Let's save the lomas!

Exploring the barriers and opportunities for the collective action at Lomas de Pamplona in Lima, Peru

Evelyn Lisseth Salas Alfaro

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LUCSUS
Lund University Centre for Sustainability Studies

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Abstract

Urban populations are growing rapidly with several environmental and social effects in the process. At a governance level, resources go from being regulated by federal and state institutions into being considered urban areas governed by the local government. Nevertheless, this can neglect the enforcement of existing laws for many reasons that deteriorate urban resources due to a rivalry in the types of usage. As a result, local groups of citizens transform urban resources into shared resources to enforce laws with support from the local government and collectively manage it to guarantee the fulfillment of their current and future needs. This thesis explores the case of Lomas de Pamplona (LP), a social-ecological system (SES) in the Nueva Rinconada (NR) sector, part of San Juan de Miraflores (SJM) district within Metropolitan Lima. A group composed by SJM citizens, called the LP collective, has arisen to protect this unique ecosystem from urban sprawl in the form of encroachment and land trafficking. Through interviews and literature review, first, second and third-tier variables from the SES framework were selected to understand how the collective manages LP, the social and ecological outcomes, and how to overcome these challenges from a SES perspective through urban commons theory.

The findings indicate the collective has a close collaboration with SJM authorities as well as environmental and media networks that enable reaching governmental and civic actors in different levels. Likewise, LP collective has a weak social network established by Flor de Amancaes, one of the 144 slums within the NR sector. This weakness comes about due to conflicts that come from clashes of interest, lack of knowledge about the SES, absence of acknowledgment about LP importance to slums' livelihood and a weak social capital among direct users. Therefore, the ecological conditions have remained the same from slums' daily activities. Yet, the informal monitoring activities and the network with the SJM municipality have put land trafficking and encroachment attempts that represent the main human pressure to the ecosystem on pause. According to the urban commons theory, the SJM municipality needs to be more supportive to integrate other slums into the collective action promoted by the LP collective. Social capital, knowledge of LP and acknowledgment of the importance of LP in slums' livelihood are essential to develop a stronger social network that could decrease the conflicts in the area.

Keywords: Social-ecological systems, coastal lomas, urban commons, collective action, urban ecosystems, lomas de Pamplona

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List of Abbreviations

CPR	Common-pool resources
FA	Flor de Amancaes slum
LP	Lomas de Pamplona
MINAGRI	Ministry of Agriculture
MINAM	Ministry of Environment
MLM	Metropolitan Lima Municipality
NGO	Non-Governmental Organisation
NR	Nueva Rinconada
PREDES	Center of Risk Studies and Prevention
RLCA	Regional Lomas Conservation Area
SERFOR	Agency of Wild Flora and Fauna
SERNARP	Agency of Protected Natural Areas
SERPAR	Lima's Parks Services
SES	Social-ecological system
SJM	San Juan de Miraflores
VE	Valle Escondido
VMT	Villa Maria del Triunfo
ZRE	Special Regulation Zone

1. Introduction

Currently, more than half of the world's population lives in cities and projections show that this will increase to 70% by 2050 (United Nations, 2012). However, urban growth generates more drastic changes in developing countries in which the urbanization process is disorganized and not controlled (Nagendra & Ostrom, 2014). From the 32% of the global urban population that lives in slums, the majority of them are located in developing countries (United Nations Human Settlements Programme [UN-Habitat], 2003). This transformation from rural to urban settlements create changes in the landscape in these cities to one of poverty, informality, and illegality in land-use change patterns and, at the same time, transforming critical ecosystems of significant global value (Lungo, n.d.; Colding, 2012). Many of these ecosystems are gradually enclosed by private lands from urban areas which transform them into urban ecosystems (Colding, 2012).

Most natural ecosystems are regulated by state agencies (Foster, 2011). When these become part of cities, local governments add a host of regulations regarding land use and control over open-access spaces due to its ownership over ecosystems (Foster, 2011; Foster & Iaione, 2019). Local governments control and regulate all open access to urban resources through their police power and land use authority (Foster, 2011; Colding, 2012). These regulations, including criminal laws, restraint certain activities, behaviors and uses to manage the shared resource according to the amount and diversity of users that have access to it (Foster, 2011). Although the management is centralized with regulations that control open access to urban resources as ecosystems, local governments can fail to enforce them for different reasons generating an imbalance, followed by a rivalry, among users and types of uses (Foster, 2011). In addition to the social effects, ecological degradation along with pressure on ecosystems and its relevance to cities, are put under threat (Dociu & Dunarintu, 2012).

The variety of ecosystem services that urban ecosystems provide to cities are abundant from socio-cultural to regulating, provisioning, and supporting services (Ravetz, 2015). Notably, the provision of public health and better quality of life for urban inhabitants, such as less noise and improved air quality, are possible solutions for existing problems in many urban areas (Bolund & Hunhammar, 1999; Bokalders & Block, 2019). In particular, most of these issues can be solved by the provision of ecosystem services from local and regional urban ecosystems (Colding, 2012). However, these are affected by the rural-urban transformation with changes in biochemical processes and circulation patterns that degrade ecosystems and, finally, deplete ecosystem services (Das & Das, 2019). Therefore, the future of cities is interdependent with the future of ecosystems and needs to consider

its complexity, dynamic, and inter-connection among systems in the moment of searching for solutions (Ravetz, 2015).

Governance and institutions play a vital role to overcome these challenges, instead of engineering and technical solutions that are the preferred way to go to face these issues (Huang, Yeh & Chang, 2010; Ravetz; 2015). According to Nagendra & Ostrom (2014), the urban commons theory gives significant insight into governance in developing countries and the role of citizens in the management of natural ecosystems in cities. Jacobs (1961) argues that cities are complex and organic systems, with key interactions among the diversity of people and land uses, are crucial for maintaining the ecological equilibrium in cities. Therefore, urban commons explain these interactions to transform urban resources into shared resources that belong to the public, in which users are capable of collectively managing to support their current and future needs (Borch & Kornberger, 2015).

As stated by Colding (2012), active land management from urban inhabitants contributes to understanding the relationships among ecosystems and people by augmenting environmental knowledge in the urban population. Yet, local governments keep centralizing the management and control of ecosystems, and leaving inhabitants aside, despite the potential of urban commons to local ecosystem governance. (Colding, 2012; Nagendra & Ostrom, 2014). Instead, local governments' role is to support the inhabitants' collective management through their ownership over urban resources and regulatory authority in cities (Foster, 2011). In return, the collective action can contribute to overcoming the decreased capacity of these governments to enforce regulations (Foster, 2011).

In 2017, 74% of the Peruvian inhabitants were located in urban areas, and, by 2025, it is expected to expand to 82% (Instituto Nacional de Estadística e Informática [INEI], 2018; UDEP, n.d). Most of this increase is concentrated in Lima, where the population augments by 200,000 people per year (Chan, 2017; FAO, 1997). However, Lima's housing capacity is one million people for a city of ten million inhabitants (Chan, 2017). As a consequence, land trafficking and encroachments continue to grow and locate settlements in areas non-appropriate for residential purposes (Chan, 2017). Urbanization has contributed to the loss of 400,000 ha of the coastal lomas in the last 60 years, from which 10% to 30% is located in Lima (United Nations Development Programme [UNDP], 2016). As coastal lomas are one of the last natural ecosystems inside a city with multiple environmental problems, this thesis reflects the importance for the conservation of lomas and its ecosystem services to Lima (UNDP, 2018a; World Health Organization [WHO], 2016; Economist Intelligence Unit [EIU], 2010).

Lomas collectives have emerged to protect Lomas in their districts due to the lack of local and regional municipalities proper management. As a result of their efforts, Metropolitan Lima Municipality [MLM] has approved the Regional Lomas Conservation Area [RLCA] in 2019, which its first stage covers five lomas in Lima. The remaining ones keep working with different actors such as Non-Governmental Organisations [NGOs], local communities, and different scales of government. Particularly, this thesis focuses on the Lomas de Pamplona [LP] Collective, a group of young activists from the San Juan de Miraflores [SJM] district that aims to protect the last natural ecosystem in their district. In this case, by acknowledging the management of the collective action lead by the LP collective, its barriers and facilitators, and the result in its ecological conditions through the Social-Ecological Systems [SES] framework, it provides an advance in understanding how to accomplish a sustainable collective management of Lomas in Lima's context.

1.1 Aim of research

This thesis aims to increase the knowledge and understanding about the repercussions on natural ecosystems from collective management in urban areas. The context of rivalry in consumption over the ecosystem, due to a lack of regulation enforcement from local governments, threatens the balance among social and ecological systems to satisfy the needs of current and future generations. Thus, I explore the opportunities and barriers of LP collective that need to be overcome to accomplish the ecosystem's sustainable management. As a result, the research on urban commons in Lima increases the way of rethinking the city and its ecosystems through the involvement of citizens in their management.

1.2 Research questions

For the purpose to achieve the aim of the research, this thesis seeks to answer the following questions:

RQ1: *How the LP Collective governs the lomas ecosystem in SJM?*

RQ2: *What are the social and ecological outcomes in LP?*

RQ3: *What factors can lead to the positive and negative outcomes in LP?*

RQ4: *How can the negative outcomes in LP be addressed from an SES perspective?*

2. Background

2.1 Urbanization in Lima

Metropolitan Lima is the residence of 32.3% of the total country's population which transforms it into a metropolis without being a planned, secure, and fair city (INEI, 2018; Garcia et al., 2015). The current urban structure in Lima consists of the following major sectors: the historical center, the centric districts of medium and high social classes, the north, east and south peripheries that are in constant development lacking urban planning (Córdova-Aguilar, 2017). These peripheries have a different Human Development Index and socio-economic level compared to the more affluent central areas of the city (Córdova-Aguilar, 2017) Behind it, migration, urbanization, and marginalization are the three main components that have contributed to what is Lima today (Abugattas, 1979). Thus, the number of slums in Lima went from 10% to 34,5% between 1955 to 1993 (Congreso de la República del Perú, n.d.)

Slums, also called "pueblos marginales" [marginalized towns], are fundamental in Lima's urbanization history since the 1950s (Castro & Riofrío, 1997). These urbanization modalities are based on encroaching a land without ownership to build houses made of fragile materials to access a housing alternative that, in most cases, lack essential services (Ludeña, 2006). In the beginning, encroachments were promoted by migrants from different Peruvian regions outside Lima that were collectively organized to pursue a better life for their families (Garcia et al., 2015). Through the years, the State has provided some implicit and explicit assistance promoting this alternative form of urbanization in lands without value in the supposedly desert peripheries of Lima (Castro & Riofrío, 1997). On the other hand, slums' expansion was encouraged by the lack of planning and investing in those areas, while authorities focused most of their efforts on the pre-existing city to satisfy the needs of the medium and high class living there (Castro & Riofrío, 1997; Garcia et al., 2015). Consequently, formal districts were created and expanded the limits of the city (Abugattas,n.d.).

