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## Urban expansion: from compact to fragmented form

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**ABSTRACT:**

The new urban order in the territorialization of cities, in general, is based on the principles of an ever more fragmented and dispersed growth across the territory. However, the growth of the urban area of Maringá diverges from this new order, retaining its compact form. In this study, the urban area of Maringá is composed of the cities of Maringá, Sarandi and Paiçandu in the State of Paraná, Brazil. The objectives of this article are to define the urban form of Maringá considering the variables *compact city*, *fragmented city* and *disperse city* and to identify the periods of urban expansion for each variable. The timeline of this study begins with the implantation of the cities in the 1940s and continues until the year 2016, since the urban area been mapped in a decennial diachronic series. Originally compact, the urban area fragments as it expands, in a movement that continues until the 2000s. After that, the occupation of its center predominates, making it compact again. Given these points, the beginning of a new cycle or new model of urban expansion is evident for Maringá.

**KEYWORDS:** urban form, urban expansion model, compactness, dispersion.

**INTRODUCTION**

The city of Maringá, originally drawn in accordance with Raymond Unwin's principles applied in English Garden Cities, had a compact form and closed in itself as a garden city should (Rego, 2001; Steinke, 2007; Bonfato, 2008; Rego, 2009; Rego & Meneguetti, 2010; Rego, 2011; Macedo, 2011). As such, the establishment of its design did not anticipate expansion beyond the original plan.

The new parceling that came after the original plan did not give continuity to the characteristic of the urban design that was implemented up to that point (Meneguetti, 2009). The roads leading from the urban nucleus towards the rural area served as supporting structures for territorial expansion. Designed and implanted along the ridge, the roads were also structure for rural parceling. This parceling is, in its totality, the basis of urban expansion for Maringá and its region.

The growth tendency of a city is also linked to its power of attraction in relation to the other orbiting cities in its surroundings. The expansion of the whole, that is, from the center toward the outskirts and from the surrounding cities toward the central city, often causes the formation of a single urban area. Under these circumstances, the so-called 'urban expansion of Maringá' or even 'urban area of Maringá' refers to city of Maringá and its neighboring cities of Sarandi and Paiçandu. It is important to clarify also that 'rural urban fringe' or merely 'urban fringe' corresponds to the boundary ring where rural meets urban land uses, and, in this text, it belongs to urban area and almost always corresponds to the most recent expansions.

The urban growth is not always continuous. At the same time that there may be an interlacing of urban fabrics between the different cities, an urban fringe may be in a process of fragmentation of its form. By the logic of the real estate market, a fragmented form leaves 'urban voids' that serve for later occupation. For this reason, it is possible to presume that from time to time there is a movement that returns to the interior of

the urban area to fill in the gaps. In other words, there is a cyclical change in the urban expansion model for Maringá, characterized at times by the compact form and at times by the fragmented form.

The confirmation and description of this movement is the first step (1) in establishing the periods of expansion evidenced by the urban form and (2) in highlighting the economic and cultural issues that characterized each of these periods. The objective is to demonstrate only one of the morphological processes listed by Conzen (2004) which is the accretionary growth and, thus, to be able to group the patterns of growth along a temporal line. The challenge is to approximate the morphological dimension to the territorial scale, which in this paper, corresponds to the identification of the expansion model of an urban area over a previously planned territory.

## MATERIAL AND METHODS

### Mapping the urban area of Maringá

A fundamental to this study was the development of a decennial historical series, which was the basis for the analysis of the form of the urban area of Maringá. The mappings of the urban area were composed of the identification of its parceled areas painting them in black in its respective historical periods. It was considered: (1) land parceling, with inclusion in the decade based on the date of approval by the relevant public agency rather than its full occupation; (2) urban land occupation including small farms without agricultural production, union of large lots or leisure estate lots and gated communities; and (3) specific urban land use, such as large industries, large areas of commerce and sectoral services, or even institutional areas such as airports.

