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Master

Peeling Back the Layers – A critical analysis of climate change adaptation policies and programs in relation to differential vulnerability.

A Study of the Áncash Region, Peru

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ABSTRACT

This thesis is grounded in the discourse on differential vulnerability and climate change. People throughout the world are disproportionately affected by climate change effects, and a growing number of researchers argue that climate change adaptation plans and measures need to address differential vulnerability in order to ensure human security.

The aim of this thesis was to analyze the extent differential vulnerability is considered in contemporary policy-making and projects related to climate change adaptation in Peru.

To do so, a qualitative research approach was used to study the inclusion of differential vulnerability in adaptation policies and projects in Peru. The analysis is based on secondary data from research articles, government documents and reports. Two government policies were analyzed, in addition to three projects implemented by three different organizations. To assess the extent these measures considered differential vulnerability, a theoretical framework outlining specific factors contributing to differential vulnerability was used.

The main findings suggest that the Peruvian government has included a few elements pertaining to differential vulnerability in its more recent adaptation policies. However, this inclusion is very limited and neither policies that have been analyzed address the complex socio-economic, political and institutional dimensions of differential vulnerability.

The role of organizations in addressing differential vulnerability in Áncash were found to be low as well. The three organization, Practical Action, CARE and The Mountain Institute, have over the past decade implemented projects that specifically address certain issues that contribute to differential vulnerability. However, several key contributing factors have been neglected by the organizations, and not all the implemented projects created positive results for the local people. As such, this thesis argues that organizations have played a low role in addressing differential vulnerability in Áncash. These findings contribute to the discourse on differential vulnerability and climate change and can help in the discussion on how adaptation plans can include factors contributing to differential vulnerability to increase people's adaptive capacity.

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ANP	Natural Protected Areas
CBA	Community-Based Adaptation
COP	Conference of the Parties
CSA	Climate-Smart Agriculture
DAC	Development Assistance Committee
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GLOFs	Glacial Lake Outburst Floods
ILO	International Labour Organization
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
MINAM	The Peruvian Ministry of Environment
NDCs	Nationally Determined Contributions
OECD	Organisation for Economic Co-operation and Development
SDC	Swiss Agency for Development Cooperation
TEK	Traditional Ecological Knowledge
TMI	The Mountain Institute
UN	United Nations
UNASAM	National University of Santiago Antunez Mayolo
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

1.1 Climate change and adaptation measures

The *Special Report on Global Warming of 1.5°C* by the Intergovernmental Panel on Climate Change (IPCC) released in 2018 beckoned an important warning; the difference between a global warming of 1.5°C and 2°C is significant in terms of human health, well-being and impacts on ecosystems. However, to limit global warming to 1.5°C requires unprecedented and far-reaching changes (IPCC, 2018). The bad news? The global community has 11 years to achieve it by cutting carbon emission by 45 percent by 2030 (Watts, 2018). The half degree variation might not sound like a lot, but for weather patterns and ecosystems all over the world, any increase in warming is associated with irreversible and long-lasting changes (IPCC, 2018).

With an already warming planet, we are seeing the consequences of global warming throughout the world. In 2005, Hurricane Katrina ravaged the Gulf Coast, killing more than 1800 people and displacing another one million (Krause & Reeves, 2017; Lein, 2015). Cyclone Nargis caused devastation in Myanmar in 2008. The category 4 storm displaced 800,000 people while 140,000 lives were lost (Gottlieb, 2018). More recently, Cyclone Idai hit Mozambique, Malawi and Zimbabwe in March 2019 with winds of more than 190 km/hour (Arndt & Ringler, 2019). Cyclone Idai is the deadliest tropical cyclone to have hit the southern African subcontinent. It left more than a thousand people dead and millions have been affected (Arndt & Ringler, 2019; Fitchett, 2019). The IPCC report predicts that the frequency and intensity of these extreme weather events will increase with warmer global temperatures (IPCC, 2018). Consequently, adapting to a warming planet and climate change is crucial.

Villages, cities, countries, regions, and organizations are working to adapt to a changing climate, although we have yet to find a proven climate-resilient development pathway. People, and especially marginalized groups, experience tremendous loss from adverse climate change effects. Food and water insecurity, environmental degradation, extreme weather events, disease outbreaks and rising sea-levels create additional suffering for people who already live with uncertainty (Food & Agriculture Organization, 2018; Laplante & Asian

Development Bank Staff, 2015; Sterner, 2015). So far, adaptation and mitigation measures have only helped so much.

Inequality and social class are often discussed as factors that determine the level of human insecurity among individuals and communities. However, how inequalities are formed and replicated over time as differentiated vulnerability to climate change requires us to look at climate change adaptation through the lens of socio-economic and political power relations (Taylor, 2013). This thesis argues that differential vulnerability is ignored by most policy-makers and large organizations when discussing climate change adaptation efforts. The technical framing of climate change adaptation, i.e., building flood defenses, does not consider "the unequal social distribution of the effects of environmental change and the uneven capacity of individuals and communities to respond" (Taylor, 2013, p. 319). Differential vulnerability is used to describe the uneven allocation of vulnerability across society due to social factors (Thomas et al., 2018). Marginalized communities will be disproportionately vulnerable to adverse environmental change if factors that produce differential vulnerability are not considered in adaptation efforts made by government and organizations. The consequences of ignoring differential vulnerability in a time when climatic changes create adverse effects can be costly. Research estimates a 23 percent reduction in average global income and widening global income inequality by 2100 if future climate change adaptation procedures follow past practices (Burke, Hsiang, & Miguel, 2015).

By examining climate change adaptation measures in Peru, this thesis aims to add to the current discourse on addressing differential vulnerability in climate change adaptation processes to enhance human security. O'Brien, Eriksen, Nygaard, & Schjolden (2007) describe human security as "occurring when and where individuals and communities have the options necessary to end, mitigate or adapt to risks to their human, environmental and social rights, and have the capacity and freedom to exercise these options" (p. 76).

Peru is the home to about 70 percent of the world's tropical glaciers (Takahashi & Martínez, 2017). However, the country is experiencing accelerating glacier retreat due to climate change and the Peruvian people are put under significant pressure as a consequence (Bury et al., 2013). Peru was chosen as the study area as the country is currently experiencing adverse climate change effects and both the government and organizations have been forced to

implement adaptation measures. The situation in Peru will be discussed in greater details later in the thesis.

1.3 Research Problem and Questions

As mentioned, addressing vulnerability in climate change adaptation measures is a central approach in creating lasting results that strengthen human security. Climate change vulnerability is a contextual, multi-dimensional problem that is influenced by economic, social, political, institutional and technological factors. However, studies show that allocating resources to address these factors in adaptation processes is often challenging (Thomas at el., 2018), and that both research on the topic and adaptation plans disregard the dynamics that produce and reproduce vulnerability over time (Eriksen, Nightingale, & Eakin, 2015; Mustafa, 1998; Nightingale, 2017; Taylor, 2013). Based on this, I became curious as to how, if at all, climate change vulnerability is addressed in a country that is currently experiencing adverse climate change effects. As such, the problem statement for the study is:

> *To what extent is differential vulnerability considered in contemporary policy-making and projects related to climate change adaptation in Peru?*

In order to address this research problem, I will interrogate adaptation policies and projects in Peru. The first research question in this thesis will address adaptation measures made on a national level. Governments play an essential part in either reducing or producing vulnerability through laws and regulations (Thomas et al., 2018). Therefore, the first research question is:

1. To what extent is differential vulnerability considered when the Peruvian government creates policies intended to address climate change adaptation?

Based on a detailed theoretical framework created by Thomas et al. (2018), Peru's Intended Nationally Determined Contributions and the Framework Law on Climate Change will be analyzed and discussed. The aim of this analysis is to examine the extent these national policies address the key drivers of climate change vulnerability that Thomas et al. (2018) have identified in the framework. The four main topics that will be addressed are: access to resources, governance, culture, and knowledge and information. As mentioned, the

theoretical framework is comprehensive covering each of the four themes. Thomas et al. (2018) have included a range of contributing factors to climate change vulnerability. These will be discussed further in the literature review.

It is not just governments who play a role in shaping vulnerability. Organizations can form climate change vulnerability through projects and programs they implement. For example, Taylor (2018) argues that the World Bank, through its climate-smart agriculture (CSA) framework, ignores issues of power, inequalities and socio-political dimensions within the agrarian sector. Because CSA is apolitical, according to Taylor, "it validates existing policy agendas" (2018, p. 89), and contributes to maintain differential vulnerability. Because of the role organizations play in shaping vulnerability, the second research question is:

2. What role do organizations play in terms of addressing differential vulnerability to the adverse effects from melting glaciers in the Áncash region?

I will analyze projects implemented by three different organization: Practical Action, CARE, and The Mountain Institute. The rationale for selecting these organizations will be discussed in the 'Methodology' chapter. The analysis of these projects will follow the same approach as the government policies, using the factors outlined by Thomas et al. (2018) as a benchmark. Áncash was chosen as a case study as it is the most vulnerable region in Peru (Clements & Torres, 2012), and the residents of Áncash are exposed to adverse climate change effects such as water insecurity, glacial lake outburst floods, and changing weather patterns. Áncash is situated on the northwest coast of Peru and stretches inland to the central highlands of the country. There, the world's highest tropical mountain range, the Cordillera Blanca, shoots up. This mountain range is an essential part of the cultural history of Áncash. The snow- and ice-covered mountains of Cordillera Blanca provide vital water supply to the region, but the glaciers are also a source of uncertainty and threats. The diversity and complexity of Áncash makes it an interesting area to study in relation to adaptation measures and vulnerability.

1.4 Structure of the thesis

The thesis is structured into eight chapters. The following chapter will provide context to the research questions and study area by providing background information. Next, relevant literature and key terms are presented, in addition to a theoretical framework on climate

change vulnerability that will guide the analysis. From there, the methodology used for this thesis is discussed. Chapters on findings, analysis, and discussion ensues before concluding the thesis with a summary and suggestions for further research.

2 BACKGROUND

2.1 History of development with a North-South focus

Differential vulnerability within the context of climate change adaptation is the focus of this thesis. However, I believe it is important to understand the deeper roots of power relations and vulnerability on a global level and within development discourse as it will give a more holistic understanding of the underlaying structures that shape policies and relations today, on both a global and national level.

Development, in its most general sense, can be understood as a process of progress undertaken by people throughout human history (Currie-Alder, 2016, p. 6; Du Pisani, 2006, p. 84). The desire to better one's current standard of living is what has helped drive societal progression. Development, with its concern of poverty within society and the pursuit to understand and shape how society transforms, is a driving factor (Currie-Alder, 2016, p. 6). In more recent times, development practice and theory have gone through different phases and the perception of what progress entails has changed over time (Currie-Alder, 2016, p. 10). Countries in Europe in the eighteenth and twentieth century focused on distribution of wealth, economic growth, freedom and equality within each nation's border (Currie-Alder, 2016, p. 6). The Industrial Revolution, which began in England in 1760 (Mohajan, 2015, p. 3), emphasized modernization, economic growth and material advancement through capital-intensive production (Jensen, 1993, p. 834). Researchers point to the Industrial Revolution as a central shift of the North-South relationship and the interaction between society and nature (Arrighi, Silver, & Brewer, 2003, pp. 5, 6; Barca, 2011, p. 1; Mohajan, 2015, p. 3). The world economy before the Industrial Revolution was primarily based on manual labor and agriculture. Poverty was distributed more equally throughout the world due to lack of competitive advantage and technological advances (Mohajan, 2015, pp. 3, 4). However; by 1950, the world equality equilibrium had drastically shifted. In 1949, President Truman introduced the concept of developed and underdeveloped regions in his inauguration speech (McMichael, 2012, p. 45; Mohajan, 2015, p. 3). In his speech, Truman proclaimed:

> We must embark on a bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas. More than half the people of the world are living in conditions approaching misery. Their food is inadequate. They are victims of disease. Their economic life is primitive and stagnant. Their poverty is a handicap and a threat both to them and to more prosperous areas. Our aim should be to help the free peoples of the world, through their own efforts, to produce more food, more clothing, more materials for housing, and more mechanical power to lighten their burdens. We invite other countries to pool their technological resources in this undertaking. Their contributions will be warmly welcomed. This should be a cooperative enterprise in which all nations work together through the United Nations and its specialized agencies whenever practicable. It must be a worldwide effort for the achievement of peace, plenty, and freedom (Harry S. Truman Library & Museum, n.d.).

Initiatives and programs were implemented with the notion that richer countries needed to assist poorer ones through aid and humanitarian assistance to help build infrastructure, tackle poverty, improve governance and boost economic growth (Currie-Alder, 2016, p. 6,7). This vision of development saw the newly independent, but poor, postcolonial countries in Asia and Africa as underdeveloped and in need of Western help (McMichael, 2012, p. 46). Development after WWII has also been described as a process that "was simultaneously the restoration of a capitalist world market to sustain First World wealth, through access to strategic natural resources, and the opportunity for Third World countries to emulate First World civilization and living standards" (McMichael, 2012, p. 46). In a document from 1996, one can get an understanding of the North-South relationship through the eyes of the North as the OECD Development Assistance Committee (DAC) report shines light on the progress of development:

> In the early 1950s, when large-scale development assistance began, most people outside the developed countries lived as they had always lived, scraping by on the edge of subsistence, with little knowledge of and no voice in global or national affairs, and little expectation of more than a short life of hard work with slight reward (OECD, 1996, p. 6).

The shift from the 1950s 'development project' to globalization in the 1980s and 1990s have not bridged the income gap between North and South (Arrighi et al., 2003, p. 10). Globalization has helped increase the "worldwide interconnectedness of places and people through markets, information and capital flows, human migrations, and social and political institutions" (Lambin & Meyfroidt, 2011, p. 3465). Parks & Roberts (2006), describes globalization as the "increasing economic, political, and cultural linkages between once-distant communities" (p. 340). The World Bank and the International Monetary Fund (IMF) have been praised for being globalizers that have helped countries into the world economy and contributed to "balance growth in the world economy" (Woods, 2006, p. 2) However, a main critique of these multilateral institutions is the extensive power countries in the global North have over the IMF and the World Bank (Woods, 2006, p. 190). Powerful corporations have great incentives to lobby and influence the decisions made by the institutions, and a few wealthy countries pick the management and staff of each institution (Woods, 2006, p. 190).

Yet, it is important to note that the discussion on North-South relations have many dimensions and equally many theories and opinions (Raffer & Singer, 2002; Roberts, Hite, & Chorev, 2014). Some economists and researchers within the development discourse believe that the understanding of the world as a North-South divide is outdated, obsolete and diminishing in importance due to globalization and that we need to shift the focus from inequality between countries, to inequalities within countries (Arrighi et al., 2003, p. 4; Roberts et al., 2014, pp. 248, 263). The United Nations (UN), the World Bank, the IMF, and other intergovernmental institutions continue to hold support among development workers, world leaders and researchers (European External Action Service, 2018; Fleming & Donnan, 2018; IDEA, n.d.; Tharoor, 2003). As data shows from throughout the world, poverty has decreased; more children worldwide attend school; and the global population with access to electricity has increased (United Nations, 2018, p. 7; World Bank, 2018a, p. 1). Nevertheless, UN acknowledges that progress to improve welfare for people on a global scale is not happening fast enough (United Nations, 2018, p. 4). Hunger is on the rise, and the number of people experiencing chronic food deprivation has increased with 17 million from 2016 to 2017 (FAO, 2018). About 30 percent of children lack access to primary education, and gender inequality prevents girls and women the same basic rights and opportunities as boys and men (United Nations, 2018, p. 6).

Currently, the focus on globalization has not changed the oligarchic wealth accumulated by the global North. Oligarchic wealth is what Arrighi et al. (2003) define as wealth that is not accessible to all because cost increases and benefit decreases as more actors become involved and thus, one's effort and intensity do not correlate to how much wealth one receives (p. 19). As well as not yielding the same results for all actors involved, the capitalistic-focused development path is also criticized for being unsustainable. Barca (2011) argues that,

> Economic growth based on the increase of fossil fuel use has been a profoundly uneven process, increasing global inequality and negatively affecting the lives of powerless multitudes, future generations and the non-human world, through the impairment of their living and working environments: as such, it cannot be the answer to poverty and it must be put under severe re-thinking (p 6).

To summarize, development since the 1950s have unsuccessfully reduced income inequality as it was shaped during the Industrial Revolution and the Colonial Era. Additionally, a body of researchers argue that the economic and social systems, as established by the North, systematically reinforces the North-South division by emphasizing a capitalistic path to development as the optimal and only choice.

2.2 Sustainable development and inequality

The Industrial Revolution not only changed the distribution of inequality in the world, it also became the starting point of an era where human activities have substantially contributed to climate change through the release of greenhouse gases and degradation of land (United States Environmental Protection Agency, n.d.) The man-made effect on the climate became too apparent to ignore and in the 1980s, sustainable development was first introduced in the development discourse. The Brundtland Commission was tasked with writing a report on development *and* the environment – "a global agenda for change" (United Nations General Assembly, 1987, p. 5). Titled 'Our Common Future', the report outlined a definition for sustainable development that has since been cited and used by many: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987, p. 41).

However, sustainable development has proven to be a challenge for the global community. Numerous times, nations have not been able to come to a global agreement on sustainable development nor are actions to slow down global warming implemented fast enough (Parks & Roberts, 2006, 2010) A main contributing factor as to why actions on sustainable development are lagging is the relationship between North-South countries and the question of fairness (Parks & Roberts, 2006, p. 339). The differences, or inequality, between global North and global South are evidently clear in questions of blame, as well as the burden of climate change effect. What we are experiencing is the "unequal distribution of the costs and benefits of economic growth among different social groups and among different areas" (Barca, 2011, p. 6) – also known as environmental injustice. To grasp the immensity of the environmental injustice, Parks and Roberts present some staggering data:

> With only 4% of the world's population, the United States is responsible for over 20% of all global emissions[1]. That can be compared to 136 developing countries that together are only responsible for 24% of global emissions. Clearly, poor nations remain far behind wealthy nations in terms of emissions per person.… The richest 20% of the world's population is responsible for over 60% of its current emissions of greenhouse gasses. That figure surpasses 80% if past contributions to the problem are considered. And they probably should be considered, since carbon dioxide, the main contributor to the greenhouse effect, remains in the atmosphere for over 100 years (p. 341).

Figure 1 shows a map of the CO2 emissions per capita in the world in 2016. The map is "resized to absolute CO2 emissions in that territory. The color shading shows the emissions per capita" (Worldmapper, 2018)

[1] The immense economic prosperity of China in the past 30 years has placed the country as the biggest greenhouse gas emitter in the world, followed by US and Europe (World Resources Institute, 2017).

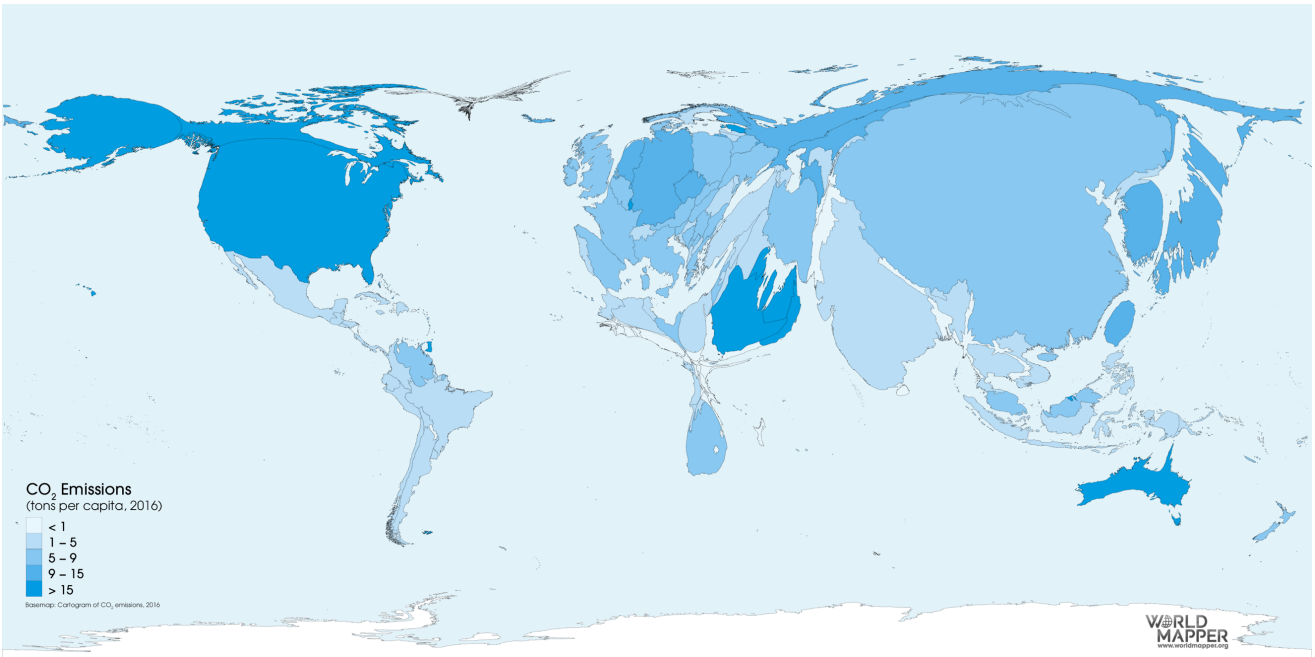

***Figure 1**: Map showing CO2 emissions per capita in 2016.*
Source: Worldmapper, 2018.

The inequality that is observed on a global scale is additionally seen in terms of climate-related disasters and adverse effects. The World Bank reports that 94 percent of the disasters in the world and 97 percent of deaths related to natural disasters happened in developing countries (Parks & Roberts, 2006, p. 341). These destructive events add additional stress to people and communities who are already vulnerable, and set back development gains and economic growth. The cost of natural disasters such as storms, floods, earthquakes and droughts were $2.300 billion from 1970 to 2008, and 3.3 million people died (World Bank, 2010).

In fact, the world is en route to far surpassing the threshold of 1.5°C, and the consequences of this will require sound planning and adaptation efforts on a global, national and local level. As such, climate change adaptation is an integral part of sustainable development.

2.3 Peru

Peru is the third largest country in South America, covering 128 million hectares of land (USAID, 2011). The Andean Range stretches vertically from the southeast to the north of the country, while it borders the Pacific Ocean to the west and the Amazon Basin to the east

(Solano, 2009). The population of Peru as of 2018 is 32.2 million (UNDP, 2018). The country is divided into 25 regions in addition to the Lima Province where the country's capital, Lima, is located. The regions were created in 2002 through the Regionalization Law which was passed on November 18 (Rojas, 2017).

