

Income diversity in Transit-Oriented Development (TOD) areas An analysis of the Belém metro station area in São Paulo, Brazil

Quentin Lamour¹, Karin Regina de Castro Marins²

Department of Construction Engineering, Polytechnic School of the University of São Paulo
quentin.lamour@usp.br

Department of Construction Engineering, Polytechnic School of the University of São Paulo
karin.marins@usp.br

Abstract

Urban segregation results in exclusion, limited opportunities for the urban poor and limited access to infrastructures. In Brazil, large-scale production housing policies invested in the periphery, exacerbating peripherisation. Inclusive urban development requires accessibility to public transport and infrastructures for all. Transit-Oriented Development (TOD) promotes high density and social diversity near transit, providing well-located and high-quality housing for the poorest.

In the context of TOD implementation in São Paulo, this paper aims to comprehend the influence of new real estate developments on the distribution of incomes near transit. It presents empirical proofs of the necessity to combine housing and transport policies.

The study investigates the Belém metro station area, in São Paulo. Land use analyses were crossed with demographic and real estate developments data analyses. The land uses were mapped to identify the construction standard of the residential vertical lots and to count the number of Housing Units (HU). The analysis of the dwellings' income of nine residential lots was based on the 2010 IBGE census data.

The study reveals a shift in target market of the residential developments, focusing mainly on high standard housing; it exposes gentrification and strengthens the need for social housing near transit. Moreover, the paper discusses the present urban legislation – Master Plan and Zoning - towards social housing near transit and concludes the relation between public transport and social housing policies is weak. The efficiency of having two different types of zones near transport infrastructures is questioned. Finally, inclusionary housing is proposed as a possible policy and the importance of the economic feasibility analysis and the inclusion of all the stakeholders in the policy design is highlighted.

Key words: Urban segregation; TOD; São Paulo; Housing policy; Urban legislation.

1 Introduction

Inequality and segregation prevail in Brazilian cities. According to Villaça (1998), segregation is observed when the city is separated in regions, each of these occupied predominantly by a defined social class. The author observed the geographical organization in circular sectors, where the upper class is concentrated in a sector. This is the result of a historical process that allowed the dominant class to control the use of space and land property, as well as the time necessary to access economic activities. In fact, these regions concentrate infrastructures – particularly transport infrastructures - and are normally close to the economic centre of the city.

The supracited pattern of social and geographical organization results in social exclusion, racial discrimination, limited opportunities for the urban poor, higher exposition to criminality and uneven access to infrastructures (Maricato, 2003). Furthermore, poor access to transit infrastructures exacerbates the effects of segregation, since it restrains the access to the workplace and other urban infrastructures, such as education, health and cultural facilities.

During the 20th century, the fast urbanization of Brazilian cities occurred by means of self-construction in the periphery, where the land prices are lower. This pattern of unplanned sprawling periphery hinders the implantation of infrastructures, for it requires a vaster and, therefore, more expensive network. Moreover, Brazilian cities typically present a job-housing spatial mismatch: in fact, jobs are normally concentrated in the city centre, while the periphery is mainly residential. This land use pattern forces millions of people to commute every day to reach their jobs, fostering the necessity of transport infrastructures.

The nowadays great housing shortage Brazilian cities is another consequence of the fast urbanization from the 20th century. According to the João Pinheiro Foundation (Fundação João Pinheiro. Centro de Estatísticas e Informações, 2016), in 2014, Brazil lacked 6 million housing units, from which 5 million (or 85.7%) in urban areas; the metropolitan region of São Paulo lacks 625,000 units. The shortage is principally concentrated for dwellings with an income inferior to 3 minimum wages (MW): in 2014, it corresponded to 84% and 80% of the urban housing deficit in Brazil and São Paulo, respectively.

In 2009, the Federal Government implemented a policy of incentives for massive housing production for the lowest social classes: the *Minha Casa, Minha Vida* programme (My House, My Life). In 2014, 3.2 millions of housing units had been contracted, and 1.5 million handed over in the whole country (Rufino, 2016). Nevertheless, several studies criticise the programme; three main arguments are adduced.

