

The Impact of New Urban Planning Guidelines on Urban Verticalization in São José do Rio Preto/SP: An Analysis of Changes in the Master Plan and zoning

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O Impacto das novas diretrizes urbanísticas na verticalização urbana de São José do Rio Preto/SP: Uma análise das mudanças no Plano Diretor e zoneamento

RESUMO

Objetivo - Este estudo avalia o impacto das recentes mudanças no Plano Diretor e nas leis de zoneamento de São José do Rio Preto, uma cidade de porte médio paulista, no processo de verticalização urbana, com ênfase nas implicações socioeconômicas e ambientais.

Metodologia - Com uma metodologia de análise espacial, baseada em simulações do Índice de Aproveitamento (IA) e da Taxa de Ocupação (TO), o estudo explora o aumento do potencial construtivo e a transformação do uso do solo em zonas estratégicas da cidade.

Originalidade/relevância - Inserido em uma lacuna teórica sobre desregulamentação urbana em cidades médias, este trabalho contribui para o debate acadêmico sobre os desafios e oportunidades da verticalização.

Resultados - Os resultados indicam que as mudanças favoreceram a concentração de empreendimentos em áreas valorizadas, intensificando a segregação socioespacial e limitando o acesso à moradia de baixa renda nas regiões periféricas.

Contribuições teóricas/metodológicas - Teoricamente, o estudo sugere uma revisão da suposição de que construções mais altas são uma solução eficiente para aumentar a densidade, propondo alternativas que maximizem o uso do solo, sem sobrecarregar a infraestrutura urbana.

Contribuições sociais e ambientais - Os achados reforçam a urgência de políticas inclusivas que atenuem os efeitos da gentrificação e promovam um desenvolvimento urbano equilibrado, destacando a importância de práticas sustentáveis para reduzir a pressão sobre os recursos naturais e as emissões de carbono, de modo a assegurar um crescimento urbano sustentável e inclusivo.

PALAVRAS-CHAVE: Verticalização urbana. Planejamento urbano. Potencial Construtivo.

The Impact of New Urban Planning Guidelines on Urban Verticalization in São José do Rio Preto/SP: An Analysis of Changes in the Master Plan and zoning

ABSTRACT

Objective – This study evaluates the impact of recent changes in the Master Plan and zoning laws of São José do Rio Preto, a medium-sized city in the state of São Paulo, on the process of urban verticalization, with an emphasis on socioeconomic and environmental implications.

Methodology – This study evaluates the impact of recent changes in the Master Plan and zoning laws of São José do Rio Preto, a medium-sized city in the state of São Paulo, on the process of urban verticalization, with an emphasis on socioeconomic and environmental implications. Using a spatial analysis methodology based on simulations of the Floor Area Ratio (FAR) and the Land Occupation Rate (LOR), the study explores the increase in construction potential and the transformation of land use in strategic zones of the city.

Originality/Relevance – Positioned within a theoretical gap on urban deregulation in medium-sized cities, this work contributes to the academic debate on the challenges and opportunities of verticalization.

Results – The results indicate that these changes have favored the concentration of developments in high-value areas, intensifying socio-spatial segregation and limiting access to affordable housing in peripheral regions.

Theoretical/Methodological Contributions – Theoretically, the study suggests a revision of the assumption that taller buildings are an efficient solution for increasing density, proposing alternatives that maximize land use without overburdening urban infrastructure.

Social and Environmental Contributions The findings reinforce the urgency of inclusive policies that mitigate the effects of gentrification and promote balanced urban development. Additionally, the study highlights the importance of sustainable practices to reduce pressure on natural resources and carbon emissions, ensuring sustainable and inclusive urban growth.

KEYWORDS: Urban verticalization. Urban planning. Construction potential.

El Impacto de las Nuevas Directrices Urbanísticas en la Verticalización Urbana de São José do Rio Preto/SP: Un Análisis de los Cambios en el Plan Director y el zonificación

RESUMEN

Objetivo – Este estudio evalúa el impacto de los recientes cambios en el Plan Director y las leyes de zonificación de São José do Rio Preto, una ciudad de tamaño mediano en el estado de São Paulo, en el proceso de verticalización urbana, con énfasis en las implicaciones socioeconómicas y ambientales.

Metodología – Utilizando una metodología de análisis espacial basada en simulaciones del Índice de Aprovechamiento (IA) y la Tasa de Ocupación (TO), el estudio explora el aumento del potencial constructivo y la transformación del uso del suelo en zonas estratégicas de la ciudad.

Originalidad/Relevancia – Insertado en una laguna teórica sobre la desregulación urbana en ciudades medianas, este trabajo contribuye al debate académico sobre los desafíos y oportunidades de la verticalización.

Resultados – Los resultados indican que los cambios han favorecido la concentración de desarrollos en áreas valorizadas, intensificando la segregación socioespacial y limitando el acceso a la vivienda asequible en las regiones periféricas.

Contribuciones Teóricas/Metodológicas – El estudio sugiere una revisión del supuesto de que las construcciones más altas son una solución eficiente para aumentar la densidad, proponiendo alternativas que maximicen el uso del suelo sin sobrecargar la infraestructura urbana. Socialmente, los hallazgos refuerzan la urgencia de políticas inclusivas que atenúen los efectos de la gentrificación y promuevan un desarrollo urbano equilibrado.

Contribuciones Sociales y Ambientales – Además, se destaca la importancia de prácticas sostenibles para reducir la presión sobre los recursos naturales y las emisiones de carbono, garantizando un crecimiento urbano sostenible e inclusivo.

PALABRAS CLAVE: Verticalización urbana. Planificación urbana. Potencial constructivo.

