Damage to the District of Puchuncaví: A Territorial Crisis

N Hormazábal1, M Vergara1, S Maino1

1Associate Professor. Universidad Técnica Federico Santa María, Departamento de Arquitectura. Avda. España 1680, Valparaíso, Chile.

E-mail: nina.hormazabal@usm.cl

Abstract. What is the zone of sacrifice? According to the TERRAM foundation, it is those territories of human settlement that are environmentally devastated due to industrial development. This devastation has direct implications on people's fundamental rights (to live, to health, to education, to work, to food, to housing, etc.) [1]. In Chile, there are five Zones of Sacrifice; Puchuncaví is one of them. Located in the Valparaiso Region, with 18,546 inhabitants [2], industrial development has affected the lives of all species living there for decades, including human beings. By declaring it as a zone of sacrifice, destruction of the landscape is assumed as a permanent and/or long-term situation, based on the economic development model applied by the State. The objective of this study is to develop an analysis of the impacts of industrial development on the community of Puchuncaví to establish a basis for better community planning based on collective experiences. The study was divided into three stages: the first was to typify the development of the industrial estate within the territorial order; the second described the ways Puchuncaví was inhabited before the installation of the industrial complex; and third compared development of the industrial estate with current ways in which this district is inhabited. Based on references such as Lefebvre (2013) and Augé (1992), among others, the methodology consisted of a participatory workshop with members of the community (general population and leaders) in which a manual collective map was built atop a to-scale territorial model in order to identify and characterize individual experiences of living in this district, as well as the impacts that industrial development has had on it.

1. Introduction

What is a zone of sacrifice? According to the TERRAM foundation, a sacrifice zone corresponds to a geographic zone—typically populated by low-income settlements—that was environmentally devastated due to industrial development. Such devastation has direct implications in the full exercise of people's fundamental rights (rights to life, health, education, work, food, housing, etc.) (TERRAM, 2017).

There are five sacrifice zones in Chile in which are located 27 of the 28 thermal power stations that currently exist in the country; the Puchuncaví district is one of them. It is located in the region of Valparaiso and has 18,546 inhabitants (INE, 2017), and has been affected for decades by industrial development causing harm to all species existing in this zone and surrounding areas. When a zone of sacrifice is decreed, the evident destruction of the landscape is assumed as a permanent and/or long-term situation, this governmental decision is founded within the prevailing economic development model.

Within this context, the following research question is in line with the objectives guiding this study; namely: how has industrial development affected the ways of inhabiting the District of...
Puchuncaví? To address this question, three objectives were derived: 1) describe industrial development within urban communities (Macro-scale); 2) recognize perceptions of the inhabitants against development in the zone (Meso-scale); and 3) characterize everyday living concerns from an inhabitant’s perspective (Micro-scale).

2. Contextualizing the Problem

2.1. Urbanization of the Rural
From the mid-1960s to 1973, agrarian reform was carried out in Chile’s rural sectors. This reform consisted of redistributing land from large private estates, held by few owners, to cooperative farms owned by those working for the former. During the same period Puchuncaví was subject to periods of pests and plagues, including basic shortages and irregular rainy seasons [3].

While Puchuncaví underwent this critical stagnation, the nation strengthened economic development through the extraction of copper. Afterward, to the construction of railway lines acted as an articulator for the production system, which still consists of extraction, transformation, and exportation of copper [4].

This territorial articulation was directly linked to urban development, which reached rural sectors by seeking to develop an infrastructure for industrial-productive transportation—first by rail then with roads, and now through mega-ports, mega-roads, and other routes of connectivity. In this way, industry is installed and developed from public policies focusing on planning production in terms of territorial infrastructure, regulations, and connectivity [5].

2.2. Globalization of the Urban
In the 1980s, Chile implemented various neoliberal policies that consolidated the opening of national trade to foreign investment. As the production of copper became prosperous, territorial articulation of the productive system around mineral extraction, transformation, and exportation were—and remain—indispensable for the country. Figure 1 depicts projections for copper production in the nation over previous decades, which is shown as ascending through 2030. In Figure 2, copper accounts for nearly half all exports.

As shown, the Chilean economy is based on a global system in which development consists of a linear and essentially economic process, mediated by the appropriation and exploitation of natural resources [6]. The introduction of the industrial estate (IE) is not an isolated or unusual phenomenon, but an inherent feature of the Chilean productive project that seeks to articulate itself within national
and global territories. also being governed by global market standards and consolidating it through economic agreements and political decisions.

