Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Social and Educational Sciences
Department of Geography

Ingrid Løken

Climate-Induced Migration in the Ancash Region in Peru

Master's thesis in Geography with Teacher Education
Supervisor: Ragnhild Lund
May 2019

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Kunnskap for en bedre verden

ABSTRACT

Løken, I. (2019). *Climate-Induced Migration in the Ancash Region in Peru.* (Master thesis in Geography with Teacher Education). Department of Geography, Norwegian University of Science and Technology, Trondheim.

The present thesis aims to answer the following research questions: *How does the rural population perceive climate change and its causes in the Ancash Region? In what way do they believe that climate change leads to migration?* The research questions have been illuminated through qualitative method of inquiry. By applying in-depth interviews and oral histories, individual experiences and perceptions have been obtained. This can provide an illustrative perspective of climate change and migration as consequence, as a supplement to external quantitative research on physical geographical changes. Snowball sampling has been selected as purposive sampling technique, additionally maximum variation as final selection of participants to obtain a wide range of perceptions. The study examines unique migration histories but also important common patterns that cut across variations.

The analytical approach applicates relevant theory and key concepts for discussion of main results. External quantitative research concerning climate change is presented, additionally a categorization of slow onset and rapid onset climate change impacts. Key terms and indicators such as multi-causality, forced migration and climate-induced migration serve as theoretical basis for discussing migration. Slow onset climate change impacts are perceived by former rural small-scale farmers in the Ancash Region. Their perceptions reveal changes in precipitation pattern, intense hailstorms and increased frequency of ground frost. The study reveals progressively increasing impacts of climate change on agricultural production since the 1960s. Environmental degradation of soil and crops has caused the participants of this study to migrate within the Ancash Region. An invisible and indirect link between climate change and migration appears, due to the following reasons: slow onset climate change impacts being less dominant than rapid onset impacts; lack of knowledge of global climate change among the participants and difficulties distinguishing causes of migration. The study reveals and discusses the complexity of migration analysis and of defining climate-induced migrants, in addition advantages and disadvantages of applying a legal decision framework of climate-induced migrants. The thesis proposes defining the majority of the participants of the present study as "environmentally forced migrants". This is due to the fact that the findings regarding perceptions of climate change reveal severe changes having detrimental effects, causing rural population of the Ancash Region to leave their places of origin. Concurrently the study reveals the importance of consideration of the multi-causality of migration in migration analysis.

SAMMENDRAG

Løken, I. (2019). *Klima-indusert migrasjon i Ancash-regionen i Peru.* (Masteroppgave for lektorutdanning i geografi). Institutt for Geografi, Norges teknisk- naturvitenskapelige universitet, Trondheim.

Mastergradsavhandlingen søker å besvare følgende forskningsspørsmål: *Hvordan oppfatter den rurale befolkningen klimaendringer og dets årsaker i Ancash-regionen? På hvilken måte opplever de at klimaendringer fører til migrasjon?* De aktuelle forskningsspørsmålene belyses ved kvalitativ forskningsmetodikk. Gjennom anvendelse av dybde-intervjuer innhentes individuelle erfaringer og oppfatninger. Slik metodikk kan gi et illustrativt perspektiv på klimaendringer og migrasjon som konsekvens, som et supplement til ekstern kvantitativ forskning. Snøballmetoden er valgt som hensiktsmessig metode for datainnsamling, videre maksimal variasjon som endelig utvalg av deltakere for å oppnå et bredt spekter av persepsjon. Studien undersøker unike migrasjonshistorier, men dokumenterer også viktige felles mønstre.

Den analytiske tilnærmingen for drøfting av hovedfunn anvender relevant teori og nøkkelbegreper. Ekstern kvantitativ forskning om klimaendringer presenteres, samt en inndeling i akutte og gradvise konsekvenser av klimaendringer. Indikatorer som fler-kausalitet, tvungen migrasjon og klima-indusert migrasjon gir et teoretisk grunnlag for migrasjonsanalysen. Tidligere små-skala bønder i Ancash-regionen opplever gradvise konsekvenser fra klimaendringer. Deltakernes persepsjon avdekker endringer i nedbørsmønster, kraftigere haglstormer og økt frekvens av bakkefrost. Studien avslører gradvis økende konsekvenser av klimaendringer for landbruksproduksjon siden 1960-tallet. Forringelse av jord og avlinger har ført til intern migrasjon i Ancash-regionen for deltakerne i studien. En usynlig og indirekte forbindelse mellom klimaendringer og migrasjon kommer til syne gjennom følgende årsaker: gradvis ødeleggelse av jordbruket som konsekvens av klimaendringer oppleves som mindre dominerende enn akutte naturkatastrofer som konsekvens av klimaendringer; mangel på kunnskap om globale klimaendringer blant deltakerne og utfordringer med å skille mellom årsaker til migrasjon. Avhandlingen avdekker og drøfter kompleksiteten ved migrasjonsanalyse og ved å definere klima-induserte migranter. Studien diskuterer også synspunkter vedrørende anvendelse av et juridisk rammeverk for beslutningstaking angående klima-indusert migrasjon. Avhandlingen foreslår å definere flertallet av deltakerne i studien som «environmentally forced migrants», ettersom funn om persepsjon av klimaendringer avslører alvorlige klimaendringer med ødeleggende virkninger som fører til tvungen rural-urban migrasjon og endring av levebrød for befolkning i Ancash-regionen. Parallelt viser studien viktigheten av å vurdere fler-kausaliteten i migrasjonsanalyse.

ACKNOWLEDGEMENTS

The process of elaboration of this master's thesis has been characterized by excitement and emotions. Norwegian University of Science and Technology and my family made field work possible, which was required if I were to carry out research regarding the specific topic. I had a deep desire to carry out a research regarding climate change and migration in Peru. Such interest stems from my family connections, having a sister and a brother born in the Peruvian Andes.

I would like to thank my supervisor Ragnhild Lund for guidance, but also faith in my choices and judgments throughout the process. I also want to thank family and friends for being encouraging, motivating and caring during the research process, especially in conduct of fieldwork in Peru. Such fieldwork would not have been possible without guidance from certain professors in Peru: Teófilo Altamirano Rua, Fray Masías Cruz Reyes, Zaniel Israel Novoa Goicochea and Martha Gwenn Bell. During my stay in Peru, Dario Villanueva played a vital role as my research assistant in the Ancash Region. Rocio Garcia Reinoso deserves an acknowledge for being a caring host in her apartment in Lima. Finally, I would like to thank several Peruvian habitants in the Ancash Region for their assistance in the search of potential research participants.

A final thanks to my parents for their continuous support during my time studying at NTNU, Trondheim.

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1 INTRODUCTION

BACKGROUND OF STUDY AND INTRODUCTION

Climate change is one of the most complex challenges of our young century. No country is immune. The impacts of a changing climate are already being felt, with events such as droughts, floods, storms and heat waves becoming more frequent (World Bank, 2010, p. 4). Abrupt, visible events and natural disasters occur. However, invisible, gradual, slow changes are equally challenging. Poor populations face prospects of crop failure; reduced agricultural productivity and increased hunger, malnutrition and disease. Developing countries will face the effects of climate change to the greatest extent, simultaneously as they strive to overcome poverty and advance economic growth. The global percentage of people living in extreme poverty fell to a low of 10 percent in 2015, from 11 percent in 2013 (World Bank, 2018). This is reflecting steady but slowing progress. The needs remain enormous. With so many people still in poverty and hunger, poverty alleviation remains the overarching priority for developing countries. Climate change only makes the challenge more complicated. Continuing climate change at current rates will pose increasingly severe challenges to development. Ecosystems stressed and changing, more extreme weather events and species condemned to extinction are some of the consequences (World Bank, 2010, p. 4).

Globally, it is estimated to exist fifty million people who have migrated in the context of climate change (Altamirano Rua, 2014, p. 15). The environmental factor may be the force that will continue to push the population out of its original context (Altamirano Rua, 2014, p. 43). It occurs when the relationship between ecology and the population breaks down because the conditions of habitability become unsustainable. There are no longer possibilities of a positive adaptation at the given location, due to the fact that resilience mechanisms are not sufficient (Altamirano Rua, 2014, p. 43). The populations that will be most affected are the poorest located in the rural areas and in the largest cities (Altamirano Rua, 2014, p. 15). In what was once a place where there existed a balance in the biophysical environment, global climate change represents a major threat to sustainable farming in the Peruvian Andes in this century. Climate change is increasingly affecting the life and daily activities of the rural inhabitants of the Ancash Region. However, do the numbers and definitions of environmental migrants include all people migrating due to climate change? Are we able to observe and take notice of

their perceptions of climate change and provide necessary support? The study concentrates on climate-induced migration, which includes human beings who experience an indirect and invisible relation between climate change and migration. For such research participants, it does not exist one acute natural hazard causing migration. The indicated population is moving due to slow, gradual degradation of soil and reduction of crops. People who may not even realize climate change being the primary cause of migration in a given context.

CONTEXT

Migration can be defined as the movement of a person or a group of persons, across an international border or internal within a State, resulting in a change of usual residence (International Organization for Migration, 2011). On a global level, the number of internal migrants is far higher than international migrants (Castles, De Haas, & Miller, 2013, p. 8). This study focuses on migrants whose movements among other factors are environmentally induced. They are moving from rural areas to urban areas, internally in Peru. However, I find it relevant to briefly present the recent history of Peru regarding migration. Inequitable ownership and unequal access to land have been the most notably causes of economic disparities in Latin America. Such economic disparities as well as disagreements regarding prevailing ideologies in society have caused migration, especially of Quechua-speaking indigenous people of Peru (Hampton, 2014, p. 83). It has given rise to conflicts and violence during a 20-year struggle between the Peruvian armed forced and two left-wing revolutionary groups: Sendero Luminoso (Shining Path) and Movimiento Revolucionario Túpac Amaru (Túpac Amaru Revolutionary Movement). Such circumstances have been the most notably challenges that have caused migration in Peru. The number of displaced people in Peru during the 1980s and the early 1990s was between 430.000 and 600.000 persons (Hampton, 2014, p. 97).

In the Peruvian geographical space, climate change has also given rise to internal displacement, especially of the Andean population migrating from the Andean mountain areas towards the coastal areas (Altamirano Rua, 2014). Deglaciation, abundance of rainfall causing elevation of the level of rivers, periods of drought and food insecurity have been significant causes of migration for the rural Peruvian population (Altamirano Rua, 2014, pp. 45-53). As the populations of the peasant communities have emigrated, large areas with agricultural and livestock activities have been abandoned (Altamirano Rua, 2014).

In the Ancash Region, migration is motivated by climate change and its impacts. People migrate from peripheral and rural areas towards urban areas due to changes in the climate. Migration has become a strategy for adaptation in the face of climate change (Altamirano Rua, 2014, p. 57). Relentless consequences of global warming have been observed in Peru – a country ranked as one the most vulnerable countries in the world to the impact of climate change. Rise of global temperature have already caused variability in climate patterns. The changes are particularly noticeable in the Andean region (Heikkinen, 2017, p. 77). Agriculture has traditionally been the most important livelihood in the Peruvian Andes. It is estimated to exist six million people who depend on small-scale farming as their main subsistence in the Andean highlands (Painter, 2007, p. 12). Great part of Peru's poverty is located in such rural areas, and particularly in the highland altiplano, situated between 2400 and 4000 metres above sea level (m.a.s.l.) (Painter, 2007, p. 12). 46% of the rural population in Peru lives in poverty, according to the INEI (Ministry of Agriculture and Irrigation, 2016, p. 30). Vulnerable, poor areas have limited opportunities for alternative livelihoods considering their already fragile economic situation (Heikkinen, 2017, p. 77).

Certain specific changes in the climate are experienced in the Peruvian Andes. Abnormal changes in the global water cycle are measured and experienced, including the Peruvian Andes. Decrease in total amount of precipitation, but positive tendencies for intense rainfall are measured, and will most likely continue in such direction (IPCC, 2013, p. 13; Sanabria, Calanca, Alarcón, & Canchari, 2014, p. 5). Contrasts in precipitation between wet and dry seasons are increasing (IPCC, 2013, p. 20). Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with an increase in the number of warm days and nights on global scale (IPCC, 2013, p. 4). For the Andean region, as well as diverse areas in the world, this has implied increase in intensity and duration of drought. Such increasing temperatures and anomalies in precipitation patterns provoke severe changes for small-scale farmers in the rural areas of the Ancash Region. The communities have farms and pastures completely dependent on certain climate conditions. Climate change leads to the disappearance of pastures for animals and soil for agriculture, especially in heights greater than 3500 m.a.s.l. (Altamirano Rua, 2014, p. 48). Agriculture and livestock have been the primary sources of income and own consumption.

To draw a complete picture of the narrative of Peru and Ancash, the economic and political transformation should be mentioned. The fundamental changes of Peru's political and

economic situation in the 1990s have influenced small-scale farmers. Along with alterations in the climate, these changes have created deteriorating situations for such poor highland farmers (Crabtree, 2002). A profound shift in the political economy occurred, converting the political and economic model from state regulation to a neo-liberal economy (Crabtree, 2002). The essential aim was to intensify and increase export-oriented growth. The neo-liberal economy no longer concerned for small-scale farmers with minor crops and harvest. The reform promoted large-scale farmers located in the coast due to their higher productivity, superior access to urban centres and export markets (Heikkinen, 2017, p. 77). In combination with climate change causing difficulties in agricultural production, the transformations in the economic and political model have caused even more vulnerable circumstances for small-scale farmers in Peru including the Ancash Region. Being aware of the political impacts and how it may have affected the small-scale rural farmers of this study is significant. Agricultural policies and capitalization have contributed to marginalize small-scale agriculture; hence this is a factor of importance. That being said, the present study has limited time and space. Certain aspects and areas of focus have been selected with proximity to the empirical evidences, as a delimitation of the study. The political aspect will not be discussed but may be an element for development, for a potential extension and further research of this study.

AIM OF STUDY AND RESEARCH QUESTIONS

Scientific research questions include: *How does the rural population perceive climate change and its causes in the Ancash Region? In what way do they believe that climate change leads to migration?* The objective is to "give voice" to dissident or marginalized people. The aim of the study is to attract attention to the perceptions of climate change of rural population and in what way migration was climate-induced. A desire is to reveal how the rural population take migration as an adaptation strategy, conscious or unconsciously. I wish to illuminate challenges in livelihood in the rural areas through empirical material: oral histories and individual narratives. The objective is to provide a qualitative, illustrative perspective of climate change as a supplement to aggregated data and quantitative studies of physical geographical changes. Hopefully, this can lead to increased investigation on adaptation strategies, and a greater concern worldwide in combating global climate change.

