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Political ecology in the study of urban segregation. A case study on the construction of walls on the outskirts of Lima, Peru

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Abstract
Objective: To evaluate and characterize the elements that generate and are generated in a socially and environmentally segregated space, based on an ecopolitical perspective, used in this study as a tool for interdisciplinary interpretation of socio-environmental problems.
Methodology: Descriptive and exploratory methodology, supported by bibliographical research and on-site observation. Semi-structured interviews were conducted with residents on the outskirts of the city of Lima, Peru. To analyze the information collected, the Pressure, State, Impact and Response (PEIR) matrix was used, in order to generate organization charts for diagnosing conflicts and problems.
Originality / relevance: There is a clear intersection between cultural, historical and political parameters that produce environmental changes in cities. The following article contributes to the study of social and physical segregation as a generator of environmental impacts.
Results: The results show that the researched object presents a complex environmental and social dynamics. A wall was built over the last decades to divide two realities of the city. In this sense, there was socio-environmental segregation, which is a phenomenon of contemporary urbanization, with historical, cultural and political influences.
Social / management contributions: Emphasize factors that are not immediate in the physical space, such as the historical interaction of society in the city and its environmental heritage. Propose a more holistic understanding through Political Ecology

Keywords: Political ecology. Urban periphery. Social and environmental segregation. Urbanization.

A ecologia política no estudo da segregação urbana: um estudo de caso da estruturação de muros na periferia de Lima, Peru

Resumo
Objetivo: Avaliar e caracterizar os elementos que geram e são gerados em um espaço social e ambientalmente segregado, com base em uma perspectiva ecopolítica, empregada neste estudo como uma ferramenta de interpretação interdisciplinar de problemas socioambientais.
Metodologia: Metodologia de caráter descritivo e exploratório, com apoio em pesquisa bibliográfica e observação in loco. Foram realizadas entrevistas semiestruturadas com moradores da periferia da cidade de Lima, no Peru. Para a análise das informações levantadas, empregou-se a matriz Pressão, Estado, Impacto e Respostas (PEIR), a fim de gerar organogramas de diagnóstico de conflitos e problemas.

Originalidade / relevância: Existe uma clara interseção entre parâmetros culturais, históricos e políticos que produzem mudanças ambientais nas cidades. O seguinte artigo contribui no estudo da segregação social e física como um gerador de impactos ambientais.
Resultados: Os resultados mostram que o objeto pesquisado apresenta uma dinâmica ambiental e social complexa. Um muro foi estruturado ao longo das últimas décadas para dividir duas realidades da cidade. Neste sentido, houve segregação socioambiental, sendo este um fenômeno da urbanização contemporânea, com influências histórica, cultural e política.
Contribuições sociais / para gestão: Salientar fatores não imediatos no espaço físico como a interação histórica da sociedade na cidade e no seu patrimônio ambiental. Propor uma compreensão mais holística através da Ecologia Política.

Palavras-chave: Ecologia política. Periferia urbana. Segregação socioambiental. Urbanização.

La ecología política en el estudio de la segregación urbana. Estudio de caso de estructuración de muros en la periferia de Lima, Perú

Resumen
Objetivo: Evaluar y caracterizar los elementos que generan y se generan en un espacio segregado social y ambientalmente, con base en una perspectiva ecopolítica, utilizada en este estudio como herramienta de interpretación interdisciplinaria de problemas socioambientales.
Metodología: Metodología descriptiva y exploratoria, sustentada en investigación bibliográfica y observación in situ. Se realizaron entrevistas semiestructuradas con residentes de las afueras de la ciudad de Lima, Perú. Para el análisis de la información recolectada se utilizó la matriz Presión, Estado, Impacto y Respuesta (PEIR), con el fin de generar organigramas para el diagnóstico de conflictos y problemas.
Originalidad / relevancia: Existe una clara intersección entre parámetros culturales, históricos y políticos que producen cambios ambientales en las ciudades. El siguiente artículo contribuye al estudio de la segregación social y física como generadora de impactos ambientales.
Resultados: Los resultados muestran que el objeto investigado presenta una dinámica ambiental y social compleja. En las últimas décadas se construyó un muro para dividir dos realidades de la ciudad. En este sentido, hubo segregación socioambiental, que es un fenómeno de urbanización contemporánea, con influencias históricas, culturales y políticas.
Contribuciones sociales / de gestión: Enfatizar factores que no son inmediatos en el espacio físico, como la interacción histórica de la sociedad en la ciudad y su patrimonio ambiental. Proponer una comprensión más holística a través de la ecología política.

Palabras clave: Ecología política. Periferia urbana. Segregación social y ambiental. Urbanización.

Introduction

Urban landscapes encapsulate the interaction of society with the economy, politics, culture and nature. Both the negative or positive results of this interaction are manifested morphologically, so the spatial products in their essence are reflections of society. As such, cities consolidate major manifestations of the status quo. The urban theme can be examined using different study focuses and, in turn, the combination of these can provide new perspectives and understandings of a particular issue. Social segregation is a reflection of intra-urban interactions, which are strongly influenced by territorial tensions, as explained in this research.

This work aimed to evaluate and characterize the aspects that generate and are generated by the socially and environmentally segregated space from an eco-political perspective, which

was considered in this work as a tool for interdisciplinary interpretations of socio-environmental problems. The following study does not portray the diversity of realities of each Latin American city, but presents a specific location as a representation of the consequences of the current context of urbanism developed by Latin American countries, as it finds a similarity and even a repetition of problems between the cities in the Latin America region.

A study point was determined on the outskirts of Lima, Peru, which presented different aspects and allowed us to elaborate the objective of our analysis. The chosen location is home to a group of human settlements on the borders between two districts of the city of Lima (San Juan de Miraflores and Santiago de Surco). Although this point does not represent the dynamics of the city in a hegemonic way, it presents a variety of crosscutting factors that produced complex socio-environmental problems, in addition to being a spatial and historical reference for segregating urbanization.

In order to understand the dynamics of the place, three aspects that interact with each other due to their physical proximity must be highlighted. The first is the precarious urbanization developed by the population in extreme poverty. The second examines a natural ecosystem in the process of degradation due to the expansion of the city. Finally, the third aspect is an urban socio-environmental barrier represented by a wall built by a privileged social group in the city to segregate the rest of the population within the district boundaries.

After several instances of social conflict, this dividing wall was built, separating the two urban realities. One favored by the State with planned urbanization and the other, an impoverished and *ad hoc* development totally lacking in infrastructure. This wall has generated several impacts not only social, but also environmental, therefore, there is a need for an interdisciplinary approach to understand its significance.