The explosive demographic increase in Lima started during the second part of the 20th century due to centralism[1], the commercial and industrial development of the city, and the lack of security in other regions due to armed social conflict (Garcia et al., 2015). When migration was increasing rapidly, MLM was not prepared to receive the number of people arriving (Chan, 2017). The only option available for housing were expensive places, insufficient for the large quantity of low-income

[1] In Peru, the centralism is reflected in the political and economic regime that produces a hierarchy of the territory and its public authorities (Contreras, 2002).

migrant population (Chan, 2017). Therefore, between 1940 and 1960, the regional government enabled people to locate their houses in the close peripheries of the city since those lands did not have any agricultural value according to the authorities (Castro & Riofrío, 1997).

A milestone that marked the onset of the expansion to the current Lima's south periphery was the foundation of "Ciudad de Dios" [City of God] on Christmas Eve in 1954 (Castro & Riofrío, 1997). Considered the first slum located outside the city, this was an encroachment of 1,000 families that located their precarious houses in a deserted area owned by the government (Archivo Atencio, 2020). These families were mostly young low-income families from different Peruvian regions outside Lima who had been living in the city before the encroachment and were looking for affordable housing alternatives (Municipalidad de San Juan de Miraflores [MuniSJM], n.d.b). Eventually, the regional government allowed them to stay and provided them with small contributions such as water and, in 1958, 2 schools and 1,400 small houses (Archivo Atencio, 2020). Years later, based on slums law[2], the SJM district was founded in 1965 (MuniSJM, n.d.b). The district is composed by "Ciudad de Dios" as a capital and Pamplona Alta, among other 4 more zones (MuniSJM, n.d.a).

Since the 21st century, most of flat lands within Lima are fully covered by previous slums which are legalized sectors of districts with improved housing quality at present (Ludeña, 2006). Thus, the remaining lands are abrupt steep lands such as "cerros" [hills] in which new slums are locating their settlements in the form of extensions of official sectors or new spots (Castro & Riofrío, 1997). Consequently, they are more vulnerable to disasters, especially due to the constant telluric movement in Lima (Mi Pamplona City, 2019). For these new settlements, obtaining property ownership is more challenging and, therefore, also essential services such as water, energy, and sanitation (Garcia et al., 2015).

Nowadays, there are two sources of land encroachment. The traditional slum, an organized group of 30 to 40 families that locate their precarious houses in the remaining open areas and, secondly, an illegal housing market also called "land trafficking", in which an individual or a group of individuals locate empty prefabricated houses in open areas or the limits of existing slums to sell them (Ludeña, 2006). The latest is considered 40% of the overall delinquency in the country related to other felonies

[2] The slum law was promulgated in 1961 and was a social housing policy to improve it physically and legally, focused on enabling people to live in encroached areas and giving them ownership of the property (Garcia et al., 2015)

such as hired assassins and extortions (UNDP, 2018b). Both are present in the SJM district pushing the limits of the districts further, putting in danger Lomas de Pamplona [LP] and also LP Collective.

2.2 Lomas in Lima and its management

Although Lima is known as the second biggest city located in an arid desert, it possesses diverse and unique natural ecosystems that differentiate it from other capitals around the world due to two main physical features: the sea current from the cold waters of the South Pacific Ocean and the Andean Mountains (Nieuwland & Mamani, 2017; SERPAR, 2014). In consequence, the coastal lomas ecosystems are found in the Peruvian and Chilean coast between 200 and 1,000 meters above sea level (Serpar, 2014). The main characteristic of these ecosystems is their high humidity due to fog and drizzle between June and September (UNDP, 2018a). During those months, the lomas and its dry ravines are covered with endemic fauna and vegetation in contrast with the desertic landscape during the summer (UNDP, 2018a). Some research establishes that lomas can reach around 40% of endemism, considered a high level for ecosystems (UNDP, 2016).

Lomas used to cover an area of 600,000 ha 60 years ago and, currently, it is just limited to around 200,000 ha from which between 10% to 30% are located in the Province of Lima (UNDP, 2016). Nowadays, there are 19 lomas in 19 districts out of the 43 that are in Lima's jurisdiction (UNDP, 2018a). They have an extension of 20 thousand ha and, during the "El Niño" phenomenon, it can extend to 70 thousand (Ipanaque, 2019). The lomas in Lima are surrounded by poor housing constructions in the forms of slums, especially in the north and center-south of Lima which leaves the ecosystem locked up within the city and threatened by urban sprawl (UNDP, 2016). This threat is exacerbated by a lack of enforcement of land tenure rights, land tenure uncertainty, and weak land-use policies and regulations (UNDP, 2016).

Lima possesses a significant deficit of green areas, and high levels of pollution and, hence, it requires solutions that the lomas can contribute to decrease through their ecosystem services (WHO, 2016; EIU, 2010). Some of these services are pollination, atmospheric water collection, clean air, soil formation, food supply, ecotourism, provision of genetic resources, green areas, education, and spiritual and religious services (UNDP, 2018a). Due to the high vulnerability of Lima to climate change, especially in the population located in the center, east, and south, lomas' ecosystem services increase the ecological resilience of the city (UNDP, 2018a). Indeed, they are essential to recovering after a disaster by the provision of food, clean water, and fuel to the population (UNDP, 2018a). Furthermore, the lomas are considered not a proper place to live because of the high humidity that causes respiratory diseases and the steep slopes not suitable for slums fragile construction (Mi

Pamplona City, 2019). Therefore, the lomas' role in the prevention of disasters is vital by restricting housing constructions and preventing rock slides (Mi Pamplona City, 2019).

The lomas in Lima are considered open spaces managed by the government (Nieuwland & Mamani, 2016). MLM, Ministry of Environment [Ministerio del Ambiente; MINAM], and the Agency of Protected Natural Areas [Servicio Nacional de Áreas Naturales Protegidas; SERNANP] are the governmental institutions involved in the management of the Lomas in Lima (UNDP, 2016). MINAM supervises the general policy of management of fragile lomas' ecosystems, as indicated in the General Environmental Law (UNDP, 2016). MINAM delegates the functions to the Department of Biological Diversity to formulate, conduct, and oversee policies for ecosystem management in Peru (UNDP, 2016). MLM and District Municipalities are responsible for the lomas management based on the Organic Law of Municipalities (Ley Orgánica de Municipalidades No. 27972) (Soria, 2018). Finally, SERNANP, through its power to determine and promote policies of conservation of natural protected areas, has been coordinating with some local governments to encourage conservation of the lomas and has given support guiding on technical criteria for the RLCA (Soria, 2018).

MLM, along with District Municipalities are the main authorities responsible for the environmental management of the lomas in their jurisdictions (UNDP, 2016). Within MLM, the Regional Program department is in charge of the RLCA program with technical support from the EbA lomas project[3] (Soria, 2018; UNDP, 2018a). Although some municipal districts have made efforts to tackle encroachments in the lomas by strengthening regulations with ordinances to declare it inalienable and intangible, some do not include it in their agendas (Sierra, 2018).

The unstable protection status has motivated action from different actors like NGOs, the private sector, but mostly the local community (UNDP, 2016). Despite their lives being exposed to risks due to land trafficking, they continue working on the protection, management, and development of ecotourism in their respective lomas, intending to close the gap from the state management (UNDP, 2018b). One of their goals is to activate different existing regulations, including the addition of each loma into the National List of Fragile Ecosystems, whose responsibility rests on the Agency of Wild Flora and Fauna [Servicio Nacional Forestal y de Fauna Silvestre; SERFOR], an organization under the umbrella of the Ministry of Agriculture [Ministerio de Agricultura; MINAGRI] (UNDP, 2016). Likewise, by working along with the government, particularly with the district municipality and MLM, results in better control of new encroachments and land trafficking (UNDP, 2018).

[3] A project held by UNDP with a duration from 2017 to 2021 and provides technical support to public and civil organizations to accomplish legal and physical protection to coastal lomas in Lima (UNDP, 2018a).

2.3 Lomas de Pamplona

Lomas de Pamplona [LP] is located in the highest parts of the SJM district, in the sector known as Nueva Rinconada [NR] within Pamplona Alta zone (Ipanaque, 2020; MuniSJM, n.d.a). This ecosystem is enclosed by four districts, as displayed in Figure 1. It is considered part of the SJM and Surco districts, and it is surrounded by the La Molina and Villa Maria del Triunfo [VMT] districts (FOVIDA, 2017). From Surco's side, "Las Casuarinas", a high-income residential area, limits with LP (Geolomas, n.d.). As well, middle-class residential houses from La Molina and Lomas de VMT, a Loma included in the RLCA, from the side of VMT are surrounding LP (Geolomas, n.d.). Moreover, a slum that is not legally recognized called Valle Escondido [Hidden Valley; VE] is located at the top of LP in between the four districts since 2014 (Ipanaque, 2020).

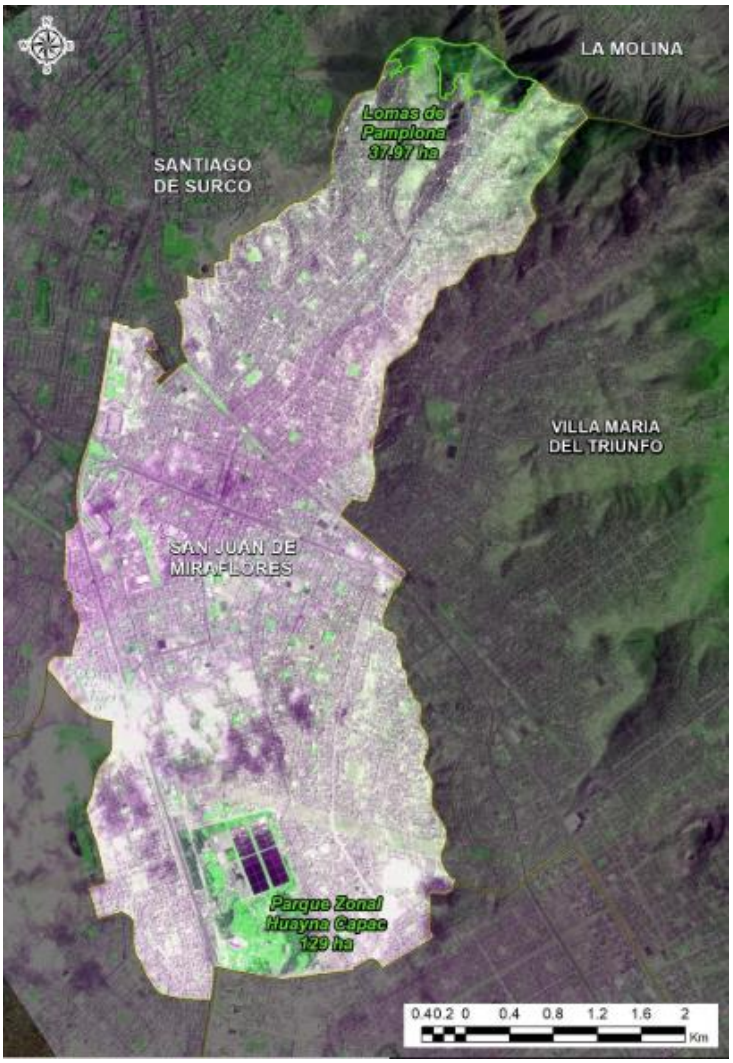

Figure 1. Map of SJM and Lomas de Pamplona, the second biggest green area in the district. (EbA Lomas, n.d.)