For this purpose, a document search was carried out at the city halls of Maringá, Sarandi and Paçandu including area surveys, locations and dates of approval for all allotments. Due to the lack of complete information, we used the Historical Images tool of the Google Earth program for the mapping of areas with specific land use, such as industrial development.

### Variables of the urban expansion model: compact, fragmented and dispersed

The city, from the point of view of its form and not necessarily its spatial organization, is described according to three variables: compact, fragmented and dispersed. The compact urban form is that which for centuries typified cities and clearly distinguished them from the countryside. Cities with clearly defined limits, reveal their compact forms either for having smaller dimensions, or due to the defensive needs of medieval cities.

The fragmented form of cities derives from the spreading of the urban land occupation over the territory. The extensive growth of cities was only made possible by the establishment of railway networks, especially in the European countries of the 19<sup>th</sup> century, and later, the creation of the highway network in the first half of the 20<sup>th</sup> century. The growth of the urban area and the maintenance of the monocentric territorial organization led to the formation of an urban continuum in the large cities of that period as described by Patrick Geddes (1915) in his book about London, 'Cities in evolution'. It was also one of the reasons for the Social City and the Garden Cities proposals of Ebenezer Howard in the late nineteenth century. The garden city was proposed as a city model with defined limits, which, in the face of urban expansion, would result in the creation of the new city. According to the author's proposal, such a model formed an urban network or a social city, preventing the formation of a vast expansion throughout a territory.

Contrary to the compact form, a city that over time expands and fragments across the rural territory begins to lose the clarity of its limits. In this conflict between countryside and city, both dissolved in urban nebulae, in the certainty that the territory was conquered by the city by virtue of its extension (Corboz, 2004). Its

notable that Josep Lluís Sert in his 1942 book *Can our cities survive?* already raised the question of urban areas and the difficulty in recognizing them as traditional cities.

The fact that urban forms are fragmented does not indicate direct correspondence to the concept of *città diffusa* described by the Italian Francesco Indovina in 1990 regarding the region of Veneto, or even the ‘edge city’ in the United States defined by Joel Garreau (Garreau, 1991; Indovina, 2004; 2010). At the same time, both concepts are based on economic dynamics and decentralized territorial organization. Within this morphological dimension, there is greater conceptual approximation to the dispersed city presented by Francisco Javier Monclús in 1998 (Monclús, & Dematteis, 1998; Monclús, 1999); and seen, in this work, from the perspective of the work of Nestor Goulart Reis in 2006 *Notas sobre a urbanização dispersa e novas formas de tecido urbano* for São Paulo State.

Reis (2006) considers that the traditional city, continuous and with relatively defined limits, interrelates with its dispersed areas throughout the territory, where “[...] there are simultaneously a process of fusion and integration between the urbanized areas of the municipalities of the region and a process of dispersion”. What is meant in morphological terms is that “[...] on the regional scale, the image is continuous; on the urban (intra-urban) scale is discontinuous” (Reis, 2006, p. 81). This is a process that has been occurring in the main regions of the state of São Paulo since the 1980s and 1990s and involves the urban areas of State São Paulo, Campinas, Baixada Santista and Vale do Paraíba.

Considering the study of Reis (2006) and Font (2007) *Dispersão e difusão na região metropolitana de Barcelona* the variables are objectively defined. The compact form refers to concentric form, with defined limits; the fragmented form as an urban form with non-occupied areas in its interior, which the perception of its limits is difficult but still possible; the dispersed form characterized by the discontinuity of the urban parceling without a clear line of its limits. Thus, this article draws a parallel and examines what has been happening in the urban fringe of Maringá.

## RESULTS AND DISCUSSION

### The design of the urban expansion

The series of cities implanted on the north of the state of Paraná by the company Companhia Melhoramentos Norte do Paraná (CMNP) were part of a colonization plan that promoted systematic occupation in the territory. This plan was based on the coffee growing in small farms. The production of coffee was transported by a railway line, the same line that articulated the urban nuclei to each other. The rural parceling was fundamental to the development of the area forming an elaborate background.