1 INTRODUÇÃO

Urbanization is growing worldwide as cities attract rapidly expanding populations and migrants from rural areas in search of opportunities. Cities are appealing because they promise community life, a diversity of activities, social services, entertainment, and, above all, employment opportunities factors that make it rare for people to return to the countryside once they have adapted to urban life.

However, this mass migration to cities generates an urgent and significant demand for housing, which is closely linked to the location and availability of “urban(ized)” land, often at alarming levels. Housing is a fundamental element of urban life, shaping access to social resources and forging connections among people, communities, and institutions, which in turn define power relations (MADDEN e MARCUSE, 2016).

Complementing this perspective, Schragger (2021, p. 166) emphasizes that “housing is a bundled good, collectively consumed,” underscoring that people’s quality of life goes beyond the dwelling unit itself. It is influenced by the characteristics of the place where housing is located, namely, access to jobs, services, infrastructure, safety, and the surrounding neighborhood all play a significant role in people’s housing experience.

In this context of growing housing demand, it is crucial to recognize that analyses of contemporary urbanization processes should not be limited to the horizontal dimension. Over recent decades, spatial theorists have deepened understandings of the volume and verticality of urban space, examining the city’s three-dimensional organization, its relationship to power, the political economy of urban space and housing, and the associated processes of elitization.

Within this expanding body of scholarship on contemporary urbanization, notable contributions include those of Graham and Hewitt (2013), Graham (2015), Harris (2015), Hirayama (2017), Montès, Appert and Drozd (2017), Nethercote (2018; 2022), Liong, et al., (2020), McNeill (2020) and Glauser (2022), among others. These scholars treat urban verticalization as a significant phenomenon in recent decades, broadening understandings of urban expansion beyond the horizontal perspective.

These analyses discuss the impacts of verticalization in cities around the world, exploring both the physical dimensions and the socioeconomic implications of this process. They also situate verticalization within the context of neoliberal urbanization practices, examining its relationship to real estate and financial markets, and thereby providing a comprehensive analysis of vertical urban expansion and its multiple ramifications.

This scholarship argues that a volumetric approach to the production of space has enabled a fuller and more complex understanding of cities, emphasizing the capacity for built densification and the creation of habitable spaces across multiple levels. Moreover, these studies explore connectivity, the diversity of activities, and urban atmosphere that is, how different parts of the city are interconnected, what activities occur in different areas, and how the overall impression of the city is shaped by its vertical dimension (MCNEILL, 2020).

McNeill (2020) also highlights the central role of calculation technologies and territorial metrics. This ranges from the area’s natural characteristics, such as soil type, to the application of urban indices and regulations. These metrics and calculations play an essential role in

conceiving and implementing real estate projects such as vertical buildings and megaprojects. Such conditions are therefore crucial for discussing how power and value are distributed in the urban environment, thus contributing to the hyper-commodification of the city.

Over the past decades, vertical buildings have become iconic and central elements in the urban landscape. In this sense, Charney, Drozd and Gillad (2022, p. 1101) observe that “much of this development agenda is translated into vertical growth”. In a convergent argument, Liong et al. (2020, p. 1074) contend that “from Le Corbusier to Philip Johnson, modern to postmodern European architecture, high-rises are a dominant feature.” Although obelisks, domes, bell towers, spires, and minarets have pierced the skies for centuries, it was only from the late nineteenth century onward that this space became habitable and functional for living and work. In this way, this condition changes the logic of the (re)production and occupation of urban space, stratifying the population, since “so much urban life is now high in the air” (MCNEILL, 2020, p. 828).

In the contemporary setting, the ongoing trend of verticalization has transformed city skylines, driven both by the exponential increase in the number of developments and by the construction of increasingly tall buildings, in central areas as well as in peri-urban regions.

This evolution has significantly affected the urban landscape. In this regard, Montès, Appert and Drozd (2017, p. 5, our translation) argue that this transformation is reflected in “contemporary high-rise buildings [, which] now seem destined solely to materialize an urbanism of distinction, composed of easily recognizable icons, but whose civic virtues are strongly limited by their restricted access”.

Globally, 75% of high-rise buildings are intended for housing (HURÉ, APPERT e LANGUILLON, 2017). According to Nethercote (2018), this emphasis is partly due to the higher profitability of residences compared to commercial spaces, since residential property prices have grown substantially relative to commercial values. This dynamic reflects a combined pursuit of profitability, attracting builders and investors to an expanding real estate market, especially in the housing segment.

In this context, verticalization not only reflects urban transformations but also illustrates changes within the real estate sector. This phenomenon is particularly evident in cities such as São Paulo, Rio de Janeiro, Tokyo, and notably London, where most new towers are intended for residential use (NETHERCOTE, 2018; GLAUSER, 2022) . In addition, in emerging cities, highly speculative investment strategies have driven both rising property values and increasing building heights (SANFELICI e HALBERT, 2015).

A practical example of this trend can be observed in Vietnam, where verticalization has been widely promoted in response to growing housing demand. Nguyen et al. (2024) note that by 2030, 90% of new housing units in major Vietnamese cities such as Hanoi and Ho Chi Minh City are expected to be apartments, demonstrating how vertical real estate development has been adopted to accommodate accelerated urban growth.

Following Aalbers and Christophers’ (2014) premises regarding the contemporary multifunctionalities of housing, which reflect not only market dynamics but also cultural and social nuances, Nethercote (2018) underscores the importance of considering specific local factors that shape the global trend toward verticalization. Although profitability is a

predominant driver, the way verticalization materializes in each city is shaped by its particularities, demonstrating that real estate development does not unfold homogeneously but rather in response to distinct urban and regulatory contexts.