JUSTIFICATION OF STUDY

Politics, focus areas, initiatives and actions are formed on the basis of climate research top-down: authorities, researchers, institutions and organizations. Decisions and assumptions are made on behalf of a population that may not always have the possibility to express their perspectives. When perspectives of people in a given context do not appear, the nuances and complexities disappear. Such nuances may appear in a qualitative study investigating human migration histories. People move for various reasons. It is difficult to distinguish individual causes, as the situation for a human being is complex with several factors involved. It is necessary to study their migration in context, to investigate whether climate change is a motive for migration in a given context. Through such research, it can be revealed whether a population is primarily driven by climate change and if so, how it affected their livelihood. Does the rural population in the Ancash Region see climate change as a motive for migration, or do they not relate climate change to migration? A close and profound examination of a person's migration story can reveal new elements. Can it reveal a possible connection between climate change and migration – a connection the interview participant himself/herself is not aware of?

According to Carey (2014), Altamirano Rua (2014) and Bell (2017, personal communication), there is not enough investigation being conducted within the field of migration due to climate change in the Peruvian Andes. There is a lack of investigation within the human geography field. There is a desire among climatologists, geographers and anthropologists within the field of climate change and migration for increased thorough investigation regarding migration as an adaptation strategy to climate change. There is a need for a regional-sensitive approach, since the problems associated with climate-induced migration, and the character of these movements, vary considerably depending on the context (Gromilova, 2015, p. 137). Lack of political help is a challenge. Investigation of climate change and consequences for the rural population in the Peruvian Andes is necessary (Carey, 2014, p. 20). The lack of attention from the authorities and political support is especially noticeable concerning population migrating due to gradual changes in livelihood caused by climate change.

Stratford and Bradshaw (2016, p. 127) emphasize how it is important to document our work. How did I become interested in the field of knowledge and for what purpose did I choose to conduct such research? Accomplishing one semester as exchange student at Pontificia Universidad Católica del Perú in 2017, I discovered my area of interest. I was inspired by

courses in the field of the geography of the Peruvian Andes and climate change. I became aware of the relevance and highly interesting and applicable aspects of the field. Due to descriptions in the latter paragraphs, I longed for conducting such research and achieve more knowledge within the field. I also find it relevant in terms of my future working life where I will teach geography for upper secondary school students. The present thesis has a pedagogical relevance considering the growing field of climate change and migration flows that are estimated to increase as consequence of climate change. Aspects as climatology and meteorology, environmental and biological changes, migration and mobility, place and identity, and politics, laws and human rights are parts of various subjects in upper secondary school. Along with such interdisciplinarity, the field of knowledge of the study intervene in several themes of the geography subject. First-hand knowledge supplied through this thesis can potentially stimulate students' interest and curiosity to immerse themselves in the field of knowledge. By using the content of this thesis for teaching, students will gain insight through oral histories of real human beings and their lives. This can potentially and hopefully add a new dimension to existing statistics and quantitative investigation the students are exposed to.

FIGURE 1 THE ANCASH REGION AND THE CORDILLERA BLANCA

2 AREA OF STUDY AND CLIMATE CHANGE

INTRODUCTION

In the following chapter, an overview of climate change will be presented: global climate change and noticeably changes in the climate in Latin America. A brief description of the Ancash Region as area of study will additionally be provided. External climate change research conducted in the Ancash Region will be presented in chapter 4.

GLOBAL CLIMATE CHANGE

October 8th, 2018, the Intergovernmental Panel on Climate Change (IPCC) published "The Special Report on Global Warming of 1,5 °C" (SR15)[1], which compiles scientific literature for decision-makers on climate change, the effects and future risks, and various types of adaptation and action. The report describes how to protect civilization by limiting global warming to 1,5 degrees Celsius, or 2,7 degrees Fahrenheit. The world would need to reduce greenhouse gas emissions faster than has ever been achieved. The Fifth Assessment Report (AR5) released in 2014 by IPCC provides a comprehensive assessment of the physical science basis of climate change from 2007 to 2013, contribution of The Working Group I. Warming of the climate system is unequivocal. In the Fifth Assessment Report, IPCC (2013, p. 4) emphasizes that the atmospheric and ocean temperatures have increased, the amounts of snow and ice have diminished, sea level has risen, and increase of the concentrations of greenhouse gases have also been measured. Each of the last three decades has proven to be warmer at the Earth's surface than any preceding decade since 1850 (IPCC, 2013, p. 5). Ocean warming dominates the increase in energy, accounting for more than 90% of the energy accumulated between 1971 and 2010 (IPCC, 2013, p. 8). The Greenland and Antarctic ice sheets have experienced deglaciation over the past two decades, and glaciers have continued to shrink worldwide (IPCC, 2013, p. 9). The rate of sea level rise since 1850 has been larger than the mean rate during the previous two millennia, and the atmospheric concentrations of greenhouse gasses have greatly increased in the past 800.000 years (IPCC, 2013, p. 11).

IPCC (2013, p. 16) emphasizes how the observational and model studies of temperature changes, climate feedbacks and changes in the Earth's energy budget together provide confidence in the magnitude and intensity of global warming. Human influence on the climate system is clear. The report underlines how this is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system (IPCC, 2013, p. 15). Human influence has been discovered in changes in the global water cycle, in warming of the atmosphere and the ocean, in reductions of snow and ice and in global mean sea level rise (IPCC, 2013, p. 17). The report states that it is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century.

CLIMATE CHANGE IN LATIN AMERICA

Deglaciation of the tropical glaciers in the Andes Mountains is one of the major issues in terms of climate change in Latin America. The majority of the tropical glaciers in South America are located mostly in the Andes Mountains: 71% in Peru, 20% in Bolivia, 4% in Ecuador and 4% in Colombia. These tropical glaciers show an accelerated reduction since the 1970s, and those located below 5500 m.a.s.l. will probably disappear in 20 or 30 years (Ramírez, 2011, p. 9). Many watersheds fed by glaciers have experienced an increase in runoff in recent years, due to increased melting of glaciers. However, hydrological models predict a rapid decrease in meltwater flows after 2050, as the glaciers disappears (Ramírez, 2011, p. 9).

While the change of global temperature since 1990 have been 0,2 °C per decade, the increase in the Central Andes Region 1974-1998 was 0,34 °C (General Secretariat of the Andean Community, 2008). The number of hydrometeorological events per year during the periods of time 1970-1999 and 2000-2005 have increased 2,4 times (General Secretariat of the Andean Community, 2008). There is a greater probability that the intensities of future El Niño-events will increase in Peru. Higher incidence of impacts produced by El Niño, measured in number of registrations (Ramírez, 2011, p. 11). Frost preservatives particularly in the southern highlands of Peru is another evidence of climate change in Peru. According to the National Institute of Civil Defence (INDECI), disasters due to ground frost and *"friaje"*, a climatic phenomenon characterized by sudden drop in temperature accompanied by strong winds, in the southern part of the Andean region have affected more than 86.200 hectares of crops.

THE ANCASH REGION

FIGURE 2 LATIN AMERICA AND PERU (GOOGLE, 2019B) **FIGURE 3 THE ANCASH REGION (GOOGLE, 2019A)**

The Ancash Region is located in the north-central highlands of Peru, occupying 2,8% of the Peruvian territory. The Andes cross the Ancash Region longitudinally from north to south. Ancash is one of the 24 regions of the Republic of Peru, containing 1.039.415 habitants. The capital is Huaraz, with its population of 127.041, with coordinates 9.53°S 77.53°W (GeoDatos, 2019). La Libertad Region is located in the north, Huánuco Region and Pasco Region east, Lima Region south and the Pacific Ocean in the west.

The Ancash Region includes two longitudinal valleys, which combine the mountain characteristics of the Santa Valley and the higher areas of Marañón Valley (Ramírez, 2011, pp. 5-6). The region is characterized by two types of landscapes: the arid coastal plain, which dominates the entire western area of the region, and mountainous areas, which occupy the eastern territory of the region. The mountain areas comprise the mountain ranges Blanca, Negra, Huallanca, Huayhuash, and the eastern sierra of Ancash and Marañón. These are all areas collectively constituting 20 summits above 6000 m.a.s.l. These geographical features serve important rivers such as the Santa River and the Pativilca River flowing into the Pacific Ocean, and the Marañón River draining into the Ucayali River (Carey, 2014, p. 14). The territory of the coast and the Andean Puna[2] is flat and horizontal, while the remaining part of

the territory is varied, being rough to a large extent. Two main mountain ranges are crossing this rough territory of the region: the Cordillera Blanca on the east side and the Cordillera Negra on the west side, with the Santa River Valley running parallel to these mountain ranges (Ministry of Environment, 2016).

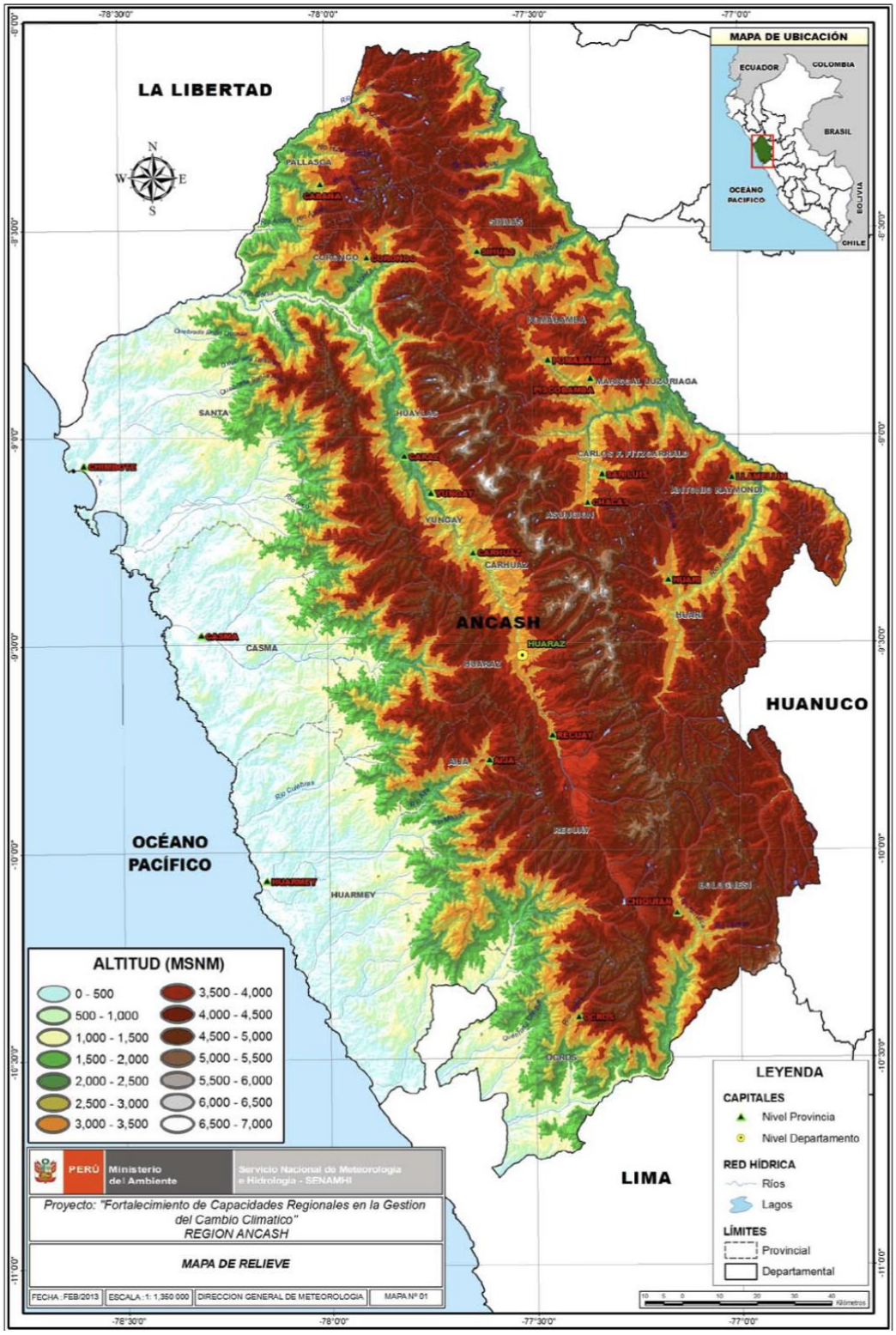

FIGURE 4 RELIEF MAP OF THE ANCASH REGION BY MINISTRY OF ENVIRONMENT, PERMITTED USE FROM MILTON CAMILLO MORALES

Agricultural and livestock activities in the region produce the largest amount of food for consumption for population and contributes an average of 7% of gross domestic product (2008-2012), occupying 25,7% of the population economically active (Ministry of Agriculture and Irrigation, 2016, p. 30). Hence, it constitutes an important element for social and economic development in Peru, in the alleviation of poverty and food security. It is one of the largest generating sectors of employment in Peru (Ministry of Agriculture and Irrigation, 2016, p. 30). The household agriculture is characterized by predominant use of family labour force, limited access to land resources, water and capital, and the multi-income survival strategy (Ministry of Agriculture and Irrigation, 2016, p. 30). In the Ancash Region, the families dedicated to agriculture are characterized by production for self-consumption, minimal sales to local markets and lower income relative to the labour force it occupies. Despite such negative developments in agriculture and land use, they are important generators of economic dynamics at the regional level, stimulating local markets (Ministry of Agriculture and Irrigation, 2016, p. 30).

FIGURE 5 TUNA

FIGURE 6 CORNFIELD

3 RESEARCH METHODOLOGY

INTRODUCTION

In the following chapter, methodological choices will be described and discussed. Research design will be outlined, including justifications of qualitative methodology, selection of participants and type of applied method. Research sample will be presented, additionally a brief description of data generation and management. The chapter continues with methodological and ethical challenges, especially in terms of cross-cultural research. A large number of ethical considerations associated with cross-cultural research can be considered. A prioritization has been made based on factors I experienced as critical and literature dealing with methodological challenges. The paragraphs are devoted to challenges regarding access to research participants and method, preparation of cross-cultural research and ethical aspects of conduction of interviews in a distinctive culture, and reflexivity and positionality of me as a researcher.