LP possesses 36 flora species with 19% of endemism, and 15 species of birds, which are important for the biodiversity of the region (EbA Lomas, n.d.). Most SJM authorities and MLM have ignored the precarious social and ecological situation in LP (Sierra, 2018). Thus, LP's extension has decreased through the years, in spite of being the last natural ecosystem in SJM, and the second biggest green area in the district (see Appendix 9.1) (Ipanaque, 2020). As a result, a group of five young people has created a local institution named LP collective in 2018 (see Figure 2). They have been working towards the protection of this ecosystem through political incidence, collaboration with different stakeholders, ecotourism as an awareness tool to Lima's citizens, identity creation in SJM towards LP, and developing an economical option to the poor population living around the slums.

Figure 2. Lomas de Pamplona during the winter and summer season (Sullca, 2019). Note. Top picture left side: Lomas de Pamplona during the summer season. Top picture right side: Visitors during winter season walking next to "El Muro de la Vergüenza" [The Wall of Shame], division among "Las Casuarinas" and "Nueva Rinconada", part of the ecotourism tour. Bottom picture left side: Flor de Amancaes [Amancaes flower] in Lomas de Pamplona, the flower symbol of Lima. Bottom picture right side: members of Lomas de Pamplona collective.

3. Theory

3.1 Tragedy of the commons

According to Hardin (1968), when rational individuals use a resource considering their particular interest, and contrary to the common good of all the users, to maximize their single gains, it may end up being overexploited or destroyed. The author calls this situation "Tragedy of the commons". As stated by Foster (2011), scholars have not developed yet a theory about how this "tragedy" occurs in urban areas, especially with the current governmental regulation over common urban resources. In general terms, expansion and densification of cities are one of the major tragedies of common goods in urban areas (Feinberg et al., 2020). The combination of large scale urban communities and open access areas make it susceptible to this tragedy, in which lack of sustainable use norms, regarding limiting use and degradation, represent a challenge to overcome, monitor and enforce collectively (Ostrom, 2005).

The "tragedy of the commons" happens in a city when local governments lose control over public goods (Foster, 2011). In other words, local governments regulate urban resources in regards to restriction on types of uses, management, and maintenance of usage patterns (Foster, 2011; Nagendra & Ostrom, 2014). Yet, periods of rapid growth, mixed with low administrative and financial capacity, produces a decline in the enforcement, and an increase in the tolerance of neglecting these regulations by users. In consequence, local governments lose control over the resource, called a "regulatory slippage" (Foster, 2011). Therefore, public goods are transformed from not rivalrous in consumption into a rivalrous and non-exclusive urban resource, which resembles more to traditional commons (Foster, 2011). This means that a competition in uses and overuse can lead to the degradation of urban resources that represents Hardin's tale (Foster, 2011).

Subsequently, when different types of users generate more demand implying a variety of uses, which creates conflict with one another, it reflects the beginning of rivalry from the congestion problem (Foster, 2011). Thus, rivalry indicates an incompatibility between the frequency of one or more usages with the others (Foster, 2011). Consequently, a consumption and congestion problem emerges, changing the usage patterns of the resource and leading to its overexploitation. In addition, cities with urban sprawl result in more people landless, creating a disconnection with natural ecosystems and limited spaces for ecosystem management that produce issues for the conservation of urban ecosystems (Colding, 2012). In this way, preferences for the conservation of a resource can be incompatible with its exploitation (Foster, 2011). According to Mincey (2012), a free-rider problem appears to the ones who carry on the protection of resources, in which some people can be

benefited without participating or not contributing enough to avoid the ecosystem and its services' degradation.

3.2 Urban commons

Governmental regulation or privatization of resources were proposed as solutions for the "tragedy of the commons" at first (Hardin, 1968). However, neither of both solutions include empirical validity regarding human capabilities and limitations in facing a variety of situations (Ostrom, 1990). Implementing any of those could produce a risk of disregarding local conditions and affect local communities' livelihood and well-being (Colding, 2012). Hence, Ostrom proposes a third option that contributed to the development of collective action theory: users of a resource organized and self-governing the commons through the design of durable cooperative institutions to assure the length of the resource to satisfy their future generations' needs (Borch & Kornberger, 2015; Ostrom, 1990).

The concept of commons was widely known due to the work made by Ostrom related to common-pool resources [CPR]. She defines it as non-excludable and subtractable resources employed by diverse individuals (Ostrom, 1990). She remarks the non-exclusivity and the rivalry in consumption to differentiate among CPRs and public goods (Choe & Yun, 2017). A resource is non-exclusive due to the full accessibility to it without any use restriction, whilst rivalry in consumption explains that ones' consumption decreases the possibilities of use for another person (Choe & Yun, 2017). In that sense, previous research on commons was based on natural resources such as irrigations, fisheries, and forests in rural areas, not considering the possible "tragedy" of public goods in urban areas (Foster, 2011; Mundoli, Unnikrishnan & Nagendra, 2018).

Because of the fast growth of cities worldwide, especially in the Global South, recently attention has been put on commons within urban areas (Mundoli et al., 2018). Urban commons are beyond the physical dimensions of cities; they are related to the dynamics occurring within it (Huron, 2017). Cities are dense, large, and permanent settlements of heterogeneous citizens, in contrast with rural areas, in which users are well-delimited, small groups of users, and present more homogeneous communities (Foster & Iaione, 2018; Ostrom, 2005). The large population in cities, combined with the lack of space that trigger density and proximity, represents the nature of cities and the type of collectivity it produces (Borch & Kornberger, 2015). Through this kind of collectivity, urban commons arise. According to Borch & Kornberger (2015), density and proximity are the base of urban commons. "Far from being a "pool", the urban commons are seen as the corollary of interactions in a dense network" (Borch & Kornberger, 2015, p. 12).

Harvey (2012) develops theoretically more the understanding of urban commons by establishing that public goods, such as public spaces, are not the same as commons. First, citizens are required to re-appropriated public goods through political action to be commons (Harvey, 2012). For instance, in many cities of the Global South residents built the city by producing their commons through this political action, contrary to the more affluent cities where inhabitants are being reduced to recipients of services (Zapata & Zapata, 2015). For Harvey, urban commons involve the social practice of commoning, which is an unstable and flexible social relation among self-defined social groups and the aspects of their social and physical environment relevant to their livelihood (Harvey, 2012). Consequently, urban commons theory evolved to be a shared resource with a substantial variable of collective political action that set a statement against capitalism and the state power (Huron, 2017).

The idea of political action by protesting is not the only option to transform a space into a commons (Löw; 2015). By negotiating and talking with the government, among other actors, is a way to reshape a public space into an urban commons (Löw, 2015). Moreover, the government has a supporting role in urban areas due to the scale and complexity of the resource and the heterogeneity of the users (Foster, 2011; Ostrom, 2005). Urban resources are used by many communities with different users that could need structured government institutions through its enforcement and monitoring roles (Foster, 2011).

Foster (2011) establishes that to enable stable and long-enduring urban commons, it is necessary endogenous factors such as collective efficacy, community size, community stability, resource scale, and shared social norm. Collective efficacy means that a community has trust, social cohesion, and the commitment of residents to act on behalf of the common good; in other terms, social capital (Foster, 2011). Yet, these endogenous factors have an inverse relation with an enabling government role (Foster, 2011). This means that if the collective action possesses a weak level of endogenous factors, the role of the government is essential to support the collective management through its complex and formal structure (Foster, 2011).

Against other urban scholars that propose a strong correlation between social disorder and the capacity of collective action, Foster states that communities are capable of collective action to enforce norms and to diminish the social disorder in the resource, becoming positive norm entrepreneurs (Foster, 2011). In the same way, Ostrom establishes that the size of a resource system, the system's productivity, predictability of system dynamics, resource unit mobility, collective-choice rules, leadership/entrepreneurship, number of users, norms/social capital, knowledge of SES/mental models and importance of a resource, are variables that determine the likelihood of users engaging in a collective action to manage a common resource (Ostrom, 2009).

3.3 SES framework

Ostrom claims that all the resources used by humans are immersed in complex SES composed of various sub-systems and variables (Ostrom, 2009). Nevertheless, it is required a common framework to ease multidisciplinary efforts on understanding complex SESs (Ostrom, 2009). In 2007, Ostrom proposed the SES framework to diagnose the variables that are essential to unravel these problems in ecosystem management at multiple scales (Ostrom, 2007).

As claimed by Ostrom (2009), "in a complex SES, subsystems such as resource systems, resource units, users and governance systems are relatively separable but interact to produce outcomes at the SES level, which in turn feedback to affect these subsystems and their components, as well as other larger or smaller SESs" (p. 419). As Figure 3 shows, Resource systems [physical dimensions of the ecosystem], Resource Units [the resource use in that ecosystem], Governance Systems [organizations involved in the ecosystem management], Actors [individuals who use and produce the resource] are the highest tiers which are composed by multiple variables from second-tiers to below (see Appendix 9.2) (McGinnis & Ostrom, 2014). The Action Situation box is where all the actions take place, transforming inputs from different actors into outcomes which, at the same time, give feedback to the top-tiers components (McGinnis & Ostrom, 2014). Moreover, related ecological systems and social, economic, and political settings can affect the SES components (McGinnis & Ostrom, 2014).

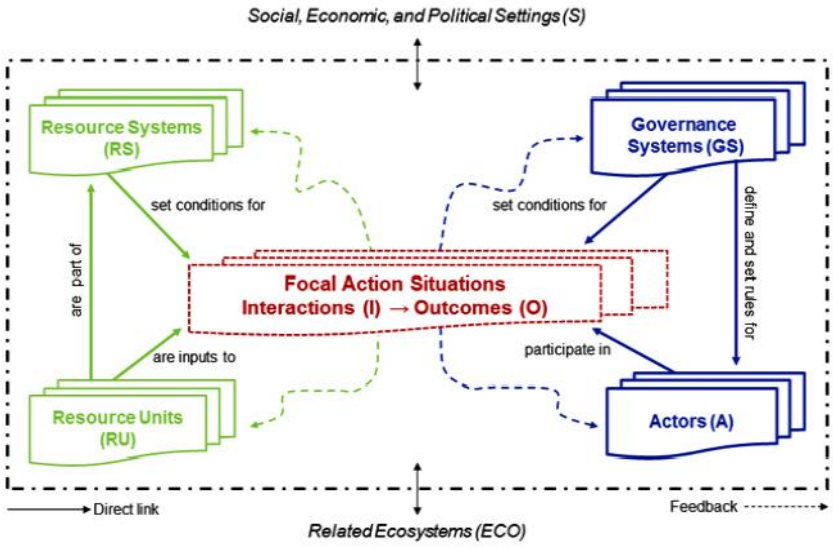

Figure 3. An overview of SES Framework displaying the relationships among first-tier categories and their linkages with Social, Economic, and Political Settings and Related Ecosystems. (Ostrom. 2009; McGinnis & Ostrom, 2014).