Figure 2: *Administrative Divisions of Peru*
Source: United States Central Intelligence Agency, 2006

2.3.1 History and politics of Peru

The history of Peru often starts with stories about the Inca empire. Situated in the southern Andes, the Incas' empire expanded out from Cusco and was referred to as Tawantinsuyu – the "Four Parts Together" by the Incas themselves (Heaney, 2016). Researchers believe the Incas started to expand and conquer beyond the Cusco valley around 1300 CE, and by the time the Spanish conquered what we know today as Peru, the Incas were a highly developed civilization who had created a sophisticated state with an efficient road network (Heaney, 2016; PROMPERU, n.d.). Although the Inca Empire is what most identify as Peru's history,

newer research has found evidence of societies in Peru since 2900 B.C.E. (Mann, 2005). More than 20 different communities lived in Norte Chico on the central Peruvian coast. In fact, they made up one of the world's biggest early urban centers (Mann, 2005). From the settlements of these communities to the Inca Empire, Peru has been shaped and formed by different civilizations for thousands of years.

On November 16, 1532, the Spanish conquistadors, led by Francisco Pizarro, defeated the Incas which marks the beginning of Spanish control over Peru that lasted for almost 200 years (Heaney, 2016; PROMPERU, n.d.) After several attempts to break free from Spanish control, the process of making Peru independent from Spain began in 1821. Three years later, in 1824, Peru won what would be the last fight against the Spanish army (The John Carter Brown Library, n.d.).

Since independence, Peru has gone through border wars with its neighboring countries, Chile and Ecuador. The country also experienced military rule for a total of 27 years. The first lasted from 1948 to 1963, while the most recent military rule occurred in 1968 and ended in 1980. In addition to these events, there were also government coups in both 1948, 1968, and 1975 (BBC News, 2018). Since 1821, Peru has had 13 constitutions, which indicates the turbulent political history of the country (Taft-Morales, 2013). Currently, the government is backed by the Constitution of 1993, and is today a democratic republic based on the principle of separation of powers with a multi-party system and an elected president (Juan, Velarde, & Zuazo, 1993, p. 17). The election of a president occurs every five years, and the selected candidate becomes the head of state and head of government. The president, his two vice presidents and the cabinet make up the executive branch. In addition to the executive branch, whose main responsibility is to carry out laws, the separation of powers also entails having a legislative branch which is vested in Congress and the government, and an independent judicial branch that includes the Supreme Court and subordinate courts (Embassy of Peru in the United Kingdom, n.d.; Juan et al., 1993, pp. 37, 39, 46).

Since March 2018, Martín Vizcarra has been the president of the country (Presidential Office, 2018). Before becoming the president, Vizcarra held the position as first vice president for Peru but was sworn in as president when then-president Pedro Pablo Kuczynski had to resign due to corruption allegations (BBC, 2018). Corruption has been a consistent Achilles' heel for Peru and its democracy. The scope of the problem ranges from local town politicians to

presidents and government officials (Bland & Chirinos, 2014, p. 92; Luis, 2018; Tan, 2018; The World Bank Group, 2017, p. 5). In 2017, Transparency International, a non-partisan organization that works in more than 100 countries to fight corruption, gave Peru a corruption score of 37 out of 100 points[2]. This score places Peru in 96th place and it shares the position with countries such as Panama, Indonesia, Brazil, Zambia, Thailand, and Colombia (Transparency International, 2018).

In the context of this paper, corruption and political environment is important because the level of transparency and efficiency of a country's government play crucial roles when fighting against the power and destructions of climate change related events.

Since the early 2000s, the political direction of Peru has shifted from centralization to a decentralized government focused on adopting participatory rights (Bland & Chirinos, 2014). Article 189 of the 1993 Constitution divides Peru into regions, departments, provinces and districts (Juan et al., 1993, p. 56). Peru has 25 departments (regional governments), 196 provinces and 1853 municipal districts (OECD, 2016, p. 148). In addition to the national government, Peru has the *Regional* Government, the *Provincial* Municipal Government and the *District* Municipal Government (OECD, 2016, p. 148). These three subnational levels of government "have significant legal powers, and responsibilities …which can be exclusive or shared powers between other layers of government" (OECD, 2016, p. 148). Peru's focus on decentralization, as well as the significant legal powers and responsibilities subnational governments hold, are important factors to be aware of and consider when evaluating policy-making related to climate change and climate change adaptation.

2.3.2 Socio-economic situation in Peru

Peru has an abundance of natural resources and has the highest production of silver in the world, in addition to being a major producer of gold, copper, zinc, lead and tin (USAID, 2011). The export of these commodities have contributed to strong economic growth since the early-2000 (Cespedes & Taj, 2018; Taft-Morales, 2013; USAID, 2017). In fact, Peru was one of the fastest-growing countries in Latin America between 2004 and 2013 (The World Bank Group, 2017). In 2010, then-President Barack Obama described Peru as an

[2] The score goes from 0 – 100, where 0 indicates high corruption and 100 signifies very little corruption

"extraordinary economic success story" (Taft-Morales, 2013). During the strong economic growth, the country's poverty rate[3] decreased from 52.2 percent in 2005 to 26.1 percent in 2013. Furthermore, the extreme poverty rate[4] fell from 30.9 percent to 11.4 percent during the same time (World Bank, 2018b). In 2017; however, poverty rate rose for the first time since 2001 from 21 percent in 2016 to 22 percent in 2017 – that amounts to 375,000 more people in poverty in one year ("A warning on poverty from Peru," 2018; Cespedes & Taj, 2018). Since 2014, Peru has experienced a slower growth rate compared to the previous years which is in large part due to a decline in international commodity prices. Manufacturing, agriculture and mining are some of the biggest economic contributors to the country; however, these sectors depend on the global market. As international prices and demand fluctuate, so does the country's GDP growth (USAID, 2011). Despite a healthy economic growth over the last decade, inequality is still high in Peru (USAID, 2017). Poverty rates are the highest in the Andes region and the Amazon basin, which are also where the indigenous population resides. Rural poverty in Peru is a staggering 43.8 percent, compared to 13.9 percent in urban areas[5] (Cohen & Cespedes, 2017).

2.3.3 Climate and environment in Peru

Peru is a nation of contrasts and biodiversity. As already mentioned, the country holds about 70 percent of the world's tropical glaciers (Takahashi & Martínez, 2017), as well as being the home to the second largest area of Amazon forest, which covers 65 percent of the country (Smith & Schwartz, 2015; Takahashi & Martínez, 2017). The heterogenous climates in the country range from the wet tropical Amazon basin to an arid coastline that receives less than 15mm precipitation per year on average (Met Office, 2011). Between the narrow coastal strip along the Pacific Ocean and the Amazon basin lies the Andes mountain chain. This region experiences a more diverse climate depending on altitude and location; however, precipitation is usually somewhere in between the two opposites. Each climate zone experiences different climate conditions and holds distinct resources; thus it is expected that climate variability and change will affect each region differently (USAID, 2011)

[3] Poverty rate is the percentage of the population living on US $5.50/day
[4] Extreme poverty rate is the percentage of the population living on US $3.20/day
[5] Statistics from 2016

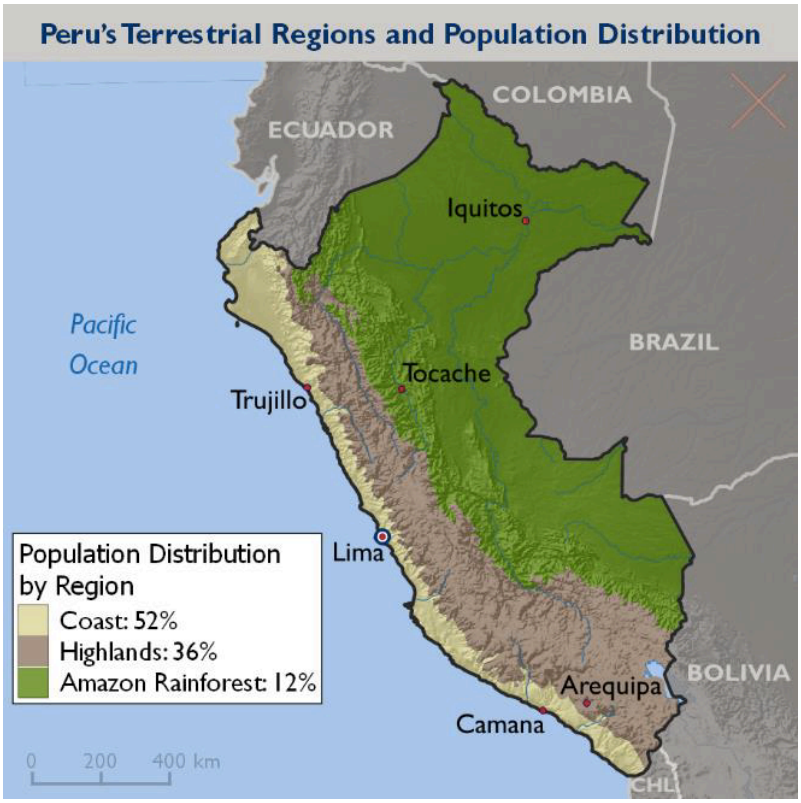

Figure 3: *Map of Peru's terrestrial regions*
Source: USAID (2017)

Peru is among the top ten most biodiverse countries in the world whilst also being one of the countries that have dramatically felt the effects of a changing climate. The Peruvian people live in rapidly changing environments where shifting water availability, mining, new weather patterns and deforestation pose substantial challenges to their future (Mark, Bury, McKenzie, French, & Baraer, 2010; Stensrud, 2016). Peru is ranked as one of the most vulnerable countries in the world to the impacts of climate change, in addition to being among the most susceptible to natural disasters in Latin America (Heikkinen, 2017; Takahashi & Martínez, 2017). The country has seven of the nine vulnerability characteristics defined by the United Nations Framework Convention on Climate Change (UNFCCC). In the tropical Andes, variations in weather pattern and glacier melting are threatening humans and biodiversity alike (Bury et al., 2013; UNEP, 2016). Mining in the Andes region and the Amazon forest is stripping indigenous groups of their land, decreasing local water quality, and creating conflicts between stakeholders (Bebbington & Williams, 2008). The northern coast is highly predisposed to El Niño occurrences that have left areas flooded from extreme precipitation.

The Peruvian government is aware of the challenges its country is facing and has initiated measures, i.e., policies and programs, aimed to adapt to the changes (Lagos, 2007; Pramova, Di Gregorio, & Locatelli, 2015; Takahashi & Martínez, 2017). The construction of a legal framework for land protection started in 1961 when the Congress established Peru's first national park. Since then, Peru has established 76 natural protected areas (ANP), in addition to 147 private- and regional conservation areas (SERNANP, n.d.). Increased glacial meltwater flow has sparked government-led development and economic initiatives that have helped create new agricultural areas that consequently have stimulated the national economy (Casey, 2017). However, several government measures related to climate change and climate change adaptation have received critique, and communities throughout the country continue to live under considerable stress and uncertainty (Carlson et al., 2015; Wrathall et al., 2014).

2.3.4 Region of focus – Áncash

The time constraints and length limitations associated with a master thesis, required me to narrow down the focus from a national to a regional level. The Áncash region was chosen as it is the most vulnerable region in Peru and climate change is directly affecting the local population (Clements & Torres, 2012). The Cordillera Blanca, the world's highest tropical mountain range, stretches for about 200km within Áncash and is an essential water source for Peru (U.S. Geological Survey, 1999). The Andean regions in Peru supply water to roughly 95 percent of Peru's population, and the Cordillera Blanca is a significant source of this water supply (Stark, Guillén, & Brady, 2012, pp. 3–4).

The Áncash region is located on the northwest coast of Peru and stretches inland to the central highlands of the country. The region is diverse in terms of its geography and topography. There are beaches along the Pacific Coast, while the Andes Mountain Range contains glaciers, lagoons and rivers. The highest mountain in Peru, Nevado Huascarán, is also a feature of the region. (FCMCISAL, n.d.; UNESCO World Heritage Centre, n.d.). Áncash has 26 of the 34 current climates in the world and contains 83 percent of the world's ecosystems (FCMCISAL, n.d.).

***Figure 4**: Map of Áncash*
Source: FCMCISAL, n.d.

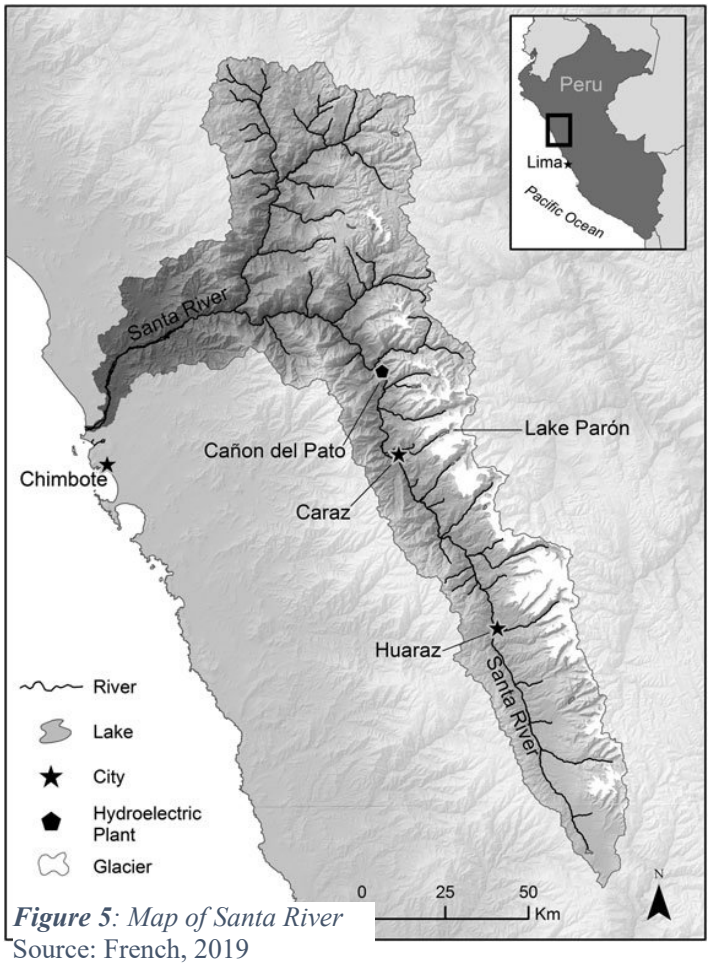

***Figure 5**: Map of Santa River*
Source: French, 2019

The Cordillera Blanca supplies water to the Santa River, which runs through the Callejón de Huaylas valley and down to the Pacific Ocean (Drenkhan, Carey, Huggel, Seidel, & Oré, 2015). The Santa River provides water for millions of people, but although the highland communities of Áncash are in close proximity to the upper watersheds of Santa River, access to water is one of the most pressing concerns for the local population. Only 50.8 percent of households have access to potable water, and this number is a stark contrast to the neighboring province of Lima where 95 percent of households have potable water (INEI, n.d.).

Studies show that highland communities have low political participation in Peru, are more likely to live in poverty, and experience high vulnerability to climate change (Heikkinen, 2017; Oliver-Smith, 2014). The rural areas of the highlands have the highest level of poverty in Peru (Oliver-Smith, 2014).

2.3.5 Challenges in Áncash

The Cordillera Blanca has most of the world's tropical glaciers, which makes it an interesting region to study for this thesis. As mentioned, tropical glaciers are melting at an accelerated rate and the consequences are acute for the people in the region. However, climate change is not only melting glaciers in Áncash but also altering weather patterns that affect biodiversity and farming. Control over water is another factor that contributes to concerns for the local

communities. This section will discuss some of the most pressing challenges that people in Áncash are faced with.

Glaciers

The glacier retreats in the tropical Andes are closely related to higher global temperatures (Vuille et al., 2018). In the past 30 years, about 30 percent of the glacial cover in Cordillera Blanca has disappeared (Clements & Torres, 2012). In addition to being a source of water for people, the glaciers also have a significant cultural and spiritual value to local communities (Drenkhan et al., 2015). For many people in Áncash, the mountains are spirits that need to be respected and sometimes left alone. The interference with mountains, glaciers, and lakes are by some believed to cause the loss of ice cover and seasonal droughts (Jurt, Burga, Vicuña, Huggel, & Orlove, 2015).

The Áncash region is familiar to the hazards associated with the glaciers in Cordillera Blanca. Disastrous glacial lake outburst floods (GLOFs) have occurred several times and pose risks to vulnerable and exposed populations. Between 1942 and 1950, three GLOFs killed approximately 5700 people living in the valleys below the glacial lakes (Carey, French, & O'Brien, 2012, p. 185). An earthquake in Áncash in 1970 triggered a GLOF that killed 20,000 people and demolished the town of Yungay. In more recent years, GLOFs have not taken any lives; although a GLOF in 2010 caused substantial damage to land and homes in Carhuaz. However, it is not just the nearby villages that are affected by GLOFs. Of all glacial hazards[6], GLOFs have the most widespread effects due to flooding and contamination of water (Hill, 2016). The accumulation of meltwater from glaciers create glacial lakes that are often enclosed by moraine that easily collapses from big swells and avalanches. According to studies, global warming has led to "the formation of moraine-dammed glacial lakes that can have a high potential for glacial lake outburst floods (GLOFs)" (Carey, Huggel, Bury, Portocarrero, & Haeberli, 2012, p. 735).

Water

Water supply in Áncash is determined by snow- and ice cover in Cordillera Blanca, precipitation and water management. Concerns over water quantity and quality has led to conflicts between local people, mining companies and hydroelectric corporations (Drenkhan et al., 2015). The mining sector is a significant user of water and its impact on water quality

[6] Such as debris flows, ice and rock avalanches

is pronounced (Bury et al., 2013). Carey et al. (2014) reported that since 1990, "more than 90 percent of all mining claims were placed in the Santa water" (p. 66). About 41 percent of the surface area of the Santa River was used for mining in 2009, but in just one year this number had increased to 52 percent (Carey et al., 2014; Mark et al., 2017). Mining activities release about 13 billion m^3 of effluents yearly into Peru's waters, and the water quality in Peru is repeatedly falling short of the standards set for animal and human consumption (Bebbington & Williams, 2008; Bury et al., 2013). Low government regulations and lack of independent and reliable information on the environmental consequences of mining in the Andes region are some of the reasons why mining is allowed to continue its polluting practices.

Most of the water from the Santa River is "extracted in the lowest portion of the watershed for large-scale coastal agriculture and urban water provision" (Mark et al., 2017, p. 73). The Peruvian government has been favoring large-scale agricultural projects in the coastal, arid areas that focus on commercial, high-yield crop to be exported internationally (Heikkinen, 2017). As a whole, the agricultural sector uses 86 percent of the total fresh water supply in Peru (Drenkhan et al., 2015, p. 9).

3 LITERATURE REVIEW

Climate change and adaptation efforts are at the core of this thesis. However; there are two distinct ways to assess adaptation. One focuses on the technical and institutional fixes such as dam control and alarm systems, while the other examines the socio-political dimensions of vulnerability and emphasizes policies and societal changes. As such, there are different ways to interpret vulnerability when it comes to climate change. The first section of the literature review will examine two such interpretations and frame the focus of this thesis within contextual vulnerability. From there, insights from political ecology help steer the analysis toward the underlying factors that produce and reproduce vulnerability over time. Lastly, the theoretical framework of Thomas et al. (2018) lays the foundations for analyzing the extent to which vulnerability is considered in climate change adaptation policies and programs in Peru that directly affect communities in the Áncash region.

3.1 Vulnerability in the climate change discourse

Vulnerability to climatic change have become a popular topic among researchers, policymakers and organizations. A quick search of 'climate change vulnerability' in the online library of University of Agder gave more than 94,000 results[7]. It is widely understood that vulnerability is a function of exposure, sensitivity and adaptability (O'Brien et al., 2007, p. 74). However, this meaning is broadening, and some literature also include risk and impacts, while others incorporate social, political and economic factors into the framework. Differing interpretations of vulnerability shapes how research is conducted and the political response to climate change (O'Brien et al., 2007, p. 74). O'Brien et al. identify two common interpretations of vulnerability in climate change literature: outcome vulnerability and contextual vulnerability.

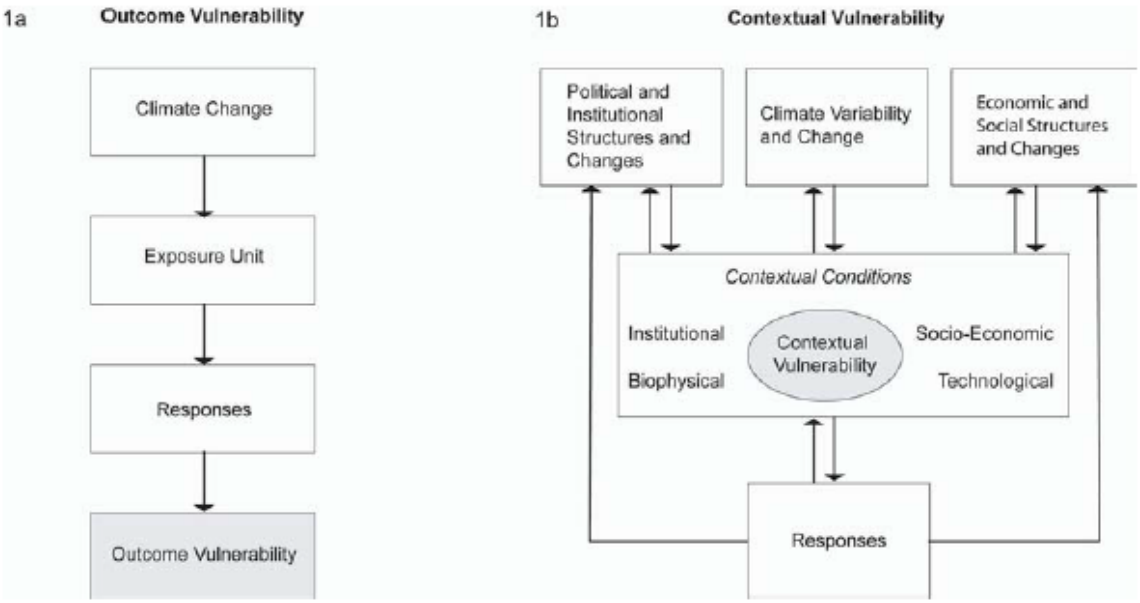

***Figure 6**: Outcome vulnerability and contextual vulnerability*
Framework 1a illustrates outcome vulnerability and framework 1b illustrates contextual vulnerability. Source: O'Brien et al., 2007, p. 75

Outcome vulnerability associates the negative outcomes with vulnerability and can be viewed as a scientific framing of climate change (O'Brien et al., 2007). This understanding of the framing is important because "the framing of an issue creates boundaries around social

[7] Search done on March 27, 2019

groups, biophysical entities, or their interactions, to establish an ordered vision of event" (O'Brien et al., 2007, p. 76). Outcome vulnerability is based on the idea that adaptations are created based on anticipated climate change events toward 'exposure units', i.e. communities, regions, ecosystems etc. That is why scientific knowledge is emphasized in order to determine what will happen over time with climate change. Sectoral and technological changes are used to address adaptation, which can include irrigation schemes, drought-resistant seed options, and improved infrastructure (O'Brien et al., 2007, p. 84).