RESEARCH DESIGN

QUALITATIVE METHODOLOGY

A qualitative method of inquiry has been conducted as a means of studying subjective perceptions. According to Winchester and Rofe (2016) and Tjora (2012), oral methods are the most popular and widely used methods of data production within qualitative methodology. Qualitative methodology was most suitable for my research due to, among other elements, the illustrative picture and supplementary data I would like to add to the quantitative investigation already existing in the field of climate change in the Ancash Region. With a qualitative methodological approach, we achieve an illustrative selection, not a representative selection (Flowerdew & Martin, 2005). The quality of the information the interview participants can offer is the main goal, not typicality or representativeness (Crang & Cook, 2007, p. 14). I desired to investigate individual experiences and social processes in the context of human environments – fundamental elements possible to adequately illuminate through qualitative methods (Winchester & Rofe, 2016, p. 3). Qualitative methods are conducted to explore the complexities of everyday life, in order to gain a deeper understanding of the processes shaping our social worlds (Tjora, 2012). A qualitative research can elucidate human environments and human

experiences (Winchester & Rofe, 2016, p. 5) . I have aspired to capture oral histories expressing perception. The desire has been to gain selective access to appropriate groups of people; people to teach the researcher about the research questions from their various perspectives (Crang & Cook, 2007, p. 14). A qualitative approach has been suitable to obtain adequate information for adaptation measures to climate change for protection and improvement of the livelihoods of rural populations.

I find it important to highlight that "qualitative geographical research tends to emphasize multiple meanings and interpretations rather than seeking to impose any dominant or correct interpretation" (Winchester & Rofe, 2016, p. 8). What are individuals' experiences of places and events? Winchester and Rofe (2016, p. 7) emphasize that individuals experience and understand the same environmental changes differently. The experiences of individuals cannot necessarily be generalized, but they do constitute part of a multifaceted and fluid reality. Let us consider migration; you achieve an overview by counting the number of people moving from one place to another. However, you do not know *why* an individual is migrating and *how* the process of migration is experienced by the migrant.

SELECTING PARTICIPANTS

Exploratory and background work gave me as a researcher the capacity to begin to conceive context and perspectives of potential research participants. Understanding human beings' perspectives in complex cultural situations usually requires some form of in-depth interviewing. The more comprehensive our background knowledge gets, the more confident we are regarding who we wish to involve in our research and why (Stratford & Bradshaw, 2016, p. 123). Accordingly, purposive sampling was selected as sampling technique. Purposive sampling is a non-probability technique selected based on characteristics of a population and the objective of the study. The units being investigated are based on the judgement of the researcher (Etikan, Musa, & Alkassim, 2016). Snowball sampling, also referred to as referral sampling or chain sampling, was chosen in the search of interview participants. It is a sampling technique frequently used in the search for hidden populations. Starting point is identifying an individual having the key characteristics required by the research design. This person can nominate others involved in similar cases with similar characteristics (Stratford & Bradshaw, 2016, p. 124). Such sampling technique was the only option for my research in terms of practical conditions and logistics. I was not in possession of contact information to any potential participants. I was

also aware of how this was a hidden population, knowing that potential interview participants might not own a cellular phone.

When reaching a selection of potential interview participants, maximum variation sampling was conducted as final selection of participants. Maximum variation sampling is a type of purposive sampling. The sampling documents variations that have emerged through adaptation to different conditions and identifies important common patterns that cut across variations (Stratford & Bradshaw, 2016, p. 124). In this study, a broad sample was accomplished by conducting individual interviews with people of different ages and genders. I had an aim of sampling as wide a range of perspectives as possible to capture the broadest set of information and experiences (Kuper, Lingard, & Levinson, 2008). People in diverse situations can provide different perspectives and reveal various reasons why people migrate in the context of climate change. In my case, I strived to avoid getting overlapping information, and rather choose research participants who provided more distinctive information.

Type of Applied Method

Interview and oral history

In accordance with the aim of my research described in the paragraphs above, interview and oral history have been applied as methods for the present research. Interviewing has been a primary instrument used by ethnographic researchers in attempt to grasp the context of different people's everyday social, cultural, political and economic lives (Crang & Cook, 2007, p. 60). According to George and Stratford (2016) and Tjora (2012), interview and oral history are excellent methods of gaining access to information that can cover the purpose of my research: opinions, perceptions and experiences. If you have easy access to a large number of informants and possess a vast amount of knowledge regarding a phenomenon, a quantitative questionnaire survey can be considered. However, it is challenging to create adequate survey questions with complementary response categories for research in an area where you do not carry abundant knowledge regarding a phenomenon (Tjora, 2012, p. 105). Such challenges were present in my fieldwork. I did not have access to a large number of participants. Nor did I possess sufficient knowledge regarding the phenomenon, despite my knowledge of the country. In-depth interviews were appropriate, moreover considering the purpose to illuminate a phenomenon through people's perceptions, experiences and meanings. When using interview as primary mean, you are able to investigate complex behaviours and motivations, and the diversity of

perceptions and meanings (Dunn, 2016, p. 150). For my research, there was also a requirement of a method that shows respect for and empowers the people who provide the data. The use of interview as method allowed me to be aware of and properly manage sensitive questions. I was able to value and treat the informant's view of the world with respect (Dunn, 2016, p. 150).

The qualitative method named "oral history" constitutes the principal method for the present research; an ethnographic method in human geography. I have found the method appropriate in order to generate data concerning environmental history. To indicate time perspective was desirable, as perception of climate change requires dimensions of time. Moreover, I have desired to provide aspects in order to understand how meanings differ among people of different age, gender, class and ethnicity. Oral history interviews can provide such information (Dunn, 2016, p. 161). The aim of oral histories is to record the first-hand knowledge, experience and perception of a participant (Tjora, 2012, p. 104). This way of interviewing helped me produce a more comprehensive picture of the causes of environmental change than what was available through physical methods of inquiry. Data generated included people's memories of change in climate and local resource use. According to Dunn (2016, p. 161), individual narratives can fill gaps in the "scientific record", and it can be used to complement data gathered using physical or quantitative methods. As indicated, this was my aspiration. Additionally, perception of climate change and how it might lead to migration are domains sensitive to context. George and Stratford (2016, p. 189) emphasize how oral histories can facilitate improved, detailed and nuanced understandings of such themes. In general, space, place, region, landscape and environment are areas of study sensitive to context in the field of human geography. Insight has been gained from oral histories to better understand the area of study of the present research within its context. Oral histories reveals what happened, how and why, from a personal perspective (George & Stratford, 2016, p. 191).

Semi-structured and unstructured interviews

Three major forms of interview exist: structured, unstructured and semi-structured interview. These three formats can be placed along a continuum (Postholm, 2010, p. 68). The present study is located in between semi-structured and unstructured interview; ordered but flexible questioning. To be able to answer the scientific research questions, I was required to let the conversation be directed by the informant rather than by rigid set questions. However, some explanations need to be made regarding exact type of interview and interview guides. Semi-structured interview is characterized by some degree of predetermined order but likewise

maintains flexibility in the way issues are addressed by the interview participant. Unstructured interview is linked to oral histories (Dunn, 2016, p. 150). It is associated with the type of in-depth interviewing desirable for my research; each interview being unique and focusing on personal perceptions and personal stories. Oral histories may appear to be unstructured. However, oral history as method requires a prepared interviewer conducting a specific and outlined interview (George & Stratford, 2016, p. 190). Interview guides are usually associated with semi-structured forms of interviewing, however, due to preparations being required and valuable for the conduct of unstructured forms of interviewing, an interview guide was a valuable tool for my research.

An interview guide and visualization of the conduct of the interview was essential, partly due to Spanish not being my native language. It was vital for me to have questions prepared that could redirect the conversation if it was derailing. Such was especially the case if I did not quite understand the participants' answers. The interview guide of this study is divided into a three-part format, corresponding to the tradition of oral history: orientation questions to establish the participants background, common questions all interview participants would answer, and specific questions applied to obtain information regarding individual experience (George & Stratford, 2016, p. 197). Despite the fact that the interview guides were created to help me keep the conversation on track, I was required to follow the dialogue and obtain their individual oral stories regarding climate change and migration. Each interview was unique and adjusted to the interview participants during the interview.

RESEARCH SAMPLE

In the present study, 12 interviews of migrants have been conducted. Stratford and Bradshaw (2016, p. 125) emphasize that there are few rules in qualitative methods related to sample size, and it depends on what is needed in the way of knowledge, on the purpose of the research, on its significance and for whom, and on logistics and resources. I was aware that I had limited time and resources for conducting my fieldwork. Originally, I was supposed to carry out the fieldwork alone, but I was lucky to organize with an assistant before I travelled to Peru. However, the amount of time he had to help me was uncertain. Such practical conditions often determine the specific research sample size. I strived to coordinate and organize to be able to collect sufficient data material to properly answer my research questions. In qualitative research, the emphasis is usually upon an analysis of meanings in specific contexts, and the

sample is not intended to be representative. According to Stratford and Bradshaw (2016, p. 125) and (Kvale & Brinkmann, 2015, p. 148), the validity of the information is more dependent on the abilities of the researcher than on size of sample.

The study area is the Ancash Region. Participants have migrated internally from rural areas towards urban areas. Some participants have moved to the city of Huaraz, others to small urban villages nearby the city of Huaraz. Due to challenges in accessing potential participants, it was required to be open to various places of origin and places of destination within the Ancash Region. The essential goal was to reach small-scale farmers migrated from rural to urban areas as a result of climate change. Seven participants have moved from higher areas between 3600 and 4500 m.a.s.l. to areas between 3050 and 3300 m.a.s.l. Five participants have migrated from areas between 2900 and 3300 m.a.s.l. to areas of approximately same altitude.

TABLE 1 RESEARCH PARTICIPANTS

Participant	Gender	Age	Place of origin	Place of destination	Migration year
Migrant 1	Male	65	Chavín de Huantar District	Huaraz Province	1990
Migrant 2	Female	62	Chavín de Huantar District	Huaraz Province	1990
Migrant 3	Male	38	Chavín de Huantar District	Huaraz Province	2005
Migrant 4	Male	38	Wanchaq District	Huaraz Province	2006
Migrant 5	Male	80	Chavín de Huantar District	Huaraz Province	2012
Migrant 6	Male	51	Macashca District	Huaraz Province	1993
Migrant 7	Male	49	San Marcos District	Huaraz Province	1993
Migrant 8	Male	71	Marcará District	Huaraz Province	1967
Migrant 9	Male	49	Olleros District	Huaraz Province	1981
Migrant 10	Female	31	La Merced District	Huaraz Province	2000
Migrant 11	Female	52	Quiches District	Carhuaz Province	1981
Migrant 12	Male	26	Anta District	Huaraz Province	2008

DATA GENERATION AND MANAGEMENT

Although methodological aspects of cross-cultural research will be elaborated in the following sections, I will briefly describe practicalities regarding data generation and the management process. While generating data in the field, I realized the vitality of using a research assistant. In many interview surveys conducted in scientific research projects, an assistant supports during the fieldwork and transcribes the recordings (Kvale & Brinkmann, 2015, p. 207). The assistant was a friend of mine from my time in Peru as an exchange student. He possessed knowledge

about the area and had experience in conducting investigation of qualitative methodology from his psychology degree. By being of Peruvian origin with Spanish as native language, additionally English speaking, he was valuable assistance in guiding me in the Ancash Region and coordinating with potential interview participants. He was highly valuable in translating if necessary while I was conducting the interviews, and in general interpretations of uncertainties. He was also helpful in transcribing interviews. We both conducted one set each of detailed transcriptions of all of the interviews. I chose to conduct complete transcriptions of all interviews as detailed as I was capable of, to maintain proximity to the data material. However, I was aware of limitations concerning language. The transcribed interviews accomplished by my research assistant ensured correct data, as I had an extra set of transcriptions to verify words, expressions and perceptions.

During the fieldwork I wrote memos – a short note to oneself to serve as a reminder (Cope, 2016, p. 374). I wrote memos to document my work and always keep in mind recent information. It allowed me to explore possible points of view for the analysis and ensured a critical review and self-reflection of choices and my position in the research. Furthermore, it is essential to comment certain formalities: informed consent and confidentiality. General procedure for all interviews was to follow certain ethical guidelines of Dowling (2016) and Kvale and Brinkmann (2015): assure the participants were informed regarding aim of research, guarantee confidentiality and anonymity, and ask for informed consent. For most participants, the aim and content of the research project were comprehensible. However, it was a challenge to properly explain the project by using an interpreter for the Quechua-speaking participants. They had never been participants in a similar research project earlier and were sceptical of sound recording. Such circumstances required a detailed explanation of the project, where the interpreter used a vocabulary intelligible for the participants. By also allowing unlimited number of questions regarding the research, the interview participants expressed understanding and acceptance for implementation of the interview and a body language revealing tranquillity.

In the analysis of the qualitative data I performed thematic coding and categorizing. I have applied the computer program "Nvivo", an analysis tool frequently used in qualitative research. I created certain descriptive codes such as age, gender, place of origin, year of migration, former agricultural production, present occupation etc. However, mainly analytical and thematic codes have been established. Thematic coding involves identifying passages of text that are linked by a common theme. This allows me to arrange the text into categories and "establish a framework

of thematic ideas about it" (Gibbs, 2007, p. 2). I have retrieved all text coded with the same label to combine sections that are all examples of the same phenomena within the field of the research. Such strategy of analysing has been a useful method of organizing the data in a structured way. At the outset of the coding, and to some extent parallel during the process of coding, a proper theoretical approach emerged, which enabled me to examine, structure and categorize the data material. A theoretical framework can "frame" every aspect of a study. The chosen theoretical approaches have provided powerful concepts applied in the coding and the analysis of the data.

METHODOLOGICAL AND ETHICAL CHALLENGES

ACCESS TO PARTICIPANTS AND METHOD

Finding participants appeared to be demanding. As I wanted to get in touch with former small-scale farmers having completed rural-urban migration in the Ancash Region, snowball sampling appeared as a suitable method of purposive sampling. Key informants assured me of the existence of this group of people, but they did not know their end destination of migration. I was told that various people moved to the city of Huaraz (Altamirano Rua, 2019, personal communication; Cruz, 2019, personal communication). I established contact with geography professor Fray Cruz at The National University of San Marcos in Lima, having geographical knowledge of situation and context regarding climate change and affected population in the Ancash Region. Additionally, the region was his place of origin. Hence, he became helpful in several ways. I obtained contact with family and friends of the professor in Ancash, who put me in communication with potential interview participants.

