

## MORPHOLOGICAL CONTRAST AND URBAN POLICIES ON THE BORDER OF BRAZIL AND PARAGUAY

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### ABSTRACT

*This is a morphological study in the conurbation of border cities of Ponta Porã, Brazil, and Pedro Juan Caballero, Paraguay. These territories are marked by cultural diversity, land dispute and socio-spatial segregation. An imaginary international line that cuts the urban space in two defines a multipurpose space streamlined by commercial transactions, currencies and languages, forming areas of urban subversion conceded by governments, which are agents of integration or reproduction of urban crises. This study questions if this conurbation has morphological distinctions and, if so, what factors cause them. The hypothesis is that distinct urban policies and the culture of illegality define dynamic urban forms of space appropriation unique to each country. Through the identification and analysis of urban paths, centralities, blocks, meshes and ruptures in fragments of urban fabric extracted from satellite images available in Google Earth Pro, it was possible to verify that pacts, transgressions and informality imply different arrangements peculiar to urban areas. The results show urban morphologies typical of the 21st century, resulting from adaptations and appropriations from cultural interaction, business, public policies, and urban social dilemmas. Keywords: urban morphology; twin cities; socio-spatial segregation.*

### INTRODUCTION

This investigation seeks to understand the urban morphology in the conurbation of Ponta Porã, located in Mato Grosso do Sul state, Brazil, and Pedro Juan Caballero, capital of the Department of Amambay, Paraguay (Fig. 1). This is considered the second largest conurbation of the Brazilian dry border. Under the urban paradigm of the 21st century, it is characterized by cultural diversity, land dispute and socio-spatial segregation. According to Torrecilha (2014), this border is also known for hosting a network of arm and drug trafficking, and for boosting organized crime, corruption and, contradictorily, the regional economy. Thus, the twin cities are not only a territory of violence, but also a conurbation with diverse opportunities, flows of companies and consumers, in conditions that form a dynamic zone of businesses and services (Torrecilha, 2014).



**Figure 1.** The twin cities of Ponta Porã, in Brazil, and Pedro Juan Caballero, in Paraguay

Torrecilha (2013) and Souza *et al* (2020) state that the conurbation of these border cities have specific urban characteristics. They equal large urban centers, with deep problems related to the lack of integration between the public policies of the two neighboring countries. The cities of Ponta Porã and Pedro Juan Caballero have in common the increased scarcity of housing, infrastructure,

mobility and accessibility, which contributes to socio-spatial segregation, the commercialization of spaces, and the commercial dynamization of urban soil (Maricato, 2015; Rolnik, 2015; Harvey, 2005; Lefebvre, 2001).

On the other hand, this study also aims to answer whether this troubled urban space has morphological distinctions. If so, the investigation aims to identify these distinctions and their causes. The hypothesis is that different urban policies, the permissiveness or restrictiveness of urban legislation (Gomes, 2019), and the culture of illegality mediate typical urban and dynamic forms of space appropriation in each country. Thus, the codes of urban space, pacts, and transgressions between Brazil and Paraguay would result in peculiar urban forms.

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## BACKGROUND

This investigation performs an analysis of land occupation, added to the teachings formulated at the School of Architecture of Versailles as a reaction to modernism and their rejection of history (Moudon, 2015), which we call Functional Approach (Bitencourt and Gomes, 2019). This approach treats the city as architecture, fragmenting it into analyzable elements (Oliveira, 2013). The term “functional” derives from the understanding that society has an organic model: a large functional clock, formed by a set of indispensable and specialized elements, with immediate spatial implications (Durkheim, 2004; Carpintero, 1998). Such studies are also related to the crisis of the stable radiocentric model, dominant until the middle of the 20th century. This model was dismantled due to economic decolonization and the recent acceleration of globalizing processes, with the emergence of the contemporary city and its elements (Panerai, 2006).

But what are these elements? If the city is a complex and open spatial system in which every element influences the others, as defined by Allain (2004), such elements are instruments of analysis (Panerai, 2006). They allow for the observation of cities and the recognition of their recurring logics, since the same types of phenomena can be found among them. Some elements that make up the functional approach are: the urban paths, the centralities, the block and the grid, and the ruptures.

