



Urban sustainability and mobility in Sao Paulo city's 2002 and 2014 master plans. A comparative analysis

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ABSTRACT: This article aims to discuss the contemporary urban-territorial policies pointing to sustainable development of cities. To do this, it investigates two different moments of urban planning for the city of São Paulo: the Municipal Strategic Master Plan approved in 2014 and the previous Master Plan, from 2002, making a comparative approach. The paper discusses the urban mobility issue linked to sustainability, assuming population density as a critical indicator to the analysis, which relies on specific literature on sustainability and urban mobility presented, among others, by the authors: Henri Ascelrad, Nabil Bonduki, and Erminia Maricato. It regards the planning instruments presented in co-related legislation, such as the 2012 Municipal Urban Mobility Plan for São Paulo and the 2001 Statute of Cities, as well. It is presupposed that there is a close relationship among urban sustainability and mobility, both concepts connected to population density. Thus, it stands up for the thought that a denser and multifunctional city corresponds to social and environmental sustainability as it is more democratically accessible. The paper concludes that in the scope of Sao Paulo city's urban planning there was an evolution of the main territory ordering device towards urban sustainability during the studied period. At the end, it seems that this set of issues encourages the production of a city better committed to the community and to building up socially just urban space, especially in access to public spaces and urban services.

Keywords *Sao Paulo, Urban Planning, Strategic Master Plan, Sustainability, Urban Mobility.*

1. INTRODUCTION

Master Plans are key tools in supporting city growth and giving direction to it as they are responsible for the regulation of the many actors involved in the production of urban space. It is through such legal instruments that public policies are legitimized and multiple interests of society are mediated. Given the complexity of urban-environmental problems in contemporary cities together with the lack of satisfactory policy responses towards sustainable development, especially in developing countries, discussing territorial planning regulatory instruments in cities such as Sao Paulo is of fundamental importance.

Historically, Brazil has failed to plan and invest in three basic structural urban public policies linked to the production of the built environment: transport, housing and sanitation (Maricato, 2011). However, in the twenty-first century, Brazilian urban planning has evolved and manifested through various modalities. One of these is the Strategic Master Plan (SMP), which determines legal grounds for urban planning at municipal level. Sao Paulo was the first Brazilian state capital to approve its own SMP in 2002. After ten years, this SMP was revised and its new version has been in force since 2014.

This article aims to discuss relations between urban mobility and sustainability through the implementation of urban planning tools. In order to do that, firstly is presented the city of Sao Paulo and the mobility crisis experienced in the metropolis. Then, the theoretical contributions in which the reading of the 2002 and 2014 SMPs is grounded.

2. “ROADWAY-ISM” IN SAO PAULO

Sao Paulo is a state capital and the largest city in Brazil. It covers an area of 1521.11 km² with an estimated 11,967,825 inhabitants population (IBGE, 2015). The so called Great Sao Paulo congregates 39 municipalities and forms the 10th most populous megacity in the world (Demographia, 2015), gathering 20.935.204 million inhabitants, which means 10.32% of total Brazilian population (IBGE, 2014). The state of Sao Paulo holds more than 30% of the country's vehicle fleet, which exceeds 91 million (Denatran, 2016). The city of Sao Paulo alone holds 8,229,617 vehicles (Denatran, 2016), which represents almost 9% of the whole Brazilian fleet. It also means 1.45 people per each vehicle in the city. Sao Paulo's urban scenario has been moulded by individual car-priority policies with major roadworks, which Nakano (2015) classified as “roadway-ism” [rodoviarismo]. In this same vein, Rolnik (2014c) speculated that there would be half a city of garages underground. According to Rolnik (2014c), the historical pattern of vertical construction seen since the 1970s stimulated greatly the consumption of private cars by predicting too many car parking spaces in buildings.