First, the distribution of the production does not reflect the distribution of the deficit. Indeed, the programme was divided in three income ranges: for dwellings with an income 1) under 3 MW, 2) between 3 and 6 MW and 3) between 6 and 10 MW. The investment has been focusing principally on ranges 2 and 3, whereas the deficit is concentrated in range 1 (Marques, 2013; Pequeno, 2013; Rolnik and Royer, 2015); so that the shortfall for the poorest is not addressed. Second, the programme is blamed to focus only on quantity, disregarding the quality of the projects. Huge lots are urbanised without providing the basic infrastructure, such as schools, dispensaries or markets (Pequeno, 2013; Rolnik and Royer, 2015; Almeida and Melchior, 2017). Third, the location of the projects is highly criticised. The major part of the projects were developed in the periphery, where the land is less expensive, but also where there is a lack of public infrastructure and facilities. This large-scale production model exacerbates segregation and fosters urban sprawl (Pequeno, 2013; Rolnik and Royer, 2015; Almeida and Melchior, 2017).

Inclusive urban development requires accessibility to public transport and infrastructures for everyone. To address those critical issues (segregation, housing shortage, urban sprawl), Transit-Oriented Development (TOD) promotes high density and social diversity in walking-distance from transit; this theory intends to promote the right to the city for all and to avoid exclusive rich neighbourhoods near public transport infrastructures, providing well-located and high-quality housing also for the poorest.

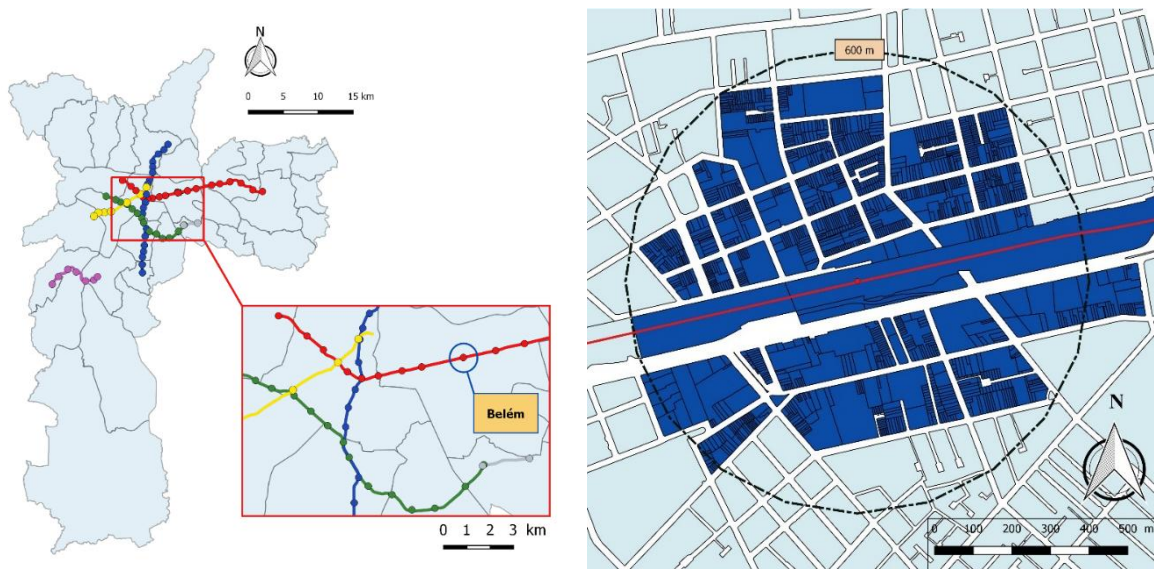
In São Paulo, the new urban legislation – 2014 Master Plan (Prefeitura do Município de São Paulo, 2014) and 2016 Zoning (Prefeitura do Município de São Paulo, 2016) – puts into practice the TOD theory in the ZEUs (*Zona Eixo de Estruturação da Transformação Urbana* – Structuring Axes of the Urban Transformation Zones). The blocks within a 600 metres radius from metro stations are in ZEU. In these zones, special rules were established to implement TOD: the maximum Floor Area Ratio (FAR) is 4 and is 6 for social housing, while it is only 2 far from transit; a minimum number of housing units per surface area was set to promote density; only one parking place per housing unit is permitted, therefore promoting active transportation modes; and special incentives were established to promote mixed-use developments.