1 Literature review

1.1 Political ecology and the city

The ecological approach is more usually linked to the biological sciences and appears to be a departure from other sciences. This observation is debatable when verifying that from the 1950s onwards studies have been formulated that bring ecology closer to various sciences, resulting in academic interest in "sociobiology" or "ecological economics" which articulate the ecological bases with social issues (Palacio & German, 2006). It was in the 1970s that politics was addressed according to Jatobá, Cidade and Vargas (2009), when different academic theses aimed at analyzing the demographic pressure on natural resources, the interaction of communities and the limits of their environment.

In the processes that brought ecology closer to politics, Radical Ecology emerged (mid-twentieth century), which aims at territorial separation to protect nature, as it posits that human activities cannot be undone. Moderate Environmentalism also appears, broadly related to "Sustainable Development", a reconciliation between the conservation of natural territories and obtaining economic benefits. It is noteworthy that there is no complete, integrated formulation that demonstrates the full effectiveness of this conciliation. Finally, Political Ecology emerges, which attempts an interdisciplinary analysis of socio-environmental issues, in which different geographic and social scales must be considered, as the territory makes conflicts explicit in order to move away from superficial development discourses (Jatobá, Cidade & Vargas, 2009).

It is important to reference the concept of territory chosen for the following work. Haesbert (2014) goes beyond the spatial issue and explains that territory is associated with power and its political exercise, but by 'power', the reference is to dominance and appropriation. In short, political ecology analyzes the current dichotomy between nature and society that generates a dispute for resources and territories, often violently. Whether in cities or outside them, this in turn causes social and environmental impacts but which are not assimilated in an equitable manner for all sectors of society, as stated by Palacio and German (2006) because there are mechanisms of power over the management of nature and therefore control over society. Andrade and Blumenschein (2014) point out that environmental degradation is not only visible in nature, but also in the misery of populations and, therefore, an ecological awareness linked to political thinking is necessary and in the case of cities, constitutes an Urban Political Ecology (EPU).

For Lipietz (2015), the individual, society and territory make up a triangularity in which politics is discussed and artificial territories for the transformation of natural territories are generated; which promote life and in turn the right to housing and the city. In this dynamic and through its interdisciplinary approach, urban ecopolitics considers history as a condition that reveals the previous society-nature relationship with the view to interpreting its evolution and its impact on space.

1.2 Urban segregation

Socio-spatial segregation is understood, in the words of Salgado, Romero, Vásquez and Fuentes (2009), as the physical and functional separation of spaces according to their occupation by different social groups. This distinction categorizes individuals according to purchasing power and geographic location, but other standards such as race, culture and others are also considered. Caldeira (2003) explains the tendency to build physical barriers formalizing the fragmentation of the city according to its social characteristics through the instrumentalization of fear. Urban issues

such as violence fuel the discourse of social differentiation although the result of this is other types of systemic violence. This discourse legitimizes the appropriation of private and public security, omitting the transversal solution of the city's central problems.

According to Moraes (2006), the morphological fragmentation generated by the delimitation of territories and resources creates two types of urban ecosystems in the same city. One of them that has ample urban benefits; and another although recognised officially, technically improvised, although constantly adapted to outside the established norms. In effect, two concomitant cities actively interact with each other. The first one generated from the original plan where elites enjoy government services, and the other physically and socially peripheral for the impoverished classes.

The evolution of contemporary cities presents a clear disharmony in their expansion and sustainability, especially in Latin America, where cities are undergoing an accelerated process of industrialization that benefits a sudden economic growth but does not guarantee sustainability and social equity. Authors such as Freitag (2006) point out different phenomena derived from this type of growth, such as the process of Megalopolization that is increasingly frequent in this part of the world. A megalopolis comprises around 10 million inhabitants, not necessarily due to a population explosion, but often as a result of considerable internal migration.

This context generates the unsustainability of the city as the demands often exceed its natural and administrative limits and resulting in harm to certain social groups. The distribution of basic services such as sanitation does not meet social needs and benefits a spatial portion. The domination of the city by a social sector is acknowledged by the instrumentalized segregation and consequently in the impoverishment of a part of the population.

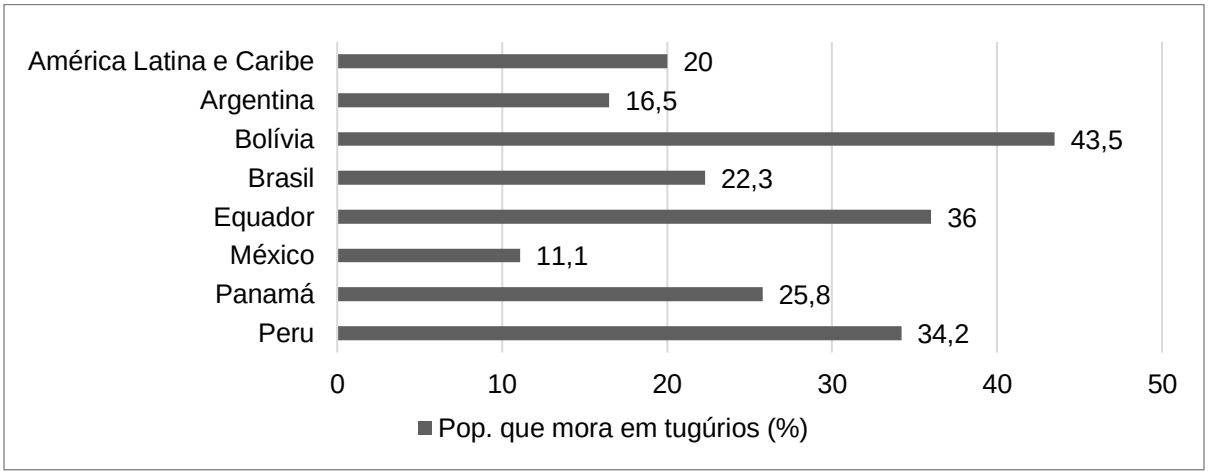
This impoverished part has its own ecosystem with a specific urban metabolism adapted to adversity. It is the product of an institutionalized precariousness because, for Santos (2009), the city can create misery through social and economic relations through the application of a structure or a model that does not expand the city through employment, but through improvisation.

There are historical examples in the Latin American region, such as the case of Colombia in the 1970's, where there was a rural exodus to the cities encouraged by the government to make the civil construction sector more dynamic with low-cost labor. Subsequently, population growth exceeded the generation of employment and the urban political limits (Mejía, 2013). Another example is the construction of capital cities in Brazil, which despite having been carefully planned, as mentioned by Moraes (2006), the State sought the modernity of the rural area and encouraged the population to move to new territories under construction. Later they became positively dynamized in an economic way, but its sheer size would also surpass the city that was planned.