Given the growing urbanization and the intensification of verticalization in global cities, it becomes essential to understand how urban planning instruments influence this process and its socioeconomic outcomes. Verticalization, beyond transforming the urban landscape, is directly linked to land-use policies, real estate market strategies, and dynamics of population densification.

In the Brazilian context, medium-sized cities have experienced significant transformations driven by revisions to urban planning, an example of which can be observed in the municipality of São José do Rio Preto. Accordingly, the next chapter examines how recent changes in the Master Plan and urban legislation in the municipality have reconfigured zoning and stimulated verticalization, with direct impacts on land occupation, the real estate market, and the socio-spatial structure of the city.

2 MASTER PLAN, THE NEW URBAN ZONING ORDINANCE, AND VERTICALIZATION

São José do Rio Preto, located in the northwest region of the state of São Paulo, approximately 450 kilometers from the capital, began to take shape in 1820 with the arrival of pioneers from southern Minas Gerais, who sought land for subsistence agriculture and, later, cattle ranching. The city was officially founded on March 19, 1852.

Currently, with a population of 480,393 inhabitants, São José do Rio Preto is classified as a Regional Capital B and exerts significant commercial and territorial influence over the state's northwest region and neighboring areas, such as southwestern Minas Gerais, southern Goiás, and northeastern Mato Grosso do Sul. As the core city of the São José do Rio Preto Metropolitan Region (RMSJRP), it has a total population of 1,094,736 inhabitants and encompasses 37 municipalities in the state of São Paulo. The city thus transcends its local scale, reinforcing its regional relevance (IBGE, 2008; FIPE, 2022).

Urban growth and increasing population density in medium-sized cities such as São José do Rio Preto have driven important revisions to urban planning instruments. With a municipal area of 431.30 km², the city's urban perimeter expanded substantially over time: in 2010 it covered 119.48 km², and by 2020 it had more than doubled, reaching 251.27 km² (SEMPPLAN, 2021). Notably, between 2021 and 2022, a period marked by the approval of the new Master Plan, there was no expansion of the urban perimeter nor the incorporation of new areas (SEMPPLAN, 2022; SEMPLAN, 2023).

In principle, the recent reformulation of the Master Plan and zoning laws, concluded in 2021, sought to adjust land use and urban occupation to current demands, promoting more intensive verticalization in strategic areas. These changes aim not only to optimize already consolidated infrastructure, but also to stimulate economic development and expand the housing supply in areas previously characterized by low-rise, horizontal residential occupation (LISBÔA, 2024).

The new legislation altered construction parameters by increasing the Floor Area Ratio (FAR) and adjusting the Building Coverage Ratio (BCR) across several urban zones, and it also expanded the categories of non-computable areas, thereby further increasing development potential. These adjustments, especially in mixed-use and predominantly commercial zones, raised development capacity and encouraged the construction of taller and denser buildings. In theory, this configuration sought to contain outward expansion of the urban perimeter by promoting densification in already occupied areas, thereby reducing urban sprawl.

The new zoning rules, beyond facilitating larger and taller buildings, also significantly expanded commercial activity within neighborhoods (MARQUES, 2020). These conditions can be seen as a driver of urban and economic development by leveraging consolidated areas with existing infrastructure.

However, these actions also have the potential to induce gentrification, displacing residents and small businesses due to rising land costs and rents. This aspect of urban policy must be managed carefully to avoid exclusion and socio-spatial segregation, which often accompany such processes. In other words, accelerated verticalization introduces significant challenges, including socio-spatial impacts, pressure on infrastructure, and issues of socioeconomic segregation.

The densification strategy, by drastically transforming the character of various neighborhoods, may increase population density and place additional pressure on existing infrastructure. While it may help revitalize urban areas and foster economic development, it also entails the risk of exacerbating urban problems, such as rising land prices, congestion, insufficient public services, and deteriorating quality of life, if not matched by necessary improvements in transportation, green areas, and other essential services.

Therefore, as a condition for expanding development potential, regulatory permissiveness should be accompanied by urban policy instruments that effectively enable environmental and spatial upgrading. In recent Brazilian regulatory experiences, such instruments can operate directly at the interface between verticalization and the environmental performance of the urban fabric, insofar as “the Environmental Contribution, in these cases, would be contributing to the environmental improvement of building density” (MONTANDON e MARTINS, 2024, p. 326).

A critical aspect was the rushed manner in which the plan was approved, described by the local press as a “fast-track vote”, which allegedly restricted public debate and raised questions about the effectiveness and the real extent of democratic participation in the process, particularly amid criticism that the new regulatory framework limited planning instruments such as the Charge for Additional Building Rights (OODC) (LIMA, FERREIRA e FRANÇA, 2020; MARQUES, 2020).

In this context, it is noteworthy that although the plan formally includes instruments established by Brazil’s City Statute, such as the aforementioned OODC, Urban Consortium Operations, and the Transfer of Development Rights, these mechanisms have not yet been properly mapped, delimited, or regulated, which restricts their effective application. The Transfer of Development Rights, for example, could constitute a strategic instrument to foster urban renewal processes in specific areas of the city, since the literature recognizes it as a

provenly efficient mechanism for this type of intervention, as evidenced by Wang, Fan, and Yang (2022).

To complement the critique of the revision and implementation process of the new Master Plan and its urban legislation, the following discussion explores how the new regulations significantly expanded the possibilities for verticalization in São José do Rio Preto, with special attention to Building Coverage Ratio (BCR), Floor Area Ratio (FAR), and computable areas.

2.1 Urban Zones: General Characteristics and development potential

While retaining the basic structure of the previous legislation (Law No. 5,135/1992), which established 14 urban zones, the new legislation (Law No. 13,709/2021) introduced adjustments to nomenclature, characteristics, and development and use potentials, and also created new Urban Zones, for example, the Land Tenure Regularization Zones (Zone 07) and Special Interest Zones (Zone 09), which address areas of irregular occupation and properties/buildings of public interest (SJRP, 1992; SJRP, 2021).

