikie et al., 2003: 56)

When perceiving vulnerability from this perspective, social adaptation should not address *systems* because inequality and the reasons behind occur between humans and affect individuals. If adaptation shall be a development factor that can address the root-causes behind vulnerability, it is not about restoring or conserving the current systemic livelihood conditions, but about social transformation (Blaikie et al., 2003 ; Ensor, 2011 ; Schipper, 2007). Ensor stresses the potential to use the adaptation agenda as an opportunity for social reform and he sees it as important to support specifically the processes through which communities are able to engage with creating and shaping change (Ensor, 2011). As will be elaborated in the analytical sections, the four NGO's which have made strategic adaptation interventions in Bharlang and Beldanda during the last decade, have had a focus on transformation of livelihood conditions, but they have not actively addressed power and dependencies within the local context.

It is not only academics who have started to address the above raised critiques. At the Seventh International Conference on Community-Based Adaptation to Climate Change in Dhaka, Bangladesh April 2013, several practitioners representing NGO's and the United Nations included the questions of exclusion and power-relations as hitherto neglected although important issues in strategic adaptation (Fischer, 2013).

The criticisms we have outlined above, and the findings from the empirics generated in the study area have inspired us to include a focus on root-causes, power, relations and processes when investigating explanatory factors for inequality of effectiveness in adaptation in the study area.

1.2.4 Sub conclusion

We conclude that it is widely acknowledged that poor and marginalised groups are often more exposed to environmental hazards or climate change than privileged groups in the same societies. Most often because they live in prone areas left aside by privileged groups, because they are more often engaged in dangerous income activities, and because they often sustain on the local natural resource base having difficulties to afford alternatives (IPCC, 2012 ; Harland-Scott et. al., 2013). Secondly, the most vulnerable groups are facing difficul-

ties extracting the same benefits from planned management and adaptation approaches compared to privileged groups.
The type of problems to be addressed at local level in community-based adaptation processes is steered by frameworks and tools, but beside that the decision about which local issues to address and which not to address are made by local agents. This can be an advantage in order to tailor the activities to be contextually relevant, but there is also a possible risk of not capturing 'hidden' issues like discrimination between ethnic groups and uneven dependency patterns which can result in elite capture, less effective-, unequal- or maladaptation (Levine et. al., 2012 ; Jones et al. 2011 ; Blaikie et al., 2003 ; Pain, 2013).

There tends to be a more intense focus on natural, physical, economic and skills based solutions to climate change impacts in current community-based adaptation approaches, but studies point out that the current approaches are giving insufficient attention to structural and institutional issues of power and entitlements along with issues of relations and local processes (Ensor, 2011 ; Jones et al. 2011 ; Sekine et. al., 2009 ; Schipper, 2007).

2. Chapter

THEORETICAL FRAME

2.1. Adaptation as development - a theoretical framing

To analyse the reasons behind the inequalities in effectiveness of adaptation observed in the study area we need a theoretical frame to understand what the important aspects of vulnerability are, and what makes some individuals and groups decrease their vulnerability more actively than others, i.e. adapt more effectively? When we write about adaptation it refers to a process where vulnerability is decreased (please refer below for a definition on vulnerability). The theoretical choices for this thesis further build on three framing pre-understandings.

First one is that we approach adaptation as *a social phenomenon* in *a social-ecological context*. Consequently the focus is on structures and actors and how they influence and change their relation with nature and each other. We delimit the analysis from the human-nature relation that has to do with mitigation. When this is said, many adaptation measures can at the same time be categorized as mitigation, because an important part of adaptation is to sustain the eco-systems on which people depend. An example of an adaptation measure found in the study area, which can also be considered as climate mitigation, is planting of trees for soil-protection on riverbanks.

The second pre-understanding that frames our theoretical choices is that we analyse adaptation from the perspective that it is *a strategy for development*. This means, that the aim of the adaptive measures is not to get back to equilibrium or status quo after a shock or long term trend of change, but about transformation to what is considered to be a better situation or an improved and more sustainable living condition (Ensor, 2011, Jones et al., 2011). Many of the development approaches that have been practiced from long before the climate adaptation agenda emerged can be considered as generating adaptation. Examples are income generation or income diversification strategies, education, right-based approaches, advocacy, social mobilization, empowerment and disaster risk reduction strategies (Care Int. and IISD, 2010). The important difference is that adaptation is not only about meeting and 'absorbing' current problems, but about building capacity to meet new challenges characterised by uncertainty, continuously (Ensor, 2011).

The third aspect that frames this study is the focus on *strategic adaptation*[40]. In our understanding strategic adaptation is adaptation with an aim driven or kick-started by strategic interventions, which is contrary to autonomic adaptation (modified from Jones et. al., 2011). It presupposes that either local citizens or external stakeholders as NGO's or government

[40] For definition of adaptation see paragraph 1.2.2.

institutions are aware of environmental changes and current as well as potential future impacts. The awareness can be intellectual or based on experience, but the common feature is, that actors expect changes and want to actively prepare for or prevent impacts from these.

2.1.1. Structures and actors - how different point of views supplement our approach

We have found useful descriptions and definitions of vulnerability by Blaikie, Wisner, Cannon and Davi in their book *'At Risk - Natural Hazards, people's vulnerability and disasters'* (Blaikie et al., 2003[41]) where they argue that social, economic and political structures, what they define as root-causes, are as important in order to understand vulnerability, as is the actual exposure to a natural hazard or change in environment. Blaikie et al. are not alone in pointing out how political and socio-economic structures constitute some of the important societal aspects of vulnerability (Adger, 1999; O'Brian et al., 2004; Brooks, 2003; Blaikie et al., 2003, Schipper, 2007). Thus, the structural root-causes are central as to understand why some households adapt more effectively than others even though provided the same strategic measures for adaptation (Blaikie et al., 2003). We find that Blaikie et al. provides an important understanding of the political and socio-economic structures that lie behind a certain level of vulnerability. Blaikie et al. do also acknowledge that vulnerable people should not be viewed as passive recipients, as they are capable of changing their lives. By the use of their capacity people can resist, avoid or adapt to the processes that makes them vulnerable (Blaikie et al., 2003). However, this is how far Blaikie et al. go in describing the ability to shape change possessed by the actor.

In order to analyse and understand the findings from Beldanda and Bharlang, we needed a theoretical perspective that could supplement the structuralistic arguments from Blaikie et al. This, we have found in Ensor's theoretical writings on adaptation integrated with development in his book '*Uncertain Futures - Adapting Development to a Changing Climate*' (2011). Ensor is in line with Blaikie et al. in the sense that he underlines power and inequality as important aspects for adaptation, but where Blaikie et al. elaborates how people are limited by different political, socio-economic and environmental factors, Ensor writes more on how to raise people's ability to create change in their life and actively meet climate challenges up-front via adaptive capacity. His eligibility lies within his focus on how actors relate to accelerating rates of uncertain change as the condition for their agency.

Structural root-causes and adaptive capacity are both societal aspects of what constitutes an actor's vulnerability, but where the structural root-causes can be perceived as a limiting factor for wellbeing, adaptive capacity is about how people do actively protect or increase their wellbeing or whether they hold the ability to do so, when their situation changes. The two theoretical angles on vulnerability also entail a difference in the scale they focus on. Where

[41] First ed. 1993.

respectively Blaikie et al. have their focus mainly on macro and meso level underlying causes in vulnerability, Ensor elaborates on the micro level, and which specific relations and actions to address in the local context (Blaikie et al., 2003 ; Ensor, 2011).

2.1.2. Vulnerability - an expression of combined societal and environmental factors

Adaptation is the actions of decreasing vulnerability, and therefore we need to understand the different aspects which constitute vulnerability, in order to be able to analyse effectiveness of adaptation.

In the way we interpret it, vulnerability is a complex concept entailing different societal and environmental aspects.
One of the aspects that create vulnerability is the exposure to environmental hazards and slow, unfolding changes (Blaikie et. al. 2003 ; Ensor, 2011), but when dealing with social adaptation it is important to understand how vulnerability is also a socially constructed state (Abramowitz et al., 2002; Adger and Kelly, 1999; Blaikie et al. 2003 ; Jones et al., 2011). Besides being influenced by exposure and societal structural conditions, vulnerability is constituted by the physical, natural, financial, human and social resources available to the actor in the specific context, and by his or hers ability, in form of adaptive capacity, to create change by the use of these resources (Ensor, 2011; O'Brien et. al., 2004; Adger, 2006; Blaikie et al.; 2003). Consequently, in this thesis, vulnerability is a concept combined by the aspects of environmental exposure, political and socio-economic structures, the resources available, the adaptive capacity possessed by the actor, and the absorbing capacity within current living conditions.

Furthermore, vulnerability is a dynamic dimension because the aspects that constitute it are dynamic themselves, i.e. climate and weather changes over time, as do political and social situations, accessibility of resources and ability to create change (O'Brien et al., 2004; Adger, 2006; Ensor, 2011).

We have, consequently, chosen to use the following definition of vulnerability from Blaikie et al. throughout this thesis. Vulnerability is:

> *"The characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process). It involves a combination of factors that determine the degree to which someone's life, livelihood, property and other assets are put at risk..."*
> (Blaikie et al., 2003: 11)

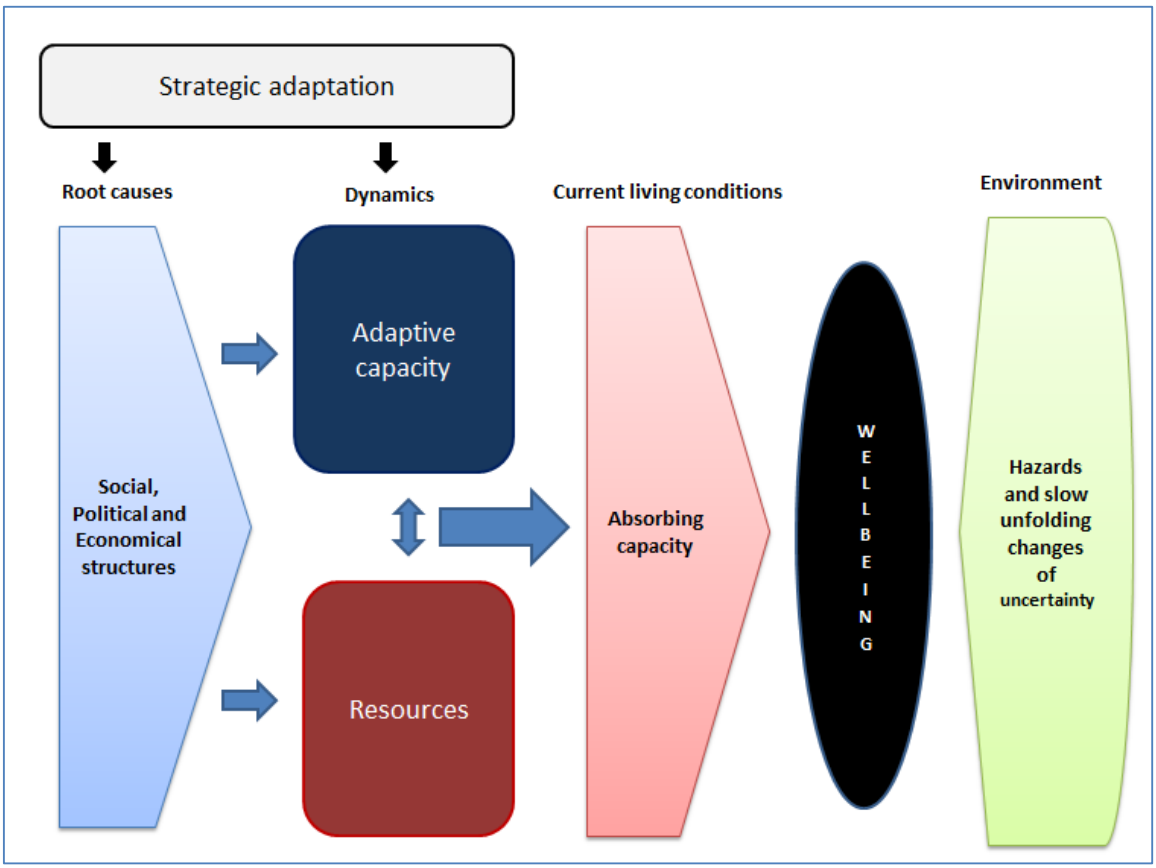
In this definition capacity to change is recognized as a central factor, but as mentioned, we find that Ensor has a better theoretical strength to describe this, thus adaptive capacity will be discussed in a separate paragraph below.
The exposure part of vulnerability to climate change means that the uncertain long term trends are as important as the extreme natural events. Environmental exposures on the one side, and societal conditions on the other side, are both adding pressure to the state of vulnerability, but not necessarily with the same weight.

Because vulnerability is a dynamic dimension, people can be more or less vulnerable. Therefore we examine vulnerability and change herein as a relative phenomenon internally in our study area of Beldanda and Bharlang. It means those citizens who are the least vulnerable internal in the study area, can still be very vulnerable to climate and natural resource changes compared to a middleclass Nepali living in Kathmandu, or to a Dane.

2.1.3. A theoretical model to capture all aspects of vulnerability

With inspiration from both the structuralist and the actor focused theoretical angles on vulnerability and adaptation, we have developed our own theoretical model, which we call the vulnerability model. The aim is to be able to make analytical use of a model, which can capture all the five above mentioned aspects of what constitutes vulnerability.
Below is a pure theoretical presentation of the whole model. Thereafter the individual parts of it will be elaborated, as we go through a description of the societal aspects that constitute vulnerability. After identifying the theoretical aspects of vulnerability, we use the vulnerability model further as a methodological tool that guides the analysis of findings from Bharlang and Beldanda. The model will thus be presented several times during the thesis. As the different aspects are presented, the part of the model, which is in focus, is accentuated with colour and the parts, which are not dealt with in that paragraph has been secluded with grey.

Figure 1: The vulnerability model



(Own model with inspiration from the design of Blaikie et al.s' Pressure and Release Model (2003: 51))

How to interpret Figure 1: The vulnerability model: The vulnerability model shows how the political and socio-economic root-causes (the turquoise box), the five types of resources (the red-box), the possessed adaptive capacity (the blue box), the absorbing capacity within current living conditions (the pink box) and the environmental exposure (the green box) do all constitute vulnerability. How these five aspects interrelates in a given time and space constitutes *the degree of vulnerability*, and this can be measured in wellbeing, but can also be perceived as the theoretical *potential or likeliness of being able to adapt* to what will happen in the future. In this way, the model can respectively show two things. The model can on the one side show how a given degree of vulnerability is a combination of a range of factors. It can also show the potential for adaptation, in form of the combined capacity (will and ability to change) and the opportunity to mobilise resources. Both of these two aspects are being fully or partly shaped by time, space and political, cultural and socio-economic structures.

The absorbing capacity in the current living conditions, e.g. the food-*security*, *quality* of houses or *healthiness* of the ecosystems, is important as to how well environmental change (i.e. hazards or slow-unfolding events) can be *absorbed* in a given correlation with hazards or change, without turning into decreased wellbeing or disasters (Ensor, 2011). However, the dynamics, i.e. the access to resources and the adaptive capacity possessed, are what make the actor able to *adapt*, either proactively or reactively, to whatever change may occur. The *absorbing capacity* is thus time specific, and can be interpreted as the result of historic adaptation, and the dynamics reflect the *potential* to prevent or prepare, i.e. increase the absorbing capacity to future shocks and changes.

This is the societal side of vulnerability, but the pressure from the green box, the environmental exposure, can be more or less, and is thus also an important aspect of vulnerability.

Strategic adaptation approaches can support respectively the resource base, the capacity to act and change, and it can target the structural root-causes. The pressure which is expressed in wellbeing can likewise be strategically reduced by addressing the climatic factors visualized in the right, green box. This is mitigation and will not be a focus for this thesis.

How the terms resources and structures are used

We use the term resources to cover the five resource types defined under the Sustainable Livelihood Framework, i.e. physical, natural, financial, social and human resources (DFID, 1999). Throughout the analysis, we will however often define them as either tangible resources (i.e. physical, natural and financial) and intangible resources (human and social). This is done in order to be able to structure the analysis of findings and address the critique, which we referred to in chapter 1, that community-based adaptation approaches are too focused on 'hardware' solutions.

The difference in for example economic structures and financial resources (this could also be social structure vs. social resources), as it is used in this study, is, that the economic structures are shaped in forums and networks of power which are often distant from the individual, and the availability of financial resources is directly related to the individuals economic situation, e.g. income and expenditures, although we acknowledge the latter to be influenced by structures.

2.1.4. The links between root-causes, dynamics and current living conditions

The left side in the vulnerability model, shows the relation between root-causes, dynamics and current living conditions. In defining this correlation, we have been inspired by the way Blaikie et al. introduces three sets of progressing links on the societal aspects of vulnerability:

i) Root-causes,
ii) Dynamic Pressures and
iii) Unsafe Conditions.

These connect the hazards behind a disaster to the social processes and are expressed in wellbeing (Blaikie et al., 2003). We have chosen to redefine 'dynamic pressures' into '*dynamics*' and likewise 'unsafe conditions' into *'current living conditions'*. By doing so the vulnerability model becomes flexible so as to express a positive as well as a negative change in the current living conditions. A condition which seems safe, and capable of absorbing change in the current situation, can potentially be unsafe in the future due to the uncertain character of impacts from climate change. This is why we prefer the term 'current living condition'. The term 'dynamics' include changes based on use of possessed capacity and available resources in order to decrease vulnerability. We do not use the term pressure in relation to dynamics because the dynamics have as much potential to release pressure, i.e. decrease vulnerability, as to increase it.

The links between root-causes via dynamics into current living conditions will be elaborated hereunder, but it is important to underline, that it is not solely cause and effect processes, which create the societal aspects of vulnerability. The longer backwards in the chain of explanation we go, the more difficult it becomes to show reliable evidence for causal connections. There are many ways dynamics translate the root-causes into specific time and space bound conditions, which converge with environmental change (Blaikie et al., 2003).

Root-causes

The characteristic of structural root-causes is, that they are shaped and arise distant from the individual. Spatially distant in the sense that they arise in political and economically powerful centres. Temporally distant in the sense that they are bound in history, and third, they are distant in the sense that they can become 'hidden' or taken for granted because they are rooted in cultural beliefs and social relations (Blaikie et a., 2003). An example of the latter expression of a root-cause is when cultural structures restrict the issues that people think they can make decisions over and change (Ensor, 2011).

As mentioned, the important root-causes that impact vulnerability lies within political, social, cultural and economic structures and processes because these effect the distribution of

resources in a given society, and they often steer the political awareness to needs within some specific groups (Blaikie et al., 2003).

Dynamics

While the root-causes are spatial and temporally distant from the individual, dynamics are the processes that 'translate' the root-causes into the specific current living condition. The dynamics can increase or decrease vulnerability depending on their character, the situation and the way they are taken into use. Therefore the research of these processes must be local and historically specific (Blaikie et al., 2003). The resource base can increase without the actor's use of adaptive capacity, and the adaptive capacity can likewise increase without a change in availability of resources (please refer below for an elaboration of adaptive capacity). The relation between the two concepts is that adaptive capacity and access to resources are only theoretical potentials for decreased vulnerability until they are put into use in actions that result in changed living conditions. An example is knowledge-sharing which is considered an important factor in adaptive capacity (Ensor, 2011). If you are actively sharing knowledge in many networks and at different scales you have a higher potential to be able to handle change, but your current living conditions has not become better to meet and absorb change before you put that knowledge into practical use. You will not survive only by knowing how to change crops, you have to implement that knowledge if your traditional crops do no longer provide a sufficient yield due to climate change. This relation is illustrated by the double arrow between the two categories of dynamics, and the arrow pointing towards current living conditions within the vulnerability model.

Some actors can have high adaptive capacity and little available resources and vice versa. This relative distribution is partly determined by root-causes. Beside this, we have to remember, that a certain current living condition can also change when the environment changes (represented by the impact from the green box in the vulnerability model). The vulnerability of a household will for example decrease if the weather conditions leads to an exceptionally good harvest, and this is not a reflection of the dynamics in the vulnerability model.

Current living conditions

The quality of the current living condition is the aspect of vulnerability which defines how well change can be absorbed without decrease in wellbeing. Ensor defines this, by the ability to absorb shocks or ride out changes (Ensor, 2011: 6). The absorbing capacity is an important indicator of vulnerability, but the ability to absorb change can be more or less sufficient as to preserve wellbeing or avoid disaster. As mentioned above, the dynamics have to be activated before actual adaptation happens. This is needed when the absorbing capacity is no longer expected or experienced as able to match for example the degree of climate change impacts.

Where Blaikie et.al use the concept 'unsafe conditions' we use the term 'current living condition' to define the time-specific absorbing capacity. However, the quote below is a good expression for the concept:

> *"Unsafe conditions are the specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard.*"
> (Blaikie et al., 2003: 55).

The current living condition includes for example the location of people's houses, their individual food-security, their health and the quality of the eco-systems they extract services from. Blaikie et al. also mentions intangible resources like networks for support such as membership of saving and loan groups, or the knowledge and skills the households possesses (Blaikie et al., 2003). We see the latter more as potentials for adaptation, i.e. expressions of social and human capitals, because for example knowledge and skills need to come into use before it manifests in decreased vulnerability, as argued in the paragraph above.

As described, we found Blaikie et al. to be too structuralistic as to capture the adaptive potentials related to the specific actor. This is why we give adaptive capacity a special focus in the paragraph below.

2.1.5. Adaptive capacity - emphasizing the role of the actor

Ensor stresses that vulnerability reduction should be a part of adaptation to climate change, but strengthening adaptive capacity is in his perspective the key-factor, because it makes people better to meet challenges up-front. We differ from Ensor by considering adaptive capacity as a *precondition* for decreased vulnerability, and thus, not as an aspect separate to the complex vulnerability concept.
Adaptive capacity is what makes people able to engage with all viable future options, and this could both be by a modification or a transformation of the current livelihood (Ensor 2011).

As previously shown in the vulnerability model, adaptive capacity is needed to actively change your current living conditions, and we have previously defined it as the ability possessed by the actor to actively decrease his or her vulnerability.

In reality households do often not intent to use their adaptive capacity specifically to decrease their vulnerability to environmental change, but rather to increase their income or create development in general.

As the building of adaptive capacity is an ongoing process, it does not refer to a specific outcome. Ensor's point is, that if strategically implementing adaptive measures with one specific

objective, there is a risk of creating lock-in situations and also a risk of missing the importance of creating conditions for flexibility within social-environmental contexts where climate change are expected to bring new, still unknown impacts. Several experts and practitioners therefore points to the potentials within social learning as an open approach to build adaptive capacity (Ensor 2011, Care 2012, Østergaard 2012). To promote social learning practitioners seek to facilitate conditions, forums or relations that will lead to an increased continuous knowledge-sharing and development of new techniques and solutions to meet current and future challenges. The point is to encourage local agents so they themselves, with their available tangible and intangible resources, and their will to change, become the drivers for adaptation. Social learning is therefore closely connected to adaptive capacity, and will in this study be used to measure adaptive capacity, even though we recognise that it is a theoretical potential and therefore is hard to capture (Ensor, 2011; Care, 2012; Jones, 2011a)

The three enabling aspects of social learning are:

i) *Power-sharing,*
ii) *Access to new information and knowledge-sharing,*
iii) *Experimentation and testing* (Ensor, 2011; ACCRA, n.d.).

These three conceptual categories are used in our analysis as explanatory factors for inequality of effectiveness in adaptation, and therefore we will elaborate on their theoretical implications in the paragraphs below.

Power-sharing

In the theoretical framework by Ensor, power-sharing between different actors at different scales is the most essential issue for a process of building adaptive capacity. In the second section of chapter 1 we have already established the notion, that adaptation is not politically neutral and that there is a risk of reproducing existing inequalities while implementing strategic adaptation.

In adaptation power is reflected not only in *what* is decided, but also in *who* decides what measures should be taken and how resources shall be distributed. Ensor therefore underlines, that analysing how power dynamics play out in different contexts needs to be recognized as a task in its own way, when creating strategic adaptation (Ensor, 2011). He refers to Borrini-Feyerabend et al. (2007) who have identified different types of power[42] that shape

[42]Examples they put forward are: Power of position (having authority, being in a position to make or influence decisions); Power of knowledge (having information unavailable to others); Personal power (being personally forceful, persuasive); Group power (being a member of an ethnic, religious or other type of group that has a dominant social position.);Economic power (commanding financial or other economic resources in overwhelming amounts with respect to the resources of others);Political power (having a powerful supportive constitu-

how individuals and groups have ability to influence the management and utilization of natural resources. We think that the important thing to note is that power in the sense of being in a privileged situation of influence is important to keep in mind, it does not necessarily need to be power used as an oppressing factor.

Ensor speaks about power in a slightly different way than Blaikie et al. do, by not only focusing on how people are bound in structures, but rather emphasising how they can reorganise in new relations. Relations are a social resource, but at the same time they can also give access to the power that makes a household or individual able to get access to the flows of other resources and to be able to extract benefits from these. Ensor uses the definition power-*sharing* as a way to get around the notion that power is 'owned' by some actors and that a conflict is necessary to change inequality. He rather emphasis how power occur in relations and how these relations can be shaped and reshaped as to expand the range of opportunities for marginalized and poor groups. One of his main points is that time needs to be invested in building trust between local actors and having them to identify shared challenges. From there only, they should expand the relations to stakeholders external to the community (Ensor, 2011).
Ensor's way of addressing power has strengths, e.g. to expand the relations in which useful information are provided and knowledge shared, or to distribute power in matters where interests are overlapping, this may be of all actors interest. At the same time Ensor also acknowledges the difficulties in power-sharing processes, especially for those holding privileges in the current structure (Ibid.). However, we find, that Ensor forget some of the more 'hidden' and distant aspects of power, e.g. the invisible, historically grounded cultural habits of marginalization which Blaikie et al. highlights.
An important issue is the power of and legal relations to the authorities. It is important whether the citizens can get their adaptive needs reflected in the public budgets. Allowing adaptive capacity to unfold is not about creating one specific governance model, the central point is to change power-relations which blocks possibilities of change (Ensor, 2011). This is not necessarily an easy task, but Ensor argues, and it is also in line with Blaikie et al, that if attention is not put on power-sharing, '*most adaptation does not necessarily reduce the vulnerability of those most at risk'* (Ensor, 2011: 37).

