City and Movement

Mobilities and Interactions in Urban Development

ITDP Brasil

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Editors
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Cities face unprecedented mobility challenges worldwide. Modernization, rising incomes, and public policies have fueled explosive growth in automobiles, trucks, and motorcycles in Brazilian and other global cities. Today, motorized vehicles account for more than one-fifth of the world's carbon dioxide emissions, a major contributor to global climate change.

Motor-vehicles and the motorways that carry them should not be demonized, however, for they provide unprecedented freedom to move about and take in the life of the city. They are also spatial liberators, enabling more and more households to live on the outskirts to secure affordable housing. But in so doing they dramatically increase commute durations. More and longer trips invariably worsen traffic congestion, hurting local economies, polluting the air, inflicting stress, and detracting from quality-of-life.

Motorization is often accompanied by a decline in the mobility roles of greener, more sustainable modes, notably public transport, walking, and cycling. Heated competition for scarce urban space and the social and political conflicts that result also intensifies. As the mobility footprint of cities and regions increase, so does the consumption of open space, displacement of households, and uprooting of longstanding neighborhoods and urban enclaves. Community empowerment and participatory planning become all the more important in giving voice to local citizens on how land and urban spaces are best allocated and put to public use.

As the rich compendium of essays in City and Movement make clear, sustainable mobility futures will necessitate a re-ordering of public priorities in ways that promote inherently resourceful forms of mobility, frames investments and policies in holistic terms, and seizes upon opportunities to integrate transport infrastructure and urban development when and where they avail themselves. Mobility policies, plans, and investments must also be increasingly pro-poor. Designing cities and mobility systems in ways that provide equal and affordable access to all will be vital toward achieving socially just as well as economically robust and environmentally resourceful cities of the future.

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Federal Government of Brazil

Ministry of Planning, Development and Management
Minister, Interim Dyogo Henrique de Oliveira

ipea **Institute for Applied Economic Research**

A public foundation affiliated to the Ministry of Planning, Development and Management, Ipea provides technical and institutional support to government actions – enabling the formulation of numerous public policies and programs for Brazilian development – and makes research and studies conducted by its staff available to society.

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The work depicted on the cover of this book is the drawing New York, by Candido Portinari (1903-1962), dated 1942. Besides the undeniable beauty and expressiveness of his works, Portinari has conceptual importance for a research institute such as Ipea. The "painter of the New World," as he was once called, portrayed key moments in the history of Brazil, its economic cycles, and above all the Brazilian people in their conditions of life and work: matters whose study is part of the very mission of Ipea. The institute thanks the Portinari Project for the honor to use the artist's works in its production.

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FOREWORD IPEA

All the world's great cities share at least one major challenge for the 21st century: reshaping the current daily mobility standard that has transformed huge areas into individual transportation facilities during the past hundred years. Cities such as Los Angeles – the quintessential city constructed for automobiles – set aside more land for parking than roads; together they greatly outstrip other uses of the city, such as living, working, studying, entertainment etc.

Our daily commutes interconnect places in the city and also structure our relationships, while also defining construction standards for our living areas. With a realistic view of possible scenarios for the future of our cities, an awareness of the ongoing process of climate change, and engaged in fine-tuning public policies so that they contribute to the construction of cities for all citizens, rather than cities for automobiles, Ipea signed a cooperation agreement with Institute for Transportation and Development Policy (ITDP-Brazil) and joined the quest for effective urban mobility upgrade solutions. We now have the pleasure of sharing some of the outcomes of this partnership. The topics addressed here extend beyond the issue of transportation: this publication has the merit of showcasing a systemic overview of urban mobility, spreading outside daily commutes to encompass social, residential and job mobility, among other aspects.

Together with ITDP, Ipea has thus fulfilled its mission of producing knowledge applied to fine-tuning public policies. Written by a wide variety of authors ranging from Ipea and ITDP technical staff to guest contributors, the chapters presented here unveil a profusion of ideas that not only offer critical assessments of what has already been done, but above all indicate alternative paths to be followed by a society that is no longer willing to be constrained by the chains of the past.

Pleasant reading!