The revision of zoning regulations, illustrated in Table 1 and Figure 1, indicates a deliberate strategy to steer vertical development toward key areas of the city, especially in Zones 4, 5, 6, and 10. These zones, featuring uniformly high Floor Area Ratios (FAR) of 4 and Building Coverage Ratios (BCR) ranging between 40% and 50%, were designed to accommodate higher urban densities.

Table 1 – Zoning regulations for vertical multifamily development: Urban indices – Law No. 5,135/1992 and Law No. 13,709/2021

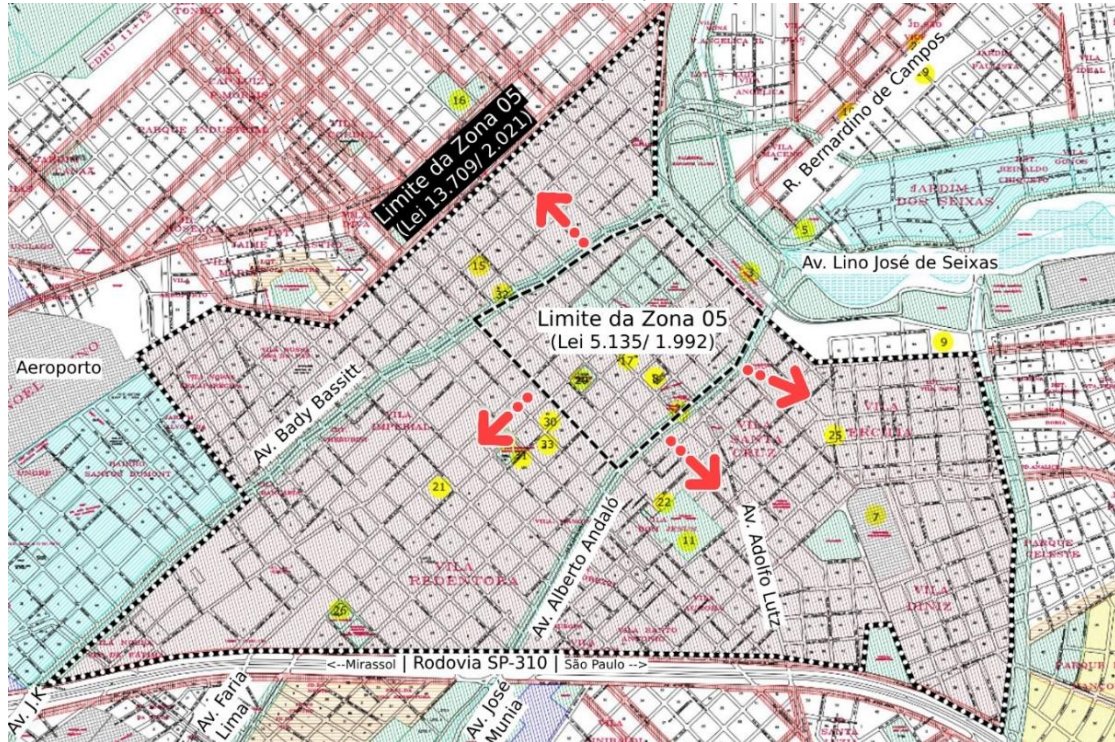
Law No. 5,135/1992 (09/2020 version)				Law No. 13,709/2021			
Zone	FAR	BCR	Maximum Height	Zone	FAR	BCR	Maximum Height
04 – Mixed residential and commercial use zone, medium density	3	50%	-	Zone 4 – Medium-Density Mixed Use	4	50%	as per Integrated Air Defense and Air Traffic Control Center (CINDACTA) and Brazilian Air Force Command (COMAER)
05 – Urban Recovery Zone – decreasing density	2	50%	-	Zone 5 – Urban Recovery	4	40%	as per CINDACTA and COMAER
06 – Commercial Corridors – medium density	3	50%	-	Zone 6 – Predominantly Commercial	4	50%	as per CINDACTA and COMAER
10 – Special Zones	2	50%	-	Zone 10 – Valley-Bottom Avenues and Special Areas	4	50	as per CINDACTA and COMAER

Fonte: Prepared by the author based on SJRP (1992) and SJRP (2021).

Zone 04 – Medium-Density Mixed Use (shown with a white background in Figure 1) covers a significant portion of the city and is intended for a combination of residential and commercial uses, adjusted to support increased verticalization. This zone shows a substantial increase in FAR from 3 to 4, while maintaining a BCR of 50% (Table 1).

Zone 05 – Urban Recovery, shown in Figure 1 (in brown), was expanded to include neighborhoods with consolidated infrastructure that are nevertheless undergoing degradation and therefore require preservation, recovery, and revitalization (SJR, 2021).

Figure 1 – Zone 05 | Delimitation under Municipal Law No. 5,135/1992 and Post-Revision Territorial Expansion under Law No. 13,709/2021



Source: SJRP (2021), edited by the authors.

The adjustment of Zone 05's FAR, from 2 to 4, along with the reduction of the BCR from 50% to 40%, reflects the idea of urban renewal through increased development potential. This expansion encompasses not only the central area but also neighborhoods such as Vila Redentora, parts of Boa Vista, and the Santa Cruz, Ercília, and Diniz districts. Figure 1 presents Zone 05 in São José do Rio Preto, highlighting the boundaries established by Law No. 5,135/1992 and the subsequent expansion under Law No. 13,709/2021, reflecting the extension of its limits.