Ensor sees power-sharing as a precondition for both information and knowledge-sharing, and for experimentation and testing, which are the two other vital aspects of what enhances adaptive capacity.

---

ency or access to political leadership); (by Borrini-Feyeraben, referred to in Ensor, 2011: 38). These have been used as pre-understandings when we identified power dynamics in the case.

Information and knowledge-sharing

Ensor distinguishes between knowledge and information, where knowledge is what makes information useful. According to him, communities must seek to increase their input of external information and expand their knowledge base in order to understand the challenges of an uncertain (climate) future, and to develop responses to these changes. Bridging together actors with different knowledge and views is at the core of adaptation, and he sees adaptation to climate change as a development arena that needs input from scientists to supplement indigenous knowledge (Ensor, 2011).

One should not be blind to the aspect that power is a part of knowledge production, knowledge-sharing and of access to information. It influences on who participates, who talks, who gains privileges (Ensor 2011), and we could add, who defines the priorities in adaptation actions?

When we were gathering data in Nepal, we had a specific focus on formal and informal knowledge-sharing, and in the analysis we will explore how these practices are linked to vulnerability and especially the adaptive capacity part of it.

Experimentation and testing

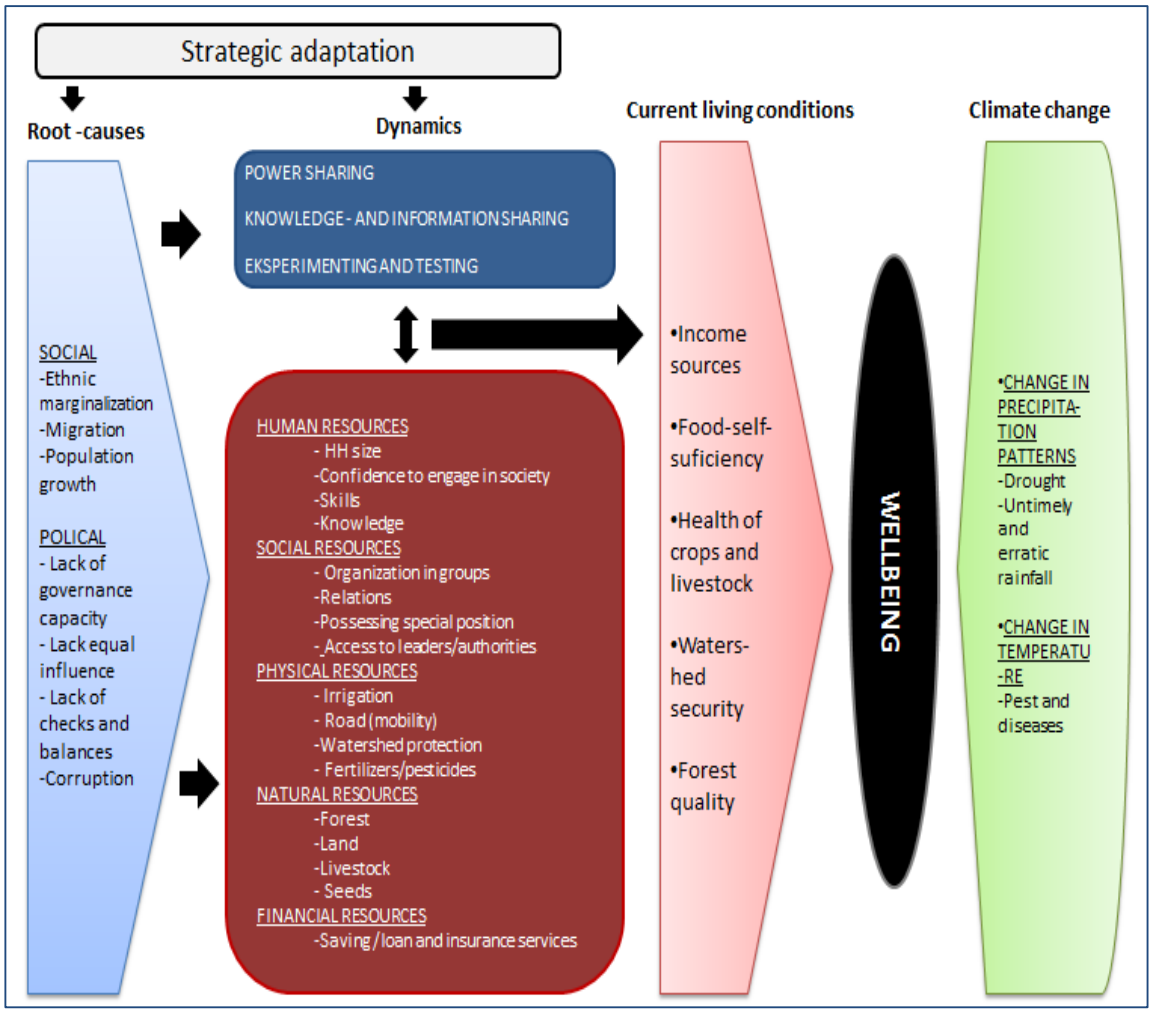
Innovative practice is an important element in adaptive capacity (Care 2012 ; Jones et. al., 2011 ; Ensor, 2011), because it is what transfers the potential within the dynamics, i.e. available resource base and adaptive capacity into a changed current condition. Only by an active act of change, the time- and space specific absorbing capacity can be expected to potentially increase. Ensor also emphasise the activities of experimentation and testing, because they are important to make systems flexible rather than rigid in the face of uncertain changes. He highlights *technical capacity* which is the ability to make informed decisions over alternative technologies, and *technical choice* which is the skills and knowledge that individuals possess to engage in experimentation. Both of these can be enhanced through the building of new relations (power-sharing) and sharing of knowledge and information (Ensor, 2011). Ensor does not mention, that of course the relevant tangible resources, for example in form of infrastructure and technologies, should also be available before change can manifest.

Ensor argues that while promoting experimentation and testing, it will be fruitful to start working with progressive community members willing to take risks because others will replicate and learn from their knowledge and experiences (Ensor, 2011). But then one can ask, whether such an approach too easily excludes the poorest and most vulnerable? Here Ensor points to a study showing, that there is no relation between the wealth of a farmer and his/her willingness to obtain new management practices (Ibid.). This is not the case in Beldanda and Bharlang, as will be discussed in the analysis.

2.1.6. Operationalisation of the theoretical frame for analytical use

Ensor claims that it does not make sense to define a universal set of factors which can be used to create or measure adaptation. The context is of great importance, so an investigator must identify key-factors from his or her knowledge about the specific context in order to investigate or plan for adaptation in that area (Ensor, 2011). With this in mind, and because the theoretical concepts are rather abstract, we have concretized a set of factors representing the theoretical concepts but with specific relevance to the case of Bharlang and Beldanda. These are shown in figure 2 below, and they do also guide the analysis of findings in chapter 4.

Figure 2: Contextual model for vulnerability among investigated households



(Our own model)

How to interpret figure 2: The vulnerability model specified for use in the case of Bhalang and Beldanda is also the methodological tool that has guided our analysis of findings. The factors in each box derive from our qualitative based insight and knowledge on what constitutes vulnerability for households in Bharlang and Beldanda, and on the actions for adaptation in their farming practices. The analysis will be guided by operationalisation of the model in the following way:
First we analyse the specific root-causes (listed in the turquoise box) and impacts from climate change which is identified in the study area (listed in the green box). Then we identify features of inequality of absorbing capacity within the current living conditions (the pink box) of the households in the case. We have isolated one specific factor, which is a strong example to exemplify how some households have adapted in their farming, and thus increased their absorbing capacity more effectively than others. This is the expression of who have actively experimented, tested and implemented new practices in their farms during the last decade and who have not. Explanatory factors for this difference in adaptation is found by analysing respectively the importance of available resources, and the importance of adaptive capacity processes of power-sharing and knowledge-sharing (the red and the blue boxes). Some explanations are then tracked back to the structural root-causes.
The findings and analysis on the inequality of effectiveness of adaptation is found in chapter 4.

3. Chapter

METHODOLOGY AND DELIMITATIONS

3.1. Methodology

This chapter starts with an explanation of our thesis process, thereafter we present the most important methodological choices, and finally we will present choices of delimitations.

The thesis process

We initiated the thesis-work with a hypothesis that the strategy community-based climate adaptation followed western rationales that was not necessarily consistent with rationales among rural, Nepali communities. We thought that such a difference in rationales could be a main barrier for successful strategic adaptation. Thus, we wanted to make field-studies in a society where strategic, local climate adaptation had been implemented, but it showed to be difficult for us to establish contact to organisations which had terminated their implementation of community-based adaptation projects. We got in contact with several NGO's who had projects running, but ended up choosing Practical Actions' community-based adaptation project in Kabilash VDC, which was terminated in 2007. We have thus worked together with Practical Action and used their office facilities in Bharatpur as a base for our field work.

Before reaching the study area we tried to find out if other projects had been implemented in the study area, but without luck, so when we later found out that several other NGO's had been working in the study area using different strategies, we had to reshape our focus. This, combined with the inequality we found in the two villages, is why we have changed our focus to investigate the reasons behind the inequality in the effectiveness of adaptation.

Our field work in Kabilash VDC was carried out in about one month. The following three weeks was spent on expert and key-informant interviews in Kathmandu and with arranging the transcribing process. We used three Nepali interpreters for our field work and together with three other Nepalis they have transcribed the interviews and translated them to English[43].

Empirics

The empirical foundation for the case-analysis within this thesis is primarily based on 56 different interviews which have been supported by observations, all carried out by the authors[44].

[43] We chose to have the Nepali sentences transcribed rather than the interpreted ones, this was in order to capture details, which missed the translation in the interview situation.

[44] With support in form of interpretation and logistics by Reshu Bashyal, Subita Pradhan and Guarav Lamichhane.

We have conducted 43 interviews with local households in Kabilash VDC, but due to different reasons we have only made use of 37 in the final analysis[45]. Beside the local residents, we interviewed two government officials from relevant District Development Council offices in Chitwan and the secretary and his assistant of Kabilash VDC. We interviewed representatives from each of the NGO's which have been working in the study area, and three interviews was conducted with local residents who are considered key-informants due to their extensive knowledge about local development processes and living conditions. Besides interviews with these actors, who all are stakeholders connected to the area of Kabilash VDC, we have interviewed four experts on climate change adaptation in Copenhagen and three in Kathmandu. Only one of the experts had connection to the study area. (See appendix 2 for a detailed list over respondents.)

Table 1: Number and types of interviews

Type of respondents	No.	Interview techniques	Gained knowledge about:
Residents of Bharlang and Beldanda (each representing a local household)	37	Semi-structured	Study area, resource basis, relations, adaptive capacity and adaptation actions
Experts	7	Open explorative	Strategic climate change adaptation and development
District Development Council and Village Development Council authorities (key-informants)	4	Semi-structured	Study area, district and local governance and policies
NGO representatives (key-informants)	5	Open explorative and Semi-structured	Study area, NGO activities and experiences
Local key-informants	3	Open explorative and Semi-structured	Study area, relations, NGO activities

We have found the amount, the quality and the details of the above sum of interviews sufficient as to compose a non-biased, comprehensive and solid empirical basis for the case-analysis. Only few case details have been added by secondary data from reports[46].

3.1.1. Arguments for the chosen methodology

In this paragraph we will explain the most important methodological choices we have made.

[45] Some interviews was sorted out because the respondents did not live in either Bharlang or Beldanda and others, because they had recently moved to the area.
[46] I.e. Makey, 2013 and Rimal, 2011.

Case study

We have chosen to gather empirical data via a qualitative case study because we wanted to get detailed data on resources, positions, rationales and reflections from people who had been targeted by strategic adaptation. Adaptation planning relies on understanding what climate change means in a specific context (Ensor, 2011), and we found it relevant to also get in depth with a specific case situation in order to understand implications within adaptation. Only by having access to and knowledge about adequate in-depth data on the local resources, dynamics and processes of change, we could be able to identify reasonable explanations about inequalities in the effectiveness of adaptation among the investigated households. To get such types of data, we decided to make semi-structured interviews with a heterogeneous selection of residents and to supplement with information from key-informants who were all, or had been, stakeholders in the area.

Focus on households

We chose to focus primarily on households instead of village-, community or individuals. From key-informant and local residents we understood that, regarding adaptation and livelihood activities, people acted as a household entity rather than as individuals or villagers. There is however a relevant uncertainty connected to the choice of having a household focus. When interviewing the local respondents, we did not always gather a group of household members, but interviewed one person only, and we always had one main respondent who was then sometimes supplemented. There are of course differences between members from the same household regarding their knowledge and awareness, how they engage in the society and so forth. To minimize the risk of being too biased in situations with only one respondent, we have tried to steer the interview in a way that gave us information on the household's general conditions and relations. With regards to some of the questions it was however harder for one respondent to answer on behalf of the household as such. This could be when asked about issues of confidence to raise voice and engage in the local society, whereas for example membership of groups is a more factual matter.

Distribution of local respondents

When we planned how to choose respondents, we wanted an equal distribution between gender and ethnicity. Regarding gender we found out that the important inequalities in effectiveness of adaptation was between households instead of internally within the households, as described above, and key-informants also told us that gender inequalities was not particular widespread which we could confirm when talking about adaptation issues. Another reason why we did not carry out an equal gender distribution among respondents was that we could not practically arrange who was at home when we made our visits. Most often we spoke to the household members who was at home when we came by, and in some cases we made appointments to come back in order to meet the right respondents.

We have interviewed all the households except two that we could not encounter in Beldanda, all of them belonging to the ethnic group called Chepang, and in Bharlang we prioritised to get to talk to a mixed distribution of households with different ethnicities (the ethnic distribution of respondents will be elaborated in the paragraph 4.1.).
The interviews with household members were of 45 minutes to two hours.

Semi-structured qualitative interviews
In order to be able to combine a use of the theoretical concepts, which we had operationalized into practical factors, and at the same time keep space for empirically based contextual factors of importance, we found a semi-structured interviewing method to be most useful. We asked about specific conditions and relations as if they had received training in vegetable production or whether they shared knowledge and problems whit others. At the same time we made room for the respondent's explanations about their society and personal conditions and relations, which gave us an understanding of the specific area and knowledge about each household's change in access to resources, and just as important, the processes each households engaged in where adaptive capacity could be build. The choice of using semi-structured interviews often turned out to be valuable to clear up misunderstandings because we throughout the interview touched on the same themes several times.

Data processing
As mentioned, we had all interviews transcribed by Nepalis who could capture as many details as possible and translate them into English, but we have used extensive resources to make sure that the quality of the transcriptions was high. When all relevant interviews were transcribed, we used the software programme for qualitative data-processing, Nvivo, to structure the extensive amount of data. With a starting point in the theoretical concepts we made categories and extended and reshaped the number of categories, as we found new relevant comments in the interviews that did not fit in the existing categories. We have categorised all the interviews. By looking at these categories we identified some parameters we could easily count, for example which households have taken training and what type of training they have taken. We also combined different statements from respondents to outline more complex parameters in order to measure trends, for example whether a respondent had confidence to raise voice and participate in the society which are matters analysed on a combination of different expressions. In our analysis we have combined the trends which we identified via the use of Nvivo with qualitative statements and observations.

3.1.2. Delimitations

In this paragraph we will present relevant delimitations. Other delimitations are presented when relevant for the interpretation.

Predictions of future climate change in Kabilash VDC

Although we acknowledge that predictions on future climate change in the study area is indeed important for local adaptation, we do not include such predictions in our investigation because the model generated data available is insufficient to describe climate change at regional and local levels in Nepal (Paudel, 2011). The predictions from the SRES B scenario model, which we refer to in chapter 1, only describe trends for the Indian subcontinent and the Tibetan plateau which is too large an area to make reliable predictions for Kabilash VDC. Instead we refer to historical methodological statistics from a methodological station relatively near to the study area to describe the climatic trends of change until now (Maskey, 2013). Sometimes historical statistics are used to extrapolate future climate change, but they do not take the acceleration and thresholds of climate change into account. We are thus focusing on adaptation to historic and current change. Therefore we can only treat the factors of adaptive capacity within each household as something which have been used as to shape the current vulnerability level, and as a theoretical potential to meet future, uncertain change and hazards.

Economic and ecological sustainability

We delimit from carrying out an economic and ecological sustainability analysis of the adaptation initiatives that will be dealt with in the analysis of the case. A range of economic conditions are relevant to investigate to assure that adaptation initiatives, like facilitation of a new income source, would be an economical sustainable solution. Also a number of ecological implications connected to adaptation initiatives would be important to understand, as to assure that the local environment will not be degraded by undertaken adaptation measures. Our impression is, however, that most of the strategic interventions in the area have had ecological sustainability concerns in mind, e.g. in the change of forest management practice, in soil- and watershed protection management and in teachings on how to make organic pesticides and fertilizers. However, we did not have the adequate skills to measure the soil-quality, forest density, biodiversity and the like.

4. Chapter

ANALYSIS OF FINDINGS FROM BHARLANG AND BELDANDA

Chapter four contains four analytical sections.
In the first section we provide information about certain characteristics of the study area, including the local climatic variability and change. This section is also a presentation of important root-causes.
In the second section we present factors, which we estimate as relevant in investigating the absorbing capacity within the household's current living conditions and thereafter a household ranking based on current living conditions is presented. From there we have identified one factor which is suitable to explain the difference in effectiveness of adaptation among the household sample.
In the third section we investigate whether inequality in access to and control over tangible resources can explain the inequality in effectiveness of adaptation presented in section 4.2.
The fourth and last analytical section is an analysis of the explanatory strength within differences in human and social capitals along with processes of power-, and knowledge-sharing.

4.1 First analytical section

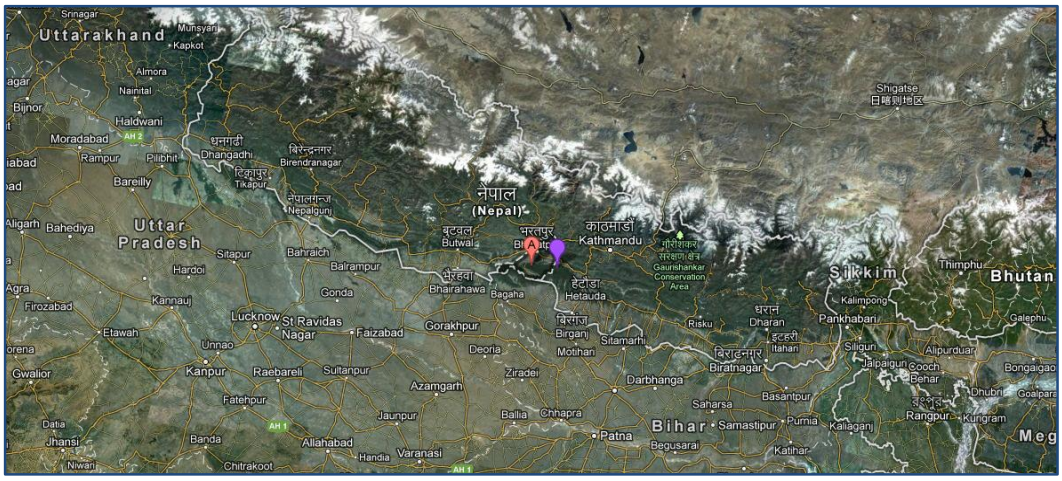
Characteristics of the study area and root-causes

The first analytical step is, to understand relevant factors that impact on the current living conditions in the villages of Bharlang and Beldanda, Kabilash VDC, Nepal. This first part of the analysis will provide information about certain characteristics of the study area, which is needed to understand the subsequent analytic paragraphs. We will shortly present information about demographical and geographical characteristics, as well as information about climate change in the area. Further we will present important root-causes, i.e. the political structures and ethnic marginalisation, which can influence climate change adaptation in the area.

4.1.1 Demographical and geographical characteristics of the study area

The area we have investigated is the two neighbouring villages Bharlang and Beldanda, which are situated in Kabilash VDC, in Chitwan district, in the central-southern part of Nepal bordering India (please refer to Figure 3: Map 1 - Chitwan District in Nepal).

Figure 3: Map 1 - Chitwan District in Nepal



(Source: Google Maps.)

People living in Bharlang and Beldanda do have relatively good access to markets, as Jugedi, which is the main village of Kabilash VDC, is located next to one of the few central tarmac roads of Nepal, connecting Bharatpur, the capital of Chitwan, with Kathmandu. Bharatpur can be reached from Jugedi within 30 minutes by car (please refer to Figure 4: Map 2 - Kabilash VDC with Bharlang, Beldana and Jugedi). Both Bharlang and Beldanda are situated near gravel roads, which connect the villages to Jugedi.

Figure 4: Map 2 - Kabilash VDC with Bharlang, Beldana and Jugedi

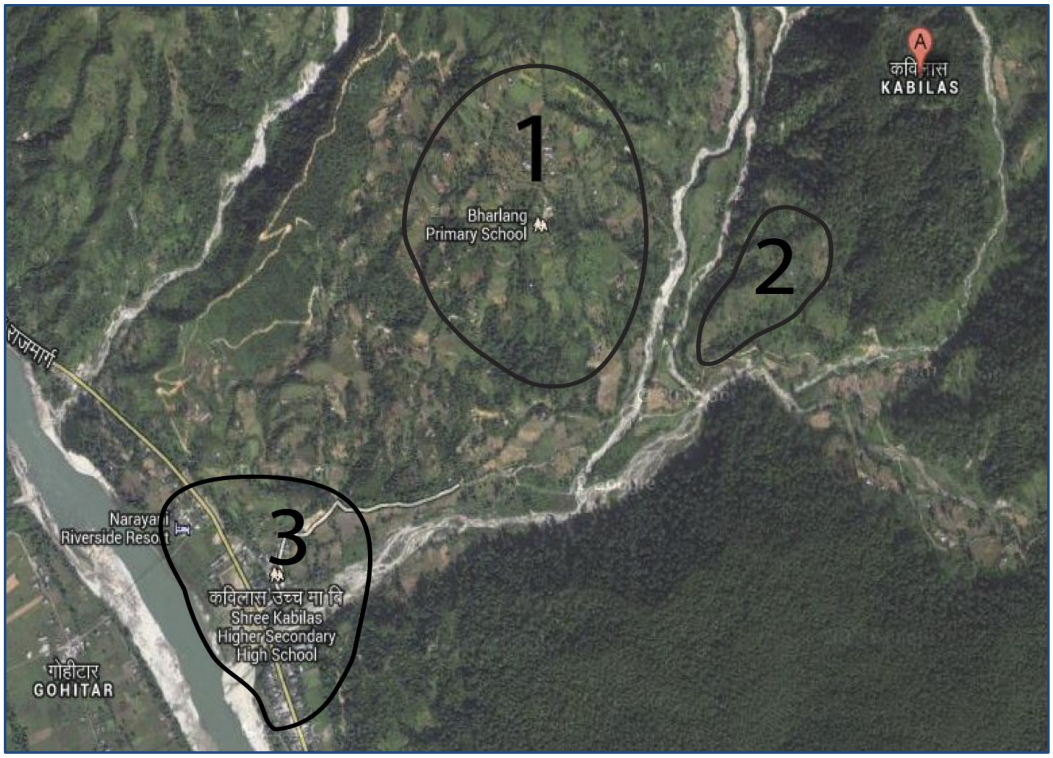
(Source: Google Maps. We have made drawings on the map.)

Explanation of Map 2:
1: Bharlang ; 2: Beldanda ; 3: Jugedi, the main village in the VDC with VDC office, market, school etc.)

Demographics

Kabilash VDC has a population of 5815 residents distributed on 1164 households (National Planning Commission Secretariat, 2012). In 2005 Beldanda had 14 households and Bharlang about 70 households (Ganesh, 2005). Both villages are located on hillsides in direct view of each other only separated by two rivers (which are easy to cross most of the year) and a tiny piece of land (please refer to Figure 5: Map 3 - Bhalang, Beldana and Jugedi).

Figure 5: Map 3 - Bhalang, Beldana and Jugedi



(Source: Google Maps. We have made drawings on the map.)

Explanation of Map 3. 1: Bharlang ; 2: Beldanda ; 3: Jugedi

Social groups

All the residents we have interviewed in the two villages belong to the ethnic part of the Nepali society, which are called Janajatis. There is, however, an exception of two households

in the sample, which by Hindus are considered to be the highest in the caste[47] system, called Brahmins. Among the Janajatis there are differences in how high and low the ethnic groups are considered in the caste/ethnic system. The residents in Beldanda all belong to the lowest Janajati group, called Chepang. In Bharlang we have interviewed households belonging to these Janajati sub-groups: Newar, Gurung, Magar, Tamang and Chepang.

Migration

Migration to and from Bharlang and Beldanda is an expression of a root-cause, which we will investigate as a possible explanation for the inequality in effectiveness of adaptation within the household sample. According to local citizens there has been an increase in villagers that emigrate for work, but in spite of this, the population of the study area has increased according to immigration and the general population growth which follows the national trend of a growth in population by 1,76 per cent annually (Indexmundi, homepage).

An interesting development, which will be investigated in the fourth analytical section, is the immigration from Dhading district to Bharlang 10 to 26 years ago.

Income

The main incomes among the households in the sample are vegetable selling, firewood selling and daily wage labour as seen below in table 2. Besides this, all households, except one, are doing subsistence farming.