Twenty-first century Latin America is visibly urban as it is estimated that in 2010 the population occupying cities reached 80% of the total. Approximately 469 million people live in cities with more than 20,000 inhabitants (Mejía, 2013). As already explained, this urbanization did not take place in a harmoniously, which means that a significant portion of the population lives in vulnerable structures such as slum dwellings. In 2014, the World Bank estimated that this share had reached 20% of Latin Americans (Figure 1).

Figure 1

Population that lives in Latin American Slum Areas according to selected countries



Source: The World Bank "Population living in slum areas (% of urban population)", 2014.

Figure 2 shows that countries such as Bolivia, Ecuador and Peru surpass the percentage of other selected countries and the average for the region. On the other hand, it is also necessary to emphasize that, in the case of countries with greater economic potential, there are relevant internal inequalities as is the case in Brazil. According to the João Pinheiro Foundation (2018), in 2015 there was an average housing deficit in the states of 9.3%, but the same study indicates that this average demonstrates a considerable gap between the percentages of the states with the highest and lowest deficit. The state of Maranhão acknowledged a housing deficit of 20% that year, which means it was actually twice the national average if one considers an overview of inequality by region.

The combination of poverty and inequality makes Latin America susceptible to paradoxes such as the coexistence of structures and services that do not differ from "first world" countries and neighborhoods with systemic structural deficiencies within the same city. The relegated area of the city's planned structuring is discarded by the real estate market, according to Daher and Sandoval (2016), despite being impacted by the city's economic dynamics. An example of this is

the installation of industries with high emission of pollutants or even liquid or solid waste deposits in places where there is no interest in the property market, although the poorest population occupies it. The distinction between sanitation and environmental quality between different districts or regions in a city characterizes environmental segregation. For Maricato (1999), with environmental segregation the affected population is forced to adopt alternative methods to alleviate the lack of sanitation, although it is often not sufficient to positively affect the health of this population.

Responses to the complexity of circumstances are varied. Davis (2006) points out that the adverse daily life causes the creation of community organizations that optimize housing costs, housing quality, security and even urban services. Establishing aid and cooperation links, building social capital, mitigates the lack of State actions. These social and environmental movements are the solidification of responses that enable the exercise of the right to structured city dwelling and organized political action that is often restricted to certain authorities. They represent a society that assumes democratic responsibilities ignored by the Government.

2 Study methodology

The verification of the condition of the socially segregated space was obtained through a descriptive and exploratory methodology with the support of bibliographic studies that diversify the study perspective with the interdisciplinarity that is sought in political ecology as historical, geographic and socio-environmental information. In-situ observations were also completed, enriched with the application of semi-structured questionnaires carried out through digital recordings of a group of residents and social actors to structure the analysis. The interviews aimed to obtain qualitative elements that complement the data obtained through the bibliographic survey. For the balance of information, it was decided to generate organizational charts for diagnosing conflicts and problems. These are from the Pressure, State, Impact and Response (PEIR) matrix developed by the United Nations Environment Program, UNEP (2004).

It was decided to adapt the Pressure, State, Impact and Response (PEIR) analysis matrix developed by the United Nations Environment Program, UNEP (2004), to visualize the dynamics of socio-environmental issues in a way that facilitates interpretation. It enhances the consideration of social, economic, political and environmental aspects, which allows a reading from an eco-political perspective of the dynamics, scenarios and complex issues involved. The arrangement of data facilitates the visualization of solutions. The PEIR model was developed to recognize the link between environmental problems and their social causes and consequences. The detailing of each component of the matrix is applicable to any territorial scale as shown in table 1.

Table 1

Details of PEIR components

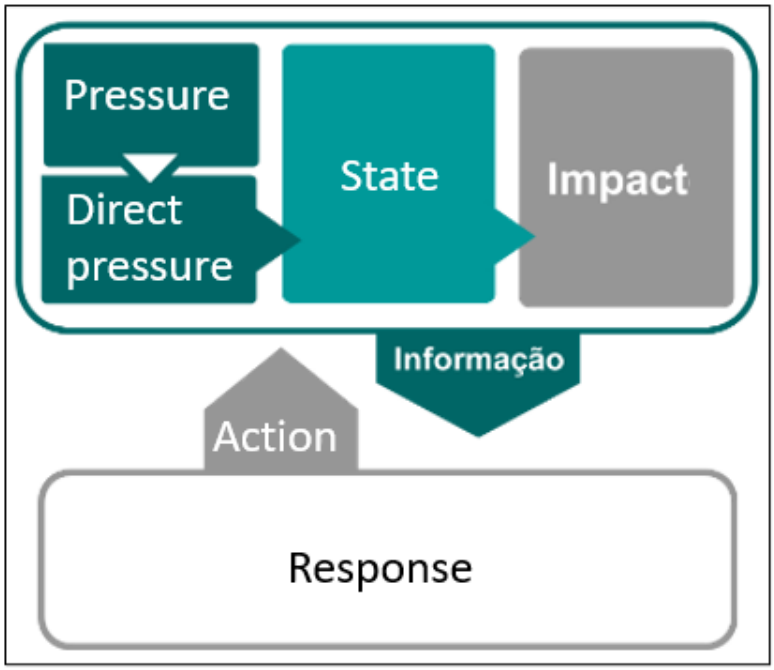
COMPONENT	ANALYSIS	RESPONDS
Pressure	These are the underlying economic and social forces. From a political perspective, pressure is the starting point for dealing with environmental problems.	Why is this happening?
State	The condition of the environment resulting from environmental, economic and social pressures.	What is happening to the environment?
Impact	The effect produced by the state of the environment on aspects such as quality of life, on the environment itself and/or on the built environment.	What is the impact caused by the state of the environment?
Response	Collective or individual actions that mitigate or prevent negative environmental impacts, correct damage caused to the environment, preserve natural resources or contribute to improving the quality of life of the local population.	What are we doing about it?

Source: Prepared with data from the Methodology for the preparation of GEO Cities Reports, UNEP, 2004.

In table 1, each component seeks to approach the problem through an analysis proposal. Each part of the analysis is subject to answering a certain question that makes it possible to characterize the event and place of interest by its elements of influence. The components are codependent and produce an interaction as shown in Figure 2.

Figure 2

PEIR Interaction



Source: Prepared with data from the Methodology for the preparation of GEO Cities Reports, UNEP, 2004.

3 Results and discussion

3.1 Brief history of segregation in Lima

As previously mentioned, history is a relevant factor to condition the study of socio-environmental problems, therefore, in a multi-faceted way, a set of historical data was compiled that contributed to understanding the causes of socio-economic and ecological problems encountered at the locale of our study, which is located on the periphery of Lima, the capital of Peru. Today's cities in that country were preceded by other formations and urban systems, many of them specifically developed in the Andes by pre-colonial civilizations such as the Incas. The Spanish colonizers chose to build their main colonial base on the coast and not in the Andes in order to destabilize the pre-existing organizational structures. Administrative and political power was centered on the coast in the city called “Ciudad de los Reyes” that would later be called Lima. Thus emerged a logic of economic and social discrimination that would benefit the coast and exploit the Andes and the Amazonian part of Peru. This logic continued to prevail after political independence and with the emergence of the new republic. Although desiring independence as a

country, the elites in place from independence still showed a yearning for European culture (Mar 2012).