Like the routes, defended by the morphological-type approach (Bitencourt and Gomes, 2019), *urban paths* organize the territory from an immemorial time, leading point by point, region by region, invariably constituting the first settlement marks in the landscape. Its clarity, orientation and topographical sensitivity significantly shape a community’s self-image and sense of place (Southworth and Owens, 1993), but not only. Over time, the implantation of large urban axes demonstrates the capacity to organize the city, giving rise to new centralities and articulating them.

Panerai (2006) indicates that the center is that place where inhabitants meet and where work, leisure, consumption and transport activities that structure daily life are mixed. For this reason, *centralities* are essential structural elements, as they provide a destination and a meeting point for the neighborhood. However, they also represent a contradictory process between the needs to agglomerate at one point and to move away from another due to common activities and interests, cooperation, and interdependence (Talen, 2018).

*The block and the grid* are some of the most important elements of urban planning and have been used throughout the history of the city to organize the territory. From Greece to Modern Thought, the block was a paradigm of order and harmony. Used after the Industrial Revolution by Cerdá at the Eixample of Barcelona, it allowed for an indefinite organization and extension of the city, while

being also an industrial process: easy access, wide and representative facades, and good hygiene and health conditions, as well as the image of the city as a business, the speculative logic, and an affirmation of the new ruling class, the bourgeoisie (Carvalho, 2003). The grid maximizes infrastructure costs, offers the shortest travel lengths and the largest number of lots and options of walkable routes. However, in many cases, the low variability and the lack of hierarchy may imply lower levels of legibility.

As a structural element of the city, the block and the urban grid are an important object of analysis mainly for incorporating major urban transformations and the maintenance of urban tissues. In the 20th century, while the dissolution of the block was discussed (Panerai et al., 2013), a concurrent pattern was found, the *superquadra* of Brasília—an abstract demarcation, with buildings released on free soil, preserved vegetation, all articulated by traffic roads and pedestrian paths, in a new and controversial space.

Later, in the third age of the city's history, Portzamparc (1997) would present the semi-open block, which had the same original structure, but with direct access to the internal portions. That solution sought to restore the public character of these areas, which constituted a sequence of complex spaces in the traditional city: workshops, gardens, patios, garages, equipment, and old cloisters, usually linked to the streets that surrounded it, always reacting to any tissue imbalance (Panerai et al., 2013). In all stages of urban transformation and analysis, what remains is the importance of the blocks as morphological components of the city, which can be reproduced at the whim of ideologies and thoughts of the occasion.

*Ruptures* are large technical infrastructures built over time, buried or incorporated into the built mass (Panerai, 2006), but which in other cases create separation effects, arise from the non-negotiated confrontation, and persist as fragments that shape the city. The importance of ruptures is due to their behavior as almost independent networks that intersect, establishing their own tissue, with morphological characteristics (Kropf, 2017) that are indispensable to analyze and understand. Thus, they are also useful elements for the morphological analysis and the understanding of the phenomenon. For this, fragments of the urban tissue were used as representative samples of the troubled city.

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## METHODOLOGY

The method used involved: i) review of consolidated studies on urban legislation, ii) analysis of the urban evolution and dynamics of the conurbation, and iii) exams of satellite imagery from Google Earth Pro, clipping between 1984 and 2020. Six morphological regions were analyzed: original border, current border, residential/PY, residential/BR, peripheral/PY, and peripheral/BR. Thus, it was possible to understand the conurbation as an urban totality, to test the hypothesis and to answer the research questions.

The scientific studies consolidated in research developed, on the urban plans of the two cities, by Torrecilha (2013) and Souza *et al.* (2020), were important elements of research and methodological support. In Ponta Porã, the Master Plan that defines zoning is Complementary Law 31 of October 10, 2006 (Ponta Porã, 2006), with revisions included by Complementary Law 084 of July 3, 2012 (Ponta Porã, 2012). In Pedro Juan Caballero, the Territorial and Environmental Plan (Pedro Juan Caballero, 2010) of November, 2010 defines zoning with parameters that regulate land use, but falls short of territorial urban planning as usually defined in a Master Plan.

## FINDINGS

On the macro scale, such examinations promote the analysis of the structure of the space, through the observation of the composition and organization of the blocks in the territory, identified in the images from Google Earth Pro. In the origin of Pedro Juan Caballero, a territorial organization plan is noted with lanes and green spaces, forming a mesh with “orthogonal, homogeneous and compact layout, organized by blocks mostly with dimensions 100 m by 100 m” (Torrecilha, 2014, p. 940). On the Brazilian side, one finds fragmented urban fabric, a “patchwork” in its overall structure.