Table 2: Main income sources of the 37 investigated households[48]

Vegetable selling	Firewood selling	Daily wage labour
21	14	23

(Table based on our household sample)

According to local citizens and key-informants the growing population and the utilization of water for irrigation have had a severe impact on the natural resources with deforestation and pressure on water resources as results. These pressures on the natural resources, and the responses that have been made to conserve the resources, will be discussed in the second analytical section (paragraph 4.2).

[47] The caste and ethnic system is complex to outline, but in the study area it is mostly ethnicity that is central in describing the local conditions, and thus we will discuss ethnicity instead of caste differences.

[48] We asked the responding households about the income sources most important to the household livelihood. This means that other income sources, than the ones mentioned here, might also influence on the households livelihood. Production of local brew is e.g. a widespread income activity, but we found this subject a taboo, which might be the reason, why no households point this income source out as one of the most important for their livelihood.

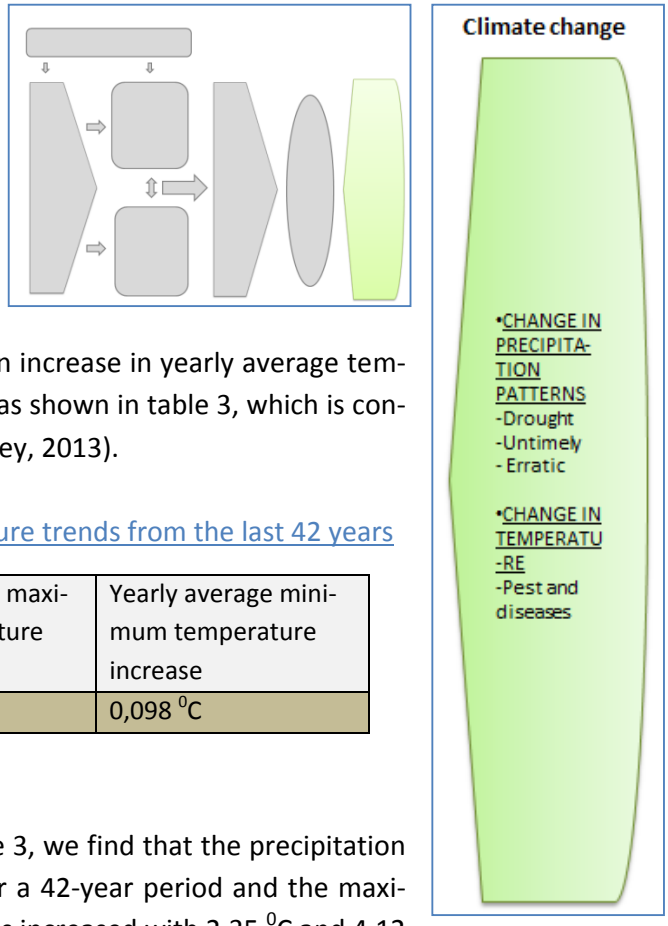
4.1.2 Climate variability and climate change in the study area

In this paragraph we will discuss the pressure from climate change, which is illustrated as the green box in the vulnerability model, see figure 6 below .

Climate Change and impacts in Kabilash VDC

Before we describe trends in local climatic conditions, we will remind the reader that we only look at environmental hazards and slowly unfolding events to which the investigated households are equally exposed. The hazards and slow unfolding events we include in the thesis are presented in figure 6.

Figure 6: Climate change



A study from 2013 has examined climatic data from the last 42 years collected at a nearby meteorological station in Rampur[49]. This study also included local perceptions from residents in Kabilash VDC on the climatic development over the last ten years. From the collected meteorological data an increase in yearly average temperature and precipitation is found as shown in table 3, which is consistent with local perceptions (Maskey, 2013).

Table 3: Precipitation and temperature trends from the last 42 years

Yearly average precipitation increase	Yearly average maximum temperature increase	Yearly average minimum temperature increase
8,04 mm	0,056 ^{0}C	0,098 ^{0}C

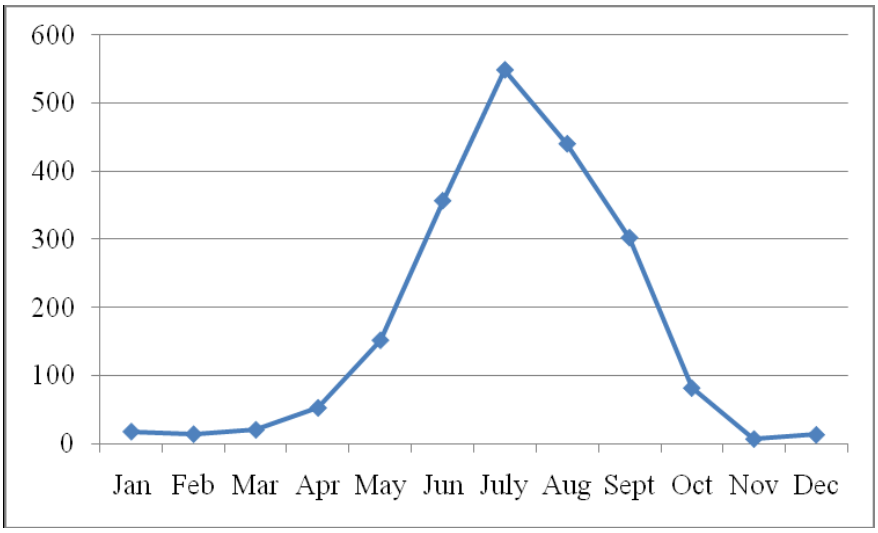
(Source: Maskey, 2013)

By using the data presented in table 3, we find that the precipitation has increased with 337,68 mm over a 42-year period and the maximum and minimum temperature has increased with 2,35 ^{0}C and 4,12 ^{0}C (Maskey, 2013). The increases in temperature are in line with the perceptions of the local respondents from Kabilash VDC, who also experienced fewer days with cold weather in the winter and more hot days in the summer (Maskey, 2013).

[49] Rampur is located 20 kilometres from Kabilash VDC.

In a study of climate change, based on meteorological data collected from different parts of Nepal, Marahatta et al. found that the average monthly precipitation is highest in the monsoon season (79,6%) followed by the pre monsoon season (12,7%), the post monsoon season (4,2%) and the winter season (3,5%)[50]. Similar trends were found in the study of Kabilash VDC, which is shown in figure 7 (Marahatta et al., 2009; Maskey, 2013). The spreading and amount of precipitation in the different seasons are crucial factors for when rain-fed agriculture can be practised and when irrigation is needed. Precipitation patterns are important to investigate in order to assess the need for adaptation in the agriculture. In Figure 7: Average mean monthly precipitation in mm (1967-2009) below the average spreading of precipitation in the study area is presented.

Figure 7: Average mean monthly precipitation in mm (1967-2009)

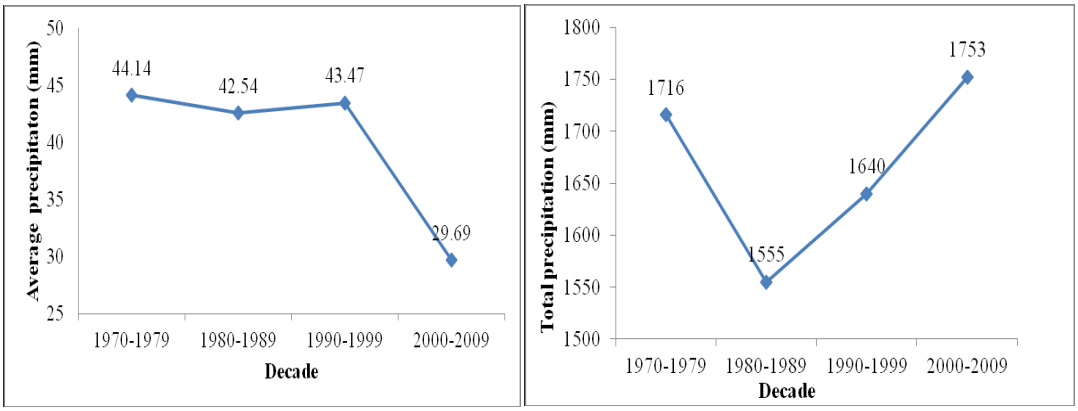


(Source: Maskey, 2013)

The average winter precipitation in the study area has decreased between the decades of the 1990's and the 2000's as seen in Figure 8: Left: Average precipitation in winter season; Right: Average precipitation in monsoon season(left) while the monsoon precipitation has increased between the decades of 1980's and the 2000's as shown in Figure 8: Left: Average precipitation in winter season; Right: Average precipitation in monsoon season(right). These trends are however short-term trends in a climate context, and so we cannot distinguish whether this is climate variability or climate change, but no matter what, this suggests that there have been a need for adaptation.

[50] Monsoon: June to September; Post monsoon: October to November; Winter: December to February; Pre monsoon: March to May.

Figure 8: Left: Average precipitation in winter season; Right: Average precipitation in monsoon season



(Source: Maskey, 2013)

Because a central part of our analysis focuses on vegetable farming in the winter season, it is noteworthy that the amount of precipitation in the winter is low compared to the monsoon season and the pre and post monsoon season as Figure 8: Left: Average precipitation in winter season; Right: Average precipitation in monsoon seasonshows. It is also interesting that the precipitation has decreased in the winter season while it has increased in the monsoon season. With or without this short-term trend of decreasing precipitation in the winter in mind, we can conclude that irrigation is needed for agricultural production in the winter. This will be further discussed in the third analytic section.

79,5 % of the respondents from Maskey's study in Kabilash VDC express that they experience that precipitation patterns has changed in the summer and winter, and they highlighted untimely, irregular precipitation and absence of rainfall in important farming periods as characteristics for the change (Maskey, 2013). About 80 % of the respondents in Kabilash VDC said that there had been a change in heavy rainfall, which was described as irregular, with high intensity, destructivity and occurring in only short periods (Ibid.). The monsoon rain was observed to be delayed nearly a month from one year to another, which makes it critical to rely on rain-fed agriculture production even in the rainiest period of the year, the monsoon season.

81,8 % of the respondents from Kabilash VDC pointed out drought as a problem especially in the months of April and May (Ibid.). All respondents in our household sample referred that the rain had been so delayed the last two years that their maize production, which is initiated April-May, had been spoiled.

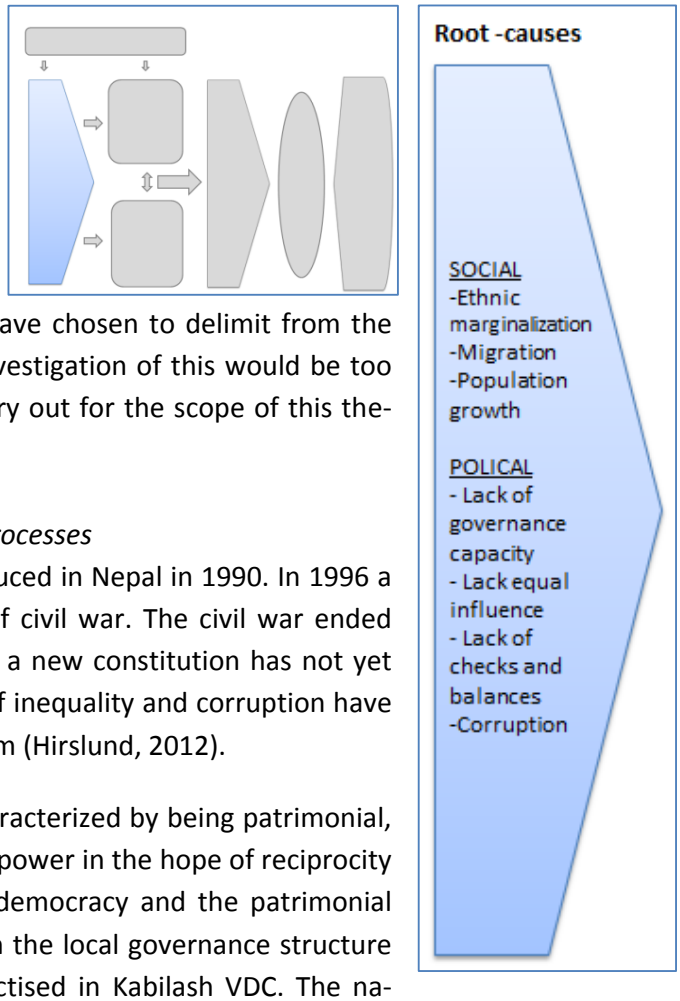
Both the meteorological data and the experiences of the residents of Kabilash VDC about weather patterns support that there have been changes in the climatic conditions in the

study area. The conditions for rain-fed agriculture have worsened as the precipitation falls more unpredictably and is concentrated in shorter periods. Drought periods also increase the need for proper irrigation.

4.1.3 Root-causes

In this paragraph we look further into root-causes that can be explanatory factors for the inequality in the effectiveness of adaptation among households (see second analytical section for a verification of this). We have already in the previous paragraph highlighted migration as a possible root-cause and here, we will shortly present information on the political structures and governance processes along with ethnic marginalization in order to use these root-causes as explanatory factors in the latter analytical sectors (see Figure 9: Root-causes).

Figure 9: Root-causes



Economic root-causes are also relevant for adaptation in the study area. Local market demands, inflation and macro-economic relations, such as trade agreements between Nepal and India, influence the interaction between the study area and the surrounding societies. We have chosen to delimit from the economic root-causes because an investigation of this would be too time and resource demanding to carry out for the scope of this thesis.

Political structures and governance processes

Parliamentary democracy was introduced in Nepal in 1990. In 1996 a Maoist uprising initiated ten years of civil war. The civil war ended with a peace resolution in 2006, but a new constitution has not yet been formulated and the problems of inequality and corruption have not been solved by the political system (Hirslund, 2012).

The political structure in Nepal is characterized by being patrimonial, where clients do favours for those in power in the hope of reciprocity (Pfaff-Czarnecka 2008). The lack of democracy and the patrimonial political structure have influenced on the local governance structure and the way decision making is practised in Kabilash VDC. The national and the local governance structure is thus a potential root-cause that can affect the

investigated household's opportunity to adapt to climate change. A further explanation of the local political structure will be presented in paragraph 4.4.1, where the consequences for adaptation is analysed.

Ethnic marginalisation

Caste and ethnicity as a possible root-cause for the inequality in the effectiveness of adaptation among households in Bharlang and Beldanda, because it determines wealth, position and self-perception among most Nepali people (WB and DFID, 2006).

Even though banned by law in 1962, the caste system is still culturally in practice in Nepal, and the Dalits[51] and the Janajatis are still marginalised politically, economically and socially (IDSN, 2011; WB and DFID, 2006). Ethnicity and caste is a dividing theme in Nepali politics, and an attempt to form a new democratic constitution failed in 2012 among other reasons due to disagreements on this subject (Dhungana, 2013). Inequality and exclusion of low caste and Janajatis remain a critical issue (UNDP, 2009 ; IDSN, 2011 and WB and DFID, 2006.).

The underlying hierarchical norms, values and behaviours for social interaction and actual distribution of resources along with protection of rights are still influenced by a determining distinction between different castes and ethnic groups. Many Nepalis are of the beliefs that certain characteristics are connected to a human being, because of the caste or ethnicity he or she belongs to. We found several signs of this determination due to caste/ethnicity in the statements and argumentations from our respondents.

The majority of citizens in Bharlang and Beldanda are Janajatis but even internally among Janajatis social production of class and marginalization exist. If we look at the Janajati groups represented in Bharlang and Beldanda (they are listed in table 4), The Nepal Federation of Indigenous Nationalities have made a classification of their relative position in the Nepali society, which is presented in table 4.

Table 4: Ranking of different local ethnic group's socio-economic status in Nepal

Advanced group	Newar
Disadvanced group	Magar, Gurung
Marginalized group	Tamang
High marginalized group	Chepang

(Source: WB and DFID, 2006)

The culture of ethnic marginalization is a root-cause with a history of more than 2000 years, and it is to some extent sustained by the political and economic elites, even though there

[51] Which means 'broken people'.

are also tendencies of progression, at least in terms of law-based rights. The 'invisible' factor of prejudice and discriminatory behaviours is still obvious in the way people speak and act (IDSN, 2011).

4.2 Second analytical section

Households' current living conditions

4.2.1. Inequality in absorbing capacity among the households

This second section of the case-analysis deals with the current living conditions, i.e. the current absorbing capacity among the households. As we have described, absorbing capacity is a time-specific expression of the historic development and adaptation, and consequently, when we refer to absorbing capacity, it represents the current living conditions as we had them described, and as we observed them to be in January and February 2013.

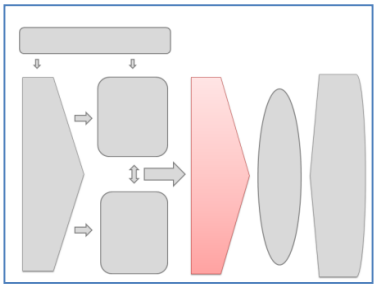
By looking at current living conditions, combined with the trends of change described by the respondents, we have isolated the factors where the households have adapted their conditions over the last ten years. We have chosen to look at the outcome of this ten-year period of change, because this is the period of time where strategic adaptation approaches have been carried out in the area.
While outlining the current living conditions, we mainly focus on the expressions, where respondents have generated and experienced a change within the last ten years. We did not only look at absorbing capacity in the farms, but also in the quality of the forests, the security of the watershed and the healthiness of livestock. These natural resources are important for the livelihood of all households in the area. However, the main focus in this section is the distribution of income sources, where some have changed significantly over the last ten years while others have not. We focused on distribution of income sources because it was important in order to understand to which extent we could justify continuing the analysis (in section three and four) by only looking at adaptation in farming practices.

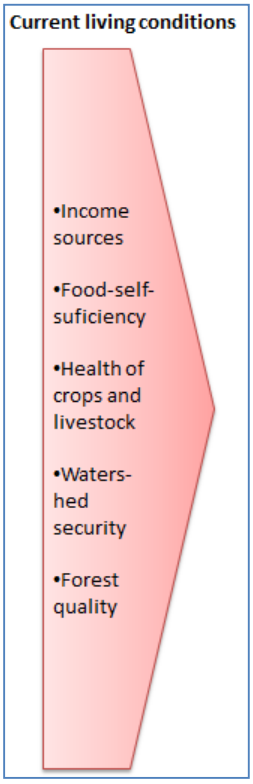
Some of the investigated factors for absorbing capacity are specifically related to the individual household, for example, outcome of farming, others are considered commons, for example, the quality of the forest or the security of the watershed. We have found that the change in some of the parameters represents an equal increase in absorbing capacity for the households, whereas, the change in other parameters have been different among the households and therefore, also resulted in different absorbing capacity. These latter parameters are of our specific interest, as they show where we find inequality in effectiveness of adaptation. By the end of this section we have analysed one parameter which shows un-

equal adaptation within the households farming practices. This parameter will further guide the analysis in section three and four.

4.2.2. Criteria's for assessment of households' current living conditions

Figure 10: Current living conditions





When we first visited the study area we observed an immediate difference in the quality of the household's current living conditions. Based on field observations, the quality of the houses of the Chepangs in both villages was relatively low compared to the other houses in the study area, and none of them had sanitation, which again distinguished them from other households in the area. As described there was also a remarkable difference among the productivity in the fields between Bharlang and Beldanda. To get a valid insight in these differences, we identified five expressions of current living conditions in the study area for further investigation. These expressions are presented in figure 10. In table 5 below we show whether there has been a general trend, distributed over all households in the sample, of improvement for each of the expressions, and whether these improvements have benefited the households absorbing capacity equally or not. The changes refer to the last ten years period. They are not measured against a baseline, but based on respondents experiences of change.

Table 5: Identified factors for current absorbing capacity

Expressions of absorbing capacity in current living conditions	Outcome of adaptation distributed over all households	Difference in benefits between households
I) Quality of forests	No trend found	No trend found
II) Watershed security	Improved	Unequal among HH
III) Health of livestock and crops	No trend found	No trend found
IV) Food self-sufficiency	Improved	Unequal among HH
V) Income sources	Improved[52]	Unequal among HH
- Vegetable production	Improved	Unequal among HH
- Daily wage labour	Not investigated	Unequal among HH
- Selling firewood	Improved	Unequal among HH
- Remittances	Not investigated	Unequal among HH
- Livestock	Improved	Unequal among HH
- Service holders	Not investigated	Unequal among HH
- Pension	Not investigated	Unequal among HH

(Table based on findings from our household sample)

How to interpret table 5: The row ' Expressions of absorbing capacity in current living conditions' shows the factors identified for the analysis below. The row, 'outcome of adaptation' shows the general trend of change in living conditions due to adaptation actions over the last decade. The classifications in this row derive from our overall impression based on the total data sample. The last row ' Difference in benefits between households' shows that even though the common absorbing capacity has been increased in a range of factors, the households have not benefitted equally from this improvement.
No negative trends in terms of change in absorbing capacity were found, but for some of the factors, we could not identify a trend. The reasons why we have classified the outcome of adaptation as improved or as no trend found, will be argued below.

That no negative trends have been identified, confirms our general notion that almost all respondents have experienced a positive improvement of living conditions over the last ten years. With this said, there are still two of the five factors where no trend is found, and these can possibly cover decreased absorbing capacity.
Even though trends of improvements have been identified when looking at the total sample, there is a difference of importance when we look at the same expressions at the household level.

4.2.3. Factors of absorbing capacity and trends of change

Forests quality

[52] The reason why we have classified the outcome from income sources to be improved even though we can only show it for three out of seven types of income sources, is, that vegetable production, selling firewood and rearing livestock is relatively more widespread among the sample than getting income from service holder jobs, pensions and remittances.

An expanding population in the study area has led to increased pressure on the natural resources, with consequences of deforestation, erosion and siltation.
Almost all of the respondents use the forest to collect firewood and grasses for their animals, and according to them, it has become harder to find such resources during the last decades. In an initiative to discourage the deforestation, the management of the forests has been changed within the last decade, so the forests are now managed as community forests[53]. The residents control the usage of the forests and are allowed to use some of the ecosystem services. Deadwood for cooking purpose, fodder-grasses and food such as berries can be collected for personal use by the villagers. The Chepangs are the only inhabitants allowed to use the dry firewood for commercial purposes. They have traditionally used the forest's resources as a major foundation for their livelihood.
The quality of the forest have been decreasing for a long period, but the reason why we classified the change in quality as "no trend found" is that the change in forest management has stemmed deforestation, according to both residents and key-informants. We have not though been able to clarify, whether the quality of the forests have become better or whether the changes in forest management has only slowed down the deforestation. We also could not estimate differences in the quality of the forests near Bharlang and those nearby Beldanda.
We know that almost all households use the forest's resources, but also that some households are more directly dependent on the forest's resources than others. With this being said, all households are dependent on the healthiness of the forests, such as springs, soil-protection and fodder-grasses. Respondents in Bharlang told us that there used to be more spring sources back in older days, which indicates a likely decrease in absorbing capacity due to deforestation.

The change in forest management can be considered as an action of adaptation which has stemmed, or at best stopped the rate of decrease in forests quality. However, forest quality as an expression of absorbing capacity in the current living conditions cannot be used to explain the differences among households, as we cannot estimate a difference in dependency of the forests among the investigated households.

Watershed security
During the past decade, there have been built an extensive amount of check-dams and speed-breakers in the rivers below Bharlang and Beldanda, and community forest groups have planted grasses and trees on the river banks for soil protection and afforestation. The extensive work for improved watershed in Kabilash VDC has especially been motivated by the flooding induced disasters in years 2003 and 2006. Similar weather conditions causing flooding have not occurred since then, so the improvements have not been tested, but from

[53] The forests are officially not the property of the residents but the government.

our observations and respondents statements[54], we estimate that the area has got an increased capacity to absorb flooding so it does not turn into disaster. The improved forest management has also potentially minimised the bank erosion. Respondents all explain that they feel more safe from flooding now, than ten years ago, thus we estimate that the adaptation has resulted in an improvement for all.
Since Bharlang and Beldanda are located on hilltops, we find that the households are relatively equally prone to flooding, and they have all benefitted from the watershed protections, flooding induced damage on shared resources like roads and electricity poles, has become less likely. However, we have still classified the benefits from the adaptation as unequal among households because the households close to the rivers are still more prone to erosion than others.

Health of livestock and crops
The conditions for medical treatment against diseases and pests regarding livestock and crops have improved over the last decade, as a veterinary clinic has opened in the main village in Kabilash VDC. Education of three citizens in agro-vet skills has been part of the strategic adaptation plan introduced by the NGO's and supported by VDC and Forest Management Groups. All the respondents we spoke to use the veterinary if they need treatment for livestock or plants, and the medicine is affordable for almost all households[55]. Respondents told us, that previously, they could not do anything else than slaughter their animals when diseases occurred. And there was no treatment available for diseases in plants, so there has been an improvement in treatment possibilities.
On the other hand, both the manager of the veterinary clinic and the citizens told us that the occurrence of new diseases and pest or exacerbation of already known ones has increased during the last years. When we asked our respondents whether the health of livestock and crops had gone up or down, we got diverse answers. We estimate that the households have all benefitted in terms of increased treatment possibilities. Further they are equally exposed to increase in diseases and pests that threaten livestock and crops, but they are unequally sensitive, because they grew different types of crops and rear different types and amounts of livestock.

Income sources
Even though the focus of this study is on vulnerability and adaptation in agriculture, we have investigated the respective importance of the seven income sources we found among the households: Livestock rearing, service holder jobs, remittances, pension, selling of firewood, daily wage labour and commercial-scale vegetable production. We observed that some

[54] We also spoke to several residents in Kabilash VDC who live near the rivers, and they all feel safer since the improved water infrastructure has been build.
[55] Only a few respondents said such an expense would be hard to manage.

households had taken up commercial-scale vegetable production in the water-scarce winter month during the last decade. Thereby they had been able to improve both their food self-sufficiency and their total income. Others had not taken up this practice and they only produced rain-fed crops during the monsoon. Our immediate impression was that those who had adapted in the sense of upgrading or introducing vegetable production had a remarkable higher absorbing capacity to meet change in monsoon precipitation patterns than those who only depended on rainfall. However, before we can conclude that the households which updated or introduced vegetable farming had generally higher absorbing capacity than others, we have to investigate whether those who have not introduced vegetables, use other income strategies which makes their current living conditions equally as strong.