Moreover, to cope with the housing shortage among the poorest, the urban legislation of São Paulo, based on a federal law that gives guidelines to implement urban policies – the 2001 City Statute (*Estatuto da Cidade*) (Brasil, 2004) – defined special zones called ZEIS (*Zonas Especiais de Interesse Social* – Social Interest Special Zones). This instrument allows the delimitation of reserved areas allocated mainly to social housing (social housing are intended for dwellings with an income under 6MW). In São Paulo, the Master Plan defines five types of ZEIS: 1) areas occupied by *favelas* (slums), 2) underused or vacant lots, 3) underused or vacant buildings in regions served by infrastructures, 4) vacant lots in environmental protection areas and 5) underused or vacant lots in regions served by infrastructures.

In the context of TOD implementation in São Paulo, this paper aims to comprehend the influence of new real estate developments on the distribution of incomes near transit. It presents empirical proofs of the necessity to combine housing and public transport policies and discusses this combination in the new São Paulo urban legislation. The paper is based on the case study of the Belém metro station area, in the East Zone of São Paulo.

2 Method

This investigation used the Belém metro station area as a case study, as shown on [fig. 1a]. The studied area is composed of the blocks contained within a 600m radius, as presented on [fig. 1b]. This distance is typically used on TOD development and recommended by the literature. It is also the distance specified by the Master Plan to define the ZEUs. The total area of blocks represents 544.109 m², and it does not take into account the central area dedicated to the railway.

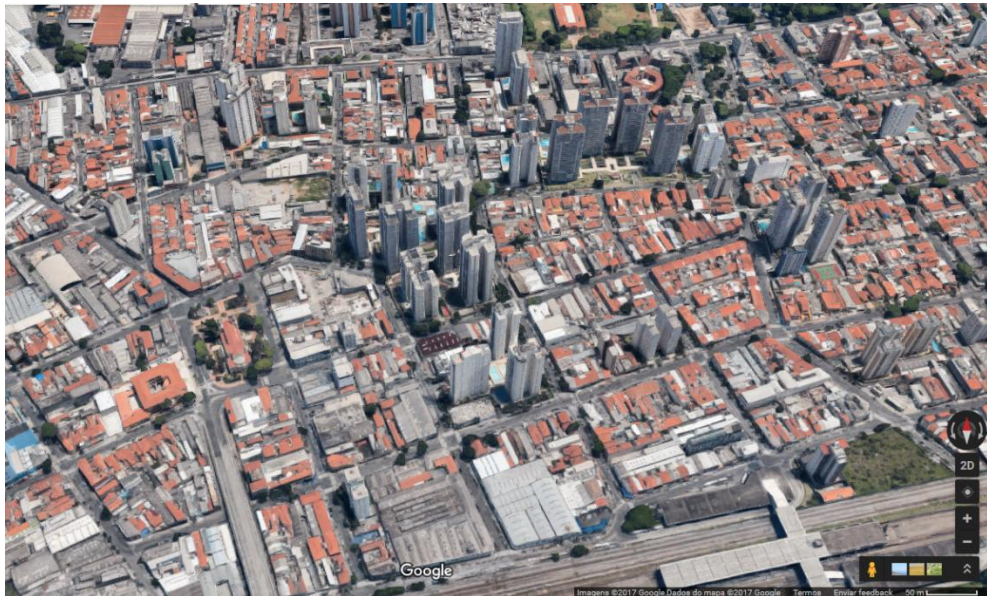


[fig. 1] a) Location map of the Belém metro station in São Paulo, Brazil (Source: the authors); b) Studied area (Source: the authors)

This area has suffered densification during the last decades. The original fabric was mainly made of vast industrial lots and warehouses, and of small residential lots. The receding industrial activity in the area is responsible for turning the former warehouses into vertical residential buildings. On the other hand, the

small residential lots remain untouched, as real estate developers normally face difficulty to pool many small lots and focus their action on larger lots.

