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THE DECOLONIAL DEBATE TERRITORIES

PORTUGUÊS-ESPAÑOL I ENGLISH
REVISTA . JOURNAL
ISSN 2175-974X

UNIVERSITY OF SAO PAULO
INSTITUT OF ARCHITECTURE AND URBANISM
NOMADS.USP
WWW.NOMADS.USP.BR/VIRUS
DECEMBER 2023

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ARTICLE SUBMITTED ON AUGUST 6, 2023

How to quote this text: Costa, C. F. R., Nome, C. A. (2023). Towards a Latin-Based Urban Design. *V!RUS Journal*, 26, 144-161. http://vnomads.eastus.cloudapp.azure.com/ojs/index.php/virus/article/view/828.

Abstract

This paper discusses the opportunities of parametric urban design associated with well-known urban design metrics to develop a Latin-based urban design model. The research argues that contemporary parametric tools can pave the way for design solutions rooted in a decolonial perspective. We present two case studies in João Pessoa (Brazil). The first case study, in the Varadouro neighborhood, considers the limitations of heritage conservation, exploring the opportunities for new densities and uses towards improving urban vitality. The second case study, in the Bancários neighborhood, presents comparative scenarios that raise straightforward questions about the impact of floor space index considerations on density and urban infrastructure. A parametric model developed in Grasshopper for Rhinoceros 3D simulates the scenarios and evaluates the urban metrics in each sample. This process provides valuable information for city planners, evidence-based estimates of impact on existing infrastructure, and a basis to identify and explore solutions that shift traditional governance models to more contemporary and responsive ones. In the discussions, the article explores how implementing such simulations in the urban planning process would clarify to all actors involved the potential outcomes of unquestioningly accepting the demands of construction companies and real estate developers' lobbyists.

Keywords: Parametric urban design, Urban design metrics, Decolonial urban design Latin-based urban design model

1 Introduction

Urbanization has intensely influenced the socioeconomic dynamics of Latin America over the centuries. Rapid urban expansion, characterized by uncontrolled city growth, population migration from rural to urban areas, and resulting spatial reconfiguration of human settlements has been the subject of extensive research highlighting the urbanization multifaceted nature and its countless implications on society, infrastructure, socioeconomic disparities, and environmental sustainability (Davis, 2006; Greenfield, 1994; Hardoy, Mitlin, & Satterthwaite, 2001; Gilbert, 1998; Martine & McGranahan, 2010; Portes & Roberts, 2005).

Given Latin America's context, marked by a history of colonial rule and the enduring effects of colonialism on its cities, a decolonial perspective becomes an essential approach to many subjects and research fields (Escobar, 2007; Mignolo & Walsh, 2018; Quijano, 2000). In the current context, decolonization involves much more than nations gaining independence from colonial rule: it consists of reassessing and dismantling colonial views and ideologies that persist across multiple fields of knowledge, including urban design. The act of decolonizing urban design, for example, represents a substantial paradigm shift. It requires an understanding of North American and European dominance, recognizing the diversity and value of other ways of knowing and fostering inclusivity and equity in the decision-making process and resulting urban spaces, compelling us to reconsider urbanization as a spatial reconfiguration process and an expressive tool to dismantle prevailing colonial paradigms (Mignolo, 2007, 2011; Mignolo & Walsh, 2018).

A decolonial perspective recognizes that the urbanization process in Latin America surpasses an economic or demographic phenomenon but is also profoundly interwoven with the historical structures of coloniality. This perspective questions the models and practices that have been imposed and seeks to acknowledge and integrate the diverse local realities (Escobar, 2007, 2011). The North American city model, predominantly car-centric, promotes urban sprawl and unsustainable low-density suburban areas due to their high energy and land consumption (Newman & Kenworthy, 2015). This model creates social and economic segregation, as areas are often divided into residential, commercial, and industrial zones, limiting opportunities for social interaction (Putnam, 2000). The European model, characterized by high-density urban cores and strict land-use regulations, can lead to affordability issues and displacement of local communities (Marcuse, 1985). Often, these models need more flexibility to accommodate informal economies and diverse housing needs prevalent in many previously colonized societies (Roy, 2005). Moreover, these models' architectural and spatial aesthetics may not resonate with local cultural values, resulting in places that feel strange to their inhabitants (Lefebvre, 1991).

This study questions the market-driven forces that shape cities for real estate capital and not for citizens, in addition to establishing a critique of the misapplications of urban laws. We argue for a reformulation of legal frameworks so that they are more adaptable and attuned to the specificities and cultural needs of the local population. Such a change would resist the commodification of Latin

American cities, ensuring urban planning serves as an agent of community empowerment and authentic representation rather than a mere facilitator of market interests or a perpetrator of outdated legal constraints (Grosfoguel, 2011; Ndlovu-Gatsheni, 2013).