Livestock rearing

The number of livestock in the study area has increased according to local respondents. Livestock is an asset that can be used for income purposes and livestock can also be used as a kind of insurance if a household in crisis needs money to respond to such treats. All the NGO's that have worked in the study area have implemented local goat sharing schemes[56] both in Bharlang and Beldanda. When asked about the important income sources, only a few highlighted livestock as important. There was diversification in the number of livestock possessed by each household, but our impression from the interviews was that the current livestock situation would be different if we returned to the area half a year later because most households sold their goats and hens when they were at the optimum size and age. Also it was hard to understand the different importance of cows, bulls, goats and hens for each household. Although we have gathered information about the households' livestock composition, we have chosen not to investigate adaptation in this factor further due to the mentioned difficulties in using livestock to describe differences in living conditions between households.

Service holders and Pension

Service and pension holding are both factors which we have screened out because only four service holders and two pension holders was found in the total sample.

Remittances

[56] The NGO's have given an amount of goats to certain households which then had to deliver offsprings to other households.

Migration in and out of the study area influences the current living conditions among households, for example by an inflow of remittances. Although only nine out of the 37 households in the total sample gets remittances, it is our impression that sending a family member out to earn money for a period is a widespread economic strategy used by the households. The livelihood strategy of emigration can potentially decrease the households' vulnerability because income diversification gives the households more opportunities when faced by shocks or change. The data does however not show a trend that the households who get remittances[57] are stronger to absorb climate change impacts, than households who depend on other income sources.

Daily wage labour and selling of firewood

The households which do not produce and sell vegetables all depend on daily wage labour, selling firewood and/or remittances[58]. Those engaged in daily wage are mainly engaged in others farms, but also in construction and transport. Only those households belonging to the ethnic group, Chepangs, are entitled to collect firewood for commercial purposes.

From respondents in households, which supplement their farming with daily wage and firewood selling, we were told, that they prefer to be engaged with their own agricultural production more than other income sources. They only do work as a daily wage labourer or sell firewood, because they do not have a sufficient agricultural production to feed the household. This tells us that the engagement in daily wage labour and selling firewood reflects the insufficiency of the households own agricultural production and are income sources, they use for survival.

Income diversification is often described as a strategy for adaptation (Ensor, 2011 ; Care, 2012) and thus a more detailed investigation, of the type and the amount of employment opportunities, the households that were engaged with daily wage labour, or service holder jobs had, would have been useful in order to shape a more thoroughly differentiation of these households. As an example, a local resident, Dil Bahadur Chepang, told us he was engaged in carpentry, often worked as a bus conductor and also took labour in the agriculture production in others' farms (Dil Bahadur Chepang, local resident in Bharlang, 2013). Other respondents only did work in others' farms for a short period of the year. There is difference in the amount of different jobs a resident in our study area can get employment within, as well as a difference in how much daily wage labour the respondents have had. We have asked the respondents how often they take daily wage labour, but the quality of the data did not have the details we needed in order to investigate income diversification within the daily wage category. Further, we found the difference between vegetable growing households and non-vegetable growing households to be a more apparent distinction to the households

[57] Some of the nine households which get remittances are getting them on regular basis, whereas others only get remittances in times of crisis.

[58] Few households are also engaged in service holder jobs or gets pension, see 'Service holders and Pension' above.

absorbing capacity. This means that we estimate engagement in one valuable income source, namely growing vegetables, to be of greater importance for the absorbing capacity of a household than being engaged with several 'less valuable' income sources.

Growing vegetables

We have identified, that the difference between growing vegetables during the winter months or not, is the most distant difference as to the absorbing capacity in current living conditions among households in Bharlang and Beldanda. Traditionally crops like maize and millet have been cultivated based on rain-fed production in the monsoon period and the lands used to be kept fallow in the winter. During the last decade nineteen households among the sample have introduced or upgraded [59] cultivation of vegetables in the winter season, and some have increased their earnings considerably due to the sale of tomatoes.

Besides increased income from selling vegetables the production has also had an positive effect on many households' food self-sufficiency, due to their own experiences. Another considerably benefit as to the absorbing capacity is, that those who produce in the winter have an extra opportunity for harvest in case of drought, untimely rain or pests are destroying crops in other seasons.

Food self-sufficiency

We have also included a household's food self-sufficiency to investigate absorbing capacity, because this is important for how dependent a household is on other income sources than growing food for own consumption. High food self-sufficiency may not necessarily improve the absorbing capacity to weather-induced hazards, but it can mean that a household is less prone to a number of external variables such as market fluctuations, accessibility to markets and de- or inflation. We do also estimate that those having twelve months of food self-sufficiency are having a higher absorbing capacity than those who have, for example, two months of food self-sufficiency, because all households in the area are dependent on the local farming. Looking at food self-sufficiency as a factor for the households' current living conditions comprehends certain difficulties. Some households may give prioritization to cash crop production, because the income outweighs the savings from growing one's own food. Another source of error, connected to the usage of food self-sufficiency in describing household's current living conditions, is that crops are less tradable than money, and therefore harder to convert into non-food consumption items, health treatments, transportation and so forth. A measurement of food-security would thus have been more appropriate to describe the absorbing capacity to climate-induced impacts than food-self-sufficiency.

4.2.4. Ranking of households based on absorbing capacity in current livelihood strategies

[59] Some households have cultivated vegetables for more than a decade, but the quantity of the production has increased compared to production of vegetables 15 to 20 years ago.

In Table 6, we have ranked the households in the sample based on the absorbing capacity within their current living conditions. Only the factors close to the individual household's livelihood strategies have been included, since we could not rank their individual level of absorbing capacity deriving from commons.

Table 6: Absorbing capacity ranking based on households' current living conditions

Main respondent from household	Location	Ethnic group	Sell vegetables	Grow vegetables	Food self-sufficiency (months)	Daily wage labour	Selling firewood	Grouping
Kali M. Chepang	Bharlang	Chepang			n.d.a.	X	X	No production of vegetables during winter
Grandmom Chepang	Bharlang	Chepang			n.d.a.	X	X	
Mamata Chepang	Bharlang	Chepang			0	X	X	
Ganesh B. Tamang	Bharlang	Tamang			1			
Raj K. Chepang	Beldanda	Chepang			2	X	X	
Jiwan P. Chepang	Beldanda	Chepang			3	X	X	
Suk B. Chepang	Beldanda	Chepang			5	X	X	
Gore M. Chepang	Beldanda	Chepang			6		X	
Punte P. Chepang	Beldanda	Chepang			6	X	X	
Santa B. Chepang	Beldanda	Chepang			6	X	X	
Shanta B. Chepang	Beldanda	Chepang			6	X	X	
Shanti Chepang	Beldanda	Chepang			8	X	X	
Bishnu M. Chepang	Beldanda	Chepang			9	X		
Ban B. Chepang	Beldanda	Chepang		X	6	X	X	**Veg. for own consumption**
Omlal Shrestha	Bharlang	Newar		X	6	X		
Yub R. Chepang	Beldanda	Chepang		X	12	X	X	
Saman Chepang	Bharlang	Chepang	X	X	3	X		Commercial scale vegetable production
Indra k. chepang	Bharlang	Chepang	X	X	6	X		
Aaiti M. Tamang	Bharlang	Tamang	X	X	6	X		
Mahendra N. Shrestha	Bharlang	Newar	X	X	6	X		
Bir B. Gurung	Bharlang	Gurung	X	X	6	X		
Santa M. Gurung	Bharlang	Gurung	X	X	6			
Gori M. Gurung	Bharlang	Gurung	X	X	6			
Nama R. Shrestha	Bharlang	Newar	X	X	7	X		
Dil B. Chepang	Bharlang	Chepang	X	X	8	X		
Mati M. Shrestha	Bharlang	Newar	X	X	9			
Chitra B. Gurung	Bharlang	Gurung	X	X	11			
A-Bir B. Gurung	Bharlang	Gurung	X	X	11	X		
Mankumari Chepang	Bharlang	Chepang	X	X	12	X	X	
Surja Gurung	Bharlang	Gurung	X	X	12			
Man B. Gurung	Bharlang	Gurung	X	X	12			
Uma D. Poudel	Bharlang	Bhramin	X	X	12			
Sabita Lamichhane	Bharlang	Bhramin	X	X	12			
Jeet B. Strestha	Bharlang	Newar	X	X	12			
Krishna L. Shrstha	Bharlang	Newar	X	X	12			
Bhuwa L. Shrestha	Bharlang	Newar	X	X	12			
Hari M. Baral	Bharlang	Magar	X	X	12			

(Table based on data from our household sample)

How to interpret table 6: The table on absorbing capacity in current income situation is ranked in a descending order, where the households having least absorbing capacity is ranked in the top of the table, and those having the highest level are ranked in the bottom. The factors, on which we have ranked the households, have not been given the same weight. As argued for in the above paragraphs, we have identified whether households sell vegetables or not, as the most important factor for ranking the absorbing capacity of their current living conditions, and thus this factor has been the primary as to the relative ranking of each household. The second most important factor for the ranking is whether households produce vegetables for their own consumption. We see vegetable production for own consumption as a movement from not growing vegetables towards selling vegetables. These two divisions gives us three main groups; i) **vegetable selling households**, ii) households which ***grow vegetables for own consumption***, iii) and **non-vegetable producing** households. Intern in these three categories we have then ranked the households according to their food self-sufficiency.
Daily wage labour and firewood selling are not used to rank the households, but they are presented in the table to show which other income sources many households depends on.

Findings from the ranking of the current living conditions among households
From table 6 we can see that the households with the least absorbing capacity in their current income and food self-sufficiency situation, are all from the ethnic marginalised group Chepang, except one. It should also be recognized that all residents in Beldanda, except two, have not introduced vegetable production in the winter months. Further analysis on the trends related to ethnicity and location are found below in the fourth section of the analysis.
The households which do produce vegetables generally have better food self-sufficiency than those who do not produce vegetables. We also see that daily wage labour is a relatively widespread income source, but not among the households having the highest amounts of months with food self-sufficiency. We can conclude, that selling firewood and taking daily wage are income strategies which are rather undertaken due to a lack of adaptation in a households farming practice, than as prioritized strategies for livelihood improvements.
Consequently, in the following analysis, we do only focus on inequality of effectiveness of adaptation within farming practice.

4.2.5. Adaptation in farming practice among the households

Now that we have ranked the households according to the absorbing capacity within their current income and food self-sufficiency situation, we will focus on the most important adaptation measure identified above; the shift towards vegetable cultivation as a supplement to rain-fed farming, and a source of income.
In table 7 we present the households which have grown vegetables for more than a decade, the households which have changed to vegetable production within the last decade, and the households which do not grow vegetables.

Table 7:Adaption in farming practice

Respondent	Location	Ethnic group	Have grown vegetables more than 10 years	Upgraded or introduced vegetable production within the last 10 years	Do not grow vegetables
Kali M. Chepang	Bharlang	Chepang			X
Grandmom Chepang	Bharlang	Chepang			n.d.a.
Mamata Chepang	Bharlang	Chepang			X
Raj K. Chepang	Beldanda	Chepang			X
Jiwan P. Chepang	Beldanda	Chepang			X
Suk B. Chepang	Beldanda	Chepang			X
Gore M. Chepang	Beldanda	Chepang			X
Punte P. Chepang	Beldanda	Chepang			X
Santa B. Chepang	Beldanda	Chepang			X
Shanta B. Chepang	Beldanda	Chepang			X
Shanti Chepang	Beldanda	Chepang			X
Bishnu M. Chepang	Beldanda	Chepang			X
Ganesh B. Tamang	Bharlang	Tamang			X
Ban B. Chepang	Beldanda	Chepang		X	
Yub R. Chepang	Beldanda	Chepang		X	
Saman Chepang	Bharlang	Chepang		X	
Indra k. chepang	Bharlang	Chepang		X	
Dil B. Chepang	Bharlang	Chepang		X	
Mankumari Chepang	Bharlang	Chepang		X	
Aaiti M. Tamang	Bharlang	Tamang		X	
Bir B. Gurung	Bharlang	Gurung		X	
Santa M. Gurung	Bharlang	Gurung		X	
Gori M. Gurung	Bharlang	Gurung		X	
Chitra B. Gurung	Bharlang	Gurung		X	
Surja Gurung	Bharlang	Gurung		X	
Man B. Gurung	Bharlang	Gurung		X	
Hari M. Baral	Bharlang	Magar		X	
Omlal Shrestha	Bharlang	Newar		X	
Mahendra N. Shrestha	Bharlang	Newar		X	
A-Bir B. Gurung	Bharlang	Gurung		X	
Uma D. Poudel	Bharlang	Bhramin		X	
Sabita Lamichhane	Bharlang	Bhramin		X	
Nama R. Shrestha	Bharlang	Newar	X		
Mati M. Shrestha	Bharlang	Newar	X		
Jeet B. Strestha	Bharlang	Newar	X		
Krishna L. Shrstha	Bharlang	Newar	X		
Bhuwa L. Shrestha	Bharlang	Newar	X		

(Based on data from our households sample)

How to interpret the colours		
Has not adapted	Has adapted	Had already adapted

The five households from the sample represented in the bottom of the table, have been classified as 'already adapted' because they had a practice of commercial scale vegetable farming, when they came to Bharlang from Dhading district anywhere from 26 years to 10 years ago. The nineteen households ranked as 'adapted' in the middle group within the table, are those who have introduced or upgraded their farming of vegetables during the last decade while strategic adaptation programmes have been implemented in the area. The last group is only producing rain-fed crops and do not make use of irrigation for winter production, thus they are ranked as 'not adapted'. In the remaining part of the analysis, when referring to a household which has adapted or one which has not, it only refers to whether they have upgraded or introduced vegetables in the winter or not.

In the following two analytical sections, we will analyse how we can describe the above identified difference in effectiveness of adaptation, by looking at the explanatory strength within the dynamics from the vulnerability model; the distribution of access to and control over resources, and the engagement in processes of building adaptive capacity. The groups of households focused on for these analyses are those who have adapted during the last decade and those who have not adapted.

4.2.6. Sub-conclusion

We can conclude that the absorbing capacity within the current livelihood conditions of Bharlang and Beldanda, has overall improved due to the adaptation that has taken place during the last decade. This confirms that by far, the majority of the respondents share the experience that their living conditions have improved during this time span. The outcomes from adaptation identified above are; improved watershed security, a stemmed deforestation, better agro-vet health service and improved income and food self-sufficiency. The latter are generated by winter farming of vegetables and can be directly linked to the implemented strategic adaptation measures, but other political, socio-economic, environmental factors and structural changes may also have had an impact in the generation of the above mentioned improvements.

We can conclude that the local residents have all benefited, although not necessarily equally, from the improvements in commons, whereas only some have created a higher absorbing capacity by starting to grow vegetables in a season where the lands traditionally used to be kept barren.

All respondents would prefer to improve their current livelihood situation by working on their own lands compared to selling firewood and/or taking daily wage labour. Therefore, we are puzzled to find explanations which can show why some have introduced or upgraded their vegetable production, while others still only cultivate rain-fed crops, which are limited

to the months around the monsoon. We have above validated that there has been inequality in the effectiveness of adaptation among the households during the last decade, but we still need to understand *why* it is so. Consequently the following two analysis sections will deal with the explanatory strength found in the dynamics which are preconditions for adaptation, namely the available resource base, and processes of building adaptive capacity.

4.3 Third analytical section

The explanatory strength of difference in access to and control over tangible resources

4.3.1. A methodological choice: Segregation of tangible and intangible resources

The vulnerability model (please refer to figure 1 in chapter 2) shows how adaptation depends on respectively adaptive capacity and access to human, social, physical, natural and financial resources. These two aspects of vulnerability are what we define as "dynamics". Where availability of resources can be measured directly, adaptive capacity is a potential until it manifest in adaptation. In order to be able to measure it even though it is theoretically considered a potential, we have, with inspiration from Ensor, operationalised the concept into processes and relations. For example, the relationship between power-sharing and, sharing of information and knowledge which are preconditions for experimentation and testing, the act of creating change.

As we found human and social resources to be of specific importance for measuring the relations and processes, we made a methodological choice to divide the analysis of the explanatory strength found within dynamics into two sections. In this third analytical section we focus on the importance of tangible recourses. Then, in the fourth analytical section we look into social and human resources and, the processes where they are used to generate adaptive capacity. This methodological segregation, also gives us the ability to show more easily whether the present case-study can validate the critique raised, 'that community-based adaptation strategies have too much focus only on the *"hardware"* aspect of adaptation, and too little on relations, power and processes' (Levine et al., 2012 ; Jones et. al., 2011 ; Ensor, 2011 ; Blaikie et al., 2003).

In this section, when addressing tangible resources, it does include financial resources although they do not always occur in a tangible form. We also address the size, specifically, the number of members of each household even though, this 'resource' can be classified under the human category.

4.3.2. Distribution of availability of tangible resources among the households

As described in the theoretical framework, Ensor points out that technical capacity and technical choice are preconditions for adaptation to happen (Ensor, 2011). But before the capacity and choice can manifest, the relevant tangible resources needs also to be available. One of the criteria important for whether a household can adapt or not is their access to and control over resources such as land, irrigation facilities, seeds, capital for investments and possibly also fertilizers and pesticides.

Figure 11: Tangible resources

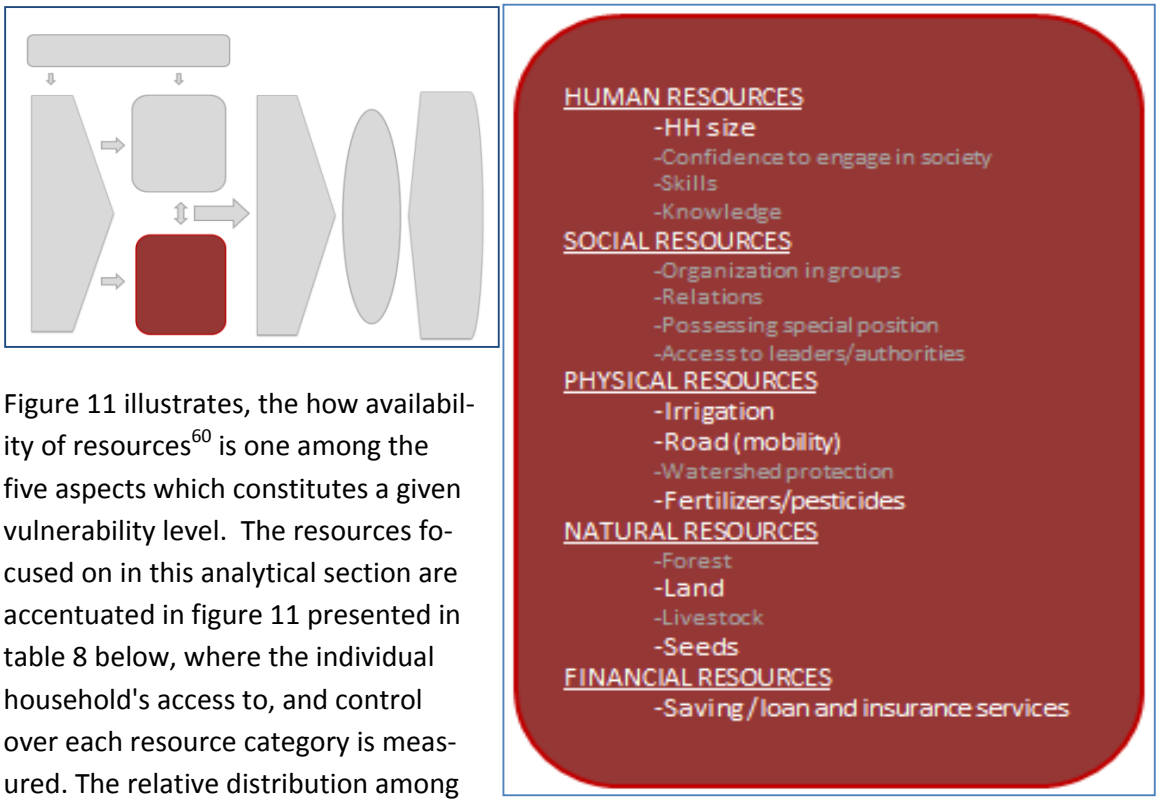


Figure 11 illustrates, the how availability of resources[60] is one among the five aspects which constitutes a given vulnerability level. The resources focused on in this analytical section are accentuated in figure 11 presented in table 8 below, where the individual household's access to, and control over each resource category is measured. The relative distribution among households of each of the resources will thereafter be analysed in order to identify whether inequality in the tangible resource basis can be an explanatory factor for the inequality in the effectiveness of adaptation.

[60] It should be noticed, that the social and human resource categories, except from household size, along with watershed protection, livestock and forest have been secluded in *figure 11*. This is not to divert from the theoretical logic within the vulnerability model, but only to show which resources are analysed in this section. Among the tangible resource factors identified as important in Bharlang and Beldanda, we have in the previous section established, that we only look at inequality in terms of adaptation in the farming practices therefore delimiting further the investigations of watershed protection, forest and livestock.

Table 8: Distribution of tangible resources

Main respondent from household	Location	Land size (Khatta[61])	Land size (Hectar)	Access to Irrigation	Use of Irriga-tion	HH size	HH member of save and loan association
Kali M. Chepang	Bharlang	2	0,068	x		4	
Grandmom Chepang	Bharlang	n.d.a	n.d.a	x		2	
Mamata Chepang	Bharlang	0	0	x		4	
Raj K. Chepang	Beldanda	2	0,068	x		7	X
Jiwan P. Chepang	Beldanda	3	0,101	x		7	
Suk B. Chepang	Beldanda	4	0,135	x		5	
Gore M. Chepang	Beldanda	n.d.a.	n.d.a	x		3	
Punte P. Chepang	Beldanda	3	0,101	x		7	X
Santa B. Chepang	Beldanda	3	0,101	x		4	X
Shanta B. Chepang	Beldanda	5	0,169	x		7	
Shanti Chepang	Beldanda	n.d.a.	n.d.a	x		6	
Bishnu M. Chepang	Beldanda	10	0,338	x		2	X
Ganesh B. Tamang	Bharlang	3	0,101	x		8	X
Ban B. Chepang	Beldanda	5	0,169	x	x	5	X
Yub R. Chepang	Beldanda	13	0,439	x	x	9	X
Saman Chepang	Bharlang	4	0,135	x	x	4	X
Indra k. chepang	Bharlang	3	0,101	x	x	4	X
Dil B. Chepang	Bharlang	11	0,372	x	x	6	X
Mankumari Chepang	Bharlang	3	0,101	x	x	4	X
Aaiti M. Tamang	Bharlang	4	0,135	x	x	4	X
A Bir B. Gurung	Bharlang	40	1,352	x	x	26	X
Bir B. Gurung	Bharlang	n.d.a.[62]	n.d.a.	x	x	6	X
Santa M. Gurung	Bharlang	5	0,169	x	x	6	X
Gori M. Gurung	Bharlang	n.d.a.	n.d.a.	x	x	5	X
Chitra B. Gurung	Bharlang	43	1,453	x	x	8	X
Surja Gurung	Bharlang	20	0,676	x	x	5	X
Man B. Gurung	Bharlang	16	0,541	x	x	3	X
Hari M. Baral	Bharlang	30	1,014	x	x	5	X
Omlal Shrestha	Bharlang	9	0,304	x	x	11	X
Mahendra N. Shrestha	Bharlang	10	0,338	x	x	5	X
Uma D. Poudel	Bharlang	10	0,338	x	x	3	X
Sabita Lamichhane	Bharlang	40	1,352	x	x	2	X

(Table based on data from our household sample)

How to interpret the colours in table 8	
Has not adapted	Has adapted

[61] Khatta is a widely used measure for land-size in Nepal. 1 Khatta equals 0,034 hectare. We have chosen to show the land size in both measures because it is easier to interpret the relative difference in khatta, as all households have relatively little amounts of land. The presentation of the equal amount in hectare, is for those readers whom are not familiar with khatta.

[62] Bir B. Gurung answered that he owned 2 khatta, but he showed us his land and it was definitely larger than this, so we have decided not to use land size data for this respondent.

The table shows the distribution of tangible resources ranked between those households which have adapted and those which have not.

Land size

Due to the simple correlation that land is needed in order to grow vegetables, we found it relevant to compare the amount of cultivatable land possessed by each household to the possibility of growing a higher amount, e.g. commercial scale, if one has more land.

Only one household among the sample does not possess[63] cultivatable land. Among the households where no data is available (n.d.a.) we know that all of them possess land but there has been confusion on the exact amount.

As it can be seen in table 8 above, the households which grow vegetables in the winter season, do in general have more land than households which do not grow vegetables in the winter. This could suggest that a certain amount of land is needed in order to adapt, but six vegetable-growing households only have between 3-5 khatta (0,1-0,18 hectare), which is just as little as most of the non-vegetable growing households. Thus land size seems not to be a significant barrier. Only one of these six households with relatively small amounts of land (i.e. Ban B. Chepang) does not sell vegetables, so the size of land does not seem to be determinant for cultivating vegetables commercially. Having relatively less land, and thus relatively less potential yield, can be a reason for some households to focus on other income sources. An example is Raj K. Chepang and Jiwan P. Chepang, whom are both young men working abroad several months out of the year. However, it is noteworthy that not one of the respondents mentioned a lack of land when we talked about rationales for a household not to grow vegetables (Raj Komar Chepang, local resident in Beldanda, 2013 and Jiwan Praja Chepang, local resident in Beldanda, 2013). Since there is not a clear trend that having small land means not being able to produce commercial-scale vegetable farming and, based on the rationales among the respondents, we conclude that land size is not an important explanation for the inequality in effectiveness of adaptation.

