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Master Thesis

**“Local community leaders’ perceptions of environmental (im)mobility in
the case of El Niño in Lurigancho-Chosica”**

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Master Thesis

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June 25th 2023

Wordcount: 9864

Abstract

This study aims to investigate how community leaders of Lurigancho-Chosica, in Lima-Perú, perceive environmental (im)mobility in their community due to the effects of El Niño-Southern Oscillation [ENSO]. ENSO is a recurrent climate event that will likely worsen with rising world temperatures. Lurigancho-Chosica is a highly vulnerable area and one of the most affected by ENSO in the country because of landslides. More knowledge is needed on this issue because it has not been researched in this community and due to its significant toll on the community's livelihoods. Using a qualitative approach, interviews were conducted with ten community leaders as key informants from Lurigancho-Chosica to explore their perspectives on environmental (im)mobility in their communities in the context of El Niño episodes. Community leaders proved to be a valuable source of information. The findings suggest that community leaders do not perceive mobility as a salient strategy for facing ENSO. Some aspirations to migrate are identified, but abilities to make those aspirations a reality are lacking. Adaptation is more centered on a community level, and they highly rely on their organization skills and networks to face the consequences of the phenomenon, demonstrating social resilience. This study highlights the complexity of the (im)mobility continuum and the need to consider the interconnectedness of the different factors that explain migration proclivity at different levels. The study suggests future research, including applying a life course perspective on immobility, delving into the policy implications of the issue, and exploring other Peruvian contexts regarding ENSO.

Keywords: *environmental (im)mobility, El Niño, community leaders, adaptation strategies, environmental change*

Table of contents

Introduction	1
Theoretical framework	3
Community leaders.....	4
Mobility studies	5
Context.....	8
Research design.....	10
Data collection	10
Sampling methods	11
Data analysis.....	15
Results	15
Context.....	16
ENSO and infrastructure.....	16
Lack of State presence	18
Land trafficking	19
Effects of ENSO	20
Factors that affect the community’s ability to respond to ENSO.....	23
Relocation.....	25
Strategies and resources.....	28
Future and expected climate change.....	30
Conclusion.....	31
Discussion	33
Limitations.....	33
Future research	34
References.....	35
Appendix.....	40
Appendix A. Interview guide.....	40
Appendix B. Information letter and informed consent.....	42
Appendix C. Code book.....	46

Local community leaders' perceptions of environmental (im)mobility in the case of El Niño in Lurigancho-Chosica

Introduction

Perú is affected by multiple natural disasters, which has forced its population to constantly adapt to new circumstances to maintain their means of living; therefore, the country is highly exposed and vulnerable to various climate-related dangers, but vulnerability is unequally distributed among the population (Bergmann et al., 2021). From the country's weather events, El Niño-Southern Oscillation [ENSO] is a recurrent climate event with diverse effects in different regions and has had grave social, physical, and financial consequences (French et al., 2020). Although ENSO is not a product of climate change, studies forecast that with the planet's increasing temperature, the frequency of severe episodes will increase (Cai et al., 2014; Wang et al., 2017).

The last time ENSO had significant country-wide consequences was in 2017, specifically with coastal El Niño, a variant of the event. One of the most affected areas was Lurigancho-Chosica, located in Lima. Here, they suffer from landslides; rising temperatures caused by ENSO increase the precipitation levels, and rivers and creeks overflow, which, in turn, create landslides with heavy rocks that have destructive power in their passing (Depaula, 2019; French et al., 2020; French & Mechler, 2017).

Some measures have been taken to protect the population, especially infrastructural installations such as geodynamic barriers, dykes, and containment walls, but these have a limited effect, and people remain at risk due to the consequences of ENSO (Castro et al., 2023; Comeca et al., 2019; French & Mechler, 2017). There is a lack of information about the community's perceptions of environmental mobility as an individual or collective strategy for facing the effects of ENSO, and it is not included as a measure in any governmental or

municipal plans (Municipalidad Distrital de Lurigancho, n/d; Servicio Nacional de Meteorología e Hidrología del Perú, 2014).

It is crucial to study how community leaders from Lurigancho-Chosica perceive the possibility of environmental (im)mobility in their community as an alternative for facing the effects of ENSO because it is a recurrent event that will keep happening, and its intensity will exacerbate due to global warming (Cai et al., 2014; Wang et al., 2017). Additionally, if immobility is more salient, exploring other strategies communities recur to face the consequences of ENSO is interesting.

In risk management and disasters, community leaders possess essential knowledge about the community's vulnerabilities, resources, and experiences (Metzger & Boutron, 2013). Therefore, it is necessary to explore community leaders' perceptions of (im)mobility of the population due to the effects of ENSO. Gaining more understanding of how the community approaches the problem from the key informants' perspectives is crucial, as they possess essential information about the community's situation and policy implications; additionally, they constitute a way of gathering quality information (DiCicco-Bloom & Crabtree, 2006; Loto, 2021; Marshall, 1996; McKenna et al., 2011). Besides, in Perú, community organizations are prevalent and relevant, especially for safeguarding the community and dealing with challenging situations (Metzger & Boutron, 2013; Sanborn & Cueva, 2000).

This is a pressing issue in which more knowledge is needed because it has yet to be researched in this community and other regions of the country affected by ENSO. In addition, the consequences of ENSO will continue to take a significant toll on the community's livelihoods (French & Mechler, 2017; French et al., 2020). Lurigancho-Chosica is one of the areas hardest impacted by the phenomenon and has endured several consequences due to its vulnerabilities and lack of preparedness (Comeca et al., 2019; Depaula, 2019; French &

Mechler, 2017). Moreover, an ENSO phenomenon and the coastal El Niño are predicted for 2023 with a moderate to strong intensity (El Comercio, 2023, May 7; El Comercio, 2023, June 13; Montaña & Pinedo, 2023, April 16).

Therefore, this research will explore how community leaders of Lurigancho-Chosica perceive environmental (im)mobility in their community due to the effects of El Niño. The future implications for the community highlight the urgency of the present research. Exploring the perceptions towards environmental (im)mobility is a starting point for generating further evidence that will allow a better understanding of where the community stands concerning mobility facing ENSO and ultimately inform about the local social environment, discourses, and migration networks.

Theoretical framework

Mobility is one of the many strategies to face the consequences of climate events. The Foresight Report (2011) established the benefits of migration as an adaptive strategy to face climate events and environmental changes, and at the same time, pointed out the difficulties and costs that it represents:

“Environmental change is equally likely to make migration less possible as more probable. This is because migration is expensive and requires forms of capital, yet populations who experience the impacts of environmental change may see a reduction in the very capital required to enable a move” (The Government Office for Science, 2011, p. 9).

Mobility requires resources, networks, and political will; it can be temporary, permanent, voluntary, or forced (Black et al., 2013). Historically, cyclical movement patterns have been used to adjust to the supply and accessibility of resources; however, financial, societal, or individual possibilities might make transitory migration more lasting, as is the case of rural-urban migration (De Sherbinin et al., 2011; Zickgraf et al., 2022).

There is growing concern about a rise in migration or displacement in the face of impactful extreme climate events; however, immobility has gained less attention (Black et al., 2012; Zickgraf, 2021). Immobility is on the other end of the mobility continuum for populations unable or unwilling to migrate as a coping strategy, as pointed out by the Foresight Report (The Government Office for Science, 2011). This matter should be given equal or more attention to designing appropriate public policy responses (Black & Collyer, 2014; Zickgraf, 2021). Furthermore, in the discussion around migration as adaptation, Sakdapolrak and collaborators (2016) propose the translocal social resilience approach, which is also key for understanding the interconnectedness of the individual and community level to the structural factors of society.

