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METROPOLITAN FORMATION FROM FRAGMENTATION. THE CONURBATION PROCESS OF GREATER LA SERENA

ALEJANDRO GUILLERMO ORELLANA MC BRIDE

I. INTRODUCTION

The study of Latin-American metropolization has mainly been made regarding the large capitals of the continent, ignoring other urban systems (Maturana & Rojas, 2015). In the Chilean case, Santiago de Chile, the capital, is the almost exclusive model, even from language and the State administration³. However, other urban systems have developed metropolitan processes through intermediate cities and would not necessarily be repeating the big city model. Greater Valparaíso or Greater Concepción are two metropolitan areas recognized as such in Chile⁴, but they do not match the structure of Greater Santiago exactly, but rather evidence the joint action of several intermediate cities in a conurbation system.

Research on the morphological transformations of intermediate cities, like Los Ángeles and Chillán (Azócar, Sanhueza & Henríquez, 2003; Azócar et al, 2007; Azócar, Henríquez, Valenzuela & Romero, 2008; Henríquez, 2009) have been developed based on traditional metropolization models and, therefore interpret structural patterns that are similar to those identified in large Latin-American cities. In the case of intermediate city systems, the work of Hidalgo, de Mattos and Arenas (2009) brings together research on the systems of San Felipe-Los Andes (Arenas, Hidalgo & Aliaga, 2009), Quillota-La Calera (Negrete & Hidalgo, 2009) and Rancagua-Machalí (Arenas, Hidalgo & Aliaga, 2009), but these are left at a regional analysis level, without going into depth about the morphological patterns of the Metropolitan setup. From a functional analysis, Napadensky & Orellana (2019) have explored the cases of Greater La Serena, Greater Concepción, and Greater Puerto Montt, finding divergent trends with large Latin-American cities. All in all, many authors concur that the research in this field is incipient and that the models which explain the phenomena are exploratory in nature (Garín, Salvo & Bravo, 2009; Maturana & Rojas, 2015; Henríquez, 2014).

The case of Greater La Serena is analyzed, with the purpose of progressing with the understanding of the metropolization processes of intermediate urban systems, and with the goal of characterizing and explaining its morphological patterns. 1952 is taken as the starting point, with the end of the Serena Plan's works (1948-1952), while the ending point is taken as the latest aerophotogrametric survey and the information of the full census data made in 2012.

Using mainly documents, complemented with field observations and laboratory work, the urban structure and its evolution over time is firstly characterized, identifying and describing the urban events and factors that have led to its formation. After this, a summary of the morphological patterns and phenomena of the case study is made, before finally seeking explanation from the geohistory and contextual factors of its development.

II. THEORETICAL FRAMEWORK

Latin American studies of metropolization

In Latin America, the metropolization of capitals at the start of the 20th century was associated to industrialization (Buzai, 2014). From the economic crisis of the 1930s and the second world war in the 1940s, secondary industrialization initiatives were developed to substitute imports. This was linked to transformations in urban-rural relations, in the structure and role of the State and in its relationship with the city. The capital cities, seats of state and economic power, experienced great expansive population and surface transformations, complicating their social structure (Borsdorf, 2003). This phenomenon has been modeled by academia since the last third of the 20th century, aiming at explaining the metropolization process of the Latin-American city. The following models stand out from this, as they correspond to the end product of a line of research and have had a great influence on the urban research of the subcontinent:

- Generalized model of Latin American city structure (Griffin & Ford, 1980; Ford, 1996) (Figure 1, A).
- Latin American city model. (Borsdorf, 2003; Borsdorf, Bähr y Janoschka, 2002) (Figure 1, B).
- A model of socio-spatial differentiation in the metropolitan areas of Latin America. (Bähr y Mertins, 1981; Mertins, 2003) (Figure 1, C).
- Social spatial structure of Latin American Cities. (Buzai, 2014) (Figure 1, D).