**Figure 2.** Chilean main products of exportation. Source: Central Bank of Chile. (2017). Statistical database.

2.3. **Territorial Planning**

Through the Territorial Planning Policies and Procedures (TPPP), the state and municipalities are responsible for reviewing, regulating, and assessing proposals and projects from the industry, as well as the type and amount of emissions produced by industrial development in the territory.

A problem arises when industrial development in rural areas becomes uncontrolled due to massive installation of polluting industries with extremely permissive planning, regulation, and control by state authorities. Although there are TPPP and legislative tools to regulate such production, in our study case, eighteen companies have been installed in the bay of Quintero since 1958. The state did not foresee the environmental and social impacts that this industrial estate would have in the region, which was developed on behalf of so-called “national economic progress,” and failed to give any consideration to the inhabitants (See Figure 3).
In this way, the state responds to the logic of the market through territorial planning, allowing the installation of industries and associated environmental degradation of territories in which they are installed, without considering the preservation of the ecosystem or the communities inhabiting it. The consequences of environmental impact do distinguish social classes, as Svampa and Viale mention, since it is vulnerable sectors of the population that suffer most from environmental damage [7].

This phenomenon was also described by Lerner in his book on sacrifice zones in the United States, 2010, which, as reviewed by Bullard states:

“Sacrifice zones are often ‘fenceline communities’ of low-income and people of color, or ‘hot spots’ of chemical pollution where residents live immediately adjacent to heavily polluting industries or military bases…[P]oor people who live on the ‘wrong side of the tracks’ and in ‘throw-away communities’ whose residents receive unequal protection, if any protection at all; such communities contain locally unwanted land uses, or LULUs, and industries deposit pollutants just outside the factory gates” [8].

3. Theoretical References: Lefebvre and Augé
For the scientific method to characterize this complex social phenomena through mixed tools from qualitative methodology, typically used in architectural studies, the literature review concentrated mainly on two theories presented by two French authors, their work is vast and appropriated to tackle the study and understanding of inhabiting space and place at different scales.

3.1. Capitalist Production of Space – Lefebvre
Contemporary French philosopher Henri Lefebvre defines social space via society’s modes of production, focusing his theory of on production of space [9] on how each society generates and models the space it occupies in history [10]. Space is produced under certain social canons that respond to a model of society determined by economic and cultural facts.
Sacrifice zones testify that geographical zones affected by the installation of industrial estates are not isolated cases, but, on the contrary, have been affected by the state's negligence in allowing the excessive development of given sector industries. Whereas the accumulation of such industry is destined to be geographically expansive, due to the permanent demand for lower transportation and communication costs, the concentration of production is relegated to a few urban centers in favor of elite economic groups [11].

The installation, construction, and development of these industrial estates has been a political decision from the beginning that considers global resources as unlimited. The result is cumulative impact on adjacent communities that directly affect quality of life, creating zones of sacrifice.

This study is based on two theories supporting the understanding and analysis of related research. A discussion and contextualization of this information is presented in the following two sections.

3.2. Place and Non-Place – Augé
Anthropological place is defined by the relationship or link that users have with it, allowing for individuality. The history of a place is also fundamental, since examining the past adds a dimension for length of experience. This time factor is key to understanding variables that affect ‘places’ and ‘non-places,’ because the amount and quality of time dedicated to a place characterizes the relationship of the user with it [12].

French anthropologist Augé terms our era a “supermodernity” [13], given the modernization of transportation and current communication systems, in which there is a constant overabundance (or superabundance) of events. This state “…is expressed in changes of scale, in the proliferation of imagined and imaginary references, and in the spectacular acceleration of means of transport. Its concrete outcome involves considerable physical modifications: urban concentrations, movements of populations, and the multiplication of what we call ‘non-places.’” [13].

Thus, non-places are characterized as impersonal, impossible to experience as one’s own, and/or as spaces of mere transit.

This study proposes that industrial estates are ‘non-places,’ or places of mere transit, in which alteration is impossible, feelings of belonging are difficult to produce, and relationships with other subjects are ephemeral. To study the industrial estate, it is essential to conceive of it within the district of Puchuncaví, as this is necessary for understanding how co-exist with industrial development, assuming -as Augé has- that “Places and non-places are intertwined and tangle together. The possibility of non-place is never absent from any place.” [13].

3.3. Transduction – Lefebvre
Understanding the object of study based on its origin and transformations, Lefebvre proposes the concept of “transduction,” (1978) understood as an intellectual operation that seeks to understand reality through facts and their possibilities [14].

Lefebvre proposes three types of spaces that determine the functions of everyday life (see Figure 4).
Figure 4. Transduction scheme based on Lefebvre’s theory of space types.