Ernesto Lozardo
President of the Institute for Applied Economic Research

FOREWORD ITDP

The problems faced by Brazilian cities today trace their roots to patterns of urbanization that are decades old. Growth has been marked by urban sprawl, priority for personal vehicles, socio-spatial segregation, and physical separation between jobs, housing, and opportunities. The 21st century began with around 82% of the Brazilian population living in cities, largely marked by the lack of integration between transport policies, use, and occupation. By 2030, 90% of Brazil's population is expected to live in cities.

Starting in the 1950s, a series of political, economic, and cultural factors led Brazilian cities to start being planned for the convenience of cars. Rising personal incomes and the expansion of the local auto industry made personal vehicles more accessible to Brazilian residents. Between 2002 and 2012, the number of private vehicles doubled all over the country.

As a result, Brazilian often must contend with long commutes, unsafe street crossings, and a lack of social integration. Our cities need urgently to renew their focus on improving urban growth patterns, fixing the problems of the past and preparing themselves for a stronger future.

How can Brazilian cities face these challenges? There are no easy answers to this question. The Institute for Transportation and Development Policy (ITDP), working closely with Ipea in this publication, strives to inspire people to rethink Brazilian cities addressing these concerns. We hope that these articles can make a difference, increasing awareness of good urban growth concepts, in order to reshape cities, returning them to a human scale, planned and made by and for people.

Clarisse Cunha Linke
Country Director, Institute for Transportation and Development Policy (ITDP-Brazil)

CITY AND MOVEMENT: MOBILITIES AND INTERACTIONS IN URBAN DEVELOPMENT[1]

This book is the outcome of a fertile partnership between Ipea and the Institute for Transportation and Development Policy (ITDP) that began in 2013. Published in English and Portuguese, it gathers together thirteen articles that address the issue of the city and urban development through the logic of movement.

In the sciences as well as public policies, approaches to the topic of cities and urban development are usually strongly linked to long-term locations, particularly homes and other places where daily activities are performed. Land use and the distribution of facilities, amenities, services and infrastructure firmly steer analyses of the city and its urban aspects.

In other words, the circulation of goods, people and ideas is usually addressed through a set of fixed items that allow, demand, increase or curtail transportation options. Taking the movements that enliven the life of relationships – among people, and between people and fixed facilities in places – as a starting point to address the city and urban development is not necessarily the most common analytical starting point, although these movements are a matter of concern for a wide variety of studies.

Projects exploring urban mobility (both physical and symbolic) are becoming steadily more important as daily commutes multiply and intensify, underpinned by countless techniques developed and adapted to the acts involved in moving around, embracing all possible ways of commuting in today's world, without necessarily changing locations where people spend lengthy amounts of time. Similarly, theories and analytical methods are multiplying, paving the way for new and more tightly-tailored structures that are both explanatory and propositional.

The outcome of innovative public efforts, this book strives to give mobility the status of a major category for reading and analyzing urban space. The idea of mobility appears here as an effectively integral part of urbanization processes that lead to new urban experiences and forms. The reason for gathering together the authors whose works are presented here was to move beyond discussions of mobility *per se*, instead fostering a reading of mobility grounded largely on aspects explaining the conditions of places and regions. Consequently, mobility is viewed as a socio-spatial process, a complexity endowed with characteristics specific to each

1. The editors thank João Pedro Rocha for his support.

place, shaped by social and spatial aspects: in other words, a process encompassing a totality that is defined differently by the factors distinguishing each place.

This publication was initially conceptualized in the wake of street protests that flared up all over Brazil in June and July 2013. This was the first time that the issue of urban reform made nationwide headlines in Brazil: not only the media, but also significant numbers of automobile drivers *took ownership* of the idea that the solution involved upgrading public transportation.

Another major aspect is that Brazil's upwardly mobile lower-to-middle class – which began to purchase automobiles during the past few years of relatively more even wealth distribution and growth – is now becoming aware that invitations to buy their own cars and finally join the modern world are mere illusions. As urban automobile fleets doubled during the past ten years, gridlocked traffic choked mass transportation systems as well. Even options with exclusive infrastructure – such as subways, trains and Bus Rapid Transit (BRT) systems – are now constantly overcrowded, packed by a population avid to consume not only store-bought goods, but also urban space.