The expansion of the urban area of Maringá occurs on a matrix defined by rural parceling. The ridges are evident in this matrix, which correspond to the vicinal roads. These are the anthropic structures that connect the initial urban nuclei implanted in the 1940s to the subsequent expansions (Figure 1).

In the first fifteen years after implantation of the cities of Maringá, Sarandi and Paçandu (1945-1960), when the cities were still in the process of land occupation, the form corresponding to each city was quite compact, with clearly defined limits. It did not yet correspond to a single urban area, but rather to three distinct cities, articulated by a road-rail structure.



FIGURE 1.

Partial plan of rural parceling for the region of Maringá, Sarandi and Paçandu, 1945. Legend: center: area of the initial plan of the city of Maringá; right side: Sarandi's initial plan area; left end of the figure: area reserved for the patrimony of Paçandu. Source: Companhia Melhoramentos Norte do Paraná collection.

During the 1960s (1961-1970) the compact form of each city was maintained. The biggest change that occurred in this period was the implantation of the Jardim Alvorada neighborhood, which was the first large expansion of the city of Maringá. This expansion occurred continuously to the existing built-up area, positioning itself radially and forming the first radius of expansion of Maringá in the northern direction (Figure 2).

In these first decades the economic base was still in the coffee growing that for years corresponded a large part of the Brazilian production. The quickly full occupation of this territory and its attractiveness, in rural and urban areas, promoted the success of the colonization. Thus, this period was highlighted by population and urban growth.



FIGURE 2

The compact form of the cities of Maringá, Sarandi and Paçandu. Legend: top to bottom: images corresponding to the years between 1945 and 1960; and the years between 1961 and 1970. Source: Companhia Melhoramentos Norte do Paraná collection, Prefeitura do Município de Maringá collection. Developed by authors.

The fragmentation of the urban area of Maringá began in the 1970s (1971-1980) with the formation of a fragmented urban fringe. However, the original urban nuclei remained compact and their immediate expansions occurred continuously to them. It was also in this decade that the design of the Maringá-Sarandi conurbation began and with it the second radius of urban expansion, but at this time in the eastern direction, following the road line and giving shape to a certain linearity in the urban form.

Undoubtedly, the urban growth in 1970 and 1980s was the result of a migration movement of the rural population to live in a city. This movement was due to bad climatic conditions that damaged the coffee growing and due to the federal governmental incentive to change the agricultural production model. Thus, the population increase was approximately 134% between the two decades.

The consequence of the migration was the fragmented urban fringe that widened and intensified while the continuous expansion of the more central area persisted in 1980s (1981-1990). This continuous expansion gave form to two important road structures in support of urban growth - Kakogawa avenue and the PR317

highway. This decade was also characterized by the formation of the third radius of urban expansion, but this time in the western direction, accentuating the east-west linearity initiated in the previous decade. Consequently, the three distinct urban areas began to agglutinate into a single urban area. On the other hand, the fragments in the urban fringe expanded into small and medium sizes orbiting the city of Maringá.

The vertical urban expansion was together with 1980's growth of the city. It was the first moment of the expressive urban verticalization in Maringá and it occurred in central area and two other neighborhoods - Zona 07 and Jardim Novo Horizonte.

In the following decade (1991-2000), a series of farmlands beyond the urban perimeters that were in force at the time were parceled. Therefore, that urban movement was giving signs of spread with an urban character across the territory, later denominated as rural gated communities. These gated communities were concentrated to the north and northwest of the city of Maringá, thereby demarcating two vectors of urban expansion for this period.

There was also a greater dynamic of occupation along the fragmented urban fringe especially to the north and northeast of the urban area. Thus, the Maringá-Sarandi conurbation was reinforced within the continuous urban fabric. In this way, the linear form of the urban area was giving way to another, more circular form.