Decolonial approaches gain particular importance in contemporary Brazil as the country contends with severe urban challenges, including rapid urbanization, housing deficits, and socio-spatial segregation (Rolnik, 2015). Hence, integrating such lenses is critical for offering alternative approaches to the urbanization process while recognizing the deeply entrenched structures of coloniality that persist in modern urban environments. The questions guiding this investigation are: (1) How can we sidestep urban spatial quality discussions predominantly structured around North American and European city models? (2) How can Computer-Aided Architectural Design (CAAD) assist in adapting these discussions to the specificities of the Latin American context?

We argue that parametric tools can provide a crucial foundation for design solutions rooted in a decolonial perspective. These tools applied in urban design present an opportunity to reimagine our cities, analyze complex data sets, visualize urban spaces, and generate novel designs (Batty, 2013; Schumacher, 2009). Computer-Aided Architectural Design (CAAD) and its contemporary advances can be further enhanced by drawing upon the insights from studying urbanization in Latin America. By leveraging the critical perspectives provided by the literature, CAAD can be contextualized within the social, political, and economic dynamics associated with urbanization in the region, developing a Latin-based urban design model.

This study simulates scenarios in two João Pessoa's neighborhoods. We seek to establish a decolonial framework resonating with the local realities of the urban landscape by applying consolidated urban performance metrics to the specific research context, adapting parameters to match Brazilian reality. The research explores the potential of parametric urban design to evaluate existing urban models and to adapt and reinterpret metrics, supporting the incorporation of new perspectives and facilitating the design of urban environments that are reflective and responsive to the people they serve. Our analysis, grounded in local challenges and historical context, offers insights relevant to other Latin American cities with colonial pasts. We aspire to foster culturally contextualized urban design by actively engaging with the decolonial discourse through critical thought and dialogue about the role and potential of CAAD in such urban design solutions.

2 Materials and Methods

The study combines quantitative and qualitative approaches following Creswell's (2013) mixed-methods strategy. The discussions and procedures adopted on the Varadouro sample informed and shaped the subsequent study of the Bancários sample. The research provides a numerical representation of specific parameters (urban diversity, urban built density, population density) using key performance indicators and indexes. We then combine quantitative and qualitative data, producing a 3D model that provides the basis for discussing experiences and perceptions within the urban environment. By integrating these data types, the research maximizes the strengths of both approaches, and the outcome is a more comprehensive exploration of the urban space, offering insights and strengthening the validity of the findings.

Data is collected using GIS maps provided by the local municipality, enhanced with additional geometrical refinement using *GoogleMaps* and the *StreetView* tool. In-field surveys are also conducted to determine the total number of building floors and their usage. Subsequently, this data is structured within the R*hinoceros3D* software with the support of the *Grasshopper* plugin. This step was followed by the parametric evaluation to process the data and build a computational 3D model that helps visualize results for each sample. Lima, Costa, and Rosa (2020) described the methodological procedures adopted, having been improved in Costa, Nome, and Queiroz (2023).

We choose Parametric Urban Design as our primary technique, applying algorithmic thinking and computation to evaluate and design urban spaces. Parametric Urban Design allows for high adaptability and complexity in creating and understanding urban environments, which proves valuable in exploring urban configurations (Batty, 2013; Burry, 2011; Kolarevic, 2003; Menges & Ahlquist, 2011; Oxman & Oxman, 2014; Picon, 2010; Schumacher, 2009). By emphasizing continuous modification and adaptation, this technique aligns with the goals of decolonial urban design, promoting flexibility and context sensitivity.

The study applied three key indexes: (a) IUMTe index developed by Silva (2021) and refined by Costa et al. (2023); (b) *Mixed-use Index* (MXI) developed by Hoek (2008); and (c) *SpaceMatrix* indicators developed by Berghauser Pont & Haupt (2010), which includes the *Ground Space Index* (GSI), *Floor Space Index* (FSI), and *Open Space Ratio* (OSR) (Berghauser Pont & Haupt, 2010).

The IUMTe index establishes a mathematical relationship between residential and non-residential built areas in a sample. It aims to assess the diversity of uses and the impact of each street to understand the neighborhood's overall livability and walkability. Considering only the street level, the IUMTe index provides insights into the mix of use along the streets, a crucial aspect of urban design since the ground floor is often the most accessible and visible part of a building, contributing significantly to the character and functionality of a street and the surrounding area.

