

Environmentally-Induced Migration of Andean Indigenous Communities in Times of the Coronavirus Pandemic

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Abstract:

This chapter explores the locally held understandings and experiences of the linkages between the environment and migration during the COVID-19 pandemic, of the Aymara community in Bolivia, an Indigenous group significantly impacted by climate change. Utilizing micro-narrative interviews, the study examines the experiences, perceptions, and management strategies of Aymara communities facing migration-related decisions due to climate change. The findings reveal that both climate change and the pandemic are actively shaping the health and livelihood outcomes of the Aymara. While the community has historically leveraged traditional ecological knowledge to adapt to environmental variabilities, the accelerating pace of climate change poses a significant threat to their adaptive success. Additionally, anthropogenic stressors such as overexploitation and pollution further jeopardize their livelihoods. Although the Aymara have remained relatively unaffected by the COVID-19 pandemic thus far, quarantine measures have led to a pattern of return migration, risking the spread of disease, exposing weaknesses in health infrastructure, and intensifying competition for already strained natural resources. The study suggests that policy and project design should prioritize strengthening household resilience through an asset-based perspective, enabling individuals to manage multiple stresses according to their needs, including migration as a choice rather than a necessity.

Keywords: Climate migration; Community vulnerability; Micronarratives; Traditional Ecological Knowledge

1. Introduction

Human-induced global warming is leading to significant climatic changes, resulting in more frequent and intense extreme weather events and gradual hazards that pose serious challenges to human societies and ecosystems worldwide. (IPCC, 2021). The exposure to these climate change impacts exacerbates existing vulnerabilities and, through a complex interaction with economic, political, and social dimensions, influences where and how people can live (Foresight, 2011). In 2020, sudden-onset disasters caused 30.7 million new internal displacements, the highest in a decade (IDMC, 2021). Slow-onset disasters further intensify humanitarian crises and prompt additional migration.

While climate change affects all nations, developing countries face the most excellent exposure to natural hazards and the least capacity to adapt (Cardona et al., 2012). Latin America and the Caribbean are among the most disaster-prone regions globally, with the Bolivian Altiplano particularly impacted by frequent climatic shocks (OCHA, 2021). This region is home to the Aymara community, which maintains strong connections to their ancestral territories and preserves distinct social, cultural, economic, and political aspects of life (ILO, 2017; UNDP, 2000). Their intrinsic relationship with the environment makes them among the first to experience climatic changes. Research indicates that the people in the Bolivian Altiplano have adapted to various climatic conditions over generations. Research demonstrates that the Aymara have adapted to multiple climatic conditions over generations, drawing on their Traditional Ecological Knowledge (TEK) to navigate environmental challenges (Ayala et al., 2016). However, as climate and environmental changes intensify, it remains uncertain how these communities will continue to adapt.

Climate change multiplies existing migration drivers, making it difficult to separate environmental factors from social, economic, and political ones (De Sherbinin et al., 2011; Brandt, Kaenzig, and Lachmuth, 2016). To better determine the factors affecting mobility choices, local experiences and perceptions should be highlighted. This research uses in-depth micronarrative interviews with the Aymara to understand their experiences and perceptions of climatic and non-climatic environmental changes and how these shape their migration decisions within the Aymara community.

The first aim is to contribute to the broader scientific literature by providing insights into the human experiences of the Indigenous Aymara community and the linkages between the environment, health, and migration. This leads to the following research objectives:

1. Understand how Aymara people perceive and manage climatic and non-climatic environmental impacts.
2. Understand whether and how their perceptions of climatic and non-climatic environmental impacts influence their decisions to move internally or internationally.
3. Determine whether and how the pandemic is impacting existing migration trends.

The second aim is to use these insights to inform policy design and practices that address vulnerability and human mobilities according to the local environment, livelihoods, and cultural context.

2. Literature review

2.1 Changing Climate

Climate change, the natural variation of the Earth's long-term average temperature and weather patterns, is accelerated by anthropogenic activities and greenhouse gas emissions (GHGs) (IPCC, 2021). The global warming of the atmosphere, ocean, and land is changing the frequency and intensity of sudden-onset and gradual hazards worldwide (IPCC, 2021). Direct impacts on the population's health and security are related to sudden-onset hazards. In contrast, indirect impacts occur through changes in the environmental, ecological, and social systems, such as land loss, changes in crop yield, reduced availability of clean water and food, and the spread of new or resistant pathogen strains (Gaillard, 2010, Kronik and Verner, 2010). These health and livelihood challenges profoundly impact those affected by psychological wellbeing (Fritze et al., 2008).

2.2 Climate change, Indigenous communities, and sustainable livelihoods

Paradoxically, developing countries, which have contributed the least to current GHG emissions, will endure the most of climate change impacts while having the least capacity to cope (Cardona et al., 2012). Further, poor communities, including traditional rural and Indigenous people, are disproportionately vulnerable to these

impacts. The sustainable livelihoods approach (Carney, 1999) is often used to analyse disaster risk at a local level, considering economic, human, physical, natural, and social capital as livelihood inputs. Cahn (2006) adds culture as a potential capital source. According to this approach, a livelihood is sustainable when communities, households, and individuals can cope with and recover from external shocks while maintaining outcomes like income and food security. The more assets a household or individual has, the more secure their livelihood and the less vulnerable they are to shocks.

Hazards and overexploitation can undermine natural capital, affecting financial and human capital (health). Indigenous communities face existential threats when exposed to fragile ecosystems due to their reliance on the environment for natural resource-dependent livelihoods (Morrissey, 2012), compounded by economic and political marginalisation. Tauli-Corpuz and Lynge (2008) highlight that their economic, social, and cultural systems, ecological knowledge, and identities as distinct peoples are at risk. However, empirical studies show their considerable capabilities to overcome environmental hardship using Traditional Ecological Knowledge (TEK) to inform adaptation strategies (Kelman et al., 2019). Despite lacking abundant financial capital, rural communities use other assets, including land, TEK, and social networks, to sustain their livelihoods and defy the usual framing of 'helpless Indigenous victims' facing climate change.