Access to public transportation was the banner of union and revolt triggering street protests that swept through Brazilian towns and cities in 2013, highlighting something more than a mere refusal to accept the hike in bus fares that sparked the entire process.

The dispute here could be summarized as a public space crisis: an amenities crunch discussing how open space should be shared with these new arrivals in the world of consumption and – why not – citizenship, even if still somewhat incipient.

Living through its commutes, when the city sees these flows halted, with barriers blocking free movements and trains and subways constantly packed, it also sees friction between bodies and objects rise, pumping up political pressures and social temperatures.

This quick and partial overview of an important time for urban struggles in Brazil provides the context for Ipea's efforts to produce and promote knowledge that fosters the enhancement of public policies nationwide.

Since then, a group of researchers from Ipea has been issuing a set of technical notes and studies that provide input to discussions of this issue. In just a few months, several policy alternatives were drawn up in detail for upgrading traffic and transport quality in Brazilian towns and cities. Ipea presented each of them in the working group set up by the Brazilian presidency during these demonstrations, in addition to ensuring widespread dissemination of the resulting expertise to the federal legislature, town and city Councils, grassroots movements and the media in general.

Soon afterwards, Ipea experts perceived a clear need to pursue an understanding in greater depth of the concept of mobility, addressing this urban crisis beyond its simplest but most obvious aspect and looking beyond transportation system use.

These efforts also stem from a desire to bridge the classic gap between the sciences and transportation/traffic practices associated with urban planning and society. A characteristic inherent to human beings, mobility – is better addressed here in the plural, as *mobilities,* which create the conditions for the daily lives of people and places, of cities.

As such, the task is to analyze the formation and configuration of urban and social space in all its cross-connected complexity, which links so many different sectors together, in order to pursue a better understanding of people's movements. It involves moving beyond the conceptual and the methodological to the empirical as well, exploring the separation between commutes and commuter conditions and the characteristics of the places where they occur.

Everyday mobility – meaning the daily flows of people around the city in short commutes, without changing their main places of residence – may be addressed conventionally, but can also be viewed as something more complex, and with significantly greater capabilities for explaining urban facts and interventions in the conditions of the development of mobility.

The intention here is to focus on how everyday mobility or some of its configuration characteristics (type of transport, regulation etc) are closely associated with other types of mobility, some of which are material, moving through physical space, while others imply social or symbolic commutes, although all are interconnected.

Everyday mobility is addressed through these other types of mobility: social, residential, temporary migration (tourism), long-term migration and even lifespan mobility, from childhood through to old age. Efforts are also made to focus on mobilities through the conditions that structure urban settings and affect each of these types, consequently defining and/or influencing the outcome of these conditions for engaging in other types of mobility, especially everyday mobility.

Viewing everyday mobility as a mobilities system – in which social mobility[2] is today its clearest link, with a powerful impact on transportation systems – has become a need and the responsibility for a group of Ipea researchers, clustered mainly in the Department of Regional, Urban and Environmental Studies and Policy.

2. During the past ten years, the lives of 30% of the Brazilian population have been transformed through moving up into the middle class.

The partnership then arose with ITDP Brazil, a non-profit non-governmental organization that was set up in the United States in 1985 to encourage sustainable transportation. The scope of the activities of ITDP centers mainly on research and drafting propositions jointly with governments and civil society organizations, in order to produce and disseminate applied knowledge that transforms urban policies and transport policies into integrated policies that lead to cities designed for people rather than for automobiles, simply put.

Right from the start, this partnership has been steered by the idea that we can and will produce new knowledge together in language that is easy to understand – due to its usefulness and quality – for public administrators and others concerned with or advocating alternatives and solutions upgrading the urban quality of life, interacting and constantly experiencing contacts with differences, in terms of means of transportation and lifestyles.

In general, the use of public transportation in Brazilian towns and cities (as well as in the United States, where ITDP was initially established) is directly associated with lower income segments of the population or migrants. The purpose of ITDP – to produce knowledge and mechanisms that pave the way for urban development, associated with trunk routes and main mass transportation lines – thus constitutes a logic of transformation and reformation of the city.