The MXI index establishes the relationship between the total residential and non-residential built areas within a sample considering the entire built area, including all floors above the ground level. It aims to verify the balance of different land uses in the area, considering the total floor number. Hoek (2008) states that when the ratio between the entire residential and non-residential areas approaches the balance, the urban diversity is close to the ideal, which means a higher diversity of uses in the area is desirable because it indicates a well-integrated and dynamic urban environment.

The *SpaceMatrix* density indicators support understanding the urban space's physical form and configuration and present a thorough picture of urban density, form, and land use, enabling an in-depth analysis of urban livability, sustainability, and the potential for densification. The indicators are the *Ground Space Index* (GSI), *Floor Space Index* (FSI), and the *Open Space Ratio* (OSR) (Berghauser Pont & Haupt, 2010). The GSI measures urban density at the ground level. It is calculated by establishing a ratio between the built and total areas. The FSI measures the total gross floor area relative to the total land area, providing an overview of the floor space used in an urban area and giving insights into the potential capacity for further development. Lastly, the OSR quantifies the proportion of open spaces relative to the total area, highlighting the availability and distribution of open space.

Figure 1 summarizes the methodological procedures, and Figure 2 shows the evaluation process on one of the samples.

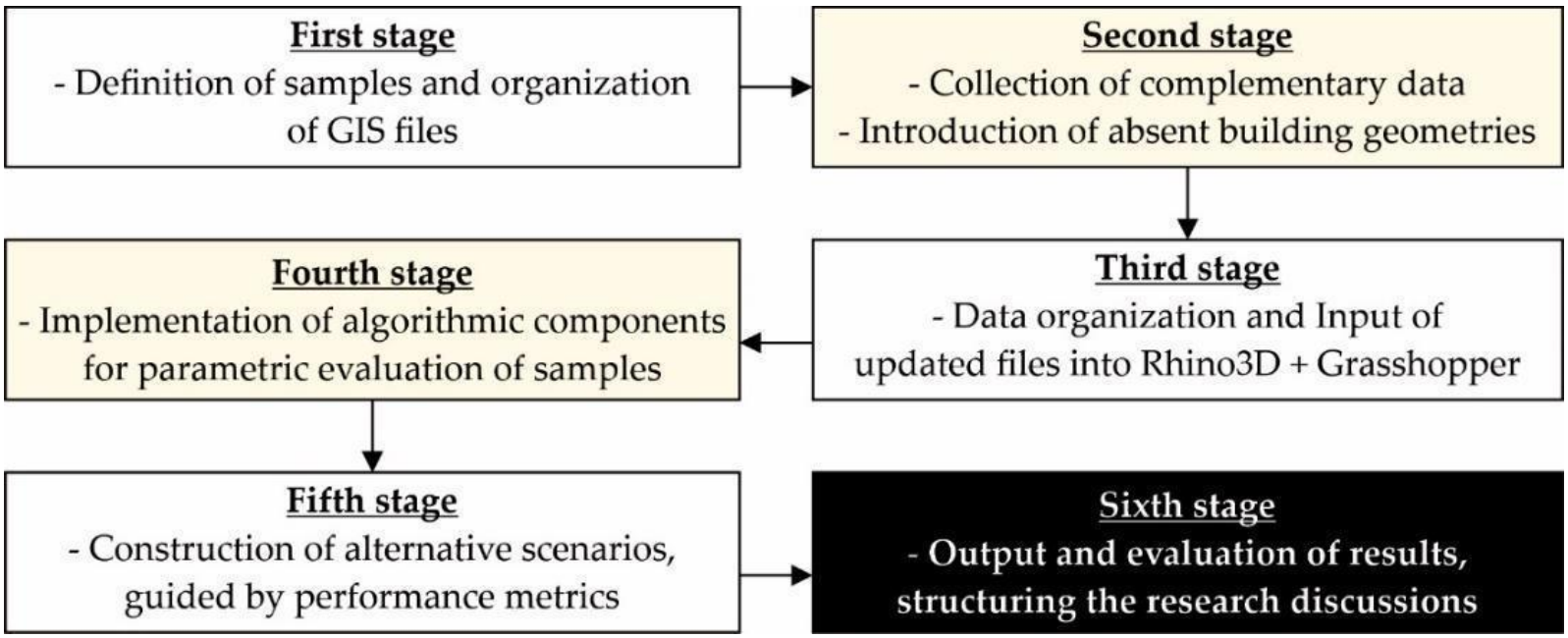

Fig.1: Methodological procedures organized by stage. The authors, 2023.