Although the four models have their own features, they share common patterns of growth of the urban sprawl, where urban explosion and implosion phenomena simultaneously coexist (Soja, 2000/2008; Sousa, 2010; 2015), forming a compact and diffuse urban structure (Abramo, 2012), with the previous formal foundational and industrial matrices, along with spatial spread phenomena in the territory, characteristic of post-modernity (Soja 2000/2008; Cacciari, 2010; de Mattos, 1999; 2010), persisting. All the models suggest that the Latin-American metropolization preserves the foundational center as the hub of the system, around which concentric expansions are developed, followed by sectorial growth, and finally, fringe spread and internal fragmentation (Figure 1). The model prepared by Borsdorf, Bähr and Janoschka (2002) outlines this morphologic

³ The regionalization process that took place in Chile in the 1970s defined 12 regions plus the Metropolitan Area of Santiago (Decree in Law 575/1974, Ministry of the Interior), which later became the Metropolitan Region (Decree in Law 1317/1976). To date, the term "Metropolitan" is closely linked to Santiago.

⁴ The General Ordinance of Urbanism and Building establishes a minimum of 500,000 inhabitants to have the category of Metropolitan area (Article 2.1.7).

evolution in phases, which can be identified in the geohistory in most large Latin-American capitals (Figure 1, B).

Figure 1.- Main Latin-American city models. Source: (A) Ford, 1996; (B) Borsdorf Bähr & Janoschka 2002; (C) Bähr & Mertins 2003; (D) Buzai 2014.

Metropolization of intermediate cities

One of the greatest difficulties in studying intermediate cities is their definition. The most commonly used one alludes to their role in the national urban systems, mediating between the territory and the large metropolis (Maturana et al, 2017). In this context, intermediate cities establish relational networks with other urban hubs (Llop et al, 2019), tending to develop conurbation practices, both in their functional aspect, which involves the dynamics of the whole, and their physical one, which refers to the phenomenon of the encounter of urban structures (Véliz, 1995; Moreno, 2010, Patiño, 2010; Larrosa, 2012).

In Chile, the joint operation of intermediate urban units has created metropolization processes that do not yet have a clear definition: 'urban complex' (Hidalgo, Arenas & Aliaga, 2009), 'larger intermediate agglomerations' (Martínez, Altman & Rodríguez, 2013), 'conurbations' (Maturana, 2015) or 'intermediate urban systems' (Napadensky, Monti & Villouta, 2017). These intermediate urban systems, as units with particular features, do not necessarily fit with what is characterized in the specialist literature, but rather as a new form of metropolization, would tend to have a closer relationship with the conurbations observed by Patrick Geddes (1915/2009) than with the traditional models of the Latin-American city.

III. METHODOLOGY

To analyze intermediate urban systems in greater depth, a case study with a high theoretical value is used. Following the geohistoric approach of Soja (2000/2008), the urban growth of Greater La Serena is mapped based on diverse sources which, depending on their purpose, are classified into:

- Local historic background information: including historic publications, local newspapers, laws and decrees, digital publications, magazine articles and municipal and ministerial archives.
- Spatial information: The restoration of 2012 by the Housing and Urbanism Ministry (2012) serves as the basis for the study, complemented with census coverage from the National Statistics Institute (INE, in Spanish), aerial and satellite photographs, historic plans, and documents of the council and the Housing and Urbanism Service (SERVIU, in Spanish), as well as the collection of information onsite.

Analysis of morphological evolution

The analysis was organized into six historic periods, identifying in these the factors that had an impact on urban development and the forms of growth; and how the spatial setup led to actions by different urban agents. It begins with the results of the Serena Plan (1955). The second and third periods correspond to the urban expansion seen in the 1960s and 1970s. The fourth and fifth periods correspond to the inter-census periods and the last one outlines the most recent trends and events.

Starting from the geohistoric analysis, the morphological patterns of the metropolization process are summarized and explanations are sought of the particular aspects of the case and their contextual factors.

