



Urbano

ISSN: 0717-3997

ISSN: 0718-3607

azazo@ubiobio.cl

Universidad del Bío Bío

Chile

Oliver Pujol, Mariona; Bisbal-Grandal, Ignacio
DIVERSITY IN URBAN SPRAWL MORPHOLOGY OF
RESIDENTIAL AREAS IN PERI-URBAN GREATER MENDOZA
Urbano, vol. 22, no. 40, 2019, November-, pp. 46-63
Universidad del Bío Bío
Chile

DOI: <https://doi.org/10.22320/07183607.2019.22.40.03>

Available in: <https://www.redalyc.org/articulo.oa?id=19864321004>

- How to cite
- Complete issue
- More information about this article
- Journal's webpage in redalyc.org

redalyc.org

Scientific Information System Redalyc
Network of Scientific Journals from Latin America and the Caribbean, Spain and
Portugal

Project academic non-profit, developed under the open access initiative

DIVERSITY IN URBAN SPRAWL MORPHOLOGY OF RESIDENTIAL AREAS IN PERI-URBAN GREATER MENDOZA

MARIONA OLIVER PUJOL
IGNACIO BISBAL-GRANDAL

I. INTRODUCTION

Countless authors have pointed out that the urban built environment is not only the physical embodiment of social and economic aspects of the different places and historic moment, but also, at the same time, it affects them, maintaining a dialectic relation where the urban form and society are closely linked (Mumford, 1954; Jacobs, 1961; Gehl, 1971; Bramley, Dempsey, Power et al. 2009; Congress for New Urbanism, 2000; Porta & Renne, 2005; Zumelzu & Barrientos, 2019).

In the case of the Latin American city and, more specifically, the Argentinean city, there is a certain consensus in manifesting that recent urban growth follows a sprawled, diffuse and fragmented model (De Mattos, 2002; Bähr & Borsdorf, 2005; Cardoso, 2011; D'Inca & Berón, 2013; Mawromatis, 2013; Usach & Freddo, 2015; Lentini, Palero & Montaña, 2010), which bears important differences with the context of Europe and the United States (Abramo, 2012; Szupiany, 2017).

On the other hand, medium-sized cities represent a key factor in the development of the United Nation's New Urban Agenda (Secretariat of Habitat II, 2017), within a policy which favors a balanced, polycentric, mixed use and compact territorial development. In recent decades, a new boost for these cities has been seen from a distribution logic in the network of the sprawled city, substituting the traditional hierarchical development (Michellini & Davis, 2009; Cardoso, 2011). In addition, this growth of medium-sized cities has its own distinctive features which differentiates it from the urban processes of the large metropolis in the era of globalization (Sánchez, Moya, Álvarez et al.; Michellini & Davis, 2009). In the context of this reality, and maintaining the focus on urban morphology, it is worth asking, how are the recent processes of the city sprawl model expressed in medium-sized Argentinean cities? How are the new residential fabrics that have arisen under this model distributed? Finally, how are these models characterized in morphological terms, considering the specific nature of their context? Our hypothesis initially considers that given features of this growth, like the reduced size of the fragments, their relative isolation and the lack of connectivity, complicate the efficient

provision of facilities and trade and the connection with the surroundings, determining an urban development which continues orbiting around the traditional city center and depends, to a great extent, on major traffic infrastructures. On the other hand, the question is whether, within this characteristic model of relatively homogeneous urban growth, distinctions in its fabric can be made and how these can be analyzed internally, since studies on Latin American suburbs focused on a neighborhood scale are much more scarce in number than those which address metropolitan scales and the socio-economic processes associated to city sprawl. Thus, this study looks to contribute, at a neighborhood and metropolitan scale, with information about the new residential fabrics of medium-sized Argentinean cities, shedding light on their diversity. It is proposed to reach this goal through a critical analysis with a morphological base which characterizes said fabrics and establishes which morphological models have arisen.