2.1 Territorial structure of the metropolis

Santos (1993) described precarious living conditions and general habitability deterioration problems faced in large cities by conceptualizing the metropolitan involution phenomenon. Wide horizontal expansion of the metropolis turns out as a territorial structure that segregates the population spatially and socially (Santos, 1993). On one hand, the low-income population suffers from lack of infrastructure and urban services. On the other, social strata of middle and upper income isolate themselves in high-walled and gated communities, surveilled and accessible primarily by car. Peripheral urbanization spreads over protected areas in both ways: by substandard housing with no access to urban land market, and by upscale developments, fleeing

the violent city (Santos, 1993; Bonduki, 2012). According to Samora (2012), in 2000, 57% of Sao Paulo's people lived in suburban districts, of which 30% in slums. In 2007, almost 20% of empty homes in the city were located in central districts (Samora, 2012). The data show that while downtown and former quarters lose population, land outside the city reproduces rapidly, not only in Great São Paulo, but also in Brazilian inland medium-sized cities (Pescatori, 2014). Thus repeating a waste-resource and polluter paradigm, which degrades quality of life in cities (Acselrad, 1999) by minimizing public space importance.

2.2 Mobility challenges in Sao Paulo

Several authors (Scaringella, 2001; Rolnik, 2011; Maricato, 2012; Bonduki, 2012; Nakano, 2015) point out poor conditions of mobility as main social and urban problems. Inefficient public transport systems together with prioritization of individual motorized transport for the daily commute aggravate problems associated to long distances between housing and employment. The twentieth century in Sao Paulo began with a paradoxical housing growth in the extreme east, while jobs were offered primarily in the southwest quadrant of the city (Scaringella, 2001). Radiocentric highways organize an urban structure which generates intense flows of people and vehicles on pendulum dynamics among central and peripheral areas (Nakano, 2015). Therefore, morphological "roadway-ism" practiced for decades as city planning has resulted not only in dispersed residential fragments but also in progressive concentration of jobs and services on inarticulated urban centralities. Commute occurs mostly within an extent of 2.5 thousand kilometers of roads, while town encompasses over 14 thousand kilometers of roads. This excessive path convergence results in slow or congested traffic flow at specific times, which turns into urban imobility (Scaringella, 2001).

On this basis, Scaringella considers that the "root of the crisis" is the "divorce between land use policies, transport and transit" (Scaringella, 2001, p.56) and concurs with Nakano who states that "balancing spatial distribution of homes and workplaces is as important as investing in public transportation systems" (Nakano, 2015, p.267). There is broad agreement in literature that tackling the issue of mobility requires a systemic approach, with long-term vision, in technological, political and administrative spheres, with particular emphasis on achieving participatory management processes (Acselrad, 1999; Bonduki, 2012; Rolnik, 2014a; Pescatori, 2014; Orrico Filho, 2015; Nakano, 2015).

2.3 Mobility impacts on human health

Saldiva (2015) argues that urban policies should be focused on quality of life and health as the lack of urban mobility entails many negative impacts in population's health. First of all, people are more exposed to the ills caused by air pollution while stuck in traffic. Secondly, given the long duration of daily routes, people are subjected to long hours of inactivity, which affect physical and mental conditions. According to Saldiva (2015), obesity rate is lower when population adopts active transport such as walking, cycling or even taking buses and subways. In Sao Paulo, for instance, mass transit users walk an average 1 to 3 kilometers a day (Saldiva, 2015). Saldiva (2015) highlights many dangers of exposure to air pollution, starting from its relation to cardiorespiratory system disease rates. There are also many risks to pregnancy as mothers exposed to polluted air can develop hormonal disorders. Babies also may suffer from difficulties related to weight gain or compromised pulmonary development (Saldiva, 2015). Air pollution is

also one of the main causes of increased mortality due to temperature rise because it contributes directly to the formation of heat islands in urban environment (Saldiva, 2015).