Contextual vulnerability, on the other hand, focuses on why some are more vulnerable than others and include socio-economic issues in its framework. O'Brien et al. (2007) position this interpretation of vulnerability within a human-security framing of climate change. Vulnerability is viewed as multidimensional and a "characteristic of social and ecological systems that is generated by multiple factors and processes" (O'Brien et al., 2007, p. 75). Vulnerability is not just based on where people are located, but rather influenced by contextual conditions such as political, economic, social, technological and institutional processes and structures (O'Brien et al., 2007, p. 76). This will be discussed further in the following section as this is the interpretation of vulnerability that I will use for this thesis.

It is important to distinguish which interpretation I am using as it reflects how I assess adaptation efforts. However, although the thesis is based on one interpretation of vulnerability does not mean I think the other interpretation is wrong. Outcome vulnerability most certainly has an important place in climate change adaptation research and policies. To put it in the words of O'Brien et al.: "the two interpretations represent complementary means of understanding the significance of climate change and its relevance to society" (2007, p. 74).

3.2 Addressing vulnerability through the lens of political ecology

As the climate is heating up and adverse effects become more frequent, research is continuously done to understand the consequences we might endure. As such, climate change adaptation is formed around the knowledge we have at the time but also through the "changes in access to and control over resources" (Eriksen et al., 2015, p. 523). O'Brien et al. (2007), define adaptation as "adjustment in ecological, social, or economic systems in response to

actual or expected climatic stimuli and their effects or impacts" (p. 83). To date, three concepts, vulnerability, adaptive capacity, and resilience, form the analytical climate change adaptation framework which has become the universal go-to method (Taylor, 2015, p. 53). Much of the current literature "examines diverging means of conceptualizing and measuring these core concepts of vulnerability, resilience and adaptive capacity, with the aim of translating them into a format suitable for policy implementation" (Taylor, 2015, p. 54). However, this homogeneous framework has been criticized for ignoring the diversity among countries, their socio-ecological settings, the unique anthropogenic challenges they face, and uneven social-economic dimensions (Taylor, 2015, p. 53). Adaptation policies throughout the world that receive support and funding from organizations such as the UN follow templates where vulnerability assessments are conducted to understand biophysical hazards for so evaluating who is at most risk from these hazards. From there, the focus of the adaptation plans are on the technical measures, such as infrastructure, and institutional design (Nightingale, 2017, p. 11). It is argued that these internationally backed adaptation programs fail to consider political complexities and in fact build up on power and authority that determine resource access and shape climate change vulnerability (Nightingale, 2017). Mustafa (1998) argues that mitigation processes and hazards research heavily emphasize risk while to a large degree disregard social factors that contribute to vulnerability. In his research about structural causes of vulnerability to flood hazards in Pakistan, he notes:

> This technocratic approach[8] toward hazards is capital and technology intensive and places a low priority on the social factors that contribute to the differential vulnerability of population groups. … Technocratic approaches may be successful in preventing loss of life, but they are too expensive for poorer countries and communities and do not offer a long-term solution to the problem of vulnerability mitigation and disaster prevention (Mustafa, 1998, p. 290).

Mustafa's research brings an important focus to the uneven outcomes of climate change effects experienced by communities with differing social-economic features. The same type of event might produce limited damage in one community while creating tremendous damage in another based on their degree of vulnerability.

[8] i.e., approaches that focus on risk

It might seem that the progress of adaptation and vulnerability research is limited, as well as the advancement of adaptation policies that reflect the focus on socio-economic factors. Eriksen et al. (2015) voice a concern that research on vulnerability and adaptation "suffer from an under-theorization of the political mechanisms of social change and the processes that serve to reproduce vulnerability over time and space" (p. 523). Additionally, Taylor (2018) critiques the current push for CSA. He argues that its framework is apolitical and focused on technical fixes, while ignoring issues such as power, inequality and "the socio-political dimensions of food production and distribution" (Taylor, 2018, p. 90).

In order to change the existing trends of adaptation programs, a growing number of climate change adaptation researchers have begun to incorporate ideas from development studies and environmental studies (Taylor, 2013, p. 318). Through the focus of human security in the environmental change discourse, it is argued that climate change adaptation needs to move towards an emphasis of a more "equitable public policy approach that can address both poverty and vulnerability simultaneously" (Taylor, 2013, p. 318). A drawback to the human security and environmental change paradigm is its tendency to highlight *how* levels of vulnerability are strengthened through inequality without giving tools to analyze the vulnerability and inequality in an analytical way (Taylor, 2013, p. 320). As an alternative to address this weakness in the discourse, Taylor proposes a theoretical framework based on political ecology. A main concern in political ecology is how vulnerability is produced and reproduced over time and at various scales to shape economic opportunities, exposure to risk, political power and distribution of resources – all of which impacts adaptation efforts to climatic change (Taylor, 2013, p. 321).

Taylor (2013) has investigated the relationship between power, inequality and vulnerability in the context of agrarian environments. More specifically, Taylor focuses on relational vulnerability which occurs when "the relative security of some social groups is achieved through the production of insecurity among others" (Taylor, 2013, p. 318). In his study of an agrarian community in Andhra Pradesh in southern India, Taylor observed how uneven access to central resources such as water, land, labor, and credit had a strong correlation to people's vulnerability to climatic variability. Additionally, the research found that the vulnerability of marginalized groups in fact created a level security of others. As such, climate change vulnerability in all its shapes and forms are tied into a much more complex, stratified system than that of a battle between humans and the elements of nature.

Climate change vulnerability is a multi-dimensional problem situated within a complex socio-political context. Principles from political ecology can help explain and provide solutions to this multifaceted issue that is happening throughout the world (Adger & Kelly, 1999; Coirolo & Rahman, 2014; Eriksen et al., 2015; Nightingale, 2017; Taylor, 2013, 2018). Power relations, drivers of inequality, constraints for self-determination and how vulnerability is produced and reproduced over time are central themes within political ecology (Taylor, 2013; Tschakert, 2012). Discourse on climate change vulnerability is using the lens of political ecology to *address* the underlying factors that shape vulnerability, rather than merely identifying the symptoms. Bryant and Bailey argue that political ecologists have three core assumptions:

1. Cost and benefits associated with environmental change are for the most part distributed among actors unequally
2. An unequal distribution of environmental costs and benefits reinforces or reduces existing social and economic inequalities.
3. The differentiated social and economic impact of environmental change also has political implications in terms of the altered power of actors in relation to other actors (Bryant & Bailey, 1997, pp. 28–29).

Political ecology encourages the discussion on climate change adaptation to widen its focus to include institutional, political, social and cultural factors when studying vulnerability (Nightingale, 2017; Tschakert, 2012). Nonetheless, there is a lack of incorporating politics into climate change adaptation (Eriksen et al., 2015). The research on climate change adaptation that look at the underlying factors of vulnerability have found that power relations, access to and control over resources, knowledge, and control over activities are among the contributing dynamics that shapes vulnerability (Coirolo & Rahman, 2014; Eriksen et al., 2015; Nightingale, 2017; Taylor, 2013). Despite these findings, there has not been a detailed conceptual framework that addresses the politics of adaptation (Eriksen et al., 2015, p. 524). That is; however, until Thomas et al. released a comprehensive framework in 2018 in which they address and identify key underlying drivers of climate change vulnerability that have been detected from previous research. The framework shifts the focus from people adapting to climatic change, and rather defines and address the obstacles that are created by people preventing some from being elevated from climate change vulnerability. The framework is

detailed; however, I believe it is needed when working with a topic as complex as vulnerability. It provides a thorough framework to this thesis and allows me to analyze policies and the role of organizations based on the extent to which the key factors that are presented in the framework are addressed by both in Peru.

3.3 Theoretical framework

Taylor's (2013) theoretical insights from political ecology has shed light on the role of relational vulnerability to produce and reproduce insecurity of households. However, Taylor admits that his findings, although important for the climate change adaptation discourse, do not make it any clearer how to move forward with climate change adaptation policies.

The framework created by Thomas et al. (2018), which addresses the underlying social drivers of climate change vulnerability on a local scale, are employed to analyze climate change adaptation policies in Áncash, Peru in relation to differential vulnerability. The framework aligns closely with Taylor's observations on human insecurity, inequality and power. However, where Taylor is focused on relational vulnerability, the framework presented by Thomas et al. (2018) addresses differential vulnerability and presents four themes that influence vulnerability.

Thomas et al. defines vulnerability as a "multidimensional process affected by social political, and economic forces interacting from local to international scale" (2018, p. 2). More specifically, the framework outlines vulnerability as a function of exposure, sensitivity and adaptive capacity as shown in figure 3.

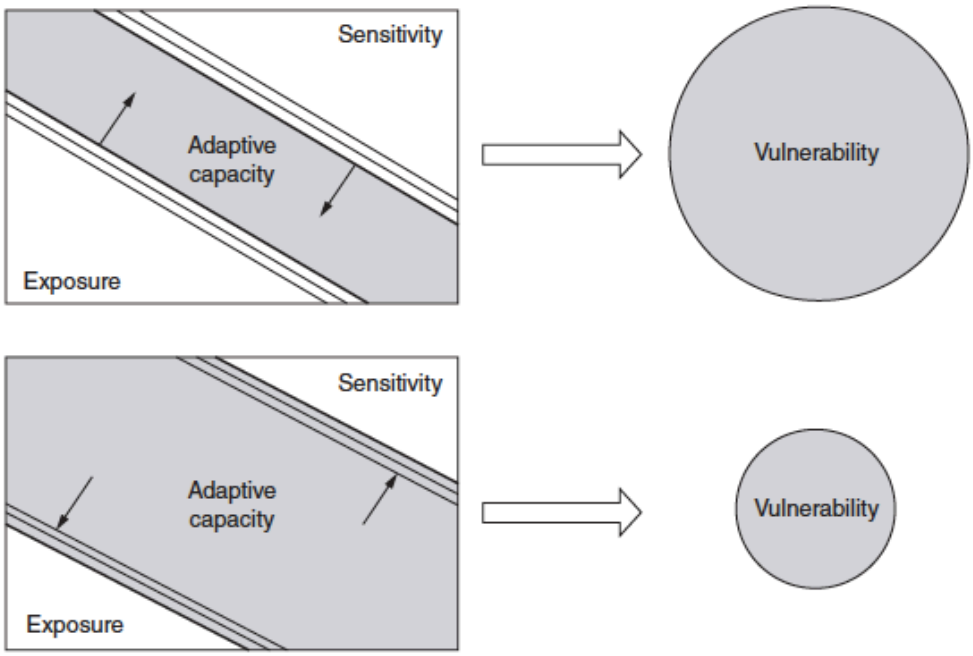

***Figure** 7: Vulnerability as a function of exposure, sensitivity and adaptive capacity Vulnerability is intensified when adaptive capacity is low relative to sensitivity and exposure (top). Vulnerability is reduced when adaptive capacity is high which mitigates the effects of sensitivity and exposure (bottom). Source: Thomas et al., 2018, p. 2*

Everyone will to a certain extent feel the effects of climate change; however, some groups of people are hit harder, both economically and socially. This is what Thomas et al. (2018) define as differential vulnerability where vulnerability is unevenly allocated across society due to social factors. The framework details four broad themes: resource access, governance, culture and knowledge which help recognize the social aspects of vulnerability and how they interact with sensitivity, exposure, and adaptive capacity. Within each theme, more specific issues are discussed that affect differential vulnerability.

Thomas et al. argue that an understanding and consideration of these factors will create more sustainable adaptation policies and strategies that "minimize exposure and sensitivity, and that elevate adaptive capacity under a changing climate" (2018, p. 3). This framework builds on the arguments of Taylor (2013) that power relations and vulnerability are immensely important factors to climate change adaptation; yet many adaptation plans focus on technical fixes such as infrastructure, crop variety and change of practice (Taylor, 2013, 2018). Environmental injustice can explain why some countries, such as Peru, are feeling the consequences of climate change more than other countries, such as Norway. Political ecology

adds to this discourse by looking at the socio-economic factors that create these differences and unequal distribution of vulnerability. The research into what makes a good adaptation plan is still on-going and scholars agree that this is a complex topic with no exact answer. However, the framework of Thomas et al. (2018) provides a set of key issues that are relevant to climate change vulnerability by either building up on vulnerability or reducing it. It works as an appropriate analytical tool to analyze current adaptation strategies in Peru to get a better understanding to the extent differential vulnerability is addressed both by governmental institutions and organizations.

Access to Resources

The framework defines access to resources as the "ability to derive benefits from natural and human resources" (Thomas et al., 2018, p. 3). These are both private and public goods that either increase or decrease sensitivity, adaptive capacity and, exposure based on community access. Such resources can be disaster warning systems, emergency response, insurance, migration support, alternative housing, private capital, food stores, infrastructure, information and communication networks, liquid assets and transportation. A geographical area can have access to a vast array of resources while still experiencing tremendous consequences from climate change effects. That is because lack of resources is often not the contributing factor – rather an unequal distribution of existing resources is. Policies and programs that work toward distributing available resources equally among a community are more likely to reduce differential vulnerability and produce more sustainable adaptation outcomes. The distribution of resources is a development issue that Thomas et al. (2018) link to three social hierarchies:

- Race, caste and gender
- Poverty
- Power differentials

Race, caste and gender

Thomas et al. (2018) looks at structural racism that has produced racial differences in the United States when it comes to income, education and wealth due to unequal resource access. This has led to differential vulnerability in the country with the nonwhite population experiencing an increased vulnerability to climate change effects. In the context of Peru, indigenous groups experience a similar form of discrimination. Lack of control and access of

resources – some that have previously been available to indigenous groups in Peru – put them in a higher state of vulnerability to climate change effects.

Gender is a significant factor to climate change vulnerability. Women experience a higher degree of vulnerability as a result of less access to, and control of, basic resources. In many areas, gender inequality creates restricted gender roles and prevent women access to education, political representation and health resources.

Poverty

Poverty is one of the factors that most often is linked to climate change vulnerability. Poverty affects access to resources in various ways which subsequently make it a difficult issue to tackle. Thomas et al. (2018) identifies three areas where the level of capacity determines vulnerability, and in which the people experiencing it may be considered poor:

1. Lack of economic capacity: income or wealth limits the access to resources which results in vulnerability
2. Lack of institutional capacity by a group: resources are not available in an area where a specific group resides which enhances vulnerability
3. Lack of political capacity to obtain or retain resources: exploitation or surplus appropriation limits the access to resources and creates vulnerability

A group might experience various combinations of these three when adapting to climate change. Thomas et al. (2018) reflect on this:

> In many places, it is more difficult for poor households and communities to prepare for climate threats because they lack the required income, time, language abilities, and knowledge of resources and how to access them. Vulnerability among these households reflects both limited wealth to prepare for climate-related impacts and limited institutional capacity to ensure that disaster preparation resources exist in a form that is useful to them (p. 5).

Poverty also affects vulnerability in terms of how and where people live. Poor people often live in areas that are more prone to adverse effects of climate change, and many reside in housing that may lack the necessary structures and foundations to make them safe when climate related events occur. When a disaster hits, poor communities often find relocation

one of the biggest challenges, which contributes to less adaptive capacity and increase of vulnerability.

Power differentials

Similarly to Taylor (2013), the framework by Thomas et al. (2018) addresses power differentials as a key factor to creating and reproducing vulnerability among people. Power differentials are conceptualized in the framework as a synthesis of poverty and marginalization, where the "ability to influence or coerce different groups – social power – is derived from and reproduces the social hierarchies that create inequalities in access to resources, which in turn engender differential vulnerabilities among communities" (Thomas et al., 2018, p. 5). Adaptation policies and programs can create vulnerability by further increasing poverty or marginalization of groups by allowing powerful people, companies or countries to regulate where negative and positive environmental externalities occur. The pollution of a river or deforestation caused by economic activities are examples of negative environmental externalities where some social groups suffer while others benefit. On the other hand, a positive environmental externality is the reduction of pesticides and herbicides which contribute to better air quality and preservation of biodiversity.

According to Thomas et al. (2018), power differentials are seen in adaptation planning as "groups with more political power are more likely to secure funding to plan for, cope with, and respond to climate-related impacts" (p. 5). Studies show that in many areas, adaptation strategies benefit economically valuable areas, local elites and groups with political power while farmers, rural communities and disadvantage groups are disproportionately affected. Additionally, uneven access to disaster-response resources and medical care among communities, especially rural and urban, underpins differential vulnerability.

Governance

As the second theme in the framework, governance processes are defined as "how societal problems are addressed by governments and other organization" (Thomas et al., 2018, p. 6). In terms of climate change vulnerability, governance can contribute, as well as respond, to it. Governance does not only entail formal institutions, but can also be interest-based networks, private actors, and markets that have an influence on policy making.

The linkage between governance and vulnerability lays in representation. Whether a group is able to participate in political processes that influence their human security is imperative to their vulnerability to climate change. This political representation influences groups on all levels – from local, national to global. Countries with various degrees of representation in the global arena experience different levels of climate change vulnerability. Uneven governance representation where policies favor certain groups and political power is imbalanced, is fundamental in producing and sustaining vulnerability over time. Therefore, addressing governance should be incorporated into adaptation policies to reduce vulnerability to climate change. The framework emphasizes that "scientifically sound and socially robust approaches to adaptation involve community groups in every stage of the process: identifying issues, designing responses, implementing actions, and evaluating results" (Thomas et al., 2018, p. 7).

Public and private governance

Organizations, private companies and, governmental institutions all play a role in reducing climate change vulnerability, whether they work together or separately. Regardless of the governance type, resource allocation to reduce vulnerability is often a challenge for organizations as the benefits of vulnerability reduction are often seen further down the road and short-term goals and needs are often prioritized instead. Adaptation plans that consider all facets of vulnerability are few and most plans focus on a subset of the sources of vulnerability. Such an approach might not create the same results as a plan that focuses on all aspects of vulnerability and as a result becomes more complex, time-consuming and resource intense.

In many areas, parts of adaptation activities are maintained and monitored by local groups. A drawback to this approach is the limiting funds and lack of technical expertise that many local groups experience. In fact, such an approach might indeed increase vulnerability which demonstrates the importance of collaboration across different governance groups when developing and implementing adaptation plans (Thomas et al., 2018, p. 7). Another challenge with governance is the scope in which climate change risks are viewed. Plans run the risk of not reducing vulnerability "if projects are too narrow in defining the population, geographical area, issues, or time scale of concern" (Thomas et al., 2018, p. 7).

Civil society engagement

Civil society is another piece that makes up governance. Civil society groups that work toward improving adaptive capacity range from climate action social movements, faith-based organizations, national and international networks and indigenous groups. These groups can play a key role in helping communities both prepare and respond to climate change through dissemination of knowledge. This helps increase people's understanding as to why climate change is relevant to their lives and why adapting is necessary. As the framework states, "states alone are no longer seen as the sole solution to the problem; effective governance to reduce climate change vulnerability now engages a range of actors encompassed by governments, civil society, and the private sector" (Thomas et al., 2018, p. 8).

Culture

Culture is "the shared and patterned meanings held by members of social groups" (Thomas et al., 2018, p. 8), and an important component to climate change vulnerability. Understanding the cultural context in areas where climate change risks are prevalent can help shape a more successful adaptation plan by identifying who are more exposed to threats, what responses are more realistic for the social group and their relationship to nature and their environment. However, navigating cultures can be difficult. They are ever-evolving systems that are often implied rather than explicitly spelled out, which can make them complicated and time-consuming to understand. And yet; "the identification of risks, decisions about responses, and means of implementation are all mediated by culture" (Thomas et al., 2018, p. 8), which is why it is an imperative part of adaptation strategies.

Tangible and intangible factors

Climate change impacts both tangible and intangible factors in people's live. Often, the tangible factors are the ones attracting the most attention and are addressed more frequently in adaptation strategies. Infrastructure, food supply and access to clean water are tangible factors that impact people's vulnerability to climate change. On the other hand, intangible factors are equally important to people's well-being. Daily practices that make up someone's everyday life are important intangible factors, in addition to social systems and cultural knowledge. The tangible and intangible factors are often connected and the protection of one can sustain the other. Conserving land and historic environments are great examples of the link between tangible and intangible factors. Activities such as fishing, gathering and hunting teach and preserve local knowledge about the environment, history and cultural practices.

Regulations that restrict access to land or the use of local practices create "loss of cultural and societal significance that is often invisible to those calculating climate change impacts" (Thomas et al., 2018, p. 9); yet the affected social groups experience tremendous loss and are left more vulnerable to climate change.

Risk and culture

The way people perceive, act and recover from risk are all tied to culture. Because of this, adaptation programs are more likely to be successful if they align with the risk perception of the target community. Since different groups each have a distinctive culture, defining and adapting to risk can pose a unique challenge. What some perceive as a risk, others do not – even when they are subjected to the same exposures. An explanation to why this is the case is because "people tend to perceive risks when their ideal social organization or worldview is threatened" (Thomas et al., 2018, p. 9). Therefore, the same hazard can be viewed by people differently depending on their relationship and interaction with nature, previous experiences, knowledge, needs and beliefs. Thomas et al. (2018) suggest that "adaptation options that include 'clumsy solutions' in which a diversity of people can see their own cultural worldviews, perceptions of risk, and experiences reflected, may be less politically tidy but more likely to be agreed upon and enforced" (p. 10).

Vulnerability and well-being

When looking at vulnerability through a cultural lens, there are aspects that go beyond what one can measure. Adaptation policies aim to reduce the exposure to adverse climate change effects and improve the response and recovery of such effects; thus, reducing vulnerability. However, for most people, well-being extends beyond physical survival and their vulnerability is tied to the protection of physical places. Relocation as part of adaptation can often create loss and suffering for the affected groups as "there may be no equivalents to the territory with important mythic associations, the fishery that supported culturally salient livelihoods, or simply the sense of place that provided an emotional and spiritual foundation for multiple generations" (Thomas et al., 2018, p. 10). The gap between survival and culturally relevant well-being needs to be addressed in adaptation programs and in the discussion of climate change vulnerability. As an example, switching crop type to address drought may improve food security for people which from an adaptation standpoint is a success. However, it can increase vulnerability by taking away important cultural characteristics that are related to the native crop type.