Since its inception, Lima has presented physical manifestations that fragmented the city with the aim of dedicating physical spaces according to social and racial class. For Bethell (2004, p. 60), it was a way to impose colonial values since cities were a

"Vehicle for the transplantation of a social, political and economic order".

The use of intra-urban walls to control the social order was explored. For example, Jones (2013) reports the existence of a segregated and walled space within the city, called 'Santiago de El Cercado', in 1571, destined for the homes of indigenous people who worked in the city and to facilitate their evangelization. Other spaces were also identified for African slaves who were separated from local indigenous peoples.

After emancipation, another rational to segment the city emerged. Lima had experienced a serious crisis when Peru and Chile went to war. Peru lost the conflict that was called 'La Guerra del Pacífico' in 1884. To overcome the instability resulting from the invasion of the capital and the conflict itself, the rulers sought to implement a hygienic, urban plan for the city of Lima with the objective of modernizing the urban landscape. Between the end of the 19th century and the beginning of the 20th century, buildings erected in an improvised way by the lower classes in the center were removed and replaced by modern structures. Later, around 1940, the upper classes became interested in settling in areas further away from the center as the state had structured access to new planned urbanizations, but this created new territorial and spatial interactions with other social groups such as immigrants from the rural exodus that had taken place between 1940 and 1990 (Jones, 2013). Like many other cities in Latin America, large waves of migration from the countryside influenced the demography of the second half of the 20th century. However, in the case of Peru, this migration, in addition to the precariousness of the rural economy, was reinforced by internal military events that took place in the decades of 80s, 90s and 00s, and that mainly affected the Andean regions of the country.

Traditionally rural and Andean, Peru had become urban and coastal in the space of two generations. Following Chile, it unthinkingly developed a liberal economic development policy that introduced factors such as the reduction of the role of the State, the deregulation of the economy and decentralization. These structural transformations took place in a historical context of the

economic crisis in the 1980s and the armed conflict with Shining Path1 (1980 – 2000) that provoked and expanded the massive rural exodus to Lima. Under the Alberto Fujimori regime (1990 – 2000), the fight against terrorism and against narco-terrorism allowed political authoritarianism and corruption to undermine democracy and human rights (Sierra, Robert, Gluski & Metzger 2015, p. 3, author´s own translation from Spanish).

Complex national demographic events have produced a diversified capital. It is estimated that the total provincial region of Lima has the greatest diversity of native indigenous languages and that Quechua is one of the most spoken (Ministry of Culture of Peru, 2018). However, this cultural plurality is often ignored in different public policy initiatives in the country, as it can also cause territorial tensions between the different social groups that make up this city.

3.2 Consolidation of walls.

Currently the city is divided into 50 districts that in turn can be categorized by their appearance. The most central ones have a planned appearance, while the more peripheral ones have an improvised appearance as a result of demographic dynamics throughout the second half of the 20th century. The planned urban constructions or the established part of Lima was developed on flat land in its hydrographic basins and is surrounded by hills, mountains and slopes that make up the western slope of the Andes, as described by Núñez and Vásquez, (2009). The steepest reliefs were reported by Mar (2012) as territories progressively and precariously occupied by human settlements as a result of constant migratory waves from rural areas and the Andes Mountains. This type of occupation was an urbanization alternative given the State's inefficiency in meeting the growing needs of the Peruvian population.

The royal city is clearly divided between the occupants of the flat regions and the occupants of hills. This situation represents more than a morphological division, since the housing, ethnic and cultural patterns between the two types of occupation are clear. Unceta and Rivero (2017) inquired about the occupation of hillsides and social landmarks in the second half of the 20th century. The authors explain that Metropolitan Lima expanded into land with gentle slopes (up to 20% slope) until the 1990s. Once these lands were depleted, the following occupations were established in places that bordered the lower western slopes of the Andes with a 47-50% slope, unsuitable for human habitat. According to the National Center for the Estimation, Prevention and

[1]A group that came from internal ruptures within the Communist Party of Peru. The main objective of the organization was to put an end to the institutions considered bourgeois through a communist revolution of peasant origin inspired by the Chinese Revolution of Mao-Tse-Tung. (FRANCE, 2012).

Reduction of Disaster Risk (CENEPRED, 2015), from a slope of 45° onwards there is a significant risk of mass movements by gravity.

Those who occupied these areas were the last members of the migratory wave produced as a result of the political violence suffered by the country since 1980, coming especially from the poorest areas of the Andes. Once again, the developments on the slopes of Lima ended up being the sectors with the fewest resources, housing the stigmatized, and the poorest of the poor. The derogatory gaze of those who occupy the flat area to those living on the hills is repeated, but now it is from old settled migrants towards the newer more recent migrants. (Unceta & Rivero, 2017, p. 139, author´s own translation from Spanish).