Irrigation

As shown in table 8 we assess that all households in the sample have access to some source of irrigation during the winter season. Due to differences in geographical locations, and inequality in type of accessible water resources, there are differences in the quantity available. This is important to elaborate on because irrigation is absolutely necessary for vegetable

[63] Without getting a full insight, we found out, that some own their land legally, others do not, and some have a composition of respectively legal and not legally owned land. The status of legal ownership, did not seems to be of importance for the households willingness to invest in farming on their lands.

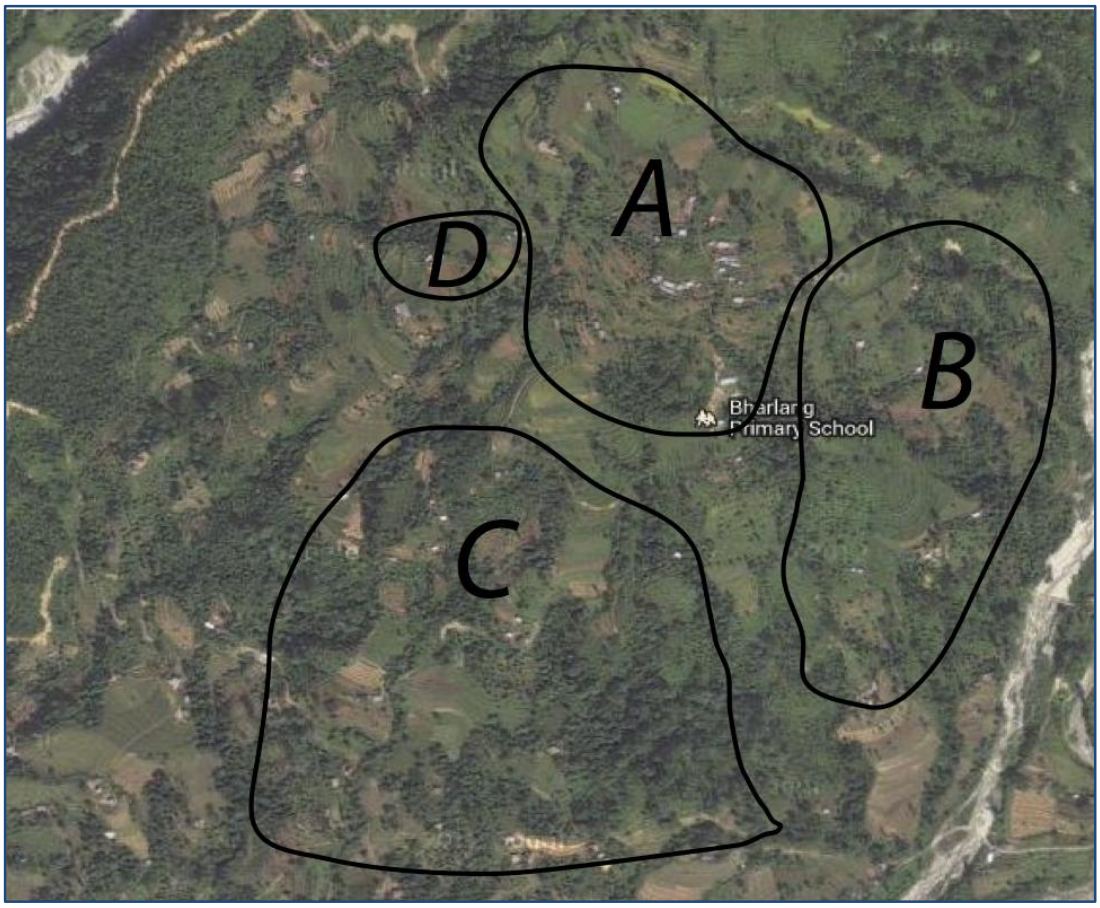
growing in the winter season, as the meteorological data shown in the first analysis section shows.

In Beldanda there are no natural springs, but through project activities pipes from a spring a one-hour walk away, have been dragged to the village, and two water tanks have been build. All households in Beldanda, except two which has pipes connected to another nearby spring, have access to this system. When we visited the village in the middle of the winter we observed and were told that there was enough water for all households to grow vegetables.

In Bharlang the picture is a bit more complex. As can be seen on map 4 below, the households investigated in Bharlang can be grouped into four categories. In Bharlang, two[64] water tanks systems have been built: one tank system, which provides drinking water through narrow pipes, and one tank system that provides water for irrigation through big pipes. The reason the difference in pipes is mentioned is that the villagers told us that the narrow pipes get blocked with sediment, which makes this system less suitable for irrigation purposes than the system with big pipes. In area **A**, (shown in map 4 on next page) farmers use the irrigation tank system to irrigate their fields, while the two households in area **D** use the narrow drinking water pipes for irrigation since they cannot afford big pipes which could connect them to the irrigation tank system. Group **B** irrigates their fields by the use of nearby springs. In area B, we do also find the only four households of Bharlang who do not grow vegetables in the winter season. In area **C** the households use nearby springs to irrigate.

[64] There are more tanks but they are not important to include when discussing irrigation.

Figure 12: Map 4 - Different irrigation areas in Bharlang



(Source: Google maps. We have made drawings on the map)

Explanation of Map 4:
Area **A**: Newar, Gurung and Magar households of Bharlang, who uses the irrigation tank-system ; Area **B**: Chepang and Tamang households of Bharlang, where vegetable cultivating households uses natural springs for irrigation ; Area **C**: Newar and Bhamin households, which uses natural springs for irrigation; Area **D**: Two Newar households, which do not have access to the irrigation tank-system and thus irrigate with water from a drinking water system.

Based on our detailed investigation into each households' access to irrigation sources, we can conclude that despite local differences in the sources of water for irrigation, all households in Bharlang and Beldanda do have adequate water available to grow vegetables in the winter season. As shown in table 8, only the households that cultivate vegetables make use of irrigation, but lack of access is not the reason why some households have not adapted.

Household size

The number of members in a household can potentially influence both the manpower for agricultural work available in the household and on the number of mouths to feed. We have not found any connection between the size of each households and whether they produce vegetables in the winter. Also, no correlation with the level of food self-sufficiency has been found.

Roads

Gravel roads, which connect Bharlang and Beldanda to the main road, have been built within the last decade and several cash-crop growing households mention this infrastructure improvement as an important factor for their marketing possibilities. All households in the sample do have equal access to these gravel roads, and although all households were clearly not located in exact the same distance to the roads, this difference is not distinct.

Financial services -savings, loan and micro-insurance

Twenty-five households, among the sample shown in table 8, are members of Mother or Father groups which, among other things, imply save -, loan- and in some cases also micro-insurance mechanisms. Being able to save and take loans at micro-scale is an important measure for adaptation because it increases the household's range of economic management opportunities (Collins et al., 2009). Even though many households from the sample cannot afford loans for investments, despite the low interest rates in the groups, they still use the saving function. Saving is a way to pool the financial resources of the household, which gives a potential for investments in practices of prevention or preparing for change and chocks, and it can also be used as a decisive reactive measure to help recover from crisis. However, we have not talked to any respondents who mentioned the membership of saving and loan groups, as their source for investments in the farming practices. On the other hand, we cannot rule out this option, as we found a clear tendency, that households with poor living conditions, could not afford loans. However they could still create small lump-sums from savings which are used for crisis or small investments. Some of the households with better living conditions had used loans from the groups for investment in education. We also have one example where a household has taken a loan for investing in income generating activities. Consequently, there is likeliness that the households which do not have memberships in saving and loan groups, do not have the same possibility for start-up investments in their fields. As can be seen in table 8, eight of the households which do not grow vegetables in the winter are not members of such groups, while all vegetable growing households are members. This can be an explanatory difference for the inequality in the effectiveness of adaptation among households in the study area. Additionally a couple of respondents referred to their experience of being poor, when we discussed their rationales for not adapting.

Seeds, fertilizers and pesticides

We have not seen any distinct trends in the current availability of seeds and seedlings. Several of the strategic projects have during the last decade provided start up seedlings for those who wanted to introduce vegetable farming or wanted to experiment with other types of crops[65]. We assess that this has to some extent outweighed the inequality which may be found in start-up investment capital among the households, as explained above.

Some few households told us, that they use hybrid seeds, but the information gathered about this issue is not sufficient enough to draw conclusions from. The same can be said with the use of fertilizers and pesticides; some households use these technologies and there are some which use chemical and other organic fertilizers and pesticides. Respondents told us that the usage of these technologies was of importance to their production, but we have not seen any connection between the usage of these technologies and the difference in vegetable and non-vegetable growing households.

Besides the above mentioned tangible resources, *time* is of course also an important resource factor. But since it is closely linked to processes, we have chosen to discuss it, in the below analysis section on adaptive capacity.

4.3.3 Sub-conclusion

Access to and control over land, irrigation and seedlings is decisive for being able to adapt in the sense of introducing or upgrading vegetable farming. Fertilizers and pesticides also seem to be important, however, we cannot decide to which extent.

Even though there is difference in size and source, all households have sufficient availability of land and irrigation in order to adapt their farming practice, and seeds and seedlings have over the last decade been provided for free.

Further, the data on size of the households does not correlate with the factor showing whether a household have adapted. The road accessibility is equal among the investigated households, so this is also not an explanatory factor for difference.

There is an inequality among households in the financial tools they have available, which is the only strong explanatory 'tangible[66]' resource factor that can influence the inequality in effectiveness of adaptation found among the households. We can therefore conclude that some households may not have adapted their farming practice due to a lack of financial tools and financial strength which are important for start-up investments. However, the fact that seeds and seedlings have been provided for free by several NGO's makes this explanation a little less likely.

[65] Several households have on this basis experimented with different types of fruit trees and other crops.

[66] We acknowledge that a financial resource is not always tangible, but as argued above we have grouped it with the tangible resources anyhow.

Besides the explanations within the financial resource category, we do not find the difference in the availability of tangible resources to be the explanatory factor for the identified inequality in effectiveness of adaptation among the households. Therefore, before we can draw a final conclusion, we need to look into the explanatory strength found within distributions of human and social resources, and within local processes of power-sharing and sharing of information and knowledge which again should be combined with the possible impact from structural root-causes. This analysis is provided in the following, and last analysis section.

4.4. Fourth analytical section

The explanatory strength of adaptive capacity factors

In the former paragraph we identified that access to and control over tangible resources relevant for adaptation along with the size of the household could not alone explain, why some households have introduced or upgraded their farming of vegetables while others had not. In our ambition to explain this, we will in this paragraph investigate the explanatory strength found within difference in adaptive capacity.

Because adaptive capacity is a theoretical potential until it manifest in adaptation actions, we have, as earlier described, operationalized it to be reflected within social learning processes, i.e. power-sharing, sharing of knowledge and information, and experimentation and testing (Ensor, 2011). This is a methodological choice made in order to be able to measure and assess the adaptive capacity possessed by each household as something distinguishable from the aspect of availability of resources. However, we have chosen to analyse relevant aspects of social resources, e.g. relations, and of human resources, e.g. knowledge, in this section, because these resources are closely connected to the processes highlighted by Ensor as important for building adaptive capacity.

We interpret the action of introducing or upgrading vegetable farming as an expression of innovation, which is part of Ensor's three conditions for building adaptive capacity (Ensor, 2011). If the outcome of experimentation and testing improves the absorbing capacity in livelihood conditions, we consider it as an expression of adaptation. This is confirmed by our findings on the result of introducing vegetable farming in the study area. Ensor then reminds us that power-sharing and sharing of knowledge and information are preconditions for experimentation and testing. Thus, we will now look into these processes for explanations of the inequality of effectiveness of adaptation among the households. We have used eight factors relevant for the specific case of Bharlang and Beldanda to describe how the households are differently engaged and active in local power-sharing and in formal and informal knowledge-sharing.

It is important to mention that the five households of immigrants from Dhading district are excluded from the investigation of adaptive capacity within households. This is done because they already practiced vegetable farming at commercial scale when they moved into the area, and we cannot assess how much they have adapted within this practice since they came to Bharlang[67]. However, their presence and sharing of capacity will still be used as an important explanatory factor for the difference in adaptive capacity in respectively Bharlang and Beldanda.

The structure of the section
The following analytical section is structured in three sub-paragraphs. Before we show the findings from each household, we identify and validate the individual importance of each of the eight factors used as measures for adaptive capacity. The eight factors respectively derives from theoretical arguments and findings from the empirics. We found it necessary to present our rationales behind choosing these eight specific factors, because adaptive capacity is contextual. Secondly, we present a table with a score ranking based on each households' positions within the eight factors. In this second paragraph we also present the most significant trends within the distribution of factors between those having respectively a high and a low score in the adaptive capacity ranking.
Thirdly, we analyse what importance location and ethnic group has to the spreading of households on the score ranking.

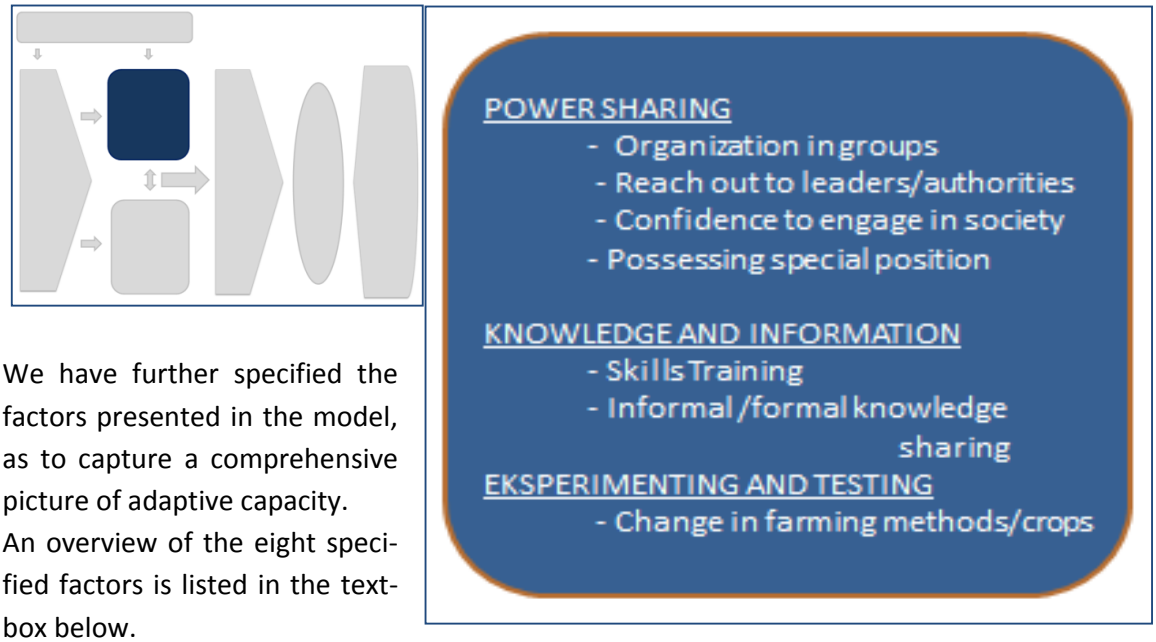
The explanations found from the score ranking gives, together with our qualitative knowledge on each household and their relations, some interesting conclusions, which we have compared to the households individual effectiveness in adaptation.

4.4.1. The contextual factors of adaptive capacity

As we have done throughout the report, we want to remind the reader, how adaptive capacity is only one aspect of what constitutes the total vulnerability of households. This is done in Figure 13: Adaptive capacity below.

[67] All five interviewed households with immigrants from Dhading lives in Bharlang.

Figure 13: Adaptive capacity



We have further specified the factors presented in the model, as to capture a comprehensive picture of adaptive capacity.
An overview of the eight specified factors is listed in the textbox below.

Specification of the eight factors on which we have measured adaptive capacity:

Factors representing power-sharing status:

- Do the household members reach out to leaders and authorities for support?
- Do the household members have confidence to raise their voice and participate actively in society?
- Do anyone from the household have a special position within regular groups, are they engaged in groups or committees close to the VDC, or are they a member in a Special Interest Group?

Factor representing engagement in networks where power is shared, and which are of specific importance for formal knowledge-sharing and training:

- Is anyone from the household a member in regular local groups?

Factors representing formal and informal sharing of knowledge and information/skills are:

- Do the household members have a general practice of sharing knowledge and problems with others?
- Have the household members changed farming practice based on informal knowledge-sharing?
- Have someone from the household taken training in vegetable growing or other farming skills?
- Have the household members changed farming practice based on trainings?

Below we argue for the contextual relevance of each factor.

4.4.1.1. The relevance of power-sharing

As power-sharing, according to Ensor, is a precondition for the other aspects of adaptive capacity, we start out by arguing for the contextual relevance of the below four factors:

- Do the household members reach out to leaders and authorities for support?
- Do the household members have confidence to raise their voice and participate actively in society?
- Does anyone from the household have a special position within the regular groups[68] or are they engaged in groups or committees close to the VDC, or are they a member in a Special Interest Group[69]?

Why is it important for adaptive capacity whether household members reach out to village leaders and authorities for support?

Inclusion in networks of power or access to actors with power is decisive for the access to flows of tangible resources, information and knowledge of importance to make change and decrease vulnerability (Ensor, 2011). As the local governance structure is not democratic in Kabilash VDC, and have not been for ten years, social services and support are often not distributed by standard procedures (Khadka, 2013; Dhungana, 2013). Therefore, it becomes important which alternative ways of access to power and support the households make use of. To understand this we elaborate shortly on the local governance structure.

Since the citizens have not had the opportunity to vote for political representation in the VDC for a decade, the Ministry of Local Development has appointed the officials at the top of the local power hierarchy. We call them VDC officials. There are three of these: the VDC secretary (comparable to a Danish mayor), the head of health and the head of agriculture (Khadka, 2013). They control the VDC budget and get advises from five local politicians. The politicians have no decision power, but can through argumentation try to influence the VDC officials. The VDC secretary describes the decision making process like this:

> *We can make decisions without advice of these political advisory bodies, but it is much easier to make decisions in their presence.* (Khadka, VDC secretary, 2013)

While the VDC officials takes the overall decisions about the distribution of the VDC budget, another body consisting of 22 members, the Integrated Planning Commission, have some influence over which development activities will be selected among the applications received from 'user groups' in Kabilash VDC (Ibid.). We have not been able to find out, exactly

[68] 'Regular groups' refers to the groups that are not exclusive in any way like the special interest groups. Regular groups are most often mothers/fathers groups (gender dependent) and saving and loan groups. Saving and loan groups are in practice often merged with mothers/fathers groups.

[69] Referring to women's- or school committees, an organization for squatters rights or political parties.

how the power is distributed between the VDC officials and the Integrated Planning Commission, but the VDC secretary here elaborates on the power relation:

> *"… 22 members (Integrated Planning Commission) have power to decide in any such developmental activities. However, mostly the decisions are made in meetings. There's no voting system but we convince people about our decisions in the meeting."*
> (Khadka, VDC secretary, 2013)

The VDC secretary further explains that he has chosen the 22 members (Khadka, 2013). This means that not only are the VDC officials, the ones with the most decisive political power, but the secretary has also appointed the rest of the official power holders. In practice the VDC officials have almost monopoly over the distribution of public support, and the democratic checks and balances are practically non-existent between the citizens and the VDC officials.

With such a democratic deficit, how can the citizens then reach out for support from power holders? There are 33 'user groups[70]' in the VDC, which can apply for support from the authorities. When the VDC receive such applications, the VDC officials together with the Integrated Planning Commission select among them and forward some of the requests to the District Development Committee (DDC) or (I)NGO's. The members of the 'user groups' are village leaders. They are supposed to represent their local village, but we have not been able to find out exactly how someone becomes a 'user group' member. There are different levels of village leaders, but it is our impression that the power structure is more or less complex with some sort of hierarchical structure and thus difficult to fully understand, also because the power structure probably is different from village to village.

The important finding from the case is that the citizens do not have any direct power over the local decision-making. What they can do is limited to convince the VDC officials, the political advisors, or, as most of our respondents who have tried to gain influence have done, speak to their local village leaders. The village leaders have a greater chance of influencing higher levels in the VDC. The most of the respondents did not consider themselves in a position to directly approach the VDC officials in case of problems or needs, but they perceived it more realistic that they could go to the village leaders and then hope, that these would represent their voice at higher levels. This is expressed by one of the citizens in Bharlang in the following sequence:

[70] There are 33 user groups in the whole VDC (Khadka, 2013). However, due to the confusion on number and responsibilities of different groups among the respondents, we could never be clear about how well citizens from respectively Bharlang and Beldanda where represented within user groups. The 33 user groups are distributed among 9 wards, where Bharlang belongs to ward 1 and Beldanda to ward 9 (Khadka, 2013 ; Tamang, 2013)

Q[71]: How do you consider the relation between the community you live in and the committees of VDC and DDC?

A: I don't think big persons will hear from us small people. If bigger people [people in higher positions] *from among ourselves go then VDC and DDC might hear them.*

Q: Do the VDC listen to the voice of this 'big' person; do they listen to what he brings?

A: About the issues brought by him, VDC may not ignore. They will see if the problem is big or not, weather the program is feasible or not.

(Bir Bahadur Gurung, local resident Bharlang, 2013)

The households can generally be divided into four groups as to how they consider their relation to authorities. There is one group of households that are closely engaged with village leaders and VDC, either because one of their members is a village leader, or because one or more of their members are represented in the Integrated Planning Commission. The second group are those who do actively approach leaders and authorities with their problems and needs. The third group consists of households having the attitude that politics and power are none of their business, and they prefer to solve as much as they can without involvement with leaders and authorities. However, this third group seems still to approach their village leaders now and then for counselling. The last fourth group do not believe that authorities will be responsive to them. This count for 17 households in the sample, but 6 among them, do still reach out for their village leaders, meaning that they do not believe that authorities will be directly responsive to them, but they still consider it worth to go through the village leaders. The lack of trust on responsiveness can either be based on experiences, but we also found some households where it rather seemed to be a question of self-perception. The respondents perceived themselves to be in a social position, which they thought the leaders and authorities would never pay attention to. This is an expression of the type of power, where Ensor suggests that people delimit themselves from acting due to a cultural belief that they are not able to act or change on a certain issue (Ensor, 2011).

One of the examples from the case that shows the importance of reaching out for leaders and authorities in order to get support for adaptation is that some households have received financial support to buy irrigation pipes, only by actively reaching out for leaders and the authorities.

Why is it important for adaptive capacity whether the household members have confidence to raise their voice and participate actively in society?

It is our qualitative based impression that the households where members are actively engaged in social forums and activities adapts more effectively than the households who do not engage much in the local society. Even though designed with a participatory approach,

[71] Q refers to the interviewer and A to the respondent.

the citizens have themselves needed to actively go out and participate in general assemblies, meetings and trainings in order to influence the planning and implementation procedures in projects, but also in order to extract benefits as for example knowledge from trainings. An example is that in Bharlang only the households that have contributed with labour in the process of building the irrigation tanks and channels became included in the irrigation user systems. Further we found that active engagement is needed in order to be a member and extract benefits from the groups.

Why is it important for adaptive capacity whether someone from the household is holding a special position within the regular groups, that they are engaged in VDC committees, or that they are a member of a Special Interest Group?

The simple argument for this is that those who are more engaged in networks of power or with close relationship to powerful actors have privileged access to decisions, resource flows, new information and exchange of knowledge (Ensor, 2011). This is Ensor's theoretical argument, but we found it to correspond well to the situation in the study area.

We found that the eight[72] households, which have members that are in a special position like chairperson or secretary, have members in a VDC committee or are involved in Special Interest Groups generally had better insight in rights and availability of resources and processes to access resources. Along with that, they did also, qua their positions, have easier access to reach out for support from leaders and authorities, and they have often been offered information and training through their position.

4.4.1.2 The relevance of engagement in groups

We have chosen to rank the specific adaptive capacity factor of being member in a local group as a hybrid category representing both processes of power-sharing and sharing of knowledge and information. Membership of groups mean that the household members are engaging in a formal network where power is shared, and an important function of the groups is, that they also are actively used as forums for sharing problems, experiences and to get access to new information.

Why is it important for adaptive capacity to be a member of a local group?

We have asked people what benefits they get from memberships in groups, and also asked those who are not members of groups for their reasons. Before elaborating on this, it is, however, important to know more about the context for and the local functions of the groups.

Due to the undemocratic governance structure in Kabilash VDC only appointed people or people with special positions, have access to forums were decisions about the local distribu-

[72] Of these eight only six are represented in table 9 below and in appendix 1, because the immigrants from Dhading from are not represented in that table.

tion of resources are taken. General assemblies are arranged in the study area, but these are not considered important forums for power-sharing by the common citizen. Parts of the strategic interventions by NGO's over the last ten years have therefore been to form groups and committees at local level (Bhandari, 2013). The formation of groups have been a strategic action by the NGO's with the aim of creating local, social forums for implementation of adaptation measures, for empowerment, awareness raising and with the hope to sustain project activities by creating local ownership (Bhandari, 2013 ; Ghimire, 2013, Rawal, 2013 ; Piya, 2013). Examples of local groups are mothers and fathers groups with saving and loan mechanisms[73], irrigation users groups and an irrigation committee network, agricultural co-operatives[74] and Community Forest User Groups (Khadka, 2013 ; Bhandari, 2013, 2013a).