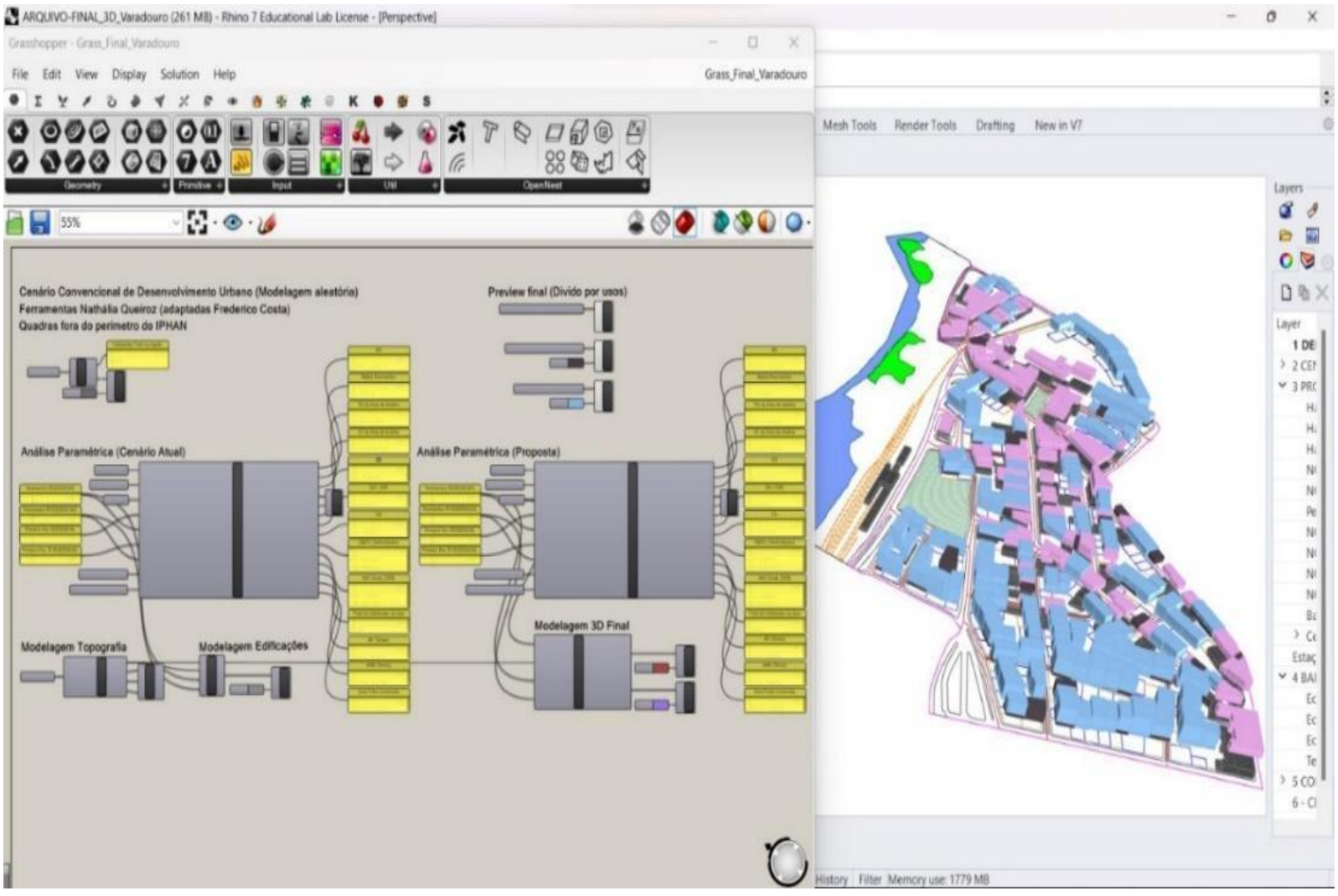

Fig.2: Parametric evaluation (Rhino + Grass) in progress on one of the samples. The authors, 2023.

3 Decolonial urban design and the role of computational approaches: A Short review

Urbanization in Latin America has intensely influenced the socioeconomic dynamics of the region. Davis (2006) critically examines the growth of informal settlements and slums, highlighting urban populations' socioeconomic challenges and delving into the root causes and consequences of slum proliferation. The author emphasizes the interconnectedness of urbanization, poverty, and inequality, shedding light on the complex dynamics shaping these marginalized environments. Hardoy, Mitlin, and Satterthwaite (2001) explores the environmental challenges of rapid urbanization in Latin America, emphasizing the urgent need for integrating environmental considerations into urban design processes. Their study addresses urban growth's harmful impacts on natural resources, ecosystems, and climate change, underscoring the importance of sustainable urban development strategies.