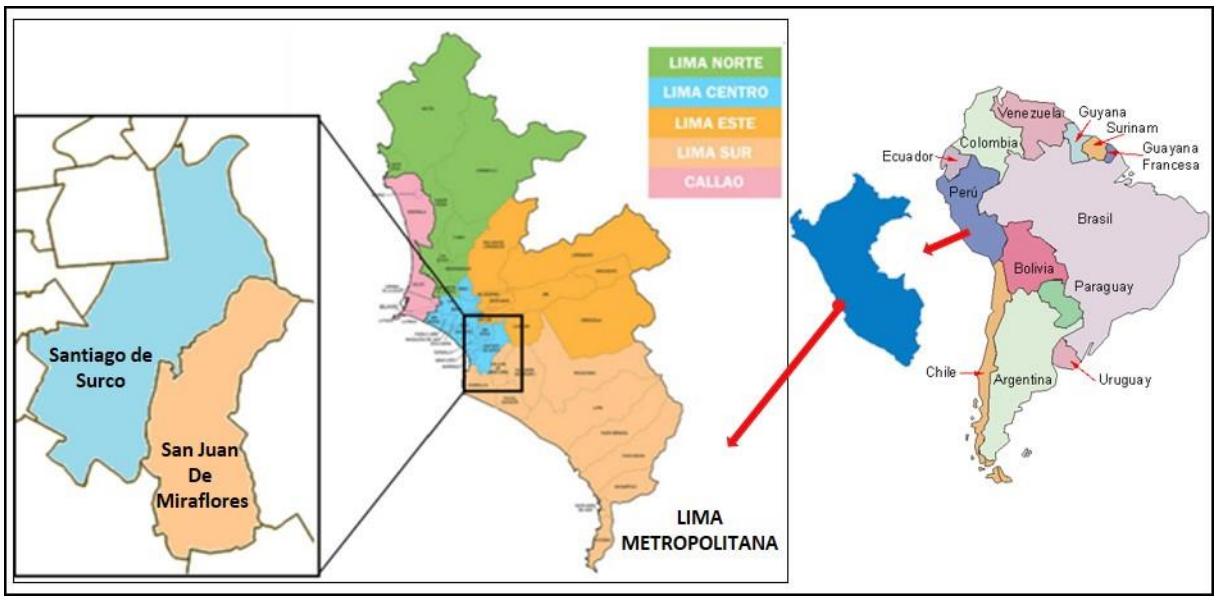
According to Sierra, Robert, Gluski and Metzger (2015), the mode of urbanization of Peru's peripheries has not changed significantly in the last 50 years. It is still in most cases self-replicating - an organized population with the objective of regularizing the construction of the new neighbourhood once development reaches a certain level obtains the land informally and illegally. All work is done autonomously and is not guaranteed the normal benefits of urban development such as sanitation, water supply or other necessary facilities. The regularization provided by the complacent profile of the State to neutralize popular discontent and the weakness of public policies formalized particular social dynamics in these zones. Public transport provision and real estate transactions are developed outside the regulations, allowing activities such as '*grilagem*' 2 to become part of the urbanization of the city. This scenario almost guarantees an exaggerated and disordered physical expansion. It is estimated that 60% of the current urban network was self-built, which shows a significant inequality in accessing housing.

An example of the most relevant territorial and social tension in the recent history of Lima developed on the borders of districts to the south of what is now Lima Metropolitana, where this distinction between two border districts is verifiable. Santiago de Surco, a district characterized by its high-rise, high- end luxury apartment complexes and San Juan de Miraflores, a district that originated outside the urbanized area of Lima in the 1960s by rural migrants (Figure 3).

[2]Illicit conduct intended to transfer public lands as other people´s assets (CARVALHO, 2019). In Peru the expression "land trafficking" is used.

Figure 3

Location of Santiago de Surco and San Juan de Miraflores districts



Source: Prepared by the authors, 2020.

Figure 3 shows that the two districts mentioned are bordering - in the case of San Juan de Miraflores, it is a district that received formal recognition in 1965 when the government verified that the great extensions of human settlements came to represent 47% of the population in the south of Lima (Mar, 2012). In the 70s, some of the first episodes of conflicts with the district to the north of Santiago de Surco occurred. Approximately two hundred families occupied land close to neighboring residential areas. This event had repercussions in the media at the time and among act individuals interested in real estate development in Santiago de Surco, which resulted in a sequence of acts of repression by the authorities. One of the most serious in the early morning hours of May 5, 1971, resulted in two deaths.

Even with these episodes, the expansion of settlements continued due to the lack of a housing policy for low-income inhabitants. Throughout the 70s and 80s, residents' associations in Santiago de Surco undertook construction of perimeter enclosures on the highest part of the hills that bordered the districts. As reported by Santos (2011) in 1975 the construction company Villa Sol bought the poultry farm on the border in one of the regions furthest up the slope. In 1976, it closed one of the access roads between the districts, placing large amounts of construction waste there to create an artificial hill with the intention of protecting both spatially and market-wise one of its most exclusive urban developments. These attempts did not prevent the physical encounter of the city's two socioeconomic groupings elsewhere on the district border as the city continued to

expand demographically. Different types of constructions such as tents became visible on the side of the planned urbanizations as they spread to the highest parts of the hills.

In the 1990s, leaders in Santiago de Surco opted for the construction of a more reinforced concrete wall and also for the purchase of more territories on the hill, which meant that the settled population could be evicted. Community leaders from the settlements opposed the construction, and the conflict resulted in a series of lawsuits and even the arrest of community leader Juan Almeida. The wall was consolidated even though the purchase of more territories by representatives of private urbanizations did not take place. The barriers have intermittently expanded through other urbanizations that make up a 10-kilometer long boundary structure. For Santos (2011) and as observed in loco, the wall has the appearance of a fortification that cannot be assigned a merely limiting function. The purpose of the construction is physically perceptible. It makes abundantly clear the visual, spatial and social divide, which led us to corroborate the author's words - the wall is the mark of segregation between rich and poor (Figure 4).

Figure 4

Boundary wall between Santiago de Surco and San Juan de Miraflores

Source: From the authors' own collection.

Figure 4 shows the proximity of the wall with the settlements of San Juan de Miraflores. It has a level, even height in its surrounding boundary, but it was constructed higher in the area that

borders on precarious constructions, reaching up to three meters in height at some points. The wall generates political, economic, social and even environmental interpretations among visitors. Christian Rafael, as a resident of the zone and a socio-environmental activist, recognizes the complexity of addressing the issue of segregation between locals and non-locals in the district of San Juan de Miraflores. He indicates that the wall did not prevent occupations in the city, it only prevented them from being seen -

> *"One of the most opulent regions in Lima on the one hand and one of the most deprived areas on the other. Some say that it is the wall that divides the rich from the poor; others say that it prevents the expansion of invasions into the city, but in fact, invasions were only avoided on the side of Santiago de Surco. It is also said that it is an aesthetic issue because the wall prevents the houses from being seen from this side. There will always be different stories. Opinions too.* (Christian Rafael, resident and activist, 2019).

Segregation is palpable in the wall's structure and its historical origins. The wall seeks to prevent the visualization of precarious structures, but it also made it possible to make the socio-environmental state of San Juan de Miraflores invisible. In the following segments, the residents will detail some of the side effects of this structure, such as the environmental situation of the segregated region, the perception and response.

3.3 Socio-environmental barriers

The district of San Juan de Miraflores is made up of 7 zones that in turn are divided into sectors of housing complexes and human settlements. 'Pamplona Alta' is one of these zones, less consolidated and one of the most precarious in the far north of the district. Its location presents a greater complexity of interactions, between a part of the wall and the remains of a natural ecosystem in the region called Lomas Costeras and with the inhabitants of the settlements. The bibliographic data of this part of the city are not always updated, so the reports offered by the population supported this study. The field research was intended to describe and analyze these dynamics with the inhabitants closest to the wall, as it has a daily influence on the life of the place.