We found that organization in groups is an important opportunity to strengthen adaptive capacity because of the following findings. Three quarters[75] of the household sample have memberships in local groups, and they are generally positive about being organized. Most respondents have been organized in groups for around 5-10 years. This indicates that people have taken ownership over the idea of meeting in formal forums. Some of the benefits that people experience by being organized are that they have learned the value of knowledge-sharing, and they see the groups as forums for learning new skills and as a place to discuss problems and get information. As described in the third analytical section above, the majority also use the saving mechanism within their group, and some of those who can afford it take loans for small investments. Some groups have micro-insurance schemes; others give loan to members in case of crisis. In this way, some of the groups also have a social security function.

Only a few respondents have the view that too much time is wasted in futile meetings, and although there have been economic mismanagement in a couple of groups, the general trend is, that the groups are functioning well.
Several respondents express, that after they became members in groups, they have become aware that speaking up and sharing one's opinion and knowledge is not only a privilege for leaders, but also for them. That said, the general picture is still, that people feel more com-

[73] Formation of new groups and committees every time an NGO entered the area with its project led in the end to confusion about the multiplying memberships that people were holding. Thus, recently all 'old' groups have been reorganized, but we were not able to find out how many groups of which kind there were in Bharlang and Beldanda. (Tamang, 2013).
[74] The agricultural cooperatives are not very well functioning due to the local respondents.
[75] Membership of Community Forest User groups is not counted in the adaptive capacity score, because it is a membership that every single household have to the Community Forest where their household belong. This membership means the households have certain rights to utilize the forests resources. Some of these members are engaged in meetings about the management of the forests, but most households only use the forests resources and participate in forest management activities when others initiate them. We have not been able to find out, which households which are more active than others in these groups.

fortable raising their voice to those, who they perceive as having the same or less knowledge than themselves.

The groups are both in Bharlang and Beldanda perceived as forums where you can bring your problems and learn, but many respondents mentioned the economic management opportunity, they get through the saving and loan mechanisms, as the main benefit from being organized. Practicing saving and loan in groups rather than in your individual house is a way of using power-sharing to increase the volume in this adaptive measure because the pooled resources give opportunities for bigger investments and shared interest rates for those, who only use the forum for saving.

Increased empowerment of women is another change that the power-sharing, which is generated by the organization of citizens in groups, have brought. There is a majority of mothers groups in the area, and in many of the interviewed households it was the women who were actively engaged in groups. This is one of the examples why we do not see huge difference in adaptive capacity between gender in the local case, but we should say that this is a case specific observation, as most literature suggest women to be more vulnerable than men in developing societies (Care, 2012 ; Ensor, 2011 ; IPCC, 2007).

The influence of the skills training that have been given in the area will be analysed below, but it should be mentioned, that many of these trainings have been provided through the groups, and this is an example on how power-sharing is a precondition for knowledge-sharing (Ensor, 2011).

The last power-sharing function of the groups is that households often make use of their group, when they want to go to higher more powerful individuals or groups with wishes and complains. In the groups the members sometimes discuss certain issues and sometimes they as a group present wishes and complains to village leaders or other more powerful individuals or groups. Thus, by being organized in a regular group a household's opportunity to influence the transferring of public resources to their local level is enhanced.
When groups get support granted from the authorities, the donor will be provided 75% of the resources and the user group have to supply the remaining 25% from internal resources. There is the possibility that the citizens can contribute the 25% in labour instead of money or materials. Key-informant Sher B. Tamang and the VDC secretary Khadka both express, that the community groups with more resources give more applications than those groups, where the members are poor and have little surplus in resources and energy (Tamang, 2013 ; Khadka 2013).

4.4.1.3. The relevance of formal and informal knowledge-sharing and skills training

Ensor along with others argues that due to the complexity of trends and impacts of climate change, communities need information from outside in order to grasp the complexity of risks and change and adapt to them (Care, 2012 ; Ensor, 2011). Other academics argue for a contrary epistemology. According to their understanding climate change does not happen locally before the impacts are felt and recognized as problems or incitements to change by local people themselves, meaning the problem does not arise in the local context just because science describes them to be there and deliver this information to the local level (Østergaard, 2012[76]). Based on our data, we tend to agree with Ensor. The history in Bharlang and Beldanda shows a process where the citizens felt change and disasters, but needed outside information in order to be convinced that they could stay in their villages and find ways to adapt instead of being resettled.

Even though we found outside information to be important for the capacity, which had been built internally, we also found, that some types of outside information seemed not to have taken root in practice. The example we found on this is, that even though project interventions had provided local weather stations and information on the relevance to use weather forecasts in agricultural planning, no one of the respondents reflected the idea that they could plan and act differently in their planning of agriculture in order to adapt to change in precipitation patterns. When asked if they discuss with their neighbours about lack of rainfall and whether they could plant with another timing to better match the rain, several people asked us: "*What to discuss, the rain will not come by discussion*". Even though they experience failed harvests due to untimely rain[77], all respondents still plant on dates according to tradition, and in general they do not trust weather forecasts from the radio. The small weather stations provided by one of the projects are not in use. Some people express though that they respond to lack of rainfall by putting more labour into the farming, and it seems like residents in Bharlang increases the use of the management system of water rotation when there is water scarcity.
We have not included the factor of planning agriculture based on tradition versus based on weather forecasts in the score on adaptive capacity, as no one planned according to weather forecasts.

Despite the above mentioned example, residents in the study area value the information and skills training they have got through project interventions, however, as Ensor points out, information first becomes valuable when turned into knowledge through experience (Ensor, 2011).

[76] Østergaard gives the example of some researchers within the anthropologic research program on climate change called 'Waterworlds' at Department of Anthropology, Copenhagen University (Waterworlds, homepage)
[77] The maize harvest has failed in 2011 and 2012 due to delay in the monsoon (information from respondents).

Even though they are often interrelated we will distinguish between 'formal knowledge-sharing' and 'informal knowledge-sharing'. Based on the local context of the case, we define *formal knowledge-sharing* as knowledge and information that is shared during general assemblies, announced meetings, trainings, exposure visits and knowledge and information shared when a group gathers*. Informal knowledge-sharing* is when people share knowledge when they meet informally, when people observe others practice and learn from that, and when people approach others actively to learn from their experiences.

To validate the role information (including skills training) and knowledge-sharing have had on the households' adaptive capacity, we have identified four factors of importance to be measured on the following parameters:

- Do the household members have a general practice of sharing knowledge and problems with others?
- Have the household members changed farming practice based on informal knowledge-sharing?
- Have someone from the household taken training in vegetable growing or other farming skills?
- Have the household members changed farming practice based on trainings?

Why is it important for adaptive capacity to share knowledge and problems with others?
Inspired by Ensor's arguments we asked our respondents if they in their household had a practice of sharing knowledge and problems with others, and whom they have practices of informal knowledge-sharing with. We found a clear tendency that those who did not share knowledge and problems outside the household or only with households where their relatives live, are also having relatively poor living conditions. Beside the theoretical argument, this is the main reason for including general knowledge-sharing as one of the contextual factors in the score.

Why is it important for adaptive capacity whether household members have informal knowledge-sharing on farming practices?
Among those households that were having an active practice of informal knowledge-sharing, we found that many had learned how to grow vegetables by observing and sharing knowledge with others and not from skills trainings. This is why we have designed one of the eight indicators to contain this practise of knowledge-sharing on agricultural subjects. The households that have shared such knowledge have also put new agricultural practises into use because of this exchange of farming knowledge. When talking to the respondents about what had made them capable of changing farming practices, techniques or crops, we were surprised that 17 of the 32 households mentioned that looking at others practice, and sharing knowledge with them had been an important way to gain the knowledge needed (please

refer to appendix 1). Those households which have learned new practices by knowledge-sharing, but only implemented it in their rain-fed farming of for example maize and millet in other seasons than the winter season, are also included in this trend. This means that they have changed farming practice, but not farming practises on winter vegetable cultivation, which is why they are not represented in table 8 over households which have adapted in the sense of having introduced or upgraded production of vegetables. However, they have still got the positive score on the specific adaptive capacity factor; showing that they use informal knowledge-sharing as a way to improve their farming practice (please refer to appendix 1).

Why is it important for adaptive capacity whether someone from the household has taken training in vegetable growing or other farming skills?

An important part of the strategic interventions by the projects have been to offer skills training in farming related practices (Bhandari, 2013 ; Ghimire, 2013, Rawal, 2013 ; Piya, 2013). The skill trainings have been provided in different venues. Some went outside the study area to specialized training venues, others learned it from teachers coming directly to their field, and some went to others fields in the study area. All respondents who have applied the training they got in vegetable farming (only two households have got vegetable training without applying it in practice), expresses that they found it easy to apply theory into practice. This is said with no difference depending on training venue. This indicates that training has been given by methods easy to understand for both literate and illiterate, which is also confirmed by some respondents.

As expressed in the quote below, some of the respondents who have taken farming related training express that the training was crucial for them in being able to cultivate their lands, which they considered an important improvement compared to their forefathers who did not cultivate.

Q: Have you benefited by the training provided by FORWARD and any other organizations?
A: Yes, certainly. Our forefathers did not know how to grow tomatoes and other crops. They used to survive on local fruits and nuts found in the forest but now the conditions are changed. There have been some changes that can be felt. When I was child I remember we did not have anything to eat. But now the conditions are better."

(Dil Bahadur Chepang, local resident in Bharlang, 2013)

Others acknowledge training as the factor that made them able to scale up and make their production volume high enough for commercial production.

Those who have got training acknowledge it as important for their change in practice, and many of those who had not got farming related training mentioned that they would like to learn farming and especially vegetable growing skills. This is the reason why we have chosen the factor whether household members have taken training or not, as one among the eight indicators of adaptive capacity.

Why is it important for adaptive capacity whether the household members have changed farming practice based on trainings?

As will be elaborated in the analyses of findings in the adaptive capacity score, we found that some households had got farming skills training without implementing it in practice, but what is also important is that some respondents expressed that while training had been important for them in order to change farming practice or crops, the informal knowledge-sharing had been even more important. We found that there were some interesting patterns to explore as to understand for whom training had been the most important factor for being able to change practice and for whom informal knowledge-sharing had been the most important factor. Some respondents expressed that both had been of equal importance for them, and this is why we have identified both factors to be important to include in the score.

4.4.2. Score of adaptive capacity

We could not, based on the interviews and observations, establish some of the eight above-mentioned factors to be more important than others. Consequently we have ranked the factors equally in the score. The households have got a score on each factor; please refer to appendix 1 for the total picture of trends.

The scores are defined in a way that getting the score 1 represents that the household has gained less adaptive capacity on this factor, e.g. no membership of groups, and 2 is representing that the household has gained more adaptive capacity, e.g. holding one or more memberships. The reason why we write 'less adaptive capacity' and 'more adaptive capacity' instead of 'have adaptive capacity' and 'do not have adaptive capacity' is that adaptive capacity cannot be measured directly, so we have looked at processes and relationships which are likely to have increased the adaptive capacity among those who engage in them. In this way 8 is the score obtained by the households with lowest adaptive capacity within the sample and 16 is obtained by those households having the highest adaptive capacity.

This gives us a picture where we have been able to evaluate a matrix with information of respectively: i) relative levels of adaptive capacity among the households, and how it is distributed over the different adaptive capacity factors; ii) a view on the households relative distribution on whether they have adapted; iii) whether they live in Bharlang or Beldanda and iv) what ethnicity they have. We will unfold the interesting points related to the distribution of trends in the matrix in the analysis below.

For the sake of giving a simple overview, table 9 presented below, does only show respectively whether the household has adapted, their location, their ethnicity, their total score on adaptive capacity, and in the last row, the way we have grouped them to analyse trends[78].

[78] We want to remind the reader that the five households with immigrants from Dhading are not represented in table 9, since they already had a practice of growing vegetables on commercial scale when they immigrated, and we have not been able to evaluate how their adaptive capacity have resulted in a change in farming practice.

Table 9: Adaptive capacity score among the households[79]

Person representing the HH	Location	Ethnicity	Total score	Reasons for grouping
Shanta B. Chepang	Beldanda	Chepang	8	**Group A:** Common for group A is that none of the households have introduced vegetable farming, and they have low adaptive capacity.
Mamata Chepang	Bharlang	Chepang	8	
Kali M. Chepang	Bharlang	Chepang	8	
Grandmom Chepang	Bharlang	Chepang	8	
Suk B. Chepang	Beldanda	Chepang	9	
Jiwan P. Chepang	Beldanda	Chepang	10	
Gore M. Chepang	Beldanda	Chepang	10	
Punte P. Chepang	Beldanda	Chepang	10	
Ganesh B. Tamang	Bharlang	Tamang	10	
Indra K. Chepang.	Bharlang	Chepang	11	**Group B:** Within group B there are som interesting findings on why some have introduced or upgraded vegetable farming and others have not, even though they have the same levels of adaptive capacity.
Omlal Shrestha	Bharlang	Newar	11	
Shanti Chepang.	Beldanda	Chepang	12	
Santa B. Chepang	Beldanda	Chepang	12	
Mahendra N. Shrestha	Bharlang	Newar	12	
Bishnu M. Chepang	Beldanda	Chepang	13	
Aaiti M. Tamang	Bharlang	Tamang	13	
Bir B.Gurung	Bharlang	Gurung	13	
Saman Chepang	Bharlang	Chepang	13	
Raj K. Chepang	Beldanda	Chepang	14	
Yub R. Chepang	Beldanda	Chepang	14	**Group C:** Group C is a rather mixed group, because there are different explanatory reasons why the respondents have this relatively high adaptive capacity and have all upgraded or introduced vegetable farming.
ABir B. Gurung	Bharlang	Gurung	14	
Chitra B. Gurung	Bharlang	Gurung	14	
Santa M. Gurung	Bharlang	Gurung	15	
Mankumari Chepang	Bharlang	Chepang	15	
Hari Maya Baral	Bharlang	Magar	15	
Surja Gurung	Bharlang	Gurung	15	
Gori M. Gurung	Bharlang	Gurung	15	
Ban B. Chepang	Beldanda	Chepang	15	**Group D:** Within group D the households have a priviledged power position and do all have high levels of adaptive capacity**.**
Dil B.Chepang	Bharlang	Chepang	15	
Man B. Gurung	Bharlang	Gurung	15	
Uma D. Poudel	Bharlang	Bhrahmin	16	
Sabita Lamichhane	Bharlang	Bhrahmin	16	

(Table based on data from our household sample)

[79] Please refer to appendix 1 to see the background for each total score.

How to interpret the colours in table 9				
Have adapted	Have *not* adapted	Resident in Beldanda	Resident in Bharlang	Being Chepang

4.4.2.1 General trends

Let us initiate by taking a look at the general trends in the table, and how we can see some preliminary patterns of interest. The first thing is that those who have upgraded or introduced vegetables do generally have a higher adaptive capacity score than those who have not. This confirms the theory and our observations, and is not a big surprise. Therefore it is of greater interest to understand the internal dynamics making the households distribute the way they do on adaptive capacity. We can also see that only two households from Beldanda have adapted in terms of upgrading or introducing vegetable farming in the winter, and that the Chepangs are generally having lower adaptive capacity than the other ethnicities. Explanations related to location and ethnicity will therefore be analysed separately below in paragraph 4.4.3.1. and 4.4.3.2.

To analyse the general trends of interest, we have grouped the households into four groups, i.e. A, B, C and D. These groupings are based on the total picture of the scores among the eight factors shown in appendix 1.

Table 10: Trends within group A

Household representative	Location	Ethnicity	Membership of group	Taken training	Learned farming practises from training*	Learned farming practises from knowledge-sharing*	Practice general knowledge sharing	Reach out to leaders/ authorities	Raise voice, participate in society	Special position	Total score
Shanta Chepang	Beldanda	Chepang	1	1	1	1	1	1	1	1	8
Mamata Chepang	Bharlang	Chepang	1	1	1	1	1	1	1	1	8
Kali M. Chepang	Bharlang	Chepang	1	1	1	1	1	1	1	1	8
Grandm. Chepang	Bharlang	Chepang	1	1	1	1	1	1	1	1	8
Suk B. Chepang	Beldanda	Chepang	1	1	1	1	2	1	1	1	9
Jiwan P. Chepang	Beldanda	Chepang	1	1	1	1	2	2	1	1	10
Gore M. Chepang	Beldanda	Chepang	1	1	1	2	2	1	1	1	10
Punte P. Chepang	Beldanda	Chepang	2	1	1	1	2	1	1	1	10
Ganesh Tamang	Bharlang	Tamang	2	2	1	1	1	1	1	1	10

Explanation: 1 = less adaptive capacity ; 2 = more adaptive capacity. * = have taken new farming practises into use.

Group **A** consists of the nine households from the sample having the lowest levels of adaptive capacity. None of them has introduced production of winter crops, i.e. vegetables. Common for this group of households is, that they are not engaged in relations of power-sharing, except for two households who are organized in local groups. None of them are holding positions close to powerful agents. This means that these households have difficulties to generate adaptive capacity through networks, where support and knowledge are

channelled or exchanged. It seemed to us that this group had a common feeling of not being able to shape change in their living conditions themselves, meaning they felt powerless. Some of them had a recipient attitude, where others expressed that they felt lack of energy and power to create changes in their living conditions, and that this was the reason why they have not improved their farming. Only one household in group A has taken training, though without using it, and although four households have a practice of sharing their problems with others (reflected under 'knowledge-sharing'), only one have learned and used farming related knowledge through knowledge-sharing. For a number of reasons, the households in group A do not participate actively in their societies, and their awareness on local issues is very low.

All households of group A belong to the Chepang, except for one, whereas they are distributed between both Bharlang and Beldanda.

Table 11: Trends within group B

Household representative	Location	Ethnicity	Membership of group	Taken training	Learned farming practises from training*	Learned farming practises from knowledge-sharing*	Practice general knowledge sharing	Reach out to leaders/ authorities	Raise voice, participate in society	Special position	Total score
Indra K. Chepang	Bharlang	Chepang	2	2	2	1	1	1	1	1	11
Omlal Shrestha	Bharlang	Newar	2	1	1	2	2	1	1	1	11
Shanti Chepang	Beldanda	Chepang	1	1	1	2	2	2	2	1	12
Santa B. Chepang	Beldanda	Chepang	2	1	1	1	2	2	2	1	12
Mahendra Shrestha	Bharlang	Newar	2	1	1	2	2	2	1	1	12
Bishnu M. Chepang	Beldanda	Chepang	2	1	1	2	2	2	2	1	13
Aaiti M. Tamang	Bharlang	Tamang	2	1	1	2	2	2	2	1	13
Bir B.Gurung	Bharlang	Gurung	2	1	1	2	2	2	2	1	13
Saman Chepang	Bharlang	Chepang	2	2	2	1	2	1	2	1	13
Raj K. Chepang	Beldanda	Chepang	2	2	1	2	2	2	2	1	14

Explanation: 1 = less adaptive capacity ; 2 = more adaptive capacity. * = have taken new farming practises into use.

The ten households of group **B** have adaptive capacity scores ranging from medium-low to medium-high in the total sample. These ten households are of special interest because some of the households, who have adapted in terms of upgrading or introducing vegetable farming, have a *lower* adaptive capacity score, than others who have not introduced vegetable farming in the winter period.

Common for the households of group B is that they are all, except for one, members of formal groups, but none of them has special positions of power. It is interesting that the four households that have not introduced vegetable farming actually reach out for leaders and authorities, as well as participate actively in the society, whereas some of those who have adapted do not. This suggest that reaching out to power holders and raising one's voice do not seem to be as important as other adaptive capacity factors in terms of whether an household starts to cultivate vegetables in the winter. Knowledge-sharing and training on

farming practices have raised the vegetable growing households' adaptive capacity, however we hold that the major explanatory factor leading these households to grow vegetables, is their location.

All the five households of group B, which have upgraded or introduced vegetable farming, live in Bharlang, whereas the four that have not, all live in Beldanda. The importance of which village the households belong to will be analysed in the paragraph below. We suggest that the four households of group B, which have not introduced vegetable farming yet, do not necessarily lack the adaptive capacity needed to do so. Two of them have planned to start production next winter, and one of them is using a migrant strategy to upgrade the household income and therefore does the not have enough manpower in the household to cultivate the winter farming. The last household, which has not adapted, has a relatively good income from practicing mantras believed by others to have a magic impact.

Table 12: Trends within group C

Household representative	Location	Ethnicity	Membership of group	Taken training	Learned farming practises from training*	Learned farming practises from knowledge-sharing*	Practice general knowledge-sharing	Reach out to leaders/ authorities	Raise voice, participate in society	Special position	Total score
Yub R. Chepang	Beldanda	Chepang	2	2	2	1	2	2	2	1	14
ABir B. Gurung	Bharlang	Gurung	2	2	2	2	2	2	1	1	14
Chitra B. Gurung	Bharlang	Gurung	2	1	1	2	2	2	2	2	14
Santa M. Gurung	Bharlang	Gurung	2	2	2	2	2	2	2	1	15
Mankumari Chepang	Bharlang	Chepang	2	2	2	2	2	2	2	1	15
Hari Maya Baral, B	Bharlang	Magar	2	2	2	2	2	2	2	1	15
Surja Gurung	Bharlang	Gurung	2	2	2	2	2	2	2	1	15
Gori M. Gurung	Bharlang	Gurung	2	2	2	2	2	2	2	1	15

Explanation: 1 = less adaptive capacity; 2 = more adaptive capacity. * = Have taken new farming practises into use.

Common for all households within group **C** is, that they have upgraded or introduced vegetable farming in the dry winter months. They do all have a relatively high score of adaptive capacity, just as they are all organized within formal groups. They all reach out for support from leaders and authorities and, except for one though, engage actively within their society. The most remarkable difference between the households in group B and those in group C is, that all households in group C, except for one, have undergone farming-related training, just as six households in group C have used both training and informal knowledge-sharing as a strategy for building adaptive capacity. One household of group C has changed agricultural practice based only on the capacity gained through informal knowledge-sharing, whereas one other household state that training has given them capacity to change practise. This

latter household is the only from Beldanda within group C, whereas the rest lives in Bharlang.

Table 13: Trends within group D

Household representative	Location	Ethnicity	Member-ship of group	Taken train-ing	Learned farming practi-ses from train-ing*	Learned farming practises from knowledg e-sharing*	Practice general knowled-ge sharing	Reach out to leaders/ authori-ties	Raise voice, particip a-te in society	Spe-cial posi-tion	Total score
Ban B. Chepang, Be	Beldanda	Chepang	2	2	2	1	2	2	2	2	15
Dil B.Chepang	Bharlang	Chepang	2	2	2	1	2	2	2	2	15
Man B. Gurung	Bharlang	Gurung	2	2	2	1	2	2	2	2	15
Uma D. Poudel	Bharlang	Bhrahmin	2	2	2	2	2	2	2	2	16
Sabita Lamichhane	Bharlang	Bhrahmin	2	2	2	2	2	2	2	2	16

Explanation: 1 = less adaptive capacity; 2 = more adaptive capacity. * = Have taken new farming practises into use.

All five households within group **D** have adapted by upgrading or introducing vegetable farming, and they are having the highest scores on adaptive capacity among the sample. The main difference between this group and the other groups is that all the households in group D have special positions, meaning that they are engaged in closer relationships with power and information, or they have easier access to actors with power, e.g. VDC officials, than the rest of the households in the sample[80]. Our qualitative impression from interviews with group D households is that they all have members with some sort of status as village leaders or they have close relations with leaders and authorities. Examples hereof, are Dil B. Chepang from Bharlang and Ban B. Chepang from Beldanda. They are both unofficial leaders of the Chepang communities in their respective villages. Besides, they are also members of Special Interest- and privileged groups through which they have undergone extensive training. Both of them are well informed about local processes of governance and distribution of resources and information (Ban Bahadur Chepang, local resident in Beldanda, 2013 and Dil Bahadur Chepang, local resident in Bharlang, 2013).

Summing up, the households that have started growing vegetables in the winter or have upgraded their production have a higher adaptive capacity than households, which have not done so. None of the eight indicators for this assessment has a decisive impact in itself, thus all the eight indicators contribute to the indicated trend. However, the power-sharing indicators follow the trend more closely than the other indicators.
Even though power-sharing at first did not seem to be the factor of greatest importance, when only investigating internal trends within group B, the trend was different when we

[80] Several of the immigrants from Dhading are also holding special positions, but, as argued above, they are not represented under the sample in which adaptive capacity is measured.

looked at the full picture. We see that those households engaged in power-sharing relations and actions, generally are those who have adapted within the last ten years. Furthermore, those who engage actively in power-sharing do also more often exchange farming related knowledge and have more often undergone farming related training. Both the knowledge that households have gained from knowledge-sharing and training has generally helped the vegetable growing households to cultivate vegetables or upgrade their production of vegetables.
Thus, concluding that Ensor's theory about power-sharing being a precondition for sharing of knowledge and information, and then these factors being the preconditions for experimentation and testing, that is adapting, resembles the progressivity of adaptive capacity building that applies to the case of Bharlang and Beldanda.

4.4.3. Explanations behinds the identified trends

We have now identified that active engagement in relations of power- and knowledge-sharing together with knowledge from training has been the important difference between the households who have adapted in their farming practice and those which have not. But why have some households been able to build and use relatively more adaptive capacity than others? To understand this, we will look into the relevance of the total level of shared adaptive capacity in the social relations each household engage in. These social relations are identified by location, and the root-cause of ethnic marginalization. However, we also found, that there are some deviations from the explanations that can be given in terms of root-causes and relations. The households representing the deviations are interesting, because they are examples of how the actor's own ability to adapt seems stronger than the structural conditions he or she lives under.

4.4.3.1 Location - the importance of capacity within relations

In this paragraph we will for a moment leave the idea of measuring adaptive capacity within a household, and instead let the villages of Bharlang and Beldanda represent two units in form of social relationships. This is done in order to analyse what the level of shared adaptive capacity in social relationship means to the individual household's effectiveness in adapting.
We see, that only two out of eleven households from Beldanda have adapted in form of introducing vegetable farming in the winter, whereas seventeen out of twenty-one in Bharlang have adapted over the last ten years. Even though the sample from Beldanda is smaller than the one from Bharlang, there is a distinct difference. The adaptive capacity scores among the households in Beldanda are also relatively lower than those among households in Bharlang. Why do we find this difference, despite the fact that the villages are located in close vicinity of each other, and despite the fact that the project interventions have covered both villages, just as they are under the same governance structure in the same VDC?