Gilbert (1998) focuses on the historical, social, political, and economic factors that have shaped urban development across Latin America, examining critical trends and patterns in the region's urbanization. The author clarifies the complex dynamics of city growth, marked by migration from rural to urban areas, the emergence of informal settlements, and urban governance and planning challenges. Martine and McGranahan (2010) also focus on historical perspectives on urbanization in Latin American cities, providing insights into these cities' unique trajectories and urban dynamics examining migration patterns, economic development, and urban governance. Both works highlight the connections between urbanization and poverty, inequality, environmental sustainability, and social justice.

Portes and Roberts (2006) investigate neoliberal economic policies' role in shaping Latin American cities' urbanization patterns. By delving into the political and economic dynamics of the neoliberal era, the authors expose the relationships between market-oriented reforms, urban governance, and the spatial and social transformations that occurred in cities across the region. Rolnik (2015) delves into the specific urban policies and practices that have emerged in Brazil's urban context, exploring the dynamics between global finance and housing policies to illustrate how the colonization of land and housing has profoundly influenced urban landscapes. The author investigates the transformation of housing access, emphasizing how financial and speculative interests have taken precedence over the fundamental housing requirements of lower-income communities.

Shifting the urban focus towards inhabitants requires understanding urban design's social dimensions. Panerai, Castex, and Depaule (2004) highlight the importance of more flexible, user-centered design approaches. Gehl (2010) emphasizes human-scale urban design, supporting urban environments, prioritizing pedestrians and community interaction, and creating functional, engaging, and enjoyable spaces for those who inhabit and use them. Engaging and challenging the dominant urbanization models opens the door to more sustainable and socially equitable urban environments. The decolonial thought, anchored in the understanding that modernity and coloniality form an indivisible theoretical pair, critically examines and exposes the enduring structures of domination by the North American and European countries. Even following the colonial period's conclusion, these domination structures continue to impact former colonies today (Escobar, 2007; Mignolo, 2007; Quijano, 2000).

Escobar (2007) questions the hegemony of these countries' notion of modernity in its various formulations, placing the decolonial discussion from different disciplinary fields at local, regional, national, and global scales. The author critically assesses the planetary diffusion and imposition of the North American and European conception of knowledge and its many derivatives and applications. The cultural imposition creates a biased idea of knowledge and its production, dissemination, circulation, and legitimation modes. This process discredits other forms of knowledge and critical voices, thus perpetuating the imperial and colonial ideas that govern the modern and colonial world system, as characterized by Quijano (2000) and Wallerstein (2004). These critiques represent essential shifts in understanding and addressing the persistence of colonial frameworks and their implications in our realities.

Rogers (1997) has long emphasized the role of compact cities in fostering sustainability, pointing to the efficiency and potential of dense urban spaces to promote more integrated, resource-efficient landscapes. Higher urban density can lead to more efficient use of resources, reduction in transportation emissions, and more significant social interaction (Newman & Kenworthy, 2015). This spatial configuration can drive economic growth, enhance public transportation, and create more liveable spaces (Glaeser & Kahn, 2018). Berghauser Pont and Haupt (2010) have explored the correlations between urban density, land use, and spatial form, supporting that thoughtful density strategies can significantly contribute to sustainable urban development. In compact cities, overlapping uses offer

suitable urban infrastructure, which is essential to achieving sustainable urban areas (Calthorpe, 2010; Jacobs, 1961). Jacobs (1961) pioneered the idea of mixed-use neighborhoods and human-scale design to foster a vibrant and sustainable neighborhood, providing a range of amenities and services for the residents while accommodating commercial, retail, and public spaces to cater to the population's needs (Calthorpe, 2010; Chakrabarti, 2013; Hoek, 2008).

Schumacher (2009) articulates parametricism as a global style, enabling designers to create more expressive and nuanced solutions. This approach synergizes well with Kolarevic's (2003) insights into integrating design and manufacturing, revolutionizing traditional construction processes. Burry (2011) emphasizes the critical role of scripting and programming in architectural design, aligning with Menges and Ahlquist's (2011) exploration of computational design thinking as a gateway to innovative methods and techniques. Oxman and Oxman (2014) provide a theoretical foundation by examining the profound impact of digital technology on architectural thought and practice, while Picon (2010) underscores the cultural transformation embedded within this digital shift.

4 Case Studies

The Varadouro neighborhood (Figure 3) was taken as a sample because it contains part of the historic center of João Pessoa. This region was essential in the consolidation of the city in the last century, concentrating businesses and residences, having lost prestige thanks to the advance of urbanization towards the city's waterfront. The historic center's emptying and loss of prestige, with several abandoned or underutilized historical buildings, can be justified by a lack of urban proposals with coherent spatial readjustment given its urban fabric, characteristic of the period of Portuguese colonization.