In the current investigation, (im)mobility will be discussed based on community leaders' perspectives; therefore, it is pertinent to understand the role they play in Peruvian society.

Community leaders

In the Peruvian context, community organizations are widespread, especially in settlements (Metzger & Boutron, 2013). They are self-organizing and seek to contribute to the community's well-being and the social, economic, and cultural conditions (INEI, 2019). Social organizations gained more importance in the 80s when the presence of the State was lacking; they have served an essential role in the formation of leaders in different social groups to represent historically excluded topics from the public agenda, as well as promoting solidarity and community identification (Sanborn & Cueva, 2000).

They are also recognized by the State as important actors in different settings. The law for creating a national risk management system (Law N° 29664, 2011) includes social organizations as important actors (besides governmental actors, police, and military) for

optimizing risk management activities. The Municipality of Lurigancho also includes social organizations in their public safety strategies (Municipalidad Distrital de Lurigancho, n/d).

Evidence shows that social organizations are relevant when a disaster hits the community because they are a resource for managing emergencies, they appeal to the organizational capacity, are more knowledgeable about their territory, the population, and its vulnerabilities, as well as their resources and weaknesses, and lastly, they are a vehicle for communication between authorities and the population (Metzger & Boutron, 2013). More specifically, there are propositions to include social organizations in managing climate disasters (United Nations Development Fund [UNDP], n/d).

Mobility studies

As mentioned, mobility and immobility will be analyzed based on community leaders' perspectives; hence, this concept will be understood mostly from said perspective but not excluding individual cases or experiences narrated by participants. With the effects of ENSO in their communities and the likelihood that it will worsen over the years due to rising world temperatures (Cai et al., 2014; Wang et al., 2017), communities of Lurigancho-Chosica may perceive mobility as a strategy or maybe opt to rely more on their social resilience.

Mobility and immobility should be understood as flexible, complex, and multicausal concepts (Zickgraf, 2019). A climate event can be an important but one of the many reasons for an individual to migrate, and it is closely related to the chances of maintaining or finding means of subsistence (Black et al., 2013). Social, psychological, and cultural factors are also crucial when analyzing the reasons for wanting to leave or stay at a certain place (Zickgraf, 2019).

Understanding different currents of thought on immobility may shed light on this concept's different levels of analysis. A multilevel framework where components at the macro, meso, and micro-levels affect each other is vital for comprehending the organizing

factors in migration aspirations and other coping mechanisms for environmental changes (Van Praag & Timmerman, 2019). This way, it will help understand the different factors at play when analyzing the community leaders' perspectives.

With relation to the macro-level, the emphasis ought to be on the natural and social settings, the first consists of the type of environmental alterations and their consequences, and the latter comprises the monetary, political, and societal settings that affect how well a population can adapt to the effects of environmental events (Van Praag & Timmerman, 2019). At the meso-level, the discussions around global climate change play a significant role, as well as the assets and linkages accessible for migration events (Van Praag & Timmerman, 2019).

At the family level, the focus is on understanding environmental impacts on livelihoods and how they can be planned in order to compensate for the loss of a specific asset because of an environmental event, with the goal of maintaining the family's subsistence in a participatory way (Brocklesby & Fisher, 2003; Kniveton et al., 2008). Additionally, mobility can be understood as a calculated and voluntary plan of collaboration, shifting the attention from personal autonomy to mutual interrelatedness (Stark & Bloom, 1985). The household decides collectively whether to relocate to alleviate economic pressure or vulnerability (Zickgraf, 2021).

At the individual level, the interaction among aspirations and migration abilities is essential to understanding migration proclivity (Carling & Schewel, 2018; Van Praag & Timmerman, 2019). The first step consists of analyzing if migration is part of an individual's aspirations, and the second step is the ability to make it a reality, with its inherent opportunities and obstacles (Carling & Schewel, 2018). It is important to note that the latter is connected with broader structural aspects, such as income, wealth, and possible destination locations (Black et al., 2013); therefore, all levels are, in a way, intertwined.

Despite the importance of understanding factors at each of the levels previously mentioned, the analysis should include structural aspects. Sakdapolrak and collaborators (2016) argue for an interdependent relationship between the individual level and structural elements that shape people's abilities to adapt and cope, proposing the concept of social resilience. Centering only on the household as the analytical unit and rationalizing the decision to migrate excludes interconnectedness, social power relations, and structural limitations (Sakdapolrak et al., 2016).

Lastly, (im)mobility has important policy implications. If relocation is considered for dealing with the damaging consequences of environmental events, it requires a solid scientific and political base; at the same time, immobility also poses an important challenge for safeguarding the rights of immobile individuals (Black et al., 2013). If the goal is to encourage mobility, it is necessary to comprehend the processes behind immobility (Black & Collyer, 2014). Moreover, the framing and analysis of (im)mobility also influence the policy recommendations that emerge from it, leading it to center more on structural or individual aspects (Sakdapolrak et al., 2016).

Exploring the case of Chosica through the mobility versus immobility continuum in the face of a climate event will provide insights, through the perceptions of community leaders, into the community's environmental mobility, their local social environment, discourses, and migration networks, to provide knowledge about their decision-making process and if environmental events are sufficient factors to leave their place of residence. Based on their special global perspective, community leaders will provide an important overview of factors at different levels of analysis that might help understand how (im)mobility is experienced to deal with ENSO impacts in the district.

Context

ENSO is a recurrent climate phenomenon in the Pacific slope; it is a major source of climatic variability and comprises oceanic and atmospheric phenomena that cause fluctuations in the wind, sea temperatures, and rainfall (French et al., 2020). These have several physical and social consequences, depending on the levels of exposure and vulnerability, added to the lack of accurate predictability (French & Mechler, 2017; French et al., 2020). Of the countries affected, Perú is one of the most vulnerable (French & Mechler, 2017).

Although ENSO is not a product of climate change, studies forecast that at 1.5°C of warming, there would be a doubling of the frequency of severe episodes; the regularity of intense ENSO occurrences and the earth's temperature are positively associated, besides, with growing CO₂ levels, intense rainfalls are more sensitive to anomalies in sea temperature levels (the starting factor of ENSO), which results in a higher regularity of major ENSO episodes (Cai et al., 2014; Wang et al., 2017). Therefore, despite ENSO not being a consequence of climate change, it is highly vulnerable to it.

Because of its linkages with social, political, and economic hazards that indicate varying degrees of vulnerability, Perú is a highly exposed country (French et al., 2020). The country's urban development is related to its vulnerabilities; rapid urbanization has led to the proliferation of informal settlements located in hazardous areas (like dry riverbeds or steep territories) and built with materials vulnerable to flooding (Calderón et al., 2015; Seminario & Ruiz, 2008; Martínez et al., 2017; Practical Action, 2017). As a result, these settlements are highly affected by ENSO and severely underprepared to face it.

In the last coastal El Niño in 2017, around one million people were affected by the phenomenon; 143 fatalities were registered, 258 000 homes were affected, and 23 000 remained uninhabitable (Organización Panamericana de la Salud, 2017). Additionally, there

were also several health-related consequences, including physical and mental health (such as vector-borne diseases, zoonotic diseases, diseases transmitted through contaminated water and/or food, nervous-system infections, skin diseases, respiratory diseases and mental health issues such as anxiety, depression, post-traumatic stress and suicide) as well as damage to the health system infrastructure (Hijar et al., 2016; Maguiña & Astuvilca, 2017).