3. URBAN SUSTAINABILITY

3.1 Socio-environmental Justice

As stated above, understanding sustainable mobility is way beyond management of transport systems, especially in emerging economies' large cities. In these contexts, there are structural issues that need to be worked out such as the democratization of urban space consumption (Orrico Filho, 2015). The sprawling city reflects a physical environment of dispersion added up with imbalances in environmental, social and economic terms in urban space production (Acselrad, 1999). Building a more sustainable Sao Paulo requires a profound change in city's historical matrix of urbanization. To promote environmental justice is to act against unequal qualification of public spaces (Acselrad, 2002; Bonduki, 2012; Nakano, 2015). Socio-environmental justice implies inter-sectoral set of public policies and financial investments focused on dignity of human person (Ferreira and Ferrara, 2015). The emergence of the environmental justice concept was described by Acselrad (2002) as the spatial imposition of unequal vulnerability to environmental risks and power over land. More than that, it was identified as institutional practice of governments, in clear alignment with market pressures in contrast to fragile minorities not conscious of their condition (Acselrad, 2002).

3.2 Sustainable mobility and compact city

Addressing the issue of mobility involves issues much greater than urban design of transportation networks. Sustainable urban mobility policy is invariably articulated to all sectors affecting the occupation and use of land (Orrico Filho, 2015). A city's mobility system is composed of several transportation systems that are interrelated, so that specific and disjointed investments contribute little to resolve a general crisis. Embracing the notion of socio- environmental justice outlined above, the concept of the compact city has been under consideration by several authors such as Henri Acselrad, Marta Romero and Frederick Holand as a possible strategy to keep back urban sprawl (Pescatori, 2014).

In the 1960s, Jane Jacobs wrote in defense of urban density intensification, as opposition to modernist renovations and suburbanization and as a start for further formulations on urban compaction. Jacobs also recommended the diversification of uses, size limitation of urbanized areas and claimed for formal cohesion to the cities, pedestrian scale urban design and humanization of urban environments (Jacobs, 2000). In the following decade, discussions on urban densification and its relation to sustainability emerged, aiming smarter ways in using natural resources. There are multiple benefits by the increase in built area and population densities in the consolidated neighborhoods, as they save new territories from being occupied. This practice aids agricultural and natural areas preservation. Thus, concentrating urban functions showed up as a way to more sustainable urban environment.

Agenda 21 (United Nations, 1992) condemned the excessive urban expansion and recognized it as a result of urban land speculation. Compact urban forms are based on environmentalism and are motivated by the costly pattern of consumption and production of low-density urban areas, especially the suburbs of the United States and Europe. Sao Paulo city's low population density of

7398.26 inhabitants per km² suggests that mobility issues amendments may begin with better allocation of housing. Precariousness in transport systems, housing and urban infrastructure in distant neighborhoods suffer also from inefficient governments in preventing environmental disasters.

To compact means to densify but cannot be restricted to its pure definition. In contemporary discussions, it is understood as a sustainable urban design solutions set to tackle environmental problems. Facing urban sprawl requires a purposeful attitude to design and implement new forms of urban development. Thus, the literature on the compact city suggests direct urban design and strategies for practical problem solving for different sectorial spheres in contemporary cities (Pescatori, 2014). In a pragmatic way, the compact city offers space occupancy response to major issues of contemporary urban planning such as environmental degradation, fuel consumption and greenhouse gas emissions, urban mobility, social and spatial exclusion and public space decay (Acselrad, 1999; Pescatori, 2014; Bonduki, 2012; Orrico Filho, 2015).

4. THE URBAN PLANNING INSTRUMENTS

4.1 Methodology

The Strategic Master Plan (SMP) is the main municipal urban planning instrument in Brazil. From here, we will examine São Paulo's 2002 SMP, as well as its subsequent review, which is the current SMP, in force since 2014. Literature review provided the fundamental concepts that sustain our comparative analysis of past and present Master Plans. Several authors guided this research to address the mobility issue by metropolitan perspective, instead of a city-confined matter. Moreover, theoretical basis pointed to planning and production of buildings and urban space as a social processes, directing attention to interactions between the people and the legal planning instruments. Prior to the analysis of Master Plans, here we present the City Statute, Brazilian national legal instrument that regulates all SMPs. Then, Sao Paulo's 2002 and 2014 SMPs are briefly described in their ways in dealing with land access and use, transportation, and public policy oriented to urban mobility. The analysis that follows was based on the compact city concept as a link between sustainable urban space and population density. Together with land use diversity, some influencing factors over restructuring Sao Paulo's territory seemed to be inspired by compact city urban design strategies. Finally, the article evaluates the progress of the Master Plans over time and points out a broader meaning for metropolitan sustainable mobility.