Knowledge and Information

Knowledge and information are important pieces to understand differential vulnerability to climate change as access to the two determines who benefits from resources. More so, "different types and sources of information and modes of knowledge transmission affect how people understand, perceive, and act on information" (Thomas et al., 2018, p. 10). Sensitivity, adaptive capacity, and exposure are directly and indirectly shaped by knowledge and information. A joint collaboration where both researchers, government and community come together to shape the access, distribution and application of knowledge increases the chances of creating more successful adaptation plans.

Transmission of environmental knowledge

The way people access and perceive information occurs through a combination of different sources such as social media, interpersonal communities, radio, TV and the Internet. People evaluate whether information they receive is salient, credible and legitimate before acting upon it. This is often done through the lens of their social network. Social networks "help people access, personalize, and perceive the relevance of information" (Thomas et al., 2018, p. 11), and people are more likely to act upon threats when there is a consensus within the social network that the risk is legitimate. This is termed 'social amplification of risk' and helps us understand why different groups respond and act on information about climate risks differently.

Social memory

Previous experiences can have important significance to whether or not risks are being perceived as threats. However, whether past events and the knowledge gained from those are used further down the line depends on effective social transmission. Past experiences and the dissemination of information, such as seeking higher grounds to avoid the risk of tsunami after an earthquake, can be of critical importance to hazard response. Social memory can be remembered and shared for thousands of years unless political or economic factors disrupt or disregard it. Regulations, laws, and, favoring scientific knowledge can restrict local practices and lead to the disappearance of local environmental knowledge and strategies. This practice of disregarding local knowledge and reducing the strength of social memory can "reduce the capacity to identify local risks, and thereby increase vulnerability" (Thomas et al., 2018, p. 11).

Local, indigenous, and traditional ecological knowledge

Social memory is one important aspect of knowledge; however, local, indigenous, and traditional ecological knowledge (TEK) have an equal significant role in climate change vulnerability. This place-specific knowledge includes information about weather patterns and climate occurrences that have been transmitted over time and through generations. As indigenous groups are some of the most vulnerable to climate change, TEK can be of essential importance to enhance the adaptive capacity of these communities. The framework suggests that a combination of TEK and science can provide important understanding of climate change and adaptation but emphasizes that trust between the parties is necessary. Furthermore, it needs to be acknowledge that "TEK is embodied in cultural practices and beliefs that are inseparable from deep cultural contexts" (Thomas et al., 2018, p. 12).

Deep time knowledge

The use of archaeological records can provide understanding and knowledge of how people have responded to climate events in the past. Archeologists can recover lost knowledge and through that, contribute to strengthen place-based knowledge and improves adaptive capacity. However, this way of maintaining local knowledge is under pressure as cultural landscapes, historic structures, and archaeological sites are destroyed or damaged at an unprecedented rate due to development and environmental changes.

Knowledge coproduction

Lastly, this framework highlights knowledge coproduction as a factor that can help elevate climate change vulnerability by creating adaptation plans that combine both scientific and local knowledge. In one report, knowledge coproduction is defined as "the contribution of multiple knowledge sources and capacities from different stakeholders spanning the science-policy-society interface with the goal of co-creating knowledge and information to inform environmental decision-making" (Djenontin & Meadow, 2018, p. 886). Knowledge coproduction bridges the gap between researchers and end users, whether it be policymakers or communities. It is believed that knowledge coproduction "increases the relevance and usability of science for society" (Djenontin & Meadow, 2018, p. 885). It has therefore become popular in climate change adaptation discourse. Thomas et al. (2018) give examples of cases where communities use both research and local knowledge and perspectives to plan for climate change and create adaptation strategies. However, research might in some cases

be either hard to access or understand. To resolve that, organizations come in as boundary organizations linking people to researchers and help communicate science while also eliminating barriers that can inhibit stakeholder participation (Thomas et al., 2018, p. 13).

4 METHODOLOGY

4.1 Research Strategy & Methods

A qualitative strategy in research tends to focus on words when collecting and analyzing data rather than numbers. Since I was interested in studying the content of documents from organizations and the Peruvian government, a document analysis approach was deemed as most fitting. This is a systematic approach that "entails finding, selecting, appraising, and synthesizing data contained in documents" (Bowen, 2009, p. 28).

Early on in my preliminary research on the topic of differential vulnerability, it became apparent that governance and politics play a central role in shaping differential vulnerability. Studying policies seemed to be the most appropriate approach. Additionally, development organizations play an important role in addressing differential vulnerability as their actions can either reduce or produce differential vulnerability. I therefore decided to do a qualitative study in which I analyzed both government policies and projects implemented by organizations.

Bryman (2012) argues that description and the emphasis on context are often central techniques used in qualitative research. This detailed information gives a contextual understanding of the behavior and the social setting that is being observed. Because people and communities experience differential vulnerability based on a range of factors, understanding the social, cultural, economic and political setting in Áncash was important in order to study the extent government policies consider differential vulnerability and the role organizations play to address it. Without this knowledge about the factors that contribute to differential vulnerability in Áncash, answering the research questions would be near impossible. In line with Bowen's (2009) argument that "information and insights derived from documents can be valuable additions to a knowledge base" (p. 30), a detailed account of Áncash was produced by using journal articles, newspaper articles and a master's degree

thesis. I also used these documents to build trustworthiness (credibility) in the findings and claims I presented in the analysis.

4.2 Sampling

As with most sampling in qualitative research, I conducted a purposive sampling. This type of sampling is "conducted with reference to the goals of the research, so that units of analysis are selected in terms of criteria that will allow the research questions to be answered" (Bryman, 2012, p. 418). Among the different forms of purposive sampling, generic purposive sampling was the most suitable sampling approach for my thesis. According to Bryman (2012), "when using a generic purposive sampling approach with respect to the selection of cases or contexts, the researcher establishes criteria concerning the kinds of cases needed to address the research questions, identifies appropriate cases, and then samples from those cases that have been identified" (p. 422). I chose my cases based on their relevance to Peru and Áncash, and also based on the criteria that the documents had to relate to climate change adaptation. Because I knew I wanted to study climate change adaptation and differential vulnerability in Áncash, the sampling was done in a strategic way where my cases were relevant to my two research questions. I knew I had to include government policies and projects by organizations to answer these. Furthermore, the sample cases had to pertain to Peru and Áncash.

Although I knew early on the type of cases I needed to sample, I did find myself using a sequential approach in where my sampling evolved as I added more documents to my sampling whilst my research progressed. However, my research questions never changed so that criteria for my sampling stayed the same throughout the whole research. This is termed as an a priori purposive sampling approach (Bryman, 2012, p. 418).

4.3 Data Collection

As already discussed, the approach to data collection I used for the thesis is one of the central methods linked to qualitative research in where texts and documents are collected and analyzed (Bryman, 2012, p. 383).

In selecting documents for the analysis, four criteria where used to ensure good quality of the documents: authenticity, credibility, representativeness and meaning. However, these criteria should not be applied in a rigid and formalistic way and they "should not be regarded as distinct stages in assessing the quality of documentary sources" (Scott, 1990, pp. 34–35).

The authenticity of a document is based on its soundness, is it original or a technically sound copy, and who is "responsible for its production" (Scott, 1990, p. 20). The documents that were used in this thesis were either sourced from official websites, educational institutions, or scholarly journals. For this reason, the documents were deemed authentic. The credibility of a document is based on its sincerity and accuracy. Scott (1990) emphasizes that "the question of credibility concerns the extent to which an observer is sincere in the choice of a point of view and in the attempt to record an accurate account from that chosen standpoint" (p. 22). When it comes to official documents, one needs to be aware that they are sometimes "based on a political interest in presenting one view rather than another" (Scott, 1990, p. 22). This was considered when analyzing the documents from the Peruvian government and the organizations. Accuracy was also a factor I needed to take into consideration as both the government and the organizations had an agenda behind their reports and might not include details that are unfavorable. Retaining political and/or financial support could be underlying factors to omitting unfavorable information in these documents. The secondary sources were used to add supplementary data to these documents.

Scott (1990) argues that "the intelligent use of documents involves a judgement as to whether the documents consulted are representative of the totality of relevant documents" (p. 24). However, an unrepresentative selection of documents does not mean that a research cannot be good. The researcher needs to take into consideration the extent and in what ways the documents are unrepresentative. How this is related to the documents I used is addressed further in the 'Challenge' section of this chapter. What to emphasize here is that representativeness were considered as I collected my documents. The last criteria that Scott (1990) presents is meaning. He defines this as the "ultimate purpose of examining documents" (Scott, 1990, p. 28). Meaning refers to the literal meaning, i.e., how well the document is understood by the researcher[9], and interpretative understanding. The latter refers

[9] Obstacles to understanding a document can be language barrier and technical terms.

to the process where the researcher "relates the literal meanings to the contexts in which they were produced in order to assess the meaning of the text as a whole" (Scott, 1990, p. 29).

The data collection consisted of two government policies, three projects implemented by organizations, and 21 secondary sources. The data was collected based on certain criteria. For the policies 'climate change adaptation' became a criterion. Laws and regulatory plans that were specifically made in relation to climate change adaptation were chosen to stay within the time and length constrictions associated with the thesis. Another criterion that quickly became apparent and an important factor of the data collection was that all documents had to be in English. This, of course, limited the selection of policies I had access to, which will be discussed further in the section on challenges.

To find organizations that worked in Áncash, I started a broad search with these search terms:

- "adaptation programs in Áncash, Peru"
- "adaptation projects in Áncash, Peru"
- "development programs in Áncash, Peru"
- "development projects in Áncash, Peru"
- "nonprofit in Áncash, Peru"
- "organizations in Áncash, Peru"
- "NGO in Áncash, Peru"

By including such a broad spectrum of search terms, I hoped to get a good understanding of the organizations working in the area, regardless of how these organizations define themselves. I then selected three larger organizations based on the information that was available to me about their projects with consideration to language accessibility. Several of the organizations that came up were Peruvian and therefore only shared information in Spanish. As a consequence of the language barrier, the organizations I chose had headquarters in English-speaking countries.

Because I was not able to conduct primary research in the region myself, I also had to collect data from secondary research pertaining to Áncash and specifically related to climate change and/or the political, social, economic and social context. I used this data to get a more comprehensive understanding of the situation in the region and to support my analysis and

discussion. Before I started, I did not have a set number of secondary sources I wanted to collect. I collected 28 documents but ended up using 21 after reading through them. I chose the 21 documents based on their relevancy to my topic. I decided to end my data collection of secondary sources when the information I read became repetitive.

4.4 Methods of Data Analysis

In document analysis, the researcher skims, reads and interprets the documents (Bowen, 2009, p. 32). This process uses elements of both content analysis and thematic analysis. Bowen (2009) describes content analysis as "the process of organizing information into categories related to the central questions to the research" (p. 32). When analyzing the documents, I had to identify and extract the relevant information from that which did not relate to my research questions. Thematic analysis "is a form of pattern recognition within the data, with emerging themes becoming the categories for analysis" (Bowen, 2009, p. 32). Since I already had a theoretical framework that laid out defined factors of differential vulnerability, it seemed fitting to use these factors as themes in which I analyzed the content of the chosen policies and projects. According to Bryman (2012), "thematic analysis is a common approach to analyzing documents …, and it can be applied in relation to different kinds of orientation to qualitative data" (p. 558).

I analyzed the documents with an understanding that the creators of the documents have an agenda and that important information may not have been included. The journal articles, dissertation and newspaper article that I used as secondary research provided valuable data that gave me a more nuanced understanding of the information offered in the documents by the Peruvian government and the organizations.

Before getting into the analysis, I read through all the documents I had collected. Then, I created a new document in which I laid out the four broad focus areas from the theoretical framework. I also included the specific issues that were discussed within the four thematic sections.

From there, I read the secondary research once more, but this time I had all the topics from the theoretical framework next to me and highlighted anything in the documents that pertained to these topics. I used four different highlight colors to differentiate between the

four broad themes. Once I finished analyzing the documents, I transferred the highlighted parts into a document titled '*Analysis Findings'*. I did this with all of the 21 secondary sources so that I had one document with all of the relevant data about differential vulnerability in Áncash sorted into the four thematic categories: access to resources, governance, culture and knowledge and information. This made up the data I used to study the extent the policies consider differential vulnerability in Áncash and the role organizations play to address differential vulnerability.

I then started with the two government documents. I created a new column titled *'Framework Category'* in the table of each policy. By thoroughly examining each article or objective; I added the theme(s) in which each addressed. I did this process twice for both documents to make sure I felt confident that I had labelled each article or objective correctly. After I had thematically categorized each article or objective, I then examined how these compared against the secondary data on climate change effects and vulnerability in Áncash that I had collected. I repeated this process for the projects from the three organizations.

Throughout the analysis, I kept coming back to the two documents I had created with the factors that contribute to differential vulnerability and the data on Áncash and its communities to make sure I did not omit any significant information while I examined each document.

This was a tedious approach to analyzing my data. However, I chose this manual method because I had never used coding software before, and I simply did not feel confident in my abilities to use the software correctly. I also believe I would have spent the same amount of time, if not more, to learn the coding program.

4.5 Reflexivity

Reflexivity is a central concept to understand and reflect upon when conducting qualitative research. Reflexivity "entails a sensitivity to the researcher's cultural, political, and social context" (Bryman, 2012, p. 394), and has also been described as "the process of a continual internal dialogue and critical self-evaluation of researcher's positionality as well as active acknowledgement and explicit recognition that this position may affect the research process and outcome" (Berger, 2015, p. 220). Reflexivity challenges the connotation that knowledge

is objective and "the view of knowledge production as independent of the researcher producing it" (Berger, 2015, p. 220). In terms of my research, I understand that how I collect and analyze the data, and also how I draw conclusions can to a degree be based on my values, beliefs and biases. One way of incorporating reflexivity is to use "first-person language and provision of a detailed and transparent report of decisions and rationale" (Berger, 2015, p. 222). I have incorporated this approach when I discuss my methods of data analysis, data collection and sampling strategy. I have also incorporated reflexivity into my analysis by being conscious of analyzing only what has actually been written in the documents, rather than trying to interpret what the text can potentially mean or imply based on my own biases.

4.6 Challenges

This section discusses the challenges I encountered throughout the process of working on this thesis.

4.6.1 Language barrier

My lack of abilities to read and understand Spanish has been a significant limitation. There are documents that could have provided valuable data that I was not able to access due to the language barrier. It would have been useful if I had used a translator or worked with someone who speaks Spanish. However, due to money constraints, paying to get documents translated was simply not feasible. I would argue I have been able to gather a sufficient amount of data regardless of the language barrier, but it has been a more labor intensive and time-consuming road than if I was proficient in the official language of the country I studied. Yet, I think with the internet and the vast information accessible in English, not knowing a language is not a reason to not pursue a research topic that is of great interest to the author. However, it is important to acknowledge and address this shortcoming of my thesis and reflect on how it has affected the research and collection of data to some degree. As an example, there are other government laws in Peru pertaining to climate change adaptation that might have given me a more thorough understanding of the government's efforts in tackling differential vulnerability as part the of the country's climate change adaptation measures. However, all laws, except the two used in the thesis were only available in Spanish. The National Climate Change Strategy, National Adaptation Plan and Action Plan on Gender and Climate Change were all

documents that I did not have access to but would have been of great interest to the topic of this thesis.

4.6.2 Traveling restrictions

Traveling restriction was another obstacle I had to overcome. Because I was going through a visa process in the United States, traveling outside of the country was not possible at the time I collected my data. That is why I relied on document analysis and secondary research as my research methods. The advantage to these methods is the readily availability to documents on the Internet. It is also cost-effective to use documents to collect data which suits the wallet of a student. However, the research could have benefitted with me traveling to Áncash. For one, I could have gained access to some of the communities that had been included in the projects implemented by the organizations. This would have given me specific data on how these projects have played a role for the communities. Conducting field work could have also provided me with a more detailed insights into the extent government policies considers differential vulnerability from the perspective of residents and local authorities in Áncash.

5 FINDINGS

This chapter is split into three sections: adaptation policies, projects by organizations, and secondary data. Combined, they make up the data of the thesis that will be analyzed.

5.1 Outline of climate change adaptation policies

To answer the first research question, "*to what extent is differential vulnerability considered when the Peruvian government creates policies intended to address climate change adaptation?*", one national strategy and one framework law were chosen. Intended Nationally Determined Contributions and Framework Law on Climate Change are both focused specifically on climate change and have adaptation as a major component.

5.1.2 Intended Nationally Determined Contributions

Intended Nationally Determined Contributions (INDCs) outline the national climate targets, including adaptation and mitigation, of countries across the world who has ratified the

UNFCCC (World Bank, n.d.). The decision-making body of the UNFCCC, the Conference of the Parties (COP), "invited all Parties to communicate to the secretariat their INDCs … by the first quarter of 2015" (UNFCCC, n.d.-b). Of the 197 member countries of the UNFCCC, 190 had communicated their INDCs by April 18, 2016 (UNFCCC, n.d.-b). The INDC is the preliminary step before countries submit their Nationally Determined Contributions (NDCs) which is a requirement of the 2016 Paris Agreement to address climate change.

The INDCs for Peru was published in September 2015. The Peruvian Ministry of Environment (MINAM) with support from the German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), created the document (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2019b). This is the first and so far, the only, form of NDC that Peru has submitted – although United Nations Development Programme (UNDP) states that the country should have submitted an updated version with ratification, making it the NDC, by the end of 2018 (UNDP, n.d.).

Peru's INDC is one of the country's "instruments of climate management, with binding nature for the competent authorities" and it has to be considered in Peru's national budget (LSE - Grantham Research Institute on Climate Change and the Environment, 2018). Data from analysis and studies since 2003 were used to create the INDC and different ministries collaborated to create mitigation and adaptation objectives. For the adaptation goals, the INDC specifics that collaboration between government, relevant sectors, regions, and civil society formed the processes in which five sectors were chosen to be the main areas to address adaptation efforts (Peru Ministry of Environment, 2015). The five sectors that are emphasized in the adaptation section of the INDC are: water, agriculture, fishery, forestry and health. In order to create effective adaptation plans, the INDC outlines five crosscutting areas that apply to all five sectors: disaster risk management, resilient infrastructure, poverty and vulnerable populations approach, gender approach and promotion of private investment in climate change adaptation. In addition to the five sectors, the INDC also highlights certain groups within the Peruvian population that are viewed as especially vulnerable to climate change and who will be prioritized in adaptation plans. These are: "rural populations related to subsistence family farming and/or weak market linkages, many of the them grouped in peasant and indigenous communities; small farmers; artisanal fishermen; native communities; small forest producers; and, from a health perspective, infants, women and seniors" (Peru Ministry of Environment, 2015, p. 9).

Lastly, the INDC has its own section where the importance of promoting "equal participation of women and men in the consultation and decision-making processes for the control and access to natural resources, management of GHG emissions and generation of mitigation and adaptation strategies" (Peru Ministry of Environment, 2015, p. 11).

It needs to be mentioned that there are so far no implementation plans, nor any budgetary and financial assessments related to Peru's INDC. However, a NDC Multi-Sectoral Working Group (GTM) has been established whose mission it is to create an action plan for NDC implementation (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2019a; UNDP, n.d.).

A modified version of the table in the INDC is presented in Appendix A. The five sectors are outlined in addition to scope, intermediate objectives, framework category and crosscutting areas and goals.

5.1.1 Framework Law on Climate Change

In April 2018, Peru passed what is the country's first framework law on climate change, in Spanish called Ley Marco sobre Cambio Climático. The law, known as Law No. 30754, took three years to create for the 130 members of the unicameral Congress and was enacted by the president on April 17 (Chauvin, 2018; Heller, 2018). It consists of 23 articles relating to climate change, adaptation and mitigation. Collaboration between government, civil society, private sector, and indigenous people is among the subjects that get attention in the first section of the framework. Integral management of climate change is also a topic of focus, where both culture, human rights and traditional knowledge are highlighted in article 3. The law defines the responsibilities of government; including local, regional and national. It also "established a high-level climate change commission that will design adaptation and mitigation measures to meet Peru's nationally determined contributions" (Chauvin, 2018). In addition to the climate change commission, article 9 of the law states that "the National Commission on Climate Change, chaired by the Ministry of the Environment, is the permanent space through which the public sector and civil society monitor compliance with public policies on climate change" (Congreso de la República, 2018). In addition to this,

transparency, access to information, education, and climate financing are topics included in the law.

The law sets out to "establish the principles, approaches and general provisions to coordinate, articulate design, execute, report, monitor, evaluate and disseminate public policies for the integral, participatory and transparent management of adaptation and mitigation to climate change" (Congreso de la República, 2018). The law requires the inclusion of climate change adaptation and mitigation in projects, policies, strategies and investments on local, state and national level (Chauvin, 2018; Heller, 2018). The framework backs up the country's 2014 National Strategy on Climate Change as a legislative instrument (Climate Action Tracker, 2018). President Martín Vizcarra said the goal of the law is to "reduce the country's vulnerability to the effects of climate change and to take advantage of low emissions growing opportunities" (Law, Environment and Natural Resources, 2018). At the time when the law was passed in 2018, Peru joined Mexico and Honduras to be the first three countries in Latin America with a framework legislation on climate change (Grau, 2018; Heller, 2018). Appendix B gives a detailed overview of the relevant articles of the framework law.

5.2 Overview of organizations in Áncash

Three organizations were selected to answer the second research question, "*what role do organizations play in terms of addressing differential vulnerability to the adverse effects from melting glaciers in the Áncash region?*". Practical Action, Care Peru with partners, and The Mountain Institute (TMI) have all conducted projects aimed specifically toward the population of Áncash that live with high uncertainty and great vulnerability due to climate change and melting glaciers in the region. The projects span across 11 years and included initiatives starting in 2006 with the most recent work ending in 2017.

Organization	Project Name	Area	Timeframe	Funding
Practical Action	Climate Change Adaptation and Mitigation Technologies	Yungay Province	2006 - 2007	European Commission
CARE	Preparing for glacial lake outbursts in Peru	Carhuaz Province	2011 - 2014	Swiss Agency for Development and Cooperation (SDC)
The Mountain Institute	Securing mountain water & livelihoods	The Municipal Commonwealths of Tres Cuencas, Waraq and Río Yanamayo[10]	2014 – 2017	USAID

***Table 1**: Overwiew of selected organizations with projects in Áncash*
Source: Table created by the student

5.2.1 Practical Action

Practical Action is a UK development organization that was established in 1965 (Practical Action, n.d.). From 2006 to 2007, the charity implemented adaptation strategies in the Áncash region of Peru, in addition to six other areas in the country. The projects, which were sub-programs of a bigger initiative titled 'Climate Change Adaptation and Mitigation Technologies", received funding from the European Commission.