In Perú, Lurigancho-Chosica is a specific location where ENSO has considerable consequences; therefore, it is a pertinent case for exploring how community leaders perceive the possibility of environmental mobility. Lurigancho - Chosica is located in the department of Lima and is one of the most populated districts in the city (Instituto Nacional de Estadística e Informática [INEI], 2022, 17 January). Different factors contribute to the vulnerability of Lurigancho-Chosica to face the landslides that occur because of the overflow in rivers and creeks for higher precipitation levels due to ENSO (Depaula, 2019; French et al., 2020; French & Mechler, 2017).

There is a relationship between the consequences of ENSO and irregular land occupation in various sensitive zones (Comeca et al., 2019). With Lurigancho-Chosica's urban development, the surrounding areas of almost every creek and stream bed have been occupied for housing, leading to 27 zones and 30 000 families in high risk (Castro et al., 2023; Comeca et al., 2019; Depaula, 2019).

There have been preventive action attempts, such as retaining concrete walls and geodynamic barriers (Comeca et al., 2021; Castro et al., 2023; French & Mechler, 2017). Nevertheless, they are not properly maintained, leaving the population in greater danger because of the significant amount of debris and rocks trapped in these barriers, which could rupture and create great harm (Castro et al., 2023; Comeca et al., 2019).

The Municipality of Lurigancho-Chosica designed a plan to prevent and reduce risk (Municipalidad Distrital de Lurigancho, n/d). It includes different strategies, mostly based on

information, capacity building, and infrastructure-related measures, but it does not include any mobilization strategy. On a national level, the Government has invested in risk management facing ENSO; however, its actions are mainly focused on increasing its predictability, and not many other strategies are included (Servicio Nacional de Meteorología e Hidrología del Perú, 2014).

More evidence must be provided regarding the desire of the community to mobilize. Some evidence suggests that the population living in high-risk areas desires to be relocated (Comeca et al., 2019). Nevertheless, other cases, such as the case of creek Carosio, reflect the population's refusal to relocate despite the grave consequences they have endured due to landslides, and they continue living at high risk (Comeca et al., 2019; French & Mechler, 2017). Social sciences allow a deeper understanding of the complex processes behind the desire (or lack thereof) to mobilize and how hazard and coping strategies are perceived in affected communities (Depaula, 2019).

Therefore, in the case of Lurigancho-Chosica, leaders from social organizations can provide important insights about the community's perceptions towards environmental (im)mobility while facing the consequences of ENSO, as well as their views on policies and the community's adaptation.

Research design

Data collection

For the study, the main data collection instrument was semi-structured interviews. Additionally, during the process of interviews, the opportunity to do field work arose. It was possible to go twice to the field and see the different houses affected by ENSO, the infrastructure that has been installed to prevent more damaging landslides, and to learn first-hand the different levels of vulnerability and problems afflicting the district, such as extreme poverty and land trafficking.

Based on the research objective, ten in-depth semi-structured elite interviews were conducted. In these, a set of questions was organized into topics that served the interviewer as a guide. Nevertheless, the interview aimed to explore the participants' perceptions and opinions about immobility regarding El Niño in Chosica; therefore, the process also maintained flexibility, and the questions and topics explored were also dependent on the interviewee's answers and what they perceived as a priority.

The interview had 12 overarching questions that guided the process and allowed flexibility and openness in the conversation (see interview guide in Appendix A). The first domain of questions was about context as a way of introducing the topic and learning more about their role in the community. The second domain was about macro-level factors to explore the ENSO phenomenon and its effects. The third domain was about meso-level aspects for exploring the perception of the community leaders about the discourses around migration and ENSO. The fourth domain was regarding micro-level factors, specifically their perceptions about the members of their community regarding aspirations and abilities for migrating. The fifth domain was about the interaction between the elements, and the last part was about their perspectives on the future and climate change's possible role in ENSO. Lastly, the participants were thanked for their participation and asked if they had anything else to add or any other questions regarding the investigation.

Sampling methods

Participants of the study were ten local community leaders from Lurigancho-Chosica, with the requirement that they have a particular involvement with the prevention and attention to ENSO. The criteria for selecting key informants are their role in the community, knowledge or information on the desired topic, willingness to participate in the study, ability to communicate their knowledge to the general public, and impartiality (Tremblay, 1957). Interviewing key informants allows for gathering quality data in a short time (DiCicco-Bloom

& Crabtree, 2006; Loto, 2021; Marshall, 1996; McKenna et al., 2011). Additionally, there was an attempt to have a gender balance among the leaders interviewed because there is a possibility that men and women approach the issue differently, and it is essential to highlight women-based organizations (Loto, 2021) as they may differ in their perceptions regarding environmental mobility.

The participants were recruited through target and snowball sampling (Hernández et al., 2014). The search for participants started with contacting institutions that work in the district, especially with community leaders and/or climate-related events, and asking them if they could help reach community leaders for an interview. The list of institutions was based on an extensive online search of organizations in the area, including non-governmental organizations, the Municipality of Lurigancho-Chosica, and religious institutions. This was done both online and in person.

Only one NGO answered and put me in contact with a community leader from a human settlement in the district. Afterward, she was a key figure in reaching other community leaders for interviews, starting a snowball sample, getting to know the district during the fieldwork, and seeing the different levels of vulnerability for facing ENSO. Furthermore, when going personally to the church, it was possible to interview the parish priest briefly. The rest of the attempts to contact institutions did not work, despite having tried several times and in many different ways (online, telephone, and in-person visits).

Most of the participants belong to two human settlements in the district that are regularly affected by ENSO because they are built around riverbeds. The first five interviews were done face-to-face, and the next five were done via telephone because of a rise in Dengue cases in the district (Hinostroza, 2023, June 1; Instituto Nacional de Salud, 2023, February 26; Valdivia, 2023, March 15). The interviews lasted between 15 and 70 minutes, depending on the person's availability and openness, and they were performed in Spanish. There was a

gender balance regarding the interviewees, which was purposefully looked for. Participants had different and important roles in their communities (See Table 1), and they all proved to be very knowledgeable about the prevention and attention to ENSO episodes.

Table 1.

Sociodemographic data of respondents.

Code	Age	Gender	Education level	Occupation	Social organization affiliations	Role
P1	59	F	Incomplete superior education	Retired	Emergency operations and disaster management committee of human settlement A	Leader
P2	63	F	Superior	Preferred not to disclose that information	Emergency operations and disaster management committee of human settlement A	Health commission
P3	68	F	Incomplete technical education	Household	Emergency operations and disaster management committee of human settlement A	Brigadier
P4	71	M	Incomplete superior education	Retired President of the district (past) Military (past)	Political party	Member
P5	61	F	Incomplete superior education	Household Social worker (past)	Emergency operations and disaster management committee of human settlement B	Brigadier
P6	47	F	Incomplete secondary school education	Owner of a store	Community's directive	Director
P7	65	M	Unknown	Retired	Community association of human settlement B	Leader
P8	Unknown	M	Unknown	Parish priest	Parish	Parish
P9	58	M	Superior	Teacher	Community association of human settlement B	President
P10	68	F	Complete technical education	Retired	Community association of human settlement B	Water committee, billing, and secretary to the community's president.

In the first contact, participants were asked if they were knowledgeable about ENSO in their communities and then were informed about the investigation and their voluntary

participation. After that, this aspect was highlighted with the information and consent form, where every important part was detailed, and questions were resolved (See Appendix B). Through this, it was also made explicit that the participants were free to withdraw from the investigation and/or interview at any moment if desired. Before the interview, participants were also asked for their permission to record the interview, and they were aware that it would be transcribed verbatim and, after doing so, stored with a code.