Fig.3: Part of the Varadouro Neighborhood. Reprinted from "Iphaep suspende embargo a obras no Porto do Capim após recomendação de João Azevêdo" by Jornal da Paraíba (2023). Source Rizemberg Felipe, 2019.

The Bancários neighborhood (Figure 04) was chosen because it is essential for the urban structure of João Pessoa, with a central role in the southern part of the city. The neighborhood is experiencing rapid growth and increased pressure for more density, increasing the impact on its existing infrastructure. Thus, it is perceptible that the neighborhood was not structured to meet its current commercial demand, and the expansion process lacks coherent urban planning.

Fig.4: Part of the Bancários Neighborhood. Reprinted from "Prefeitura de João Pessoa lança projeto do Parque das Três Ruas nos Bancários" by Portal Correio (2023). Source: Sérgio Lucena/Secom-JP/Divulgação, 2022.

4.1 Case Study 1: The Varadouro neighborhood results

Varadouro is a neighborhood where the current legal framework prohibits major interventions due to several heritage laws. We explored the challenges in Varadouro and how legal constraints define urban forms and density patterns. The study's question was: What is needed to achieve better density and diversity in the neighborhood?

We evaluated the neighborhood configuration and then created a predictive scenario of how urbanization would advance, with a region immobilized by heritage laws and part of the neighborhood surrendering to a mix of North American and European city models. Scenario 01 (Figure 5, Scenario 01) has good results if we unthinkingly evaluate only the metrics, disregarding the spatial quality: the average of the performance metrics used was attractive, but this was not reflected in the spatial quality, as a more aggressive urbanization model influenced the numbers in part of the neighborhood. Finally, we designed a proposal to balance the indicators and achieve better spatial quality (Figure 5, Scenario 02). Table 1 shows the objective results found in each scenario.

Varadouro Neighborhood					Varadouro - Scenario 01					Varadouro - Scenario 02				
Urban Diversity		**Built Density**			**Urban Diversity**		**Built Density**			**Urban Diversity**		**Built Density**		
IUMTe	MXI	GSI	FSI	OSR	IUMTe	MXI	GSI	FSI	OSR	IUMTe	MXI	GSI	FSI	OSR
0.12	0.09	0.45	0.70	0.63	0.50	0.70	0.56	2.89	0.2	0.72	0.45	0.38	1.35	0.28
Populational Density					**Populational Density**					**Populational Density**				
Gross	Net	Inhabitants in the area			Gross	Net	Inhabitants in the area			Gross	Net	Inhabitants in the area		
21.21	24.24	752			437.55	500	15,510			407.68	585.92	14,451		

Tabela 1: Varadouro neighborhood results. Source: The authors, 2023.

Fig.5: 3D models of the Varadouro neighborhood. The first model presents the neighborhood in its current state. Scenario 01 simulates the advance of the traditional urban growth model, highlighting the difference between the historic zone (Pink buildings) and the royal state neo-liberal city model (Grey buildings). Scenario 02 is an alternative design solution proposed by the authors, emphasizing metrics and performance in the entire sample. Scenario 02 achieves better results by mixing historic and new buildings (yellow and purple). Source: The authors, 2023.

When evaluating the results, it is possible to notice that the neighborhood has 45% of the land occupied (GSI 0.45), with a low verticalization (FSI 0.70) and a high degree of open spaces in the region (OSR 0.63). Regarding the diversity of uses, only 9% of the total area of the Varadouro neighborhood is used as housing (MXI 0.09), representing 12% of all ground floors in the sample (IUMTe 0.12). Consequently, the neighborhood has only 752 inhabitants.

Scenario 01 shows that occupied ground space was improved (GSI 0.56) since it is a conventional urban growth scenario based on a high verticalization model (FSI 0.2.89). Regarding diversity, the numbers indicate a significant change in uses, with 70% of the total constructed area being now residential (MXI 0.70), representing half of all ground floors in the sample (IUMTe 0.50). As part of the neighborhood was excessively verticalized in this scenario, it is possible to notice an impact on the open spaces (OSR 0.2). We reach a total of 15510 inhabitants in the region. This result may seem optimistic, but the restricted number of verticalized blocks puts excessive pressure on the urban infrastructure, which can be problematic if the region does not support it.