There exist some methodological challenges in the application of interview as method, regarding type of population group being the selection. This is a group of people with low educational level, several participants have barely completed primary and secondary school. They do not possess the scientific vocabulary referring to disciplines connected to climate change. I have experienced the importance of choosing appropriate words and expressions being recognizable for the interviewees. There was also crucial to assure the interviewees that they understood the issues. By doing so, I encouraged more open and detailed answers, as highlighted by Crang and Cook (2007, p. 67). Due to lack of education, there was a lack of grammatical correctness and a modern language, especially revealed in sentence structure. The

interviewed participants were challenging to understand both during the interviews and in transcribing the interviews. Local terms and expressions are difficult to translate into English. Occasionally, it was highly challenging to understand the Spanish of the interviewees. The research assistant could guide me in translating and confirm and/or dispel my doubts. Certain interviewees exclusively spoke Quechua, a Native South American language family spoken primarily in the Andes and highlands of South America (Oxford Dictionary, 2019). In such case of my fieldwork, both my assistant and I needed the help of another interpreter. An interpreter we got to know from the local community was applied.

Ethical Considerations in Cross-Cultural Research

Working across the differences that constitute "cultures" is a common challenge for geographical researchers. Most human geographic research can be defined as cross-cultural research, due to its involvement in other people's perceptions and constructions of space, place, region, landscape and environment (Howitt & Stevens, 2016, p. 46). The present research has been performed in a highly distinctive culture, completely different from the surroundings of previous projects I have realized. Howitt and Stevens (2016, p. 46) highlight the necessity of physically travel to the field of research to engage with "others", given the complex dimensions of diversity. What concerns preparatory work, it can be virtually impossible to prepare adequately to carry out research within a field in a different culture when you are located in your home country. Both Howitt and Stevens (2016) and own experiences from preliminary work underpin the following statement: when arriving the country and area of study you have the possibility to get a closer look into your research, obtain new and recent information and encounter current viewpoints and unexpected challenges.

When finally reaching out to potential interview participants, certain ethical challenges arose. The rural population of Ancash is introverted and humble. The research participants appeared to be little self-centred and uncomfortable conversing about themselves. A fundamental element is to treat the interview participants with respect. Avoid intervening into issues appearing to be sensitive. I averted too rapid progression during the interview and made sure they followed and understood throughout the whole interview. I aimed to avoid insecure situations for the interviewees, e.g. if they did not understand the interview questions. The advantage of interview and oral history is achieving the situation of a normal conversational-interaction (Dunn, 2016, p. 160). It allows you to explain and ask questions repeatedly in

different ways, ask follow-up questions, thus obtain sufficient and comprehensive information. The rural population being reserved is also evident through modest vocabulary. Some interviews were somewhat shorter than others. I reached a saturation point after conducting eight interviews and made a choice of conducting a few more than originally planned to obtain more varied information and more detailed information with regard to certain topics.

Researchers Reflexivity and Positionality

I am highly emotionally engaged and interested in the issues of this thesis. I have a brother and a sister adopted from Peru, I have been an exchange student at the Pontifical Catholic University of Peru in the city of Lima and I have visited Peru several times. Possession of knowledge of Peru enabled me to perform a research project on the given topic in the Ancash Region, and had its advantages during preparations in Norway. It could potentially have been too demanding to carry out such project in terms of timeframe and expertise, having no pre-existing knowledge of e.g. geography, culture and language of Peru. Such insight was also valuable in understanding and analysing answers during the conduct of the interviews. It facilitated understanding of context. Furthermore, I believe the insight, knowledge and family connection can permit nuanced reflections through all stages of the project. However, such engagement and pre-existing knowledge may have led to some prejudices, such as characteristics of the rural population and presumed scenarios concerning climate change and the linkages to migration. Waitt (2016, pp. 295-296) stresses the relevance of becoming self-critically aware of the ideas that form our understandings of a particular topic. In the process of being self-critical, I constantly reviewed pre-existing ideas shaping my understanding. I discussed and exchanged knowledge with professors and local experts in Lima during preparations for the fieldwork. I aimed for a meta-perspective throughout the entire research process: identify and consider own preconceived ideas and prejudice regarding the situation of the rural population of the Ancash Region, their perceptions of climate change and their reasons for migrating. To become reflexive, such preconceptions must be held in suspense. Pre-existing knowledge does not have to be rejected definitively but not entirely accepted; the ideas are always results of constructions (Waitt, 2016, p. 295).

Being a critically reflexive researcher means analysing my own situation as if it was something I was studying. This can help me identify the implications of subjectivity and intersubjectivity in the research (Rose, 1997). Objectivity has traditionally been emphasized referring to non-

personal involvement between the researcher and the researched (Dowling, 2016, p. 34). However, pure objectivity will be impossible in any qualitative research conducted. Qualitative research should be acknowledged as a social relation and I ought to be aware of the nature of my involvement. It has been essential to be aware of my emotionally engagement and subjectivity; how I might influence the data material and how it might influence me. My personal relation to, and experience with, the Peruvian rural population made me sympathize with the challenges they were experiencing. I intensively wished to share their personal histories. Hence, I had to prevent such emotional engagement directing the data material during the research process. The task for me as a researcher was to recognize and acknowledge the situated subjectivity and my emotional engagement, rather than strive for an objectivity. Crang and Cook (2007, p. 13) emphasize that once this is done, subjectivity is much less a problem and much more a resource for deeper understanding. What concerns my positionality in the interview setting, I appear as an outsider. On the other hand, I possess some of the characteristics of an insider by speaking Spanish almost fluently and comprehending customs, unwritten rules, norms and behaviours. Such condition was beneficial in accomplishing acceptance and recognition from my interview participants.

4 Analysis and Concepts

Introduction

A wide range of theories, concepts and typologies can be applied in qualitative methodological investigation in the field of geography. Reviewing literature and multiple theoretical frameworks, one must acknowledge that the terms "theory" and "theoretical framework" do not have clear and consistent definitions. Nevertheless, theoretical frameworks and key concepts can focus a study and serve as "lenses" to study phenomena and help the researcher make sense of the social setting and context being studied (Creswell & Poth, 2017). There is no unified theory of any of the two concepts of climate change or migration. However, potential and relevant indicators and typologies of climate change and migration have been reviewed, and certain approaches have been chosen to provide theoretical justifications for the aim of the study.

As mentioned above, it does not exist one unambiguous theory of climate change, but climate researchers emphasize various factors to understand climate change. Such indicators may be changes in temperature, precipitation, wind, time and regional variations (Houghton, 2009). As concerns migration, an analysis can be conducted in the light of various theories, concepts and indicators, which emphasize various aspects to explain causes of migration and the migration process. As will be explained in the section on migration (p. 29), it has proven to be difficult to identify one single theory. Certain factors such as multi-causality, forced migration and climate-induced migration have been chosen for the thesis. These factors can serve as a theoretical basis for analysing and discussing in what way climate change has led to migration for the research participants and examine how climate-induced migrants can be labelled and defined. A thorough explanation of the analytical approach is presented towards the end of this chapter: a clarification of how I desire to operationalize the concepts with the aim of discussing the findings.

KEY CONCEPTS

CLIMATE CHANGE

Time frame and regional variation of climate change

According to IPCC (2013, p. 5) who developed The Fifth Assessment Report, changes in weather and climatic events have been observed since about 1950. It is very likely that the number of warm days and nights have increased on the global scale, causing such extreme events. Global surface temperature changes for the end of the 21st century is likely to exceed 1,5°C. Warming will continue to display year-to-year variability and will not be regionally uniform (IPCC, 2018b, p. 20). As stated by IPCC (2013, p. 19), the global warming is causing changes in the global water cycle, and these changes are not uniform. Such non-uniform regional environmental changes shape regional and local perceptions of climate change. Climate change is global, but the impact is local. Thus, human beings will perceive and respond to climate change in several ways, depending on location (Altamirano Rua, 2019, personal communication).

Peru is located at the equatorial line. As a result of this it would be natural to define the climate as tropical. However, the presence of several microclimates makes it difficult to speak of one climate for all of Peru. Various factors generate a heterogeneous climate (Ministry of Environment, 2016, p. 43). Some main factors affect: the Peruvian ocean current of Humboldt, the Andes Mountains and the dynamics of cyclones and anticyclones of the South Pacific (Gallardo, 2008, p. 11; Ministry of Environment, 2016, p. 43). Hence, it is expected that climate change in Peru will be expressed differently. There are areas where temperature and rainfall increase, other areas where such elements decrease (Gallardo, 2008, p. 11). As in the whole Andean region, the climate of the Ancash Region is varied. This is particularly due to the annual hydrological cycle. Seasonal precipitation characterizes the region. Precipitation increases from August towards the core rainy season from October to April (Gurgiser et al., 2016, p. 499). The dry season – the Andean winter – is present from May to September (Heikkinen, 2017, p. 78). Furthermore, altitude partly determines the climate. Sowing and cultivation periods vary strongly along the elevation. The desert climate dominates the coastal areas of the Ancash Region, with few and unevenly distributed rainfall. At medium higher altitudes (approximately 1500-4000 m.a.s.l.) we observe zones with a temperate and dry climate on the eastern and western Andean slopes, as well as in the Santa Valley. Cold and dry climate characterizes the

higher altitudes (approximately 4000-5000 m.a.s.l.) and a polar climate in the snowy mountain peaks. At the east of the Cordillera Blanca and at the bottom of the Marañón Canyon, there is a warm-humid climate, with high temperatures during day and night (Ministry of Environment, 2016; Ramírez, 2011).

Quantitative investigation of climate change in the Ancash Region

Precipitation

According to IPCC (2013, p. 5), the number of heavy, intense precipitation events have increased various places at a global level. Precipitation is likely to be more frequent and less easy to predict in the future (IPCC, 2013, p. 7). Such challenges are already present. Several studies in the Central Andes and the Ancash Region reveal certain common findings regarding anomalies in precipitation. Recent monitoring has revealed abnormal changes in precipitation. Gurgiser et al. (2016), Haylock et al. (2006), Heikkinen (2017), Sanabria et al. (2014), Ramírez (2011) and the Regional Government of Ancash (2016) have conducted analysis of precipitation in the Central Andes and the tropical Santa Valley. Although these studies show that the total amount of rainfall has not decreased significantly in the Central Andes, intense year-to-year variation in precipitation has been identified in the Ancash Region regarding frequency and intensity of heavy rainfall. There are evident tendencies for numerous intense rainfall events. A regional investigation of climate change of Ancash has been conducted by the Regional Government of Ancash[4]. Changes in intensity and frequency of rainfall have been proven (Regional Government of Ancash, 2016, p. 8)[3]. The data measured with meteorological instruments from 1965 to 2012 show a slight increase of the total amount of annual rainfall in the stations of Recuay and Chiquián. But the increase is small: barely an increase rate of 5 mm/year. As of now, not considered as a significant increase (Ministry of Environment, 2016; Regional Government of Ancash, 2016). However, measurements from Recuay show increase in the number of days with heavy, intense and extreme rainfall (Regional Government of Ancash, 2016, p. 10). Heavy rainfall caused an increased number of emergencies in the Ancash Region from 2003 to 2014, according to the National Institute of Civil Defence (Regional Government of Ancash, 2016, p. 37).

Temperature

Temperatures in the Ancash Region have been significantly altered. In the southern sector of the Ancash Region (Recuay and Chiquián) maximum temperatures have increased and minimum temperatures have decreased since 1965 (Regional Government of Ancash, 2016, p. 8). Measurements show following changes in maximum temperatures: 0,4 °C / decade in Recuay and 1 °C / decade in Chiquián (Regional Government of Ancash, 2016, p. 9). Longer periods of summer and droughts have been observed and measured, as well as increased ground frost. In the Ancash Region there will be a clear pattern of warming up to 1,8 °C in 2030 compared to current climate conditions (Ministry of Environment, 2016, p. 146).

Slow onset and rapid onset climate change impacts

Different types of environmental causes of migration can be identified (Bates, 2002; Homer-Dixon, 1993; Lonergan, 1998; Renaud, Dun, Warner, & Bogardi, 2011). Literature reviewing environmental migration present categorizations of principal environmental causes of migration. Among others, Renaud et al. (2011) and Lonergan (1998, pp. 9-10) propose frameworks for determining environmental migrant sub-categories. One type of consequence of climate change that can cause people to migrate is rapid onset environmental processes and natural events. Such abrupt and acute events can be natural disasters including floods, earthquakes, volcanoes, landslides and various types of coastal storms, including tropical cyclones. Poor people in developing countries are the most affected due to high degree of vulnerability. The other category of environmental change consists of slow-onset changes or cumulative changes. Such changes are generally natural processes occurring at a slower rate. Changes such as land and soil degradation and erosion, droughts, changes in the hydrological cycle, deficiency of water and global warming. These changes result in reduction of crops for small-scale farmers (Lonergan, 1998; Renaud et al., 2011).

Investigation of climate change related to rapid onset environmental changes in Ancash has been conducted for several years. The Cordillera Blanca is the highest tropical ice-covered mountain range in the world and represents approximately the fourth of the world's tropical glaciers (Carey, 2014, p. 30). It has the largest concentration of ice in Perú (Carey, 2014, p. 13). It was registered 722 individual glaciers in The Cordillera Blanca in the 1970s, covering an area of 723,4 km^2 (Ministry of Environment, 2016, p. 161). Based on analysis of satellite imagery, in 2009 the glaciers merely covered an area of 527,6 km^2. This shows a reduction of 27% of

the glaciers (Ministry of Environment, 2016, pp. 161-162). This has caused and will cause rapid onset disasters landslides, avalanches and floods (Regional Government of Ancash, 2016). Deglaciation of the glaciers with subsequent natural disasters and acute hazards appears as the field getting substantially attention in Peru and major publications in the popular media. In general, we are exposed to information concerning rapid onset changes to a higher extent than slow onset changes destroying soil fertility and quality.