Some adaptations of the framework have been made from scholars to better understand SESs. For instance, Delgado-Serrano and Ramos develop third-tier variables to improve the understanding of the framework and its practical use at a local level (Delgado-Serrano & Ramos, 2015). Moreover, other scholars have applied the SES framework in urban areas, in response to the lack of institutional analysis for urban ecosystems' research (Mincey et al., 2013). Since the causes and consequences of ecosystem degradation and recovery are both social and ecological, Nagendra and Ostrom affirm that the SES framework is useful for discussing urban and rural resources' complex issues that rely on multiple disciplines (Nagendra & Ostrom, 2014). One relevant study on urban commons using the framework was on the lakes in Bangalore city, in India, to determine why some lakes have been successful when negotiating with local governments, and others have deteriorated (Nagendra & Ostrom, 2014). Among the selected variables, they created a third-tier one called "networking with the government" within Interactions (I) due to the location of the lakes in an urban area (Nagendra & Ostrom, 2014).

4. Methodology

4.1 Case Study

This research is based on qualitative data that focuses on the management of the coastal lomas from civil collective action taking place in Lima, Peru. Thus, a case study suits best for the research design through its quality to explore the complex and particular nature of issues as well as providing a deeper understanding of a specific case (Bryman, 2012). Case studies are defined through certain parameters like timeframe and location (Creswell & Poth, 2018). In terms of location, this study explores the portion of the Lomas de Pamplona [LP] within SJM district's political borders, and the related actors involved in the management of the ecosystem. This thesis will present a special emphasis in LP Collective because they are leading the collective management towards the protection of LP against the predominant urban sprawl in Nueva Rinconada [NR]. Regarding the timeframe, it is settled by the beginning of the collective in May 2018 until February 2020, before the round of the interviews started.

4.2 Data Collection

4.2.1 Primary data

Sixteen semi-structured crucial interviews were made to key informants from different actors involved in LP collective management from March 2020 to July 2020. The purpose of these interviews were to provide qualitative data to complete the SES framework to answer the first three

research questions. The answer of these research questions determined the variables to respond to the fourth one.

The interviews were conducted from Sweden through video calls. Most of the interview's duration was around an hour and, in some cases, more than 2 hours. A snowball technique was used to determine relevant interviewees. Most contacts were provided by the social networks of the interviewed actors. Since May 2018, actors mentioned in Table 1 were gradually involved in the protection of LP. All the interviews were made in Spanish and, therefore, required translation, transcription, and analysis from the author.

Table 1. List of interviews grouped by actors, specific organizations in each group, and numbers of interviews. (Source: Author)

Actor	Who	Number of interviews
Users	"Lomas de Pamplona" Collective	6
	"Flor de Amancaes" Slum	1
NGO	PREDES	1
Civil Society Organizations	Centro Urbes	1
	Mi Pamplona City	1
Government	MLM	2
	SJM Municipality	1
International Cooperation	UNDP - EbaLomas project	1
Lomas Network	Lomas de Paraiso	1
	Lomas de Asia	1

4.2.2 Secondary data

Most of the data that supports this research were based on primary data. However, some qualitative data came from secondary sources to complete variables of the SES framework that were not covered with the interviews. Despite that the existing academic literature in LP is scarce, virtual tools and a report from the EbA lomas project about LP, as well as literature from other lomas in Lima with a similar situation than LP, were useful. Likewise, reports about NR's slums and SJM district, made by NGOs and the SJM municipality, determined variables related to attributes of NR and SJM municipality. All of these were in Spanish language.

4.3 Data analysis

To analyze the data, I created a google sheet with all the first, second and some third-tier variables from the SES framework. The third-tier ones that were included are from Delgado-Serrano and

Ramos, and Nagendra and Ostrom's studies. First, I began codifying the interviews by placing each piece of information provided in the respective variable. Followed by positioning the secondary data that were relevant to this study on the framework. As a result, the first, second and third-tier variables were selected according to the case study to answer the research questions. In that process, some variables were left out from the research due to lack of fitting in the LP case and lack of data, as displayed in table 2. Finally, a set of tables have been developed per first-tier variables to summarize each second and third-tier ones to facilitate the response of the interactions and, subsequently, of the outcomes.

Table 2. Variables excluded from the SES framework in my study of Lomas de Pamplona. (Source: Author)

Notation	Variable	Reason for exclusion
Social, economic and political settings (S)		
S6	Media organizations	No literature related to media interest to broadcast news about coastal lomas.
S7	Technology	Not relevant to the case study.
Related Ecosystems (ECO)		No literature available.
Resource Systems (RS)		
RS5	Productivity of the system	No data was found. The productivity is related to the size of LP (RS3)
RS8	Storage characteristics	No data was found to support this variable.
Resource Units (RU)		Resource units variables were not selected because the management of LP is related to the ecosystem and not in the availability of resources units.
Actors (A)		
A9	Technologies available	No data was found to support this variable.
Governance System (GS)		

GS6	Collective-choice rules	The focus is on the governance of LP with special emphasis on LP collective and there are no collective-choice and constitutional-choice rules that they are involved in. Governmental institutions such as MLM and SJM municipality still have the control over the formal governance of LP.
GS7	Constitutional-choice rules	
GS8	Monitoring and sanctioning rules	There are no formal rules of monitoring and sanctioning in LP. Governmental institutions such as MLM and SJM municipality still have the control over the formal governance of LP.
Interactions (I)		
I1	Harvesting	There is no harvesting in LP
Outcomes (O)		
O3	Externalities to other SESs	Not included in this thesis because the focus is on the collective management and its impact on the ecological dimension of LP

4.4 Limitations

The current situation of the coronavirus limited my study because it was not possible for me to do field work that could contribute to having direct contact with actors' dynamics and observing to assess the ecological situation of LP. Therefore, this thesis is based on interviews and secondary data that set a limitation to this study. Likewise, Peru was one of the countries most affected in South America by coronavirus and, hence, governmental institutions and inhabitants were focused on this issue. Consequently, I could not contact some relevant actors such as SERFOR and other slums from NR sector and VE to have more information about LP management. Regarding the interviews, having them by calls and video calls could create a distance between the interviewees and me, as an interviewer, that leads to limited answers. Nevertheless, I tried to control these limitations by building a trust connection with them, such as trying to talk about them before the interviews started.

5. Results

In this section, the three first research questions are going to be answered. The first one through the governance system section and the second and third ones in the outcomes section.

5.1 Social, economic and political settings (S)

Similarly as Metropolitan Lima Municipality [MLM], the San Juan de Miraflores [SJM] district maintains a constant population growth (S2a) (INEI, 2018). The current settlement patterns in vulnerable areas of the district are a combination of the expansion of the existing slums and land trafficking in open areas (S2b) (Apedjinou, 2019). As reflected by one of the members of the collective:

> [Illegal land dealers] gather and mobilize local people to seize the land. Then, those lands are given to the people that have participated in the encroachment and after that they [illegal land dealers and people that participated] sell it. (...) Some neighbors [of Pamplona Alta] have participated in encroachments between 2000 and 2010. For that reason, people that live in Pamplona are the same ones that have invaded the upper lands. Now they have 2 to 3 houses. (...) They spread the word for encroachments attempts. (LP collective, personal communication, May 18, 2020)

In the corruption perception index, Peru is placed 101 out of 180 countries (S3a) (Trading Economics, n.d.). A trigger to this dissatisfaction is the high levels of corruption in different scales of the government. For instance, the illegal house market is possible by their connections with government officers with the aim of giving the appearance of legality to hide their economic interest (Cawley, 2015). Regarding the political stability index, the country has -0,26, being -2,5 the lowest result, reflecting an unstable national political scenario (S3b) (The Global Economy, n.d.). Situations like the closing of the congress in September of 2019 increased the time for approving bills in favor of the conservation of fragile ecosystems.

The legal framework that impacts LP is extensive coming from different directions without coordination among sectors (S4a). On the environmental side, around 9 laws provide direct and indirect protection to the LP area, from the Political Constitution of Peru, Article No.68 until the latest approved Supreme Decree 007-2020-MINAGRI “Inter-institutional protocol to protect fragile ecosystems” (see Appendix 9.3) (EbA Lomas, n.d.; Lomas de Lima; 2020). On the other hand, the housing sector promotes governmental institutions and laws that grant property titles to families that obtained lands through encroachments, solving population’s social needs but not the cause of a lack of urban planning. At present, 6 bills in the current congress aim to expand and consolidate encroachments that occurred in the last decade by giving the families settled in those areas property titles that threaten LP (SPDA, 2020).

Each governmental authority sets the political direction that depends on their interest, political reasons, and their level of populism (S4b) (Apedjinou, 2019). As exemplified by the representative of Centro Urbes:

> [After Susan Villarán, MLM's Mayor between 2011 and 2014], Castañeda's period [MLM major between 2015 and 2019] was not interested in the protection of Coastal Lomas and shot down projects and programs related to it. Instead, Congress and the [Environmental] Ministry were paying attention to this problem. (Centro Urbes, personal communication, March 31, 2020)

As a consequence of an incoherent political direction, the compliance of inhabitants to environmental policies is weak and has even incentivized a profitable illegal house market through land trafficking (S4c). Moreover, through the years, the tourism industry has increased within Lima with 33% of tourists traveling around the region, out of which 52% considered nature and landscape along with reduced prices to be important in terms to choose a place to visit (S5) (Turismo in, 2019).