Seeking to maintain the advances in metrics and improve spatial quality uniformly, Scenario 2 sought to moderately increase land use compared to the current state, raising it to 38% (GSI 0.38). The index of open spaces indicates a smaller number of voids, representing uniformity in density, even with a drop in FSI (FSI 1.35). The values for the diversity indexes were again adjusted (IUMTe 0.72 / MXI 0.45), representing an area with 45% of the total residential built area, representing 72% of the uses at street level. We reached 14,451 inhabitants distributed in the neighborhood, generating potential for social interaction in the sample and securing a relevant number of people to encourage local commerce.

4.2 Case Study 2: The Bancários neighborhood results

The Bancários neighborhood deals with a different context: a latent urban expansion movement, with intense pressure from the market for a more permissive set of laws aiming at forced densification. When evaluating this sample, the research found a need to recalibrate the adopted mixed-use indexes, given the building typologies often found in the region, with the ground floor often used as a garage. To sustain the discussion of decolonizing performance metrics, we developed the IUMTec and MXIc: adapted versions of the urban mixed-use indexes, which do not consider uninhabited floors in residential buildings (leisure areas or garages, for example). The study's question is: What would happen if we materialized the maximum constructive potential currently allowed?

We evaluated the neighborhood and then created a predictive scenario for its spontaneous growth (Figure 6, Scenario 01). Thus, we modeled the neighborhood at its current maximum potential (Figure 6, Scenario 02), and finally, we modeled the modification proposal imposed by the real estate market (Figure 6, Scenario 03).

Bancários Neighborhood

Urban Diversity				Built Density			Populational Density		
IUMTe	IUMTec	MXI	MXIc	GSI	FSI	OSR	Gross	Net	Inhabitants
0.83	0.69	0.90	0.81	0.24	0.47	1.30	124.12	224.86	27,180

Bancários Neighborhood - Scenario 01: predicted growth

Urban Diversity				Built Density			Populational Density		
IUMTe	IUMTec	MXI	MXIc	GSI	FSI	OSR	Gross	Net	Inhabitants
0.82	0.53	0.89	0.75	0.31	0.74	0.74	181.47	328.75	39,738

Bancários Neighborhood - Scenario 02: current max. densification potential

Urban Diversity				Built Density			Populational Density		
IUMTe	IUMTec	MXI	MXIc	GSI	FSI	OSR	Gross	Net	Inhabitants
0.85	0.16	0.92	0.72	0.36	1.28	0.38	327.43	593.16	71,700

Bancários Neighborhood - Scenario 03: market proposal for a new max. densification potential

Urban Diversity				Built Density			Populational Density		
IUMTe	IUMTec	MXI	MXIc	GSI	FSI	OSR	Gross	Net	Inhabitants
0.85	0.16	0.94	0.86	0.36	3.12	0.16	1,042.77	1,889.04	228,342

Tabela 2: Bancários neighborhood results. Source: The authors, 2023.

Fig.6: 3D models of the Bancários neighborhood. Scenario 01: Predictive urban growth; Scenario 02: Maximum verticalization currently allowed; Scenario 03: Simulating the impacts of the maximum verticalization proposed by the royal estate and building companies. Source: The authors, 2023.

The neighborhood has 24% of the land occupied (GSI 0.24), with a low verticalization (FSI 0.47) and a high degree of open spaces (OSR 1.30). 90% of the total area of the Varadouro neighborhood is used as housing (MXI 0.90), representing 83% of all ground floors in the sample (IUMTe 0.83). Applying the adapted indices, which exclude uninhabited residential areas, the numbers change: only 72% of the total area of the neighborhood is used as housing (MXIc 0.90), occupying 16% of all ground floors in the sample (IUMTe 0.16). The neighborhood has 27,180 inhabitants.

Scenario 1 reveals that 31% of the land is occupied (GSI 0.31), with the emergence of some buildings with more than four floors (FSI 0.74), generating a drop in the index of open spaces (OSR 0.74). In this scenario, the neighborhood would remain predominantly residential, with 89% of the total area used as housing (MXI 0.89), representing 82% of all ground floors in the sample (IUMTe 0.82). With the adapted indexes, only 75% of the neighborhood's total area seems to be used as housing (MXIc 0.75), occupying 53% of all ground floors in the sample (IUMTec 0.53). In this scenario, the neighborhood would have 39,738 inhabitants.

Exploring the current maximum densification potential, Scenario 2 increased land use to 36% (GSI 0.36). The index of open spaces is significantly impacted in this scenario (OSR 0.38) due to filling all available plots with four-story buildings (FSI 1.28). Regarding diversity, the neighborhood would remain predominantly residential (MXI 0.92), significantly increasing the number of residences on the street level (IUMTe 0.85). The adapted indexes show a substantial drop in numbers, revealing that 72% of the neighborhood would be residential areas, with only 16% of the areas at street level. This result means that most residential buildings give up the ground floor to build garages, which means a considerable loss of urban vitality given the concept of active facades. In this maximum potential scenario, the neighborhood would have 71,700 inhabitants.