IV. CASE STUDY

Greater La Serena is located in the region of Coquimbo (Figure 1, A). This region has three provinces: Elqui, Limarí and Choapa (Figure 1, B). The case study is located in the Province of Elqui (Figure 1, C), which is divided into six districts. The districts of La Serena, with 221,054 inhabitants, and Coquimbo, with 227,730 inhabitants, concentrate 74.4% of the regional population. The urban areas of these two districts form Greater La Serena, one of the urban systems with the highest populational growth in the country (Table 1).

Table 1. Population growth and urban area of Greater La Serena. Source: Preparation by the author based on census data and urban sprawl maps of Greater La Serena.

Greater La Serena is the regional capital, with the highest economic growth in the last four decades, with a 54.2% share of the national GDP (Daher, 2016). Although it has low levels of functional specialization, it is not a 'commodity region', but rather has a more diversified economy (Rojas, Maturana & Morales, 2015). It did not experience large industrialization and deindustrialization processes. The city of La Serena mainly developed tertiary economic activities. Coquimbo developed some industry with the ports and railroad, but these are marginal when compared with the industrialized regions of the country.

Figure 2. Presentation of the case study. Source: Preparation by the author.

The metropolization process of La Serena has hardly been documented by the academia, producing partial visions of the urban system (Ortiz, Castro & Escolano, 2002; Cid, Castro & Rugiero, 2012). In 1995, Véliz analyzed the urban growth that characterized the conurbation process of La Serena and Coquimbo. In the 21st century, studies of the urban restructuring linked to vulnerability (Ortiz, Castro & Escolano, 2002) and socio-spatial changes (Escolano & Ortiz, 2004) describe the city as spread out and multipolar. From the State, it has been characterized as

bipolar with a growth process related to diffuse and desegregated urbanization (MINVU, 2007). The analysis of Hidalgo, Arenas & Monsalve (2009) concludes that the system is in a clear process of metropolization. Along the same line, Daher (2016) speaks about the 'emerging metropolis' and 'quasi-metropolis'.

V. RESULTS

1955. The transformations of the Serena Plan. Metropolitan grounds

During the government of Gabriel González Videla (1946-1952), the Development and Urbanization Plan for the Provinces of Chile was implemented as a pilot plan (Chile, Presidency of the Republic, 1951).

Figure 3. Greater La Serena in 1955. Source: preparation by the author.

The President, who was born in the area, choose it to apply a development plan which involved the architectonic, functional and socio-spatial transformation of the city, of the connectivity of the region and of its productive structure (Fierro Page, 2015). The urban space of La Serena was profoundly redesigned, wide areas were demolished, emblematic amenities were built, along with new public spaces in the urban sector. In Coquimbo, the cargo port was improved, and a new mechanized port was built for the mining exports. A thermoelectric power plant and railroad yard were also built (Figure 3, points 7, 8 and 9). The Serena Plan increased the urban surface area of La Serena and Coquimbo by more than 80%, but a large part of this increase (33%) occurred through settlements that were separate from the consolidated urban units, an undesired consequence of the Plan (Figure 3, point 4).

1955-1965. The city of fragments. Tension in the city's expansion

Urban growth in that period was produced in two contrary patterns. Each urban hub had a slow growth due to their proximity, within the urban boundaries approved in 1961 for Coquimbo and 1964 for La Serena while, on the other hand, rapid expansion processes due to the informal occupation in areas outside the urban continuum went beyond planning boundaries (Figure 4, points 1, 2 and 4). In the 1960s, the informal settlement Tierras Blancas appeared, started by the families whose homes had been damaged by the mudslides in 1957 (Pinilla, 2014). Although this sector was within the administrative boundaries of Coquimbo, from the beginning strong functional links were established with the city of La Serena, along the road to Ovalle (Figure 4). To the west of Tierras Blancas, some industrial sites were installed. A second informal occupation appeared in Las Compañías (Figure 4, point 1), which was regularized during the following decade (Gili, 2004). The third sector of growth corresponds to the neighborhood of San Juan, projected by MINVU to provide a habitational solution for those affected in 1957 (point 4). The seaside resort and fishing village of Peñuelas (point 3), created by the Serena Plan, is outside the urban planning.