A systematic review suggests that TEK is losing value due to globalisation and climate change altering climatic and ecological conditions (Aswani, Lemahieu, and Sauer, 2018). For example, the reindeer-herding Saami in Scandinavia has experienced shifts in forage availability and reduced accessibility of migration paths (McLean, 2012). Similarly, islanders in Samoa have had to move inland due to sea-level rise, adjust traditional farming systems, and use their seasonal calendar due to climatic variability (Flores-Palacios, 2016). The reduced reliability of TEK, lack of economic resources, and limited understanding of modern technology threaten their lives and livelihoods (Tauli-Corpuz and Lynge, 2008). Accumulated stresses may eventually induce the need or desire to pursue a life elsewhere.

2.3 Nexus of environment, health, and migration

Environmental factors have long shaped human movement, leading to various types of environmentally induced migration. These classifications include voluntary and forced migration and international and internal movements driven by rapid-onset events like natural disasters and slow-onset impacts like climate change. These migrations can be permanent, temporary, or circular (Ober, 2019). With the increasing urgency of climate change, a new category—climate migration—has emerged, often highlighted in media narratives that focus on mass migrations to high-income countries. This has led to political responses aimed at deterring such movements through border closures and reduced assistance. However, the reality is that most environmentally induced migration occurs within countries, as people tend to prefer familiar cultural and linguistic environments, which also require fewer resources to navigate (McLeman & Hunter, 2010).

The discourse around environmental migration often frames it as a strategy for adapting to climate change (Foresight, 2011). Short-term migration can be a risk management tool, allowing families to diversify their income and mitigate localized risks (UNFCCC, 2020). Yet, environmental migration can also signify a failure to adapt to climate change in situ. At the same time, the choice to remain can reflect either a successful adaptation strategy or an inability to adjust (Kelman et al., 2015). A Maldives and Lakshadweep Islands case study reveals that affected individuals tend to focus on immediate needs rather than future scenarios, suggesting that migration is often a last resort (Kelman et al., 2017).

Environmental stresses exacerbate existing cultural, demographic, economic, political, and social vulnerabilities affecting migration decisions (Foresight, 2011). The complexity of environmentally induced migration challenges the simplistic attribution of movement solely to climatic changes (de Sherbinin, 2011). Migration drivers are influenced by both push factors from the area of origin and pull factors toward the destination (Warner et al., 2009). However, this push-pull theory oversimplifies the decision-making process, as individuals are not merely passive responders to external forces. People's perspectives on hazard risks and migration interests vary significantly (Kelman et al., 2019). Understanding aspirations and capabilities within perceived geographical opportunities is crucial (Schewel, 2020; de Haas, 2021) as these factors contribute to the agency's ability to make choices and take action. The

DFID acknowledges five livelihood capitals: Financial, Human, Social, Natural and Physical (Carney, 1999).

Individuals with higher levels of capital can choose between migrating and staying. When capabilities allow, migration can be a means to escape unfavourable local conditions or pursue better economic opportunities and lifestyles elsewhere (Morrissey, 2012). However, despite the statistic that one in seven people are on the move, few scholars explore why six out of seven remain stationary in our globalized world, highlighting a significant gap in understanding the factors influencing people to stay put. Schewel (2020) emphasizes the mobility bias in migration studies, which often focus on migration while neglecting the reasons for immobility. Immobility can be a conscious choice rather than merely a result of limited opportunities or capability. While economic opportunities are critical drivers of migration, non-economic motivations stemming from deep attachments to family, culture, and place identity play a vital role in the decision to remain (Kelman et al., 2015; Mallick 2023; Schewel, 2020). Those unable to migrate despite their desires are often labelled as “trapped;” while those who wish to stay but cannot, are considered “forced migrants” (Black et al., 2011; de Haas, 2021). The influence of environmental factors on migration decisions—such as whether to migrate, the chosen destination, timing, and duration—varies significantly depending on the specific context. These aspects affecting migration decisions are illustrated in Figure 1.