4.2 The City Statute (Law no. 10,257 of July 10, 2001)

Brazilian Urban Reform Movement that has taken place since the 1960s in the struggle for urban planning based on social justice ideals. In 58 articles, the City Statute approval set important achievement due to pressures from the Urban Reform Movement on public policies and politicians. City Statute nationally regulates a number of urban planning instruments, and operationalizes the application of two articles on urban policy (Art. 182 and 183) of the 1988 Constitution. These laws obliged all Brazilian cities with more than twenty thousand inhabitants to elaborate a Strategic Master Plan (SMP) and enforce it as a basic instrument of municipal urban development policy. Above all, they established parameters for social use of urban land and regulation of environmental concerns to urban space. A SMP presents the guiding principles related to economic and social development within the city, covering key aspects such as transport, sanitation, housing, education, among others (Brasil, 2001).

4.3 Strategic Master Plan 2002 (Law no. 13,430 of September 13, 2002)

The plan proposes a number of important principles in which social justice is highlighted: it points out the necessity of reducing social and regional inequalities, equal right to the city for all, including the access to urban land, housing, environmental sanitation, urban infrastructure, transportation, public services, work and leisure (São Paulo, 2002). It also stands out for universalization in mobility and accessibility; priority to public mass transit; preservation and restoration of the natural environment and participation of the population in decision-making, planning and management. Weakness resides on its too general guidelines, objectives and concepts articulated on 308 articles (São Paulo, 2002). No less than 338 Strategic Actions, showing lack of objectivity, expose the excessive generality of this law. While Plan and Law for Land Use Control and for Regional Plans were included, Villaça (2005) stated that Housing Plans, Road Traffic and Transport have become “mere attachments”.

This plan demonstrated some concern for mobility and restoration of the environment. Article 9 addresses development of social functions on urban land towards socially just and ecologically balanced and diversified territory to ensure the equitable welfare of its inhabitants by items: IV - the reduction of displacement between the housing and labor, supplies, education and leisure and VI - the preservation, protection and restoration of the environment and urban landscape. This last item interacts with Article 10 in Section II stating the rational use of natural resources to ensure a sustainable town, socially, economically and environmentally, for present and future generations. It vaguely seeks to stimulate densification along Collective Public Transportation Structural Network by intensifying and varying land use around it and the so called Tertiary Poles, which are Poles of Centralities and Axes between them (São Paulo, 2002).

In short, the vision of Sao Paulo's 2002 SMP was considered positive, but too optimistic or idealistic compared to its application (Villaça, 2005). Although there were placed social and economic thoughts, the text actually restricted itself to control urban zoning, of which implementation occurred only through the Use and Land Occupation Law (Law 13,885/2004).

4.4 Strategic Master Plan 2014 (Law no. 16050 of July 31, 2014)

As in the previous SMP, this text also begins with the explanation of the scope of the concepts, principles and objectives of the law. Sao Paulo's 2014 SMP is based on the fundamentals set out in the Federal Constitution, the City Statute and the Organic Law of São Paulo Municipality. Among the principles and objectives contained in it, Chapter V - Policy and Mobility System reserves a number of sections (Section I to Section VIII) that deal with objectives and guidelines to various city planned mobility systems. It describes pedestrian circulation system with universal accessibility, road system, public and private transportation systems, cycling and car sharing systems (São Paulo, 2014, pp. 139-152). The guidelines seek to optimize urban mobility through integration and coordination between various modes of transport, discouraging individual transportation by limiting park spaces. It also encourages expansion of mass transit network and non-motorized transport systems considered less polluting, such as cycling and walking. It aims to introduce new components to urban mobility system, like logistics system, water transport and car sharing, in order to widen the means of transport and their efficiency, seeking to produce a balanced environment. To reduce the individual motorized commuting in long term, it combines average transportation network to high capacity Axes, foreseeing spaces to consolidate jobs and housing in so called Structuring Axes of Urban Transformation. Article 6 guideline III presents Urban Development Policy to direct the distribution of land uses and use intensities in a balanced