At the same time, ensuring good quality transportation system that is affordable and accessible to all means inviting other social classes to make regular use of a system that thus becomes more efficient, serving everyone fairly. This means that dealing with mass transportation systems as part of urban development policies also requires addressing other types of mobility, particularly social and symbolic.

The issue of everyday mobility – part of daily routines – is usually addressed by analyzing transportation systems, their characteristics, use and regulation, together with their relationships to the urban areas under examination. This classic approach to mobility, modes and means of transportation, together with access and accessibility, is of the utmost importance for describing and analyzing urban configurations and the conditions and possibilities offered by urban space for the movements of people, objects and actions.

The contributions in this book deploy their own methodologies in their assorted quests to present the historical, social and political impacts and pacts that define and characterize the socio-spatial structure that underpins mobility, focusing on specific issues.

Consequently, the issues addressed in following chapters range from the creation of urban gaps and the peripheralization process resulting from real estate sector pacts and dynamics, together with housing and urban development policies,

through to an understanding of how urban formats are associated with political selections of commuter transportation options, exploring their impacts on the conditions for materializing other means of transportation and other types of mobility.

The efforts reflected in this book attempt to explore not only aspects disclosing systemic links among types of mobility, beyond the determining factors of certain social structures and urban infrastructures. There is also an understanding that progress in theoretical and applied concepts is required, moving ahead with the conceptualization and justification of broader explanatory frameworks that display long-term political decisions or even social structures such as urban segregation, socio-spatial exclusion, etc.

Several authors also underscore the need to showcase specific illustrative experiences in pursuing a broader understanding of the *urbe* and addressing issues in the everyday life of cities and their relationships with mobility systems and vice versa. This standpoint encompasses efforts to assess the quality of urban design projects, together with constructed environments and landscapes, pursuing possibilities of access to production and consumer goods.

Thus, chapter 1 – *Mobility, a Systemic Approach* – by Renato Balbim, explores the polysemic content of the concept of mobility. From a primarily historical standpoint, the term *circulation* is retrieved and its use in the sciences is examined until reaching the term *mobility.* A discussion is then presented of classic authors such as Max Sorre, Foucault and Raffestin, debating and exploring in greater depth the understanding of the concept of mobility. The purpose outlined by the author is to reveal the systemic status among the various types of physical or symbolic mobility, presented by the author in a systematized manner. The issues discussed here steer other discussions and ideas in this book.

In chapter 2 on *The Significance of Mobility in the Democratic Construction of the City*, Jorge Luiz Barbosa introduces the political dimension into the urban mobility debate, taking as a hypothesis the triumph that the mastery and management of mobility scales represents for the players in question – governments, companies and citizens – under the aegis of metropolitanization, as a process speeding up the homogenization of space, intensifying its fragmentation and offering location hierarchies. Within a context of *territorial urbanization*, unequal opportunities become even more skewed as urban workers grow increasingly dependent on (lengthy) commutes that eat away their time for rest, recreation, study and pleasure. This thus constitutes a public sphere of political disputes for social control and mastery of mobility scales, buttressed by demands to transform the meaning of the city: the democratization of mobility corresponds to the renovated construction of its fabric, making it a shared endeavor.

In chapter 3 on *Everyday Urban Mobility, Urban Segregation and Exclusion*, Eduardo Alcântara de Vasconcellos extends the two previous contributions through a set of analyses empirically demonstrating the impacts of motorized commutes on the lives of Brazilians, prompted by expanding road space consumption (with constraints on other uses) trip times and energy use, in addition to pollutant emissions. This analysis indicates unequal *mobility consumption*, distinguishing between who pays for mobility and who really benefits from it, reaching the conclusion that calling road system investments democratic and fair – at least in the manner in which they are currently handled – is an urban myth in Brazil. However, mobility is addressed in many different ways by public policies, ranging from disdain with poor (or even feigned) services and support, through to protection and even adulation, depending on the means of transportation involved.