MIGRATION

Multi-causality

Migration appears as a difficult concept to define given that people move for various reasons. People have migrated due to fear of persecution and civil unrests, from war and conflicts, for economic reasons, natural disasters and climate change. The reasons for migration are diverse and interlinked. It is difficult to distinguish and define the causes of migration separately. King (2012) provides an overview of theories and typologies of migration. Several approaches are theorizing the causal stimuli for migration. Despite the relatively long tradition of research on migration, it has been demonstrated that there is no single theory that captures the full complexity of migration, and nor will there ever be (King, 2012, p. 24). It can be extremely hard to distinguish between e.g. environmental, economic and political factors for migration, and too narrow definitions can be misleading and even damaging, since it can divert attention from complex causes (Castles, 2003). Van Hear (2010) has written that the desire for searching for an overarching theory of migration has waned along with the increasing diversity of migration flows. Both Van Hear (2010) and Castles (2006) speak of mixed migration, a term encapsulating mixed motivation for migration and the mixed nature of migratory flows. Castles (2006) exemplifies: a migrant primarily moving due to economic reasons may also flee political oppression. A person moving due to degradation of soil and lack of vital environmental resources may also aspire for improved economic circumstances (Castles et al., 2013, p. 26). It is difficult to separate economic, social, cultural, political and environmental causes of migration. Castles (2006) argues that the majority of forced migrants move due to mixed motivations. The process of migration is often affected by a complex set of push and pull forces, where push forces relate to the place of origin while pull factors relate to the place of destination (Warner, Hamza, Oliver-Smith, Renaud, & Julca, 2010, p. 690). The conceptual advances made in migration studies since the 1990s reflect such understanding of migration processes and its causes (Van Hear, 2010, p. 1535).

Related to views of multi-causality of migration, two different and opposing perspectives arise. Suhrke and Hazarika (1993) present the minimalist view and the maximalist view, being apparent in literature on environmental change and population movements. The minimalists see environmental change as a contextual variable that can contribute to migration, but they warn that we lack sufficient knowledge about the process to draw firm conclusions (Suhrke & Hazarika, 1993, p. 4). Migration is not a mono-causal phenomenon, and for various rural populations, migration is one of several coping strategies to tackle poverty. A combination of social, economic, environmental and political conditions contributes to migration. In contrast, the maximalist view focus on the environmental variable, extracted from an array of causes, describing migration as a direct result of environmental degradation (Suhrke & Hazarika, 1993, p. 6).

Forced migration

The theory of forced migration describes the potential factors that force people to involuntary leave their habitats. The term "forced migrant" has no specific legal definition but can refer to various types of migration – some of them legally defined, others not on a legal basis. Various scientists, politicians and international organizations have attempted to define the concept of forced migration. According to Castles (2006, p. 8), forced migration refers to not only the movements of legally defined refugees and asylum seekers, but also anyone forced to leave their homes by violence, persecution, development projects, natural or environmental disasters or famine.

According to Terminski (2012), causes of forced migration can include environmental challenges. The term "environmental migrant" has been utilized to represent people who are forced to leave their traditional habitat due to environmental factors having negative impact on his or her livelihood, or environmental disruptions such as biological, physical or chemical change in ecosystem. Warner et al. (2010, p. 701) state how forced migration in the context of climate change often refers to rapid onset disasters. However, there is evidence of forced migration due to slow-onset climate change impacts. Migration can occur as a result of slow-onset climate change, such as land degradation (Warner et al., 2010, p. 701). Despite such definitions, defining forced migrants in practice can be complex and difficult. A person may not fit into one of two categories: entirely forced to migrate or moved entirely voluntary. A continuum can be discovered. Both Van Hear (2010) and Tete (2011) remind us of the

complexity of labelling migrants, and draw on Richmond, having an axis running from voluntary (more choice, more options) to involuntary (less choice, less options).

Climate-induced migration

Despite the evidence of people migrating in the context of climate change and the variety of approaches and definitions, it does not exist any global political measures to address them. The United Nations High Commissioner for Refugees (UNHCR) and the International Organization for Migration (IOM), two global agencies investigating and making decisions regarding refugees, consider that environmental migrants do not have a legal basis by reasons of not being recognized as refugees. They do not fit into any of the legal definitions of a refugee, even though the definition of who is a refugee has expanded since its first international and legally binding definition in 1951. Hence, they are not offered the same legal protection as refugees (Altamirano Rua, 2014, p. 16).

Different opinions exist whether environmental migrants should be given legal status as refugees according to the law system of the United Nations. As indicated, definitions of environmental refugees or environmental migrants have been criticized and commented from many points of view, more so than presented in the previous section. Several migration experts are questioning whether to define such people as refugees. Castles (2003) considers "environmental refugee" as a label that can lead to forgetting the multi-causality of migration. Homer-Dixon (1993) believes that the term "environmental refugee" is misleading due to its indication of environmental scarcity as the direct and sole cause of migration. In most circumstances, several interacting physical and social factors together may force people to leave their place of origin. Nor does the term "environmental refugee" differentiate between people moving due to abrupt disasters and those who migrate for a variety of less urgent environmental reasons (Homer-Dixon, 1993, pp. 40-41).

In contrast, definitions of environmental migrants are proposed in order to manage, protect and achieve progress for future administration of environmentally induced migrants – a growing group of people (Altamirano Rua, 2014). Moreover, such definitions and categorization may serve as a fundament for creating a legal basis and protection for such population groups. In the myriad of definitions of environmental migrants, Myers (2002, p. 609) is known for his definition: "People who can no longer gain a secure livelihood in their homelands because of drought, soil erosion, desertification, deforestation and other environmental problems, together

with the associated problems of population pressures and profound poverty". International Organization for Migration proposes a similar definition, adding how migration either can be temporarily or permanently, and internal or international (Melde, 2014, p. 13)

However; may *one* definition be deficient? The above literature review reveals how one definition of all environmental migrants may not be sufficient. Numerous typologies of environmental migrants are provided by experts of migration such as Castles (2006), Suhrke and Hazarika (1993), Bates (2002), Myers (2002) and Renaud et al. (2011). They argue for a demand of sub-categories in defining environmental migrants. Related to empirical findings from the study I have conducted, I will present the typology of Renaud et al. (2011) – a typology being similar to the one IOM has developed. Potential sub-categories of present definitions of environmental migration may be useful to indicate the motivations for migration and the urgency to receive assistance. Renaud, Bogardi, Dun, and Warner (2007) and Renaud et al. (2011) identify three categories of environmental migrants, namely "environmental refugees", "environmentally forced migrants" and "environmentally motivated migrants". "Environmental refugees", in 2011 modified to "environmental emergency migrants", are individuals who flee the worst of an environmental impact on a temporary basis (Renaud et al., 2007, pp. 29-30; Renaud et al., 2011, p. 14). "Environmentally forced migrants" are people who "have to leave" in order to avoid the worst of environmental deterioration. Due to a slower deteriorating environment, the urgency to move is minor than for the previous category (Renaud et al., 2007, pp. 29-30; Renaud et al., 2011, pp. 14-15). The third category "environmentally motivated migrants" are people who "may leave" a steadily deteriorating environment and decline in land productivity in order to prevent the worst. There is no emergency, but an environmental degradation leading to increased poverty that may cause people to decide to move in order to avoid further deterioration of their livelihoods.

ANALYTICAL APPROACH

The research illuminates perceptions of climate change for rural population migrated in the context of climate change. The study explores how rural population perceive changes in the climate, and in what way it has led to internal migration from rural areas in the Ancash Region. The study examines different migration histories, documenting uniqueness, and important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity. The study reveals essential features of a phenomenon as experienced by diverse people among varied contexts. Within the field of geography, relationships between physical and social aspects of the environment can help us understand what makes individuals and communities vulnerable and/or resilient, and their ability to adapt to changing physical and social conditions. Climate change is global but with regional variations and local impacts.

Throughout exploring and establishing my research, having sessions and discussions with key informants in the field of knowledge and conducting first interviews, I realized the divergence between what area of focus we are exposed to, and what different types of climate change and challenges also being perceived by small-scale farmers in the Ancash Region. Currently, a variety of climate change is affecting farmers in the area, with lack of qualitative in-depth research being conducted, especially examination in context of migration. What changes in the climate do former small-scale farmers perceive? Do findings of my study correspond with external quantitative investigation and measurements conducted in the Ancash Region and time horizon of changes? The categorization of slow onset and rapid onset climate change impacts will serve as a framework for separating impacts and types of climate change perceived among the former farmers. It can additionally illuminate the invisible link between slow onset impacts and migration for the research participants, which will be discussed in chapter 6.

Furthermore, this study aims to illuminate in what way climate change might lead to migration. The multi-causality of human migration and related views can affirm the complexity of discovering and defining causes of migration. This applies both to the researcher and to the informants / research participants themselves. The concept of forced migration that has been portrayed will be used to discuss the degree of coercion for the migrants in this study. It will also be applied to discuss if and how persons displaced in the context of slow onset climate change impacts can be defined as forced migrants. Furthermore, advantages and disadvantages of defining climate-induced migrants and having a legal system of management and protection

of climate-induced migrants will be discussed. A theoretical approach illuminating such aspects can serve as elements for discussing if, what and how climate-induced migrants can be labelled and the decision-making regarding degree of forced and voluntary migration. The typology of Renaud et al. (2011) will serve as a potential framework for categorizing the climate-induced migrants of the present study.

USE OF TERMS

Due to absence of any consensus on defining migration, different kinds of migrants can be distinguished. I consider it essential to explain the terminology utilized in this thesis. The terms "environmental migrants" and "environmental refugees" are used somewhat interchangeably in theoretical approaches and conceptualizations due to lack of consensus and definition of legal kind (Warner et al., 2010, p. 693). This applies in general for several terms, with regard to both the primary word describing the climate aspect and the latter word describing the person being displaced. Such terms can be "ecological refugee", "environmental refugee", "environmental migrant", "climate refugee", "forced environmental migrant", "climate-induced migrant", "climate change refugee", "environmentally displaced person" (EDP), etc.

When I refer to researchers and their typologies, I will apply their particular definitions. However, to reach the objectives of this thesis, the terms "climate-induced migrant" and "environmental migrant" will be applied. These terms can refer to "people who have an environmental signal in their reason for migration" (Warner et al., 2010, p. 693). Due to lack of international and national legal recognition of the term "environmental refugee", and the word "refugee" being politically charged, I find it complicated to use such term. Additionally, "refugees" are defined as persons crossing an international boarder, according to the Refugee Convention of 1951 (Tete, 2011, p. 19). Nevertheless, the term "refugee" can be a compelling word to describe the participants of the present study who have migrated due to a high level of force. But this does not apply to the entire selection, nor is it wise considering that it might limit the discussion and exclude the complexity and relevant aspects of a migration process.

5 FINDINGS AND RESULTS

INTRODUCTION

In the following section, the findings and results of the research will be presented. As described in the section concerning the methodological approach, thematic coding has been used in the process of analysing and coding the data material. Categories that summarize and reveal important and relevant findings have been created. To begin with, perception of slow onset climate change impacts in the Ancash Region and impact on land use will be displayed. The former small-scale farmers' perceptions of climate change are evident through changes in agriculture. Findings related to perception of changes in precipitation and temperature and timeframe of such changes will be presented. Secondly, I will present the participants' stories regarding migration. The findings reveal causes of migration for the research participants and in what way climate change has led to migration. Emotions regarding the migration process and degree of forced and voluntary migration will be presented. Eventually, the participants' knowledge of and perception of meaning of climate change and the link between the perceived agricultural changes and global climate change will be revealed.

Annotation: All participants have migrated and thus to the greatest extent experienced and perceived climate change and subsequent consequences for agriculture in the past, while still residing in their place of origin. However, climate change is not a phenomenon limited to the past and still visible for the participants. Therefore, I will submit main results common for the majority of participants by applying verbs in present tense. In presentations of participants' specific, personal experiences and in terms of timeframe, verbs in past tense will be applied.

PERCEPTIONS OF CLIMATE CHANGE

As presented in description of research sample, five participants have migrated from areas between 2900 and 3300 m.a.s.l. to areas of approximately same altitude, while seven participants have moved from higher areas between 3600 and 4500 m.a.s.l. to areas between 3050 and 3300 m.a.s.l. By all means, there are differences between and within these areas, as mentioned in the theoretical approach. At medium higher altitudes where five research participants were residents, there is a temperate and dry climate. At higher altitudes, seven

research participants resided. Cold and dry climate characterizes such altitudes. On the other hand, there are certain particular changes in the climate all interviewed participants perceive. Maximum variation has been chosen as purposive sampling technique, providing diverse time perspectives and migration histories. Perceptions of climate change and descriptions of environmental conditions prior to observable changes are either from childhood of the elderly research participants, or environmental conditions perceived by grandparents and parents forming a basis for comparison for the younger research participants.

PRECIPITATION

The ecosystems and existing species in the region are subjects to dangers of hydrometeorological origin. The study reveals modification in the hydrological cycle.

Year-to-year variability

The majority of the participants cultivated potatoes, one of the major agricultural products in the Ancash Region. They also cultivated one or more products among olluco, oca, beans, broad beans, wheat, peas, corn, mashua, barley, quinoa, kiwicha, maca root, linen and muela. By cultivation and observation of degradation of soil and crops, they have learnt in what way the climate has been changing. The research participants provide information of how the calculated onset date for the rainy season and the initial adequate sowing conditions ordinarily took place in the period of September and until mid-October. However, the majority of the research participants report how they experience a year-to-year variability of the onset dates of the rainy season. The calculation of the onset dates and periods of rainfall and droughts appeared obvious and easy to predict until approximately the 1980s, making sowing and harvesting predictable and following a certain pattern year after year. A year-to-year variability in duration of wet and dry seasons has been perceived by the interviewed participants the past 40-50 years. Such variability of onset dates and duration of wet and dry seasons threaten agricultural activities. Several migrants express how they remember from their childhood how their parents could calculate the onset date of the rain to be able to sow:

> *Now, we do not know what's going to happen, if it is going to rain, if it is not going to rain, and when the rain starts. Before, it was not like that. It rained from a specific date to a specific date, we harvested from a specific date to a specific date. It was the same every year. Not now, everything is turned around, everything is upside down.* (M10)

The rainy season was unequivocally defined, originally initiating in the beginning of September lasting until the end of April. December, January and February used to be the months with the largest amount of rainfall. They scheduled the initial sowing and cultivating according to the prediction of the onset date of the rainy season. Now, *"the agricultural calendar has been modified; it is not stable"* (M12). According to migrant 3 and his parents, they experienced change in their previous agricultural practices:

> *The seasons used to be more marked, more defined. You knew when to prepare the ground for being sown, every year it was the same onset dates. We harvested exactly the same period of time every year. It is not possible anymore.* (M3)

Unpredictable precipitation within a year and greater contrasts

All research participants express how they perceive unpredictability in precipitation within a year and a season. They experience unforeseen intense rainfall events, with subsequent water scarcity due to lack of rain and sudden periods of drought. The interviewed participants perceive challenges in predicting the hydrological cycle. The following difficulty is revealed: low possibility of predicting damaging dry periods after days or weeks of adequate sowing conditions. The interviewed participants report how their crops depended on a certain amount of water at the right time. Hence, such unpredictable precipitation has been proven to be very damaging in a long-term perspective. They experience lack of water at irregular and random times. Several former farmers mention how they frequently and unexpectedly perceive 15 days with absence of rain, during the rainy season. Such circumstances are very different from previous conditions.