There were also two field trips, both in human settlement A and took place after the first interview. I was guided by the Emergency operations and disaster management committee leader of human settlement A. I saw the different infrastructures installed to prevent ENSO (such as the geodynamic nets, dykes, and containment walls), houses that were recently built in hazardous areas and that are going to be very vulnerable in the next ENSO episode, and houses that were half destroyed because of landslides. Additionally, I spoke with affected people who were open to discussing the missing essential services in their communities and resources to face ENSO episodes. During these visits, the extreme poverty levels in the communities were very visible. The field trips allowed me to have better interviews because I knew more about the topic and the infrastructures or places they sometimes refer to. It also allowed me to be more confident in the questions and build a better rapport. Besides, it allowed me to comprehend more about the level of scarcity in their communities.

To finalize the ethical aspects of the investigation, it is essential to mention that I was prepared to handle possible strong emotional responses from participants during the interview. The questions could elicit emotional responses due to the proximity to the issue and potential personal implications or affections. To handle this situation, a set of measures was prepared to safeguard the participant's emotional well-being, which included a possible derivation to accessible psychological services.

Data analysis

The data analysis process started after the information was collected through a series of interviews. Interviews were transcribed verbatim, and then the transcriptions were analyzed using Atlas.ti. The process was characterized by open coding, selecting the recurrent themes brought up by participants that were according to the research question (Boeije & Bleijenbergh, 2019). The first four interviews were coded first, and then a list of codes was created; afterward, the codes were reviewed and compared with the research question to evaluate their pertinence for the investigation. Finally, a tree code was elaborated; the coding for the first four interviews was reviewed and, when pertinent, corrected, and then the rest of the interviews were coded (See Appendix C for the code list).

For the analysis, a thematic analysis was followed, compatible with a constructionist paradigm, “[...] a method for identifying, analyzing, and reporting patterns (themes) within data” (Braun & Clarke, 2006, p. 6). The themes that emerged during the analysis were the following: information about context, effects of ENSO, factors affecting risk response, relocation, strategies and resources, and future and climate change. These themes will be further discussed in the results section.

Results

Community leaders proved to be a valuable source of information regarding El Niño in Lurigancho-Chosica. The human settlements of the district are organized in associations, and one of their responsibilities (among others) is to work in the prevention and attention of ENSO in their specific locality; they all have an elected ‘president’ of the community with its team, and one human settlement also has a committee for risk management and prevention. Community leaders are in charge of organizing the efforts around ENSO and are very knowledgeable about the phenomenon and different characteristics of their communities, in line with what Metzger and Boutron (2013) propose about social organizations. They also

appear to be important figures in their communities, as there is significant respect towards them, and all the inhabitants know them. They are also key figures in forming community identity, just as Sanborn and Cueva (2000) state.

They are also important figures when it comes to communicating with authorities or pushing for demanding more resources, or presenting projects. They serve as a bridge between non-governmental organizations and other institutions interested in working or contributing to the community. They gave specific examples, such as communicating with the National Water Authority, the district Municipality and the provincial Municipality, and the National Center for Managing Risk and Disasters, among others.

They constantly dedicate themselves to learning more about their communities and the possible problems that may arise; therefore, they are continually learning more about ENSO and its implications. Risk management is an essential topic of interest since their efforts in managing the effects of ENSO mainly center around reducing risk for the population.

Context

ENSO and infrastructure. All participants perceive the importance of ENSO in their communities and have been affected multiple times by it. As community leaders, they are also very knowledgeable about the meteorological and environmental details of the phenomenon, its unpredictability, and its different impacts on their communities. Additionally, they are informed about the different infrastructures required to face the effects of ENSO at the community and household levels.

Further, they highlighted that their communities have significantly grown in the last decades, and many new families are still moving there, resulting in a salient migrating background in the community. This leads to many new surrounding areas being inhabited and new hazards to consider. Furthermore, they pointed out that having essential services has

been a long process, most of them still do not have access to drinking water, and Participant 6 noted that they still do not have drainage systems, or electricity, because they are from a recently settled community that the Municipality has not yet recognized.

Infrastructure is crucial because it influences people's perceptions of risk and their abilities to face the consequences of ENSO at the community and individual levels. At the community level, many participants recognized the importance of specific infrastructure to prevent the damages caused by landslides, for example, the two geodynamic grids built by the central Government, dikes, and retaining walls. Nevertheless, these installations require maintenance from specialized personnel and machinery to maintain their effectiveness in preventing heavy rocks from sliding when heavy rain falls. Participant 5, a brigadier from human settlement A who has seen many *huaicos* [landslides] pass, notes:

I have seen that over the years, they have done canalization, right? And I have also seen that they have installed the nets, the retaining walls, so that it goes down because before the stones that came down, came down to the highway, right?¹ (P5, female, 61 years old, brigadier)

She recognizes the progress made throughout the years in terms of infrastructure because before when landslides came, the debris fell all the way to the main highway. She maintains a more positive outlook on the matter, while Participant 1 explains the lack of maintenance and how there is mismanagement from the authorities:

But as I said, our authorities have not been aware of risk management issues, and these structures have been neglected; of the two geogrids we have, we have seen that they have removed the material in recent years but have not done the maintenance. (P1, female, 59 years old, community leader)

¹ The quotes were translated by the author and may have been slightly adjusted to improve readability.

At the individual level, they perceived that in their communities, characteristics of houses' infrastructure amount to a significant level of vulnerability when ENSO occurs. Many houses are built in or nearby riverbeds or gullies, not giving the necessary space for the water to pass. Participant 7, a leader of a locality inside human settlement B that is constantly affected by heavy rains and landslides due to ENSO, states:

The landslide strip should be 25m wide on both sides of the riverbed, but unfortunately, nobody respects that, here the landslide is in a strip 7, 8 meters wide, and on the sides houses, on one side, houses, on the other side, houses [...] here, unfortunately, people do not respect that, they wait a little bit for the time to pass, there is no landslide for a year, two years, and then they put their house on the edge.
(P7, male, 65 years old, community leader)

Participant 7 explains that many houses in his community are built in riverbeds where landslides pass. However, since a year or two can pass without a landslide happening, people “forget” about the phenomenon. Participants mention many factors that explain this. First, the necessity to access a plot of land and not be able to afford it elsewhere. Second, is the lack of knowledge regarding the effects of ENSO because, due to the phenomenon's frequency and unpredictability, people who have recently moved there may not know about its effects. Lastly, linked to the next sub-code, the lack of State presence and reinforcement of zoning regulations also explains why houses are built in hazardous areas.

Lack of State presence. Many participants (7) point out the lack of State presence and its consequences, primarily from the district Municipality. One crucial aspect is the lack of ability to reinforce zoning regulations and lack of orientation because many houses in their communities are built in hazardous areas, in the paths where *huaicos* pass, and have a potent destructive power when they are active. The Municipality does not act to prevent houses from being built in dangerous areas, even though it is technically forbidden. Participant 7 explains

that in his community, this is mainly from a lack of information and reinforcement: “lack of guidance... generally from the authorities, for example, the Municipality should put a limit in the sectors where there are landslides and ditches so that people do not grab land that is generally abandoned” (P7, male, 65 years old, community leader).