However, in the current city and its conurbation, road systems and fragmented urban tissue are observed, disconnected and morphologically diversified. Two cities grow on different axes of this space: as shown in Fig. 2, Ponta Porã grows in a North-Southeast direction, along the international line and compressed by institutional areas (airport and military area), while the urban spot of Pedro Juan Caballero moves into Northeast-Southwest, towards the capital Asunción, consolidated after 2007 (Torrecilha, 2013; Souza *et al*, 2020).

As the main centralities move into the peripheral limits, the international border line does not function as a rupture, but as an aggregating element. In this place of intense urban and social dynamics, a unique centrality of socio-cultural diversities develops and consolidates. “The dynamics of the Brazil-Paraguay border clearly shows the cultural interweaving experienced by its inhabitants. The *chipa* vendor (typical Paraguayan food), the trilingual influences (Castilian, Guarani and Portuguese), the Paraguayan music (*polca* and *guarânia*), the *tereré* (chilled mate), the presence of street vendors and *casilleros* are seen everyday” (Torrecilha, 2014, p. 941 - translated by the authors).

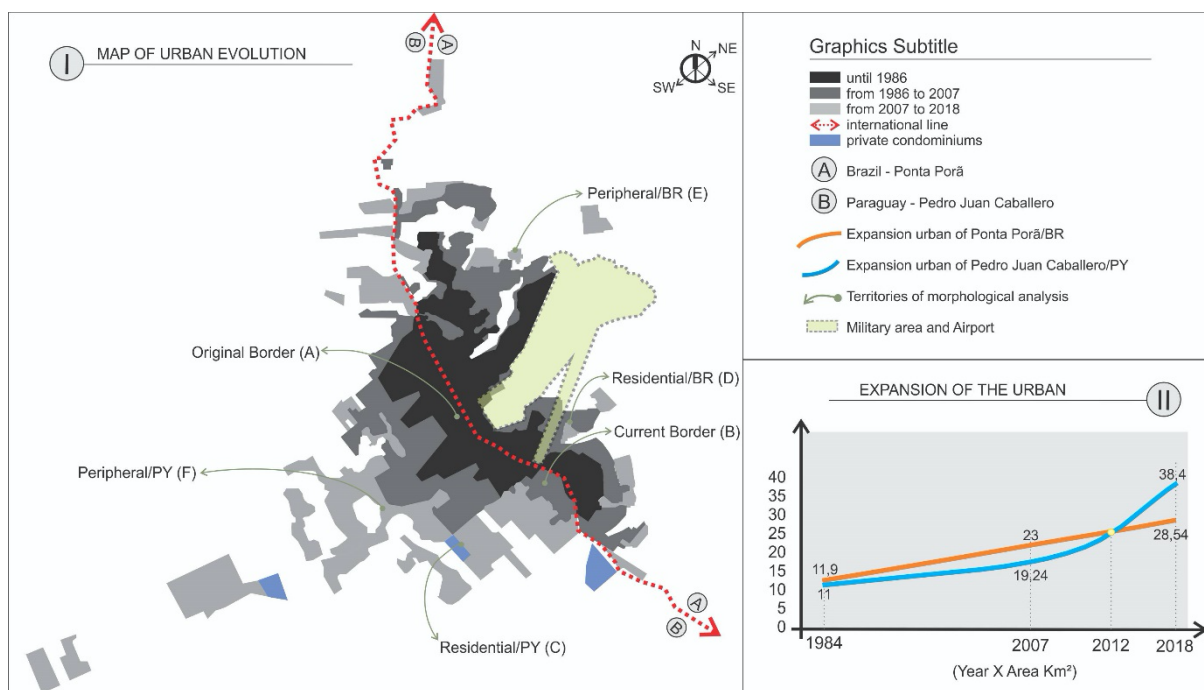
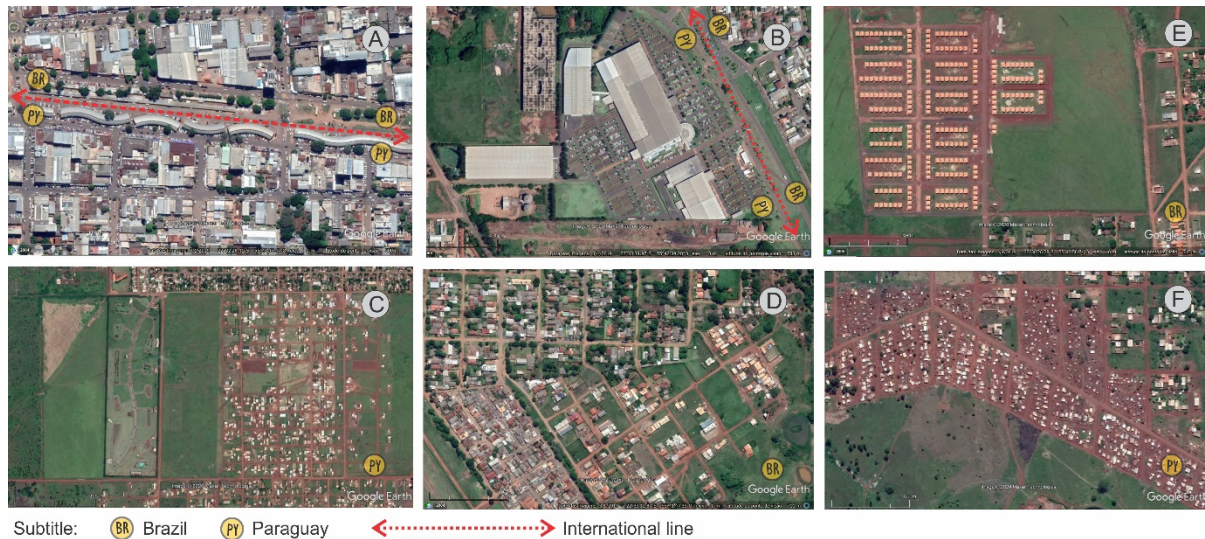