Table 3. Social, economic and political settings (S) in Lomas de Pamplona. (Source: Author)

Notation	Variable	Working Definition	Lomas de Pamplona
S2	Demographic trends		
S2a	Population growth rate	SJM population growth rate	3,5% per year
S2b	Settlement patterns	Current settlement patterns in SJM	expansion and land trafficking supported by locals
S3	Political Stability		
S3a	Respect for democratic values	Corruption Perception index	101 out of 180 countries
S3b	Political Stability	Political Stability index	-0,26 (being -2,5 the lowest result)
S4	Government resource		
S4a	Governmental regulatory framework for natural resources	Multisectoral integration reflect in Governmental legal framework for	Lacking

		Coastal Lomas management	
S4b	Environmental policies	implementation and policy direction	Inconsistent
S4c	Compliance of environmental regulatory and policy frameworks	Compliance of inhabitants to environmental governmental regulation, policy, and management	Weak
S5	Market incentives	Lima inhabitants demand for tourism in Lima	Increasing

5.2 Resource System (RS)

Based on the zoning urban plan of SJM, most of LP is considered a Special Regulation Zone [Zona de Reglamentación Especial; ZRE]. This denomination is given to the areas that require more research to determine the actual zone type and their boundaries due to the existence of slums and pig farms (RS2) (Instituto Peruano de Derecho Urbanístico [IPDU]; n.d.). In other words, the limits of the ecosystem in LP are established by the urban sprawl in the area. As a result, LP went from being part of Lomas de Atocongo, a chain of Lomas crossing multiple districts of Lima, to belong to a small ecosystem of 37.97 hectares with a lot of urban intervention such as simple pedestrian paths, a vehicular road, and 2 walls dividing SJM from Surco and La Molina districts, along with archaeological caves (RS3; RS4) (EbA Lomas; n.d.). Likewise, LP's vegetation starts to grow from 300 m.a.s.l. to 625 m.a.s.l., with slopes of 25% to 40%, as displayed on Figure 4. However, Nueva Rinconada [NR] slums are located until 450 m.a.sl. within what used to be part of LP (RS9) (EbA Lomas, n.d.).

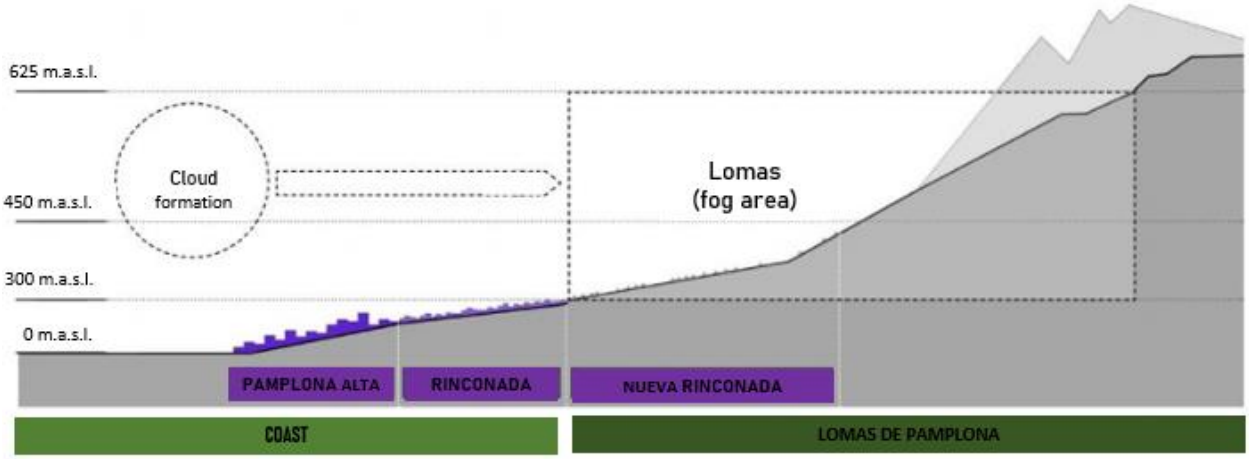

Figure 4. LP formation diagram. (Nicolacci, 2015).

The dense fog during winter activates most of these species from their "sleeping" period during the summer season, and causes a strong seasonality with a visual contrast from a desert landscape into a green ecosystem (RS7) (Claro 2013; Lleellish, Odar & Trinidad, 2015). Concerning the sensibility of the ecosystem, the vegetation's ecosystem functions allowing the equilibrium of the ecosystem to become unbalanced or stop functioning when the flora population decreases or disappears (RS6) (Apedjinou, 2019). In this regard, the former head of Lomas de Asia set an example of this:

> The lomas are covered with moss. It is like the skin of the human body and is fundamental for the functioning of Lomas. Moss is a sponge that absorbs humidity to rehydrate the soil during the dry season. When people walk over it, the moss breaks and takes 10 to 15 years to recover. (Lomas de Asia, personal communication, May 22, 2020)

Table 4. Resource System (RS) in Lomas de Pamplona. (Source: Author)

Notation	Variable	Working Definition	Lomas de Pamplona
RS2	Clarity of system boundaries	Clarity of ecosystem boundaries	Unclear
RS3	Size	Size of LP	Small
RS4	Human constructed facilities	Human-constructed facilities within LP	Intervened
RS6	Equilibrium properties	Sensibility of the ecosystem regarding external pressures	Sensible
RS7	Predictability of dynamics	Changes on ecosystem functioning from seasonal variation	Strong
RS9	Location	Closeness with settlements	Inside LP

5.3 Actors (A)

The 144 slums of NR, Valle Escondido [VE] slum, illegal land dealers, and LP collective are the users of LP (A1a). From the ecotourism activity, LP receives more than 1,500 visitors during winter (A1b). The collective members do not live in NR but in the Pamplona Alta and Pamplona Baja sectors (A4). NR and VE suffer from the poor economic situation and high levels of vulnerability of the population

living in those areas (Gallo, n.d.) (A2a; A2b), as confirmed by a specialist from the Center of Risk Studies and Prevention [Centro de Estudios y Prevención de Desastres; PREDES]:

> The population in the area is poor and extremely poor (...) the majority has precarious houses in slopes areas with foundations in bad conditions or even some houses made with brick and cement are made poorly. (...) They have many needs because they do not have water, no sanitation, they use pit latrines that are superficial because of the type of soil in that zone and, therefore, they are constantly changing the location of those [pit latrines]. They pay the most expensive water in Lima because the tanker truck [that brings water to areas without proper sanitation] charges what they want. (PREDES, personal communication, May 27, 2020)

Specific unsuccessful attempts of protection have been made from a previous SJM government, Lomas de VMT collective and Flor de Amancaes slum [FA] at different moments (A3). In 2003, LP was part of the local sustainable tourism development program of SJM municipality, which did not continue because of the lack of interest from the following SJM authorities and, consequently, the urban sprawl from NR progressed as well as from other districts. Because of the same reason, LP did not achieve being included in the Regional Conservation project in 2013 when it was still part of Lomas de VMT. Among slums in NR, FA distinguished for considering LP as a green area and, in that way, making efforts to preserve it with no success such as reforesting part of the ecosystem, placing 3 fog collectors, spreading rumors that LP was the property of a university and that a water reservoir project was going to be executed there. Based on it, there is presence of leadership from FA in the protection of LP, along with the collective, but their motivations are different (A5a; A5b):

> An important characteristic [of the members of the collective] is the commitment to the environment. (...) Each of us provides a different approach to the topic [protection of LP]. All of us want to develop a district identity, change the perception of SJM dwellers and that is what motivates us: to change the mentality of people [towards LP]. (LP collective, personal communication, May 22, 2020)

> [The members of the collective] motivation comes from their belief that green [spaces] are important because is what they have learned in contrast with FA slum that are local leaders and first-generation migrants that have a connection with natural areas since their childhood and [LP] make them remember their native lands. (Centro Urbes, personal communication, March 31, 2020)

Most inhabitants in NR are from regions of Peru outside of Lima, they have been connected with nature until they move to the city, where that connection was lost (A6c). The activities carried out by inhabitants in LP are strongly related to its seasonality (RS6), lack of knowledge about the ecosystem (A7), and their economic situation (A2a). However, LP contributes to its ecosystem services in their livelihoods, like soil formation that avoid rock sliding (A8). Moreover, slums in NR have a heritage of collaboration, each of them has their own board to coordinate strategies and activities for the formalization process of their settlements. When they have a common interest like access to water, they work together displaying integration among them (A6a):

> Will exists in NR. If you motivate them, many things can be achieved. The people [from NR] are active but the problem is that they do not have resources. They do what is possible to improve the conditions of their slums to get [basic] services by making activities but more than that is not possible for them. (PREDES, personal communication, May 27, 2020)

Concerning the collective, the members have developed local, regional, and national networks because of their experience in social and environmental projects from different sectors, including members of district organizations as Mi Pamplona City, and a member that is part of the current SJM government as the head of the citizen participation department (A6b).

Table 5. Actors (A) in Lomas de Pamplona. (Source: Author)

Notation	Variable	Working Definition	Lomas de Pamplona
A1	Relevant actors		
A1a	Direct users of natural resources	Number of direct users	Large
A1b	Other actors	Number of visitors during the wet season	Around 1,500 visitors
A2	Socio-economic attributes of users		
A2a	Economic attributes	Economic situation of slums	Poor
A2b	Vulnerability attributes	Level of vulnerability of slums	High
A3	History or past experiences	Presence of attempts to protect Lomas de Pamplona and successfulness	Present and Unsuccessful

A4	Location	Sharing of location among direct users	Different
A5	Leadership/entrepreneurship		
A5a	Leadership/entrepreneurship in slums	Presence of leadership and entrepreneurship for protection of LP in slums	Mostly not present
A5b	Leadership/entrepreneurship in other direct users	Presence of leadership and entrepreneurship for protection of LP in Collective	Present
A6	Norms / social capital		
A6a	Social capital in slums	Presence of social capital in slums	Present
A6b	Social capital in collective	Presence of social capital in collective	Present
A6c	Traditions and community values related to natural resource use	Presence of community values related to Lomas de Pamplona to direct users	Present and mostly not active
A7	Knowledge of SES / mental models	Existence of knowledge about the ecosystem	Lacking
A8	Importance of resources	Dependence on the ecosystem for slums livelihoods	Dependent

5.4 Governance system (GS)

At a national level, most governmental authorities are not present directly in the governance of LP. However, the environmental network conformed by Centro Urbes, a multidisciplinary group that works to preserve natural ecosystems in Lima, and Lomas of Peru Network [Red de Lomas del Perú], a network of collective representatives of most Lomas in Peru, intercede through associations with these authorities relate to political incidence to demand the compliance and foment of policies regarding the protection of Coastal Lomas. UNDP, through the EbA lomas project, plays an essential

role in this environmental network in MLM and SJM, they are the technical assistant to civil and public organizations involved in the management of Lomas in Lima to establish a relation and coordination among them with the aim of conserving them. (GS3c)

Currently, MLM and SJM authorities are interested in the conservation of the coastal lomas and LP, specifically (GS1a). In MLM, 5 departments are involved in different aspects of the management of Lomas in Lima and each of them has its objectives that direct their selection criteria to choose which lomas they are going to work with. Consequently, LP has received small direct support from Environmental Education, and Tourism departments of MLM, and Lima's Parks Services [Servicio de Parques de Lima; SERPAR]. In particular, SJM's current government has intervened in the protection of LP. However, the municipal expenses of SJM are greater than its income from tax collection, which reduces its budget and resources for activities that are not priorities for SJM's citizens (GS1b) (Olortegui & Pedraza; 2016; INEI; 2014):

> We are a district with multiple priorities from which the environmental priority is important but not that much compared to current needs like civil security and cleaning services that are priorities in everyday life. (SJM Municipality, personal communication, June 24, 2020)

Due to the presence of leadership (A5b) and social capital (A6b) from LP collective, they have managed to include LP in the existing environmental network and connected the EbA lomas project to SJM municipality through the environmental management department. On the other hand, the collective's lack of organizational structure, limited time from some members, and not being legally constituted, decrease their capacity for preserving LP (GS1c). Most members reflected on this:

> Regarding internal organization, everything that we have done was disorganized and maybe empirical. Many times we have tried to plan but we have not succeeded on that. Each of us has a specific role. However, when one cannot do it, other members begin to fulfill various roles and, hence, there is no organizational structure. (LP collective, personal communication, May 18, 2020)

As displayed in Figure 5, the only committee from NR slums that is connected to LP governance is FA slum, after attempts from the collective to include Defensores de la Familia and Paraiso slums with negative results (GS3a). Likewise, Mi Pamplona City, an influential Facebook news portal in the district, forms part of the media network along with various regional news media and ecotourism websites. They attract the attention of local authorities in Lima, and in particular, SJM inhabitants about the existence and situation of LP (GS3b). Additionally, PREDES is a major NGO working in NR related to the risk reduction in 29 slums (GS2). They maintain a strong relation with SJM municipality

and all NR slums, acting as technical support in risk management and helping them on the elaboration of the Disaster risk assessment of NR to change their area from ZRE to a Residential one for providing access to water and sanitation to NR.