manner, in clear effort to avoid idleness or overload in relation to the available infrastructure, transport and the environment, and to better allocate public and private investments. It encourages a planned population density, in order to guide the growth of the city in close proximity to mass transit, balancing jobs and housing within the city and thus reducing time and distance in daily transits. Territorial ordering plan also limits car park spaces in commercial and residential buildings as well as buildings heights. It shows clear effort to avoid excessive car fleet in regions supplied with mass means of transportation.

5. ANALYSIS AND RESULTS

From 2012 to 2014 there was a discussion to recast the Sao Paulo's 2002 SMP. This revision process produced a set of discussions within society and public authorities about production of city space, pointing paths of hope for more democratically decision-making procedures in the future. The participation of commons made explicit the political conflict of collective interests and real estate market logics that has tremendously influenced public urban policies in Brazil.

5.1 Innovations from 2002 to 2014 SMPs

Both plans show concern for structuring a network to public mass transportation associated with population density. The difference lies in the articulation with different transport modalities that current master plan seeks to promote, influencing the relations of people to public spaces and to the city in general. 2014 SMP also recognizes best that building a more balanced city goes by the reversal of the current mobility model, in which the use of private cars takes a big part.

- I. **Building potential and densification:** Constructive logic defined for vertical developments, proposed greater building density in collective transport axes mass and less in the inside of the neighborhoods, including specific urban design. Vertical building construction guidelines stimulate less isolation to sidewalk and more interaction between public and private spaces. Thus, the first constructive contribution is to embed other potential uses to ground and first floors, encouraging mixed-use buildings. This is also effective to decrease the walled perimeter in pedestrian level. This strategy is called the Active Façade use (São Paulo, 2014).
- II. **Land policy:** Another significant advance in 2014 SMP are the proposals for social and urban inclusion of low-income population in central well-structured underused urban areas. For this, there are two mechanisms: the so-called Special Social Interest Zones (ZEIS) are reserved urban areas to be occupied by social housing land policy and the Solidarity Quotas, which is a certain percentage of apartment units in vertical new enterprises located on strategic urban areas that are supposed to be destined to low-income families. Rolnik (2014c) states that both legal instruments of well-located land reserve for social housing in the city is positive to urban life. It increases the possibility of access to consolidated urban land for social interest housing with the expansion and improvement of ZEIS that the 2002 SMP tried to establish back then. The institution of solidarity dimension adds to the building production some effort of social housing in valuable areas. Unfortunately, the plan has eased the guidelines from its original text towards real estate market intentions, which diverges from miscegenating classes in new ventures.

- III. Popular participatory process:** Pressures from various movements for housing and their active participation in reviewing 2002 SMP have turned the decision-making process of 2014 SMP into a more public process. The increase of popular participation during time has induced further discussion on land access and housing matters, which Rolnik (2014b) characterized as "perimeters war zones and destinations." In this context, there is room for deconstruction of the argument that these movements wish to put forward in the registration queue for housing programs, since the resources allocated to entities not compete with the allocation of funds to contractors or private housing financiers. The participatory process involved different sectors of civil society and the local government, with public and virtual discussions. Positively, it legitimized the decision-making process and strengthened democracy. Hopefully, improvements in informing, consulting and listening to city's population will deepen in the following SMP.
- IV. Encouraging non-motorized transport modes:** The Municipal Urban Mobility Plan emphasizes the pedestrian and bicycle mobility by implementing bike lanes and sidewalks reform in strategic areas. It also reinforces the need for more signage and lighting to increase public safety in pathways. Nakano (2015) calls our attention to the fact that from 2007 to 2013 there was an increase in use of public mass transport (especially subway) and non-motorized transports by upper classes, who live nearby better mobility infrastructure. On the other hand, use of motorcycles and cars has risen among lower classes, whose homes keep spreading away from urban centralities.