Figure 2. (I) Map of urban evolution (Souza *et al*, 2020, p. 154, adapted by the authors) and (II) Expansion of the urban area (Souza T. M. F., 2019, p. 65).

At the original border, the Paraguayan tissue is analyzed as an urban grid previously arranged in blocks (100x100m), occupied by warehouses, fairs, galleries, and boxes. In this original tissue, trade and urban dynamics were supported by roads, sidewalks, and the free spaces developed on

the border. This model is partially repeated on the Brazilian side, but in rectangular blocks with varying measures. In the current frontier, only on the Paraguayan side, there is a dispersed and fragmented tissue, with ruptures composed of large structures, shopping malls and parking lots.

On a reduced scale, the observation of the territory and its morphological transformations were pointed in the satellite images from Google Earth Pro. Six characteristic fragments of the territory were highlighted: original border (A), current border (B), residential/PY (C), residential/BR (D), peripheral/BR (E), and peripheral/PY (F), as shown in Fig. 3. These fragments make it possible to obtain results and draw conclusions from the hypothesis presented.



**Figure 3. Fragments for analysis: (A) original border, (B) current border, (C) residential/PY, (D) residential/BR, (E) peripheral/BR, and (F) peripheral/PY. Source: Google Earth Pro, organized by the authors.**