Practical Action facilitated an adaptation program focused on water management in Áncash. The project was implemented in districts within the province of Yungay, and it targeted the poorest population (Clements, Cossío, & Ensor, 2010, p. 32). The project employed "a series of stages: social approach, introduction of locally appropriate technologies, definition and validation of adaptation measures, and influence on social, institutional and political aspects" (Clements & Torres, 2012, p. 583). The project used both scientific information and local knowledge as part of the methodological approach.

In the report about its climate change adaptation projects in Peru, Practical Action dedicated the first chapter to adaptive capacity and resilience. The chapter highlights the two as important contributors to reduce vulnerability in situations where there is uncertainty about

[10] The districts of the provinces of Recuay and Bolognesi makes up Tres Cuencas, districts of the province of Huaraz form Waraq, and Río Yanamayo are the districts of the province of Carlos Fermín Fitzcarrald

the actual effects of a changing climate. For Practical Action, adaptive capacity is "the ability to change in response to climate changes", while resilience is "the ability to absorb or cope with the unexpected" (Clements et al., 2010, p. 14). According to the charity, specific measures to decrease vulnerability to a projected climate future need a certain level of confidence in climate change predictions. However, climate change calculations, except for the fact that the global temperatures will continue to increase, are challenging to predict. Instead, the report argues, adaptive capacity and resilience can help communities be better prepared to face and recover from a range of climate change scenarios. The report includes traditional and new knowledge, culture, institutions, power relations, and social networks as important factors that play a role in overall adaptive capacity and resilience (Clements et al., 2010, pp. 16–19).

Table 2 reviews the three components of adaptation that Practical Action took into consideration in its projects in Peru.

Approach	Comments
Vulnerability reduction	Vulnerability to climate change is assessed in reference to a particular hazard (for example vulnerability to flooding, considers underlying human and environmental factors) Vulnerability reduction targets a particular hazard, and should aim to be 'no regrets': meeting short term needs whilst addressing potential climate change
Strengthening resilience	Defined as the ability to absorb shocks or ride out changes Reduces vulnerability to a wide range of hazards Supported by diversity of assets or livelihood strategies User input in decision making supports resilience by reducing the chance of damaging policy developments
Building adaptive capacity	Defined as the ability to shape, create or respond to change Strengthens resilience and reduces vulnerability to a wide range of hazards Amount, diversity and distribution of assets facilitates alternative strategies Requires information plus the capacity and opportunity to learn, experiment, innovate and make decisions

***Table 2**: Approaches to adaptation as defined by Practical Action*
Source: Clements et al., 2010, p. 20

Project: Water Management and Climate Change

The objective of this project was to "identify ways in which rural communities in Yungay can improve their capacity to respond to the challenges presented by climate change with a focus on improving watershed management practices in the Santa River basin" (Clements et al., 2010, p. 59). Based on participatory approaches such as workshops and interviews, Practical

Action initiated adaptation measures within four areas: water, farming, knowledge, and social organization (Clements & Torres, 2012, p. 585).

At least 80 percent of the region's economy relies on agriculture and thus the impacts of climate change has strong adverse effects on people's everyday life and the local economy (Clements & Torres, 2012, p. 581). Communities experience food insecurity, diminished income, land contamination, spread of diseases and pests, and higher cultivation costs (Clements & Torres, 2012, p. 588). The adaptation strategies Practical Action implemented were therefore aligned to support agriculture and livestock sectors.

Area	**Challenges**	**Adaptation Measures**
Water	▪ Declining water supply ▪ Inappropriate irrigation techniques ▪ Conflicts over water supply	▪ Held training workshops on efficient water use practices[11] ▪ Implemented water-saving practices such as pressurized irrigation systems on six test plots where potatoes, maize and avocado grow
Farming	▪ More frequent crop disease and plagues ▪ Uncritical use of insecticides, pesticides and chemical fertilizers	▪ Collaborated with local institutions[12] to teach farmers practices based on environmental conservation principles such as soil and water analysis, correct usage of fertilizers, ecological pest management, irrigation systems, and crop selection that aligns with market demand ▪ Equipped farmers with small meteorological stations to record changes in rainfall and temperature to better understand local climate variability
Knowledge	▪ Loss of traditional agricultural knowledge ▪ Lack of modern knowledge/technologies	▪ Reinforced locally produced solutions with a proven success record while also introducing new techniques ▪ Raised awareness on the importance of saving water ▪ Partnered with communities to create water-saving methods

[11] Examples of practices that were taught: overhead irrigation, construction of irrigation canals, water-saving practices, and improvements of existing systems.
[12] Collaborated with the National Service of Agrarian Health, the Center for Development and Participation Studies, and the national University of Ancash.

Social Organization	▪ Water management is ill-prepared for future water shortages	▪ Held workshops and training sessions where farmers, community members and local authorities came to an agreement on climate change and the related local effects the region likely will experience ▪ Created an Adaptation Plan that was submitted to local authorities

Table 3: *Adaptation Measures by Practical Action*
Source: Table created by the student. The content is replicated from Clements and Torres, 2012; Clements et al., 2010

5.2.2 CARE

CARE is an international humanitarian organization founded in 1945 with headquarters in the United States (CARE, 2013). The organization's mission is to "save lives, defeat poverty and achieve social justice" (CARE, 2019).

CARE first began its work in Peru in 1952 (CARE, 2011, p. 1). Its programs in Peru are mostly focused on "empowering vulnerable groups, especially women, indigenous groups and rural populations, to exercise their rights" (CARE, 2011, p. 1), but has also in recent years implemented several Community-Based Adaptation (CBA) projects in the country to "promote local awareness of, and appropriate and sustainable solutions, to current and future climatic conditions" (CARE International, 2014, p. 9). The four main strategies of the CBA framework are:

1. Promotion of climate-resilient livelihoods strategies;
2. Disaster risk reduction strategies to reduce the impact of hazards on vulnerable households;
3. Capacity development for local civil society and government institutions;
4. Advocacy and social mobilization to address the underlying causes of vulnerability (CARE International, 2014, p. 11).

Project: Preparing for glacier lake outbursts in Peru

One of these CBA programs were implemented in Carhuaz, Áncash. The project focused on the melting glaciers in the region. CARE Peru partnered with the Peruvian government, the Swiss Development Cooperation and the University of Zurich to reduce vulnerability and risk associated with melting glaciers (CARE International, 2014, p. 55). The objective of the

project was “to strengthen scientific-technical, social and institutional capabilities for disaster risk reduction and climate change adaptation” (Ministerio del Ambiente, n.d., p. 6). Based on ethnographic studies of the area, CARE Peru identified 3 areas of prioritized hazards: avalanche, shortage of water and plagues (Ministerio del Ambiente, n.d., p. 9).

Area	Challenges	Adaptation Measures
Water	▪ Water shortage ▪ Lack of sustainable irrigation	▪ Developed a drip irrigation system to improve agriculture productivity and decrease water insecurity ▪ Created a Water Resources Management Committee that works on interagency coordination of water users and government institutions to reduce conflicts
Glacial Lake Outburst Flood	Floods	▪ Monitored and modelled glacial retreat to show different scenarios to help local authorities to identify potential hazards ▪ Developed an early-warning system for glacial outburst floods with evacuation routes and disaster response
Gender	▪ Power differentials between men and women	▪ Encouraged equal gender participation in planning committees

Table 4: *Adaptation Measures by CARE*
Source: Table created by the student. The content is replicated from CARE International (2014)

5.2.3 The Mountain Institute

TMI is a nonprofit with a goal to protect mountain ecosystems. The organization was founded in 1972 and works today in three regions: Western United States, the Himalayas and Andes (The Mountain Institute, n.d.-b). TMI works with mountain communities in these areas to protect culture and improve lives, and their programs focus on “sustainable livelihoods for farmers, women, and remote villages” (The Mountain Institute, n.d.-b).

TMI has worked in Peru since 1996 through its program called Instituto de Montaña. TMI has focused on “community-based projects designed to help locals diversify livelihoods” (The Mountain Institute, n.d.-a), to help create more sustainable local economies, protect local species, and preserve ecosystems.

Project: Securing mountain water and livelihoods

With this project, TMI aimed to "improve the capacity of people in the Huascarán Biosphere Reserve territory to conserve ecosystems and contribute to human wellbeing in the context of climate change" (The Mountain Institute, n.d.-c). To achieve this, the organization worked to improve the partnership between academic institutions, regional and local government, and mountain communities in the area. TMI viewed the objective of the project as a long-term goal where climate change information, public investments and local actions all play a crucial role in determining the success of the project. TMI also focused on merging local knowledge with science, in addition to empowering "women to have a key role in local government" (The Mountain Institute, n.d.-c).

Besides the funding from USAID, TMI collaborated with several Peruvian and international partners to implement this project. Universities from both the United States and Peru played important roles, as did the regional government of Áncash, Huascarán National Park, UNESCO, The National Institute of Research on Glaciers and Mountain Ecosystems, The Áncash regional office of Program for Rural Agricultural Development, The McKnight Foundation, and several communities, irrigation groups, villages and districts within the region of where the project took place.

Area	Challenges	Solution
Education	▪ Young people move away from mountain communities while attending university and many of them do not return to their communities. Urban migration drains mountain communities from young people and men ▪ Insufficient knowledge on climate change and applied research	▪ Developed a program to give graduating students in the Áncash public university (UNASAM) the possibility to direct their research back to mountain communities. 21 seniors graduated from this program where they were taught environmental sciences, economy and agronomy ▪ The students and teachers, with assistance from TMI, developed phone apps that lets users access water quality, climate data and forecasting ▪ GIS Atlases were created for Tres Cuencas, Waraq and Río Yanamayo with data from TMI and the UNASAM program. The atlases give integrated perspective on ecosystems, natural resources, climate and economic development

Government	▪ Mountain communities are disconnected from local and provincial governments	▪ Information produced by the students enrolled in the TMI program are used to support public investments on water security and ecosystem restoration in Peru ▪ Public service officials created ecosystem service investments and irrigation that are aligned with local priorities ▪ A Regional Climate Change Strategy was created for Áncash. This policy framework enhances the volume of public funds directed to increase irrigation, ecosystem services, and early warning systems ▪ A Compensation for Ecosystem Services Platform was established by the Regional Government. ▪ Two pilot projects in ecosystem service compensation were established in two areas of Áncash ▪ The three municipal commonwealths crated Territorial Adaptation Plans that incorporate community-level priorities
Communities	▪ Communities in the region experience water shortage ▪ Trace metals and minerals from exposed rocks wash into streams and rivers affecting irrigation and potable water systems ▪ Short-term adaptation responses have been prioritized over sustainable adaptation measures that will work long-time	▪ 8 community-level adaptation plans were created to guide public investment at the district level to make funding align better to climate change impacts identified by rural communities ▪ 6 community-level projects have started, and the goal is to fix existing irrigation systems and improve efficiency of water use. Small funds were given to these projects from district representatives with help from TMI
Women	▪ Women do not have the same representation in local government	▪ 41 women leaders were trained to promote public investment in local projects and now serve on municipal councils and grassroots organizations. These women raised $88,000 from local governments to help rural woman affected by climate change

Table 5: *Adaptation Measures by TMI*
Source: Table created by the student. The content is replicated from The Mountain Institute (n.d.-c).

5.3 Secondary Data

From the search outlined in the chapter on methodology, 21 research articles and documents were used as secondary data. The data from these sources have been used to create a more detailed and nuanced picture of the situation in Áncash in terms of climate change effects, adaptation, and factors that contribute to differential vulnerability. This information has been

crucial to better analyze the selected policies and projects, and to get a more enhanced understanding of the extent the adaptation efforts have successfully addressed differential vulnerability in the region. Table 6 gives an overview of the secondary sources that have been used. The actual data and content from the sources are used as part of the analysis.

Title	Author	Year	Category
How do gender approaches improve climate compatible development? Lessons from Peru	Arana, Quezada and Clements	2016	Gender, Climate compatible development
Water and Mining Conflicts in Peru	Bebbington and Williams	2008	Water conflicts, Mining
New Geographies of Water and Climate Change in Peru: Coupled Natural and Social Transformations in the Santa River Watershed	Bury et al.	2013	Hydrologic change, Water security
An integrated socio-environmental framework for glacier hazard management and climate change adaptation: lessons from Lake 513, Cordillera Blanca, Peru	Carey et al.	2012	Climate change adaptation, Glacier Hazard Management
Toward hydro-social modeling: Merging human variables and the social sciences with climate-glacier runoff models (Santa River, Peru)	Carey et al.	2014	Climate change, Social-ecological systems, Glacier melt
Unintended effects of technology on climate change adaptation: an historical analysis of water conflicts below Andean Glaciers	Carey, French and O'Brien	2012	Climate change adaptation
The changing water cycle: climatic and socioeconomic drivers of water-related changes in the Andes of Peru	Drenkhan et al.	2015	Hydrologic change, Water security
A New Global Agreement Can Catalyze Climate Action in Latin America	Edwards et al.	2015	Climate change, Adaptation, Mitigation, INDCs
Climate Change in the Peruvian Andes: A Case Study on Small-Scale Farmers' Vulnerability in the Quillcay River Basin	Heikkinen	2017	Vulnerability
Gender and Climate Change: An Analysis of Public Policies in Peru	Holm	2019	Gender, Climate Change, Public Policies
A framework for the science contribution in climate adaptation: Experiences from science-policy processes in the Andes	Huggel et al.	2014	Climate change, Adaptation
Climate Change Adaptation Planning in Latin American and Caribbean Cities	ICF GHK	2013	Climate change, Adaptation
Local perceptions in climate change debates: insights from case studies in the Alps and the Andes	Jurt et al.	2015	Climate change, Community perception

10 things to know: Gender equality and achieving climate goals	Kratzer and Le Masson	2016	Gender, Climate Change
Climate Change and Tropical Andean Glacier Recession: Evaluating Hydrologic Changes and Livelihood Vulnerability in the Cordillera Blanca, Peru.	Mark et al.	2010	Hydrologic change, Climate change, Vulnerability
Glacier loss and hydro-social risks in the Peruvian Andes	Mark et al.	2017	Climate change, Hydrologic change, Water security, Differential Vulnerability
Peru and its melting glaciers are an early test of adapting to climate change. It's not going well.	Miroff	2017	Climate Change, Adaptation
Climate Change Adaptation and Disaster Risk Reduction in Highland Peru	Oliver-Smith	2014	Differential vulnerability, Climate change adaptation
Integrating adaptation and mitigation in climate change and land-use policies in Peru	Pramova, Di Gregorio and Locatelli	2015	Climate change policies, Adaptation, Mitigation
Peru's road to climate action: Are we on the right path? The role of life cycle methods to improve Peruvian national contributions	Vázquez-Rowe et al.	2019	Climate change policies, INDCs,
Adaptive governance and climate change in the tropical highlands of Western South America	Young and Lipton	2006	Climate change, Adaptive capacity, Adaptation

Table 6: *List of secondary sources*
Source: Table created by the student.

6 ANALYSIS AND DISCSUSSION

The presented policies and projects contribute in shaping the course of climate change adaptation in the Áncash region. Hence, in the following section, I analyze and discuss these efforts in relation to the framework created by Thomas et al. (2018). The analysis will focus on each theme from the framework with a critical discussion on the extent to which differential vulnerability is considered in policy making. From there, the role of organizations in addressing differential vulnerability in Áncash is analyzed, once again in relation to the themes from the framework. The discussion is supplemented with data from secondary sources, which adds a more nuanced perspective on the actual situation in Áncash based on fieldwork and observations by a range of researchers. The following analysis does not attempt to give suggestions as to how Peru should form and enact its adaptation policies. Rather, the aim is to critically analyze how contemporary policies hold up to newer research on climate change adaptation and differential vulnerability.

6. 1 Government

This first part of the discussion looks at the policies implemented by the Peruvian government. Decrees and objectives will be analyzed on the extent they address differential vulnerability, and a discussion on how this stands up to the status quo in the country based on studies in Peru and Áncash.

6.1.1 Access to resources

Differential vulnerability is strongly associated with uneven distribution of resources. In Áncash, the unequal distribution of water is a key issue for the local communities. Law No. 30754 does address resource distribution in article 3.1 and 3.2. Article 3.2 is specific to water management and "guarantees the right of water" (Congreso de la República, 2018, sec. 3.2). Article 3.1 addresses indigenous people and highlights how natural resources need to be distributed equally and fairly. The INDC does not address access to resources on any level. As uneven distribution of water is a proven problem in Peru, at least 45 percent of the rural population in Peru and 9 percent of households in Áncash do not have access to permanent water supply (Drenkhan et al., 2015, p. 9), it is surprising that there is not a stronger focus on the issue in either of the most recent public policies on climate change adaptation.

With that being said, water distribution is a sensitive topic in Peru and the country has experienced several public disputes surrounding access to, and the contamination of water (Bebbington & Williams, 2008; Carey et al., 2014; Carey, French, et al., 2012; Carey, Huggel, et al., 2012; Drenkhan et al., 2015). Research on the Santa River in Áncash shows that diminishing water from retreating glaciers is not the only reason for reduced water supply to communities in the region (Bury et al., 2013; Mark et al., 2017). Rather, it is the management of water and uneven power relations that create unequal access to water. The mining sector, large-scale coastal irrigation projects, hydropower companies and the urban areas such as Lima are the winners of the water distribution (Carey, French, et al., 2012). Mountain communities in Peru experience being marginalized compared to urban, coastal populations. The rural highland populations have “restricted access to potable and irrigation water [and] less capacity to respond to the increasing water scarcity due to weak infrastructure, low income, strong reliance on agriculture and limited opportunities for alternative livelihoods” (Heikkinen, 2017, p. 77). In neither of the policies, these issues

related to water management and distribution are addressed. The INDC has an objective to "encourage and promote actions and projects that increase the availability of water in the context of climate change", but this does not change the status quo of water distribution. Inequalities and power discrepancies need to be included when water is discussed in adaptation measures (Huggel et al., 2015), and this is not the case here. The limited focus on this issue by the government in terms of climate change adaptation does not equally represent the pressing nature of the problem which is one of the leading sources of differential vulnerability in Áncash.

The topic of indigenous people arises in several of the articles in Law No. 30754 with a clear focus on including indigenous people in decision-making and using their knowledge in adaptation measures on both national, regional and local levels. Indigenous participation is included as its own section in the law, in article 22. There, ILO Convention 169, which lays out the rights of indigenous people, is included as a guiding principle in how indigenous people should be included and respected in policies and projects related to climate change (International Labour Organization, n.d.). The INDC also includes indigenous people; albeit to a lesser degree. A goal within the INDC is to "encourage the participation of indigenous organizations in actions on climate change" but how Peru aims to do this is not discussed, neither are topics such as poverty and marginalization – which are issues that greatly affect the the level of differential vulnerability indigenous people in Peru experience (Oliver-Smith, 2014).

Although not included to the same extent as indigenous people, the issue of gender inequality is brought up in both policies. Article 3.9 in Law No. 30754 focuses on equality between men and women and acknowledges that women experience differentiated damages from climate change. Women's rights are also addressed in article 3.8, with the topic of gender being discussed six times throughout the law. It is encouraging to see that gender is a focus of adaptation policies in Peru and this might contribute to a better representation of women in decision-making activities in the country and in Áncash, and a greater focus on women's rights and needs when adapting to climate change. The INDC has a 'gender and intercultural' approach as part of its crosscutting areas where the "formulation and approval of the Action Plan on Gender and Climate Change" is a target (Peru Ministry of Environment, 2015). An Action Plan on Gender and Climate Change is promising; however, the implementation of

this plan is what will be the determining factor in the success Peru will have in addressing gender and differential vulnerability to climate change.

There are hurdles to achieving greater gender equality in Peru that neither policies address. In her master's degree thesis, Holm (2019) has studied gender and climate change in Peru. Gender inequalities are an integrated part of Peruvian culture, the thesis argues. According to Holm, it is "unlikely that [the Peruvian government] has the potential to empower women and other vulnerable groups" (Holm, 2019, p. 59). This is because existing gender policies do not address current attitudes deeply rooted in sociocultural norms, nor do policies address power relations that shape the dynamics between men and women in the country. Arana, Quezada and Clements (2016) studied "whether gender-sensitive approaches to climate compatible development are being adopted in urban areas of Peru" (p. 1), with one of the study areas being Huaraz in Áncash. Their research found that a minority of the respondents believe women and men experience climate change vulnerability differently, but rather that climate change affects everyone equally. The study also found that "the implementation of policy by different sectors of the government often lacks gender awareness or sensitivity and is disjointed" (Arana et al., 2016, p. 3). Lastly, the brief argues that a patriarchal and chauvinist attitude and behavior in the study areas influence decision-making and how men and women relate to one another. Violence against women is a prevalent problem, they argue, and women are not appreciated nor is their work. As one of the respondents said, "We do not value women. We are used to seeing them work and to seeing them suffer, but we do not value their work" (Kratzer & Masson, 2016, p. 14). Neither the INDC nor Law No. 30754 address the underlying gender relations in Peru which leaves women more vulnerable to climate change. The ambiguous articulations of the role of women in climate change adaptations and no clear action steps on how to change the status quo of gender inequality leave the policies fairly weak in terms of addressing gender issues. The inclusion of women is a positive step, but the lack of transformative actions included is a significant weakness of the policies.

"Reduce the vulnerability" is a phrase used several times in the INDC. However, how this is achieved, i.e. concrete actions steps or budget allocation, is never mentioned. Although vulnerability reduction is important to adapting to climate change, simply stating it is not sufficient in a government document. Because of this, the extent to which women and indigenous people are considered in the INDC is deemed as low.

Lastly, it is important to discuss the factors of poverty and the uneven distribution of vulnerability between social groups in Áncash. Law No. 30754 does not mention poverty in any of its articles. The INDC, on the other hand, has poverty as one of its crosscutting areas where goal number 3 pertains to poverty and vulnerable populations. The approach aims to "increase the number of programs and instruments against poverty that incorporate adaptation to climate change" (Peru Ministry of Environment, 2015). This articulation of the goal is broad and leaves details and specific steps on how to tackle poverty unanswered. Poverty is one of the leading factors contributing to climate change vulnerability and it is a strong source of differential vulnerability between people. It is also a difficult issue to tackle for any government; however, that does not mean it should not be included in policies. Laws pertaining to adaptation should incorporate poverty as a step to reduce vulnerability to climate change as this will be a measure that can help increase people's adaptive capacity. To refresh the memory about adaptive capacity, the theoretical framework shows that higher adaptive capacity mitigates the effects of exposure and sensitivity and therefore reduces the vulnerability to climate change. Carey et al. (2012) found when interviewing communities in Áncash that houses situated along the river, were more vulnerable to climatic changes, and belonged to immigrants or older residents with high levels of poverty. Their limited economic capacity and the lack of public safety programs forced these residents to live in high-risk areas with limited opportunities to relocate or improve the safety of their houses. Poverty is a topic which to a large degree has been ignored in Peru's adaptation policies. As a result, it makes the policies not as comprehensive when it comes to focusing on differential vulnerability. A factor that is highly relevant to climate change adaptation.