II. THEORETICAL FRAMEWORK

The term urban sprawl is used in this work from the point of view of morphological studies, characterizing it as a model with deconcentrated growth, limited density, discontinuous and lacking structure, following the definition by Muñiz, García-López and Calatayud (2006). Growth in urban sprawl mainly happens in the peri-urban area around a consolidated city and is suburban in nature, that is to say, the emergence of low density residential fabrics, with the rest of the uses concentrated in the traditional city or in service centers, unlike the fabrics which arose up until the first half of the 20th century, where daily activities took place within a relatively reduced area (Monclus, 1998).

An important aspect to consider in the Latin American city is a certain duality that can be seen in its formal and organizational structure. Although, on one hand, the forms of urban sprawl growth have been predominant in recent decades. It is also seen that traditional city centers, although part of their resident population has been lost on occasions, continue acting as city centers in many aspects, both for service positioning and as productive fabric, which means that the suburbs depend greatly on them. In this sense, the phenomenon of the Edge City, so common in the US, where services and production have moved, to a great extent, to residential suburbs or close to them, has not yet occurred in Latin America, or it has to a lesser extent (Indovina, 1990, 1998, 2011; Abramo, 2012). Thus, a mix of the hierarchical metropolitan area model, and the urban sprawl model, isotropic in nature in its extension over the area, is produced. This duality was already expressed by Indovina (1990) in his original definition of urban sprawl as "A mixture of concentration and sprawl seems to be the recurring typology, but the rule is unique: embodying an offer system for the

sprawled city, that is to say, for a population settled in a broad low intensity territory". Therefore, the Latin American city would differ both from the compact Mediterranean model and from the Anglo-Saxon sprawl model, with its own structure which combines the compact and the sprawled, phenomenon which Abramo calls com-fuse city (Abramo, 2012).

During the revision of the literature on the morphological analysis of Latin American cities, it is seen that these inherit the classic tools used for morphological analysis from the Italian, French, English and Spanish schools from the seventies, that later evolved from the International Seminar on Urban Form (ISUF) from 1994 onwards. Different authors have developed international comparative studies that include Latin American cities (Huang, Lu and Sellers, 2007). The Latin American morphological tradition, starting from classic contributions (Hardoy, Portes, Vasconcellos), has fundamentally referred to large capital cities (Garay (2007) in Bogota, Prévôt Schapira (2002) in Buenos Aires; De Mattos (2002) in Santiago; Ludeña (2006) in Lima, just to mention a few), whose growth logics are different to the medium-sized cities, although there are morphological similarities in their periphery fabrics. The studies in medium-sized cities are much scarcer, focusing on aspects like the relation established between form and insularity (Janoschka, 2002); form and urban players (Hidalgo, 2010) or form and sustainability (Hosni and Zumelzu, 2018). These methodologies can be extended with new variables and combined with spatial analysis to distinguish the internal structure of the sprawl model. This work is located at this point, on trying to find the morphological variables that best explain the internal composition of sprawl development in Mendoza, establishing distinctions within this relatively homogeneous growth model.

III. STUDY AREA

The case of the Metropolitan Area of Mendoza (hereinafter AMM) is a clear example of a medium-sized Latin American city with a recent extensive, sprawled and low-density growth which moves towards the peri-urban area (D'Inca and Berón, 2013; Manzini, 2017). The AMM is home to more than 50% of the Province's 2 million inhabitants. It comprises six boroughs: at the center is Capital which still has most of the services. The other five boroughs have their own centers and gravitate around the main core. The residential growth during most of the 20th century continued along existing paths, with the immense majority being a series of single-family homes in a square grid, although collective housing neighborhoods were also built. However, in the mid-1980s the dynamic changed: the wine-making crisis brought agricultural land on the market at a low price and the residential use began to invade traditionally rural land (Manzini, 2017). This growth

took place, just as in so many other peri-urban territories in Argentina, following the suburban model. This growth dynamic has led Mendoza to experience an accelerated growth of the urban sprawl in recent decades (Fig. 1), which has not been accompanied by a proportional population increase. Thus, despite AMM's surface area gaining almost 100 km² between 1986 and 2010 (Table 1), the population density fell 17% from 4,897 inhab/km² to 4,075 inhab/km².