Except for the central area, these localities are predominantly composed of low-rise buildings, including remnants of Neo-colonial, Eclectic, Art Deco, and Modernist styles. Although expansion promotes initiatives that attract urban developers and encourage the regeneration of underutilized areas, it also raises concerns regarding the conservation of the distinctive architectural character of these buildings and the maintenance of the traditionally horizontal urban form historically present in these areas. This aspect was previously criticized by Marques (2020b) due to its potential to alter the original urban profile.

Zone 06 – Predominantly Commercial (shown in red in Figure 1) maintained its character as a commercial corridor and had its FAR increased from 3 to 4 (applicable to all use types and building heights), while the BCR was maintained at 50%, specifically to promote verticalization. This configuration seeks to encourage vertical development in areas with high commercial activity and heavy vehicle flows, maximizing development potential and economic

growth. The strategy aims to attract investment both in housing and in business, fostering dynamic economic growth in these areas.

Finally, Zone 10 – Valley-Bottom Avenues and Special Areas (shown in green in Figure 1) primarily encompasses avenues located along valley bottoms and other areas designated as being of special municipal interest. These avenues, included within this zone, have undergone several regulatory changes over the years, as detailed in Table 1. Currently, Zone 10 has a uniform FAR of 4 and a BCR of 50%, reflecting current urban planning policies aimed at stimulating vertical development in these specific spaces.

3 METHODOLOGY

To verify the effect of the legislative change, a simulation was proposed to analyze how modifications to the Floor Area Ratio (FAR) and the Building Coverage Ratio (BCR) expanded development potential and induced the verticalization of urban space. This simulation used four vacant lots located within the specified zones, each with an area of approximately 1,000 m².

To calculate the “typical floor plate” of each building, the maximum values permitted by the Building Coverage Ratio (BCR) in each zone were adopted. In this preliminary exercise, it was deliberately decided to disregard certain building rules, such as those related to daylighting areas and vertical circulation, as well as non-computable areas and, most importantly, architectural form. These variables can significantly change the volumetric outcome, since they “reduce” the usable floor area and, consequently, increase the number of storeys required to achieve the same development potential.

The purpose of this simulation was to simplify the model in order to focus exclusively on the effects of FAR and BCR on development potential. Although streamlined, this approach provides a clear view of how these parameters directly shape the capacity for verticalization across different urban zones. This method enables a straightforward and quantitative understanding of how legislative updates can transform the urban landscape by promoting more intensive densification in these areas of the city.

Accordingly, based exclusively on the urban planning parameters, the total number of storeys that could be built under the guidelines of both pieces of legislation was calculated, as shown in Table 1, highlighting changes in the zoning indices.

Table 1 presents a detailed comparison between the urban planning parameters established by the Zoning, Land Use and Occupation Laws (LZUOS) No. 5,135/1992 and No. 13,709/2021, for the four zones under discussion, as applied to the lots targeted in the simulation.

Table 1 – Simulations of Urban Indices Applied to Zones 04, 05, 06 and 10 – LZUOS 1992–2021

Zone	Lot Area (m ²)	Law No. 5,135/1992			Law No. 5,135/1992		
		FAR (m ²)	BCR (m ²)	Storeys (no.)	FAR (m ²)	BCR (m ²)	Storeys (no.)
04	950	2.850	475	6	3.800	475,00	8
05	1.089	2.178	544,50	4	4.356	435,60	10
06	1.091	3.273	545,50	6	4.364	545,50	8
10	900	1.800	450	4	3.600	450,00	8

Source: Prepared by the author.

Analyzing urban planning parameters is essential for understanding the dynamics of urban land use and occupation. The Floor Area Ratio (FAR) and the Building Coverage Ratio (BCR) are key indicators for regulating a given area's development potential. Together with other parameters, such as setbacks and the Permeability Rate (PR), these regulations directly shape development capacity and densification potential, affecting building heights. They do so by limiting the built area on urban lots, thereby influencing the economic value of land and the broader process of urbanization.

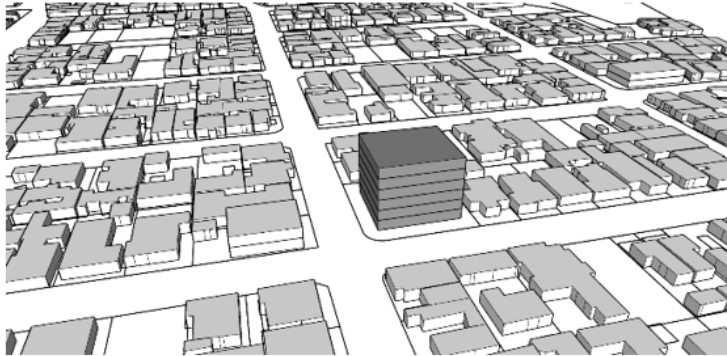
4 RESULTS

In Zone 04, the proposed test used a lot with an area of 950 m², located in the Jardim Maracanã neighbourhood, within the HB Region. Under Law No. 5,135/1992, the resulting FAR and BCR were 2,850 m² and 475 m², respectively, and the number of storeys obtained by directly dividing the urban indices would yield a six-storey building.

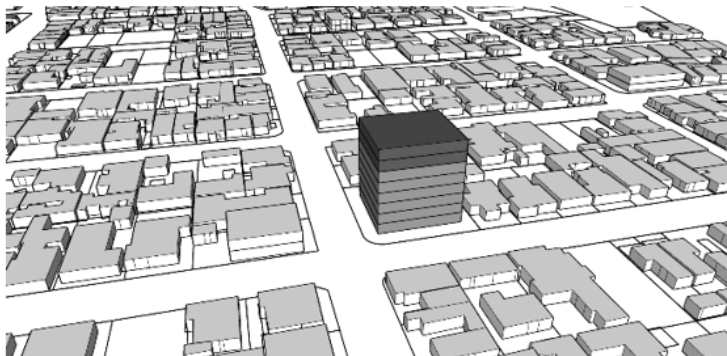
With the implementation of Law No. 13,709/2021, the FAR increased to 3,800 m², while the BCR remained unchanged at 475 m². This increase in FAR resulted in an increase in the number of storeys to eight, evidencing higher development potential, as shown in Figure 2.