> *Previously, the rain was good and stable. It gave us the possibility to cultivate the fields to have a good harvest. It is not like that anymore. In the beginning of December, the past year, it stopped raining for 15 days. Then, the crop did not grow, due to lack of water.* (M8)

The contrasts are considerable, and the climate is perceived as more extreme. The participants communicate how it used to be steady, continuous rainfall during the rainy season. At present, precipitation can arrive intense for a week, followed by a week of total absence of rain. All of the research participants experience sudden intense rainfall at unexpected dates. The rain is torrential and not continuous. Migrant 8 explains how he has experienced extended periods of absence of rain, and at the time of arrival it appears with more density and power. It damaged the crops in his place of origin. Additionally, the precipitation ordinarily initiated tranquil and

gentle, and the intensity increased with time. Currently, the rainfall arrives suddenly and abrupt, and develops quickly becoming yet more intense. *"Now, these climates are very extreme. In the dry season, it has been a more intense heat, and less rain (…). In the rainy season, when rainfall is happening, it is more intense"* (M12). Migrant 4 expresses:

> *Now, with climate change, it is very exaggerated. There are days when it rains so heavily. Then, there are days when it is hot, it really burns you. Before, it wasn't like that. It was cold, but it was "limited". It was hot, but it was "limited". Now, it is different than before. It is so extreme.* (M4)

Such changes are also visible in the migrants' perceptions of periods of drought. The majority of the participants perceive increase in intensity and duration of drought. There are no longer adequate conditions for agricultural and livestock production. The migrants could plan to sow and invest one year, further *"it's not raining when it's supposed to rain and have always been raining"* (M6). Migrant 6, a 51-year-old man, expresses difficulties in previous agricultural production. Migrant 6 lost all agricultural products and abandoned the agricultural production and the area. He explains how he occasionally was able sow something, but it did not germinate. Previously, he and his family could confidently sow and see growth. During the last years before he migrated in 1993, such cultivation was not possible.

The contrast in precipitation between wet and dry seasons is increasing. Decreased rain particularly during the dry period is perceived. Already facing challenges in terms of lack of water in the dry season, such decrease in the amount of rain makes agricultural production even more difficult. The interviewed participants express how agricultural output has decreased. Migrant 7 communicates: *"It is different now; we are not able to produce as much as before. Before, we produced a lot: potatoes, wheat, barley, broad beans. Those previous potatoes that we sowed are disappearing today. The cultivation no longer provides anything"* (M7). Previously, the production provided increased yield. Migrant 7 both threw and gave away certain amount of the products. Several research participants report how the cultivation during the past 40-60 years has delivered minor products. They do not know how to cultivate and take care of the crops with the new climate conditions. The interviewed participants have been anxious and confused in terms of climate change, and express concern during the interviews:

> *The heat is strong, and the cold is strong. It is crazy weather, crazy crazy. I do not know what will happen later (…). We cannot predict either, because nature contradicts us. We have to be very careful. I do not know what to do.* (M9)

Hailstorms

The interviewed participants perceive a higher degree of hail and hailstorms, physically ruining and shattering the crops into a thousand pieces. Such hailstorms destroying the crops are especially experienced at higher altitudes with associated low temperatures. However, the altitude is not the only determining factor, considering that it has not always been such conditions in these higher areas: findings reveal that the amount of hail and numbers of hailstorms have been proven to be increased. One respondent expresses how *"this year (2019, red.anm.), hailstorms already hit us 5 times. Big hailstones!"* (M2). The elderly research participants experience how the size of the hail has changed. The hail appears immense, at the size of an egg, and drops with more intensity. Several participants report how the hailstones separate the leaves and shatter and destroy the crops*: "Three weeks ago, we experienced strong hail. Most of what my parents cultivate was affected. It especially affected the crops of potatoes, wheat, alfalfa and corn. Most of the crops that have broad leaves"* (M12).

Some variation of the degree of destruction of the crops are revealed. Some of the research participants express how the hail damages and breaks the products, but it does not destroy and kill the crops completely. Others express deep concern, explaining how large hailstones fall and affect the crops; the whole crop dies.

> *It is not like the rainfall used to be. Before, it was normal. Now, the rain comes with hailstones, destroying agriculture. All previous years, it hailed, but it was little. Now, the hailstones are so large. It falls, it deflects it, it breaks the stems.* (M7)

GROUND FROST

The interviewed participants report greater variety in heat and cold. They perceive changes in minimum and maximum temperature: higher maximum temperature and powerful solar irradiation are perceived, with contrasting decrease in minimum temperature and several periods of cold. The research participants experience increased frequency of temperature-related ground frost. Reduced temperature especially during the nights in the dry season approximately between May and September leads to ground frost. Intense solar radiation and higher temperature in the rainy season leads to extended periods of drought. The former small-scale farmers are concerned about the contemporary changes in local climate and environment. According to several participants, the ground frost destroys the crops completely. It freezes the crops and dries out the crops: *"I remember there was a time when there was no harvest. We*

planted potatoes and did not take out one single potato. All frozen and dead" (M2). Migrant 1 has observed the change: *"There wasn't frost before, to the same extent. And now, I notice that there is no grass in the Puna, there aren't animals anymore. Before, the grass was good, but not anymore"* (M1).

The findings reveal that the majority of the research participants experience how the climate has changed over the past 50 years, regarding temperature-related ground frost. They describe how the ground frost usually occurred during the dry season; June, July and August. Currently, the ground frost arrives at any moment.

FIGURE 7 AREAS OF DEGRADED SOIL

FIGURE 8 AREAS OF DEGRADED SOIL

FIGURE 9 DEGRADED SOIL

TIMEFRAME

I find it important to outline a perspective of time to illuminate what decades the changes in the climate are experienced by the research participants. Based on the purposive sampling method maximum variation, the study indicates time perspectives viewed from different age groups. This illustrates how the former small-scale farmers view climate change from different angles and demonstrates associated perspectives. Accordingly, it reveals if they experience the environmental changes approximately in the same time period. There is a clear pattern indicating what decades there have been noticeable changes. The former farmers communicate how they perceive observable and evident changes over the past 40-60 years. Findings from the study reveal how changes have been noticed by the older former farmers from prior to the 1960s, as well as significant changes within the past 40-60 years perceived and revealed especially by the younger former farmers.

The perception is clear, both by research participants in the older age group and parents and grandparents of some of the younger participants. Degradation of rain-fed agriculture in the Ancash Region during the recent decades has been observed by informants and compared to previous agricultural production of their ancestors. Let me illustrate using some examples, initiating with a young respondent of 26 years. Like several young participants of this study, he has been informed of previous environmental conditions and adequate basis for agricultural activities by his parents and grandparents. The 26-year-old man has moved to the city of Huaraz in the search of new income sources, as a result of inadequate conditions for agriculture. He reports: *"The perception of the older people is quite clear. Before, the rains were in longer periods, but they were not so intense. Now, the total period and total amount of rain is reduced, but more intense"* (M12). Furthermore, he communicates:

> *My mom is a housewife and my father is a farmer. Part of my childhood, we were dedicated to agriculture. The type of crop has changed, compared to what my parents used to have. What was once cornfield (maizales), is now either empty or filled with products of medium size. Nothing more. The water has diminished, so the farms do not cope.* (M12)

Both migrant 1 (65 years old), migrant 2 (62 years old), migrant 5 (80 years old) and migrant 8 (71) express such concerns – being part of the older research sample in the study. The above migrants have personally experienced the changes in the climate. They experienced permanent epochs of excellent agricultural production during the years 1940-1960, remembering from

their childhood in the croplands with their parents practicing agriculture. Migrant 8, a 71-year-old man, expresses his concerns regarding the environmental changes. He communicates how his relatives including himself have been able obtain education based on income from the agricultural production of their parents working in the fields. The harvested products were both for consumption and sale.

> *The climate has affected the production so much, especially in the Puna. The potato and the olluco are affected, they are no longer the same. Nor is the fertility of the earth the same. Before, it was sown without fertilizer, now, it has to be sown with fertilizer to give us an acceptable production.* (M8)

Various research participants pertaining to the age group in the middle, 40-60 years old, have experienced periods of adequate agricultural production conditions and decent level of harvest. Through gradual changes, the harvest became poor over time. Several participants and their families suffered of famine. Lack of rain has been one of the main causes. Migrant 1, 65 years old, work as a taxi driver in the city of Huaraz and reveals the situation of his parents and what he remembers from his childhood. During the 1960s when his parents were present and dedicated to agricultural production, the production was *"stronger, abundant and nicer. There was good production"* (M1). They possessed a greater number of animals and the agricultural productivity was at a higher level. They had a large amount of potatoes, corn and wheat, but also some olluco, oca and mashua. Migrant 6 is 51 years old, and reports how he and his parents experienced record low agricultural production in the early 1990s, as a result of change in the hydrological cycle and increased hailstorms:

> *We planted one hectare and harvested 40-50 bags with potatoes. We went to Huaraz and were able to earn some money. Now, a lot of the potatoes are rotten or with worms, and we have just a few bags, and nothing to sell.* (M6)

Migrant 6 and his family abandoned their land areas in year 1993. They remain in possession of the land areas but have ceased major part of the production. At present time his parents have passed away, and he harvests at small-scale level for personal joy, by reason of having a love for the countryside and the field. Up until the 1970s and the 1980s, it was possible for his parents to produce and harvest in quantity.

FIGURE 10 POTATO PLANT

MIGRATION

The aim of the research has been to capture the unique migration histories, and how and whether the interviewees experience a link between climate change and migration. It is difficult to document the relationship between migration and climate change - to precisely state if climate change has been the primary cause of migration. A multi-causality is definitely evident for the majority of the participants. Nevertheless, we can attempt to disclose to what degree and how climate change contributed to migration, and its position among other factors also causing migration. Some results have proven to be interesting. This section outlines findings from the research which indicate how climate change has been a primary cause of migration, and the degree of urgency and force of migration for the former farmers in the Ancash Region. The study uncovers how some participants are aware of climate change being the main cause of migration, and how other participants are not conscious of such connection. Certain research participants distinguish climate change and economy as separate causes of migration. They state how their migration process was not climate-induced but rather induced by economic reasons. Further exploration of the participants' oral histories indicates how climate change and economy are closely interconnected. However, not all of the participants notice such connection. Hence, the relation between climate change and migration can appear unobservable and invisible.

CAUSES OF MIGRATION

One main finding from in-depth interviews with former small-scale farmers who have migrated to urban areas is apparent. The primary cause of migration is climate change – although for some participants indirectly and unconsciously. At the beginning of each interview, the participants state other reasons for migration, such as economy and labour. However, after further conversation and exploration, climate change seems to be the main factor leading to changing livelihood, search for new career opportunities and economic survival in urban areas. The interviewees reflect and explore what might be the primary and fundamental reason for migrating, which proves to be climate change. Participants have experienced gradual degradation of soil and reduction of crops over time, changing livelihood as outcome. Agriculture and/or livestock used to be the primary sources of income and own consumption. The participants elaborate on previous agricultural and livestock production and their

perceptions of climate change. A rather invisible relation between climate change and migration is apparent.

Environmental conditions have proven to be a cause of migration to a great extent for all participants. Reduction of soil fertility has compelled small-scale farmers to abandon the land areas. Findings reveal that in addition to the participants and their families, the majority of their neighbours in the districts of origin have also abandoned the land areas. They inform how various friends and acquaintances have migrated as a consequence of unpredictable precipitation making investing in the land difficult, and due to hailstones and ground frost killing the crops. I wish to present the story of migrant 11, a 52-year-old woman who migrated from the peripherical areas of Quiches District in 1981 when she was 14 years old. Together with her family she initially moved to Lima and later returned to the Ancash Region, although to the more populous areas of the Carhuaz Province. She describes how they suffered of famine: lack of food and nutriment both for eating and as financial resource. The land was degraded, hence a dramatically decreasing business based on agricultural activities. She elaborates on how the rainy season commenced being intricate to predict in the 1970s. She asserts that lack of rain was the main factor causing challenges in agriculture. *"Harvesting was not productive. Nothing you sowed grew. That's the factor. That's why we migrated"* (M11). Furthermore, she expresses:

> *There was a time that there wasn't harvest, there was famine. Everybody left, because there wasn't anything to eat. Many people came to this area, Huaraz, and others went to Lima or Pomabambda. They left to different places. There wasn't food.* (M11)

There is visual evidence of major changes of environmental kind contributing to migration. The research participants convey their observations from visits to their places of origin. Certain participants have older parents still residing in the countryside, others have an abandoned house in their place of origin, visiting from time to time. Such is evident for e.g. migrant 7. His parents are residents in the rural areas of San Marcos District. He continually visits the field Saturdays and Sundays, providing his parents with essential goods. *"Now it is terrible, the land is abandoned. Huaripampa is so quiet today, it is abandoned. We have all emigrated to the city or to the capital"* (M7). Migrant 6 declares the same: *"Most of the people are migrating. If you come back to the abandoned lands, they are full of grass which may be used for feeding animals"* (M6).

According to the findings, various participants have migrated due to several reasons. The oral histories of the migrants regarding their migration process indicate how increased work opportunities in the city of Huaraz generate improved living conditions for the migrants: *"Nowadays, I have kids too. When we sowed, the hail and frost affected. I have to work in other areas now, always looking for work in Huaraz. In that way we are surviving"* (M3). Migrant 3 is a 38-year-old man responsible for taking care of his family. Migrant 4 express similarities: *"After moving here, there have been opportunities of different kinds of jobs. There is a bit more of economic resources"* (M4). Furthermore, migrant 5, an 80-year-old male, migrated partly as a result of non-profitable agricultural activities during the past decades. Lack of food forced his entire family to migrate. Addedly, migrant 5 and his family experienced health issues such as headache or stomach-ache. By residing in the city of Huaraz, they receive health care and achieve a balanced and diverse diet, as nutrients and food items are available. Some of the research participants also emphasize how they, or their parents, suffered during the last decades of the rough agrarian life:

> *When I was a child, we didn't have shoes. We sometimes walked barefoot in the higher areas (...). My mother was the only one who worked, my father didn't work, he wasted his time on alcohol. Poor mother, she sacrificed herself. Every day she went looking for some herbs in the Puna to sell them in the lower areas. That is how we were economically supported. But often it wasn't enough for pants, shoes or clothes. It was certainly not enough for education.* (M4)

Nor was there enough land for all farmers. *"There are several factors for why I migrated. I did not have enough land. It was one impulse to migrate to the city"* (M6). Several participants stress how their grandparents divided the land and assigned a section of land to each of their e.g. three children. These children further divided the land in even smaller sections and delivered it to their sons and daughters. They all ended up with inadequate small sections of land.