Table 1: Evolution of the urbanized surface area and the population of the AMM. Source: own preparation based on INDEC data (National Census 1980, 1991, 2001 and 2010)

Figure 1: Urban extension of the AMM in 1986, 1999 and 2010. Source: Center for research, education, dissemination and territory management (CIFOT, UNCuyo).

IV. METHODOLOGY

The proposed methodology is based on the analysis of recent residential growth in Greater Mendoza from a morphological approach. As a first step, a topographical survey of the residential morphological units as units of analysis has been made. The morphological unit is defined as a residential fabric that has well-defined limits and homogeneous morphological properties. It is a concept related to the neighborhood unit of authors like Mumford (1954) or Perry (1929), although they focused more on the functional autonomy than on the morphology of each unit. To prepare the universe of morphological units, a planimetric revision of the neighborhoods supplied by the six boroughs has been used. Once the neighborhoods were obtained, those in areas of urban growth between 1986 and 2010 have been chosen, while those that by 2010 were still not consolidated have been discarded, that is to say, those that did not have at least 80% of smallholdings developed. This operation has been done using aerial photography from 2010. Finally, the morphological units themselves have been defined, by combining neighborhoods defined by the boroughs, using the following requirements:

- That these are adjoining neighborhoods
- That there is continuity in road sections
- That the housing typology is the same

The topographical survey has allowed determining 123 morphological units, which constitute the universe of the analysis.

Below, a series of variables have been determined to carry out the morphological characterization. These variables have been chosen based on a study about the most relevant morphological variables of specialized authors (Jacobs, 1961; Gehl, 1971; Lynch, 1984; Southworth and Owens, 1993; Bramley, Dempsey, Power et al., 2009; Mawromatis, 2013;

Zumelzu and Barrientos, 2019), choosing those relevant for the case of Mendoza and the specific situation of the Latin American suburban context, such as the type of access to the neighborhood, i.e. if this has a free access or a restricted access to a gated community. The six variables assigned along with the information collection methods are listed below:

- **Access.** Closed or open. Based on information from the boroughs.
- **Size.** In Hectares. Based on information from the boroughs.
- **Net housing density.** In number of dwellings per Hectare. Based on the information from the boroughs and Provincial Land Registry.
- **Type of urban fabric:** Rectangular (orthogonal grid with one side longer than the other), parallel uninterrupted (orthogonal grid with roads interrupted in both directions), cul-de-sac (street which is a dead end, without connection to another road) or irregular (non-orthogonal road structure). Adaptation from the classification of Southworth and Owen (1993). Based on observation from aerial photograph cross section.
- **Residential building typology.** Single family home (detached, semi-detached or terraced) or collective (block or tower) (Rodríguez-Tarduchy et al., 2011).
- **Presence of facilities** (both public and private of over 200 m²). Sanitary, sporting, educational, social, religious or commercial. Based on a combination of observation using Google Earth and direct observation during fieldwork.

Later, a descriptive statistical analysis of the universe of units and the allocated variables has been made, calculating the averages and distributions by section of the values in order to obtain a general outlook of the morphological characteristics and to make comparisons.

IV. RESULTS

The topographical survey of the 123 morphological units is expressed in a map of the residential growth that arose and was consolidated in Mendoza between 1986 and 2010 (Fig. 2). As can be seen, the growth, at a metropolitan scale, has been more intense towards the South and the Southeast, where the boroughs of Maipú and Luján de Cuyo are found. These have a higher amount of vacant land from agricultural smallholdings and are located close to the main roads. On the other hand, there is a considerable amount of sprawl throughout the metropolitan area, with a high degree of isolation (more than 1km from the main road) and an ultra-periphery location (3km outside the radius of influence of the municipal town centers). There are 31 of these units, i.e. 25%

of the total. On the other hand, a total of 46 units (37%) are grouped forming branches (groups of three or more) which in general are located along main roads and are closer to the areas of influence of municipal town centers. Finally, 30% of the total, 37 units, do not form part of a branch but are located very close (less than 500 meters) to the main roads.