As for the rest of the urban area, where the dynamic of occupation was not as extensive as that of the whole of the northern sector, an intensive fragmentation of the urban fringe was seen. This discontinuous expansion of the urban fringe persists for the entire urban area of Maringá, being even more evident in the southern sector.

Unlike the movement seen in the previous period, there were no significant additions to the urban fringe during the 2000s (2001-2010). On the contrary, the movement of parceling and land occupation remained within the existing urban area, causing the fusion of the fragments in the northwest part of the city of Maringá. The same movement was initiated in the southern part of the city.

The reduction in fragmentation of the urban fringe leads to a more compact urban area giving way to a circular urban form and diverging from the linear form present until the 1980s. With the increasingly compact and continuous urban form, the waterways become more evident (Figure 3). At the same time, the second moment of verticalization of the city of Maringá occurs also. While the first process of verticalization was in concentrated areas, this second process is characterized by occupation in specific areas, i.e. New Center, and by the spreading of skyscrapers by the urban area as a whole.

Finally, the last six years (2011-2016) were characterized by the union of the fringe fragments with the intensification of the occupation of the southern sector and the new land parceling in the northern sector of the city of Maringá. With this, the trace of linearity definitely gave way to the circular form of the urban area, and this time, with large fragments orbiting in its surroundings and no longer the small fragments that formed the fringe primarily of the city of Maringá. Retaining the compact form of the urban fringe, the waterways that penetrate the urban fabric increasingly present themselves as natural structures of this urban area (Figure 4).

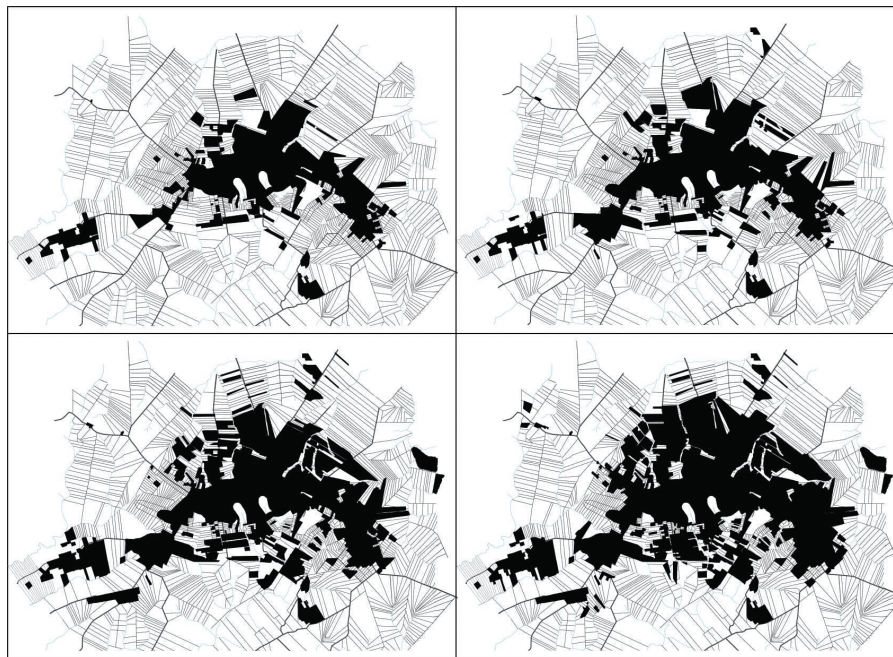


FIGURE 3.

The fragmented limits of the urban fringe of Maringá. Legend: from top to bottom/from left to right: images corresponding to the years between 1971 to 1980; 1981 to 1990; 1991 to 2000; and from 2001 to 2010. Source: Companhia Melhoramentos Norte do Paraná, Prefeitura do Município de Maringá, Prefeitura do Município de Sarandi, Prefeitura do Município de Paiçandu. Developed by authors