1965-1982. Nuclear growth

Between 1960 and 1970, the urban population grew at an annual rate of 4.7% (Table 1), pressuring the urban system, mainly growing through informal urbanization, regularized and integrated in the urban area with fragmented extensions of the urban fringes. The modification of the District Regulatory Plan (PRC, in Spanish) of 1968 defined three urban areas in the district of Coquimbo, among them, Tierras Blancas (Figure 5), allowing the building of social housing adjoining the informal settlement and the development of an Industrial District, regularizing what had already been built.

Figure 4. Greater La Serena in 1965. Source: Preparation by the author.

This new productive pole (Figure 5, point 1), along with existing industrial facilities, related to the railroad (point 6), mining (point 5), fishing (point 3) and port activities (points 2 and 4) gave an industrial role to Coquimbo, contrasting with the services role of La Serena, which only had the CCU bottling plant (point 7). In this scenario, the functional relationships between the two urban hubs grew, strengthened by the growth of the fragments in the space in between.

Figure 5. Greater La Serena in 1982. Source: Preparation by the author.

1982-1992. Physical expression of the conurbation

Starting from the 1980s, added to the informal production of the urban land, especially the sectors of Las Compañías and the Upper Part of Coquimbo (Figure 6, points 1 and 8), the actions of the private agents became really important, through the neighborhoods built by the mining companies for their personnel, like Villa El Indio (Figure 6, point 4). At the end of the decade, the first private lots in the conurbation space emerged, in the Alto Peñuelas sector and in El Rosario de Peñuelas, San Joaquín, La Florida and Sindempart (Figure 5, points 2, 3, 6, 7 and 9); and the first apartment buildings along Avenida del Mar (point 5). Some of these plots were built outside the urban boundaries in projects that brought together public and private players (Orellana, Díaz, and Fierro, 2016). In addition, a series of smaller lots were built along the link roads that connect the two cities, forming the physical meeting of the urban sectors, evidencing the conurbation as a fragmented joint growth of the two urban hubs.

Figure 6. Greater La Serena in 1992. Source: Preparation by the author.

1992-2002. Change in scale of the conurbation

During the 1990s, there was a boom in new forms of growth, like villas in sectors alongside the urban fringe (Figure 7, point 3). This was a phase that saw major property development, with the appearance of high-rise 7 to 12-floor buildings along the coastline and in the southern sector of La Serena. The La Serena-Coquimbo Conurbation begins to be spoken about.

Figure 7. Greater La Serena in 2002. Source: Preparation by the author.

With the reduction of the housing shortage as a priority of the state policy, ever smaller houses on smaller sites, of 60 m², were mainly placed in three areas: to the north of Las Compañías, to the east of Tierras Blancas and the south of Coquimbo (Figure 7, points 2, 4 and 5). The mass scale production of social housing formed broad areas with limited amenities, deficient access, and a strong stigmatization. The normative continuity achieved in 1992 (Figure 6, letters A, B and C), plus the construction of Avenida del Mar and the trends of suburbanization, formed a linear growth along three bands, which are developed on the lower area, the coast; medium area, the primary location of the city; and the higher area, with the most recent urbanizations. This period also saw the start of a large-scale project called Serena Golf (Figure 7, point), that intends on urbanizing the coast to the north of the Elqui River.

2002-2012. The overwhelmed city

With a rising property development, the construction of the highway to Santiago de Chile attracted investment capital. The consolidation of the Avenida del Mar-Costanera sector, the first structural road inside the conurbation, marked the start of a highway consolidation of the system, starting along the coastline. The inland city-port system began to be transformed into a coastal metropolitan city.