- Produced Space. Dominant space in any society, defined through geography and planning, among other technical aspects (Representations of Space).
- Lived Space. Experienced space, or, space as it is lived in by inhabitants through symbols and images (Spaces of Representation).
- Perceived Space. Spatial practices that account for daily needs, uses, and quality of life. (Spatial Practices)

In this way, the subjective and imaginative dimensions are incorporated into urban and territorial analyses [15]. At the same time, Gudynas calls for a “social ecology,” or “an articulation between the different forms of knowledge, including sensitive or subjective experiences. The different perceptions and valuations of people about their environment can add to each other, based on interactive procedures for meeting and dialogue.” [16]

By doing so, he more concretely, and from a Latin American perspective, defines the abstract spaces of Lefebvre. For our case study, we have diagrammed these spaces concerning three scales: the district (Macro), the community (Meso), and the individual (Micro), as shown in Figure 5.

Figure 5. Scheme of three studied scales: District (Macro), Community (Meso), and Individual (Micro).

Specifically, each scale was studied with a determined number of community members, for the Meso-scale two groups of 10 persons each, including key members among them, and, for the Micro-
scale, a questionnaire to 83 persons was applied, for the social-environmental evaluation the study included four groups of 10 persons each, all members of various ages from four rural schools.

4. Methodology, Tools and Results
After compiling a contextual and historical background through a review of relevant literature and sociological theories, it was necessary to consider urban reality and everyday life when researching life development in Puchuncaví. Consequently, information was systematized based on the three scales mentioned above, in Figure 5, wherein each scale corresponds to a space in Lefebvre Transduction theory. As such, each scale required determining a specific research method and strategy, as shown in Figure 6.

![METHODOLOGICAL TECHNIQUES](image)

Figure 6. Scheme of methodological techniques applied in this study.

4.1. Macro-Scale

4.1.1. Community Development
The research methodology used for the macro-scale was based on correlational research strategies derived from our literature review and theories of the aforementioned authors and aimed to understand and revise the Territorial Planning Policies and Procedures (TPPP) applied to the studied district, organizing them in hierarchical order and by community area(s) involved. These instruments define land use, and therefore, urban growth and development (urban extension areas).

Produced space, shows, on one hand, that relying on the code (policies and planning instruments) of industrial estates (IE) has created increasing development in the area that is disproportionate to community development. Likewise, the different Territorial Planning Policies and Procedures is fragmented and accommodates multiple organizations, out of which that covering the smallest area is the responsibility of local government, thus leaving the other two instruments—larger surfaces of land—in the charge of regional government. The instruments, therefore, have a hierarchical order, since they are linked through political decisions. They define urban growth and development of rural areas as it was during the installation of IE in the bay of Quintero at the beginning of subsequent and current development, as depicted in the photograph of Figure 7 of daily life in the presence of IE.
Finally, neither local authorities nor the communities in this district have an impact or say on major planning instruments, demonstrating the contradiction in using planning instruments that are designed for a specific territory without regards for those who live on it. These major instruments represent institutional domination by regional authorities who determine acceptable areas for urban expansion. Therefore, local urban development depends on macro-institutionality, where local authorities interfere once the major instruments have been defined, and they are limited to their urban boundaries.

4.1.2. Pollution
Sacrifice zones reveal that pollution is a determining factor in the quality of life of inhabitants of the territory, having important implications on both the environment and peoples’ health. Various studies have been conducted on pollution in the district of Puchuncaví, referring to the presence of heavy metals in the soil, air, vegetation, and even people (toxicological tests in children and adults). A new scale linked to the macro-scale appears here and it reflects that continued pollution is visible at the community level, while the modernization of production processes becomes imperceptible to the human eye, impacting the perception of daily damage created by pollution in the lives of the people of Puchuncavi.

4.2. Meso-Scale
For the Meso-scale, we used a qualitative research method to build a collective layout model with the community, based on guidelines of collective mapping established by the Iconoclasts and Augé’s theory of non-place. Five steps act on the previously built physical model in which participants identified their territory: 1) “territorial recognition” of geographical milestones (anthropological sites); 2) marking “productive activities of the past;” 3) marking “productive activities of the present” (community development); 4) identifying threats from industrial development; 5) tracing routes
frequently used by participants. Analysis of this activity was based on discussion and distribution of points located in the model.

![Figure 8](image.jpg)

Figure 8. Photograph of collective layout model activity with local people. Date: April 30, 2019.

Participants’ perceptions indicate that productive activities of the past were spread around the territory, connecting places and linking everyday life to them. Participants indicated that the abundance and local production of these activities created a common territorial identity based on closeness and relationships.