Figure 2. Topographical survey of the 123 morphological units of the AMM (the areas of influence have been represented with a radius of 800m, 1,600m and 3,000m from the six municipal centers). Source: own preparation.

Upon studying the statistical analysis of the variables applied to the 123 units, it is seen that these have more similarities than differences, presenting a relatively homogeneous morphological panorama. First of all, a surprising presence of a rectangular blocks is seen, which is found in 82% of the fabrics. This dominance is the result of trying to obtain the maximum number of same-sized smallholdings (due to the Lot Division Law of 1979, this is 200 m²). The single-family dwelling typology is also dominant, which is present in 98% of the units, with the collective dwelling, be these in blocks or towers, being a marginal typology. The habitational densities are, as a result, low, ranging in general between 10 and 30 dwellings/Ha, with an average of 23 dwellings/ha. In a third similarity, it is seen that most units are solely for residential use: just 27 of them have any type of facility and none are productive. The facilities are concentrated in the largest units: more than half, 56% are spread within just 7 units, all over 40 hectares. The most common is educational and sporting, together totaling 70% (with 42% and 28% respectively) of all the facilities, followed by social (15%) and religious (10%). Commercial and sanitary facilities are even less common, found in just four of the units, 3% of the total (Fig. 4). Finally, in a fourth similarity, 85% of the neighborhoods are open, with just 15% being gated. The gated units have a perimeter fence which prevents people from outside the neighborhood from entering, and the access is controlled by barriers and/or guarded by security personnel. The gated neighborhoods are located on the edge, increasing their already natural detachment from the surroundings, confirming what Manzini (2017) mentioned, although all (except in one case) are connected by fast roads to the rest of the city (Fig. 3).

Figure 3. Units with open access and units with gated access in the AMM. Source: own preparation.

Figure 4. Distribution by use of the 68 facilities surveyed in the 123 morphological units. Source: own preparation.

Despite that, in general terms, the units are relatively homogenous, they also have two variables with noticeable differences. The type of road section is mainly divided into two (Fig. 5): the rectangular, which appears in more than half the cases (56% of the total) and the parallel uninterrupted

type, which is present in 27% of cases, data which stands out due to its unusual nature. The irregular section (11%) and cul-de-sac (6%), the two remaining types, are much less represented. These are often combined and together total 17%. These last two types tend to be present in developments with much larger smallholdings: from the 19 cases with this type of section, 13 have a detached single-family dwelling typology, which requires a much larger smallholding than the semi-detached typology.

Figure 5. Types of urban fabrics detected in the AMM. Clockwise, rectangular, irregular, cul-de-sac and uninterrupted parallel. Source: Google Earth®

On the other hand, a large variability in the size of the units is seen (Fig. 6): the small units of less than 5 Ha abound, together 44% of the total. These units, which Lynch defined as “very local units, where everyone knows each other” (Lynch, 1984), do not tend to be commercial or have facilities (only 4 of the 54 have facilities). Medium-sized units are also common (of between 5 and 20 Ha), some 43% of the total. Most of these (83%) do not have facilities, although there are small shops. Finally, large units of over 20 Ha are more scarce, representing just 13% of the total, although these are better equipped (80% have one or more facilities). However, only four of them would comply with the 60 Ha size that Mumford (1954) defined as the minimum to hold a primary school (Fig. 7).

Figure 6. Number of units (y-axis) distributed by surface ranges in Hectares (x-axis). Source: own preparation.