In Zone 05 (Figure 3), the proposed lot has an area of 1,089 m² and is located in the Vila Diniz neighbourhood, within the Central Region. The FAR under Law No. 5,135/1992 was 2,178 m², the BCR was 544.50 m², and the feasible number of storeys was four.

Figure 2 – Increase in development potential in Zone 4 – LZUOS 1992–2021



LZUOS Regulation (Land Use and Occupancy Zoning Law), 1992
SA = 950 m²
FAR = 3
SC = 50%
TFA = 2,850.00 m²
ROR = 475.00 m²



LZUOS Regulation, 2021
SA = 950 m²
FAR = 4
SC = 50%
TFA = 3,800.00 m²
ROR = 475.00 m²

Legend:

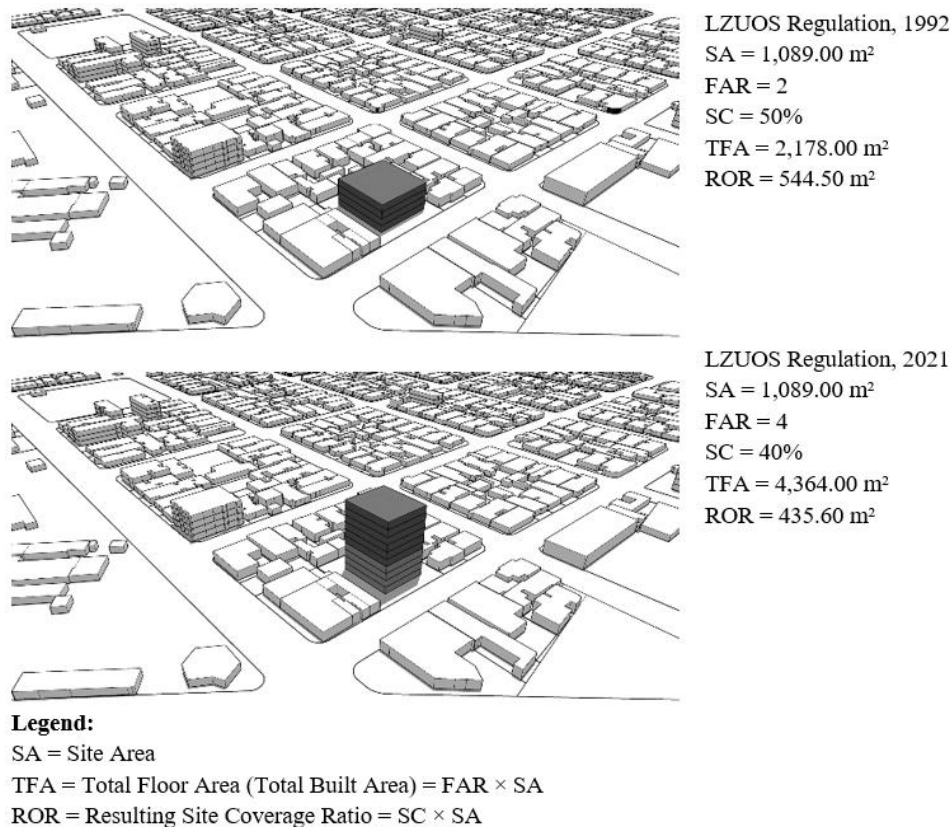
SA = Site Area

TFA = Total Floor Area (Total Built Area) = FAR × SA

ROR = Resulting Site Coverage Ratio = SC × SA

Source: Prepared by the authors.

Figure 3 – Increase in development potential in Zone 5 – LZUOS 1992–2021



Source: Prepared by the authors.

Under the new legislation, the resulting FAR increased substantially to 4,356 m², while the BCR was adjusted to 435.60 m². This increase in FAR enabled the construction of up to ten storeys, demonstrating the potential to intensify verticalization in the area (Figure 3).

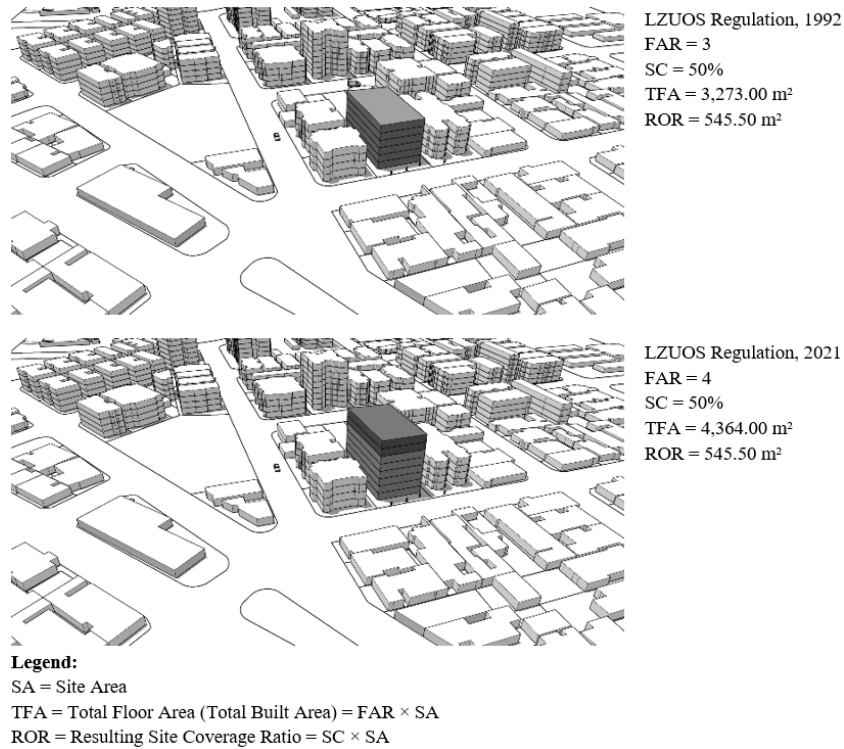
For Zone 06, the 1,091 m² lot is located in the Vila Ideal neighbourhood, within the Central Region. Under the former legislation, the permitted FAR was 3,273 m², the BCR was 545.50 m², and the feasible number of storeys was six. Law No. 13,709/2021 increased the FAR to 4,364 m² while keeping the BCR unchanged at 545.50 m², enabling the construction of eight storeys. This increase in the number of storeys reflects greater use of the lot and a trend toward higher built density (Figure 4).