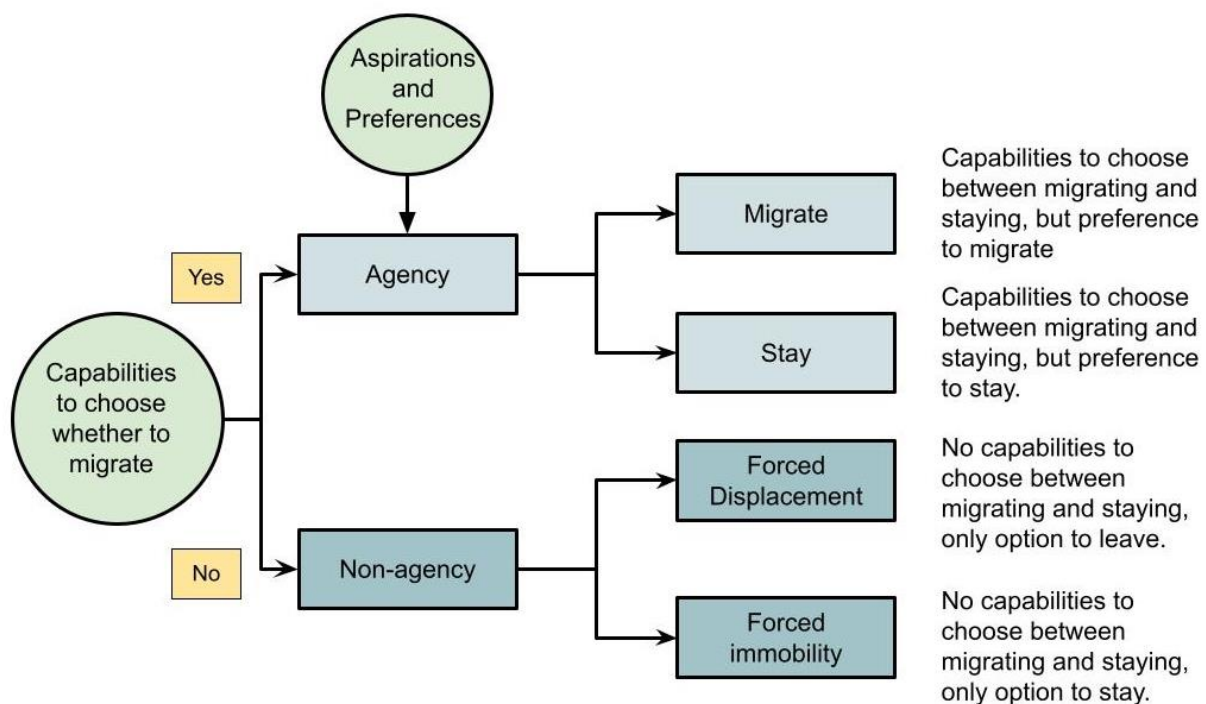


Figure 1: Summary and interpretation of mobility/ immobility typologies. (Source: first author's elaboration).

The climate change impacts (Section 2.1) directly influence health through increased morbidity and mortality linked to extreme weather events or indirectly as an impact on freshwater availability and food production. Migration can be employed to escape the localised hazard risk and improve human security and health (Foresight, 2011). Schwerdtle, Bowen, and McMichael, (2018) highlight the need to consider the health outcomes of migrants, those left behind, and the host communities. Migration can have significant and often negative health consequences, especially when unplanned. It affects health systems in the origin and host communities by depleting resources and healthcare workforce in the origin areas while increasing demand for services and potentially straining the healthcare infrastructure in the host communities. Additionally, an individual's health status can influence migration decisions, acting as a last resort or a proactive health-seeking strategy.

Often, migrants lack formal education and skills, which limits their employment opportunities in the informal sector and forces them to live in overcrowded conditions (Flores-Palacios, 2020). These circumstances have made migrants disproportionately vulnerable during the COVID-19 pandemic (Flores-Palacios,

2020). Around the world, the compounding impacts of unemployment, depletion of savings, and fear of COVID-19 have induced a trend of return migration. Globally, return migration patterns to rural communities have been observed despite the prevailing exposure to drought and food insecurity (Paoletti and Vinke, 2020).

The complex interplay between climate change, migration, and health presents a multifaceted challenge influenced by various factors, with projections for climate-related migration showing significant variability. Integrating people's experiences and knowledge is vital to designing adequate policies to tackle climate change, health, and migration threats. This study aims to disentangle the Aymara people's perception of climate change and its impacts on their livelihoods and migration choices.

3. Methodology

3.1 Background to Case Study: La Paz, Bolivia

Bolivia, a Latin American country in the southwestern hemisphere, lies between the tropics and subtropics. Our study focuses on the Northern Altiplano in the western Department of La Paz. This region receives an average of 130mm of rain annually and has an average temperature of 9°C. It experiences a distinct rainy summer from November to April and a cool, dry winter from May to October (Hoffmann, 2015). The complex topography and altitude range of 3,000 to 6,500 meters above sea level create a variety of microclimates or 'ecological levels' that differ in temperature, precipitation, and ecology (Ibisch and Merida, 2003). The Cordillera Real and Lake Titicaca glaciers are crucial for water security, feeding rivers used for crop irrigation and supplying over 25% of the water to urban and rural communities in La Paz and El Alto (Hoffmann, 2015).

The election of Evo Morales in 2006, Bolivia's first Indigenous President, marked the beginning of significant changes, including a new Constitution and various measures to foster economic growth, social development, and poverty reduction (Beverinotti, 2018). His administration introduced legislation such as the Law of Mother Earth and the Integral Development for Living Well, which promotes Indigenous rights and environmental protection. Although extreme poverty and inequality have decreased and nutrition has improved, the economy began decelerating in 2019 and has declined since COVID-19 spread to Bolivia (World Bank, 2020). Bolivia remains one of the poorest countries, with nearly 35% of its population living below the poverty

line (Action Against Hunger, 2021) and high levels of inequality (World Bank, 2020). Disaggregating this poverty statistic by ethnicity reveals further disparity, as 70.7% of Indigenous individuals are classified as poor (INE, 2018). The Indigenous Aymara people, one of Bolivia's largest ethnic groups, predominantly inhabit La Paz and face prevailing poverty along with challenges such as unequal land rights and limited access to technology and infrastructure to support their livelihoods (Ministerio de Planificación del Desarrollo et al., 2015). Beyond health implications, the coronavirus pandemic has caused social, economic, and other health challenges, disproportionately affecting the most vulnerable in urban and rural areas (World Bank, 2020). In cities, economic downturns and increased unemployment have diminished resources and remittances, complicating efforts to cope with lockdowns. Overcrowded living conditions hinder social distancing and facilitate the spread of COVID-19. While some migrants may remain in cities, others may return to rural communities.

Andean rural communities are exposed and vulnerable to climatic variability and climate hazards. Increased temperatures and the frequency of El Niño-Southern Oscillation effects result in localized, prolonged droughts, flash flooding, night frosts, and glacier melt (Oxfam, 2009; 2020b). Studies indicate that half of Bolivia's glaciers have melted over the past 50 years (UNFCCC, 2015). The high dependence on natural resources for their livelihoods and limited adaptive capacity render Andean Indigenous communities disproportionately vulnerable to the impacts of climatic events (Boillat and Berkes, 2013). The combined effects of glacier melt, and prolonged droughts threaten their water security, which is essential for both consumption and agriculture (Balderrama et al., 2011; Raoul, 2015). These communities rely on their TEK about the local climate and environment, which has been accumulated and passed down through generations (Boillat and Berkes, 2013; Young and Lipton, 2006). They have adapted to harsh environmental conditions by developing agricultural techniques such as irrigation and terracing while conserving biodiversity (Fundación Tierra, 2019). Although the Aymara have a history of living in and adapting to harsh environments, the rapid pace of climate change has created significant livelihood challenges (Flores-Palacios, 2020), leading to heightened out-migration pressures.