In chapter 4 on *Integrated Planning, Spatial Organization and Sustainable Mobility in the Context of Brazilian Cities,* Antônio Nelson Rodrigues da Silva, Marcela da Silva Costa and Márcia Helena Macêdo discuss the concept of *sustainable urban mobility*, which extends beyond sectorized circulation, transportation or land use planning. The authors describe the development of a mobility conditions of measurement tool – the Index of Sustainable Urban Mobility – and applied to six Brazilian cities. This analysis highlights the following items: better-performing aspects of public policies such as administrator qualification and capacity-building as well as preparation of master plans and urban planning legislation, negative outcomes caused by uncontrolled urban expansion during the past few decades, the centralization of public equipment and facilities, and the peripheralization of residential areas.

The intention of chapter 5, titled *The City as Result: Unintended Consequences of Architectural Choices,* by Vinícius M. Netto, is to examine the actual production of the city through its effects (not necessarily intentional, but cumulative over time and able to put down roots in space) on the appropriation of urban space and mobility, focused mainly on the chain of implications arising from the establishment of a specific architectural model that is both current and widespread, which curtails pedestrian flows while encouraging dependence on motorized commutes. Presenting evidence of these effects in Brazilian cities, this chapter discusses how to break away from the standard (prompted by a partial reality) that is characteristic of players specializing in the production of space, through the mobilization of other players in the technical, scientific and regulatory fields, as well as the users of urban space.

In chapter 6 on *Modern Brazilian Architecture and the Automobile: the marriage of the century*, Fernando Luiz Lara also underscores the unsustainable characteristics of Brazil's urban development model, following in the footsteps of the

previous two chapters. Here he examines the consolidation of two hegemonies: a modern architectural model (and city) in which automobile-driven circulation flows prevail over the characteristics underpinning other urban functions that shape the city. Describing this marriage throughout the 20th century, especially in large cities, this chapter analyses automobile-fueled urban expansion in greater detail, together with industrial policies fostering its implementation, explaining the development of modern Brazilian architecture through landmark buildings as he explores this topic.

Chapter 7 presents the *Strategic Master Plan for the City of São Paulo: analysis of transit-oriented development strategies*. Here, Iuri Barroso de Moura, Gabriel Tenenbaum de Oliveira and Aline Cannataro de Figueiredo explore the strategies constructed through this plan in the light of Transit-Oriented Development (TOD) principles that encourage denser and more compact occupancy with mixed land use, close to high-capacity public transportation stations. Approved in 2014 as the outcome of a participative process, this plan for São Paulo is particularly noteworthy for strategies proposing the socialization of profits created through the production of urban places, ensuring the right to decent housing and upgrading urban mobility while enhancing life in neighborhoods, encouraging urban growth close to public transportation, restructuring metropolitan dynamics and fostering the economic development of the city. The authors examine these aspects of the plan for São Paulo in detail and compare them to the TOD approach, with recommendations for its effective implementation.

Chapter 8 explores *A Possible Approach to the Concept of Mobility and Two Case Studies: the Maré and the Complexo do Alemão favelas*, with Jailson de Souza Silva, Eliana Souza Silva, Renato Balbim and Cleandro Krause, discusses the concept of *full mobility.* Affirmed as a right, it transcends physical mobility and encompasses effective constraints on symbolic mobility conditions (and their desired expansion) faced by squatters and shantytown residents. The authors offer two portraits of mobility in poverty-stricken communities in Rio de Janeiro: the Maré community, through the findings of a sampling survey that highlight different types of mobility behaviors, shaped by the social and economic characteristics under examination; and the Alemão Complex, through the most frequent content in the remarks of residents taking part in focus groups. The focus group participants discussed their realities, expectations and perceptions of physical and symbolic boundaries during the urban upgrade project implemented under the Accelerated Growth Program (PAC).