Finally, in Zone 10, the lot is located in Jardim Morumbi, within the HB Region, and has an area of 900 m². Under Law No. 5,135/1992, the FAR was 1,800 m², the BCR was 450 m², and the permitted number of storeys was four. With the implementation of Law No. 13,709/2021, the FAR increased to 3,600 m², while the BCR remained constant at 450 m². This increase in FAR resulted in an increase in the number of storeys to eight, evidencing higher development potential (Figure 5).

The results obtained from the simulations confirm that changes in the urban indices, especially FAR and BCR, have a direct impact on the verticalization potential of the urban zones analyzed. Higher FARs, combined with stable or reduced BCRs, produced a substantial increase

in the number of storeys that can be built, evidencing the permissiveness of intensifying urban land use. Moreover, the simulations illustrate the effects of legislative changes on development potential and their impacts on the surrounding urban landscape.

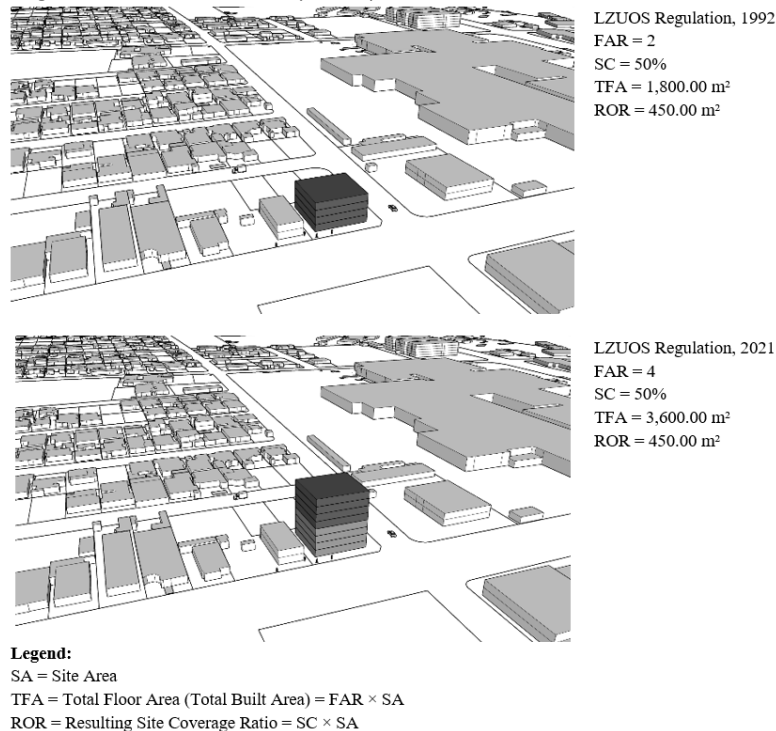
Figure 4 – Increase in development potential in Zone 6 – LZUOS 1992–2021



Source: Prepared by the authors.

Based on these analyses, the legislation that modified these indices proved fundamental to increasing built density in areas that were previously less dense. This phenomenon reflects a global urbanization trend, in which population growth and the scarcity of available land in consolidated urban areas drive verticalization under the premise of optimizing land use and responding to growing demands for housing and infrastructure.

Figure 5 – Increase in development potential in Zone 10 – LZUOS 1992–2021



Source: Prepared by the authors.

Beyond the aspects discussed above, a crucial factor that directly affects this equation is the specific provisions of the Zoning, Land Use and Occupation Law (LZUOS Law No. 13,709/2021) and the Building Code (Supplementary Law No. 649/2021). These norms significantly influence development potential, further intensifying this dynamic. For instance, certain built areas are excluded from the calculation of the Floor Area Ratio (FAR) or the Building Coverage Ratio (BCR). In other words, there are specific conditions, such as recreation areas, the number of parking spaces, and areas allocated to parking, that are not considered computable floor area.

These conditions, particularly in the case of vertical developments, directly affect development potential across the territory as a whole, aligning São José do Rio Preto's legislation with that of other major Brazilian and international urban centres, such as São Paulo, Belém/PA (MOREIRA, DE SOUZA, *et al.*, 2024), Jakarta (LIONG, LEITNER, *et al.*, 2020) and New York City (BYUNGGEOR e SUNGIN, 2022). Such strategies maximize the use of available space, foster a favourable environment for urban verticalization, and expand opportunities for rent extraction.