Another critical factor is the lack of resources and aid they receive from the Municipality, especially in moments of crisis or after a disaster when they need to rebuild their homes. Participants point out that their communities get more attention only when it is convenient (such as during the election period) and highlight the problem of corruption. As Participant 9, the president of the community from human settlement B, states, “this does not worry the authorities; they are busy with other things, corruption, and robberies, those situations, they do not see the underlying problem” (P9, male, 58 years old, president of the community).

The quote refers to how the authorities look the other way regarding prevention and risk management strategies, as well as a lack of recognition of the actual issues that afflict the communities.

Land trafficking. Land trafficking is also a significant issue in Lurigancho-Chosica. Some participants mentioned this, and it was mainly seen during the fieldwork. Land traffickers illegally occupy areas zoned as hazardous by the Municipality or zones that should be arborized. They bring machinery, make them livable and then sell them to people at a cheaper price but do not give a property title. Land traffickers do not care about the safety of the people that live there and try to sell every possible piece of land, so it ends up being a community without roads, ladders, or any evacuation route. As Participant 6 notes:

They do not care as long as they sell the land, right? They sell everything they sell for money; every corner that is empty they sell it, and then the people, out of necessity, [...] but we are at risk here, if we do not get our act together as you say, if we do not

get our act together or leave the sites that are in danger, like here the site of the landslide they have sold everything, and the people have been affected by the landslide. (P6, female, 47 years old, director of the community's committee)

These areas have been inhabited in recent years; they are located going up the hill and are only accessed on foot. People living there live in extreme poverty without access to essential services or institutions, and when the rain and landslides start due to ENSO, they are the least equipped to deal with its effects.

Effects of ENSO

The interviewed community leaders mentioned several effects of ENSO in their communities, which can be grouped into five categories: water supply problems, economic impacts, infrastructure, migration, and health-related consequences. First, regarding the water supply issues, participants mentioned that every time there is an ENSO episode, there is automatically a water shortage because treatment plants and pipes are affected. The Municipality sometimes offers water tanks, but mostly they have to source water in different ways, costing more money and significantly more effort. As Participant 5 explains, "they cut off our water completely because when the landslide comes down, it breaks the water trunk lines, the water pipes, so we have no water supply, and we have to buy water [...]" (P5, female, 61 years old, brigadier).

Some parts of the district have water and sewage systems, but the water they receive is not drinking water. Buying water from water trucks and storing it in tanks is very common. When landslides break water pipes, and highways are also affected, the overall access to water is severely affected, and therefore sanitation and consumption. Because of scarcity, water becomes more expensive; on top of that, people must walk long distances to buy it.

Second, the economic effects of ENSO in the communities are a significant issue that all participants highlighted in their interviews. Families' livelihoods are heavily affected by

ENSO because they cannot go to work, and they have additional expenses (such as water and repairs they might have to do in their houses due to the damages). As Participant 4 notes:

But those who work on a day-to-day basis have been affected, because food prices have gone up, and the cost of going to buy products, they had to walk, or spend a little more to get them, so all of this has affected them. Their economy and the economy of those who did not have anything to buy their products, that is how it is; it has affected all of us. (P4, male, 71 years old, member of a political party, former president of the community)

The rise in prices and shortage of basic supplies due to the affected highways affects the entire population of Lurigancho-Chosica, but as Participant 4 explains, the most affected are the most vulnerable. Most people who live in human settlements earn day-by-day, so the pressure of rising prices and being unable to go to work results in important economic consequences.

Third, the infrastructural consequences of ENSO can be seen primarily in houses but also in schools and roads. Many homes are destroyed or partly damaged by landslides, also because they are built in high-risk areas. As Participant 3 pointed out:

In 2017 the landslide did come down hard, high, but it did not carry houses; it only broke the houses that are inside the riverbed; if they were outside the riverbed, nothing would happen to them, but they have gone deeper into the riverbed, and that is why...

Interviewer: That is why part of the house has been washed away...

Of course, miss, since I live there, and I am there, thank God, I should not go out of my way, so if I am looking for my own accident, then, miss. (P3, female, 68 years old, brigadier)

The impact on houses also depends on the materials that they are built with. Participants also pointed out that, since there are high levels of poverty in their communities, many houses are built with precarious materials that are more prone to being damaged by landslides. Some participants also mentioned other infrastructural effects of ENSO, such as damages to school infrastructure and road blockages that heavily affected their everyday lives and responsibilities.

Participants also talked about the health-related effects of ENSO, primarily emotional and psychological consequences. ENSO episodes are described as fear-inducing and related to powerful emotional experiences due to the exposure to risk that they experience. As

Participant 3 narrates:

Well, most of them, as you can understand, most of them are... as you can say, they are scared, right? people are scared, some abandon their homes and go to the hills, to some safe place, that generally affects everyone, emotionally, right? people are traumatized, because the fear is big, because when landslides come, they come with force, they sweep away everything. (P3, female, 68 years old, brigadier)

Only one participant mentioned the physical health-related risks of water scarcity, because of hygiene problems. Lastly, only one participant noted that a consequence of ENSO is forced migration. Families that have completely lost their house choose to migrate somewhere else as a last resort, as Participant 1 narrates, “[...] we have about 5 of the 16 [affected families] that have left; the families have chosen to move to another place because their houses have been totally destroyed” (P1, female, 59 years old, community leader).

The families that left had some type of network in other parts of the country, which facilitated their migration. Nevertheless, community leaders do not perceive migration as a salient effect of ENSO in their communities.

Factors that affect the community's ability to respond to ENSO

Community leaders identify several factors that affect the community's ability to respond to the effects of ENSO efficiently. These factors are part of the broader and more structural characteristics of the communities, which results in difficulties when dealing with them. As participants explained the community's challenges in facing the consequences of ENSO, three categories can be identified: political, social, and infrastructural. Political factors are more frequently mentioned by participants, around 14 times in all interviews. They describe the lack of interest and political willingness from authorities to address the issue of floods and landslides and work on the prevention of risk, as Participant 1 narrates:

The indifference of the authorities that, I always say and think, that because they are not aware of risk management issues, there is indifference, the indifference of not enforcing the rules [...] because they are allowing, for example, the position of more houses [...] and because of the need for housing, some knowing the risk themselves, and our authorities, as they say, deaf, blind and mute. (P1, female, 59 years old, community leader)

The Participant explains how the district Municipality does not take the responsibility that it should in relation to risk management strategies (such as enforcing zoning and arborization areas). Therefore, through their indifference, they are contributing to the dangers that the people from the community experience.

Participants also pointed out that the authorities only visit their communities and make promises during elections. During the fieldwork, it was also brought to the attention that many of the houses are built in high-risk and intangible areas and that the Municipality does not take any action to prevent or address this. There seems to be a willing ignorance or lack of willpower to do something about land traffickers.

This is also linked to the social and infrastructural factors mentioned by participants. On one side, they recognize the responsibility of people who decide to build their house on or near the riverbed and note the lack of knowledge and stubbornness to move to a safer area (See Picture 1). This also causes the river flow to narrow and have greater strength in its passing. On the other hand, the lack of secure and preventive infrastructure is another crucial factor, which means there are not enough containment walls, geodynamic barriers, and dams, and the authorities do not adequately maintain the existing ones (See Picture 2). This was also noted during the fieldwork because, for example, one of the geodynamic barriers that were built is already full of rocks, so it will not be of any help for the next ENSO episode, which is predicted to start in July 2023.