The country's constitution in ART. IV, describing the structure of the State, in article 194 supports the emergence of autonomous administrative and economic management of districts, causing investments and resources to vary significantly between them because of the historical and economic gap. This type of autonomous government administration has inefficiencies. The low salaries of the population, in addition to the lack of trust of the governing officials, make the collection of taxes and service fees insufficient for district management (Wiese, Miyashiro & Marcés, 2016). The high cost of providing services has created a dependency on the municipality

and is a substantial problem because local government receipts often only amount to 35% of the total budget. The limitation of resources over time has generated a significant delay in basic infrastructure works, which are restarted and continued each time resources arrive.

In view of this, there is a considerable rate of informality regarding the implementation of services, especially in the Pamplona Alta area. There are parallel urbanization systems, land grabbing is a reality in the area and, but on the other hand, there are also associations and cooperatives that make construction feasible, often with partial or no technical assistance, with materials available for a limited budget. In 2007, 9,219 homes were considered by the survey by the Non-Governmental Organization, Fomento da Vida (FOVIDA) in Pamplona Alta, of which 5,025 were built with alternative materials to bricks and cement. Their location in turn increases the risk of accidents. The type of material used in constructions is often highly flammable, making fires one of the most frequent accidents and exposed to natural incidents such as mass landslides due to seismic movements, meaning 38,744 people are exposed to these dangers here alone..

3.4 Sanitation

The FOVIDA survey shows a significant lacking in the area of sanitation. In the on-site inspection, on the first access road to the Pamplona Alta area, you can see abundant deposits of waste that, mixed with gray water[3], because the streets to emanate strong odors, see figure 5.

[3]According to the California Graywater Standards (1994), gray water is untreated liquid waste originating from residential buildings, without contact with waste originating from the toilet bowl.

Figure 5

Garbage accumulation

Source: From author's own collection.

Some of the interviewees highlighted the lack of waste management at the site. One of them points out that

> *"There is still no garbage plan. There should be specific collection days to know when we have to take out our garbage. The garbage truck passes by twice a week, but there is no fixed time".*

Liquid waste management is also poor and many households use alternative methods to public plumbing. The 2007 census of the National Institute of Statistics and IT (INEI) indicated that 652 houses did not have their own sanitation facilities. The on-site study found that in areas further away, houses higher up the slope have only cubicles for toilets. One of the residents interviewed explains wastewater management

> *"Here, it is very common for rudimentary septic tanks for basic needs. Cleaning water is thrown outside the house." And he adds that the pits are built using common knowledge, one helps the other. But technicians are also hired, it depends on the house".*

There are also good examples of alternative construction in this area, even if it is outside government regulations. A resident who received technical help from an organization that worked on the site explained how the type of bathroom installed in his house meets his needs

> *"Many use an ecological bathroom. They are working perfectly fine, they are more hygienic. Furthermore, fertilizer is generated to maintain plants. That's why it's good; there are two benefits from the ecological bathroom".* (Manoel, resident of the human settlement Flor de Amancaes, 2019).

The 2007 INEI census indicated that 672 homes had no connection to the public water supply network. Water trucks from private distributors carry out water supply to the steeper areas further up the hillside. The trucks climb to levels where the unpaved road can support their size. There are fixed supply points where the inhabitants need to take bottles to transport water.

Figure 6

Pipa truck going up the slopes

Source: From author´s own collection.

As seen in Figure 17, the water supply also depends on the state of the roads that are often built and maintained by the residents themselves. There were also improvised pipes installed that pump water to some houses where water is stored in tanks but when poorly installed, pose a

risk to residents. The water situation is complex in Pamplona Alta as indicated by another respondent

> *"Here water is the biggest problem. In winter, water trucks have difficulty climbing through the mud and in summer, the water runs out quickly. We are fighting for this to improve the situation here. Also before, there were problems with the water quality of the trucks. The municipality was requested to investigate this. We suffered for water!* (Pascoal, resident of the human settlement Flor de Amancaes in Pamplona Alta, 2019).

Many of the settlements have already been registered in the municipality and their inhabitants have a registered identity card for the district, but even so, the houses are not supplied with basic needs. One of the interviewees indicates that the current area where many of the houses are located is zoned as an agricultural area according to the city's zoning and that there is a pending issue because, in an organized manner, many of the residents are dealing with the modification of the type zoning classification of the consolidated areas. The agricultural profile makes it impossible to build supply systems formally at the site.

3.5 Interaction with natural ecosystems

Around the consolidated areas of the city of Lima there are traces of a natural ecosystem, which is one of the most susceptible to the Pacific coast. It is called Lomas de Costeiras, which according to Paniagua (2014) is formed by hills that depend on the humid winds of the Humboldt Current for a period of flowering between May and October, as they are located in areas with cold and humid temperatures in the lower regions of the Andes Mountains where they meet the coast. When the maritime humidity comes into contact with the slopes, it produces localized drizzle that allows for a unique period of flowering, differentiating it from the higher parts of the Andes in dry climates away from the coast (Figure 7).

Figure 7

Traces of Lomas Costeras on the slopes of the hills of San Juan de Miraflores

Source: Photo provided by the organization Lomas de Pamplona (2019).

There are 70,000 hectares left of the ecosystem shown in Figure 7 in the province of Lima (37 hectares in San Juan de Miraflore). The outskirts of Lima previously had large floral walls that have since become urbanized, many of them irregularly. Living within this ecosystem can lead to respiratory problems. The dense mists formed on the slopes cause the air to reach 100% humidity for prolonged periods, and visibility is impaired. According to some residents, there are seasons when visibility is no more than three meters.

During the visits for data collection carried out in October, improvised houses were observed in places with a high density of airborne water. The occupations located on the peaks of the hills created internal tension among the residents of Pamplona Alta. Many of the houses located there resulted from the last subdivisions carried out through land grabbing, one of the main environmental social threats in the place. The issue of housing and the preservation of the natural ecosystem, which still exists there, becomes more complex with the presence of the wall, as indicated by one interviewee

"On one side Lomas Costeras is still intact because it is not occupied, that is, the wall prevented the occupation of this natural space on the other side, but on the other hand the wall consolidated the occupation here, affecting the ecosystem on this side" (Elien Alejandro, activist and resident, 2019).

The "land smuggling", as land grabbing is known locally, focuses on offering areas of land to people in extreme need, especially from the interior of the country. The areas are allotted and are located in geographically and environmentally vulnerable areas. Each plot is offered for approximately $1400.

Figure 8

Contrast of vegetation by the wall

Source: From author´s own collection.

As shown in the figure, the type of occupation and vegetation is contrasts drastically on both sides of the wall. There is a side notoriously occupied by clearly precarious housing. On the other side of the wall, it is visible that the vegetation is not occupied. Even visually, the side of Santiago de Surco is preserved, it was observed by one of the interviewees that there is also some interest in developments on this side that could affect Lomas Costeras

"The risk is not only for people who want to live here, but also for companies that extract ore. This site can be explored to extract inputs to produce concrete, gravel, fine sand, coarse sand. So it's an area open to exploration." (Elvis, journalist, resident and activist, 2019).