[fig. 2] displays an aerial view of the area located north of the railway: both aforementioned coexisting fabrics may be identified; some industrial lots still remain and may be developed in the coming years. [fig. 3] displays a view of the southern part of the area: some large lots were already developed as vertical housing, but many remain industrial, presenting a great amount of land, yet to be developed. This shows the Belém area will keep on growing and suffering densification, and therefore, represents an interesting place to be studied in a TOD context.



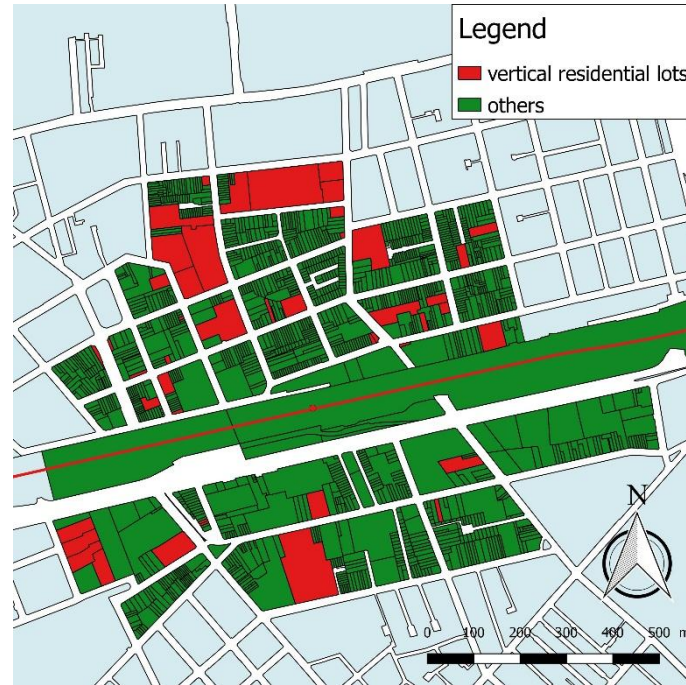
[fig. 2] Aerial view of the northern part of the studied area (Source: Google Maps – July 2017)



[fig. 3] Aerial view of the southern part of the studied area (Source: Google Maps – July 2017)

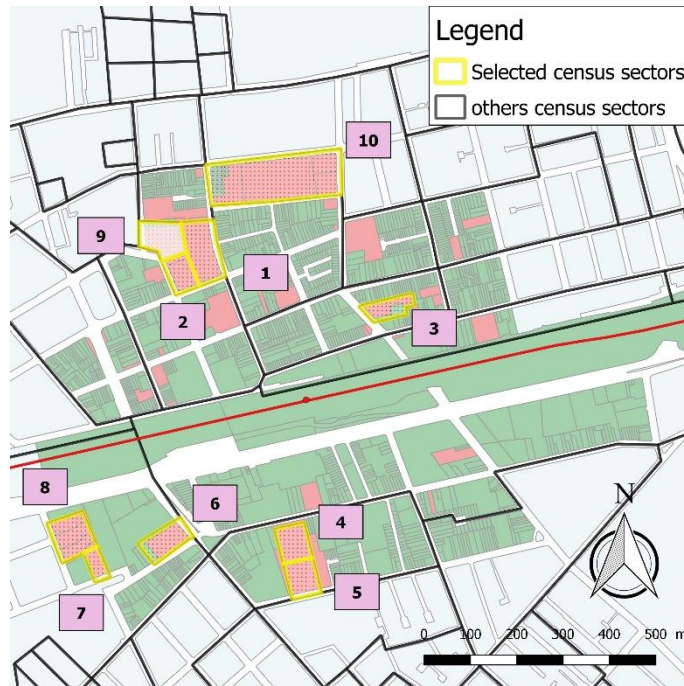
The vertical residential lots in the area were identified and mapped (see [fig. 4]). The mapping was performed on QGIS 2.18.2 – open source geographic information system. The maps of the lots and blocks were obtained from the Digital City Map (*Mapa Digital da Cidade*) (Prefeitura do Município de São Paulo, 2016). The lots map was updated considering the cadastre available on the Geosampa web portal (Prefeitura do Município de São Paulo, no date) and verified on field. For every vertical residential lot, the construction standard was established considering the number of parking spaces per dwelling and the