Andean rural communities often migrate to urban areas within Bolivia or abroad to escape harsh environmental conditions and seek economic opportunities and better

access to infrastructure and welfare services (UDAPE & INE, 2018). Typically, young adults migrate, leaving older individuals and children behind to manage agricultural responsibilities and maintain the household (Urioste, 2012). In the Andean region, climate change significantly contributes to both temporary and permanent migration, with glacier retreat and environmental degradation serving as key factors driving migration in the Bolivian Altiplano (Brandt, Kaenzig, and Lachmuth, 2016; Balderrama et al., 2011).

3.2 Research Design, Collection, and Analysis

During April-May 2021, twenty-two individual interviews and three follow-up focus groups were conducted in Batallas, Pucarani, and Puerto Pérez in Los Andes Province. This qualitative study explored the connections between the environment, migration, and the pandemic through the Aymara community's experiences.

Open-ended, semi-structured interviews facilitated dialogue, allowing participants to guide discussions. The interview template was tailored for relevance, and probing questions captured comprehensive perceptions. As indigenous knowledge is a vital part of this study, community engagement was prioritized, with an Aymaran leader serving as a research assistant to build trust. Permission was obtained from local authorities, ensuring transparency.

A purposive sampling strategy included elders and participants from diverse backgrounds, with snowball sampling ensuring representation without subgroup dominance. Oral consent was secured due to uncertain literacy rates. Interviews, averaging 60 minutes, were conducted in Spanish or Aymara and later translated and transcribed for analysis.

Narratives were reviewed for themes using inductive thematic analysis, employing descriptive, emotion, and versus coding. The concept of bracketing helped set aside preconceptions to understand local contexts. Ethical approval and a risk assessment were granted by University College London and local authorities before data collection.

In this chapter, "community" refers to geographical and cultural aspects, allowing interchangeable use with "case study area." Some narratives were quantified by analyzing the frequency of the mentioned factors, though these findings were not

assumed to represent relative importance. Ultimately, the study aimed to highlight Aymara's experiences and contribute valuable insights to climate change and migration discourse.

4. Results

4.1 Perceptions of Environmental Impacts

The findings reflect the perceptions of the Aymara community regarding environmental changes rather than confirming or denying climate change. Participants who rely on resource-dependent livelihoods such as agriculture, livestock farming, and fishing, primarily for subsistence, expressed significant challenges in achieving water and food security. They reported observing substantial physical changes in their environment over the past 10-50 years, including increased sun exposure, rising temperatures, prolonged droughts, glacier melt, and erratic rainfall patterns. One interviewee stated, “The climate has changed, and our lives have, too” (M-41-Batallas).

Participants described both the direct and indirect impacts of these environmental changes on human health. Direct effects include heightened exposure to extreme temperatures and severe weather events, while indirect consequences relate to compromised water and food security. One participant emphasized the urgency of the situation: “Water is life. Without it, we cannot produce anything” (M-41-Batallas). Concerns about inadequate food production affecting children's nutrition were prevalent, with one mother expressing, “We are worried about what our children will eat. Their health is at risk if we cannot produce enough food.” Another participant noted, “Food gives us strength, but if we have little food, we won’t be strong” (M-60-Corquemaya). This highlights Aymara's awareness that insufficient food impacts physical health and increases vulnerability to disease.

Economic frustrations were also voiced, as participants noted that the time and resources invested in agricultural products do not reflect market prices. One participant lamented, “I used to sell my produce on the market, but because the prices are so cheap, you don’t get back what you have invested” (M-41-Batallas).

Participants universally viewed environmental changes as non-natural phenomena, interpreting them through three cultural lenses. The first lens is the Aymara's

connection to Mother Earth (Pachamama), emphasizing a reciprocal relationship with nature. One participant stated, “The planet is sick. It's like your mother... if the mother of nature dies, her children will die too” (M-41-Batallas). This perspective underscores the interconnectedness of humanity and nature and the urgency of addressing environmental degradation.

The second lens involves the belief in divine retribution, with some attributing environmental changes to punishment for humanity's mistreatment of the Earth. A quarter of interviewees linked these changes to an impending apocalypse, reflecting an awareness that human actions have consequences. This belief emphasizes the sacredness of nature and the responsibility to care for it.

Finally, exposure to scientific theories has fostered a strong awareness of climate justice among community members. One participant articulated, “We know that those in developed countries are causing these changes. They must be held accountable” (M-50-Pucarani). This sentiment extends to recognizing the disproportionate suffering of developing countries, as another participant noted, “We are losing the future of humankind, especially for those living in third-world countries like us—we are the most vulnerable” (M-41-Batallas).

Nevertheless, participants also highlighted environmental factors unrelated to climatic conditions, such as population increase, overexploitation, and pollution, as causes for livelihood hardship. Within Aymara communities, land is held in customary tenure systems and gets passed down from parents and shared between siblings. The limited space makes it hard to grow enough food or hold enough livestock to feed the next generation of families.

The Aymara community described the strategies currently employed to cope with these hardships, which include the use of agrochemicals, mechanized farming tools, higher-yielding fishing techniques (such as nets), and innovative water access and transportation technologies (like digging wells, creating irrigation channels, and using motorized pumps). However, these strategies have led to new environmental issues.