Figure 8. Greater La Serena in 2012. Source: Preparation by the author.

Buildings of up to 25 floors were built along the coast and also a second line of condominiums, along with a progressive urbanization of “Las Vegas” along the Pan-American highway. The agricultural lots of the Serena Plan saw their use change. Their residents moved to higher lands and sports, touristic and commercial centers appeared. In the northern marshlands, the Serena Golf Project continued the urbanization of the bay (Figure 8, point 1). La Serena modified its PRC in 2004, increasing the buildable surface area, including the villas that had appeared in the previous period (Figure 7, point 2)

Figure 9. Suburban lots around Greater La Serena in 2015. Source: Preparation of the author.

The inward urban growth within the system, but by extension, in a lower and medium density, filled the spaces that had been left behind during the fragmented growth. In these spaces, housing destined to the highest classes was built. The social housing pressured the urban boundaries on the fringes of the conurbation system and pushed through them. In Coquimbo, the urban expansion reached the building possibilities that the urban boundary established, in effect since 1991, fostering important expansions on the rural land of Tierras Blancas, Pan de Azúcar and El Sauce-La Rinconada (Figure 8, points 3, 4 and 5).

Recent trends

Along with the clogging up of the conurbation space, in the last decade a mass scale lot system has been seen on the rural land around Greater La Serena, in a radius of up to 30 km (Figure 8). The lots, initially a minimum subdivision of 5,000 m² – decree 3,516/1980, or of 1,000m² – ‘illegal lots’, have stopped being a destination for a second home and have been transformed into an alternative for a first home for diverse socioeconomic levels. This phenomenon has extended the interurban system and complicated the management of urban services over extensive territories. The suburban lots, initially adjoining the urban boundary, are forming a city that extends along the communication links.

Morphological summary

The analysis of urban growth in Greater La Serena allows identifying two patterns that are being developed at the same time. First, a concentric growth of the hub is seen, starting from fragments; and second, the linear occupation of the bay territories is seen along the communication links. In the conurbation space, these occupation logics, lines and hubs, approach each other until creating tangent meetings, a ‘juxtaposition of location logics’ which is related with a meeting of the socioeconomic groups in the space.

From the fragments to the juxtaposed continuity

The conurbation process had its origin in formal and informal urbanization, separate from the consolidated urban hubs. These fragments established functional relationships along the connection links, initially without urbanized continuity, forming a suburban structure within the system. The current continuity is the result of an inward growth, which filled up the gaps, in direct relation with the definition of a regulatory continuity in the planning instruments and the growth of the property development industry. This produced a juxtaposition pattern of nearby sectors, but with limited spatial and function relations, connected and dependent on the linear circulation towards the hubs of the urban system.

Figure 10. Predial Surface and population density in Greater La Serena. Source: Preparation by the author.

Diverse hub growth

The fragments formed localities with a foundational logic, as satellites of the traditional hubs (Figure 11). These started growing thanks to the addition of diverse nuclear or concentric projects. These hubs are the areas with the highest population density of the urban system, up to 680 inhab/ha (Figure 10, B), due to the concentration of social housing, where the lot of 60m² dominates (Figure 10, A). The conurbation space is characterized on having a great morphological variety, seeing high contrasts of density and predial surface in nearby settings, forming a mosaic of different shapes in a space that has not yet finished its urbanization.

Figure 11. Morphological patterns of the urban growth of Greater La Serena. Source: Preparation by the author.