physical characteristics of the building as criteria. The number of Housing Units was also determined: it was extracted from the database of residential real estate developments in the Metropolitan Area of São Paulo launched between 1985 and 2003, and released by the Metropolitan Study Centre (*Centro de Estudos da Metrópole*); when data was unavailable (recent or unregistered developments), the number of Housing Units was obtained through a field research, questioning the condominiums' caretakers or doormen.



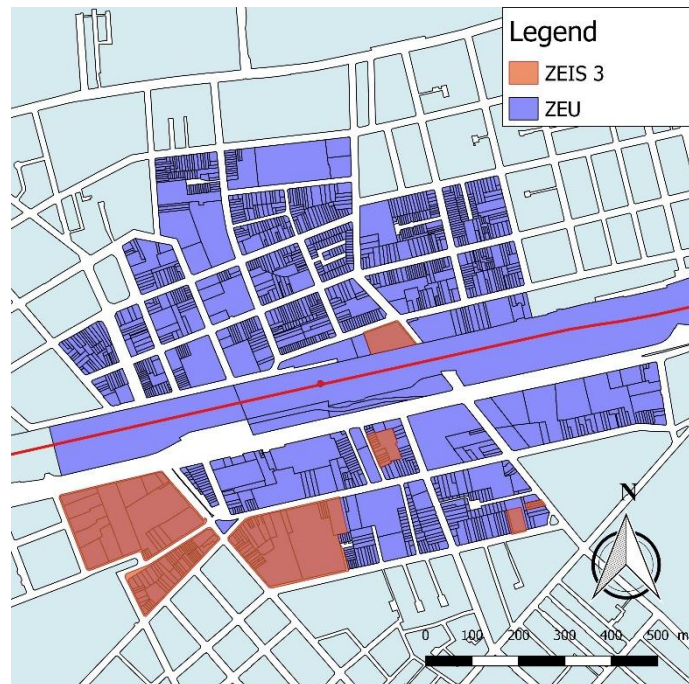
[fig. 4] Vertical residential lots (Source: the authors)

[fig. 5] shows a map of the sectors of the 2010 IBGE Census (*Instituto Brasileiro de Geografia e Estatística – Brazilian Institute of Geography and Statistics*) (IBGE, 2012); the sectors that correspond exactly to vertical residential lots were highlighted and numbered on the map. The analysis of the dwellings' income was performed for the sectors 1 to 8 based on the 2010 IBGE census data. Sector 9 was not considered in this study because of a data lack. Sector 10 was also kept out of this study for the real estate developments in the sector were handed over after the census carried out in 2010; therefore data available for that sector do not correspond to a vertical real estate development.



[fig. 5] Selected census sectors of the 2010 IBGE census (Source: the authors based on IBGE, 2010)

Finally, [fig. 6] displays the zoning of the neighbourhood. The only type of ZEIS present in the studied area is ZEIS 3. The total ZEIS surface area is 94.581 m², representing 17% of the total area (544.109 m², without the railway dedicated area).