The first reason we present is that there has been, and still is, a higher amount of information and knowledge regarding vegetable cultivation within Bharlang than within Beldanda. The second reason is that where information and knowledge are distributed and extended quite effectively through knowledge-sharing internally in Bharlang, there was no sharing of information and knowledge on vegetable cultivation in Beldanda. The third reason we found present, is that power and knowledge is whatsoever not shared between Bharlang and Beldanda.

Difference in the internal amount of information and knowledge between Bharlang and Beldanda

That the adaptive capacity in form of relevant knowledge and information is considerably higher in Bharlang than in Beldanda can be explained with two reasons. The first one is that fifteen households in the sample from Bharlang[81] have undergone farming-related training compared to only three households in Beldanda. The second important factor is that the migrants from Dhading brought significant information and knowledge on growing vegetables at a commercial scale into Bharlang, when they immigrated 10-26 years ago. No one from Dhading has moved into Beldanda.

We have not been able to identify why only three households in Beldanda have undergone training. A couple of key-respondents accentuated that it has been difficult to get citizens from Beldanda to attend training after the practice of giving allowances has been quit (Tamang, 2013 ; Bhandari, 2013a). Although only three citizens in Beldanda have undergone training in vegetable cultivation, their knowledge on vegetable production in the winter seemed to be the only knowledge on this practise in Beldanda. We did not find evidence that anyone with knowledge on vegetable cultivation had immigrated to the village.

Beside knowledge and information, traditions and lack of time and surplus in economic resources is also mentioned as rationales for not adapting among households in Beldanda. Several residents argued that a reason why so few produces vegetable in the winter had do with a lack of tradition for this kind of cultivation, and beside this, they pointed out, it was too risky to invest too much *time* and money into vegetable cultivation.

The unofficial leader of Beldanda, Ban Bahadur Chepang, told us that the households, which do not cultivate vegetables, are engaged in selling firewood or carry out daily wage labour to get food each day. According to him, these households cannot wait weeks or months for vegetables to grow, spending time in their own fields, because they need to make an earning to get food each day while the crops grow (Ban Bahadur Chepang, local resident in Beldanda,

[81] We have interviewed all households except one in Beldanda, but in Bharlang, which is a relatively bigger settlement, we have interviewed a little less than half of the total number of households.

2013). This is a possible explanation for the inequality in effectiveness of adaptation among the households in the study area.

The immigrants from Dhading were the ones who first brought knowledge of commercial scale vegetable farming into Bharlang, and they have had an impact on other households upgrading or introducing vegetable farming. Many in Bharlang state that informal knowledge-sharing with people who already grow vegetables, has been the most important strategy for them in order to build the capacity needed for vegetable farming. We also see that some have built their capacity from training and informal knowledge-sharing combined. As will be elaborated below, respondents do not agree as to which of these two factors that have been the most important for their ability to grow vegetables. However, the respondents highlight that inspiration from the immigrants from Dhading has been an eye-opener for the unexploited potential of growing vegetable on commercial scale in Bharlang. Thus, the project-based training and irrigation infrastructures provided through NGO's have been a support to display a potential that was not recognized locally.

Difference in strength of relations for distribution and extension of information and knowledge in Bharlang and Beldanda

As argued above, informal knowledge-sharing has played an important role in the distribution and extension of information and knowledge, which have made citizens in Bharlang able to adapt. Thus, the overall picture seems to be that there are more households in Bharlang, which have gained information and knowledge on vegetable farming either from the Dhading immigrants or through training, which they have undergone with their neighbours (except for the Chepangs, which will be elaborated below), than there is in Beldanda. In Beldanda, only one household told us that they in general do not share knowledge with others in Beldanda, but when it comes to sharing agricultural knowledge the picture is quite different. Only four households did share agricultural knowledge with their fellow villagers and none of them grows vegetables in the winter, so knowledge about vegetable production in the winter is not shared among the households in Beldanda. A reason why they are better at sharing knowledge and learning from each other in Bharlang, could be, that the general level of education is higher in Bharlang than in Beldanda (Rimal, 2011). However, we cannot validate this based on our own data.

Lack of relations for distribution of information and knowledge between Bharlang and Beldanda

Because the two villages are located closely to each other and have been covered by the same project interventions, we found it obvious that they had built some relations and shared capacity in terms of knowledge. However this was not the case, as there was no knowledge-sharing between the villagers of Bharlang and the villagers of Beldanda. The lack of relations and knowledge-sharing between the two villages means that the information

and knowledge, which is shared and extended effectively in Bharlang, do not reach Beldanda. An obvious example of this is the fact that those two households in Beldanda, which have started growing vegetables in the winter, have only increased their capacity from training and not from informal knowledge-sharing.

Why is the knowledge boundary so strict between Bharlang and Beldanda?
We have to look into different dimensions of this question. For some of the households in Beldanda, it seems like self-perception and confidence is what keeps them from seeking advice from Bharlang. They express, that they are unsure whether the citizens of Bharlang will be willing to share knowledge with them. The general trend in Beldanda is that people do not find it obvious to approach Bharlang or other villages for support. One respondent from Beldanda described that the village has historically been like the 'blind man' of the area:

"Q: Do anyone of your house go to other communities or lower sides of Beldanda and share your and their knowledge?
Jiwan: No there's no such sharing.
Q: Why not?
Jiwan : Well, I'm not sure about today's context but at past we had no such sharing. This village was just like a blind man and had no any idea of what to do and what not to do. They just knew to eat at the night time. They just think of working in the day and preparing meal in the evening. They don't have any other thinking rather than collecting food stuffs. However, now Ban Bahadur[82] is doing some tomato plantation."
(Jiwan Praja Chepang, local resident in Beldanda, 2013)

This quote is a description of a whole community with low confidence and low awareness, but the last sentence does also reveal that there is a feeling of gaining more capacity than earlier. Although they do not share knowledge with the citizens of Bharlang, many respondents from Beldanda are having an accentuated impression of change. Here explained by Suk Bahadur Chepang:

"*At past, we thought we have no any things to share. So we didn't share our ideas. But now within our community, culture of sharing is increasing and we've started to share our knowledge. But this provision is limited within our community not within different communities"*
(Suk B. Chepang, local resident in Beldanda, 2013)

When we crossed the river and went for interviews with households in Bharlang, we asked them why they, on their side, did not share knowledge with citizens in Beldanda? They explained that they live in another ward[83] than Beldanda. Their immediate explanation was

[82]Ban Bahadur Chepang is the unofficial village leader in Beldanda and member of one out of the two households that grow vegetables in the winter in Beldanda.
[83] Bharlang is located in ward 1, and Beldanda in ward 9 within Kabilash VDC.

thus based on the logic of geographic boundaries. However, the interviews did also reveal many ethnic based prejudices about people living in Beldanda, and as will be addressed below, we find, that marginalization is a likely reason for the strict boundary of sharing capacity between Bharlang and Beldanda.
Bhandari, the project manager from Practical Action who has been intensively involved in the area for many years, believes, that the reason why Bharlang citizens does not share knowledge with Beldanda citizens is, that they are dependent on the daily wage labour, they can buy from Beldanda. Bhandari expresses it this way:

> *...the neighbouring communities are not worried about it (*ed. the vulnerability of citizens in Beldanda*) because they are earning out of their drudgeries; they're getting farm labour from those communities.* (Bhandari, 2013a)

This is a likely explanation because many households in Bharlang can live only from their farming, while all except for one household in Beldanda have to supplement their farming with daily wage labour, most often in others fields. However, we do not have data to triangulate whether this interpretation is reflected among the citizens themselves.

4.4.3.2 Ethnic marginalization as a barrier for building adaptive capacity

As mentioned in the analysis above, we have seen some trends indicating that ethnic marginalization do play a role and can be perceived as a root-cause explanation, conferring to the theoretical idea by Blaikie et al. (2003). It is outstanding, that twelve out of a total of thirteen households in the sample, who have not adapted by introducing vegetable production in the winter months, are from the ethnic group called Chepangs. Including the Chepang households who have adapted, the Chepangs are distributed throughout the table of adaptive capacity score, but with a weight in the low end of the scale (please refer to table 9 above).

As mentioned in the paragraph on ethnic marginalization as a root-cause in the first analytical section, Chepangs are considered the most marginalized group among the different ethnic groups who live in the area. This national based description confirms our impressions from the interviews. Some Chepangs themselves express in different ways that they feel discriminated or marginalized by other groups in the area. When we asked respondents from other ethnic groups, why Chepang households in Bharlang and in Beldanda had not utilized the irrigation facilities and introduced farming of vegetables, the common answer was that being a Chepang means per se being lazy and 'backward'.
Also internally among the Chepang households from Bharlang and those from Beldanda, we found prejudices. When we asked in the Chepang community in Bharlang, we found that they, like all other citizens in Bharlang, do not share knowledge with Chepangs in Beldanda. We were not able to identify, whether there were any conflicts between the two separate

Chepang communities, but Dil Bahadur Chepang, who is Chepang village leader in Bharlang, had the opinion, that Chepangs in Beldanda and Bharlang have different mentalities. He believes that Chepangs in Bharlang are open minded and 'forward' contrary to a 'backward' mentality in Beldanda (Dil Bahadur Chepang, local resident in Bharlang, 2013). In this sense, all citizens, no matter if they are from Chepang or other ethnic groups of Bharlang, have more or less same prejudices, about people living in Beldanda. On the other hand, several of the Chepang households in Bharlang, do also feel marginalized by other ethnic groups within their own village.

We found generally two ways the marginalization became a barrier for Chepang households as to perceive themselves as able to shape change in their conditions, i.e. adapt. One group perceived themselves powerless and less knowledgeable than others. As an example, they would state that they did not organize in groups, because they are illiterate or believed that they would not be able to contribute. They expressed that their experience of being poor and/or out of surplus energy, made it more difficult for them to shape change in their own conditions, but also to act as a fellowship, e.g. help others in their fields in situations of crisis or pressure. This group of households seems to have internalized their marginalized position in their self-perception.
The second group instead had a recipient attitude in the sense that they blamed everyone else for their living conditions and expected outsiders to bring change. This tendency was found within the only four Chepang households in Bharlang which had not adapted. The same four households do not have any practice of formal or informal knowledge-sharing. Our impression is that these households are, for some reason, excluding themselves by having a recipient attitude, which means that they do not perceive themselves as holding responsibility of acting and changing their conditions.

We find that these two different attitudes among some Chepang households can be part of the explanation, why they have not adapted, because the processes of building irrigation facilities, building relationships and sharing knowledge all have required active engagement from the citizens themselves. Those who do not engage have thus not been able to benefit from these processes.

The third group of Chepangs, includes six out of eighteen Chepang households in the total sample. They do not seem to be limited by the structural root-cause of ethnic marginalization, and this is a contradiction to the argument that the structural root-cause of ethnic marginalisation is hindering Chepangs in adapting. Instead, they are satisfied by their introduction of vegetable farming, and some are eager to start producing from next year. Even though they seemed powerful in taking action and changing their living conditions, they are still to some extend limited by the relationships they are part of, qua their village. The example for this is, what we have already described above, that the Chepangs in Bharlang, who

have adapted, have been able to create an income from their vegetable cultivation in the winter, which is not the case yet for the Chepangs, who have adapted within Beldanda. It seems that a lack of relationships with experienced vegetable farmers and farmers, who have a commercial business, is part of the explanation. Another reason can be that the quantity that the two households produce is not big enough for selling. Again we find that Ensor's point about extending relations where power and knowledge can be shared is essential to build adaptive capacity.

An interesting finding about the Chepang households, that do cultivate vegetables, is that only one out of six has been able to start cultivating vegetables because of knowledge-sharing. The other five households have only become able to cultivate vegetables by undergoing skills training (see appendix 1). In the above, we have pointed out that there was no knowledge-sharing in Beldanda on vegetable cultivation, but this point is not only linked to the household's location but also to ethnicity. There is consequently almost no knowledge-sharing between Chepangs and other ethnic groups in the study area concerning vegetable production, which can be an explanation for the inequality in effectiveness of adaptation among households in the study area.

4.4.4. Sub-conclusion

From the above analysis on the importance of adaptive capacity, we found that the level of adaptive capacity within a household can be linked to the effectiveness of adaptation. The households, which are relatively more engaged in power-sharing relations, are generally those which have adapted within the last ten years. These households do also more often exchange agricultural related knowledge and have more often undergone farming related training. Both the knowledge that households have gained from training and through informal knowledge-sharing has helped the adapted households to introduce or upgrade their production of vegetables.

Both the knowledge possessed on vegetable cultivation, and the distribution and extension of this knowledge is greater and more intensive in Bharlang than in Beldanda. There are several reasons for this. First of all more households in Bharlang have undergone agricultural training, second people with knowledge about vegetable growth have immigrated to Bharlang, while only three residents in Belanda have perceived knowledge on vegetable cultivation, all of them through agricultural training. Third, there is a widespread informal knowledge-sharing in Bharlang, among households which are not Chepangs, while there is no knowledge-sharing on vegetable cultivation in Beldanda.
Lack of relations, which can generate informal knowledge-sharing, along with dependency patterns are explanations why adaptive capacity is not distributed and extended from Bharlang to Beldanda.

Almost all households that do not cultivate vegetables are from the ethnic group Chepang, and this has partly to do with the ethnic based marginalisation, which is found in the study area. Other ethnic groups perceive the Chepangs as lazy, and explain that laziness is a part of the reason, why Chepangs are 'backwards' compared to them. Thus there is a stereotypical picture of what it means to be Chepang, and this notion is also reflected in the way some of the Chepangs see themselves They have low self-confidence, expressed in the ways they do not think they themselves can actively change their situation to the better. The Chepang households that have adapted contradict this notion, and we see that training has been the key, which have enabled them to cultivate vegetables. Informal knowledge-sharing between Chepangs and other ethnic groups is almost non-existent.

We do see that engagement in relationships with access to power and/or knowledge is a precondition for effectiveness of adaptation. This can either be acquired through power and knowledge-sharing in formal groups, where training has often been an important factor, or by informal knowledge-sharing, where the strength of relationships between those who have knowledge and those who want to learn from them, is a precondition. Even when a household does not, isolated seen, have a high level of internal adaptive capacity, the household is still more likely to adapt if engaged in relations with others who have high adaptive capacity, than households with relatively higher adaptive capacity, which is not included in such relationships.
We do also see, that households, which are not a part of informal relationships with people that have high capacity, have used training to build sufficient capacity as to introduce vegetable production. However, training is offered within formal relationships (forums) limited to a given time-period and at a given venue, whereas informal knowledge-sharing has the advantage of being continuously and locally available.

Location and particularly ethnic marginalization are reasons why some residents are not engaged in relationships that has a high level of shared adaptive capacity.

5. Chapter

DISCUSSION AND PERSPECTIVES

From the investigation on inequality in effectiveness of adaptation in Beldanda and Bharlang we can see that all five resources (physical, natural, financial, social and human) have been of importance for adaptation to happen. Therefore community-based adaptation approaches should take the need for support in all five resource categories into account.

The four NGOs which have been working in the study area have mainly had a focus on supporting implementation of tangible resources, and their provision of intangible resources have been limited to skills training and forming of formal networks in terms of groups. This means that the availability of resources needed for adaptation have been improved in the study area over the last decade, but not all the citizens have been able to make use of the improved conditions like improved irrigation facilities and the availability of seeds. Our analysis shows that there is a lack of knowledge on vegetable farming among the households which have not begun to produce vegetables in the winter.

There are two ways that they could have gained this knowledge: a) through skills training, and b) through social relations, where people with knowledge on vegetable cultivation share their knowledge to those who do not possess the adequate knowledge. Regarding the first option, there is a relatively large unused potential for training activities in the study area; since only around half of the households have members who have attended farming related training. Those who have attended training has almost all used the knowledge they have gained to actively adapt. An active culture with local, informal knowledge-sharing includes however, a higher potential for decreasing the households vulnerability on a long perspective. Compared to training, informal knowledge-sharing is locally available and can be spread continuously in the society without involvement from the outside, e.g. by NGOs. In order to obtain new knowledge and information through informal knowledge-sharing; good relations to knowledge holders is needed. We do, however acknowledge that there will also be situations where no one from the local area possess the knowledge needed in order to adapt. In such situations inputs of information, hereunder skills trainings, from the outside are pivotal.

The four NGOs, which have provided training to the residents of Bharlang and Beldanda during the last decade, have had the aim to have the trained villagers share their new knowledge to fellow villagers. For this to happen, relations which can foster informal knowledge-sharing are needed. This way of distributing and extending relevant knowledge have been a success among the other ethnic groups in Bharlang, but the Chepangs have not been part of the informal knowledge-sharing on vegetable production, with no difference whether they live in Bharlang or Beldanda. This trend indicates that the strategic

interventions by NGOs and government bodies have neither paid enough attention to the relevance of social relations between different ethnic groups, nor between the two villages.

As described in the analysis within chapter 4, ethnic marginalisation is one of the reasons for the lack of interaction between Chepangs and other ethnic groups.
That the issue of barriers for adaptation processes, which is found in lack of relations due to ethnic marginalization, has not been addressed sufficiently can be exemplified where a strategic intervention aimed at awareness raising and knowledge-sharing have contributed towards sustaining the ethnic boundaries rather than dissolving them. One of the NGOs has taken some villagers of Beldanda on an exposure visit to another district where a Chepang community successfully had introduced commercial scale vegetable production. The NGO thereby took the residents from Beldanda far away to learn how vegetable production could be done, while the same knowledge was available among households on the neighbouring hill in Bharlang. By taking Chepang households far away to promote learning from knowledge-sharing with other Chepangs rather than with the local neighbours, the NGO actively sustain the notion that Chepangs are fundamentally different than other ethnic groups. Because of the long distance there have also not been any continuous knowledge-sharing with the Chepangs from the other district. This could potentially have been the case, if the NGO had instead supported a process of building stronger relationships between the citizens of Bharlang and Beldanda. Local knowledge-sharing is more sustainable in the long term than training sessions; which are time specific and involves external actors. This difference is important in a climate change adaptation optic, because we can expect continuous change with high levels of uncertainty, rather than a trend towards a stable, equilibrium situation.

To build social relationships which can carry an effective sharing of knowledge and information; and include the most vulnerable groups herein, will not only require an increased focus on relation building between groups with different levels of adaptive capacity in the society. In order to identify how relationships between local actors can support and not hinder distribution and extension of the capacity needed for adaptation, a baseline assessment is needed. Before implementing support in terms of resources, the implementing actors must gain insight in the local power relations, economic interests and dependency patterns, ethnic marginalisation and cultural beliefs. Adequate knowledge on such contextual conditions is necessary in order to identify and address the relation bound barriers for a successful adaptation among the most vulnerable groups.

We do not have data to show whether the NGOs made proper baseline surveys on issues of relations and 'hidden' aspects of power; before they started working in the study area. What we can conclude is that they have not managed to address all important factors sufficiently since some of the residents in Bharlang and Beldanda have not been able to build the level

of adaptive capacity needed in order to improve the poor absorbing capacity in their current livelihood situations.

In line with ideas from participatory development approaches the NGOs initiated their project processes by having the local residents identify needs, problems and solutions in groups or on general assemblies. With this approach, they have neglected some of the following issues.

As described in the fourth analytical section some citizens of Bharlang have an interest in keeping people from Beldanda from introducing vegetable farming, because they currently supply labour to the farmers in Bharlang. This form of economic dependency should be investigated before starting the implementation process, because local residents do not necessarily have an interest in raising the issue themselves.

From our data we have also shown that the vegetable growing households in Bharlang have a higher stake in power-sharing in that they possess special positions, and they are more active in influencing decision makers, than those who have not adapted. It is likely that those who have better access to power will also take a bigger stake in influencing and shaping the projects processes.

Another issue which should be kept in focus while identifying problems, needs and solutions through participatory processes, is the problem that deep-rooted underlying normalities in the society can be difficult for the locals to highlight as barriers for adaptation. An example is that some of the Chepangs we spoke to seemed to perceive it as a natural consequence of being Chepang that they have gained less economic development than other ethnic groups in the area. Because the respondents generally linked ethnicity as something determinant to human characteristics, we conclude, that it would not be in the mindset of the residents to highlight ethnic marginalisation as a hindrance for adaptation.

If the NGOs do not take the mentioned economic dependency, the culture of ethnic marginalization, the issue of self-perceptions and the issue of access to leaders and authorities into consideration before local citizens are chosen to shape the processes of the projects, elite capture becomes a problem.

We have identified ethnic marginalization and political structures of power to be the main root-causes behind the inequality of effectiveness of adaptation found in the case. In the following we will shortly discuss and give perspectives on which aspects of these barriers to give greater priority within community-based adaptation processes, and which to address at other scales.

Ethnic marginalisation

The ethnic marginalisation is a barrier which is ingrained in the mentality of the citizens in the study area. The issue of ethnic marginalisation is a national issue, and since the study area is not isolated from the rest of the Nepali society; such an issue cannot be solved only

by addressing it in the local context. This being said, our hypothesis is that the local understanding of what defines different ethnic groups and what they can or cannot do is not fixed, and it can be changed locally over time, also without a similar trend all over Nepal. There are already many localities in Nepal where Chepangs have living standards more similar to that of other, historically more privileged groups, and where they engage actively in their local communities (Bhandari, 2013). The NGOs could try to facilitate relationships between Chepangs and the other local ethnic groups whereby it is possible that there will be a greater understanding between the two groups and thus mutual confidence could lead to exchange of knowledge between households which have adapted in Bharlang and those who have not in Beldanda.

As described in chapter 1, researchers have criticised that 'hardware' solutions are given too much attention when it comes to local adaptation in comparison with the human and social resources and processes in adaptation. This is also what we see in the case of Bharlang and Beldanda where availability of tangible resources have been improved considerably, but there have been too little focus on human and social resources and the processes of sharing these. A reason why e.g. ethnic marginalisation has not been given the same attention as physical improvements; can be that such social changes takes more time to manifest, than the time-frame of many community-based adaptation projects. The projects implemented in the study area have all been carried out in a timespan of maximum five years. Since the NGOs most often need to produce results to show their donors, they may have given higher priority to easy measureable improvements like the amount of water tanks built, or the number of citizens who have attended training sessions. Due to our findings, greater prioritization of social and human resources and processes should over time show a result in improved effectiveness of adaptation among most vulnerable groups. The time span needed may however be of a length which cannot be targeted by projects but rather by programmes running over longer periods of time. Another strategy could be to let local; more permanent bodies like Community Based Organizations or government agencies be responsible of breaking down social barriers, that impede residents with relatively high or low adaptive capacity from engaging in well-functioning relations with each other.

Governance structure

The undemocratic governance structure in Kabilash VDC can, as examined shortly in paragraph 4.1., be an obstacle for an equal distribution of public support among the citizens in the area. Those who possess the lowest level of power-sharing, and thereby are farthest away from influence over the allocation of public resources, has no power in form of their vote to react, if they are unsatisfied with the current allocation. This can hinder that the most vulnerable groups, which according to our investigation has the lowest level of power-sharing, gets the same support from the authorities to adapt to climate change as households with a higher level of access to power. The aspects of this root-cause, which are

bound in the national lack of a democratic constitution, cannot be changed at local level. Advocacy and capacity building at central national level will probably be more effective than dealing with it on a local scale. While an NGO may not be able to change the local governance structure; it can help the most vulnerable to gain more influence in the society by empowerment and right-based approaches. Again the importance of relations is central because empowering of the most vulnerable groups among other happens by active interaction with more powerful persons in the area. Knowledge about the formal procedures for applying to the VDC for resources could also be a way to empower the most vulnerable households, to gain a higher level of power-sharing.

The above given perspectives and recommendations are targeted at NGOs which implement community-based adaptation. However, in the future implementation of the national policy the Local Action Plan for Adaptation (2011), government officials will most probably be given the responsibility of facilitating local adaptation. This can potentially strengthen the relations between citizens and the authorities that distribute social services including adaptation measures, but there is also a risk that issues of unequal power relations, misuse of power and lack of check and balances, will be harder to address.

6. Chapter

CONCLUSION

During the last decades the residents of Bharlang and Beldanda have experienced climate and weather induced impacts to their living conditions, which they have not always been able to handle without a decrease in wellbeing. Situations with severe flooding and failed harvests combined with a general wish for improved livelihoods have been important incitements for implementation of strategic adaptation actions in the area over the last decade.

From the case study we can conclude that the projects, which have been implementing strategic adaptation measures over the last decade, have accomplished to create a general increase in the absorbing capacity in the area. This complies with the widespread notion among the residents that their living conditions have improved over the last decade. We can conclude that all households have benefitted, although not necessarily equally, from the improvements generated by adaptation in commons. However, we found a distinct inequality in the effectiveness of adaptation among the household's farming practices. Only some households have introduced or upgraded farming of vegetables in the dry winter months, where the fields traditionally have been kept barren. By producing cash-crop vegetables they have increased their income, their food self-sufficiency and they are less vulnerable to change in precipitation patterns compared to those households, which still only produce rain-fed crops around the monsoon period.

Access to markets and availability of land, irrigation and seeds has been decisive factors for the households which have adapted their farming. Although there is a difference in size and source, all households have the acquired access to irrigation and land to grow vegetables, and during the last decade seeds have been provided for free by several NGOs. The explanations for inequality in effectiveness of adaptation are thus not found within the availability of tangible resources. There is inequality within the financial management tools and economic resources available for investing in adaptation measures among the households. Since some of the households with a relatively poor livelihood foundation have managed to adapt successfully, we did not find inequality in availability of financial resources to be the main explanation.