Picture 1. *Houses build attached to the riverbed's containment walls (the picture was taken during the fieldwork).*



Picture 2. *Geodynamic barrier filled with debris (the picture was taken during the fieldwork).*



Relocation

Regarding relocation, community leaders were asked about their perception of the aspirations and abilities to migrate from community members, which is essential for understanding migration proclivity (Carling & Schewel, 2018; Van Praag & Timmerman, 2019). Some participants clearly identify migration aspirations in members of their community, which they explain by the constant stress experienced by the effects of ENSO on their livelihoods; nevertheless, they also perceive that the abilities to fulfill these aspirations are limited, primarily because of financial constraints. Only households who seem to have completely lost their homes or are at a higher risk surpass these limitations but migrate to an uncertain future. Some participants do not seem to consider migration a possible strategy.

Six community leaders recognized people's desire to leave the district, primarily people in high-risk areas who have been or are at risk of being affected by landslides. They also mentioned that people with less time living in the community are more likely to prefer to migrate elsewhere. The desire resides in living in a safer area and is characterized by fear of the current situation; as Participant 1 explains, "others would like to leave, as they say, "We would like to go to a safer place," but what do we do when nobody gives them a solution of where to go?" (P1, female, 59 years old, community leader).

Economic factors are the main reasons that stand in the way of migration abilities. Seven participants mentioned that financial barriers are the primary reason why members of their community are not able to fulfill their migration aspirations, as Participant 9 clearly states:

Interviewer: And do you think there are people in the district, or families, who would like to migrate, to go somewhere else?

All the population would like to do that, but they do not know where to go. Even less so because their economic situation does not allow it; that is why it is a human settlement. The people that live here have many needs. (P9, male, 58 years old, president of the community)

Additional aspects, such as the difficulty of selling a house in a high-risk area and the fear of repercussions by land traffickers, also get in the way of migrating plans.

In contrast, community leaders also identify the desire to stay despite the risks. They mentioned that members of their community desire to remain living in their communities because they are already settled and connected; additionally, older generations of their families have also lived and died there. As Participant 4 explains:

Interviewer: And do you think that the people living near the gullies would be willing to be relocated?

They have been consulted... but on one occasion they wanted to give them land in a very distant place, right? in Ventanilla [another district in Lima], but they did not want to because their workplace is around here, their family environment is around here, so for those reasons they did not want to relocate [...] (P4, male, 71 years old, member of a political party, former president of the community)

This community leader is also talking about the relocation proposal made by the Government, but the population did not accept it due to the conditions. The proposal consisted of moving families that had lost their house and giving them a bonification for a one-year rent for an apartment in another district in Lima, but it seemed to stop there. People stayed in the community because they had larger families that would not fit in an apartment, they had to change their habits (and their work) drastically, the time was limited to one year, and they also perceived environmental risks in the new district because it is close to the ocean. This way, the relocation proposal did not consider the families' subsistence or the loss of assets as they relocated and was not done in a participatory manner (Brocklesby & Fisher, 2003; Kniveton et al., 2008).

Beyond the aspirations and abilities for migrating identified by community leaders, some see relocation as the only or inevitable long-term alternative. Participant 4 frames it for the importance of the health and welfare of a person:

[...] but from another point of view, I think it would be the best thing to do, thinking about the health and welfare of the person, because I think that at any moment, well, a major *huaico* is going to happen and perhaps no matter how many walls we have, it is going to end. (P4, male, 71 years old, member of a political party, former president of the community)

Similarly, Participant 7 perceives that landslides cause significant emotional stress and that people may reach their limit, leading them to an unavoidable alternative such as leaving their homes:

Interviewer: Do you think that some people in the community, in the future, will want to leave for these reasons?

Yes, for sure, there are some who reach the limit of their emotional capacity and say that they better leave, sell their house and leave, there are people who do think about leaving, but sometimes the situation is tough [...]. (P7, male, 65 years old, community leader)

Lastly, participants also recognize a few families that have left the district because of the effects of ENSO. The exact number remains unclear, but they perceive that the motivator is the landslides because some of the families that left had their houses completely destroyed by ENSO. The remaining families had a house near the riverbed, which makes it clear that they left because of the risk. During the fieldwork, it was also possible to identify the abandoned houses that were half destroyed by the *huaico*.

Strategies and resources

Participants' answers primarily centered around community organization when asked about strategies to face the consequences of ENSO. In other words, the community heavily relies on their organization abilities to cope with a recurrent environmental phenomenon that will likely worsen over the years. It is possible to hypothesize that they do not seem to perceive assets and linkages accessible for migration, which in turn influences the migration proclivity (Carling & Schewel, 2019; Van Praag & Timmerman, 2019) because community organization is a strategy that will most likely encourage them to stay in place and try to face the effects of ENSO.

Most of the strategies mentioned by participants are based on community organization, and these are options that are opted for before a migration or relocation strategy because they are more accessible and plausible, despite lacking resources. Nevertheless, participants also note that their efficiency is limited, requiring significant time and disposition from the inhabitants.

Some concepts mentioned by community leaders go in hand with the concept of social resilience proposed by Keck and Sakdapolrak (2013), such as coping, adaptive and transformative capacities. Participants mentioned that they work proactively on prevention strategies and evacuation routes before emergencies, forming brigades and an emergency operations committee. Participants also mention that in their communities, using bags of sand is one of the most popular strategies to prevent water from entering their houses. However, their efficiency is limited because the sand spreads out when they break, and they are no longer helpful. Additionally, members of the community attempt to build their houses with noble materials and build concrete walls in strategic places to defend themselves from *huaicos*, but this is subject to economic resources, which are very scarce. Participant 7 illustrates his perception of the efficiency of these strategies:

At least a little bit defends you, but anyway, when it comes in large quantities, not even that, it doesn't stop it, because the water overflows, the water overflows everywhere and the water comes out, it overflows, but at least it helps something, when they are small gullies at least it defends the house somewhat, But if there is a big landslide, because here in San Antonio there are always strong landslides, of great quantity, and then sometimes when there is a landslide, neither the earthen bags nor the pircas [wall of rough stones] save you, in any case, what has to happen has to happen. (P7, male, 65 years old, community leader)

When emergencies hit, they have reactive strategies such as an alarm system through WhatsApp to monitor the situation, and they organize the community to provide economic support for the most affected families who partially or entirely lost their houses. This would, ideally, restore the previous levels of well-being after a critical event (Keck & Sakdapolrak, 2013). Additionally, according to community leaders, they have limited transformative capacities because, despite the help they sporadically receive from academic or non-governmental organizations, they do not have much access to resources and help from the larger socio-political environment such as the district or provincial Municipalities or the Central Government, and they do not partake in the processes of decision making.

While making a balance of resources, community organization was a salient asset for community leaders. Three participants highlighted it as a valuable resource and one to which they have more access to. These three participants belong to the same settlement, which has made important progress in community organization. In contrast, when asked about the missing resources, the first non-verbal reaction was disbelief in the question, as if the query exceeded the time given for the interview. Participants highlighted the lack of economic and material resources to face the effects of ENSO, a lack of awareness from the general population, and a lack of time for people to dedicate to prevention strategies. Participant 7 points out, “ah well, if it were a matter of making a list, we would have nothing to resort to because, for example, here, we lack everything” (P7, male, 65 years old, community leader).

Future and expected climate change

Regarding the perceptions about the future, participants had, overall, a negative outlook. Nevertheless, they also put much emphasis on the organization of the community regarding prevention to be able to deal with the phenomenon in the future. They recurrently mentioned three aspects: the future material damages that their communities will suffer

because of landslides and rain, the higher frequency of the phenomenon, and the lack of resources that will remain unchanged.