In communities near Lake Titicaca, the overexploitation of marine resources and overfishing have emerged as significant challenges, resulting in decreased fish stocks and the complete disappearance of some species. To make matters worse, instead of the price of fish rising as they become scarcer, prices have decreased,

which further intensifies fishing pressure. Participants also highlighted the issues of pollution and eutrophication in Lake Titicaca, leading to a decline in fish stocks. One participant described the situation poignantly: “A year ago, I noticed the water turning green and oily; soon all the fish had died. A year on, and there are still no fish” (M-74-Cochabamba).

It was further noted that both the quality and the quantity of available water has decreased. One participant mentioned that water insecurity, competition, and demand have already triggered conflicts between communities: “My community has already decided to go to war with another community because they won’t let us access the water” (M-63-Chirapaca). The use of the term “war” in this context underscores the severity of the situation and the dependence of all communities on this vital resource for their lives and livelihoods.

Regardless of the cause, environmental hardship is not a new phenomenon for the Aymara, who rely on TEK, and adaptation strategies passed down through generations to cope with climatic changes. 65% of interviewees continue to advocate for traditional practices, emphasizing their importance in addressing climate impacts, using multiple seed strains, microclimates, rotating grazing fields, and storing food. However, there is uncertainty about the continued use of these traditional methods. Participants expressed concerns about the reliability of traditional forecasting methods due to unpredictable climate conditions, with many stating that these methods have become ineffective. Changes in the physical environment, such as altered animal migration patterns, further complicate the use of these strategies.

4.2 Aymara Migration: Navigating Environmental Challenges and Economic Opportunities

Migration is not a new phenomenon for the Aymara; historical patterns reveal internal and international movements. Our analysis showed that 44% of migrants move to urban areas within Bolivia, while others migrate to Argentina (22%), Brazil (21%), Peru (2%), Chile (2%), and Spain (2%). Current migration trends show a shift from circular to more permanent moves, particularly among the youth, while older generations often stay committed to their land and community. One elder stated, “I don’t want to migrate. I was born here... this is my home” (M-44-Cohana). Still, Aymara seeks several strategies to cope with agricultural hardships, including part-time employment in non-agricultural activities and migration to diversify their income.

This reflects also that many Aymara who have remained in the countryside rely on familial and social networks to provide remittances to support those remaining in rural communities.

Migration as an adaptation strategy in response to environmental pressures, including declining agricultural productivity and health challenges, emerged as a necessity from the interviews. Many expressed that migration is a choice driven by urgency: “If we don't produce, what do we eat? We starve, it's as simple as that” (M-41-Batallas). Another participant explained, “People are having trouble growing food and keeping their livestock because there is no forage for them. They are thinking about leaving to find new employment” (F-36-Batallas).

However, the environmental reasons for migrating must be understood within the broader context of long-established economic and labor drivers. Economic uncertainty and searching for alternative career opportunities emerged as significant factors influencing migration. One participant summarized this complexity: “It's a mixture of factors driving migration. This is a small area, and climate change has affected our productive capacity and economic incomes. It all adds up” (M-41-Batallas).

4.3 Impact of COVID-19 on Migration Trends

The respondents described that the Aymara community members living in the countryside had not been affected significantly by COVID-19. Interviewees noted that those who fell ill were primarily individuals who had lived or worked in cities. They attributed the lower impact in rural areas to their more vigorous health, credited to their diet and herbal remedies. Despite the limited health impact on rural communities, there was a high level of awareness about the pandemic's severity due to communication with relatives who had migrated. One respondent shared, “Many have been going from hospital to hospital with their sick ones without being able to find free space. Many have been dying.” (M-48-Huatajata). Rural communities recognized their relative fortune in being exempt from lockdowns and having the freedom to work, but the economic impacts were noticeable.

While the health effects of the pandemic were relatively mild on the Aymara studied due to strong local health practices, the economic challenges were significant. One dairy farmer expressed frustration: “There are no open markets to sell the cheese...

we used to charge 10 bolivianos per cheese, but now we are giving it away for just 1.50.” (M-37-Huatajata). This situation reflects the broader economic strain on rural communities, threatening their financial stability and livelihoods as they struggle to adapt to the challenges posed by the pandemic. Another respondent echoed this concern, stating, “Doubled now with the pandemic and such, the money is running out, and so is the food that we produce.” (F-37-Cohana). This quote highlights the intensified impact of the pandemic on already vulnerable communities. The “doubled now” indicates that the pandemic has worsened pre-existing economic challenges, resulting in a critical shortage of financial resources and food supplies. As families experience dwindling incomes and reduced food production, they face growing uncertainty about their ability to meet basic needs.

Interestingly, 55% of interviewees knew people who had returned or were planning to return from urban areas, indicating a trend of return migration. Migration drivers were framed as both push and pull forces. Pull factors included the perception of better health and safety in rural areas: “The brothers have returned because it seems that we have not been affected by this disease in Cohana; we have the medicines of our land, and we stay strong to stop it from affecting us” (M-41-Batallas). Push factors from cities included the lack of food and work: “In La Paz, there was no more food to give the children, there was no work, and that is why they came back” (M-48-Huatajata) and “...have returned to the camps out of fear and to escape being locked up during quarantine.” (F-36-Batallas).

However, this influx raised concerns with the Aymara, who had remained due to the increased strain on already limited resources: “Some have come back to the lands in La Paz, even though we are not harvesting or earning much.” (F-37-Cohana). This highlights the complex interplay between migration, economic stability, and resource management in the context of the pandemic and ongoing climate challenges.

5. Discussion

5.1 Environmental Impacts, Climate Change, and Rural Livelihoods

Respondents understand climate change through their experiences, often recalling childhood memories to compare past and present environmental states. The environmental phenomena discussed in this study may be attributed to seasonal climate variability, climate trends, climate change, or a combination of these factors.