6.1.2 Governance

Equal representation is a key factor to decrease differential vulnerability. However, Peru's history in the last two decades show that private actors and international companies often have received a more favorable political climate than that of rural communities in the country (Bebbington & Williams, 2008; Carey, French, et al., 2012; Young & Lipton, 2006).

Collaboration across sectors and groups, from local to national and private to public, are an important component of successful adaptation measures to reduce vulnerability according to

the framework by Thomas et al. (2018). Law No. 30754 incorporates articles formulated to encourage the participation of civil society and indigenous groups in the planning, implementation and evaluation of all public policies and investments that pertains to climate change. The law also acknowledges that government needs to work across levels and sectors to create comprehensive and multidimensional adaptation measures[13]. Additionally, the INDC does encourage the participation of indigenous groups as a crosscutting goal for their five adaptation objectives.

As such, the government is aware of the significance that collaboration and inclusion play in adaption efforts, and it is encouraging that they are explicitly mentioned in two of the most recent government adaptation policies. However, there are several shortcomings to these findings which stems from both the structural setup of the Peruvian government, and the political climate in the country. Putting words down on paper is one thing, actually following through and executing is another. With its history of weak state regulation (Bebbington & Williams, 2008), institutional instability (Carey, Huggel, et al., 2012), and regional and inter-regional political problems (Mark et al., 2017); Peru faces challenges in implementing adaptation measures that requires collaboration between different levels of government and the inclusion of both private and civil parties. How the government is going to achieve a more equal representation between different stakeholders is not laid out in the policies. However, as it stands now, rural communities experience lower level of political representation and skewed power distribution which produces and sustains vulnerability of this group (ICF GHK, 2013; Oliver-Smith, 2014). Heikkinen (2017) found that small-scale farmers in Huaraz, Áncash, felt forgotten by politicians and that the attention was given to urban residents. One respondent said, "now they are looking for votes and these people arrive with their hats and traditional costumes. They want to show that they are as we are, rural [indigenous] people. But when they enter [to parliament] … they don't listen to us anymore" (p. 83). Regarding the INDC, Vázquez-Rowe, Kahhat, Larrea-Gallegos, & Ziegler-Rodriguez (2019), report that "the attendance of regional and municipal authorities to the discussion panels on INDCs creation was considerable low, with many regions having no representation in these meetings" (p. 251). As of now, equal political representation among all people in Peru is not a reality and the adaptation policies do not present any new solutions that will clearly address this problem.

[13] See article no. 2.2, 2.6, 2.7, 4, 7.9, 15, 21.2, and 22.

The theoretical framework argues that the scope in which climate change risks are viewed, plays a role in determining the success of adaptation measures. Looking at the patterns in which the government incorporates inclusion and collaboration in its policies, the wording is broad and general. "Incorporating a cooperative vision and promoting the involvement of the private sector, civil society and indigenous or native people, in order to offer multidimensional and articulate responses" (Law No. 30754, Article 2.2.), is a good starting point; however, the actual steps in how to achieve this outcome are left unanswered. This is an issue that can be seen across the board in all of the articles and goals pertaining to inclusion and collaboration, and the lack of specific actions and strategies to achieve this is worrisome in terms of how the laws will play out in the current political environment.

Despite the shortcomings that have been discussed, the fact that inclusion and participation are incorporated in the writing of government policies, must be recognized as a positive step in the right direction to address differential vulnerability in adaptation efforts. However, this should be seen as a good first move, but the government needs to tackle the issues addressed above in order to truly achieve inclusion and participation in all aspects of climate change adaptation measures.

6.1.3 Culture

Climate change effects in Áncash affects both tangible and intangible factors. For the people in Áncash, glacier ice is more than just a water supply. A study conducted in Carhuaz in 2013 found that respondents experienced loss in cultural and social terms with the receding glaciers (Jurt et al., 2015). Raspadilla, a flavored ice produced from the glacier ice by mountain communities traditionally has been both a source of income and a local tradition. Nowadays, raspadilla is produced with machine-made ice, which has altered the cultural meaning of the treat and also the texture of it.

For farmers in the region, climate change is altering agricultural practices and traditions that have been used for thousands of years (Young & Lipton, 2006). For some, environmental changes have “rendered much of the traditional knowledge of crops, agriculture and climate either inoperable or obsolete” (Oliver-Smith, 2014, p. 92). Loss of biodiversity and local

species is another concerning consequence in the region. Both animals and plant species are disappearing as a consequence of water regression and a changing climate (Oliver-Smith, 2014). Some farmers hold on to traditional farming practices and have a diverse range of crops and utilize land at different elevations. Others, on the other hand, has switched to export and commercial crops such as rice, sugar cane and asparagus promoted by the government to supply a global food market (Carey et al., 2014; Young & Lipton, 2006). The hardship of keeping up with local farming practices is evident: "the cultivation of livelihood subsistence crops such as alfalfa, barley, potatoes, and wheat have consistently declined since the 1960s" (Bury et al., 2013, p. 369). The decline of local crop is a source of vulnerability to farmers as it can affect important culturally relevant well-being.

Preservation of local crop and an acknowledgment of the cultural importance glaciers provide to the people in Áncash should be addressed in adaptation policies in order to diminish differential vulnerability in the region. The protection, restoration and conservation of ecosystems are mentioned in both policies, and the protection of glaciers and mountain ecosystems are explicitly highlighted in Law No. 30754. The INDC has a focus on agriculture and highlights small and subsistence farmers as a vulnerable group that should receive special attention. Whether that means to protect the diversity of local crop is not specified, and once again the language is vague and leaves a lot open to interpretation. Law No. 30754 does a better job of including culture and does encourage the incorporation of different cultural views and conceptions of wellbeing in its approach to climate change adaptation. The cultural identity of indigenous people receives particular attention. Law No. 30754 shows that Peru is aware of the importance of preserving local culture as part of the country's approach to climate change adaptation. Nevertheless, how the government will include and protect cultural elements in its adaptation measures is hard to determine based on the policies. One thing is certain, some of the changes discussed are exacerbated by national politics that shape the types of activities that pays off, and which ones that do not.

One part of culture that is hard to measure and can be overlooked is people's cultural well-being that extends beyond physical survival. An important factor that contributes to differential vulnerability in which the government policies do not take into account is the migration of people from mountain communities to more urban areas (Heikkinen, 2017; Kratzer & Masson, 2016; Young & Lipton, 2006). Immigration creates a plethora of issues

for the mountain communities. Firstly, men are more likely to leave the community; which leaves women with all the responsibility at home. Further, research shows that young people with education leave their home communities because of more job opportunities in urban places. Young and Lipton (2006) reported that in "one sector of a community in Áncash, 87 percent of the young men between the ages of 27 and 33 had left the community" (p. 71). This migration produces social, economic and cultural consequences for the mountain communities. The people who do migrate have been found to become more vulnerable in their new urban settings as documented by Kratzer & Masson (2016). The migration of men and young people from rural to urban areas has not received any attention in the policies; however, it does affect people's vulnerability. As one report suggests, "this [out-migration of young people] might be one of the inevitable consequences of urban areas having better opportunities for education, health care, and jobs" (p. 77).

6.1.4 Knowledge and information

Knowledge and information receive quite a bit of attention from the Peruvian government. Law No. 30754 brings up both the inclusion of traditional, local knowledge and the generation and management of scientific research. This coproduction of knowledge from multiple sources follows the approach from the framework to reduce differential vulnerability. The law also brings up the transmission of climate change knowledge and how it needs to be adapted to the recipients in terms of local language and cultural context. Even the article about knowledge production in universities encourages an intercultural and bilingual approach. The INDC has a goal of increasing "the number of people with education and knowledge in disaster risk management and adaptation to climate change" (Peru Ministry of Environment, 2015). Including traditional knowledge in adaptation measures seems to be especially important in mountain areas such as Áncash. It has been found that residents of communities that have experienced glacier retreat over generations have "complex, nuanced engagements with scientific accounts of climate change, with their place in natural and cultural worlds, and with multiple social and spatial scales" Jurt et al. (2015).

Overall, the inclusion of knowledge and information in the policies is a lot more thorough and specific than the other key issues that also affects differential vulnerability. This is encouraging but studies from Peru also demonstrate that knowledge production and

dissemination are necessary. Pramova et al. (2015) report that Peru lacks, to a great extent, vulnerability analysis which restricts the success of adaptation plans and strategies. They found that "future climate projections are often based on global models at a coarse resolution, which limits their value for decision-making at the regional and local level" (p. 13). Another study found that "lack of coordinating mechanism for data collection and analysis also restricts the ability for national, regional and local agencies to identify and manage exposure to risk" (ICF GHK, 2013, p. 58). Several other studies show that data and information on climate change, vulnerability and adaption is greatly missing, especially in the Andes region but also in Peru overall (Drenkhan et al., 2015; Heikkinen, 2017; Huggel et al., 2015; Pramova et al., 2015).

6.2 Organizations

The second part of the analysis and discussion looks at projects implemented in Áncash by organizations. Adaptation measures targeting various issues will be analyzed to answer the research question, '*What role do organizations play in terms of addressing differential vulnerability to the adverse effects from melting glaciers in the Áncash region?'*.
Just with the discussion on government policies, data from secondary research is used to get a better understanding of the factors that contribute to differential vulnerability in Áncash and how these organizations address these issues.

6.2.1 Access to resources

The approach these organizations use to improve access to resources and create a more just distribution of existing resources leans more towards technological solutions. All three organizations implemented measures that improved the efficiency of water use. The approach focused on local farmers, which is an important group of water users and livelihood providers. It also targeted a specific problem in the area in that local farmers have "weak knowledge in efficient use of water" (Heikkinen, 2017, p. 83).

Although the rural communities are not the primary users of the Santa River, they do benefit from using more efficient water practices, as they most likely will continue to see lower levels of water supply in the future. These are measures that can provide a long-term reduction in vulnerability for the involved communities in Áncash as water conservation and

smart water practices are critical and existing needs for the local people. However, it is important to remember from the literature review that an approach to climate change adaptation that focuses on technical solutions is "capital and technology intensive and places a low priority on the social factors that contribute to differential vulnerability" (Mustafa, 1998, p. 290). The approach by the organizations to address water scarcity followed the interpretation of climate change vulnerability as outcome vulnerability. This is the type of vulnerability interpretation that O'Brien et al. (2007) labelled as a scientific framing of climate change and which emphasizes technological and sectoral changes to address adaptation rather than tackling socio-economic and political issues related to water distribution.

CARE worked to create more equal gender participation in planning committees in the region. It has been found that women tend to have traditional roles in the family, i.e., tending to house chores and being the caretaker of family members. Increasing the number of women in community committees is a positive step towards changing the traditional view on women and also bringing women's opinions and needs to the decision-making table for adaptation measures. TMI also addressed gender inequality. Granting women access to decision-making roles and changing how people perceive gender roles are essential steps to address the marginalization that women experience in the region. Young and Lipton (2006) found that women were "frequently marginalized form direct positions in community social organization, assemblies, or training classes" (p. 71). Thus, giving women access to these settings is an important step forward in reducing power differentials between men and women and tackle differential gender vulnerability.

Tourism is an income-source that several studies of Áncash mention (Mark et al., 2010, 2017; Young & Lipton, 2006). Tourism is an important supplementary revenue stream for people in Áncash, including farmers. In a study of two watershed communities in Áncash, the researchers found that more than one-quarter of households in both areas were involved in tourism services (Mark et al., 2010, p. 802). Young and Lipton (2006) found that many local farmers struggle to make enough by just engaging in agriculture. However, tourism is also affected by climate change, as most tourists visit Áncash for its glaciers and snow-covered mountains. Tourism has declined in the area and contributes to the lack of economic capacity in the region (Mark et al., 2010). None of the organizations address tourism or help encourage other income-streams that smallholders can combine with agriculture to make sure

farming continues to be a part of the culture in Áncash while also ensuring farmers do not fall into poverty and become more vulnerable to climate change effects.

Another focus that is not included in the projects is the poor housing situation some people experience in the region. As mentioned, people with limited financial resources live close to the riverbed of Santa River and are more exposed to potential flooding from avalanches and outburst floods from the glacier lakes. It was reported that the houses are also in an unsatisfactory condition overall, but the owners are not in a position to fix their homes. It is discouraging that neither of the three organizations focused on this issue. Of course, every organization has limitations to its budget and staff members, and it is not expected that one can cover all problems in an area. Nevertheless, it is interesting to note that between these three big organizations, long-term poverty reduction based on future climate estimates seems to not have been prioritized to a great extent.

6.2.2 Governance

All three organizations incorporated inclusion and collaboration between different actors in their projects. Practical Action worked with local institutions to teach community members practices surrounding environmental conservation principles. The collaboration with local institutions follows the guidelines of Thomas et al. (2018), in which partnerships across sectors and especially with local actors can play a significant role in having communities accept your adaptation measures and build trust. The organization followed the same strategy when it brought together local authorities, farmers, and community members to find a common understanding as to what climate change will do to the region and the types of scenarios they might need to adapt to in the future. An adaptation plan where local communities were part of the planning process was sent to local authorities. Lastly, Practical Action worked directly with local people to come up with water-saving methods that aligned with their needs and beliefs. This is part of adaptation measures that Thomas et al. (2018) endorse because, although they might not be as politically tidy or follow scientific reasoning, solutions made in collaboration with local people are sometimes the only options that get accepted by the community and therefore implemented.

TMI helped create local and regional adaptation plans that included both community-level and local and regional authority priorities. TMI focused quite a bit on guiding investments and funding for local projects in Áncash which is essential for this region as it has been shown that rural communities do not receive adequate political engagement and attention (Heikkinen, 2017). CARE contributed to the cooperation between government institutions and water users in Áncash to reduce water-related conflicts. The organization helped give rural communities representation on a critical issue by giving them a voice on water concerns that directly affect them.

As mentioned, it is difficult for an organization to cover all aspects of differential vulnerability in an area, and neither of the organizations have implemented adaptation projects that include all elements of vulnerability. This is something Thomas et al. (2018) discuss in the framework. They acknowledge that most adaptation plans do not consider all facets of vulnerability and that programs usually focus on a couple of subsections of vulnerability, as is the case here. However, the framework does argue that by creating a more complex, resource intense and time-consuming adaptation plan; the results will be greater, differential vulnerability will be reduced to a greater extent and long-term results are produced versus short-term needs and goals. The latter; however, is usually prioritized as resources are more frequently allocated to immediate needs and outcomes. Although the organizations have not created all-encompassing plans, what they have done is to include both long and short-term results as part of their initiatives. Governance, education and, inclusion of women in the local and regional decision-making help produce long-term goals. While water-saving practices and agriculture techniques create results that can be felt immediately.

6.2.3 Culture

CARE focused on some technical measures in their project such as early-warning systems for GLOFs and locating evacuation routes. Young and Lipton (2006) noted in their research that regional and community-based warning systems are lacking in the area and as such CARE addressed this issue. These sorts of technical solutions are essential parts of adaptation measure; however, they do not address the complex and multidimensional social, economic and political factors that are presented in the theoretical framework. Additionally, the cultural

context of the community needs to be accounted for when incorporating and implementing technical solutions. Studies show that some rural communities in Áncash see technical fixes as interfering with mountain spirits. Carey et al. (2015) found that Lake Aquascutum in the Carhuaz province was viewed as "sacred and traditional knowledge held that it could burst out of its bed when provoked by improper human behavior, such as the failure to provide offerings or getting too close to the 'enchanted' lake" (Drenkhan et al., 2015, p. 12). Some believe the physical encounter between humans and glaciers is what is causing the retreat of ice and the decreasing water supplies (Jurt et al., 2015). Although well-intentioned; technical solutions need to be implemented in collaboration with the local community, and the technical fixes have to align with cultural beliefs in the region to maximize the benefits that these solutions provide. This became apparent for CARE Peru. Local residents believed the early-warning devices installed by the organization caused the drought that season. One local farmer told a reporter that "everyone was saying the gringos' machines were scaring away the rain" (Miroff, 2017). A group of local villagers destroyed the $1.5 million emergency warning system one November morning. Three days later, the rain came. As of now, no new warning systems have been installed.

Incorporating early-warning systems that are accepted by the local population can be an important step towards decreasing vulnerability as studies show that relocation as a solution to long-term glacier hazard management is an unpopular option for local residents. Relocation was perceived as another risk for the residents with consequences such as loss of identity, infringements on values and cultural emblems, in addition to "economic and material losses, declining social (race and class) standing and abandonment of homelands" (Carey, Huggel, et al., 2012, p. 741). However, CARE Peru learned an expensive and valuable lesson: to include the local population and take into consideration cultural beliefs when implementing technical solutions.

The focus on rural smallholder farmers by the organizations is especially important in the region of Áncash. Local agriculture holds cultural values that are irreplaceable and has been around for thousands of years. Farming is part of the identity to many of the people in Áncash and carries old knowledge and traditional practices that extend beyond just providing food on the table. Supporting local farmers is a step toward securing the well-being of the people in Áncash and it is time-sensitive. "Over the past fifty years, rural smallholder agriculture in the region has declined significantly. … The total area of land cultivated in the

Áncash Department declined by 19 percent between 1972 and 2008" (Bury et al., 2013, p. 369).

Another important cultural factor that one of the organization's focused on was limiting the use of fertilizers and pesticides. The incorporation of ecological pest management by Practical Action facilitated the protection of biodiversity in the area as these chemicals are known to affect the soil quality and reduce the number of animal and plant species in areas where they are used (Geiger et al., 2010).

Lastly, making the rural areas of Áncash desirable for local post-university graduates, as TMI did, can help improve well-being and help protect local practices, knowledge and traditions by discouraging an out-migration from rural to urban places by the younger generation.

6.2.4 Knowledge and information

Knowledge production and information distribution are areas that received a great deal of attention from the organizations. Practical Action taught community members about environmental conservation principles and ecological pest management. They also worked together with local farmers to gather information about changes in weather patterns to better understand variability in the local climate. Practical Action was the provider of the technology, but the farmers took ownership in actually implementing the plan. Because of the limited knowledge about the climatic changes in the region, this is a measure that both produces crucial information but also gives the local community some power to undertake their own research. This information is important for future predictions and agricultural planning, while also preserving traditional ecological knowledge. A combination of traditional ecological knowledge and science is suggested as a good combination to understand climate change and adapt to its effects, according to the theoretical framework.

Heikkinen (2017) found that the dependency on fertilizer is a big reason why local farmers experience decreased income from agriculture. Farmers expressed that using fertilizers is expensive and reduces the net profit. By teaching farmers about other approaches to fertilization and encouraging local methods such as crop diversity and growing in different

altitudes, the organizations helped the farmers decrease their dependency on fertilizers and reducing their vulnerability to external price fluctuations.

The program TMI developed for a local university not only increased the knowledge pool within the local communities in Áncash, but it also served a cultural purpose as discussed in the 'culture' section. The report from TMI does not indicate that the organization worked to preserve local knowledge. However, the organization's education program did include senior students and teachers from the local university. Part of the knowledge and information produced by TMI and UNASAM were used to collect public investments and implement ecosystem restorations in the country thus showing that more knowledge and information about climate change does help contribute to adaptation measures. Related to this, CARE Peru also contributed to expanding the knowledge about the region by conducting ethnographic studies in Carhuaz and monitoring and modeling glacial retreats. The data was used to identify hazard areas that need to be addressed.

The organizations played a role in teaching and producing new, scientific knowledge while also encouraging the use of local, indigenous and traditional ecological knowledge.

7 CONCLUSION

7.1 Summary

To conclude this analysis and discussion on government policies and projects by organizations and to the extent they address differential vulnerability, there are certain remarks I believe to be important to include. As a country, Peru has made it clear that climate change and its adverse effects are of concern and an area in which the government is prioritizing. Law No. 30754 is a proof of this, as Peru was one of the first countries in Latin America to pass such a law. Furthermore, the Peruvian government is working with both international and national organization, educational institutions and transnational organizations. Yet, certain elements of these government policies show signs of weakness and a lack of creating extensive, well-rounded and substantial policies that focus on clear action steps, budget allocation and a thorough understanding of what specifically needs to be addressed. Both documents that were analyzed show vague and broad characteristics, which might be a good starting point for a brainstorming process, but it does not provide a solid

foundation on which implementation of sustainable efforts can proceed successfully. What is clearly a big hurdle for Peru to overcome is the political and socio-economic climate of the country. Economic growth in a country with desirable natural resources also pose a challenge for sustainable development and is an issue Peru needs to navigate. As research shows, Peru has been favoring private and transnational actors over smaller farmers, indigenous people and rural communities (Edwards, Roberts, Araya, & Retamal, 2015; Young & Lipton, 2006). In terms of adaptation and differential vulnerability, these priorities do not align with vulnerability reduction and adaptive capacity for communities in Áncash; and should be an area of focus moving forward. The complex socio-economic, political and institutional dimensions of differential vulnerability are to a very small extent considered in the adaptation policies that have been analyzed for this thesis. As such, neither policies address differential vulnerability in a sufficient manner to ensure the issue will decrease with the current policies.

Peru's National Adaptation Plan (NAP) will be an important indicator as to the continuing efforts of the Peruvian government to tackle climate change adaptation. The process of formulating the NAP began in 2015 and the country continues to work on the plan and has yet to submit it to the UNFCCC. The NAP is meant to give countries the opportunity to identify "medium- and long-term adaptation needs and developing and implementing strategies and programs to address those needs" (UNFCCC, n.d.-a). The plan aims to be gender-sensitive, while also following a transparent and participatory approach. MINAM refers to the NAP in the country's INDC as the "instrument for complying with the goals established in the INDC" (Peru Ministry of Environment, 2015, p. 9).

Based on the analysis of the three projects implemented in the Áncash region, I argue that the role these organizations play in terms of addressing differential vulnerability is fairly low. Although the projects do address subsegments of differential vulnerability, the approach of the organizations lean more toward technical fixes and outcome vulnerability, while disregarding the multidimensional factors that contribute to differential vulnerability. The exception to this is their efforts to include women in decision-making on a local level which do address one underlying factor that shapes vulnerability for a sub-section of the population. However, in terms of access to resources and water specifically, the projects implemented by the organization do nothing to address the political and institutional factors that drive the uneven distribution of water from the Santa River, in which highland communities receive significantly less compared to users downstream. The projects do not attempt to address the

power differentials between communities in Áncash and the mining sector. The uneven power structure between them creates an environment where rural communities do not have adequate access to clean water which in terms contribute to the vulnerability of these communities.