5.2 The gap between theory and practice

The main fragility found in SMP 2014 is to treat sustainability and mobility at city level, instead of metropolitan level. Rolnik (2014) illustrates this by pointing out the absence of specific guidelines for very important urban axis Tietê, Pinheiros, Jacu Pêssego, a stretch known as Metropolitan Structuring Macro Area. The axis in question consists of big avenues and highways that lead to Sao Paulo's downtown. It is home to water flood river areas and rail edges and have no structure linked neither to the collective mass transportation nor to Special Zones of Social Interest. Inclusive public policies are necessary, but face enormous difficulties of implementation and the lack of specific guidelines for the axis leaves it vulnerable to exploitative land market practices far away from social responsibility. By reading several authors (Nakano, 2015; Rolnik, 2014; Bonduki, 2012; Samora, 2012) we observed that real estate contractors and their ingrown shareholders are very closely related to Brazilian cities' government and management. Logically, Sao Paulo is not at all free from political and financial pressures in order to produce an exclusive city, made for the few who can pay to use their spaces and services.

Sectors of the organized civil society presented themselves in the public debate for reviewing Sao Paulo's 2002 SMP to press City Council for the yet not held Urban Reform. Besides historical procedure, misrepresented use of legal mechanisms for urban regeneration and integration of social interest residences into consolidated areas in the city of Sao Paulo as identified by Samora (2012) and Bonduki (2012) might have motivated such popular participation in their studies. Together with Rolnik (2014c) the authors agree that social mobilization in defense of more inclusive city was crucial in that moment to restrain political subordination to real estate capital. Social struggles have arisen many times against the urban inequality scenario of Brazilian cities. Although still open to improvements, the popular participatory revision process gave people a legitimate resistance tool to private appropriation of public investments and collective urban improvements that grant real estate valuation. So Maricato (2011) and Rolnik (2014c) agree that

a positive aspect was the strengthening of popular participation in the reflections on the city and urban planning in all its stages, as they contribute to concrete progress in the exercise of democracy.

6. CONCLUSIONS

Although Master Plans represent a breakthrough for urban planning and building of Brazilian cities, there are still delays or distortion in implementing measures provided by law. To enforce the available urban planning laws is a challenge related mainly to urban management. Capital power and financial elites generally submits political practice in Brazilian cities. This implies weak or altered applications of the urban legislation. Sao Paulo faces enormous inequality among the social forces involved in the production of its urban territory. This paper evaluates that popular involvement in the formulation of 2014 PDE was a first step for constituting spaces of mediation between government, civil society and the capital. Many authors agreed that participatory decision-making policies are crucial to formulate a true democratic city project, responsive to social and environmental issues. Thus, to plan and to produce urban space results from social processes, collectively developing ways to demand and supervise public policies that are closer to social and environmental justice.

The emphasis on "roadway-ism" and inequality in access to land (especially for housing purposes) imposes structural problems in urban space, directly interfering in people's mobility. In search for urban sustainability based on social and environmental justice, compact city design concepts appear in Sao Paulo's 2014 SMP. Therefore addressing the challenges of mobility in Sao Paulo together with densification and land use diversification. It is though very important to note that urban mobility crisis is part of a structural problem that surpasses the municipal field of action and requires metropolitan planning effort. In this sense, the PDE 2014 brought about a spatial structure that aims to increase density around some transport routes, but it disregarded metropolitan scale. Punctual and disjointed actions will not be enough to resolve mobility crisis or achieve urban sustainability, exactly because those are topics suited to systemic approach. Thus, full feasibility of the PDE is compromised by the formulation of an urban planning instrument that is restricted to municipal action. Therefore, we point out a need for a Statute of the Metropolis to achieve a sustainable city in Sao Paulo.

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