The majority of LP's land is owned by the government and, thus, it is a felony to usurp or profit from government lands (GS4) (EbA Lomas, n.d.). In consequence, the collective along with FA slum only have the power to notify illegal activities to SJM authorities and the police, like land trafficking and encroachment based on existing laws. Moreover, they use recommendations that work as internal rules for FA slum, like not walking outside the lomas' path, not to throw or burn their waste inside the ecosystem to maintain the paths in good shape, and not to uproot the plants (GS5).

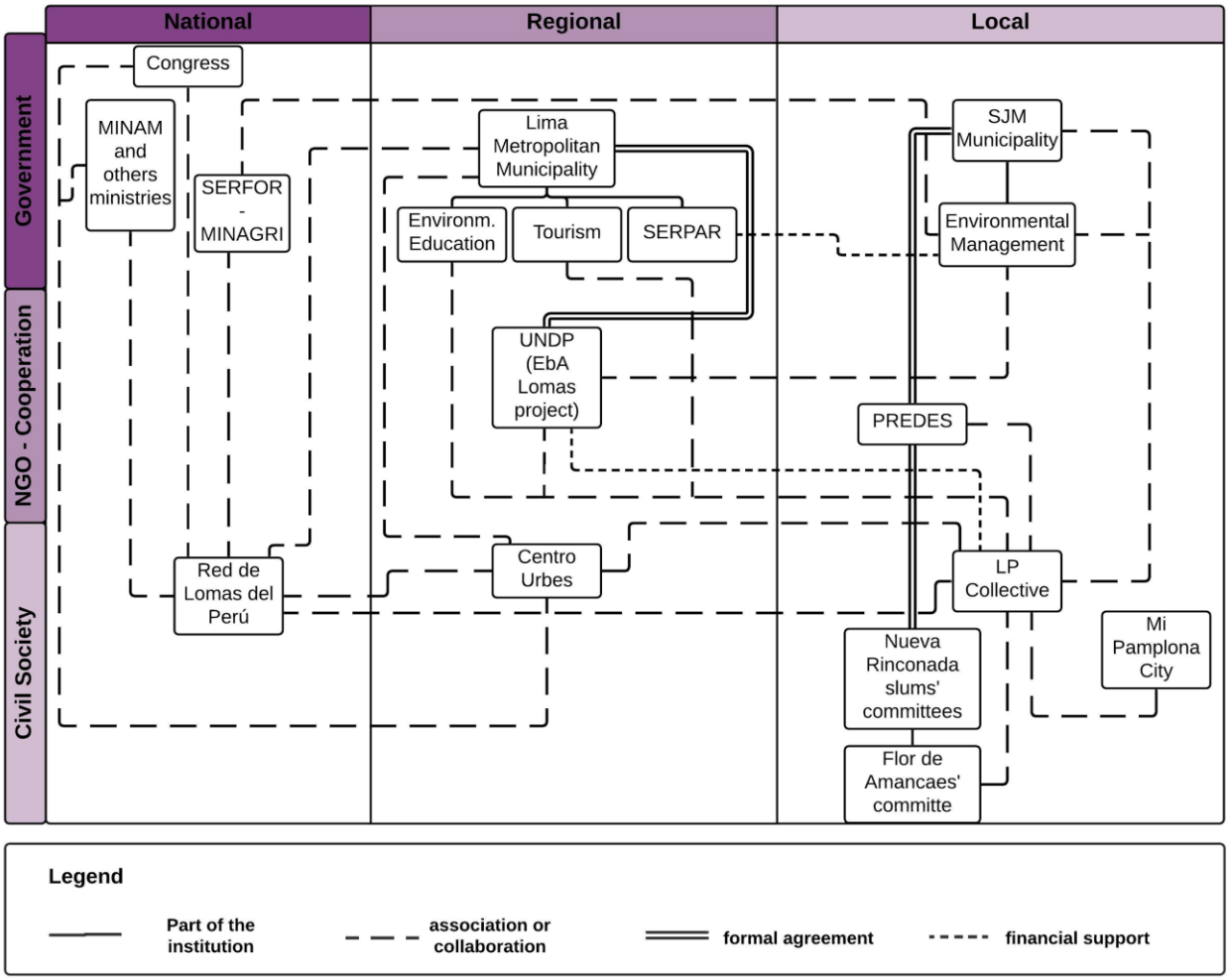

Figure 5. Diagram of conservation governance in Lomas de Pamplona. Actors and mechanisms are categorized by type and scale of the organization. (Source: Author)

Table 6. Governance System (GS) in Lomas de Pamplona. (Source: Author)

Notation	Variable	Working Definition	Lomas de Pamplona
GS1	Government organizations		
GS1a	Interested for conservation from State organizations	Interest for the conservation of Lomas from current SJM and MLM authorities	Interested
GS1b	Capacity of State organizations	SJM's negative balance sheet	High
GS1c	Capacity of Communitarian organizations	Operation of collective	Lack of formality
GS2	NGOs	Presence of NGO	Present
GS3	Network structure		
GS3a	Social networks	Level of social network in the area	1 from 144 slums
GS3b	Media networks	Presence of partners in media	Present
GS3c	Environmental networks	Presence of environmental network	Present
GS4	Property-rights system	Ownership of LP	Mostly government property
GS5	Operational rules	Operational rules among direct users	Almost nonexistent

5.5 Interactions (I)

5.5.1 Information Sharing (I2)

Due to the absence of most slums in the social network (GS3a) and conflicts (I4) indicators, the communication of actions related to the management of LP is almost non-existent. On the other hand, the information sharing among the collective and FA slum is active but informal through a WhatsApp group that they have with the people working at the EbA lomas project (GS3c) and some officers of SJM municipality. The EbA lomas project (GS3c) and the Tourism department from the

MLM (GS1a) have included LP collective and FA slum on activities of sharing experiences between Lomas and other fragile ecosystems in Lima by transmitting their processes that can contribute to improving others. Moreover, the presence of PREDES (GS2) contributes to sharing relevant information about the importance of LP to slums' livelihood in NR (A8), as part of their project to reduce their vulnerability (A2b) due to their location in this steep and loose rock ecosystem (RS9).

The social capital (A6b), leadership (A5b), and capacity of the collective (GS1c) with the support from the social (GS3a), environmental (GS3c), and especially the media network (GS3b), along with an increasing demand for tourism in Lima (S5), have fostered the knowledge about LP and its importance at a district and regional scale. As a result, more than 1,500 visitors came to LP and 3 school visits were organized, from which most were from SJM (A1b). Likewise, they have a Facebook page where they share information about LP with 5,666 followers and they go to events at universities and different institutions to share knowledge about LP.

5.5.2 Deliberation processes (I3)

A small area of the ecosystem in LP (RS3), a large number of direct users (A1a), in which most of the slums have a reduced knowledge of LP (A7), and the lost connection with nature (A6c) prevent most slums in the area from becoming part of the social network (GS3a), incentivizing conflict between them (I4) that obstruct an integrated deliberation process. Internally, the capacity of the collective in terms of formal procedures (GS1c) generates that the FA committee has not been included in the deliberation process. However, FA feels represented by the collective after many unsuccessful attempts to protect LP (A3). Moreover, the collective has made attempts to include Defensores de la Familia and Paraiso slums but it did not work out.

5.5.3 Conflicts (I4)

Similarly as in the deliberation processes (I3), a small size ecosystem (RS3) with unclear boundaries (RS2), a large number of direct actors (A1a) with a reduced knowledge of LP (A7), and a drastic seasonal ecosystem (RS7) that makes LP look like a desert during summer, incentive actions that go against LP protection. At a broader level, the type of settlement pattern in SJM (S2b), combined with the lack of respect for democratic values (S3a), a weak integration among government institutions to determine a common legal framework for the coastal lomas (S4a), weak level of implementation of environmental policies (S4b), and compliance from inhabitants of these policies (S4c), promote that NR slums, VE and illegal land dealers continue the urban sprawl (RS4). These particular interests collapse with the aim of the collective and FA slum to protect LP, causing conflicts. On a minor level,

the presence of visitors (A1b) during the wet season has to cross many slums due to their close location (RS9), producing discomfort in some slums such as VE and Defensores de la Familia (see Appendix 9.4).

Conflicts also appear in the form of threats. In 2019, due to the rapid intervention from SJM municipality (GS1a) from the pressure made by the collective (GS1c) and FA slum (GS3a), 50 precarious houses from land trafficking at the center of LP were uninstalled. As a consequence, the LP collective and FA slum have received threats from the illegal land dealers, as mentioned by the members of the collective and FA:

> They [illegal land dealers] were looking for Christian [a member of the collective]. Some people told us: "The guy that talks about LP, we are looking for him to kill him" but happily they could not find him. (LP collective, personal communication, May 16, 2020)

> The threats come from the illegal land dealers, they can ally with the slums from around or they can be from those slums. They [illegal land dealers] are mafia-like criminals, they enter the lands, register them and start selling those. (FA slum, personal communication, July 5, 2020)

5.5.4 Investment activities (I5)

The urban expansion (RS4) in a small size loma (RS3), compared to the other ones in Lima, makes it not attractive for investment on LP's conservation. Likewise, the lack of legal constitution of the collective (GS1c), and the weak capacity from SJM municipality in terms of economic resources (GS1b) have limited the level of investment for conservation in LP. Some of the few investments made in LP were the donation of native trees from SERPAR, and a welcoming sign from the education department of MLM. Also, it is important to acknowledge that ecotourism activities (A1b) have brought an economic development alternative to FA slum (A2a) through the sale of food and drink to visitors.