Through my research on climate change and vulnerability, I have made some reflections as to why the Peruvian government and the organizations have focused on more technical responses to climate change adaptation. For one, I believe technical responses create more immediate results. For the government, short-term results are important to receive political support from the population. Presidential re-elections in Peru occur every five years, while visible results from adaptation measures that focus on complex socio-economic, structural and political issues can take much longer than that. For organizations, external funding for projects is an important reason as to why short-term results are more favorable. The organizations I used for my analysis were also funded by large international agencies. Addressing differential vulnerability means changing the current political, economic and social situation in a country and I would argue that this is very difficult for organizations that are backed by government agencies. Changing the status quo can cause problems for international relations between countries and jeopardize partnerships and transnational agreements. The idea that existing state of affairs need to change in order to address differential vulnerability also means it is not a favorable option for a lot of people with power. Adaptation measures that aim to improve the even distribution of resources need to redirect said resource from one stakeholder to another. As this discourse on differential vulnerability demonstrates, people with higher social and economic status and more political power tend to have greater access to resources. Not only do influential and affluent people often have access to politicians and can therefore influence decision-making, but politicians are generally part of this group of powerful people. Changing the current socio-economic, political and structural situation in Peru will have a direct consequence on the lives of politicians, affluent people and powerful industries in the country. As such, there is not a big incentive for people in power to address differential vulnerability and technical solutions are therefore favored.

7.2 Suggestions for further research

There are several aspects within the topic of this thesis that could enhance the understanding of differential vulnerability in Peru and contribute to the overall discourse on climate change and differential vulnerability. First, an archival analysis of all policies in Peru that pertains to climate change and adaptation could provide a more detailed understanding as to how policies have changed and evolved in terms of including factors of differential vulnerability. Ethnographic studies that look at the underlying factors that produced and reproduced differential vulnerability in specific areas can help policymakers and organizations create adaptation measures that to a greater extent address these specifics issues and from there hopefully reduce vulnerability and enhance adaptive capacity for the communities. Further research on how adaptation plans and measures can incorporate factors of differential vulnerability successfully is also highly encouraged as there are no clear agreement or framework on this topic at the time of the writing of this thesis.

8 REFERENCES

A warning on poverty from Peru. (2018, May 10). *The Economist*. Retrieved from https://www.economist.com/the-americas/2018/05/10/a-warning-on-poverty-from-peru

Adger, W. N., & Kelly, P. M. (1999). Social Vulnerability to Climate Change and the Architecture of Entitlements. *Mitigation and Adaptation Strategies for Global Change*, *4*(3), 253–266. https://doi.org/10.1023/A:1009601904210

Arana, M. T., Quezada, A., & Clements, R. (2016). *How do gender approaches improve climate compatible development? Lessons from Peru*. Retrieved from CDKN website: https://cdkn.org/wp-content/uploads/2016/05/Peru-gender-brief-FINAL.pdf

Arndt, C., & Ringler, C. (2019, April 4). Cyclone Idai shows why long-term disaster resilience is so crucial. Retrieved May 31, 2019, from The Conversation website: http://theconversation.com/cyclone-idai-shows-why-long-term-disaster-resilience-is-so-crucial-114762

Arrighi, G., Silver, B. J., & Brewer, B. D. (2003). Industrial convergence, globalization, and the persistence of the North-South divide. *Studies in Comparative International Development*, *38*(1), 3–31. https://doi.org/10.1007/BF02686319

Barca, S. (2011). Energy, property, and the industrial revolution narrative. *Ecological Economics*, *70*(7), 1309–1315. https://doi.org/10.1016/j.ecolecon.2010.03.012

BBC. (2018, April 3). *Peru country profile*. Retrieved from https://www.bbc.com/news/world-latin-america-19928905

BBC News. (2018, April 3). *Peru Timeline*. Retrieved from https://www.bbc.com/news/world-latin-america-19928907

Bebbington, A., & Williams, M. (2008). Water and Mining Conflicts in Peru. *Mountain Research and Development*, *28*(3/4), 190–195. https://doi.org/10.1659/mrd.1039

Berger, R. (2015). Now I see it, now I don't: researcher's position and reflexivity in qualitative research. *Qualitative Research*, *15*(2), 219–234. https://doi.org/10.1177/1468794112468475

Bland, G., & Chirinos, L. A. (2014). Democratization Through Contention? Regional and Local Governance Conflict in Peru. *Latin American Politics and Society*, *56*(1), 73–97. https://doi.org/10.1111/j.1548-2456.2014.00223.x

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*, *9*(2), 27–40. https://doi.org/10.3316/QRJ0902027

Bryant, R. L., & Bailey, S. (1997). *Third World Political Ecology*. London, New York: Routledge.

Bryman, A. (2012). *Social Research Methods 4th Edition* (4th ed.). Oxford: Oxford University Press.

Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, *527*(7577), 235–239. https://doi.org/10.1038/nature15725

Bury, J., Mark, B. G., Carey, M., Young, K. R., McKenzie, J. M., Baraer, M., … Polk, M. H. (2013). New Geographies of Water and Climate Change in Peru: Coupled Natural and Social Transformations in the Santa River Watershed. *Annals of the Association of American Geographers*, *103*(2), 363–374. https://doi.org/10.1080/00045608.2013.754665

CARE. (2011, March). *Peru*. Retrieved from https://www.care.org/sites/default/files/documents/peru-fact-sheet-2011.pdf

CARE. (2013, October 8). CARE FAQs. Retrieved May 10, 2019, from CARE website: https://www.care.org/about/faqs

CARE. (2019, May 10). Mission and Vision. Retrieved May 10, 2019, from CARE website: https://www.care.org/about/mission-vision

CARE International. (2014). Community-Based Adaptation in Practice: A global overview of CARE International's practice of Community-Based Adaptation (CBA) to climate change. Retrieved May 10, 2019, from https://careclimatechange.org/wp-content/uploads/2014/08/cba-in-practice-lr.pdf

Carey, M., Baraer, M., Mark, B. G., French, A., Bury, J., Young, K. R., & McKenzie, J. M. (2014). Toward hydro-social modeling: Merging human variables and the social sciences with climate-glacier runoff models (Santa River, Peru). *Journal of Hydrology*, *518*, 60–70. https://doi.org/10.1016/j.jhydrol.2013.11.006

Carey, M., French, A., & O'Brien, E. (2012). Unintended effects of technology on climate change adaptation: an historical analysis of water conflicts below Andean Glaciers. *Journal of Historical Geography*, *38*(2), 181–191. https://doi.org/10.1016/j.jhg.2011.12.002

Carey, M., Huggel, C., Bury, J., Portocarrero, C., & Haeberli, W. (2012). An integrated socio-environmental framework for glacier hazard management and climate change adaptation: lessons from Lake 513, Cordillera Blanca, Peru. *Climatic Change*, *112*(3), 733–767. https://doi.org/10.1007/s10584-011-0249-8

Carlson, O., Qiu, S., Batsaikhan, A., Davis, G., DeLorenzo, J., Ingalls, R., … Walsh, J. (2015). *Land and Livelihoods: NGOs, Conflict, and Extraction in Peru*. Retrieved from https://digital.lib.washington.edu:443/researchworks/handle/1773/33277

Casey, N. (2017, November 26). In Peru's Deserts, Melting Glaciers Are a Godsend (Until They're Gone). *The New York Times*. Retrieved from https://www.nytimes.com/2017/11/26/world/americas/peru-climate-change.html

Cespedes, T., & Taj, M. (2018, April 24). Peru poverty rate rises for first time in 16 years: government. *Reuters*. Retrieved from https://www.reuters.com/article/us-peru-

poverty/peru-poverty-rate-rises-for-first-time-in-16-years-government-idUSKBN1HV2L2

Chauvin, L. O. (2018, March 21). Peru to Require Climate Change Adaptation, Mitigation Strategies, International Environment Reporter (BNA). Retrieved May 3, 2019, from Bloomberg Law website: https://www.bloomberglaw.com/exp/eyJpZCI6IjAwMDAwMTYyM2ZjY2Q0M2NhMWZlM2ZkZGJmOTkwMDAwIiwiY3R4dCI6IkJCTkEiLCJ1dWlkIjoiN08raWFYOTZjSXVicHZ1bkN0c1hRZz09c2NlNGppbVBRZktjK0VGM2ZzMEFzUT09IiwidGltZSI6IjE1MjE0OTk5NjIwNDUiLCJzaWciOiJaMEJXZ25UVjM3cG9QSStZTmZ5cjFXS3kxQWs9IiwidiI6IjEifQ==?emc=bnaden:10&service_acronym=DEN

Clements, R., Cossío, M., & Ensor, J. (Eds.). (2010). *Climate change adaptation in Peru: The local experiences*. Retrieved from https://www.preventionweb.net/files/13927_doc18005contenido.pdf

Clements, R., & Torres, J. (2012). Water Resources Management in the Peruvian Andes: Participatory Adaptive Measures to Climate Change. In W. Leal Filho (Ed.), *Climate Change and the Sustainable Use of Water Resources* (pp. 579–590). https://doi.org/10.1007/978-3-642-22266-5_35

Climate Action Tracker. (2018, November). Peru | Climate Action Tracker. Retrieved May 3, 2019, from https://climateactiontracker.org/countries/peru/

Cohen, L., & Cespedes, T. (2017, May 10). Peru poverty rate dips in 2016 in first test of Kuczynski's goal. *Reuters*. Retrieved from https://www.reuters.com/article/peru-poverty/peru-poverty-rate-dips-in-2016-in-first-test-of-kuczynskis-goal-idUSL1N1IC1J5

Coirolo, C., & Rahman, A. (2014). Power and differential climate change vulnerability among extremely poor people in Northwest Bangladesh: lessons for mainstreaming. *Climate and Development*, *6*(4), 336–344. https://doi.org/10.1080/17565529.2014.934774

Congreso de la República. (2018). Ley Marco sobre Cambio Climático-LEY-N° 30754. *El Peruano*. Retrieved from http://busquedas.elperuano.pe/normaslegales/ley-marco-sobre-cambio-climatico-ley-n-30754-1638161-1/

Currie-Alder, B. (2016). The state of development studies: origins, evolution and prospects. *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement*, *37*(1), 5–26. https://doi.org/10.1080/02255189.2016.1135788

Djenontin, I. N. S., & Meadow, A. M. (2018). The art of co-production of knowledge in environmental sciences and management: lessons from international practice. *Environmental Management*, *61*(6), 885–903. https://doi.org/10.1007/s00267-018-1028-3

Drenkhan, F., Carey, M., Huggel, C., Seidel, J., & Oré, M. T. (2015). The changing water cycle: climatic and socioeconomic drivers of water-related changes in the Andes of Peru: The changing water cycle: climatic and socioeconomic drivers of water-related changes in the Andes of Peru. *Wiley Interdisciplinary Reviews: Water*, *2*(6), 715–733. https://doi.org/10.1002/wat2.1105

Du Pisani, J. A. (2006). Sustainable development – historical roots of the concept. *Environmental Sciences*, *3*(2), 83–96. https://doi.org/10.1080/15693430600688831

Edwards, G., Roberts, J. T., Araya, M., & Retamal, C. (2015). *A New Global Agreement Can Catalyze Climate Action in Latin America* (Policy Paper No. 2015–03; p. 37). Retrieved from The Brookings Institution website: https://www.brookings.edu/wp-content/uploads/2016/06/Correct-Climate-LAC-GlobalViews52015_FINAL.pdf

Embassy of Peru in the United Kingdom. (n.d.). Government. Retrieved October 11, 2018, from The Embassy of Peru in the United KIngdom website: https://www.peruembassy-uk.com/government/

Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, *35*, 523–533. https://doi.org/10.1016/j.gloenvcha.2015.09.014

European External Action Service. (2018, September 21). The European Union at the United Nations. Retrieved November 14, 2018, from EEAS - European External Action Service website: https://eeas.europa.eu/headquarters/headquarters-homepage_en/9875/The European Union at the United Nations, fact sheet

FAO. (2018). SOFI 2018 - The State of Food Security and Nutrition in the World. Retrieved November 14, 2018, from Food Security & Nutrition around the World website: http://www.fao.org/state-of-food-security-nutrition/en/

FCMCISAL. (n.d.). Áncash - Perú. Retrieved October 19, 2018, from http://www.fcmcisal.org/en/ancash/

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. (2019a, May). NDC Support Programme. Retrieved May 3, 2019, from https://www.international-climate-initiative.com/en/nc/details/project/ndc-support-programme-16_I_293-553/

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. (2019b, May). SUPPORT OF NATIONALLY INTENDED DETERMINED CONTRIBUTIONS (INDCS) IN PERU. Retrieved May 3, 2019, from https://www.international-climate-initiative.com/en/nc/details/project/support-of-nationally-intended-determined-contributions-indcs-in-peru-14_I_223-382/

Fitchett, J. (2019, May 8). Why the Indian Ocean is spawning strong and deadly tropical cyclones. Retrieved May 31, 2019, from The Conversation website: http://theconversation.com/why-the-indian-ocean-is-spawning-strong-and-deadly-tropical-cyclones-116559

Fleming, S., & Donnan, S. (2018, April 13). US poised to support $13bn capital increase for World Bank. Retrieved November 14, 2018, from Financial Times website: https://www.ft.com/content/bedf52ca-3f57-11e8-b7e0-52972418fec4

Food & Agriculture Organization. (2018). *State of Food Security and Nutrition in the World 2018*. S.l.: FOOD & AGRICULTURE ORG.

French, A. (2019). Webs and Flows: Socionatural Networks and the Matter of Nature at Peru's Lake Parón. *Annals of the American Association of Geographers*, *109*(1), 142–160. https://doi.org/10.1080/24694452.2018.1484682

Geiger, F., Bengtsson, J., Berendse, F., Weisser, W. W., Emmerson, M., Morales, M. B., … Inchausti, P. (2010). Persistent negative effects of pesticides on biodiversity and biological control potential on European farmland. *Basic and Applied Ecology*, *11*(2), 97–105. https://doi.org/10.1016/j.baae.2009.12.001

Gottlieb, G. (2018, May 2). 10 years after, Cyclone Nargis still holds lessons for Myanmar. Retrieved May 31, 2019, from The Conversation website: http://theconversation.com/10-years-after-cyclone-nargis-still-holds-lessons-for-myanmar-95039

Grau, C. (2018, August 8). Latin America's environmental challenge. Retrieved May 4, 2019, from Equal Times website: https://www.equaltimes.org/latin-america-s-environmental

Harry S. Truman Library & Museum. (n.d.). Truman Inaugural Address, January 20, 1949. Retrieved November 9, 2018, from https://www.trumanlibrary.org/whistlestop/50yr_archive/inagural20jan1949.htm

Heaney, C. (2016). The Conquests of Peru. *Oxford Research Encyclopedia of Latin American History*. https://doi.org/10.1093/acrefore/9780199366439.013.61

Heikkinen, A. (2017). Climate Change in the Peruvian Andes: A Case Study on Small-Scale Farmers' Vulnerability in the Quillcay River Basin. *Iberoamericana – Nordic Journal of Latin American and Caribbean Studies*, *46*(1), 77–88. https://doi.org/10.16993/iberoamericana.211

Heller, D. (2018, March 22). Peru one step closer to a framework law on climate change – Pace Law Library. Retrieved May 2, 2019, from Environmental Notes website: https://lawlibrary.blogs.pace.edu/2018/03/22/peru-one-step-closer-to-a-framework-law-on-climate-change/

Hill, S. (2016, June 27). Preparing Peruvian Communities for Glacier-based Adaptation. Retrieved May 29, 2019, from GlacierHub website: http://glacierhub.org/2016/06/27/preparing-peruvian-communities-glacier-based-adaptation/

Holm, K. (2019). *Gender and Climate Change: An Analysis of Public Policies in Peru* (Aalborg University). Retrieved from https://projekter.aau.dk/projekter/files/294310431/Thesis_Kathrin_Holm_30.12..pdf

Huggel, C., Scheel, M., Albrecht, F., Andres, N., Calanca, P., Jurt, C., … Zappa, M. (2015). A framework for the science contribution in climate adaptation: Experiences from science-policy processes in the Andes. *Environmental Science & Policy*, *47*, 80–94. https://doi.org/10.1016/j.envsci.2014.11.007

ICF GHK. (2013). *Climate Change Adaptation Planning in Latin American and Caribbean Cities. Complete Report: Cusco, Peru*. Retrieved from http://www.worldbank.org/content/dam/Worldbank/document/LAC/Climate%20Change%20Adaptation%20Planning%20for%20Cusco_FINAL.pdf

IDEA. (n.d.). UN Office (New York) | International IDEA. Retrieved November 14, 2018, from https://www.idea.int/our-work/where-we-work/un-office-new-york

INEI. (n.d.). PERU National Institute of Statistics and Informatics. Retrieved May 29, 2019, from https://www.inei.gob.pe/

International Labour Organization. (n.d.). Indigenous and tribal peoples (Indigenous and tribal peoples). Retrieved May 20, 2019, from https://www.ilo.org/global/topics/indigenous-tribal/lang--en/index.htm

IPCC. (2018, October 9). Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments — IPCC. Retrieved May 31, 2019, from https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/

Jensen, M. C. (1993). The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems. *The Journal of Finance*, *48*(3), 831–880. https://doi.org/10.1111/j.1540-6261.1993.tb04022.x

Juan, G., Velarde, E., & Zuazo, P. (Trans.). (1993). *Political Constitution of Peru*. Retrieved from http://www.congreso.gob.pe/Docs/files/CONSTITUTION_27_11_2012_ENG.pdf

Jurt, C., Burga, M. D., Vicuña, L., Huggel, C., & Orlove, B. (2015). Local perceptions in climate change debates: insights from case studies in the Alps and the Andes. *Climatic Change*, *133*(3), 511–523. https://doi.org/10.1007/s10584-015-1529-5

Kratzer, S., & Masson, V. L. (2016). *Gender equality and achieving climate goals* (p. 35). Retrieved from CDKN website: https://cdkn.org/wp-content/uploads/2016/05/10-things-to-know_Gender-equality-and-achieving-climate-goals_WEBfinal.pdf

Krause, E., & Reeves, R. V. (2017, September 18). Hurricanes hit the poor the hardest. Retrieved May 31, 2019, from Brookings website:

https://www.brookings.edu/blog/social-mobility-memos/2017/09/18/hurricanes-hit-the-poor-the-hardest/
Lagos, P. (2007). Peru's Approach to Climate Change in the Andean Mountain Region: Achieving Multidisciplinary Regional Cooperation for Integrated Assessment of Climate Change. *Mountain Research and Development*, *27*(1), 28–31.
Lambin, E. F., & Meyfroidt, P. (2011). Global land use change, economic globalization, and the looming land scarcity. *Proceedings of the National Academy of Sciences*, *108*(9), 3465. https://doi.org/10.1073/pnas.1100480108
Laplante, B., & Asian Development Bank Staff. (2015). *Economic Analysis of Climate-Proofing Investment Projects*. Retrieved from http://ebookcentral.proquest.com/lib/agder/detail.action?docID=4453835
Law, Environment and Natural Resources. (2018, April 17). President Vizcarra enacts the Climate Change Framework Law in Peru. Retrieved May 2, 2019, from Derecho, Ambiente y Recursos Naturales website: https://www.dar.org.pe/en/news/president-vizcarra-enacts-the-climate-change-framework-law-in-peru/
Lein, L. (2015, August 27). Still waiting for help: the lessons of Hurricane Katrina on poverty. Retrieved May 31, 2019, from The Conversation website: http://theconversation.com/still-waiting-for-help-the-lessons-of-hurricane-katrina-on-poverty-46666
LSE - Grantham Research Institute on Climate Change and the Environment. (2018). Framework Law no 30754 on Climate Change. Retrieved May 2, 2019, from http://www.lse.ac.uk/GranthamInstitute/law/framework-law-no-30754-on-climate-change/
Luis, del V. (2018, March 10). Exporting corruption: Beyond Brazil's Car Wash scandal. *Al Jazeera*. Retrieved from https://www.aljazeera.com/blogs/americas/2018/03/exporting-corruption-brazil-car-wash-scandal-180307110441253.html
Mann, C. C. (2005). Oldest Civilization in the Americas Revealed. *Science*, *307*(5706), 34–35. https://doi.org/10.1126/science.307.5706.34
Mark, B. G., Bury, J., McKenzie, J. M., French, A., & Baraer, M. (2010). Climate Change and Tropical Andean Glacier Recession: Evaluating Hydrologic Changes and Livelihood Vulnerability in the Cordillera Blanca, Peru. *Annals of the Association of American Geographers*, *100*(4), 794–805. https://doi.org/10.1080/00045608.2010.497369
Mark, B. G., French, A., Baraer, M., Carey, M., Bury, J., Young, K. R., … Lautz, L. (2017). Glacier loss and hydro-social risks in the Peruvian Andes. *Global and Planetary Change*, *159*, 61–76. https://doi.org/10.1016/j.gloplacha.2017.10.003
McMichael, P. (2012). *Development and Social Change: A Global Perspective*. Pine Forge Press.
Met Office. (2011). *Climate: Observations, projections and impacts: Peru* (p. 117). Retrieved from http://eprints.nottingham.ac.uk/2040/18/Peru.pdf
Ministerio del Ambiente. (n.d.). *Lessons learned on Glacier Project: Climate change adaptation and disaster risk reduction for glaciers retreat in the Andes*. Retrieved from https://www.apec-epwg.org/public/uploadfile/act/932713a9f9c5df3e51fa5ae62c8fc56a.pdf
Miroff, N. (2017, August 7). Peru and its melting glaciers are an early test of adapting to climate change. It's not going well. *Chicago Tribune*. Retrieved from https://www.chicagotribune.com/news/environment/ct-peru-melting-glaciers-20170807-story.html

Mohajan, H. K. (2015). Sustainable Development Policy of Global Economy. *American Journal of Environmental Protection*, *3*(1), 25.
Mustafa, D. (1998). Structural Causes of Vulnerability to Flood Hazard in Pakistan*. *Economic Geography*, *74*(3), 289–305. https://doi.org/10.1111/j.1944-8287.1998.tb00117.x
Nightingale, A. J. (2017). Power and politics in climate change adaptation efforts: Struggles over authority and recognition in the context of political instability. *Geoforum*, *84*, 11–20. https://doi.org/10.1016/j.geoforum.2017.05.011
O'Brien, K., Eriksen, S., Nygaard, L. P., & Schjolden, A. (2007). Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy*, *7*(1), 73–88. https://doi.org/10.1080/14693062.2007.9685639
OECD. (1996). *Shaping the 21st Century: The Contribution of Development Co-operation*. Retrieved from https://www.oecd.org/dac/2508761.pdf
OECD. (2016). *Regulatory Policy in Peru: Assembling the Framework for Regulatory Quality, OECD Reviews of Regulatory Reform*. https://doi.org/10.1787/9789264260054-en
Oliver-Smith, A. (2014). Climate Change Adaptation and Disaster Risk Reduction in Highland Peru. In B. C. Glavovic & G. P. Smith (Eds.), *Adapting to Climate Change: Lessons from Natural Hazards Planning* (pp. 77–100). https://doi.org/10.1007/978-94-017-8631-7_4
Parks, B. C., & Roberts, J. T. (2006). Globalization, Vulnerability to Climate Change, and Perceived Injustice. *Society & Natural Resources*, *19*(4), 337–355. https://doi.org/10.1080/08941920500519255
Parks, B. C., & Roberts, J. T. (2010). Climate Change, Social Theory and Justice. *Theory, Culture & Society*, *27*(2–3), 134–166. https://doi.org/10.1177/0263276409359018
Peru Ministry of Environment. (2015, September). *Intended Nationally Determined Contribution (iNDC) from the Republic of Peru*. Retrieved from https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Peru%20First/iNDC%20Per%C3%BA%20english.pdf
Practical Action. (n.d.). Company information. Retrieved May 7, 2019, from https://practicalaction.org/company-information
Pramova, E., Di Gregorio, M., & Locatelli, B. (2015). *Integrating adaptation and mitigation in climate change and land-use policies in Peru*. https://doi.org/10.17528/cifor/005624
Presidential Office. (2018). Biography of the president of the Republic of Peru. Retrieved October 11, 2018, from http://www.presidencia.gob.pe/biografia-presidente-martin-alberto-vizcarra-cornejo
PROMPERU. (n.d.). Discover the Millinery History of Peru. Retrieved October 12, 2018, from https://www.peru.travel/en-us/about-peru/peruvian-identity/history.aspx
Raffer, K., & Singer, H. W. (2002). *The Economic North-South Divide: Six Decades of Unequal Development*. Edward Elgar Publishing.
Roberts, J. T., Hite, A. B., & Chorev, N. (2014). *The Globalization and Development Reader: Perspectives on Development and Global Change*. John Wiley & Sons.
Rojas, M.-F. G. (2017, September). *Inventing the past, remember the future: presentation of CIPLA, case of Mexico*. Presented at the IX Coloquio Internacional de Cultura Mexicana, Uppsala University, Sweden. Retrieved from http://result.uit.no/cipla/wp-content/uploads/sites/43/2017/10/Presentation-for-Uppsala-Colloquium.pdf
Scott, J. (1990). *A Matter of Record: Documentary Sources in Social Research*. Cambridge, UK: Polity Press.