Since its installation, the development of IE has been notoriously faster than community development, which is likely related to the nature of activities developed. The scale and rapid development of IE accelerated the deterioration of the environment affecting local productive activities that link places within the district, thus affecting territorial and community identities (territorial fragmentation).

In the first place, activity with the community showed that certain issues are accepted without much questioning, such as "air pollution" (a physical fact perceived by inhabitants). Secondly, water—the need, lack, and contamination of it—is recognized as a main conflict in the district. This vital resource is basic for any type of development, as well as for the everyday well-being of all human beings.

Workshops suggested that the community has not only been greatly affected by industrial development, but also by real estate development. Currently seen as a community threat, the latter causes the destruction of flora and fauna and negatively impacts water consumption and availability, evidencing the lack of community coverage in terms of basic services like water and sewage.

4.3. Micro-scale
For the Micro-scale, the qualitative research method utilized was the individual questionnaire, from which individual perceptions were analyzed and grouped into two sections. The first section was, linked to the spatial practices of daily life (Perceived Space) and the second linked to perceptions regarding IE and community projections for the next decade.

Spatial practices of everyday life demonstrate collective awareness of the effects of pollution and its impact on basic needs of inhabitants of the territory (housing maintenance) and their health (high presence of chronic diseases attributed to pollution).
4.3.1. Industrial estate

Participants recognized job provision as one positive aspect related to IE; at the same time, the most repeated concept obtained from the activity was the absence of positivity. Pollution was the main issue mentioned and is linked to deterioration and depletion of the environment (air, soil, water, flora, and fauna); health concerns (diseases and death); and the depreciation of life (poverty and deterioration of social fabric).

Community projection indicates an intensification of the crisis that is experienced today in the district, citing the constant increase in pollution, and thusly, greater environmental deterioration and an increase in diseases and other health concerns. This, in turn, is related to projections of industrial development that entail expansion of industrial sites and further development of road infrastructure. Finally, it is recognized as a current and future threat to covering basic urban needs, such as water (increased water deficit) and proper sewage.

5. Conclusions

Space is produced under certain canons that respond to cultural and economic models of society. The national state has been consolidated worldwide: organizing and rationally planning societies, imposing homogeneous measures, and espousing political ideologies based on history and the social origin of individuals in power. The impact of these state decisions on capitalist neoliberal systems, such as the Chilean one, affects all scales: global-planetary, continental, national, regional, communal, and individual.

5.1. Spaces

Concerning the spaces described by Lefebvre in the theory of transduction, we can conclude that there is a contradiction regarding Produced Space, which is recurrent and dependent on political decisions that adapt to the needs/interests of the territory in question. This is not true of Lived and Perceived Spaces, which complement each other and are dynamically developed as part of daily life.

5.2. Development model

The first objective involves industrial development within local urban development. Current neo-capitalist development, of which industrial development is part, is materialized through different TPPPs, and responds to logics of capital accumulation without considering the proximity of urban/rural settlements nor irreparable environmental deterioration. This indicates a need to rethink the development model in terms of how the production of space occurs through public policies. Models of production of space should be oriented to land use, quality of life and ecosystem to obtain more sustainable territories.

5.3. Territorial identity

The second objective was to recognize perceptions of the inhabitants against community development. The impacts of industrial development on living are related to accelerated deterioration of the territory, which impacts both collective memory and territorial identity. The non-place reveals emergence of a new identity based on this deterioration and pollution, validating the “zone of sacrifice” through collective consciousness, which suggests that everything has deteriorated so much that there is no real consciousness of what survives.

5.4. Urban alienation

The final objective was to characterize daily life from the inhabitant's perspective. People do not control the processes, means, or final products of national industrialization. One can view life as segregated (concerning the social/public realm of a city), as dominated by cultural reification (concerning the institutional environment), and finally, as estranged (geographical disorientation and strangeness of the urban environment).
5.5. *Territorial reclaim*

This study shows that achieving possible change, in the first place, requires territorial recognition to identify what survives, followed by re-evaluation of the territory at the community level to reach an agreement on territorial re-appropriation in which changes are determined by locals.

This study of the district of Puchuncavi and its territorial crisis has proven itself as, not an isolated case, but a sample of territories in which human rights have been violated. Therefore, this crisis is related to the need to consider territories firstly as composed of human inhabitants, then try to design and plan according to their well-being and maintaining an appropriate and productive ecosystem. Finally, coinciding with the concept of social ecology, it would be most productive for Latin America to commit to serving local lifestyle needs directly instead of trying to fit these within the practice of any borrowed scientific method.

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