VI. DISCUSSIONS

The metropolitan formation from fragments can be explained by the political-administrative system. In the case studied, the metropolization was originally conceived by a state infrastructure and economic development plan in a period that was as intense as it was short. However, the change in the state conception of the territory in the 1960s abandoned the Metropolitan vision of the Serena Plan, separating administrative competences between MINVU, that focused on state efforts to reduce the housing deficit, and the Ministry of Agriculture, that was in charge of implementing the agrarian reform, dividing by means of urban boundaries the metropolitan territory into rural-productive areas and urban-regulated areas. The State started abandoning its role as urban and metropolitan promoter, leading to the emergence of the informal market, strengthened by a social housing regularization and construction policy alongside the informal hubs. This caused an expansive growth of the urban surface (4.6% a year) and a reduction of the habitational density of the urban system (from 102.65 inhab/ha in 1970 to 75.65 inhab/ha in 1982) (Table 1). With the neoliberal reforms implemented in the 1970s and 1980s, it is the property development industry, capable of transforming extensive areas of the territory, that assumes the leadership in the following decades.

Figure 12. Modification of the urban boundary of Coquimbo of 1986. Source: Ministry of Housing and Urbanism

This context encouraged that the informal growth followed a pattern that is different from the formal city. While the initially shy formal property market was urbanizing by proximity, groups of families without access to housing “occupied” non-productive land outside the urban boundaries. The reaction of the political system was to transform occupied land into urban lands, producing a constellation of regulated areas connected by precarious infrastructure lines, amid a rural space governed by the logics of the agrarian reform. The space outside urban boundaries is an unplanned space, that is included when the aforementioned events were faced. The marked urban-rural dichotomy that proposed the urban boundary made the intermediate suburban space invisible, with the exception of those informal settlement areas which are regularized in their marginality. Following on from that, the planning instruments repeated the spatial phenomenon, forming a fragmented regulatory setting which started achieving unity through the juxtaposition and superposition of instruments, until forming a normative continuity which has allowed the urbanization of the gaps. In the 1990s, starting with an urban boundary and an area for urban expansion, the system started being built in residential strips without more spatial continuity than the access roads. This is the typical morphology of expansion areas from this decade on, with unurbanized spaces inserted in the urban section, awaiting an increase in land value, both in the central space of the conurbation,

and in all expansion areas, even in areas where social housing lots were built. The pattern of fragmentation-clogging is highly profitable in the land market, the unbuilt strips rise in value through the increase of the location value (Villaca, 2001).

VII. CONCLUSIONS

The metropolization process of Greater La Serena differs from morphological patterns, typical of Latin-American metropolization, in its spatial occupation logics. These differences are partially explained in the urban events that had an impact on their process, and in the social political context they were produced under. In the period studied, the urban system only had local urban regulation, without a metropolitan regulatory plan, or an inter-district one. Nor were large structures built that strengthened the growth vector of the higher class. Ultimately, these are the infrastructures built in the 1950s which, due to their scale, sustained urban growth for 70 years. It is a relevant factor that the case study is not a national capital, nor did it have important industries. Intermediate cities tend to not have a preexisting industrial urbanization base, but rather develop postindustrial metropolization processes from preexistences with less inertia. Therefore, the urban system is understood not only as a metropolization process developed in a neoliberal context, but rather as a set of spatial practices that express the logics of neoliberalism in the city (Hidalgo, Santana & Alvarado, 2016). The analyzed case presents characteristics that deviate from convergences in the urban modeling of the Latin-American city. This represents an opportunity to develop the understanding of urban phenomena, especially regarding metropolitan system, or those that are on their way to conformation, set up by the conurbation of two or more intermediate cities. Considering that the urban models of Latin-American cities are a model that is often used by urban studies, on many occasions without much of an analysis, the results of this research question and refute their applicability in the case of intermediate urban systems, often not acknowledged or studied with partial approaches. As a result, the case contributes to understanding the trend of intermediate cities to establish networks of urban hubs to function as a more complex system, opening up the possibility to reexamine the entire urban system in the Latin-American reality, in line with some of the efforts that have already been made (Hidalgo, de Mattos & Arenas, 2009; Maturana & Rojas, 2015; Sousa, 2015).

Traducido por Kevin Wright/ Translated by Kevin Wright