While this study does not aim to prove climate change, a strong empirical foundation supports the Aymara perception that climate change is real and manifesting in the Andes. Previous studies confirm findings from other Andean communities that reported increased temperatures and uncertainty in precipitation patterns (Thibeault et al., 2010), associated pests (Perez et al., 2010), localized drought (Canedo-Rosso et al., 2019), glacier retreat (Raoul, 2015), and increased frost nights (López-i-Gelats et al., 2015). A longitudinal study by Oxfam in Bolivia (2009; 2020b) suggests that environmental trends and weather patterns have intensified. Glacier retreat emerged as a significant concern influencing migration decisions for the Aymara. Notably, while glacier retreat has been excluded from climate change-related migration studies in Bolivia (see Balderrama et al., 2011), it poses considerable risks, such as glacial lake outburst floods (Hoffmann and Weggenmann, 2012), which were not mentioned in this study, suggesting either a low-risk perception or increasing awareness.

Although multiple physical exposures to climatic and environmental phenomena trigger hardships for the Aymara, systemic weaknesses are the root cause of disasters (Gaillard, 2010). The impacts experienced signal adaptation and development failures (Gaillard, 2010; Kelman, 2017). The results reveal how human shortcomings, such as inadequate infrastructure (e.g., lacking irrigation systems) and unsustainable practices (e.g., intensive agricultural practices, overexploitation, and pollution), exacerbate livelihood risks. Traditional farming practices, such as fallow cropping and crop rotation, have been replaced by intensive mechanization methods, foreign crop strains, and agrochemicals. While these practices increase productivity, they also deteriorate soil and crop quality over time, indicating that some adaptation strategies to changing environmental hardships have failed. Other factors influencing access to and governance of natural resources were also highlighted. This study emphasizes competition among communities for water sources, while other research in the Andes investigates water governance, competing uses, access, and distribution (Hoffmann and Requena, 2012; Balderrama et al., 2011; Raoul, 2015). Additionally, intensive logging practices in the Brazilian Amazon impact the forests' hydrological services, increasingly reducing rainfall in South America, particularly in Bolivia (Weng et al., 2018).

Participants articulated their perceptions of environmental and climate change impacts through the concept of 'here and now' (Kelman et al., 2017). The Aymara view their location as more than just a physical area; they link their surroundings with Mother Nature, community, and identity. Consequently, physical and environmental changes also cause emotional distress and tangible impacts on livelihoods and health. Regarding the 'now,' participants reported perceived climate changes through their day-to-day experiences. High temperatures make agricultural and pastoral labor more strenuous, while various climatic conditions ruin harvests, shift the agrarian calendar, reduce forage availability, and increase the incidence of pests and livestock diseases.

However, the Aymara do not seem to share the same focus on the present as Indigenous communities in the Pacific (Kelman et al., 2017). In contrast to the reported fearlessness of Pacific Island Indigenous communities, the Aymara expressed worries for the future. Elders reported not having to concern themselves with migration within their lifetime but expressed concern about their children's and grandchildren's future quality of life.

5.2 Climate-sensitive health risks

The increase in extreme climatic events has caused acute food crises, health problems, and loss of income. McLean (2012) found that the Indigenous reindeer-herding Saami in Scandinavia are also experiencing a reduction in natural capital, such as forage, leading to unsustainable livelihoods if they do not adapt. Our study focused solely on climate-sensitive health risks among those remaining in their rural communities, while Schwerdtle, Bowen, and McMichael (2018) discuss health outcomes for migrants and host communities. In our study, climate-sensitive health risks manifest through direct and indirect pathways. Reported direct health impacts include heat-related diseases, while indirect health impacts include reduced water access, food insecurity, and vector-borne diseases. As discussed by Fritze et al. (2008), the inability to address these health risks and livelihood challenges can lead to mental health disorders. The findings support those from Latin America (Kronik and Verner, 2010) and Bolivia specifically (Balderrama et al., 2011), indicating that climatic changes endanger Indigenous groups' water and food security, health, and cultural identity. The COVID-19 pandemic played a lesser role in narratives around health until researchers employed probing questions. Participants felt that the

pandemic had not significantly impacted their community, attributing this to their diet and use of medicinal herbs.

5.3 Environmental Change Adaptation Strategies

Environmental change adaptation strategies have allowed Indigenous communities to coexist with environmental change and uncertainty for centuries. Other Andean farmers have employed similar strategies informed by TEK (Boillat and Berkes, 2013; Young and Lipton, 2006). 'Earth indicators' are used as climate forecasting methods to decide when and where to base agricultural practices, and they have a long history of success. Andean communities hold rural fairs and markets to exchange farming experiences and best practice strategies and identify seed varieties tolerant to different stresses (Pazmino, 2022). The track record of success and innovative strategies to adapt to environmental hardship supports Salick and Ross's (2009) call to challenge the framing of 'helpless Indigenous victims' facing climate change. However, past successes in adaptation strategies do not guarantee future success, as the rate of environmental change challenges the adequacy of TEK. Studies on the Scandinavian Saami also reveal a disconnect between environmental changes and their livelihood practices and strategies (McLean, 2012), suggesting this may be a global trend.

This study expands on past TEK research by investigating the awareness of TEK shortcomings. Applied TEK is discontinued due to changing environmental conditions exacerbating TEK limitations and evolving social contexts. Younger generations are reportedly less willing to learn TEK and engage in traditional agricultural practices. This deviation from traditional livelihoods has been accompanied by unsustainable farming practices and out-migration. The intrinsic relationship to the environment, embodied through Aymaran values, norms, and traditional livelihoods, is key to achieving sustainable livelihoods. The role of Pachamama in the lives and livelihoods of Aymaran communities underpins their respect for the environment and sustainable practices, which have deteriorated over the past decades. However, TEK strategies have not been wholly abandoned; some older inhabitants still believe traditional strategies are the only way to please Pachamama and secure their harvest. Respect for culture emerged as key to upholding the intricate relationship between the Aymara and the environment, as these relate to place attachment, identity, traditional

livelihoods, and sustainable resource use. In a review by Aswani, Lemahieu, and Sauer (2018), 77% of papers reported a loss of TEK. In communities where TEK was upheld, it has been supplemented by Western-based modern knowledge. By leveraging culture in combination with Western knowledge systems, tangible opportunities arise in development practices to supplement adaptation strategies to changing physical and social conditions while maintaining traditional livelihoods, culture, and identity.