Finally, the study evaluated the proposal that the real estate market and some financial agents intend to approve for the sample. Scenario 3 has the same land occupation ratio as Scenario 2 (GSI 0.36). Thanks to an exaggerated verticalization, there is a high impact on the Open Spaces Index (OSR 0.16) and a substantial increase in the FSI (3.12). Diversity is also strongly impacted in this scenario, with the total use of residential areas equal to 94% (MXI 0.94), representing 85% of the built-up areas at street level (IUMTe 0.85). With the adapted indexes, it is possible to notice that only 86% of the areas are inhabited (MXIc 0.86), representing 16% of the occupied areas at street level (IUMTec 0.16), equal to Scenario 2. In this scenario, the neighborhood will accommodate a total of 228,342 inhabitants. That is nearly a sixfold increase in the total number of people currently living in the area, putting pressure on the same infrastructure. Scenario 3 has disturbing results regarding urban spatial quality, and the adaptation of the indicators adopted by this research allowed this data discrepancy to be visualized.

5 Conclusions

The research evaluated two samples in Brazil, promoting discussions about the urbanization model adopted in João Pessoa as examples of recurrent scenarios in Brazilian cities. The Parametric Urban Design technique proved a powerful tool in urban design approaches, allowing a more contextual understanding of local conditions, thereby challenging conventional planning paradigms in a decolonial framework. In this sense, it is possible to discuss the impact of these changes by testing outcomes of typical legislation that construction companies and real estate developers lobbied using well-known urban design metrics. In the case of Bancários, the new FSI of 3.12, proposed by real estate developers, instead of the existing FSI of 1.28, would lead to a potential 840% population increase in the neighborhood. Without a clear understanding of the impact on infrastructure, mixed-use demands in terms of employment generation, and impact on mobility, giving in to such pressures is a recipe for disaster. Results are well known in cities such as São Paulo, Buenos Aires, and Santiago, as well as throughout Latin America.

Metrics such as the IUMTe and IUMTec account for distortions in the traditional mix-use metrics, considering building typologies where the ground floor is used as garage space, a standard solution in Brazil. The impact of such typologies in reducing street livelihood is an essential factor in urban design that needs to be considered in other urban design models. Since adjusting computational tools is a designer's task, adapting or creating metrics sensitive to Latin issues became accessible, enabling an inclusive and democratic planning process to empower local communities in shaping their surroundings. For us, this shift towards more human-centered and context-sensitive urban design aligned with decolonial thinking and promoting spatial justice, cultural recognition, and social equity.

We demonstrated the importance of structured approaches in representing simulated urban scenarios through parametric modeling. The Varadouro example questions the maintenance of the heritage-based limitations that result in an abandoned city center. The abandonment of such areas results from generational disinterest, given the lack of opportunities. Affective memories within cities are constructed in places that offer civic and social growth opportunities. Thus, increasing density and mix use could change the current preservation approach from a top-down, law-driven model to a bottom-up, citizen-led model. Although the results generated significant data and information related to urban spatialization in both samples, we identified a limitation in how this information is consumed in the real world. The absence of tools that convert data extracted through parametric evaluation into helpful information presented in a simple, well-structured, and easy-to-understand manner represents an obstacle to improving the discussions. This resource must be provided to support policymakers and designers in making informed and coherent decisions highlighted as a gap.

As a further study, this model can support a detachment from traditional top-down planning methodologies that often prioritize market and economic goals over human well-being and cultural identity, reinterpreting urban performance metrics and indicating how they can be adapted to develop Latin-based urban design. Understanding the existing and unrealized construction potentials creates an even playing field between city planners and traditional lobbyists for indiscriminate speculative demands. Developing an urban design model that shares its multifaceted outcomes with all actors involved in the city planning process can balance the power of decision and offset public and private investment in urban infrastructure. This model must simplify the visualization of the constructive potential differential, allowing a clearer understanding of any absence or excess of potential, leading to more effective and informed city planning decisions. Therefore, this work's contribution lies in suggesting a more efficient method of presenting objective information, aiming at facilitating its consumption and practical application. This conclusion paves the way for future investigations on methods and tools that can improve the representation and understanding of data in similar contexts.

Acknowledgements

This research was funded by Coordination for the Improvement of Higher Education Personnel — Brazil (CAPES) — Financing Code 001. This research is part of the “Future of the City Centre Network” (https://www.futurecitycentre.com/).

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