Four participants recognized climate change as a factor that may influence ENSO. Three participants pointed out the uncertainty, relating it to the variability of nature and climate phenomena. One even mentioned that climate change sometimes benefits them because ENSO sometimes hits harder in the country's Northern regions. One participant clearly stated that climate change will impact the frequency and strength of the phenomenon, as he said:

Interviewer: And do you think that in the future, the El Niño phenomenon and landslides will be more recent or stronger?

In my opinion, with all this climate change, it is going to be stronger, because for example, now the weather is horrible here, it is cloudy every day, and, we are prone to any danger because the climate has changed a lot, it is not like before, now, at any moment there is rain and then a landslide comes, here more than anything because of the terrain because it is sandy when there is enough water, it drags the sand with it.

(P7, male, 65 years old, community leader)

Discourses around climate change centered mainly on its uncertainty, but there was not much emphasis on the possibility that the phenomenon would worsen over the years. Therefore, it was not possible to identify how meso-level factors, such as discourses around climate change, could play a significant role in migration aspirations.

Conclusion

This research aimed to explore community leaders' perspectives on environmental (im)mobility for facing the effects of ENSO in Luriganchos-Chosica. Findings suggest that community leaders do not perceive mobility as a salient or viable strategy for facing the effects of El Niño, which is explained by many factors. Adaptation is more centered on a

community level, and communities from Lurigancho-Chosica highly rely on their organization skills and networks to face the consequences of the phenomenon. Some aspirations to migrate are identified, but abilities to make those aspirations a reality are lacking.

During the course of the research and in accordance with what was assumed prior to the fieldwork, community leaders proved to be a valuable source of information (Metzger & Boutron, 2013) and explained how ENSO strongly defines the context of Lurigancho-Chosica, as it is a salient issue that affects the livelihoods of their communities. Several ENSO consequences were in accordance with the ones found in the literature, such as the infrastructure, in terms of damages to houses, schools, and roads; and health-related effects primarily regarding psychological consequences (OPS, 2017; Hajar et al., 2016; Maguina & Astuvilca, 2017); additionally, other important effects were identified, such as water supply issues due to shortages caused by damages of water pipes and plants, economic effects because families' livelihoods are heavily impacted on account of rising prices and the inability to work, and lastly, forced migration of families who had their house completely destroyed.

Many political, social, and infrastructural factors affect the communities' ability to respond to the phenomenon. The data analysis indicated that the vulnerabilities are linked to the country's urban development due to the urbanization processes that ultimately lead to inhabiting hazardous areas and irregular land occupation (Calderón et al., 2015; Castro et al., 2023; Comeca et al., 2019; Depaula, 2019; Seminario & Ruiz, 2008; Martínez et al., 2017; Practical Action, 2017), which are the areas that are identified as the most prone to danger. Through the interviews, it was possible to delve into the mobility versus immobility continuum and the different factors that play a role in it in the specific case of Lurigancho-Chosica, through the perspectives of community leaders. According to community leaders'

perspectives, migration proclivity varies in their communities (Carling & Schewel, 2019; Van Praag & Timmerman, 2019). There are aspirations for migrating, but financial constraints weaken them; additionally, relocation proposals have not succeeded for not considering the families' livelihoods and agency (Brocklesby & Fisher, 2003; Kniveton et al., 2008).

Community organization appears to be the reliable and accessible strategy, demonstrating social resilience in their capacities (Keck & Sakdapolrak, 2013). Therefore, it is apparent that adaptation centers more on the community than the individual or household level. Despite perceiving community organization as an essential resource for facing ENSO, the limit in its efficiency is also recognized, maintaining high levels of vulnerability because of a lack of material and infrastructural resources. This is also linked to the negative outlook on the future because they perceive that this scarcity of resources will remain unchanged, adding to the perception that ENSO episodes will be more frequent.

Lastly, researching ENSO and its implications becomes even more relevant during the fieldwork because an ENSO phenomenon is predicted to start in June 2023. Additionally, during March, unexpected heavy rain due to an unprecedented cyclone brought climate issues to the public eye.

Discussion

Limitations

There are important limitations to recognize for the present research. First, a significant limitation took place during the interview period. Recruiting participants became more difficult because there were warnings about not going to Lurigancho-Chosica because of a rise in Dengue cases (Hinostroza, 2023, June 1; Instituto Nacional de Salud, 2023, February 26; Valdivia, 2023, March 15). This led to half of the interviews via telephone, which ultimately changed the rapport during the interview. This is also linked to the second limitation, the time constraint for conducting the interviews. Initially, a more extended

interview guide was prepared to build rapport and slowly approach the topic of mobility. However, the process was cut short for some interviews due to time constraints.

Lastly, another limitation is that the interviewed community leaders were primarily from two human settlements in the district of Lurigancho-Chosica, and they were more knowledgeable about their specific settlements and communities than the district in general. This leaves areas of the district needing to be explored.

Future research

For future research, applying a life course perspective on immobility is suggested. This would include a comparative perspective in environmental migration research by exploring the role of age variations and life course phases (Van Praag, 2021). Moreover, it is essential to delve into the policy implications in the Peruvian context in this issue, given that currently, there is a lack of (efficient) policy regarding ENSO and (im)mobilities. Lastly, exploring other Peruvian contexts in which ENSO is also a critical climate phenomenon that strongly impacts livelihoods, such as the country's Northern regions, is crucial.

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Appendix

Appendix A. Interview guide.

Sociodemographic data

Name:

Age:

Sex:

District of residence:

Education level:

Occupation:

Affiliations to social organizations:

Position in the organization:

Interview guide

Domain	Question	Follow-up question	Goal
Introduction	1. Could you tell me a bit about the place where you live?	How would you describe the district?	Establish rapport with the participant and explore their role in the community.
		How would you describe the infrastructure of the district?	
		How long have you lived in this district?	
	2. Could you tell me about your role in the community and the organization/institution of which you are a member?	What is the role of the organization/institution? Has it changed over time?	
Macro-level factors	3. What are the effects of El Niño on the community? How would you describe them? Could you give me some examples?	What are the effects at the social level?	Introduce the topic of the El Niño phenomenon and explore the effects of the phenomenon on the population.
		What are the effects at the economic level?	
		What are the effects on community livelihoods?	
		What are the effects on the infrastructure?	
	4. What are the social, political and economic factors that affect the response / adaptation capacity of the population?		Explore the different factors that affect the adaptation of the population to the phenomenon.
Meso-level factors	5. How do you perceive the opinions/attitudes of the	What interpretation does the population give to the effects of El	Explore the participant's perception of the

	community regarding migration?	Niño phenomenon? What role does climate change play in perceptions of the El Niño phenomenon?	prevailing discourses on migration and the El Niño phenomenon in the community.
	8. How do you perceive the community's ability to cope with the effects of El Niño?	What resources do you think the community has? What resources are missing?	Explore the capacities of the community to face the effects of the El Niño phenomenon.
Micro-level factors	5. Do you think that several people want to migrate/leave the district? Do you have the impression that this changes due to El Niño phenomenon?	How are aspirations connected to income levels, education, age, etc.?	Explore the participant's perception of the community's aspirations regarding migration due to the El Niño phenomenon.
	6. Do you think that these people who want to leave the district can do so? Why yes or why not? Is it the same for everyone?		Inquire about the perception of the participant about the abilities of the members of the community to migrate, if they so wish.
Interaction between factors	9. How do macro- level factors (e.g. socioeconomic conditions) affect people's abilities to migrate?		Know the perception of the participant regarding the interaction between the factors.
	10. What other alternatives/strategies to deal with the effects of El Niño does the population use?	How do you perceive the effectiveness of the other alternatives?	Delve into other strategies used by the community to deal with the effects of the phenomenon.
Future perspectives	11. How do you perceive this situation in the future?		Know how the participant perceives the situation in the future.
	12. What role does climate change play? What do you think are other factors that play a role in the El Niño phenomenon?		Find out if the participant perceives climate change as a factor that can aggravate the situation.
Closure	Thank you very much for your participation in the study. Would you like to add anything else? Do you have any questions about the investigation?		Make a short summary of the interview and close it. Resolve any questions that may arise about the study.