5.5.5 Lobbying activities (I6)

At a national and regional level, Centro Urbes and Lomas of Peru network (GS3c) are two organizations working to include the coastal lomas in the political agenda. Nevertheless, the political instability (S3b), a weak integration among government institutions to determine a common legal framework for the coastal lomas (S4a), and a weak level of implementation of environmental policies (S4b) increase the challenge. However, the interest from public institutions (GS1a) have resulted in

policies in favor of the protection of this ecosystem. At a local level, the media network (GS3b) and the capacity of the collective (GS1c) created pressure on the SJM municipality to act in the preservation of LP. Likewise, having a member of the collective working in the Municipality (A6b) creates an internal pressure to SJM municipality to connect efforts and speed up processes regarding LP.

5.5.6 Self-organizing activities (I7)

The presence of conflicts in the area (I4), combined with weak operational rules (GS5), and the lack of formality from the collective (GS1c) produces a lack of internal rules for the management of LP among direct users. Nevertheless, the collective is the only environmental group that is working in the protection of LP. They, along with FA slum and its different networks (GS3), have organized many self-organizing activities like the inauguration of LP as a place to develop ecotourism activities (A1b), improving walking paths for the guided tours, giving free guiding tours to the visitors, and promoting the economic development of the FA slum (I5b). These activities display the levels of leadership (A5b) that the collective possesses.

5.5.7 Networking activities (I8)

The collective is considered an ally to the SJM municipality due to the lobbying activities promoted by it (I6). Since then, the LP collective have participated in direct meetings with the head of the Environmental Management department of the municipality to coordinate the ordinance to protect LP, connected them with the EbA lomas project (GS3c) as technical support for this legal mechanism. When coordinating LP's preservation, different departments of SJM municipality, the police, a representative of the congress, FA slum, among others, have been included in a meeting regarding the Esquema 300, a project that is going to provide water and sanitation to NR's slums. This interest of the government (GS1a), as well as the influential capacity of the collective (I6), have led to fighting against land trafficking, and demonstrating an express commitment from the Mayor to preserve this ecosystem during the inauguration of LP's protected area:

> The Mayor's priority towards LP has always been essential. First, the uninstallation of the encroachment in 2019, then her presence in the inauguration of [the collective's ecotourism routes for the visiting season at] LP in which she publicly said that the next year she is going to bring the ordinance [that transforms LP into an intangible and inalienable area]. (SJM municipality, personal communication, June 24, 2020)

5.5.8 Monitoring activities (I9)

FA slum is the one who can monitor if there is any attempt of encroachment or land trafficking in LP because the members of the collective do not live around LP (A4). The collective works as a mediator by sending photos from FA alerting the authorities of SJM Municipality, acting according to the laws that protect the governmental land (GS4). In previous encroachment attempts, the municipality has responded fast due to the strong relation with the collective (I8).

5.5.9 Evaluation activities (I10)

Since the reception of visitors in LP (A1b), the collective has not researched the carrying capacity of the ecosystem. Therefore, they have made empirical estimations to determine how many visitors can go on each tour to maintain LP's ecological balance (RS6). Likewise, the EbA lomas project (GS3c) gives them technical support about actions that can and cannot be done in LP, taking into consideration the equilibrium of the ecosystem.

Table 7. Interactions (I) in Lomas de Pamplona. (Source: Author)

Notation	Variable	Working Definition	Lomas de Pamplona
I2	Information Sharing		
I2a	Internal Information Sharing	Communication between collective and slums	Not present
I2b	External Information Sharing	Communication between collective and actors outside slums	Present
I3	Deliberation processes	Inclusion of slums into the deliberation process	Not included
I4	Conflicts	Conflicts among users	Present
I5	Investment activities		
I5a	Investment activities for conservation	Investment for the conservation of Lomas de Pamplona	Lacking
I5b	Investment activities from slums	Investment activities from FA slum to their economic development	Present

I6	Lobbying activities	Influence of collective in government	Present
I7	Self-organizing activities	Collective action activities in governing SES	Present but insufficient
I8	Networking activities	Networking with government	Present
I9	Monitoring activities	Informal monitoring activities	Present
I10	Evaluation activities	Evaluation of Lomas de Pamplona and the effects of management initiatives	Lacking

5.6 Outcomes (O)

In the following section, the second and third research questions are going to be answered. First, a description of the social and environmental outcomes is presented separately. Then, interaction variables along with other first-tier variables are used to explain the positive or negative results of the outcomes.

5.6.1 Social Outcomes

On the positive side, the presence of external information sharing (I2b), through activities that the collective is doing, has brought acknowledgment to LP's conservation at a regional and district level, making them visible to the audience as part of the coastal lomas. Likewise, FA slum has been empowered by the alliance with the collective through the development of ecotourism activities that brought them an option of economic development (I5b) and a relevant role in the monitoring activities (I9).

The strong side of the collective action (I7) is the substantial networks (GS3) integrated by the collective, which provide them an important lobbying capacity (I5) that led to networking with different public institutions, especially with SJM municipality (I8). Nevertheless, the capacity of the municipality (GS1b) delay the sign off the ordinance, during the current Mayor's period, causes a threat to the protection of LP because of the irregular political implementation of environmental policies from each government (S4b), as it is exemplified in the unsuccessful attempts from the FA slum, Lomas de VMT collective, and a previous SJM government (A3).

On the other side, the insufficient collective action among direct users (I7) is incentivized by the opposite interests that cause conflicts (I4), impacting on the internal information sharing (I2a) and deliberation processes (I3). As reflected by a specialist from Centro Urbes:

> External organization alone is difficult [to succeed in the protection of the lomas], especially if it is an urban ecosystem, it is required that the local population is involved. They [the collective] have achieved that Flor de Amancaes slum forms part of the protection of Lomas de Pamplona but it is not enough. (Centro Urbes, personal communication, March 31, 2020)

5.6.2 Environmental Outcomes

Due to the insufficient collective action among direct users (I7), LP's environmental conditions have minimally improved, maintaining most of the resource system variables. The initial presence of operational rules (GS5) have contributed to a better treatment of LP from FA slum in terms of solid waste disposal. A contrary situation happens with other slums, whose actions keep being related to the seasonality of the ecosystem (RS7), as mentioned by the specialist of PREDES:

> The lomas after the winter season disappear from people's vision. If lomas are not green, they don't care about it by putting a lot of garbage, waste of construction materials, there is no proper care. However, in the winter season, the ecosystem becomes green thanks to the humidity. During this season, people care more, you can see that it is cleaner. (PREDES, personal communication, May 27, 2020)

Additionally, the informal monitoring activities (I9), along with the network between the SJM municipality and the collective (I8), have contributed to stopping the attempts of land trafficking and encroachments, which, consequently, pause the degradation of the ecosystem (RS3) and the loss of the endemic flora (RS6). Additionally, the boundaries of LP (RS2) could be legally determined if the ordinance is approved by the municipality. Finally, considering the external information sharing (I2b), the large number of visitors (A1b) going to LP have created more pressure on the sensible ecosystem (RS6), which it is not handled properly by the collective due to the lack of research on the carrying capacity of the ecosystem (I10).

6. Analysis and Discussion

Based on the theory used in this study, the discussion will connect it with the results explained previously. Though the scope of this thesis is limited, the following arguments will intend to describe which variables, that have led to negative outcomes in LP, can be developed through the lens of SES

and urban commons theory. For that purpose, this section will try to answer the fourth research question: How can the negative outcomes in LP be addressed from an SES perspective?

Urban communities can include diverse social groups and commoners[4] claiming the power and opposite rights in the commons among each other (Borch & Kornberger, 2015) Hence, the resource is rivalrous and subject to tragic conditions (Foster, 2011). Currently, there is a rivalry on consuming LP's services from NR slums, VE slum, the collective with FA slum, and illegal land dealers. Although the collective is working in the protection of LP, the rivalry continues due to the incompatibility on LP's use, as land for settlements or for other daily purposes. LP collective has achieved to develop a strong informal external network structure, an alliance with FA slum, and a high level of network with the SJM government. Nevertheless, there is room for improvement. All direct users are capable of collectively managing a common resource as LP by addressing endogenous and exogenous factors in order to support their actual and future needs (Foster & Iaione, 2018).

As stated by Foster (2011), the level of enabling government role in supporting collective action has an inverse relation with endogenous factors, such as community size, knittedness, shared norms and relatively small size of the resource. In other words, when these factors are absent in a collective group, it is needed a strong government-enabling role that can bring support to the collective management regime through government complex structures that provide enforcement and coordination features (Foster, 2011). In the case of LP, there is a large number of heterogeneous direct users, lack of integration, different interests and a small size ecosystem. Thus, following Foster's logic, the role of SJM municipality is fundamental for a better collective management in LP. By negotiating and talking with these government institutions, LP would transform from a public open space to an urban commons for all direct users (Löw, 2015).

The collective's strong network with the SJM government is not enough to enable the enforcement and creation of legal mechanisms. In Peru, the compliance of environmental policies is weak, reason why land trafficking and encroachments still happen in LP, even if it is illegal to be located in state owned property and put at risk the endemic flora. For that reason, it is necessary the intervention from SJM municipality to connect all direct users for an improved collective management of LP. As mentioned by Ostrom (1990), all individuals that are affected by a management proposal from a group of users need to discuss it first to have a better chance to progress as a unanimous group and, for that purpose, the role of governments is to support the creation of collective institutions.

[4] Inhabitants that are linked to a resource through its usage or dependance; in other words, commoning (Feinberg et al., 2020)

Consequently, considering the formal structure and influence of SJM municipality, it can promote and offer a space for discussion among the direct users of LP. There, NR slums and the collective can discuss the management of LP in order to reach agreements. In that way, the collective avoids the slums' refusal to meet as happened before with Defensores de la Familia and Paraiso slums.

Urban commons involve the practice of commoning, which is the dynamics between the physical conditions of LP and direct users that depend on it for their livelihoods (Harvey, 2012). Urban commoning is triggered by social capital which allows informal social control from users (Foster & Iaione, 2018). To enhance social capital, social networks need to be activated through users' engagement (Foster, 2011). Even though the LP collective and NR slums present social capital, the deficient common engagement weakens the social network and reflects a lack of social capital among them. Consequently, LP's direct users require to increase their practice of commoning by developing their social capital.