[fig. 6] Zoning of the studied area (Source: PREFEITURA DO MUNICÍPIO DE SÃO PAULO, 2016a)

3 Results

[Tab. 1] displays the construction standard, the number of housing units, the number of dwellings, the hand-over year of the real estate development, the surface of the lot, the zoning and the type of developer (private or public) of the selected census sectors. Three construction standards were differentiated: 1) High for developments with refined finishes and one or more parking places per housing unit; 2) Popular

for developments with medium quality finishes and one or zero parking place; and 3) Social for social housing units, with low quality finishes. In some census sectors, the number of housing units can be much larger than the number of dwellings registered in the 2010 census; since the real estate developments were handed over in 2009, just before the census, the housing units were not entirely occupied by the time the census was performed.

Census sector	Construction Standard	No. of HU	No. of dwellings (2010 census)	Hand-over year	Lot surface (m ²)	Zoning	Private or public developer
1	High	312	161	2009	8.580	ZEU	Private
2	High	136	108	2008	2.800	ZEU	Private
3	Popular	180	171	2001	2.900	ZEU	Private
4+5	Popular	400	192	2009	13.965	ZEIS 3	Private
6	Popular	204	124	2009	3.715	ZEIS 3	Private
7+8	Social	464	497	2005-2006	9.390	ZEIS 3	Public

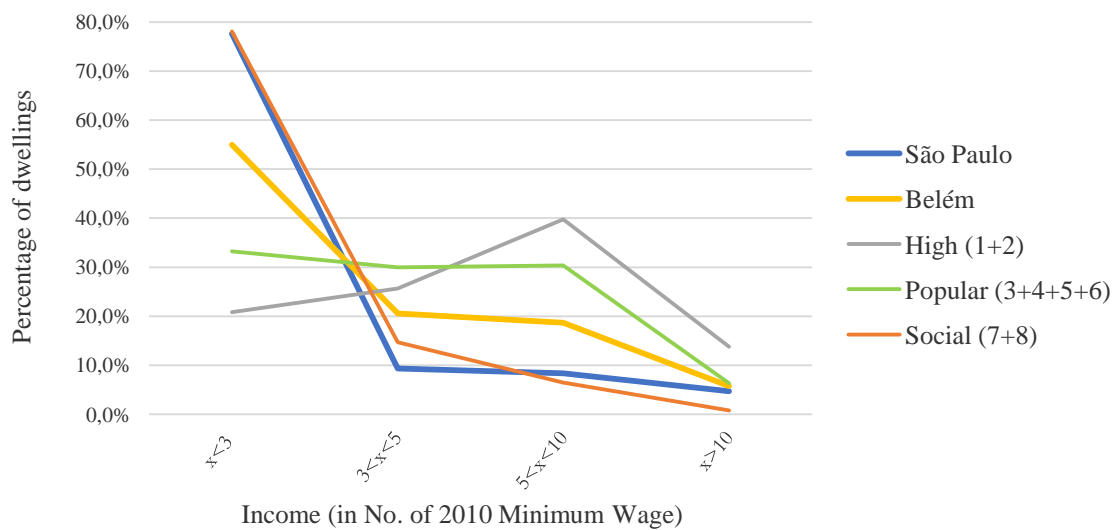
[Tab. 1] Information about the selected census sectors (Source: the authors)

[Tab. 2] shows the total number of housing units produced in the area, per construction standard; the units handed over before and since 2010 were separated from one another. In the studied area, the social housing units were all developed in ZEIS by the Housing and Urban Development Company of the State of São Paulo (CDHU – *Companhia de Desenvolvimento Habitacional e Urbano*) for low income dwellings, totalling 464 HU in the census sectors 7 and 8 and occupying 10% of the ZEIS surface. They were delivered in 2005-2006 and represent 12% of the total amount of the vertical housing units produced in the area or 9,5% of the total number of housing units (4.876 HU). Popular housing units represent 43% of the total amount and were all handed over before 2010. High standard housing correspond to 45% of the produced units; almost half of them were delivered after 2010.