This information indicates that there is no effective and integral concern for the city's natural capital by the residents and social actors of the Santiago de Surco district. The wall aims to separate two types of housing.

3.6 Social and environmental mobilization

It was noticeable that within the Pamplona Alta population there is an awareness regarding natural preservation and its social and economic benefits. The flora, when preserved, prevents landslides. There is a biotic variety not only of local interest, especially of birds, and it is a natural air purifier, much needed for the kind of air that a metropolis like Lima produces. The socioeconomic benefits were highlighted by NGO initiatives that installed mist capture systems on the slopes that produced up to 1100 liters of non-drinking water in a few days. They are currently disabled due lack of maintenance.

There is currently an association called Lomas de Pamplona, which focuses on the potential for ecological tourism and elsewhere in the city where traces of this ecosystem can be found. The association seeks to create environmental awareness of residents and visitors in addition to showing the reality of the city beyond the wall. Residents themselves raise awareness in other districts in addition to helping build trails for visitors to the ecosystem. At the time of the interviews, they were still developing projects to generate consumer products such as handicrafts and food.

This movement seeks to recognize the unoccupied areas of Lomas as an area of preservation within urban planning at the metropolitan level, based on zoning. This would prevent the continuation of land grabbing, create a local tourist spot, encourage urban environmental education, and make the social reality of the Pamplona Alta area visible

> *"The existence of other similar ecotourism projects in other parts of the city are well known. But, here there is a need to show the community. At the same time, it is necessary to raise awareness among the population of San Juan de Miraflores that Lomas de Pamplona is the only green area in the district".* (Elien Alejandro, activist of the Lomas de Pamplona movement, 2019).

During the time of our study visits, volunteers organized free visits once a week. The study and approval of the Ministry of the Environment had not yet been formalized in order to charge admission. The route that residents offer is the recognition of the reality of the communities - a walk through Lomas to appreciate the floral diversity and learn about its importance and threats to it. Finally an encounter with the wall to visualize the city's contrasts. The perspective of respondents is promising

"The main help will be the issue of documentation for our homes. Right here in the district, the Lomas are starting to become known. We are starting and there is still no return, but we believe that in the long term it will help the settlement" (Pascoal, resident of the human settlement Flor de Amancaes, 2019).

"I was happy to receive support from the Lomas de Pamplona organization. They are trying to protect this area. Their articulation with the municipality has already brought some facilities to support the area. It will do us both good. Not all places in Lima have this." (Manoel, resident of the human settlement Flor de Amancaes, 2019)

After numerous preservation initiatives at several peripheral locations in Lima where traces of the Lomas Costeras ecosystem can be found, the municipality has developed a new project proposal for a system to recognize areas of conservation, which would cover the natural reserve of Lomas and includes ten districts. It was presented to the Ministry of the Environment, the National Service for Protected Natural Areas (SERNANP) and the United Nations Development Programme (UNDP). In the proposal document, the natural area of the San Juan de Miraflores district would be integrated with the preservation areas in the other three districts as stated. The joining of the 4 Lomas districts would mean 622 hectares of protected area. If the project were approved, Lomas de Pamplona would receive resources from the municipality of Lima for its preservation, alleviating certain expenses on the part of the district municipality, in addition to giving visibility to the nearby communities.

4 PEIR matrix

The resulting tables that identify the elements raised within the PEIR matrix for the case of Lomas de Pamplona are presented below, in order to highlight the interactions and summarize the reading of the problem presented. Table 1 shows the factors that determine the pressure on the socio-environmental problem of the study site. It is noteworthy that not only immediate elements are considered here. Using the perspective of political ecology the role of the historicity of space is identified and included.

4.1 Pressure

The historical evolution of the city, both socially and physically, influenced the current form of urbanization. It is clear that a colonialist system has been "inherited" and included in the interaction within social groups, which affects the demographic distribution and points to a racial bias. This dynamic aims at a separation of classes materialized in physical and political segregationist practices.

The highly decentralized administrative and political system has resulted in a disintegrated state. The intra-urban administrative and economic autonomy of the city's districts reinforced preexisting social differentiations. There is a dysfunctionality due to the lack of an active State that prevents the city from developing harmoniously at different rates.

The country's demographic dynamics particularly affected the capital. There is an economic centrality on the coast. The accelerated population growth and the migratory flow went way beyond the administrative capacity, which resulted in Lima being the capital of an underdeveloped country that houses approximately one third of its total population.

The city's expansion has developed through unplanned occupations but with presumed permission, since informal urbanization precedes formality. Spatial capacity is compromised, resulting in social conflicts to occupy space and territorial access to urban resources. In this conflict, there is a group that is privileged and which has benefited.

4.2 State

There is a critical deficit of basic sanitation services in the studied site. Lima does not stand out for being a city with a large water reserve compared to other cities in Latin America. The shortage of its most vulnerable population and the scarcity of water is a constant factor in the place and mismanagement of water resources can be more impactful on this side of the city.

The type of occupation and distribution of the houses compromises the supply and storage of water. In order to reinforce the serious situation of sanitation, public management is disconnected from the dynamics of the location. This is seen in the accumulation of solid waste and in the absence of an integrated sewage system.

The informality and the illegality of some occupations compromised the local natural resources, which results from the scarcity of green areas not only in the area, but also in the city as a whole. By having extrapolated the space capacity, regions of high seismic and environmental vulnerability were occupied. When this type of urbanization collides with the planned and regular urbanizations of the elite, the search for space differentiation through physical structures such as walls arises.

4.3 Impact

The impacts are diverse. The environmental and socioeconomic impacts that were observed in loco were highlighted below. The remnants of the natural Lomas Costeiras ecosystem are endangered by urban advance, which in turn threatens the biological diversity of the city. Another environmental impact is the lack of basic infrastructure. The local sanitation crisis further

increases the vulnerability of residents. Solid and liquid waste, when not properly managed, poses a risk to public health.

There is a predisposition to respiratory and waterborne diseases in the area, due to occupation in risky areas. Housing costs soar; water supply, a vital good, is more costly and takes more time to reach those who live in areas of environmental and seismic danger. In addition to shortages, the risk of natural disasters and accidents increases at this point.

The lack of effective initiatives on the part of the State resulted in the low quality of life of the residents, and the distrust of public management; compromising tax collection through either evasion or lack of income. The lack of revenue in an autonomous system further perpetuates the precariousness that is visible in the local landscape.

Elites close to them see them as affronts that can affect their stability and their quality of life, so they seek to make invisible the reality of the vulnerable group, formalizing the social and physical fragmentation of the city in a planned way.