5.4 Environmental Risk-Induced Migration

Interviews revealed that migration has consistently been a part of participants' lives and livelihoods. Reflecting on their experiences, participants noted high internal and international migration levels, primarily from rural to urban areas. This indicates that urban environments, often connected to existing social networks, hold more significance than the country. Economic factors emerged as the main drivers of migration, acting as both push and pull forces. However, migration decisions are shaped by a complex interplay of factors, particularly the relationship between economic and environmental influences, which cannot be analyzed in isolation.

Morrissey (2012) highlighted the vulnerability of those with agricultural livelihoods, whose harvests and income depend on unpredictable climatic conditions. Our study supports this, showing that migration in the Andes often serves as a coping and adaptation strategy, with families diversifying their income through remittances (UNFCC, 2020). We build on Morrissey's findings by illustrating how climatic and environmental changes interact with climate-dependent livelihoods, limited coping capacity, and poverty to influence migration decisions. This emphasizes that 'natural' disasters are, in reality, 'human' disasters, reflecting development failures where exposure and vulnerability intersect with other crises (Gaillard, 2010).

Migration decisions are influenced by social, economic, historical, and political contexts, determining whether individuals migrate, their destinations, the speed of migration, and the demographics of those who migrate. While some migrate as a coping strategy, others do so for various reasons. Our findings align with Morrissey (2012), who noted that young people migrate from rural communities for economic opportunities and urban lifestyles. Participants expressed concern that their children were less interested in traditional livelihoods.

Despite the reasons for migration, many participants viewed the option to return to their rural communities as viable. By interpreting migration decisions through the aspiration capabilities framework (de Haas, 2021), we found that perceived climate changes do not necessarily suppress human agency or compel migration. Older demographics did not prioritize climate change as a reason to migrate, feeling strongly connected to their homes despite environmental changes. This desire to remain in their communities, regardless of hardship, aligns with ILO (2017), which links such sentiments to cultural, livelihood, and identity issues.

The aspiration-capability model (de Haas, 2021) suggests that migration is a choice for the Aymara, countering the notion of being 'trapped' (Black et al., 2011). This study challenges narratives that portray Indigenous communities as victims of climate change and potential refugees (Kelman et al., 2017). Aymara individuals perceive environmental changes and their decision to stay rooted in the present. Our focus on gradual-onset hazards, which allow more time for migration decisions, indicates that reluctance to migrate may change if climatic conditions worsen.

This study illustrates that migration decisions balance necessity and opportunity, risk and economic success, family support, and individual aspirations. The out-migration of younger generations has two main implications for those remaining in rural communities: it reduces pressure on natural resources, potentially enhances natural capital for production, and disrupts family social structures and livelihood roles. The older generation is left to manage agricultural activities, facing challenges related to a diminished workforce, smallholder farming, and climate change impacts. Elderly individuals are particularly vulnerable to climate-related stresses, such as high temperatures and water scarcity, which are exacerbated by socio-economic conditions and marginalization that limit their access to services and coping capacity.

5.5 The impact of COVID-19 and return-migration

The COVID-19 pandemic has added a new and ongoing dimension to environmental and climatic migration dynamics. It has revealed various vulnerabilities for individuals in rural and urban communities and those on the move, regardless of their legal status, reasons for migration, or the duration and distance of their movement (Flores-Palacios, 2020). Both rural and urban areas have faced economic challenges due to

commodity price fluctuations and market closures, exacerbating struggles to maintain food security.

In urban settings, rural migrants have been particularly affected by the pandemic. They often live in overcrowded conditions, increasing their risk of infection, and many have lost jobs or faced insecurity due to their reliance on the informal sector (Flores-Palacios, 2020). Paoletti and Vinke (2020) noted that unemployment, depleted savings, and fear of COVID-19 have led to a global trend of return migration to rural areas. Reports highlighting the contrasting situations between rural and urban communities will likely encourage this return and in-migration.

However, human mobility poses a significant risk of spreading COVID-19 and other diseases to destination areas. If the virus were to establish itself in the Andes, it could escalate rapidly, particularly given the region's underdeveloped and inadequate health infrastructure (Flores-Palacios, 2020). The loss of remittances from translocal livelihoods, which help bridge gaps during low harvests and economic uncertainty, and the deepening poverty of many community members, heightens their vulnerability to natural disasters.

Additionally, population increases from in-migration present significant challenges for Andean communities. A larger population in hazard-prone areas increases the number of individuals at risk, mainly if they have limited coping and adaptive capacities. The added pressure on already strained natural resources is a growing concern for the residents in our study.

5.7 Policy Recommendations

The factors influencing migration and immobility vary significantly across contexts and individuals. Understanding these differences is crucial for developing effective, tailored policies that address diverse communities' unique needs and aspirations. This study also aims to provide policy recommendations for post-COVID-19 development, focusing on adaptation strategies rather than solely on virus prevention (see Oxfam, 2020a). While climate change mitigation remains vital, the current levels of greenhouse gases mean that climate change impacts will worsen even with significant emission reductions.

Although public policies have been established in Bolivia to promote sustainable development, adapt to climate change, and support Indigenous communities following the new Constitution, significant challenges remain. Issues such as environmental degradation, poverty, and health crises continue to persist, and the COVID-19 pandemic has further intensified these problems. Most participants reported never receiving government assistance, underscoring the need for increased resources to address the implementation challenges of existing policies.

All policies and programs should be developed, implemented, monitored, and enforced with the equal participation of Indigenous communities. The themes outlined in the below policy recommendations are central to this study but are not intended to be exhaustive.