Appendix B. Information letter and informed consent.**Formulario de información y consentimiento**

Percepciones de líderes comunitarios locales sobre la (in)movilidad ambiental en el caso de El Niño en Lurigancho-Chosica

Introducción

Soy Antonia Lerner, estudiante de maestría y actualmente estoy haciendo una tesis en la Universidad Erasmus de Róterdam. Estoy realizando una investigación sobre movilidad ambiental en relación al fenómeno del Niño en Lurigancho-Chosica.

A continuación, explicaré el estudio. Si tiene alguna pregunta, por favor pregúnteme. Mientras lee, puede marcar partes del texto que no estén claras.

Si desea participar en el estudio, puede indicarlo al final de este formulario.

¿De qué trata la investigación?

La investigación consiste en las percepciones que tienen los líderes comunitarios de Lurigancho-Chosica sobre la (in)movilidad ambiental en su comunidad por los efectos de El Niño. Explorar las percepciones sobre la (in)movilidad ambiental es un punto de partida para generar mayor evidencia que permita una mejor comprensión de la posición de la comunidad con respecto a la movilidad frente al fenómeno de El Niño y, en última instancia, informar sobre el entorno social local, los discursos y las redes migratorias.

¿Por qué le pedimos que participe?

En su comunidad, El Niño es un fenómeno común, específicamente los deslizamientos de tierra (huaicos e inundaciones). Queremos aprender más sobre esto y creemos que nos puede ayudar al contar sobre sus percepciones respecto a la movilidad ambiental en la comunidad por los efectos de El Niño.

¿Qué puede esperar del estudio?

El estudio tiene una duración de 3 meses en total. Si participa en este estudio, participará en una entrevista de una duración de una hora aproximadamente. El objetivo de la entrevista es comprender sus percepciones sobre la movilidad ambiental en la comunidad. No hay respuestas correctas o incorrectas. Si no desea responder una pregunta durante la entrevista, no está obligado a hacerlo.

Usted decide si desea participar

La participación en este estudio es totalmente voluntaria. Puede parar en cualquier momento y no necesita dar ninguna explicación.

¿Cuáles son los posibles riesgos y molestias?

Algunos temas de la entrevista podrían producir respuestas emocionales de su parte debido a su participación personal y cercanía al tema.

¿Qué datos le pediré?

Guardaré sus datos para poder mantener el contacto.

Durante la entrevista, se recopilarán los siguientes datos personales: nombre, edad, sexo, distrito de residencia, afiliaciones a organizaciones sociales y ocupación.

¿Quién puede ver sus datos?

Sus datos serán guardados de manera segura. Solo la investigadora principal podrá acceder a sus datos personales (nombre, edad, sexo, distrito de residencia, afiliaciones a organizaciones sociales y ocupación).

Las grabaciones serán transcritas. Su nombre será reemplazado con un número o un nombre inventado.

Los datos personales se almacenarán por separado de la transcripción.

Escribiré una tesis sobre los resultados, que se compartirá públicamente. Los resultados serán accesibles para cualquier persona. No se divulgará ninguna información de identificación.

¿Cuánto tiempo se almacenarán sus datos personales?

Sus datos se conservarán durante un mínimo de 10 años. Esto con el fin de que otros investigadores tengan la oportunidad de verificar que la investigación se realizó correctamente.

¿Qué sucede con los resultados del estudio?

Puede indicar si desea recibir los resultados. Si es así, puede indicarlo al principio o al final de la entrevista o ponerse en contacto conmigo por teléfono o correo electrónico posteriormente.

¿Tiene preguntas sobre el estudio?

Si tiene alguna pregunta sobre el estudio o sus derechos de privacidad, como acceder, cambiar, eliminar o actualizar sus datos, puede comunicarse conmigo:

Nombre: Antonia Lerner Puyó

Teléfono: +51 975535915

Correo electrónico: antoniaLerner21@gmail.com

¿Tiene alguna queja o inquietud sobre su privacidad? Envíe un correo electrónico al Oficial de Protección de Datos (fg@eur.nl) o visite www.autoriteitpersoonsgegevens.nl. (T: 088 - 1805250)

¿Se arrepiente de su participación?

Puede que se arrepienta de su participación. Incluso después de participar, aún puede comunicarlo. Por favor, indíquelo poniéndose en contacto conmigo. Sus datos serán borrados. A veces necesitamos conservar sus datos para que, por ejemplo, se pueda comprobar la integridad del estudio.

Aprobación ética

Esta investigación ha sido revisada y aprobada por un comité de revisión interno de la Universidad Erasmus de Róterdam. Este comité asegura que los participantes de la investigación estén protegidos. Si desea obtener más información puede visitar <https://www.irim.eur.nl/research-integrity/irb/>

Declaración de consentimiento

He leído la información sobre la investigación. Entiendo de qué se trata el estudio y qué datos se recopilarán. También pude hacer preguntas y mis dudas fueron respondidas adecuadamente. Sé que puedo detener la entrevista en cualquier momento.

Al firmar este formulario, yo

1. doy mi consentimiento para participar en esta investigación;
2. doy mi consentimiento para el uso de mis datos personales;
3. confirmo que tengo al menos 18 años;
4. entiendo que participar en esta investigación es completamente voluntario y que puedo dejar de hacerlo en cualquier momento, y
5. entiendo que mi data se anonimizará para su publicación.

Marque las casillas a continuación si está de acuerdo (requerido para la participación en la investigación):

- **Datos**

Doy mi consentimiento para que el investigador recopile, use y conserve los siguientes datos: nombre, edad, sexo, distrito de residencia, afiliaciones a organizaciones sociales y ocupación.

- **Grabación de audio**

Doy mi consentimiento para que la entrevista sea grabada en audio.

Opcional

- **Mis respuestas en el artículo.**

Permito que mis respuestas se utilicen en documentos, como un artículo en una revista o un libro. Mi nombre no será incluido.

- **Nueva investigación**

Doy permiso para ser contactado nuevamente para nuevas investigaciones.

Nombre del participante:

Firma del participante:

Fecha:

Recibirá una copia del formulario completo de información y consentimiento.

Appendix C. Code book.

Code	Sub-code
Climate change	Favourable
	Uncertainty
Characteristics	Migrant background
	Age
	Education Level
	Occupation
	Role in social organization
	Gender
Context	State absence
	Demographical growth
	Description about infrastructure
	Interpretation / explanation of ENSO
	Land trafficking
ENSO effects	Water
	Houses
	Schools
	Economic
	Emotional
	Migration
	Health
	Vulnerability
Strategies	
Factors that affect response	Infrastructure
	Political
	Social
Future	Lack of resources
	Frequency
	Material
	Organization
Community organization	
Resources	Existent
	Lacking
Relocation	Conditions
	Desire
	Desire to stay
	Affected families leave
	Ideal / unavoidable
	Economical reasons
	Social reasons
	Return to place of origin