Complementarily, Lima and Monasterio (2024) show that stricter limits on the Floor Area Ratio (FAR) can result in greater urban sprawl. This finding is particularly significant, as a reduction in FAR may increase a city's occupied area by 12.4%, generating an additional annual cost of approximately US\$ 2.36 million when considering impacts on transport costs, health, and CO₂ emissions in a medium-sized Brazilian city. The authors (2024, p. 20) illustrate that, considering "the average area of the sample cities (64.5 km²), this would increase the spatial area in 8 km² (a ≈ 300 meter extension of the radius of a circular city)".

This dynamic aligns with recent studies that reinforce the viability of urban policies oriented toward intensifying already consolidated fabric. In other words, incremental densification of a limited share of the already urbanized territory can accommodate a substantial portion of housing needs, supporting strategies that prioritize densification over expansion into new areas (CORRÊA, CARRIELLO e CARVALHO, 2026).

These results are particularly relevant for the context of São José do Rio Preto, especially considering recent legislative changes that modified both planning parameters and the treatment of computable areas. The new regulations seek to significantly increase development potential by allowing higher densities in specific parts of the urban area.

By correlating the literature with the local context, one may infer that these new laws have the potential to reduce urban sprawl and promote more concentrated and efficient development. Such development would not only optimize urban land use but also help mitigate the economic and environmental costs associated with unplanned urban expansion, indicating that updated legislation can contribute to more sustainable and efficient urban development.

5 CONCLUSION

For the development potential resulting from the legislative changes to effectively materialize, it is crucial that urban planning in São José do Rio Preto coherently integrates mechanisms that ensure infrastructure adequacy in relation to the new population density. Global evidence suggests that simply increasing development potential and urban density, without the corresponding expansion and improvement of urban services, can exacerbate problems related to mobility, sanitation, and access to green areas (UN HABITAT, 2022).

As noted by Crosby (2020, p. 186), "Under neoliberalism, housing has become a key site for commodification and deregulation activities". This analysis reinforces the intrinsic relationship between deregulation and the commodification of housing, highlighting how the housing sector has been profoundly affected by neoliberal policies and by transformations in market practices that shape contemporary urban dynamics.

In sum, the analysis of legislative changes in São José do Rio Preto reveals a significant urban transformation driven by the reformulation of the Master Plan and by the complementary legal framework. These regulatory changes may create a favorable environment for intensifying land occupation and for verticalization, with the potential, over time, to contribute to more efficient use of urban space, reduce urban sprawl, and promote more concentrated and sustainable development, aligning with the perspective advanced by Lima and Monasterio (2024).

Accordingly, the discussions presented here corroborate the idea that the legislative changes to the Zoning, Land Use and Occupation Law and the 2021 reformulation of the Master Plan were significant catalysts for vertical expansion in the city. The stagnation of the urban perimeter between 2021 and 2022 may indicate that developers' attention shifted toward consolidated areas within the existing perimeter, leveraging new opportunities to increase built area production and enhance the value of their developments on this basis.

However, despite the advantages associated with verticalization, such as optimized land use and containment of horizontal expansion, substantial challenges must be addressed. For verticalization to be sustainable, it is essential that urban infrastructure keeps pace with increasing population density, through improvements in transport systems, water supply, sanitation, energy, and other essential services to ensure residents' quality of lives.

These challenges also raise questions about a common assumption in the real estate market: that building taller necessarily produces higher density. Martin and March demonstrated that, depending on built form, high densities can be achieved without the need for tall buildings (STEADMAN, 2014). This critical perspective suggests that, although vertical construction is widely promoted, the logic of building ever taller may not be the most efficient or sustainable approach for urban land use and quality of life. Instead, it is possible to explore forms of occupation that maximize density with lower impacts on urban infrastructure, thereby opening pathways for more balanced urban development.

Socio-environmental sustainability must be a priority, since intensifying land use can increase pressure on natural resources and urban ecosystems. Therefore, it is essential that urban development policies incorporate strategies to mitigate environmental impacts by promoting sustainable practices such as preserving green areas, ensuring efficient waste management, and reducing CO₂ emissions, particularly those generated by daily commuting.

Another crucial point is the need for social equity in the urbanization process. Verticalization and the appreciation of urban space can lead to gentrification, displacing low-income residents and small businesses due to rising living costs and rents, while privileged areas remain "protected" and valorized. Lauermaann (2022) highlights that vertical development intensifies this process by enabling excessive investment in already valued areas, transforming them into even more exclusive enclaves.

This phenomenon occurs through the superimposition of layers of property, enabling the appropriation of previously unbuilt spaces both in the skyline and in the urban subsoil. As a consequence, population displacement intensifies, affecting especially low- and middle-income groups. Considering this scenario, inclusive policies and protective mechanisms should be implemented to ensure that all segments of the population benefit from urban development, avoiding social segregation.

Therefore, for São José do Rio Preto to achieve truly sustainable and efficient urban development, it is essential to maintain a careful balance between growth and the preservation of quality of life. This includes adapting infrastructure, promoting environmental sustainability, and ensuring social equity. Only then will the city be able to fully harness the benefits of the new regulations, positioning itself as a model of efficient and inclusive urbanization for the future.

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STATEMENTS

CONTRIBUTION OF EACH AUTHOR

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DECLARATION OF CONFLICTS OF INTEREST

We, **Cristian Roberto Nazareth Lisbôa, Carolina Maria de Castro Pozzi e Luciani Maria Vieira Rocha**, hereby declare that the manuscript entitled "**The Impact of New Urban Planning Guidelines on Urban Verticalization in São José do Rio Preto/SP: An Analysis of Changes in the Master Plan and zoning**":

1. **Financial relationships:** Has no financial relationships that could influence the results or interpretation of the work. No institution or funding entity was involved in the development of this study.
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