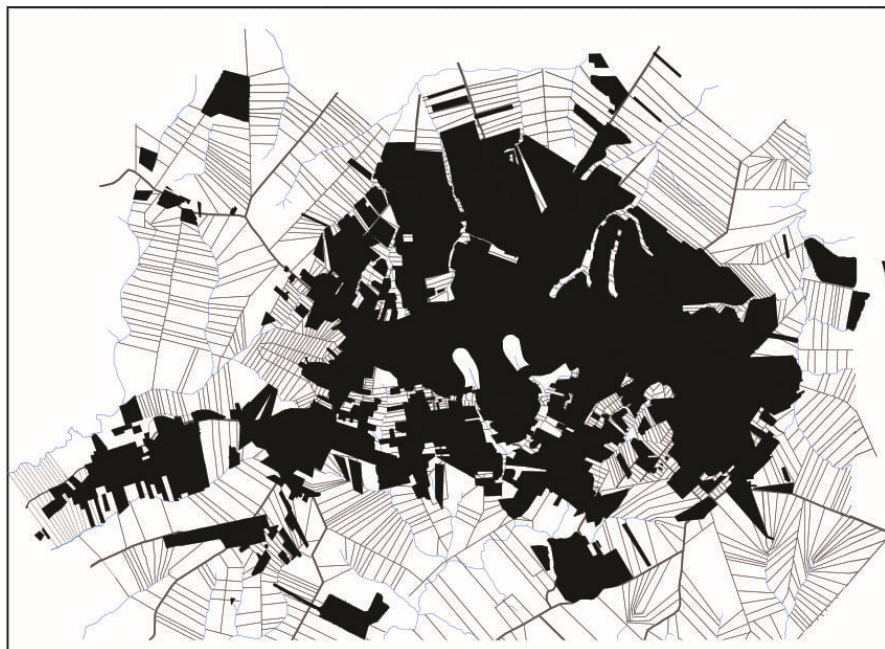


FIGURE 4

Compact urban area of Maringá 2011-2016. Source: Companhia Melhoramentos Norte do Paraná, Prefeitura do Município de Maringá, Prefeitura do Município de Sarandi, Prefeitura do Município de Paiçandu. Developed by authors.

## CONCLUSION

### The expansion periods of the urban area

In view of the series on the growth of the urban area presented, there were no cyclical changes of the urban form for the studied time frame. There was a simultaneous movement of fragmentation of the fringe and continuous urban expansion. Overall, the urban fringe became increasingly fragmented over the decades. Small and medium fragments orbited the city of Maringá. Beginning in the 2000s there was an accentuated movement of occupation of its center through land parceling in previously unoccupied areas. As a result, the urban form has been continuous and compact with large fragments orbiting the surroundings of the urban area as a whole, and no longer concentrated only around the city of Maringá.

Because the compact form is precisely the result of the growth of the urban area of Maringá, there is evidence of it distancing from the new urban order. Maringá presented controlled urban growth through the rural area, contrary to most of the Brazilian medium-sized cities that have shown a different growth pattern, sprawling in the territory. The strong presence of urban planning in daily life and in the imaginary inhabitants of the city is a force that controls the extensive growth of the urban area.

The characterization of the compact form during the first years of implantation and expansion of the urban nucleus of Maringá, Sarandi and Paçandu and the subsequent change in the way this expansion occurred during subsequent decades, led us to identify two expansion periods. The first period corresponds the years between 1945 and 1970, in which the urban area was compact with continuous expansion. The second period, in which the fragmentation of the urban fringe persists, corresponds to the years between 1971 and 2010.

In these periods only two variables of the urban expansion model were identified, compact city and fragmented city. The urban area of Maringá has not been characterized by urban dispersion, but it was possible to observe the fragmentation of its fringe in certain periods. However, the urban dynamic of the present decade indicates a new expansion period and a new model of urban expansion. With this new dynamic, the establishment of an urbanized territory and an increasingly dispersed urban form can be assumed, even though the dispersed form was not evident during the previous decades. This may occur due to the depletion of non-occupied areas within the urban area, as well the potential for new connections, transformations and the creation of new urban centralities to act as nodes of a regional network.

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