5.7.1. Staying

- Local risk assessments should guide disaster preparedness, risk-reduction measures, and climate change adaptation within broader development initiatives, including social protection measures such as safety nets and microinsurance schemes. These initiatives should specifically target high-risk groups and enhance social-ecological conditions, thereby improving the well-being of those who wish to remain and accommodate more in-migration. For the interviewed communities, water management issues in both urban and rural contexts should be a priority.
- In this study, economic factors emerged as the primary drivers of migration due to climatic uncertainty, environmental hardship, and a lack of local employment opportunities. Therefore, rural development should be prioritized as a strategy to reduce the necessity for migration and make rural life more appealing to young people.
- Rural development initiatives should focus on improving healthcare infrastructure. While many of those interviewed believe that nutrition and herbal remedies bolster their health, these measures are unlikely to provide adequate protection against all health risks. COVID-19 exemplifies the broader health context and is just one of many health threats. Consequently, health programs should adopt a holistic approach, addressing long-standing issues related to the health system's capacity to manage standard, climate change-related, and newly introduced disease arising from population movements.

- Integrating TEK with mainstream scientific processes offers a valuable resource for designing climate change adaptation and education strategies (Bennett et al., 2014). The participation of all demographic groups is essential. Older individuals possess valuable knowledge about climatic histories and socio-environmental relationships, which can inform vulnerability assessments. Engaging younger generations fosters a sense of ownership (Mercer et al., 2008) and the potential to reimagine rural livelihoods, such as linking farmers with weather forecasting systems to complement traditional earth indicators as early warning signals.

5.7.2. Migration

- Policies and programs should empower Indigenous people by providing adequate options, resources, and skills to exercise control over their migration decisions aligned with their aspirations. Awareness-raising initiatives should address the implications of population movements for both source and host communities.
- In rural areas, education should play a critical role both in preventing migration and enabling migration as a choice. By enhancing literacy rates and providing essential skills to succeed in sustainable livelihoods, education can help deter migration. Further it can improve chances of finding better employment in cities if migration is 'chosen' and reduce the likelihood of being forced into low-paid employment in the informal sector.

Overall, policies and development projects should focus on strengthening household resilience through an asset-based perspective rather than concentrating solely on specific exposures. This resilience-oriented approach equips households with the flexibility to manage multiple unfolding stresses according to their needs and priorities, including migration as a viable choice.

5.8 Limitations and Future Research

This study delves into Bolivia's climate and environmental migration, highlighting challenges and opportunities for research and policy design. While the insights gained are valuable, the study acknowledges several methodological and theoretical limitations. While sufficient for exploratory research, the sample size of 22

interviewees limits the breadth of perspectives captured. Future research with a larger sample could provide deeper insights into social capital networks, power dynamics, and gender roles within Indigenous communities.

Additionally, the study focused exclusively on rural areas, excluding the narratives of current migrants and urban residents. Including these perspectives could enhance understanding of return migration and the challenges faced during migration and urban living. However, logistical constraints, including limited financial resources and COVID-19 mobility restrictions, hindered the inclusion of additional interviews.

The specific case study and limited sample size also restrict the generalization of results to urban contexts and sudden-onset disasters, which may involve different decision-making processes and migration dynamics. While some findings may apply to other Indigenous communities, policy design should be tailored to each community's unique hazard environments and needs.

Finally, the findings related to migration dynamics in the context of the COVID-19 pandemic are preliminary. Longitudinal studies are needed to monitor changes and understand the evolving relationship between environmental factors and migration decisions. Despite these limitations, the study contributes valuable insights into the Aymara community's experiences and resilience strategies in the face of environmental and social challenges.

6. Conclusion

This study delves into the experiences and perceptions of the Aymara Indigenous people in the Bolivian Altiplano regarding climate change, the pandemic, and associated migration trends. The Aymara, accustomed to harsh climatic environments, now face accelerated climatic changes and extreme weather events, significantly impacting their health and livelihoods. Their narratives of adaptation strategies reveal remarkable resilience, yet past successes do not guarantee future ones. Management failures exacerbate their hardships, such as demographic pressures on land tenure, overexploitation, and unsustainable agricultural practices.

The Aymara's struggles include accessing water for drinking and irrigation, achieving subsistence, and maintaining family health. Climate change heightens the risk of these communities abandoning their ancestral lands, Pachamama - Mother Nature. Forced migration could have profound emotional consequences due to their deep

connection to the land, food, and sustaining water. These environmental changes interact with climate-dependent livelihoods, poverty, and the broader economic, social, cultural, and political context, influencing migration.

Individual characteristics, such as demographics, play a role in migration decisions through concepts of capabilities, aspirations, preferences, and inhibiting processes like power dynamics. Older adults, who often remain, face the highest health risks from climate change and COVID-19 and are less capable of strenuous labour.

Migration decisions balance necessity and opportunity, risk and economic success, and strategies to support families and realise individual aspirations. While migration is not currently forced for the Aymara, projected climate change impacts may make it necessary.

For migrants settled in urban areas, illiteracy and a lack of skills often lead to work in the informal sector. In cities, the COVID-19 pandemic has disproportionately impacted migrant populations, with overcrowded living conditions, exhausted savings, and unemployment exacerbating health and livelihood issues. The de-escalation of national quarantine measures and lockdowns has reversed migration patterns, threatening to spread disease, expose systemic health infrastructure weaknesses, and increase pressure on natural resources.

Despite constitutional commitments to sustainable development and Indigenous community assistance, these communities have received little support, highlighting implementation failures. Addressing multiple risks in a complementary way, rather than through interventions targeting specific exposures, presents an opportunity. Policies and development projects should fill gaps in education, social safety nets, access to early warning systems, and strengthen health infrastructure. At a micro level, allow households to manage multiple stresses according to their needs and priorities, including using migration as a choice rather than being forced.

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