Construction Standard	No. of vertical housing units handed over			Percentage
	since 2010	before 2010	Total	
High	789	983	1772	45%
Popular	0	1691	1691	43%
Social	0	464	464	12%
			3927	100%

[Tab. 2] Number of housing units in vertical developments, depending on the construction standard, handed over before and since 2010 (Source: the authors)

[fig. 7] shows the distribution of the dwellings according to the income in the city of São Paulo, in the Belém neighbourhood (studied area) and in the selected census sectors, grouped by construction standard. In 2010, in São Paulo, around 75% of the dwellings had an income inferior to 3 Minimum Wages (MW) – the MW was 510 BRL (Brazilian Real) in 2010 -; within the Belém area, 55%. In Belém and in São Paulo, only 5% of the dwellings had an income superior to 10MW. [Tab. 3] displays the criteria used by the IBGE to discriminate the social classes, according to the dwelling's income. The Belém area was mainly a middle to lower class neighbourhood.



[fig. 7] Distribution of the dwellings depending on their income in São Paulo, Belém (studied area) and in the selected census sectors, grouped by construction standard (Source: the authors, based on IBGE (2010))

Social class		Dwelling's income (No. of MW)
A	Upper class	>20
B	Upper-middle class	10 to 20
C	Middle class	5 to 10
D	Lower-middle class	2 to 5
E	Lower class	<2

[Tab. 3] Social classes depending on the dwelling's income (Source: (IBGE, 2012))

The distribution of the incomes within developments of social housing was very close to the distribution in São Paulo, where the lower class is predominant. Among popular developments, the proportion of dwellings from C and D classes was 10% higher than in the Belém neighbourhood; the lower class was 33% - 20% lower than in Belém – and the A and B classes proportion was comparable to that of Belém. The proportion of A, B and C classes in high standard developments was much higher than in the whole neighbourhood.

4 Discussion

4.1 A shift in the residential market in the Belém area

As shown by the results, in 2010, Belém was a middle to lower class neighbourhood. However, since 2010, mainly high standard projects were developed in the area, attracting preferentially middle and upper-middle class inhabitants. This reveals clearly a shift in the real estate market of the Belém neighbourhood.

From 2007 to 2013, the São Paulo metropolis – as many Brazilian urban areas - faced a real estate boom, due to several combined factors: the great pent-up demand for housing, the favourable economic context, the access to credit made easier during those years and the capital opening up of the major Brazilian real estate companies, enabling a greater investment capacity (Zanin, 2013; Cardoso and Jaenisch, 2017).

The first developments of the boom, with popular construction standard, were directed to lower-middle and middle classes, as typical target market in the area before the expansion of the real estate market. Because of the time needed to execute a real estate development, the projects developed in 2007 began to be handed over in 2009/2010, as seen in **Erro! Fonte de referência não encontrada.** The demographic pressure in the regions alongside the East metro line (Meyer, 2008), combined with the rising demand for housing in the region, increased the demand for land to execute new projects in the area; as a result, the

land became more expensive. As prices got higher, only dwellings of higher income may afford to buy new housing in the area, which could partly explain the shift in the real estate market. In fact, the demand in this region was also reinforced as prices rose among the other areas of the city where these dwellings of higher income would probably buy before the boom, forcing them to seek new regions to buy.

This shift in the residential developments market exposes gentrification in the area, what would strengthen the need for social housing, as a solution to foster diversity near transit, according to the TOD theory. **Erro! Fonte de referência não encontrada.** shows clearly the necessity to produce housing for dwellings with an income inferior to 3 MW (lower class) in order to make the distribution of the income in Belém closer to the distribution in São Paulo. Nevertheless, an effective policy for popular housing is also necessary, because the demand for this type of real estate products had no response since 2010. The trend revealed by this study – since the real estate market has been only focusing on high standard housing - is exactly opposed to that aim and highlights the necessity to better combine housing and public transport policies.

4.2 Housing policy near transit

The new urban legislation in São Paulo defined incentives and rules for social and popular housing in the ZEUs. Social and popular housing have a maximum surface area of 70m²; popular housing is intended for dwellings with an income between 6 and 10 MW, whereas social housing for dwellings with an income under 6MW. The maximum FAR is 6 and air rights are free for social housing, whereas, for popular housing, the maximum FAR is 5 and air rights cost 40 to 60% (depending on the area of the housing unit) of the air rights for high standard housing (Prefeitura do Município de São Paulo, 2014, 2016, 2016).