A lack of social capital is strongly related to the existence of social disorder in the form of violence or threats of violence like the collective's members and FA slum's inhabitants are receiving from illegal land dealers of VE (Foster, 2011). Thus, intensive public interventions are required to re-establish positive social norms and conduct (Foster, 2011). For instance, by involving local leaders and the police to protect the neighborhood, the community policing of an area regenerates the social capital in places with social disorder (Garnett, 1995). In consequence, the inclusion of more local leaders from NR slums in the informal monitoring activities, would contribute to enhance the social capital among direct users. As a result, there would be less costs of monitoring and reaching agreements due to a stronger social capital that increases the likelihood of users to self-organize the management of LP (Ostrom, 2009).

According to Ostrom (2009), users have to perceive scarcity in the resource system to self-organize. In the case of LP, the perception of scarcity is related with the reduction of its size, which has triggered the self-organizing activity from LP collective and FA slum. As well, the knowledge of the ecosystem attributes, the acknowledgement of its importance for their livelihoods, and the leadership towards the protection of LP contributes to the concern of LP's scarcity. Yet, the urban sprawl has diminished the environmental knowledge in most inhabitants and limited spaces for ecosystem management that make the conservation of urban ecosystems difficult (Colding, 2012). Hence, by increasing the knowledge about LP along with promoting the importance of the resource to users, it would incentive the chances of integrating the remaining slums into the collective action (Ostrom, 2009).

After this analysis, challenges to self-govern LP can be addressed by improving direct users' exogenous and endogenous characteristics that impact on the ecological conditions of LP. First of all, SJM municipality requires to be more involved in supporting a more inclusive collective management of LP that can contribute to the improvement of their endogenous factors. Moreover, endogenous characteristics from NR slums and the collective require immediate development because of an inconsistent implementation of environmental policies, that depend on the interest of local authorities to enforce these or not. Hence, strengthened the social network through a stronger social capital, more knowledge of LP and acknowledgement of its importance in all NR slums results in a stronger collective management. According to Miller (2013), sustainability science contributes to understanding the fundamental interactions among society and nature in order to achieve society's capacity to lead more sustainable interactions among them. By developing these variables, capacity of society increases from a stronger collective management and, at the same time, provides a sustainable relation among direct users and LP ecological dimension.

Additionally, two arguments set limitations to this thesis, the theory's limitation to explain political conflicts, and institutional constraints to face challenges. First of all, part of the urban commons theory focuses on local governments' supportive role to collective management in cities, in spite of their regulatory slippage. Still, this theory does not cover the aspect of opposite interest among the local government and the collective action, mainly in countries with prominent rates of corruption and political instability. Considering that the current SJM authority is one of the few ones interested in protecting LP, it is a possibility that the next authority can be against its protection which, in some cases, manifests through alliances with illegal land dealers.

Furthermore, some challenges are more in the realm of national government institutions and exceed municipalities' functions. As mentioned in the results section, the lack of integration from different governmental entities in Peru, predominantly from the housing sector, encourages more land trafficking and encroachments. Even though SJM municipality has the interest to protect LP and control these illegal activities, their causes have to be handled from upper levels, such as the Housing and Environmental Ministries, MLM and the Congress to plan the city and provide affordable housing options in Lima without threatening natural ecosystems.

7. Conclusion

As population growth in cities, green areas social-ecological systems [SES] are threatened to disappear by urban pressure as well as the livelihoods of citizens. With these ecosystems being part of the city, local governments are in charge of enforcing regulations to sustainably manage it among the heterogeneous users. For many reasons, regulations are not enforced, creating a rivalry among

different usages. Consequently, collective action from urban inhabitants arises to manage these ecosystems, transforming an urban resource into an urban commons. This thesis has investigated the collective action from Lomas de Pamplona [LP] collective and its management of LP ecosystem against its disappearance from the urban sprawl in the form of encroachments and land trafficking in Lima, Peru. This is accomplished by analyzing first, second and third-tier variables from the SES framework.

LP collective network with civic organizations has contributed indirectly to LP by reaching higher governmental levels to include coastal lomas in the national and regional political agenda. Moreover, the media network with Mi Pamplona City and other news, along with ecotourism websites, provide a visibility of LP in SJM's inhabitants and authorities. Therefore, SJM municipality's environmental management department and the collective have been collaborating to control the urban sprawl from Nueva Rinconada [NR] slums, Valle Escondido and illegal land dealers through informal monitoring and the creation and activation of legal mechanisms. Regarding the monitoring, Flor de Amancaes [FA] slum has been essential due to their location within the NR sector. However, it is the only slum that collaborates with the collective, out of 144 slums that conform NR. Thus, it creates conflicts for the types of usages that do not allow to create effective operational rules that reduce the urban pressure to the ecological dimension of LP.

According to urban commons theory, SJM municipality needs to be more supportive to integrate other slums into the collective action promoted by the LP collective. At the same time, social capital, knowledge of LP, and acknowledgment of the importance of LP in slums' livelihood are essential to develop a stronger social network that could decrease the conflicts in the area. Nevertheless, this theory sets limitations in explaining political conflicts and institutional constraints, as well as the existence of challenges that are more in the realm of national government institutions and exceed municipalities' functions. Hence, more studies are required to determine the governance of coastal lomas at a national level, including the interactions within the Lomas of Peru Network and its level of representativeness. In that way, it would be possible to propose solutions for a more sustainable management of this unique ecosystem.

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9. Appendix

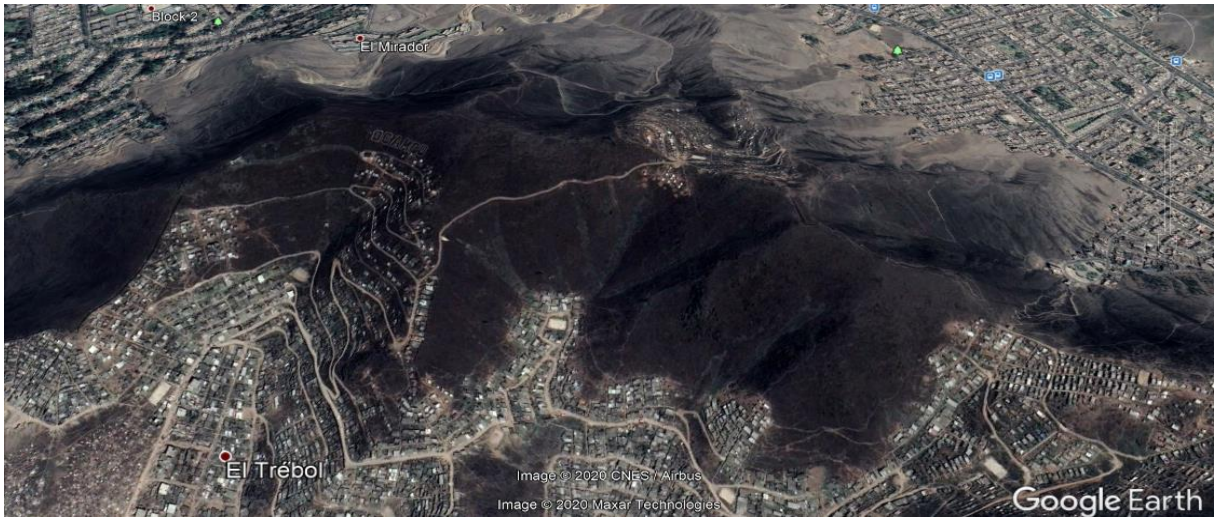
9.1 Images of the decrease of Lomas de Pamplona's extension through the years (Google, n.d.)

June 2002:

January 2010:

October 2015:

October 2018:



November 2019:

9.2 Table of variables second-tier variables from SES framework (McGinnis & Ostrom, 2014)

First-tier variable	Second-tier variables
Social, economic, and political settings (S)	S1 – Economic development
	S2 – Demographic trends
	S3 – Political stability
	S4 – Other governance systems
	S5 – Markets
	S6 – Media organizations
	S7 – Technology
Resource systems (RS)	RS1 – Sector (e.g., water, forests, pasture, fish)
	RS2 – Clarity of system boundaries
	RS3 – Size of resource system
	RS4 – Human-constructed facilities
	RS5 – Productivity of system
	RS6 – Equilibrium properties
	RS7 – Predictability of system dynamics
	RS8 – Storage characteristics
	RS9 – Location
Governance systems (GS)	GS1 – Government organizations
	GS2 – Nongovernment organizations
	GS3 – Network structure
	GS4 – Property-rights systems
	GS5 – Operational-choice rules
	GS6 – Collective-choice rules
	GS7 – Constitutional-choice rules
	GS8 – Monitoring and sanctioning rules
Resource units (RU)	RU1 – Resource unit mobility
	RU2 – Growth or replacement rate
	RU3 – Interaction among resource units
	RU4 – Economic value
	RU5 – Number of units
	RU6 – Distinctive characteristics
	RU7 – Spatial and temporal distribution
Actors (A)	A1 – Number of relevant actors
	A2 – Socioeconomic attributes
	A3 – History or past experiences
	A4 – Location
	A5 – Leadership/entrepreneurship
	A6 – Norms (trust-reciprocity)/social capital
	A7 – Knowledge of SES/mental models
	A8 – Importance of resource (dependence)
	A9 – Technologies available
Action situations: Interactions (I) → Outcomes (O)	I1 – Harvesting
	I2 – Information sharing
	I3 – Deliberation processes
	I4 – Conflicts
	I5 – Investment activities
	I6 – Lobbying activities
	I7 – Self-organizing activities
	I8 – Networking activities
	I9 – Monitoring activities
	I10 – Evaluative activities
	O1 – Social performance measures (e.g., efficiency, equity, accountability, sustainability)
	O2 – Ecological performance measures (e.g., overharvested, resilience, biodiversity, sustainability)
	O3 – Externalities to other SESs
Related ecosystems (ECO)	ECO1 – Climate patterns
	ECO2 – Pollution patterns
	ECO3 – Flows into and out of focal SES

9.3 List of laws that protect Lomas de Pamplona (EbA Lomas, n.d.)

1. Political Constitution of Peru, Article N ° 068.
2. Law No. 27867 - Organic Law of Regional Governments and its amendment Law No.27902.
3. Law No. 27972 - Organic Law of Municipalities.
4. Ordinance No. 1016-2007 – MLM "Metropolitan Environmental Management System" and its regulations Decree of the Mayor's Office No. 085 – MLM.
5. Ordinance No. 1628 - Metropolitan Environmental Policy.
6. Ordinance No. 525-2003 - MLM, Intangibility, protection, conservation and defense and maintenance of green areas for public use in Lima Metropolitan.
7. Ordinance No. 1084 -2007- MLM, establishes the special regulation zone (ZRE) in the upper area of José Carlos Mariátegui and the adjacent area of the Virgin Cemetery of Lourdes, also prohibits the occupation of areas classified as Zone of landscape protection (PTP)
8. Supreme Decree No. 043-2006-AG, List of threatened species for conservation.
9. Supreme Decree 007-2020-MINAGRI, Inter-institutional protocol to protect fragile ecosystems.

9.4 Ecotourism route from the Lomas de Pamplona collective (Geolomas, n.d.)