Figure 7. The 123 morphological units ordered by size from smallest to largest. Source: Own preparation

V. DISCUSSIONS

Just as has been explained in the results, in current Mendoza there is a great number of new fabrics located along the main roads, emphasizing the importance of horizontal connectivity in the urban sprawl (Indovina, 1990). It is interesting to state that when several units are combined, there does not tend to be a morphological integration between them, but rather they continue being separate and clearly defined units. In spite of this, these groupings seem to be attracting facilities: of the 10 cases of units under 20 Ha that have facilities, 7 of them are in some branch and of the total of 12, 8 have facilities (6 of which have more than one). This all suggests that a certain aggregation is produced to obtain a critical size for the location of facilities in the groupings of units. However, units which are not located along roads and that do not form part of a branch present a much more noticeable isolation. Within this type of sprawled and suburban growth, subtle variations have started to be seen between the units to propose the six models which explain the residential growth

of Mendoza in recent decades (an example of each one can be seen in Fig. 8).

- **Local units.** These are open access units of a small size of less than 5 Ha. The area tends to be rectangular; the smallholding has a size of between 200m² and 300m² and densities range between 20-30 dwellings/Ha. They tend to be on the periphery and, often, away from main roads. They do not have facilities and they cover 25% of all units.
- **Large units.** These are large units (of over 20 Ha) which have a parallel uninterrupted section with smallholdings that are at least 200m² in size. They are located close to quick roads and/or close to the center of the boroughs. They tend to have educational or sporting facilities and consider 10% of the total.
- **Gated community.** These fall within the class model of a private neighborhood, with restricted access and a perimeter fence. The area tends to be irregular, have cul-de-sacs or a combination of both. The smallholding is medium-sized or large, from 400m² up, with a detached single-family dwelling typology and low densities (less than 15 dwellings/ha). They are connected to quick road arteries. The internal regulations prohibit any use that is not residential, hence there are no shops or facilities. These consider 15% of the total
- **Semi-gated community.** This works in a very similar way to the previous model but access control systems are more lax, mainly because these were not thought out as gated communities, hence they do not have perimeter fences. In general, the boroughs have recorded this type of neighborhood as open, as the streets are public.
- **Vertical gated neighborhood.** Private neighborhood model with a tower typology and high densities, of close to 100 dwellings/Ha. Except for the obvious differences in density and typology, these neighborhoods also have a controlled access and perimeter fences, as well as the presence of multipurpose rooms and/or swimming pools. However, they tend to be located closer to the consolidated areas or even within them.
- **Countryside unit.** These are open neighborhoods with medium or low density, of between 10 and 20 dwellings/Ha, with a medium or small size and with a very variable smallholding within the same unit, although the minimum size ranges around 300m². These are almost exclusively located around the borough of Luján, to the South of Mendoza, and are surrounded by rural land.

Figure 8. Examples of the six morphological models proposed. From left to right and top to bottom. Local unit (RU6), Large unit (PS11), gated community (CI4), semi-gated community (VS2), vertical gated neighborhood (GB2), and countryside unit (LU1).

Starting from the results and their discussion, it is seen that the urban residential reality of recent Mendoza has a sprawled and mono-functional growth, similar to other medium-sized Argentinean cities, like Comodoro Rivadavia, whose growth in urban sprawl has been analyzed by Usach and Freddo (2015), connecting it with the oil industry, the Villa Maria-Villa Nueva development, whose periphery has been defined by Sánchez, Moya, Álvarez et al (2010) as sprawled and having a low density or Santa Fe, whose urban sprawl processes, Rausch, Martínez, Nardelli et al. (2019) connect with the neoliberal strategies of spatial mercantilization.

On the other hand, it is difficult to establish whether these growths have similarities on a neighborhood scale, as most of the studies reviewed address the metropolitan and/or territorial scale. An exception to highlight is the work of Marengo and Lemma (2017), where they analyze the recent residential fabric of Cordoba in detail, although focusing only on the gated communities.