Air rights in the ZEUs are paid to a fund called FUNDURB (*Fundo de Desenvolvimento Urbano* – Urban Development Fund); according to the law, at least 30% of the funds must be allocated to social housing – as well as 30% to public and active transport and the rest to urban and social equipment, cultural heritage, neighbourhood plans or public and green spaces. However, no geographical constraint was established to allocate the funds, allowing their investment far from transit, in regions of poor accessibility, exacerbating segregation.

Moreover, no minimum amount of social housing units has been established in the ZEUs, so that the DOT housing policy is only based on incentives, the efficiency of which can be questioned. In fact, as mentioned before, the price of the land represents an obstacle for the developers: the products are not affordable for middle and lower-middle classes and the developers only focus on high standard housing for A and B classes.

The urban legislation of São Paulo, however, defines a minimum of 80% of social housing in the ZEIS 3 (the only type of ZEIS present in the area). As presented in the introduction, only the definition of ZEIS 3 and 5 are mentioning urban infrastructure, without specifically mentioning transport infrastructures.

According to the SECOVI SP (2013) – Union of the Real Estate Companies of São Paulo -, in 2013, 51% of the ZEIS 3 area had been constructed since the implementation of the instrument, in 2002; 24% of which, allocated to social housing, totalling 12% of the ZEIS 3 area for social housing. In the Belém area, only 10% of the ZEIS area was developed for social housing, representing 12% of the total vertical housing in the neighbourhood. The figures are comparable to the results exposed by the SECOVI SP. It reveals ZEIS is necessary since it allocates land for social housing and protects the inhabitants of the delimited areas, but the instrument is not sufficient to respond to the significant housing shortage in São Paulo, neither to implement a massive social housing policy near transit.

The state is the major investment actor on the ZEIS: as shown, all the social housing units in the studied area were constructed in ZEIS by the state. Though, the investments seem insufficient to address the housing shortage at its totality. Nothing in the legislation compels the state to invest in the ZEIS - where a minimum proportion of social housing is set - the air rights raised in the ZEUs. So that no relation is

made between the two zones. As a consequence, the efficiency of having two different zones near transit might be questioned.

Inclusionary housing policy should be considered to sort out the aforementioned issues. According to Jacobus (2015), “inclusionary housing refers to a range of housing policies that tap the economic gains from rising real estate values to create affordable housing”. A policy that imposes a minimum percentage of social housing in the new developments, in return for a reduction of air rights or other incentives, should be envisaged. This would include the private developers in the social housing policy and increase the number of housing units produced near transit.

Nevertheless, this type of policy must be well designed and all the stakeholders must be included in the process to avoid resistance. The economic feasibility must be analysed and the private sector must be part of the policy design to make the programme stronger and more efficient (Jacobus, 2015).

5 Conclusion

The TOD theory intends to produce dense and socially diverse neighbourhoods in a walking-distance from transit. In the context of TOD implementation in São Paulo, this paper aimed to comprehend the influence of new real estate developments on the distribution of incomes near transit. Based on the case study of the Belém metro station area, it revealed a shift in the real estate market after the boom of 2007: the private developers focused in producing solely high standard vertical housing and neglected popular housing production; social housing has always been produced by the state. This is reflected by the settlement of middle to upper class dwellings and the gentrification of the area. This study highlighted the necessity of a social housing policy near transit.

Moreover, the study discussed the present urban legislation – Master Plan and Zoning - towards social housing near transit. It concluded the relation between public transport and social housing policies is weak and questioned the efficiency of having two different types of zones near transport infrastructures. Finally, inclusionary housing is proposed as a possible policy and the importance of the economic feasibility analysis and the inclusion of all the stakeholders in the policy design is highlighted. Further studies should analyse the parameters (mandatory percentage of social housing in the new developments, compensation in air rights and other incentives) and propose a feasible design for such policy.

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