Forced Migration and Belonging

Findings from the research reveal the degree of urgency and force of migration for the former farmers in the Ancash Region. The interviewed participants were asked about emotions regarding rural-urban migration and changing livelihood. Analysis and coding of the data material reveals how there is an urgency and reluctance to migrate for all participants. The oral histories indicate how all of the interviewed participants migrated involuntary. Some

participants migrated due to a higher degree of urgency than others, but there is not one single participant who expresses positive associations regarding the migration process, causes of migration and the rough life during their lifetime in their place of origin. The research participants appear emotional and melancholy as regards the process of migration and the adaptation to the city. The urgency to migrate is also apparent in descriptions of their previous life in the rural areas being tough, remembering difficulties in terms of unsatisfactory agriculture: *"Well, these changes, gosh, affect, because sometimes, you know, the lack of everything at home ... due to hail"* (M3). Migrant 2 expresses: *"There are years that we do not harvest well. There is no financial security when you are at the farm. It is not enough, then you have to find other work, to feed your family"* (M2). Migrant 6 expresses:

> *Many people like me from the countryside, migrate to Huaraz, to the cities. They must dedicate themselves to sell food or wash cars. People are trying to survive, coming to the city they have to fight to survive. That's my condition, personally.* (M6)

The migration story of migrant 10 depict the obstacles when migrating to a city. She, among several participants, has struggled to adapt to a new environment. Migrant 10 is a 31-year-old woman who moved from La Merced District in year 2000. Like all participants of this study, her parents committed to agriculture as livelihood. Her parents brought her to the city of Huaraz as a 13-year-old girl. According to her parents, education was the sole option for her, as a result of deteriorating agriculture. The education in urban areas would be better. She argues how she did not have the opportunity to decide for herself, as she was a child and a girl: *"It was practically against my will. I grew up with my parents and grandparents, I did not want to leave. I had to leave behind my land, the field, the countryside and the mountains, involuntarily"* (M10).

She elaborates on her experience of the migration process and the changing conditions. She expresses a longing for peacefulness of the rural areas of La Merced District that she left behind:

> *I run around here in the city. Then I return to my area because I feel calmer, more at peace and everything. But returning to the same Andean area is also a little complicated, although it is true that I love my land as I was born there. But to return is complicated, there are not many opportunities; neither labour, nor education.* (M10)

Reluctance to migrate is evident from elaborations of the participants' desire to permanently return to their place of origin. Such aspiration can indicate how the migrant was forced to move. As stated, some participants have parents or grandparents still residing in their house in the place of origin. Other participants have an abandoned house in the countryside, visiting the rural areas occasionally. Migrant 6 holds an abandoned house at his place of origin, Macashca District.

> *I am no longer working fulltime in the field, but I am still in contact with the field. I always return to the countryside. I would like to move back to the countryside, sooner or later, I have so many memories as a child there. The city is stressful, you feel overwhelmed. Living in the countryside is calmer.* (M6)

> *Living in the countryside is nice, calmer, with your animals, it is beautiful (…). I want to return to the countryside. My kids are more city citizen, but in my case, I miss my area.* (M7)

Migrant 9, a 49-year-old male, expresses the yearning of returning to his community. He is working for his village and his community, to be able to return one day:

> *In the communities you live very calmly, sincerely. I want to move back to the village the final part of my life. We do not want to live in the city, we only migrated because we had to. Now I can collect my pension, improve our children. We improve, and we return, and we live our lives there in the field. The goal is to go to our community and yes… it is the end of life for us to think. This is the plan for my wife and me.* (M9)

FIGURE 11 ABANDONED HOUSES

FIGURE 12 ABANDONED HOUSES

Upon question about the possibilities of adaptation to the recent environmental conditions, there is a clear "no" from the majority of the participants. They express how they do not believe it is possible to survive on the basis of agricultural production, as was possible for their parents and

grandparents. The reluctance is visible through participants' explanations of impracticalities and difficulties when dedicating to agricultural production.

> *It is difficult, it is no longer possible. It was possible before, but not anymore. Imagine, we have been 6 brothers. Our parents have raised us, only feeding us with products from agriculture and livestock. Now, people cannot live only from agriculture, due to the hail and the ground frost.* (M7)

The research participants argue how it was difficult to adapt to the changed environmental conditions. Several participants explain the application of an Andean method named "Majada". As an attempt to adapt to the lack of fertility of the field, they utilized such method. The method involves having a fenced-in yard where the animals deposit vast piles of nutrients on the ground, serving as natural soil fertilizer. Cultivation occurs in this area. *"We sowed in the natural way, we did not use chemical fertilizers, and the products came out more natural"* (M8). The research reveals that all participants who had livestock farming have practiced the method for a lifetime, but the past decades it has evolved to be difficult. During the last years before moving they did not manage to keep the production stable, as a result of increased ground frost and hail. The crops did not have the same flavour, several varieties disappeared, and the appearance of the crop products has changed. They lack knowledge of adaptation possibilities. Before they migrated from their place of origin, they *"could sow something, but there were few products, and the harvest was poor"* (M12).

> *Now, the products no longer have flavour. Nothing. Because everything is produced with fertilizers, insecticide. This must be done because otherwise you do not get a good harvest. However, your products are no longer as nutritious.* (M8)

KNOWLEDGE OF CLIMATE CHANGE AND LINK TO MIGRATION

Based on answers from questions regarding meaning of climate change, migrants' knowledge of climate change and the nexus between slow onset climate change impacts and global climate change, findings reveal that the research participants can be divided into two groups. A correlation between type of area the migrants have settled and degree of knowledge of climate change is uncovered. Half of the participants, those who moved to central and more wealthy areas of the city of Huaraz, possess some knowledge of the concept of global climate change (M6, M7, M8, M9, M10, M12). They are aware of how changes in the climate at a global level are evident through observations of changes in the hydrological cycle and temperature at regional and local level, affecting the agricultural production. The other part of the research sample has settled in poorer areas in the city of Huaraz, and do not possess the same knowledge of global climate change (M1, M2, M3, M4 M5, M11). When asked about what they believe affects the agricultural production, several participants answer that they do not know why. Such selection of participants notices changes in soil fertility and production but does not hold knowledge of causes. They notice how areas previously filled with domestic animals are empty at present. Germinating and blooming fields and fertile soil were observed 40-60 years ago. At present time, the croplands are arid. However, exploring and asking follow-up questions during the interview, several research participants become aware of how changes in the hydrological cycle and changes in temperature have been elements affecting the soil and agricultural production.

Nevertheless, all participants are aware of the concept of climate change in terms of rapid onset changes, despite the fact that the participants have not been exposed to such changes. When asked about meaning of climate change at the outset of the interview, nearly all research participants describe various rapid onset climate change events. Such rapid onset impacts are changes perceived by others, not affecting the interviewed participants. They have become aware of such changes through oral stories from acquaintances and/or by reading newspapers. Their immediate response regarding climate change is related to a general opinion of many habitants and local authorities of the Ancash Region: rapid onset climate change impacts, such as natural disasters as landslides, avalanches and floods as a consequence of melting glaciers in

the Andean region. Rapid onset climate change impacts appear as the primary association with the concept and significance of climate change.

For certain research participants, climate change as a main cause of migration has not appeared evident based on their perception. Such participants are labelling economy as main cause of migration, and climate change as a second and different cause, due to associating climate change with rapid onset events. Migrant 12 is a 26-year-old male contacted as a potential participant, who allegedly migrated due to changes in the climate affecting him and his parents' agricultural production in the rural areas of Ana District. Despite this, migrant 12 states that he moved due to economic reasons: *"The primary reason for me was economic. The strongest cause for most people is economic. But behind that, I am sure that it is climate change"* (M12). His associations to climate change have proven to be rapid onset changes. Furthermore, the participant elaborates on changes in the agricultural production at his family farm. He explains how the grasslands decrease and how the production is no longer profitable. His parents experience increases in demanding work hours and concurrently harvest less than previous decades. He elaborates on the severe impacts for his family, and how he migrated due to such changes. The findings reveal an unawareness of how such slow onset climate change impacts have been a main cause of migration – closely interconnected to economy as cause of migration.

FIGURE 13 THE CITY OF HUARAZ

FIGURE 14 THE CITY OF HUARAZ

6 DISCUSSION

INTRODUCTION

The research questions supply a two-part problem. How does the rural population perceive climate change and its causes in the Ancash Region? In what way do they believe that climate change leads to migration? The following chapter aims to discuss relevant aspects identified during the analysis, thereby illuminating what the study has revealed regarding the research problem. The relevant key concepts displayed in the theoretical approach will be applied to discuss the main findings presented in the analysis. This chapter will act as a concluding discussion where the aspects of climate change and migration are woven together, and desires to serve as a basis for further investigation of theme.

DISCUSSION

Time frame and regional variation of climate change

As stated by (IPCC, 2013, p. 5), each of the last three decades has proven to be warmer at the Earth's surface since 1850, and changes in weather and climatic events have been observed since 1950. Key observations experienced by participants of the present study correspond to quantitative research presented by IPCC concerning timeframe. Each respondent experiences significant changes since the 1960s. The interviewed participants perceive a delay in the growth of crops over the past 40-60 years. It is revealed through participants between 26 and 80 years old; positioned in different life situations, additionally carrying evidence from their ancestors. Regarding variation in perception of climate change discovered in the findings, it is important to emphasize the complexity of climate change and how perception of climate change will have regional and local variation in all unique contexts amongst various regions in Peru and within the Ancash Region. Nonetheless, this is precisely what justifies the importance of carrying out such qualitative research. Such specific observations from local residents as achieved in the present research, may often be the only detailed evidences on environmental change that are available (Dowling, 2016, p. 161) .

The literature reviewed in this thesis illuminates how climate change and consequences of such changes are not uniform. According to IPCC (2013, p. 19), the changes in the global water

cycle are not uniform, and climate change will have different impacts at regional and local level. The fact that climate change is non-uniform can be a reminder of how the particular changes perceived at regional and local level by the former farmers of this study are not generalizable and representative. Not for the extensive Andean mountain, neither for the entire country. Other regions can potentially experience other environmental changes. Certain particular changes perceived by all interviewed participants have been revealed in this research. As described, the climate varies along the altitudes. But the fact that all participants were resided in medium to higher altitudes with relatively cold and dry climate, can be an explanation of how they all perceive similar types of changes: changes in the hydrological cycle, increased hailstorms and ground frost.

Slow onset climate change impacts in the Ancash Region

Evidence of qualitative kind can add dimension to the quantitative research that already exists. In the present study, the qualitative investigation relates to the quantitative in a way of supplying peoples' life histories, individual perceptions, dimensions sensitive to context, site-specific impacts and aspects of time. Oral stories of former small-scale farmers in the Ancash Region reveal how they experience slow onset climate change impacts. Such results affirm the findings of external quantitative research presented in chapter 4. There are certain undeniable findings for all interviewees – a pattern cutting across heterogeneous life situations and migrations stories. Over the past 40-60 years, the interviewed participants perceive changes their parents and/or grandparents did not experience. Findings from my research point to certain common types of climate change perceived by former small-scale farmers, as submitted in the analysis. According to general descriptions and definitions of rapid and slow onset climate change impacts by Renaud et al. (2011) and Lonergan (1998), the changes perceived by the former farmers interviewed have proven to be such slow onset climate change impacts.

Their perceptions of climate change reveal changes in the precipitation pattern. The changes include decreased rain in the dry season, a year-to-year variability in duration of wet and dry seasons, and unpredictable and more intense rainfall events. The lack of possibilities of defining and demarcating the rainy season is also confirmed by key informant Cruz (2019, personal communication). The interviewed participants have also experienced that hailstorms occur to a greater extent compared to previous times and increased frequency of ground frost. Intense rainfall, hailstorms and ground frost have proven to be some of the main dangers affecting the ecoregions of the Ancash Region. The biological diversity and services that it provides are

exposed to such climate change. The findings show that small-scale farmers have experienced dramatic changes in the climate, change in land use and changing livelihood. The absence of reliable precipitation forecasts challenges successful sowing and harvesting. The ground frost and hail killed the cultivated areas, and the areas with grass that fed the animals. They all lost cultivated fields due to increased ground frost and hail. These changes affected agricultural activities, thus livelihood and health situation for the Ancashinos. Destroyed crops thus provided noticeable financial losses illustrating how climate change threatens livelihoods for highland residents in the Ancash Region. Results from quantitative methods of inquiry conducted by Gurgiser et al. (2016), Haylock et al. (2006), Heikkinen (2017), Sanabria et al. (2014), Ramírez (2011) and Regional Government of Ancash (2016) support findings from my research. The former farmers participating in the study and local key informants concur in their statements that changes in the climatic conditions have detrimental effects on agriculture. They view rain-fed agriculture as having become more challenging in recent decades. The vast majority of agricultural activity in the Andean region, including the Ancash Region, is dependent on precipitation rather than irrigation from glacial melt (Painter, 2007, p. 12). These areas will become even more dependent on rainfall for the agriculture in the long-term, knowing the acceleration of the melting and disappearance of glaciers.

Linking slow onset climate change impacts and migration

The study suggests that it can be identified an indirect and invisible link between slow onset climate change impacts and migration. Connections between the concept of climate change, slow onset climate change impacts and migration are not that visible. As displayed in the analysis, the interviewed participants' immediate association with climate change seems to be rapid onset climate change impacts: melting glaciers leading to abrupt natural disasters as landslide, avalanches and floods. The participants have not been affected by these changes in their place of origin – yet such changes dominate their associations to climate change. A variation in knowledge of the concept of climate change is also evident. Several participants are not aware of how degradation of soil and decline in agricultural productivity are consequences of global climate change, and therefore have led to migration.

Deglaciation of glaciers causes natural disasters as floods, avalanches and landslides. The effects of natural hazards have already caused people to migrate, and future challenges related to water scarcity will cause enormous groups of people to migrate to other areas (Cruz, 2019, personal communication; Altamirano Rua, 2014). Thus, research on deglaciation and

subsequent disasters is undertaken. Popular media gives attention to the field of knowledge and provides information. A direct connection between climate change and migration has been identified and will most likely become more prominent in the future (Altamirano Rua, 2014). By all means, I am concerned about deglaciation and subsequent rapid onset changes – a field in which extensive research is undertaken. However, is there a chance that these rapid onset changes are taking the focus away from slow, gradual climate change impacts, such as changes in the hydrological cycle and degradation of soil? As indicated from main findings of this research, climate change has been the primary cause of migration. However, an indirectly and unconsciously link between slow onset climate change impacts and migration is evident, which may be due to rapid onset climate change impacts being dominant in several ways, as elucidated in this section.