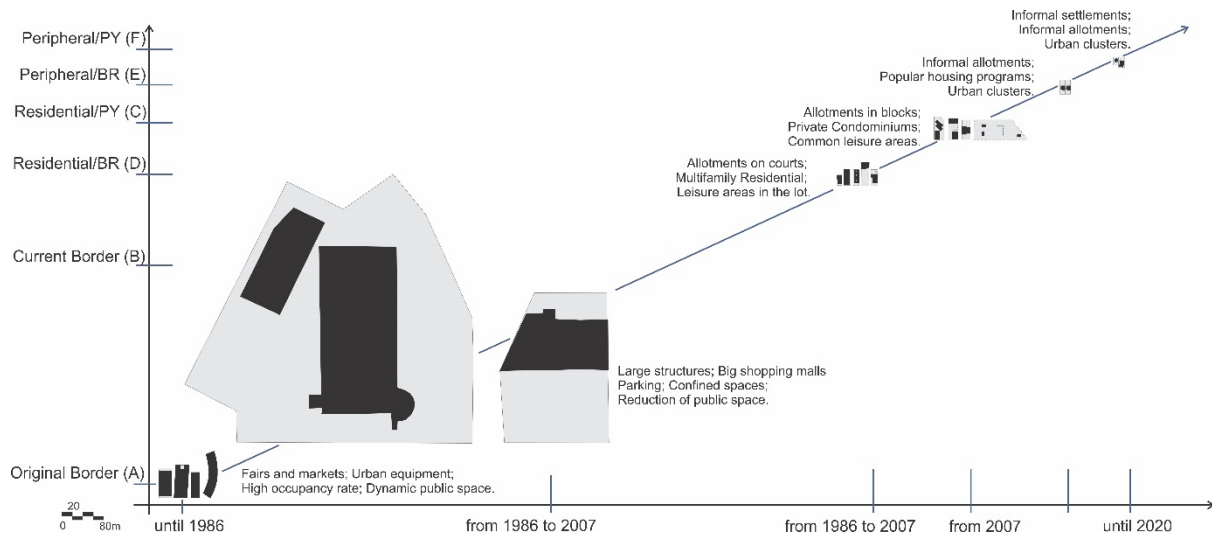
In the residential area, similarities are noted in the layout of the rectangular blocks, in the varied size of lots, in the scale of occupation, in the indoor leisure structures, such as the swimming pool and the multifamily residential use of a single lot. Differences are observed in urbanization patterns: on the Brazilian side (residential/BR), urbanization is more homogeneous, and on the Paraguayan side (residential/PY) there are lots without urban infrastructure or paving streets and sidewalks, mixed uses and greater contrast in the types of housing as well as high-end condominiums.

At the edges of the urban area, that is, the peripheral space, the Brazilian side also provides greater homogeneity and apparent control over urbanization processes, with the government's popular housing projects, the subdivisions in blocks and some informal settlements. On the Paraguayan side, there are different kinds of informal occupations, a greater number of subdivisions without urban infrastructure and fragmented and dispersed growth.

Its registered in Fig. 4 fragments, periods of implantation and the occupation of the plots, which shows the similarity between the peripheral and residential fragments, despite some discrepancies in occupation. In the border fragments, there are relevant differences in size, in the implantation, in the type of buildings and in the relationship with the road system.

Based on the periods of implantation, this study demonstrated how the urban policies and the tools to control urban soil and manage the territory have made socio-spatial discrepancies more intense in the conurbation fabric. Observing the scale occupations, it is exposed that the valorization and favoring of urban areas destined to the business sector were done to the detriment of housing

policies and walkable central commercial areas, that is, of a more comfortable human scale. On the other hand, non-accessible subdivisions are increasing, and informal settlements and low-income housing appear, in small lots, with an informal road system in the peripheral regions. Thus, the policies analyzed were not able to guide growth in the face of urban dilemmas confronted by the cities of the 21st century.



**Figure 4.** Analysis of the fragments according to the occupation of the plots and the periods of implantation. Prepared by the authors. Source: satellite images from Google Earth Pro.

## CONCLUSIONS

The urban growth of the conurbation reproduces the logic of capital. The city is seen as a business, both for the private parceling of urban land and for the implantation of equipment that does not dialogue with the city (Maricato, 2015; Rolnik, 2015; Harvey, 2005; Lefebvre, 2001). In this sense, the more permissive law on the Paraguayan side contributed to the increase in socio-spatial segregation, while the Ponta Porã Master Plan (2006) and Statute of Brazilian cities could have been tools that contributed to tackle disorderly growth (Souza *et al*, 2020).

Souza (2019) also reaches this conclusion by pointing out that the growth of the urban spot in Ponta Porã remains constant until 2012, when Pedro Juan Caballero starts to lead the urban growth, printed in the peripheral areas of the municipality. It is also important to highlight, as reported by Torrecilha (2014), that the regulatory documents of the Brazilian and Paraguayan urban territories lack shared management, given that this is a space for integration, and disregard the so-called social functions of common interest (Costa, 2013), especially infrastructure.

Thus, the study concludes that the morphological distinctions resulting from unstructured and disparate urban policies, mediated by the permissiveness or restrictiveness of urban legislation, by the culture of illegality, by pacts, and by transgressions, may have guided the constitution of peculiar urban forms of each side of the border line, despite the apparent integration of the twin cities.

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