4.4 Response

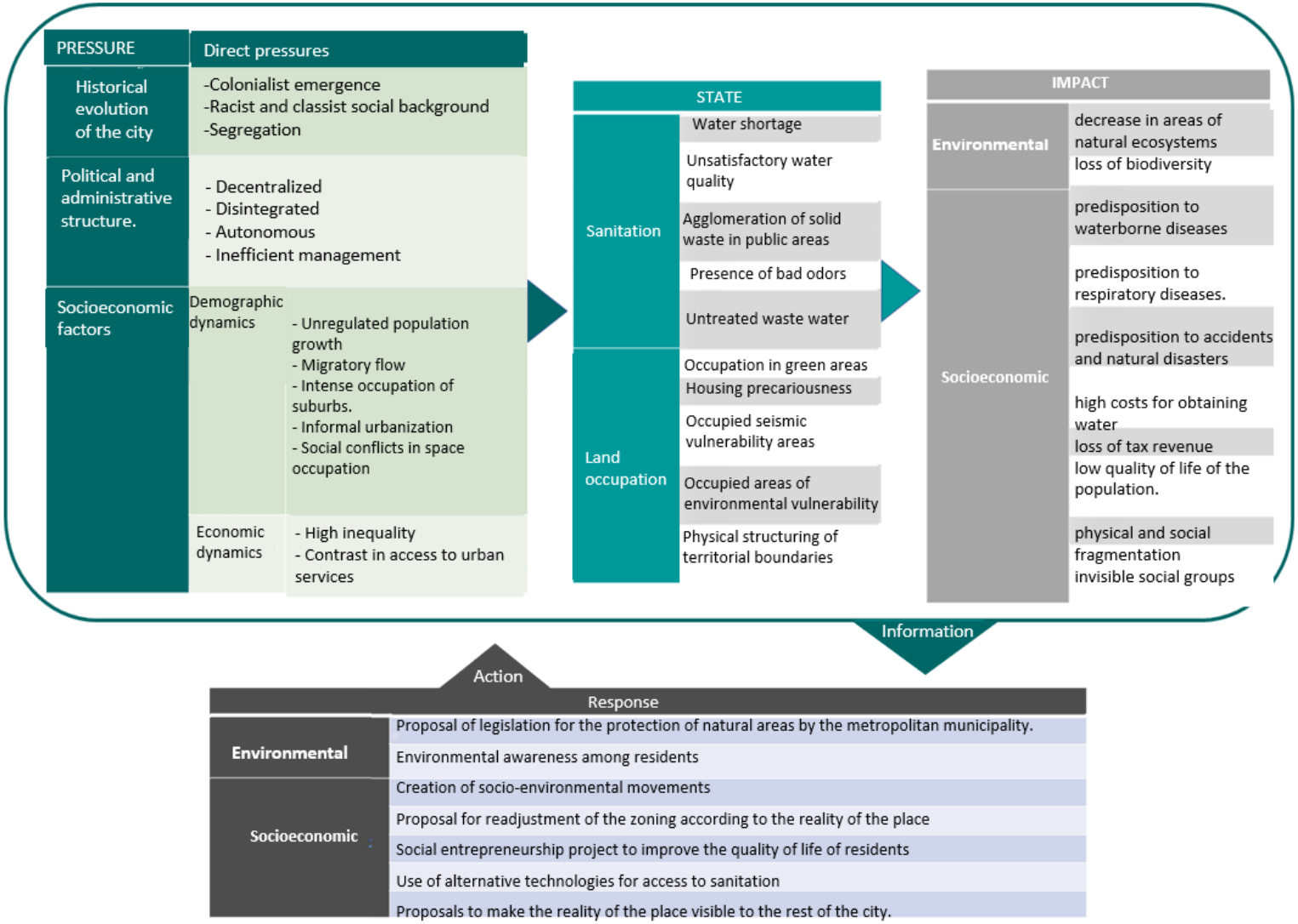
The population are conscious of the economic and social potential to be gained from environmental preservation. The socio-environmental mobilization was essential for raising awareness among the local and non-local population. Proposals for social entrepreneurship emerge that aim to readjust the zoning according to the reality of the place, as the current zoning does not meet the population's needs or environmental demands. Environmental visibility, in turn, makes visible the segregationist instrument that is the wall and the reality of the residents who interact with it. It is also noticed that the community is highly adaptable. They are receptive to alternative technologies that replace the lack of deficient management and the lack of public policies, especially those related to sanitation.

4.5 Interaction matrix

The analysis uses an interpretive approach to recognize the different elements acting on the problem reported and the different interactions that can be signaled between them. Note the induction of an explicit holistic assessment. History and the economic and political system influenced the study site in an interscalar way. Tangible local issues are presented as consequences, but also as causes of other social and environmental problems. The interaction diagram that we highlighted from the study is as follows (Figure 9).

Figure 9

Interaction of elements identified in Lomas de Pamplona in the PEIR matrix



Source: Prepared by the author.

5 Final considerations

To address social and environmental problems in cities, it is necessary to move away from the disciplinary perspective of reductionism. The city is an organism and as such produces complex interactions. This complexity demands a holistic view to be able to consider all interscholastic, tangential and transtemporal elements. History helps to understand the causes that still affect current problems. The convergence of approaches and a generation of hybrid knowledge facilitate the reading of the city's problems. Political ecology provides this perspective by admitting an interdisciplinary dynamic.

With Political Ecology, it is clear that the less favored populations and those deprived of political and economic power are territorially affected and that this disadvantage can see their projects subverted or diluted by privileged groups in the city, by the State itself and by processes inherent in the current dominant system.

Not all acts of violence by privileged groups are physical. They can manifest themselves through the institutions that regulate the city and through urban structures that favor them. Walls aim at delimiting the city's resources and ignoring the full and complete reality of the city. The visual and political denial of the most disadvantaged does not prevent their interaction with the rest of the city, as they are only impeded from benefits, but not from the economic functionality of the city.

With specific regard to the wall studied, the visual barrier not only preserves the aesthetics of closed condominiums, its objective is also to make the reality of the urbanization on the San Juan de Miraflores side invisible. The wall does not aim to protect the Lomas Costeras as an ecosystem. It fragments this natural space, deepening its degradation in areas not visible by powerful groups. It is noticeable that the distribution of the city´s resources is often decided according to the criteria of certain groups and not in a democratic and planned way, which necessarily produces both social and environmental impacts.

Political institutions clearly benefit a sector of the city. Favored groups create mechanisms not to lose privileges that strengthen specific urban conformations. Faced with this, the most disadvantaged populations create response systems. The organization through social and environmental movements of the underprivileged population allows them to acquire and articulate greater political positions. In the case studied, environmental awareness allowed them to consolidate common goals among the residents in order to respond to both the State’s inefficiency and its precariousness.

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