The most evident explanations why some households have adapted while others have not are found in the possessed and obtained human and social resources, and the difference in engagement in processes where adaptive capacity is generated and shared. The level of human and social resources and the insensitivity with which the household share and extend these can thus be linked directly to the effectiveness of adaptation. Obtained knowledge about vegetable farming has been decisive for those households which have adapted, and

engagement in relations with other households has been a precondition for access to new knowledge. The households which have adapted within the last ten years are also relatively more engaged in relations with more powerful actors or with people who have a higher adaptive capacity than themselves. The adapted households have gained new knowledge about vegetable cultivation from either training or informal knowledge-sharing, which have been decisive for their ability to introduce or upgrade vegetable cultivation. We can conclude that the shared level of knowledge and information and the distribution and extension of this knowledge and information is higher and more intensive in Bharlang than in Beldanda. Informal knowledge-sharing is almost non-existing between Chepangs, whether they live in Beldanda or Bharlang, and the same is the case with informal knowledge-sharing between Chepangs and other ethnic groups. The knowledge obtained by the Chepangs, who have adapted, is generated in formal relations through skills training. Lack of relations which can generate informal knowledge-sharing and dependency patterns are explanations to why knowledge and information is not distributed and extended from Bharlang to Beldanda and from other ethnic groups to Chepang households

These findings show that having well-functioning relations to people, who have a relatively high level of adaptive capacity and experiences from adaptation actions, is the most decisive factor for effectiveness of adaptation. To engage in formal relationships, e.g. regular groups, where households become capable of growing vegetables at NGO training venues, is the other way households in the study area have gained sufficient adaptive capacity to adapt. Access to irrigation, land, seeds, power and knowledge are preconditions for adapting.

We can conclude that increased availability of tangible and intangible resources is vital when it comes to introducing or upgrading vegetable cultivation, but the availability of such resources does not alone enable all households to extract the potentials and adapt.

The local processes of experimentation, testing and sharing of the obtained knowledge are absolutely dependent on well-functioning relations. Strategic interventions can to some extent help those, who are not engaged in relations with people who have the knowledge needed, by providing trainings. However, the advantage of continuously and locally available knowledge distribution and extension is found within local relations, not in time and space-specific training venues.

Knowledge, information and especially relations are the main aspects which divide those households that have adapted from those which have not. The reasons behind is that some households, especially the Chepang households, have not been able to build relations and seek farming related knowledge from those households which have already adapted or from training venues. The barriers are mainly due to ethnic marginalization and local inequality in power-sharing, which have not been targeted by the strategic interventions. We conclude that community-based adaptation strategies must give a higher priority to breaking down these barriers in order to support the processes which make the most vulnerable groups capable of utilising tangible and intangible resources to adapt to climate change.

Bibliography

- Abeygunawardena, P., Vyas, Y., Knill, P., Foy, T., Harrold, M., Steele, P. and Tanner, T., Hirsch, D., Oosterman, M. and Rooimans, J., Debois, M. and Lamin, M., Liptow, H., Mausolf, E., and Verheyen, V., Agrawala, S., Caspary, G. and Paris R., Kashyap, A., Sharma, R., Mathur, A., Sharma, M. and Sperling, F., 2002. *Poverty and climate change: reducing the vulnerability of the poor through adaptation*. African Development Bank.

- Abramowitz, J., Banuri, T., Girot, P.O., Orlando, B., Schneider, N., Spanger-Siegfried, E., Switzer, J., and Hammill, A., 2002. *Adapting to Climate Change: Natural Resource Management and Vulnerability Reduction*. Background Paper to the Task Force on Climate Change, Adaptation and Vulnerable Communities.

- ACCRA (Africa Climate Change Resilience Alliance), homepage. Available online: http://community.eldis.org/.59d66929/ (Last visited June 11, 2013).

- ACCRA (Africa Climate Change Resilience Alliance), n.d.. *Consultation Document: The ACCRA Local Adaptive Capacity Framework (LAC)*. Available online: http://community.eldis.org/.59d669a7/LACFconsult.pdf (Last visited June 11, 2013).

- Adger, W.N., 2006. *Vulnerability*. Global Environmental Change 16: 268-281.

- Adger, W.N., Arnell, N.W. and Tompins E.L., 2005. *Successful adaptation to climate change across scales*. Global Environmental Change 15: 77-86.

- Adger, W.N. and Kelly, P.M., 1999. *Social vulnerability to climate change and the architecture of entitlements*, Mitigation and Adaptation Strategies for Global Change, vol. 4, pages 253-266.

- Adger, W.N., 1999. *Social vulnerability to climate change and extremes in coastal Vietnam*. World Development, vol. 27, no. 2, pages 249-269.

- Bhandari, Dinanath, 2013 and 2013a. *First and second interview*. Project coordinator - Disaster Risk Reduction and Climate Change, Practical Aciton. Former project coordinator at Practical Actions community-based adaptation project in Kabilash VDC (2003-2007). Appendix 3 – file '2013.01.01 Bhandari, D. Practical Action Nepal - 1. Interview' and '2013.02.27 Bhandari, D. Practical Action Nepal - 2. interview' – page 12.

- Bir Bahadur Gurung, local resident Bharlang, 2013. *Interview*. Appendix 3 – file '2013.01.24 Bir Bahadur Gurung. Bharlang' – page 7.

- Blaikie, P., Wisner, B., Cannon, T., Davis, I., 2003. *At Risk: natural hazards, people's vulnerability and disasters*. Second edition.

- Borrini-Feyerabend, G., Pimbert, M., Farvar, T., Kothari, A. and Renard, Y., 2007. *Sharing power, learning-by-doing in co-management of natural resources throughout the world*. Earthscan, London, UK.

- Brooks, N., 2003. *Vulnerability, risk and adaptation: a conceptual framework*. Tyndall Centre for Climate Change Research, Norwich, working paper 38.

- Bruun, O. and Casse, T. (eds.), 2013. *On the Frontiers of Climate and Environmental Change: Vulnerabilities and Adaptations in Central Vietnam*. Springer-Verlag Berlin Heidelberg pages 273.

- Byg, Anja, 2012. *Interview*. Post doctoral researcher in the Division for Economics, Policy and Management Planning at Forest and Landscape, University of Copenhagen. In charge of the research programme Climate Change and Rural Livelihoods in Nepal.

- CADP-N, 2011. *Climate Adaptation Design and Piloting Project, Nepal.* Report made by: Anderson, S., Kaur, N., Rijal, D., Ayers, J., Pradhan, S., Dixit, A., Moench, M., Khan, F., Sapkota, B. and Chapagain, B.

- Care Int. and IISD, 2010. *Toolkit for integrating Climate Change Adaptation Into Development Projects -Digital Toolkit -version 1.0. July 2010*. Care International and International Institute for Sustainable Development, pages 1-69.

- Care, 2012. *Participatory Monitoring, Evaluation, Reflection and Learning for Community-based Adaptation*. Pages 1-88.

- Care, 2009. *Climate Vulnerability and Capacity Analysis Handbook*. Pages 1-44.

- Care toolboxes, homepage. *Step-by-Step Guidance on Implementation*. Available online: http://www.careclimatechange.org/tk/cba/en/step_by_step_guidance/implementation.html (Last visited June 11, 2013).

- Chambers, R., 2010. *Paradigms, Poverty and Adaptive Pluralism*. Institute of Development Studies, working Paper, vol. 2010, no. 344.

- Chaudhary, P., Thapa, K., Lamsal, K., Tiwari, P. R. and Chhetri, N., 2012. *Community-Based Climate Change Adaptation for Building Local Resilience in the Himalayas*. Chapter 2 in Earth and Planetary Sciences » "*Human and Social Dimensions of Climate Change*".

- Christoplos, Ian, 2012. *Interview*. Programme coordinator at the research programme Climate Change and Rural Institutions under the Danish Institute of International Studies (DIIS)

- Climate Change Policy, 2011. *Climate Change Policy, 2011*. Published by Ministry of Environment, Nepal. Available online: http://www.climatenepal.org.np/main/?p=research&sp=onlinelibrary&opt=detail&id=419 (Press "download" - last visited June 12, 2013).

- Collins, D., Morduch, J., Rutherford, S. and Ruthven, O., 2009: *Portfolios of the Poor: How the World's Poor Live on $2.00 a Day*. Princeton University Press.

- Cook, J., Nuccitelli, D., Green, S.A., Richardson, M., Winkler, B., Painting, R., Way, R., Jacobs, P. and Skuce, A., 2013. *Quantifying the consensus on anthropogenic global warming in the scientific literature*. Environmental Research Letters.

- DFID (1999) *DFID sustainable livelihoods guidance sheets*. Department for International Development (DFID), London, UK.

- Dhungana, Hari, 2013. *Interview*. Executive Director of Southasia Institute of Advanced Studies, Kathmandu, Nepal.

- Dil Bahadur Chepang, local resident in Bharlang, 2013. *Interview*. Appendix 3 – file ´ 2013.01.23.Dil Bahadur Chepang. Bharlang´ - page 5 and 11.

- Engberg-Pedersen, L., 2013. *Development Goals Post-2015: Reduce Inequality*. The Danish Institute of International Studies (DIIS), Copenhagen, Denmark, policy brief.

- Ensor, J., 2011. *Uncertain Futures - Adapting development to a changing climate*. Practical Action Publishing Ldt. Schumacher Centre for Technology and Development. Bourton on Dunsmore, U.K.

- Fischer, S. from IIED, 2013. *Challenging Inequality is at heart of Climate Adaptation.* Article posted in Thomsen Reuters Foundation on April 23rd, 2013.

- Ganesh, G.C., 2005. *Report on Participatory Rural Appraisal (PRA)*. Practical Action Nepal – intern paper. Available in Appendix 3.

- Google Maps. Search on '*Kabilas, Nepal'* via: http://maps.google.dk/maps?hl=da&tab=wl (Last visited June 11, 2013).

- Harland-Scott, C. UNICEF, UN Women, Advisory Group and e-discussion submissions, 2013. *Global Thematic Consultation on the Post-2015 Development Agenda - Addressing Inequalities - the Synthesis Report of Global Public Consultation*.

- Hernø, Rolf, 2012. *Interview*. Programme coordinator at Cares Adaptation Learning Programme.

- Hirslund, D. V., 2012. Sacrificing Youth – *Maoist cadres and political activism in post-war Nepal.* Faculty of Social Sciences at University of Copenhagen, Copenhagen

- Ibrahim, M. & Ward, N., 2012. *Promoting Local Adaptive Capacity: Experiences from Africa and Asia.* Research report for World Vision, London, United Kingdom.

- IDSN, 2011. *Nepal*. Annual Report 2011. Published by International Dalit Solidarity Network (IDSN).

- IIED, homepage. *CBA7: 7th conference on community-based adaptation to climate change*. Available online: http://www.iied.org/cba7-7th-conference-community-based-adaptation-climate-change (Last visited June 11, 2013).

- Indexmundi, homepage. *Nepal Population growth rate*. Available online: http://www.indexmundi.com/nepal/population_growth_rate.html (Last visited June 12, 2013).

- IPCC, 2012. Summary for Policymakers. In: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 1-19.

- IPCC, 2007. Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi, 2007*: Assessment of adaptation practices, options, constraints and capacity. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 717-743.

- IPCC, 2007a: *Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

- Jiwan Praja Chepang, local resident in Beldanda, 2013. *Interview*. Appendix 3 – file '2013.02.02 Jiwan Praja (Chepang). Beldanda´ - page 14.

- Jones, L., Levine, S. and Ludi, E., 2011. *Rethinking Support for Adaptive Capacity to Climate Change- The Role of Development Interventions*. Published by Overseas Development Institute 2011, 111 Westminster Bridge Road, London, UK.

- Jones, L., 2011a. *Are we jumping the gun in trying to measure adaptation*? Published under articles and blocs at Overseas Development Institute homepage 25. March 2011. Available online: http://www.odi.org.uk/opinion/5689-adaptation-adaptive-capacity-climate-change-monitoring-evaluation (Last visited June 11, 2013).

- Khadka, P.K., 2013. *Interview*. VDC secretary in Kabilash VDC through the last 10 years. Appendix 3 – file '2013.01.30 Khadka, P.K. VDC secretary in Kabilash' – page 14.

- Lamichhane, Bichal, 2013. *Interview*. Officer in District Energy and Environment Unit under the District Development Committee, Chitwan, Nepal.

- LAPA (Local Adaptation Plans for Action) Manual, 2011. *National Framework on Local Adaptation Plans for Action*. Government of Nepal, Ministry of Science Technology and Environment, Singha Durbar.

- LAPA (Local Adaptation Plans for Action), 2011a. *The LAPA Framework – Local Adaptation Plan for Action – Summary of steps, key actions and tools.* Prepared by: Ministry of Environment, Ministry of Local Development, Climate Adaptation Design & Piloting, September 29, 2011.

- Levine, S., Pain, A., Bailey, S. and Fan, L., 2012. *The relevance of 'Resilience'?* HPG Policy Brief 49. September 2012 from Overseas Development Institute.

- Maplecroft, homepage. Available online: http://maplecroft.com/about/news/ccvi.html (Last visited June 12, 2013).

- Marahatta, S., Dangol, B. S. and Gurung, G. B., 2009. *Temporal and Spatial Variability of Climate Change over Nepal (1976-2005)*. Practical Action Nepal Office, 2009.

- Maskey, G. 2013. *Local Peoples' Perception and Adaptation to Climate Change Impacts – A study in Kabilash and Shaktikhor VDCs of Chitwan district .* Master thesis. Master of Science in Environmental Science at Department of Environmental Science, Khwopa Collage, Bhaktapur, Nepal.

- Moser, S. C., 2009. *Whether our levers are long enough and the fulcrum strong? Exploring the soft underbelly of adaptation decisions and actions*. In Adger, W.N., Lorenzoni, I. and O'Brien, K.L.'s (eds) Adapting to Climate Change, Thresholds, Values, Governance, pages 313-334.

- NAPA (National Adaptation Programme of Action), 2010. *National Adaptation Programme of Action to Climate Change*. Government of Nepal, Ministry of Environment.

- National Planning Commission Secretariat, 2012: *National Population and Housing census 2011*. Central Bureau of Statistics, Nepal.

- Nelson, D. R., Adger, W.N. and Brown, K., 2007. *Adaptation to environmental change: contributions of a resilience framework.* Annual Review of Environment and Resources, 32: 395-419.

- Nepal Federation of Indigenous Nationalities, homepage. Available online: http://www.nefin.org.np/list/Categorization-of-Indigenous-People-based-on-development-/5/95/6 (Last visited May 7, 2013).

- O'Brian, K., Eriksen, S., Schjolden, A. and Nygaard, L., 2004. *What's in a word? Conflicting interpretations of vulnerability in climate change research.* Center for International Climate and Environmental Research Olso (CICERO) working paper 4.

- Pain, Adam, 2013. *Interview*. Responsible for Nepal under the research programme Climate Change and Rural Institutions under the Danish Institute of International Studies (DIIS) and visiting Professor at the Department of Urban and Rural Development, Swedish University of Agricultural Sciences, Uppsala, Sweden.

- Paudel, N.S., Khatri, D.B., Karki, R., Gurung, N., 2013. *Avenues and challenges of mainstreaming community adaptation initiatives into local development*. DRAFT, submitted to Care Denmark, Jan. 2013.

- Paudel, P.P., 2011. *Vulnerability Assessment and Formulation of Climate Change Strategies in Churia Region*. First draft, submitted to Care Nepal, Janakpur Cluster Office.

- Pfaff-Czarnecka, J., 2008. *Distributional Coalitions in Nepal: An Essay on Democratization, Capture, and (Lack of) Confidence*. Local Democracy in South Asia: Microprocesses of Democratization in Nepal and its Neighbours. Gellner, D. N. and Hachhethu, K. (eds.), pp. 70-104. New Delhi: SAGE Publications India Pvt. Ltd.

- Piya, L., 2013. *Interview*. Forward Nepal, programme coordinator.

- Rawal, D.K., 2013. *Interview*. SRAM-NEPAL, Executive Director.

- Resilience Alliance, homepage. *Adaptive Cycle*. Available online: http://www.resalliance.org/index.php/adaptive_cycle (Last visited June 11, 2013).

- Ribot, J., 2009. *Vulnerability does not fall from the sky: Towards multiscale, pro-poor climate policy*. In Mearns, R. and Norton, A. (eds), Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World, pages 47-74, The World Bank, Washington DC, USA.

- Rimal, S., (ed.), 2011.*VDC profile of Kabilas.* Rimal, S., Poudel, A., Adhikari, S.

- Schipper E.L.F., (2007) *Climate change adaptation and development: exploring the linkages*. Tyndall Centre for Climate Change Research, Norwich, working paper 107.

- Sekine, H., Fukuhara, K., Uraguchi, A., Tan, C.K., Nagai, M. and Okada, Y., 2009. *The effectiveness of Community-based Adaptation (CBA) to Climate Change - From The Viewpoint of Social Capital and Indigenous Knowledge.* Mitsubishi Research Institute and United Nations University - Institute of Sustainability and Peace (UNU-ISP).

- Suk B. Chepang, local resident in Beldanda, 2013. *Interview*. Appendix 3 – file '2013.01.21 Suk Bahadur Chepang. Beldanda' – page 9.

- Tamang, Sher Bahadur, Local key-informant, 2013. *First and second interview*. Resident in Kabilash VDC, Vice-president in SRAM Nepal, Facilitator for Ecocentre and Rural Reconstruction Nepal, Assistant Secretary in Mitra Milan Saving and Cooperation, Vice-president in Organic Kabilash Cooperative, District level president in Landless squatter's peoples association of Chitwan.

- UNDP, 2009. *Nepal Human Development Report 2009 - State Transformation and Human Development*. Published by United Nations Development Programme (UNDP), Kathmandu, Nepal.

- UN (United Nations), 2013: *A New Global Partnership: Eradicate Poverty and Transform Economics Through Sustainable Development.* The Report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. United Nations Publications, New York, USA.

- UN System Task Team, 2012. *Addressing inequalities: The heart of the post-2015 agenda and the future we want for all*. Thematic Think Piece - ECE, ESCAP, UNDESA, UNICEF, UNRISD, UN Women.

- Waterworlds, homepage. Research program at Department of Anthropology, University of Copenhagen. http://waterworlds.ku.dk/ (Last visited May 31, 2013).

- World Bank (WB) and Department for International Development (DFID), 2006: *Unequal Citizens – Gender, Caste and Ethnic Exclusion in Nepal*. Co-publication of WB and DFID.

- World Meteorological Organization, 2013. *A specialized agency of the United Nations 2013. Observed concentrations of CO2 cross 400 parts per million threshold at several Global Atmosphere Watch stations*.

- Østergaard, 2012. *Interview*. Post doctoral at Waterworlds, University of Copenhagen

Appendix 1

Person	Location	Ethnic group	Member-ship of formal group	Have taken training	Learned new farming practice from training (only if taken into use)	Learned new farming methods from knowledge sharing (only knowledge taken into use)	Having a practice of knowledge sharing	Reach out to leaders/authori-ties	Have confidence to raise voice and participate in society	Special position or member-ship in S.I. group	Total score
Shanta B. Chepang	Beldanda	Chepang	1	1	1	1	1	1	1	1	8
Mamata Chepang	Bharlang	Chepang	1	1	1	1	1	1	1	1	8
Kali M. Chepang	Bharlang	Chepang	1	1	1	1	1	1	1	1	8
Grandmom Chepang	Bharlang	Chepang	1	1	1	1	1	1	1	1	8
Suk B. Chepang	Beldanda	Chepang	1	1	1	1	2	1	1	1	9
Jiwan P. Chepang	Beldanda	Chepang	1	1	1	1	2	2	1	1	10
Gore M. Chepang	Beldanda	Chepang	1	1	1	2	2	1	1	1	10
Punte P. Chepang	Beldanda	Chepang	2	1	1	1	2	1	1	1	10
Ganesh B. Tamang	Bharlang	Tamang	2	2	1	1	1	1	1	1	10
Indra K. Chepang.	Bharlang	Chepang	2	2	2	1	1	1	1	1	11
Omlal Shrestha	Bharlang	Newar	2	1	1	2	2	1	1	1	11
Shanti Chepang.	Beldanda	Chepang	1	1	1	2	2	2	2	1	12
Santa B. Chepang	Beldanda	Chepang	2	1	1	1	2	2	2	1	12
Mahendra N. Shrestha	Bharlang	Newar	2	1	1	2	2	2	1	1	12
Bishnu M. Chepang	Beldanda	Chepang	2	1	1	2	2	2	2	1	13
Aaiti M. Tamang	Bharlang	Tamang	2	1	1	2	2	2	2	1	13
Bir B.Gurung	Bharlang	Gurung	2	1	1	2	2	2	2	1	13
Saman Chepang	Bharlang	Chepang	2	2	2	1	2	1	2	1	13
Raj K. Chepang	Beldanda	Chepang	2	2	1	2	2	2	2	1	14
Yub R. Chepang	Beldanda	Chepang	2	2	2	1	2	2	2	1	14
Abir B. Gurung	Bharlang	Gurung	2	2	2	2	2	2	1	1	14
Chitra B. Gurung	Bharlang	Gurung	2	1	1	2	2	2	2	2	14
Santa M. Gurung	Bharlang	Gurung	2	2	2	2	2	2	2	1	15
Mankumari Chepang	Bharlang	Chepang	2	2	2	2	2	2	2	1	15
Hari Maya Baral, Bha	Bharlang	Magar	2	2	2	2	2	2	2	1	15
Surja Gurung	Bharlang	Gurung	2	2	2	2	2	2	2	1	15
Gori M. Gurung	Bharlang	Gurung	2	2	2	2	2	2	2	1	15
Ban B. Chepang, Be	Beldanda	Chepang	2	2	2	1	2	2	2	2	15
Dil B.Chepang	Bharlang	Chepang	2	2	2	1	2	2	2	2	15
Man B. Gurung	Bharlang	Gurung	2	2	2	1	2	2	2	2	15
Uma D. Poudel	Bharlang	Bhrahmin	2	2	2	2	2	2	2	2	16
Sabita Lamichhane	Bharlang	Bhrahmin	2	2	2	2	2	2	2	2	16

Appendix 2

List over respondents and date for interview

Local residents used in final sample, representatives from each household

From Beldanda

- 2013.01.21 Gore Maya Chepang
- 2013.01.21 Raj Komar Chepang
- 2013.01.21 Suk Bahadur Chepang
- 2013.01.22 Ban Bahadur Chepang
- 2013.01.22 Bishnu Maya Chepang
- 2013.01.22 Shanti Chepang
- 2013.01.27 Punte Praja (Chepang)
- 2013.01.27 Shanta Bahadur Chepang
- 2013.01.29 Yub Raj Chepang
- 2013.01.30 Santa Bahadur Chepang
- 2013.02.02 Jiwan Praja (Chepang)

From Bharlang

- 2013.01.23 Bhuwa Lal Shrestha (Newar)
- 2013.01.23 Ganesh Bar Tamang
- 2013.01.23 Hari Maya Baral (Magar)
- 2013.01.23 Krishna Lal Strestha (Newar)
- 2013.01.23 Saman Chepang
- 2013.01.23.Dil Bahadur Chepang
- 2013.01.24 Bir Bahadur Gurung
- 2013.01.24 Man Bahadur Gurung
- 2013.01.24 Mati Maya Shrestha (Newar)
- 2013.01.25 Nama Raj Shrestha (Newar)
- 2013.01.25 Sabita Lamichhane (Brahmin)
- 2013.01.25 Santa Maya Gurung
- 2013.01.25.Jeet Bahadur Strestha (Newar)
- 2013.01.27 Chitra Bahadur Gurung
- 2013.01.27 Indra Kumari Chepang
- 2013.01.27 Mahendra Narayan Shrestha (Newar)
- 2013.01.27 Mankumari Chepang
- 2013.01.27 Omlal Shrestha (Newar)
- 2013.01.27 Aaiti Maya Tamang
- 2013.01.29 A-Bir Bahadur Gurung
- 2013.01.29 Gori Maya Gurung
- 2013.01.29 Mamata Chepang, Kali Maya Chepang and Grandma Chepang

- 2013.01.29 Surja Gurung
- 2013.01.29 Uma Devi Poudel (Brahmin)

Experts

- 2012.09.18 Byg, Anja. University of Copenhagen
- 2012.10.02 Østergaard, Jonas Nielsen. University of Copenhagen
- 2012.10.05 Hernø, Rolf. Care Denmark
- 2012.10.08 Christoplos, Ian. The Danish Institute of International Studies
- 2013.01.08 Maskey, Gyanu. Southasia Institute of Advanced Studies
- 2013.02.07 Dhungana, Hari. Southasia Institute of Advanced Studies
- 2013.03.01 Pain, Adam. The Danish Institute of International Studies and visiting Professor at the Department of Urban and Rural Development, Swedish University of Agricultural Sciences, Uppsala, Sweden.

Key-informants

DDC and VDC authorities

- 2013.01.28 Luitel, Balram. District Development Committee, Chitwan
- 2013.01.30 Khadka, P.K. Village Development Committee secretary in Kabilash
- 2013.01.30 VDC staff member (did not get her name)
- 2013.01.31 Lamichhane, Bishal. and Luitel Balram. District Development Committee, Chitwan

Local key-informants

- 2013.01.13 Tamang, Sher Bahadur.
- 2013-02-02 Lama, N. B.

NGO representatives

- 2013.01.01 Bhandari, Dinanath. Practical Action Nepal
- 2013.02.01 Ghimire, S. and Dhungana, Ram. Rural Reconstruction Nepal
- 2013-01-31 Piya, Luni. Forward Nepal. (start at 19.30)
- 2013-02-01 Rawal, Dil. K. SRAM Nepal