VI. CONCLUSIONS

On a metropolitan scale, it is seen that the growth of Mendoza in recent decades has followed a clear pattern of urban sprawl, just as many authors have described is occurring in Latin America (De Mattos, 2002; Bahr and Borsdorf, 2005; Lentini, Palero and Montaña, 2010; Cardoso, 2011; D'Inca and Berón, 2013; Mawromatis, 2013; Usach and Freddo, 2015). This situation is similar to that of other average Argentinean cities which have followed a similar urban sprawl model, like Córdoba (Marengo and Lemma, 2017), Comodoro Rivadavia (Usach and Freddo, 2015), Villa Maria-Villa Nueva (Sánchez, Moya, Álvarez et al., 2010) or Santa Fe (Rausch, Martínez, Nardelli et al., 2019).

Expressing this sprawled and fragmented growth, clearly marked morphological units have recently emerged in Mendoza which have a limited interrelation and with their immediate surroundings, without having a continuity with the pre-existing city. Although several units, in some case, form branches that are close to the consolidated city and units are also found very close to the main road, in many cases the units are isolated and in quite peripheral locations. On the other hand, the large number of small-sized units (less than 5 Ha) leads one to wonder about the reasons for the proliferation of this type of offer: although it is not the goal of this work to reveal these, it is worth asking whether the limited current regulations that regulate the land outside the consolidated areas is not leading the private developers, with more capacity, to focus on the offer to the higher classes, especially with gated communities. This would leave the rest of the options in the hands of small private developers, whose main goal is maximizing the number of small 200m² smallholdings, producing, in this way, countless small units with a rectangular area and extended block, lacking the sufficient size or population to house facilities.

In addition, on a neighborhood scale, the in-depth study into aspects like size, position in the AMM and internal setup reveal the great importance of detecting subtle differences between apparently homogeneous units and thus be able to establish guidelines to better connect these neighborhoods and attract facilities and even other non-residential uses. In this sense, it would be interesting for future lines of research to analyze how branches or groups of already existing units could be consolidated, integrating them and encouraging the presence of facilities.

Finally, as a synthesis of this morphological, multiscale and detail based analysis, the following characterization of the residential growth of contemporary Mendoza is proposed:

- Suburbanization based on a single-family dwelling, with marked internal mono-functionality and limited or complete lack of non-residential uses.
- High fragmentation, generating a kaleidoscopic landscape in the peri-urban use, comprising fragments or parts that are not put together, where the land has a discontinuous presentation but ends up being homogeneous in its lack of hierarchy and structure.
- Lack of variation in smallholding size and the building typology within each unit, which indicates a high socioeconomic homogeneity of the inhabitants.
- The connectivity to and between units is horizontal (Indovina, 1990), along main roads and mainly using a private vehicle. Public transportation is limited and not very efficient.
- Well-defined unit edges and limited connection with the immediate surroundings, often formed by empty or rural sites or infrastructures (irrigation canals or main roads), causing units to turn their backs on these spaces.
- Trend towards creating restricted access enclosed sites (gated communities), whether through the construction of private neighborhoods or other more informal and ever more frequent means of appropriating public space, like placing fences which gate off streets or installing guard huts at the access to public neighborhoods (Manzini, 2017). Gated communities have sprung up in recent years, although this study only includes 17 units consolidated prior to 2010, since at the start of the century many gated communities were created which were later consolidated. Lentini (2010) had already counted more than 180 in 2009, including those which were in a consolidation process.

The morphological analysis allows characterizing residential units in detail, capturing the subtle but important differences and establishing shape factors that affect the construction of the urban collective space. Therefore, the interest of the methodology applied is confirmed as an analysis tool of the

new growth in medium-sized Latin American cities, which have specific characteristics that are noticeably distant from European and North American models. Said analysis can be taken as the basis for possible future proposals to improve the urban quality of these suburban residential fabrics.