SERNANP. (n.d.). What is an ANP? - National Service of Natural Protected Areas by the State. Retrieved October 3, 2018, from http://www.sernanp.gob.pe/ques-es-un-anp
Smith, J., & Schwartz, J. (2015). Deforestation in Peru | Magazine Articles | WWF. Retrieved October 3, 2018, from World Wildlife Fund website: https://www.worldwildlife.org/magazine/issues/fall-2015/articles/deforestation-in-peru
Solano, P. (2009). *Legal Framework for Protected Areas: Peru*. (81), 51.
Stark, J., Guillén, S., & Brady, C. (2012, June). *Follow the Water: Emerging Issues of Climate Change and Conflict in Peru*. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/FollowWater-EmergingIssue_of_Climate_Change%2520_Conflic_Peru.pdf
Stensrud, A. B. (2016). Harvesting Water for the Future: Reciprocity and Environmental Justice in the Politics of Climate Change in Peru. *Latin American Perspectives*, *43*(4), 56–72. https://doi.org/10.1177/0094582X16637866
Sterner, T. (2015). Economics: Higher costs of climate change. *Nature*, *527*(7577), 177–178. https://doi.org/10.1038/nature15643
Taft-Morales, M. (2013). *Peru in Brief: Political and Economic Conditions and Relations with the United States*. 20.
Takahashi, B., & Martínez, A. (2017). *Climate change communication in Peru*. Retrieved from http://repositorio.igp.gob.pe/handle/IGP/2247
Tan, R. (2018, July 20). Leaked calls reveal systemic corruption in Peru's judiciary, sparking flurry of resignations. *Washington Post*. Retrieved from https://www.washingtonpost.com/news/worldviews/wp/2018/07/20/leaked-calls-reveal-systemic-corruption-in-perus-judiciary-sparking-flurry-of-resignations/
Taylor, M. (2013). Climate change, relational vulnerability and human security: rethinking sustainable adaptation in agrarian environments. *Climate and Development*, *5*(4), 318–327. https://doi.org/10.1080/17565529.2013.830954
Taylor, M. (2015). *The Political Ecology of Climate Change Adaptation: Livelihoods, Agrarian Change and the Conflicts of Development*. New York: Routledge.
Taylor, M. (2018). Climate-smart agriculture: what is it good for? *The Journal of Peasant Studies*, *45*(1), 89–107. https://doi.org/10.1080/03066150.2017.1312355
Tharoor, S. (2003). Why America Still Needs the United Nations. *Foreign Affairs*, *82*(5), 67–80. https://doi.org/10.2307/20033683
The John Carter Brown Library. (n.d.). Sources of Peru | Independence. Retrieved May 28, 2019, from https://www.brown.edu/Facilities/John_Carter_Brown_Library/exhibitions/peru/peru/independence.php
The Mountain Institute. (n.d.-a). Andes Program. Retrieved May 12, 2019, from http://mountain.org/where-we-work/andes/
The Mountain Institute. (n.d.-b). History. Retrieved May 12, 2019, from About Us website: http://mountain.org/about-us/
The Mountain Institute. (n.d.-c). Securing Mountain Water and Livelihoods. Retrieved May 13, 2019, from http://mountain.org/securing-mountain-water-livelihoods/
The World Bank Group. (2017). *Country Partnership Framework for The Republic of Peru for the Period FY17-FY21* (No. 112299-PE; p. 102). Retrieved from http://documents.worldbank.org/curated/en/522711493949637279/pdf/Peru-CPF-112299-PE-04102017.pdf
Thomas, K., Hardy, R. D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., … Winthrop, R. (2018). Explaining differential vulnerability to climate change: A social

science review. *Wiley Interdisciplinary Reviews: Climate Change*, *0*(0), e565. https://doi.org/10.1002/wcc.565
Transparency International. (2018, February 21). Corruption Perceptions Index 2017. Retrieved October 18, 2018, from www.transparency.org website: https://www.transparency.org/news/feature/corruption_perceptions_index_2017
Tschakert, P. (2012). From impacts to embodied experiences: tracing political ecology in climate change research. *Geografisk Tidsskrift-Danish Journal of Geography*, *112*(2), 144–158. https://doi.org/10.1080/00167223.2012.741889
UNDP. (2018). Human Development Reports - Peru. Retrieved October 3, 2018, from http://www.hdr.undp.org/en/countries/profiles/PER
UNDP. (n.d.). Peru. Retrieved May 3, 2019, from NDC Support Programme website: https://www.ndcs.undp.org/content/ndc-support-programme/en/home/our-work/geographic/latin-america-and-caribbean/peru.html
UNEP. (2016). *Outlook on climate change adaptation in the Tropical Andes mountains.* Retrieved from https://gridarendal-website-live.s3.amazonaws.com/production/documents/:s_document/19/original/Andes_screen.pdf?1483646261
UNESCO World Heritage Centre. (n.d.). Huascarán National Park. Retrieved October 19, 2018, from UNESCO World Heritage Centre website: https://whc.unesco.org/en/list/333/
UNFCCC. (n.d.-a). National Adaptation Plans. Retrieved May 2, 2019, from https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans
UNFCCC. (n.d.-b). Nationally Determined Contributions (NDCs) | UNFCCC. Retrieved May 3, 2019, from https://unfccc.int/process/the-paris-agreement/nationally-determined-contributions/ndc-registry#eq-4
United Nations. (2018). *The Sustainable Development Goals Report 2018*. Retrieved from United Nations website: https://unstats.un.org/sdgs/files/report/2018/TheSustainableDevelopmentGoalsReport2018-EN.pdf
United Nations General Assembly. (1987). *Report of the world commission on environment and development: Our common future.* Retrieved from United Nations General Assembly, Development and International Co-operation: Environment. website: http://www.un-documents.net/our-common-future.pdf
United States Central Intelligence Agency. (2006). *Peru, administrative divisions.* [Image]. Retrieved from https://www.loc.gov/item/2006627392/
United States Environmental Protection Agency. (n.d.). Causes of Climate Change [Overviews and Factsheets]. Retrieved February 7, 2019, from /climate-change-science/causes-climate-change
U.S. Geological Survey. (1999, February 9). Cordillera Blanca. Retrieved October 19, 2018, from Peruvian Cordilleras website: https://pubs.usgs.gov/pp/p1386i/peru/occident.html#STEFAN
USAID. (2011). *Peru Climate Change Vulnerability and Adaptation Desktop Study* (p. 72).
USAID. (2017, February). *Climate Change Risk Profile Peru*. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2017_Climate%20Change%20Risk%20Profile_Peru.pdf
Vázquez-Rowe, I., Kahhat, R., Larrea-Gallegos, G., & Ziegler-Rodriguez, K. (2019). Peru's road to climate action: Are we on the right path? The role of life cycle methods to improve Peruvian national contributions. *Science of The Total Environment*, *659*, 249–266. https://doi.org/10.1016/j.scitotenv.2018.12.322

Vuille, M., Carey, M., Huggel, C., Buytaert, W., Rabatel, A., Jacobsen, D., … Sicart, J.-E. (2018). Rapid decline of snow and ice in the tropical Andes – Impacts, uncertainties and challenges ahead. *Earth-Science Reviews*, *176*, 195–213. https://doi.org/10.1016/j.earscirev.2017.09.019

Watts, J. (2018, October 8). We have 12 years to limit climate change catastrophe, warns UN. *The Guardian*. Retrieved from https://www.theguardian.com/environment/2018/oct/08/global-warming-must-not-exceed-15c-warns-landmark-un-report

Woods, N. (2006). *The Globalizers: The IMF, the World Bank, and Their Borrowers*. Cornell University Press.

World Bank. (2010, November 15). Natural Hazards, Unnatural Disasters: The Economics of Effective Prevention [Text/HTML]. http://www.worldbank.org/en/news/feature/2010/11/15/natural-hazards-unnatural-disasters-the-economics-of-effective-prevention

World Bank. (2018a). *Poverty and Shared Prosperity 2018: Piecing Together the Poverty Puzzle.* Retrieved from World Bank website: https://openknowledge.worldbank.org/bitstream/handle/10986/30418/9781464813306.pdf

World Bank. (2018b). The World Bank in Peru [Text/HTML]. Retrieved October 10, 2018, from World Bank website: http://www.worldbank.org/en/country/peru/overview

World Bank. (n.d.). Intended Nationally Determined Contributions (INDCs). Retrieved May 3, 2019, from http://spappssecext.worldbank.org/sites/indc/Pages/INDCHomeMore.aspx

World Resources Institute. (2017, April 11). This Interactive Chart Explains World's Top 10 Emitters, and How They've Changed. Retrieved November 20, 2018, from https://www.wri.org/blog/2017/04/interactive-chart-explains-worlds-top-10-emitters-and-how-theyve-changed

Worldmapper. (2018, November). CO2 Emissions per capita 2016. Retrieved May 31, 2019, from Worldmapper website: https://worldmapper.org/maps/emissions-co2-relative-2016/

Wrathall, D. J., Bury, J., Carey, M., Mark, B., McKenzie, J., Young, K., … Rampini, C. (2014). Migration Amidst Climate Rigidity Traps: Resource Politics and Social–Ecological Possibilism in Honduras and Peru. *Annals of the Association of American Geographers*, *104*(2), 292–304. https://doi.org/10.1080/00045608.2013.873326

Young, K. R., & Lipton, J. K. (2006). Adaptive Governance and Climate Change in the Tropical Highlands of Western South America. *Climatic Change*, *78*(1), 63–102. https://doi.org/10.1007/s10584-006-9091-9

Appendix A: Intended Nationally Determined Contribution (INDC): Peru

	1. Water	2. Agriculture	3. Fishery	4. Forestry	5. Health
Scope	Includes supply (resources) and demand (use): direct human consumption, agriculture and livestock, energy, mining and industry. It includes physical and eco-systemic infrastructure.	Considers protecting the sector and its contribution to the economy and includes attending the most vulnerable groups (small and subsistence farmers).	Considers protecting the sector and its contribution to the economy and includes attending the most vulnerable groups (artisanal fishermen).	Considers protecting ecosystem services that forests provide and attend the most vulnerable groups (indigenous communities and small forest producers).	Considers increasing the adaptive capacity of health services in order to face CC, and the resilience of vulnerable populations to its effects.
Intermediate Objectives	Encourage and promote actions and projects that increase the availability of water in the context of CC.	Reduce the negative impact of climate change on the agrarian activity (agriculture, livestock and forestry).	Reduce the vulnerability of the fishery and aquaculture sector to Climate Change	Promote comprehensive land management with a landscape approach, oriented to increase forests resilience to CC, and reduce the vulnerability of local populations.	Reduce vulnerability and increase the population resilience to the health effects of climate change
Framework Category	Access to resources	Access to resources Culture	Access to resources Culture	Access to resources	Access to resources
Crosscutting areas/ Goals	**1. Disaster Risk Management** • Increase the number of prioritized districts, due to hydro-meteorological and climate events, that are monitored. • Increase the number of people with education and knowledge in disaster risk management and adaptation to climate change. Framework category: Knowledge and information				
	2. Resilient Public Infrastructure - Climate Shield of the National Public Investment System (SNIP in Spanish) • Incorporate guiding elements in the methodological guidelines for the development of public investment projects of the National Public Investment System (SNIP), that allow, for relevant sectors, performing these activities in a climate change context.				
	3. Poverty and Vulnerable Populations Approach – adjustments to the design of programs and regulatory frameworks with adaptation criteria • Increase the number of programs and instruments against poverty that incorporate adaptation to climate change Framework Category: Access to resources				
	4. Gender and Intercultural Approach • Formulation and approval of the Action Plan on Gender and Climate Change • Encourage the participation of indigenous organizations in actions on climate change Framework: Access to resources, Government, Knowledge and information				
	5. Promotion of private investment in adaptation • Evaluate the introduction of innovative mechanisms to encourage private investment that increase the resilience of vulnerable systems.				

The table has been modified from its original form as found in the INDC report for Peru Source: (Peru Ministry of Environment, 2015).

Goals conditioned to international funding

Appendix B: Law No. 30754 – The Framework Law on Climate Change

		Name: Law No. 30754: The Framework Law on Climate Change Author: Congress of the Republic of Peru Date: April 17, 2018	
Focus	**Article Number**	**Content**	**Framework Category**
Principles	2.2	Principle of transversality. The intervention of the State in the face of climate change is transversal and multilevel. It is planned with the intervention of the different sectors and actors, incorporating a comprehensive vision and promoting the involvement of the private sector, civil society and indigenous or native peoples, in order to offer multidimensional and articulated responses.	Governance
Principles	2.6	Principle of participation. Everyone has the right and duty to participate responsibly in the decisionmaking processes of the integrated management of climate change adopted at each level of government. For this purpose, the State guarantees a timely and effective participation, considering intercultural and gender approaches.	Access to resources Governance
Principles	2.7	Principle of climate governance. The processes and public policies of adaptation and mitigation to climate change are constructed in such a way that the effective participation of all public and private actors in decision making, conflict management and consensus building is possible, based on responsibilities, goals and objectives clearly defined at all levels of government	Governance
Approaches for the integral management of climate change	3.1	Mitigation and adaptation based on traditional knowledge. Recover, value and use the traditional knowledge of indigenous or native peoples and their vision of harmonious development with nature, in the design of mitigation measures and adaptation to climate change, ensuring the fair and equitable distribution of the benefits derived from the use of them.	Access to resources Knowledge and Information
Approaches for the integral management of climate change	3.2	Mitigation and adaptation based on river basins. Protects, restores and sustainably manages the hydrological cycle and the existing water systems in the watersheds of the Pacific, Atlantic and Titicaca, through a management and ordering of the territory that foresees its vulnerability to the effects of climate change, and that guarantees the right the water.	Access to resources
Approaches for the integral management of climate change	3.3	Mitigation and adaptation based on ecosystems. Identify and implement actions for the protection, management, conservation and restoration of ecosystems, particularly fragile ecosystems, such as glaciers and mountain ecosystems; marine coastal ecosystems; and protected natural areas, in order to ensure that they continue to provide ecosystem services.	Culture
Approaches for the integral management of climate change	3.7	Intercultural approach. Dialogue and values incorporate the different cultural views and ancestral knowledge, conceptions of wellbeing and development of indigenous and AfroPeruvian peoples closely related to their identity.	Access to resources Culture
Approaches for the integral management of climate change	3.8	Focus on human rights. Designs, executes, monitors and evaluates mitigation and adaptation measures to climate change, considering its impact on human rights, particularly, of women, children, indigenous or native peoples, and other vulnerable human groups.	Access to resources

Approaches for the integral management of climate change	3.9	Approach to equality. Public entities have the responsibility to carry out the necessary actions to guarantee equality between women and men, developing policies that counteract negative situations that ignore the presence of women in mitigation measures and adaptation to climate change, prioritizing their interests and needs, and considering the differentiated damages.	Access to resources
Comprehensive management of climate change	4	The measures of adaptation and mitigation to climate change are incorporated into the policies, strategies, plans, programs and investment projects of the three levels of government, within the framework of their competencies and functions, in a coherent and complementary manner, under a participatory process , transparent and inclusive of the private sector and civil society, with special emphasis on indigenous or native peoples, in order to integrate the management of climate change and the development of the country in harmony with nature.	Governance
Competent authorities	5.2	Ministries, regional governments and local governments are competent authorities on climate change and, as such, promote, coordinate, articulate, implement, monitor and evaluate the integrated management of climate change within their jurisdictions, and issue the corresponding regulations in the scope of their competences and functions.	Governance
National authority	6.6	Promote and carry out scientific research and technological development for the mitigation and adaptation to climate change, through its ascribed and specialized entities, considering the traditional knowledge of indigenous or native peoples.	Knowledge and Information
National authority	6.7	Incorporate into the National System of Environmental Information the existing scientific research and technological development on climate change, as well as that produced by the State, universities and research and study centers; prioritizing the management of this knowledge.	Knowledge and Information
Sectoral authorities	7.5	Promote the development of integrated vulnerability and adaptation studies for the identification of vulnerable zones, as well as scientific research and technological development for mitigation and adaptation to climate change, considering the traditional knowledge of indigenous or native peoples.	Knowledge and Information
Sectoral authorities	7.9	Promote the informed participation of citizens, particularly vulnerable populations, such as women and indigenous or native peoples, in the comprehensive management of climate change aimed at strengthening climate governance and sustainable development in harmony with nature.	Access to resources Knowledge and Information Governance
Regional and local authorities	8.4	Promote the development of integrated vulnerability and adaptation studies for the identification of vulnerable zones, as well as scientific research and technological development for mitigation and adaptation to climate change, considering the traditional knowledge of indigenous or native peoples.	Knowledge and Information
Regional and local authorities	8.7	Promote the informed participation of citizens, particularly vulnerable populations, such as women and indigenous or native peoples, in the comprehensive management of climate change, aimed at strengthening climate governance and sustainable development in harmony with nature.	Access to resources Governance Knowledge and Information
National strategy and regional climate change strategies	13.2	The National Climate Change Strategy is prepared by the Ministry of the Environment, in coordination with the National Commission on Climate Change. and approved by supreme decree with the approving vote of the Council of Ministers.	Governance
National strategy and regional climate change strategies	13.3	The Regional Climate Change Strategy is prepared by the regional government, in coordination with the Regional Environmental Commission. and approved by regional ordinance, with favorable opinion of the Ministry of the Environment.	Governance

Measures to adapt to climate change	15	The State, in its three levels of government, in an articulated and participatory manner, adopts measures to adapt and take advantage of opportunities in the face of climate change, which are aimed at guaranteeing a resilient and sustainable territory, prioritizing the efficient use of water in industrial and mining activities, the territorial and environmental ordering, the development of sustainable citie, and the prevention and management of climate risks among other.	Governance
Environmental education	18.1	The Ministry of Education and the regional and local governments, in coordination with the Ministry of the Environment, the Ministry of Culture and the Ministry of Women and Vulnerable Populations, implement the National Environmental Education Policy and the National Environmental Education Plan, considering the approaches of equality, interculturality, climate risk management, sustainable development in harmony with nature, intergenerational and vulnerable populations, adapted to the linguistic particularities of each locality.	Access to resources Governance Culture Knowledge and Information
Research, technology and innovation	19.1	The public entities competent in scientific research, technological development and innovation, assigned to the sectoral authorities, generate and manage knowledge about climate change and conservation of biological diversity.	Knowledge and Information
Research, technology and innovation	19.2	Public and private universities, education and research centers promote and carry out scientific research, technological development and innovation in the field of climate change, with an intercultural and bilingual approach.	Knowledge and Information
Right to information and citizen participation	21.1	The competent authorities, and public and private organizations that administer financial resources for mitigation and adaptation to climate change are obliged to provide timely, adequate and continuous information, considering intercultural approaches and the language or predominant language in the locality where plan to execute the public policy or the investment project associated with climate change, in order to ensure effective enjoyment of the right to information.	Knowledge and Information
Right to information and citizen participation	21.2	The competent authorities, and public and private organizations that administer financial resources for mitigation and adaptation to climate change establish mechanisms for the exchange of information, consultation and dialogue, in order to ensure effective participation of stakeholders in all stages of public policies and investment projects associated with climate change.	Governance
Indigenous participation	22	The State safeguards the right of participation of indigenous or native peoples, respecting their social, collective and cultural identity, their customs, traditions and institutions, in the formulation, implementation, monitoring, and evaluation of public policies and investment projects referred to the Climate change that affects them, as it pertains to ILO Convention 169, Convention on Indigenous and Tribal Peoples in Independent Countries.	Access to resources Governance Culture
Financing	23.4	In the procedures for the management, negotiation and obtaining of financial resources, as well as public, private and international cooperation funds, priority is given to those destined to vulnerable populations, particularly women and indigenous or native peoples.	Access to resources