Multi-causality

The indirect and unconsciously link can explain and illuminate the lack of recognition and concern of such gradual, slow and slightly invisible climate change impacts, such as soil and crop degradation. Climate change, and especially slow onset climate change impacts, being an underlying and often invisible issue in relation to migration points to a general problem with migration research illuminated by Castles (2006), Tete (2011), Van Hear (2010) and Warner et al. (2010): people's reasons for migrating are complex. Various elements may cause migration. It is also essential, and can be just as difficult, to identify what the migrant defines as cause(s) of his or her migration process, and what might actually be the primary cause. The complexity of migration analysis cannot be repeated too frequently. It attempts to reveal, define and categorize causes of migration, and a multi-causality is nearly always evident (Castles, 2003). Results from my research demonstrate the complexity of discovering and defining causes of migration. It is evident how several drivers have affected migration for the research participants. Despite the fact that the environmental variable is clearly evident, a multi-causality is also discovered during the research.

Distinguishing between causes can be similarly difficult. Causes of migration are interconnected (Castles, 2003). Defining a person as *one* type of migrant can divert attention from complex causes. Certain typologies refer to "economic migrants" in attempt to define migrants in context of environmental degradation. We have to take into consideration that people who migrate because they are victims of poverty are in many cases driven by environmental degradation. The findings suggest that some of the migrants identify the main

cause of migration as economic, as exemplified with migrant 12. From the present study it can be concluded how economy and environmental change are clearly interrelated. In terms of the second research question, several participants are not aware of climate change being the main cause of migration. In the context of defining climate-induced migrants, a maximalist view can be misleading in migration analysis, which involves extracting the environmental variable from an array of causes (Castles, 2003; Suhrke & Hazarika, 1993). Are we excluding relevant causes necessary to consider in migration analysis? Are we distinguishing causes from each other and extracting one main cause, forgetting that several causes might connect and reveal similar aspects? Findings from the present research suggest that it can be misleading to differ between refugees driven by environmental factors and those who are forced by economic problems. There is a risk that we are reducing migration to simplistic categories, if we do not view migration as a multi-causal phenomenon.

Forced migration

Beyond seeking to define and analyse causes of migration, exploring the continuum of forced and involuntary migration can also appear relevant in the study of a potential connection between climate change and migration. Findings from the study suggest that no participants migrated voluntarily. They all migrated due to environmental factors that forced them to involuntarily leave their habitats (Terminski, 2012; Warner et al., 2010). All participants in the study have been forced to migrate but to varying extent. How the participants migrated out of compulsion to a greater extent than volunteerism is revealed in several ways: research participants expressing pessimistic associations regarding the migration process. They have moreover experienced lack of adaptation possibilities for agriculture. The younger research participants experienced challenges in adapting to a new life in urban areas, due to a higher educational level in the city compared to education level at their primary school in place of origin. Nor have they been able to decide for themselves. Their parents have compelled them to migrate as a consequence of deteriorating environment in the rural areas, hence no opportunity for labour. Migrants in the selection containing middle aged and older participants have moved as a consequence of deteriorating livelihood, being responsible of supplying their families. Involuntary migration is also indicated through participants' statements of a longing for the countryside and a desire to return permanently. The latter aspect is discovered through oral histories with the older participants, being in a life situation where they enter the final phase of life. No participants could survive of previous agricultural production at their place of origin. As Castles (2006) defines: among several factors, forced migrants are also those who moved

due to "natural or environmental disasters or famine". Some of the participants of the study suffered of extreme scarcity of food, especially migrant 1, 3 and 11. The findings indicate how slow onset changes affected the livelihood and main source of income.

Despite the aspects of the latter paragraph, there can be difficult to group people in categories of forced or voluntary migrants (Castles, 2003; Homer-Dixon, 1993; King, 2012; Myers, 2002; Suhrke & Hazarika, 1993; Tete, 2011; Van Hear, 2010; Warner et al., 2010). As stated by Lonergan (1998), Renaud et al. (2007) and Renaud et al. (2011), slow onset climate change impacts can create both forced and voluntary movement. Due to the slow and gradual development of slow onset impacts, some people might choose to move before they are in circumstances where they are forced to move. Obviously, this movement is not entirely voluntary. The interviewed participants of the present study are not victims of changes forcing them to migrate *acute*. However, over time the slow onset climate change impacts have affected livelihood and resulted into non-liveable conditions forcing them to migrate. The findings suggest that the migrants of this study can be referred to as forced migrants. However; an axis can be identified, and the migrants can be placed on various points on the axis. Evidence of forced migration due to slow onset climate change impacts revealed in other studies can provide justifications for labelling the participants of the present study as forced migrants (Warner et al., 2010).

Climate-induced migration

Despite a multi-causality being evident, the study reveals how one main factor has caused migration to a greater extent than other factors. Findings show that slow onset climate change impacts can be just as damaging as rapid onset events, in a long-term perspective. Such impacts from slow onset climate change are also causing people to migrate. According to Warner et al. (2010), slow onset impacts will give environmental push factors an increasingly important position in the migration "decision". However, such gradual changes will emerge over time. Slow onset impacts may not be as clear and visible as a main cause of migration. Such perspective supports the findings of the study, as it brings to light an invisible and indirect link between slow onset climate change impacts and migration.

Certain advantages of creating a framework of defining environmental migrants come forth. It has been argued that categories are important to policy makers and states in managing human mobility and negotiating specific forms of protection rights and entitlements (Tete, 2011). Such

framework can provide these migrants assistance and protection. The urgency to receive assistance should be highlighted. My results show how the environmental variable has been clear. To enable protection by law, the environmental factor has to be extracted from other factors – a maximalist-view. Several migration experts have strived to create various typologies, with potential to serve as decision-frameworks; Castles (2006), Bates (2002), Myers (2002) and Renaud et al. (2011). They emphasize issues concerning the lack of legal status of environmental migrants. What municipalities, regions, states or authorities are responsible for managing people migrating in the context of climate change? Additionally, I believe it may have a function in illuminating climate change and its causes, and particularly slow onset climate change impacts.

The participants in the study may be labelled according to the typology of Renaud et al. (2011). It contains potential sub-categories of potential adequate definitions of environmental migrants. The majority of the migrants of the research have not "fled the worst of an environmental impact". Thus, they are not to be labelled "environmental emergency migrants". The second category is "environmentally forced migrants", which includes people who "have to leave" in order to avoid the worst of environmental deterioration. They are experiencing slower deteriorating environment and the urgency to move is minor than for the previous category. Such description may serve as an adequate definition for the interviewed participants of the completed study. However, some research participants may have "left a steadily deteriorating environment and decline in land productivity in order to pre-empt the worst" (Renaud et al., 2011). This is the description of the third category "environmentally motivated migrants" – can the migrants be placed in the latter description? It comprises cases where "environmental degradation has led to increased poverty, that have caused people to decide to move in order to avoid further deterioration of their livelihoods." (Renaud et al., 2011). However, no participants in the study moved exclusively to avoid *further* deterioration of their livelihood. It was already present and damaging. The findings reveal how most of the participants were forced to migrate and change livelihood. They had reached a situation where the agricultural production did not provide sufficient outcome for survival.

7 CONCLUSIONS

The thesis has attempted to answer the two research questions to achieve the aim of the study: reveal perceptions of climate change of rural population in the Ancash Region and in what way such changes in the climate have led to migration. Some main findings related to how the rural population perceive climate change and its causes have been identified. These results correspond with external quantitative research. Climate change and slow onset climate change impacts are perceived by former rural population in the Ancash Region. Their perceptions reveal changes in precipitation pattern: decreased rain in the dry season, a year-to-year variability in duration of wet and dry seasons, as well as unpredictable and more intense rainfall events. The former farmers have also experienced increased and more intense hailstorms with larger hailstones, furthermore increased frequency of ground frost.

The study documents how climate change since the 1960s has had a progressively increasing impact on degradation of soil and crops in agricultural production. Such environmental degradation has caused the participants of this study to migrate within the Ancash Region. However, an invisible link between climate change and migration has appeared. Some causes have proven to be prominent: slow onset climate change impacts being less dominant than rapid onset impacts; lack of knowledge of global climate change among the participants; and difficulties distinguishing causes of migration. To elaborate on the latter aspect: it can be hard to distinguish between environmental and economic factors. However; when the participants communicate their migration stories and perceptions of climate change, it is revealed how climate change has been one main cause of migration (among other causes of minor importance). The results, supported by theoretical perspectives on forced migration, show how there has been a reluctance in terms of the process of migration. All participants have been forced to migrate.

The connections between climate change and migration generate debate, both in public sphere and in research communities. There is no full consensus on how to define the issue. Climate-induced migrants are not protected by international law. Creating and applying a legal decision framework with a typology defining and categorizing climate-induced migrants both have some advantages and some disadvantages. People migrating as a consequence of slow onset climate change impacts can receive assistance and protection if they are included in a legal definition. A management system can be created. In such case, there is a need to extract the environmental

factor and clearly define the climate-induced migrants. Using the typology of Renaud et al. (2011), I have discussed if and how the migrants of the present study can be defined and categorized. The majority of the research participants may be included in the category "environmentally forced migrants". The environmental factor can be extracted, and the migration process is characterized by coercion. Although, it is debatable if the migrants of this study are those who are in need of protection, taken into account displaced people who have been forced to cross national borders and under no circumstances can return home safely at current time. Such people may be in need of protection to a greater extent than the participants of this study. Nevertheless; at the sight of how climate change can destroy livelihood and lead to migration for the rural population of the Ancash Region, the problem and issue of migration due to slow onset climate change impacts needs to be addressed.

In contrast, there is a chance that we exclude and overlook other causes of migration, and forget the multi-causality and the minimalist view necessary to address and manage such a complex problem. Warner et al. (2010) state how we know little about the interplay between environmental change and the outcomes in terms of climate-induced migration. Such relationships are often "reduced to simplistic causal explanations (…), misleading to conclusions that deny the complex multivariate processes – environmental, political, social and economic – which are the root causes of environmentally induced migration" (Warner et al., 2010, p. 690). We desire to get to the root of the migration issue; prevent migration instead of managing the problem in retrospect. Further qualitative research should be undertaken to illuminate and identify both causes and impacts of slow onset climate change. The results from the study regarding perceptions of climate change reveal severe changes having detrimental effects, causing rural population of the Ancash Region to leave their places of origin and change livelihood.

FURTHER RESEARCH

I have a desire for further investigation regarding a potential decision-framework for legal protection of climate-induced migrants in need of such protection. If we are to achieve expanded knowledge of how climate-induced migrants can be identified and how to define such migrants, various cases must be studied with the aim of revealing additional aspects to create a decision-framework. To enable to illuminate the issue of climate change and migration and its linkages more nuanced, further qualitative investigation is necessary. The research presented in this thesis does not represent entire populations or regions. As climate change has regional and local impacts, each case where people feel compelled to migrate can have their own regional and local peculiarities. Every case must be studied, and I wish for further qualitative investigation within the discipline. From my study conducted in the Ancash Region, we can gain additional valuable knowledge about the link between climate change and migration.

Further investigation and expansion of the study may include farmers' specific adaptation strategies in the face of climate change. Adaptation projects frequently ignore traditional local knowledge and do not acknowledge existing local adaptation strategies. However, there has been an increase in research conducted and literature written concerning the inclusion of local insight into systems with scientific knowledge. This to handle changes in resource and ecosystem management and improved understanding of climate change in specific contexts (Folke, Hahn, Olsson, & Norberg, 2005, p. 446). Participation of rural indigenous communities can have the potential to enhance understanding of local climate change impacts and rural populations' adaptation strategies, and lead to elaboration of context-specific adaptation and development projects. Strengthening of citizen involvement can additionally lead to higher acceptance of desired adaptation projects. Such aspects may be food for thought and potentially further development of this thesis.

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FOOTNOTES

1. The report includes over 6000 scientific references and was prepared by 91 authors from 40 countries (IPCC, 2018a).
2. The Puna is an ecoregion at the highlands in the central Andes in South America. The area is covered by ecosystems at altitudes between 3000 and 4500 m.a.s.l. (Ministry of Agriculture and Irrigation, 2016)
3. To determine the trend of precipitation and of temperature in °C / annual and seasonal decade, districts having stations with long and relatively complete series were selected (the period of time 1965-2012). The stations of Recuay and Chiquián are located in the southern sector of the Cordillera Blanca in the Ancash Region, and the stations of Mollepata and Quiruvilca located in La Libertad Region, adjacent to the northern area of the mountain range mentioned above (Regional Government of Ancash, 2016, p. 8).

APPENDICES

APPENDIX A: INTERVIEW GUIDE

Orientation questions to establish the participants background

1. How old are you?
2. Where were you born? Where did you grow up?
3. When did you move from the area?
4. What was your occupation living in the area?
5. What is your occupation today?

Common questions for each participant

Meaning of climate change

1) How did you perceive climate change and its causes when you lived in the rural area in the region?
2) How do you perceive climate change and its causes in the Ancash Region today?

Migration

1) What was the main reason for moving from rural to urban areas?
   a) Climate change
   b) Economy
   c) Poverty
   d) Employment
   e) Education
   f) Politics
   g) Health issues
   h) Other reasons
2) Was climate change to some extent part of the reason for your relocation/migration? If so:
   a) What do you mean by climate change?
   b) How do you see migration as a consequence of climate change?

Specific questions related to individual experiences of climate-induced migration

1) What were the impacts and consequences of climate change for your livelihood during your time in the area?
2) What specific changes did you experience?
3) In what way did you notice these changes?
4) Were there possibilities of local adaptation to the changes when you lived in the area?
5) Do you see these changes as consequences of global climate change? If so:
    a) How do you see a connection between the changes you experienced and the global climate change?
6) Are there other reasons or a combination of things that contributed to migration? If so:
    a) What other reasons?
7) What do you think of changing your livelihood and move to urban areas because of climate change?
8) Have your family members also moved from the area? If so:
    a) Where do they live?
    b) Why did they move?
9) Do you know other people who have migrated to more urban areas because of climate change? Who?

NTNU
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Science and Technology