In Chapter 9 on *Transborder Mobility: between the diverse and the ephemeral,* Rosa Moura and Nelson Ari Cardoso explore the everyday life of relationships on national borders, using, among other data, recent information released by

the Brazilian Institute for Geography and Statistics (IBGE) on international migration and cross-border commutes by Brazilians for work and for study. Generally viewed as divisions, borders are instead viewed here as contact zones, especially in contiguous towns linking Brazil to its neighbors, with interactions driven by the differences among them. The data allow recognition of a standard profile for migrants, with Latin Americans more numerous in transborder clusters. These movements offer possibilities of preserving contacts and links of identity with their places of origin, although migrations may be prompted by many different motives. Commuter flows (consequently not implying changes of domicile) originate largely in major Brazilian urban hubs, followed by border towns; nevertheless, these flows are important along the entire length of the border, due to either their absolute volumes or proportions of the total flows. Jobs requiring workers to cross borders frequently require attention through appropriate public policies, together with cultural hybridization and loss of identity – after all, these movements suggest the pursuit of rights not materialized at their places of origin.

Chapter 10 examines *Mobility in Brazilian Metropolitan Regions: migration and commuting processes,* with Paulo Delgado, Marley Deschamps, Rosa Moura and Anael Cintra conducting an in-depth analysis of the relationships between these two types of mobility, highlighting changes sweeping across Brazil. On the one hand, migration patterns have become more complex, with more short-term commutes and inter-regional exchanges, and fewer long-distance migrants; concomitantly, the expansion of outlying metropolitan sprawl and the resulting distances between homes and workplaces result in longer and more complex commutes. The analyses indicate that this upsurge in commuting has become an important strategy for any worker, not only migrants. The most important flow for everyone (and even more significantly for intra-regional immigrants) consists of commutes from the outskirts to the center, with the latter group maintaining employment links downtown and moving to the outskirts of the city, due probably to housing costs.

Chapter 11 weighs *Impacts of Registered Jobs and Urban Location on Work Commutes: an intra-urban analysis of five metropolitan areas*, with Vicente Correia Lima Neto and Vanessa Gapriotti Nadalin conducting job analyses using data from the Demographic Census (like the previous chapter), but split into registered (formal) or unregistered (informal) employment. It attempts to prove a possible substitution between home locations and commuting costs/time to workplaces: the hypothesis presented by these authors is that employment in the formal sector would relativize the need to live closer to work, compared to unregistered workers with similar incomes. This hypothesis is prompted by recent increases in commuting durations in metropolitan regions, as well as growth in formal-sector jobs and the resulting availability of travel subsidies through transport vouchers.

The hypothesis in the survey was tested by estimation through a model, followed by an exploratory analysis of data taken from the 2010 Demographic Census for five metropolitan regions, in order to explain the commuting time variable. The analysis of the determining factors proved the hypothesis, showing longer individual commute times in all the metropolitan regions, due to jobs in the formal sector. On the other hand, the variables that shortened worker commute times to the greatest extent include income, metropolitan location (shorter distances to metropolitan centers) and family ownership of vehicles.

Chapter 12 examines *Urban Insertion of Government Housing Projects: everyday mobility and land use*, by Clarisse Cunha Linke, Bernardo Serra, Fernando Garrefa, Débora Cristina Araújo, Simone Barbosa Villa, Vanessa Gapriotti Nadalin and Cleandro Krause, gathering together contributions from ITDP, Uberlândia Federal University and Ipea through two approaches. The first approach analyzes the findings of a survey of housing developments under the aegis of the My Home, My Life (*Minha Casa, Minha Vida*) Program, highlighting the specific impacts of this new habitat on housing and transportation conditions and costs. The second approach involves an assessment of the urban insertion of each project, in terms of accessibility to formal-sector jobs, public transportation, equipment, facilities, amenities, trade and services, in addition to design and integration with their surroundings. This examination of urban insertion indicates that none of the developments under analysis – in São Paulo, Rio de Janeiro and Uberlândia – offer fully acceptable levels of access to urban opportunities and integration with urban space. The method adopted indicated specific issues to be taken into consideration for upgrading this program as a whole.

In chapter 13, *Regulating Urban Bus Services in Brazil* is examined by Alexandre de Ávila Gomide and Carlos Henrique de Carvalho. The authors analyze the prevailing mode of motorized urban commutes, and present technical and political arguments that justify the regulation of these services. This chapter describes selected regulatory variables in order to construct a reference framework for analyzing new regulatory models, as they are implemented in Brazilian towns and cities. These variables are grouped by their potential impact on the quality of services and their economic validity, in addition to territorial arrangements. Finally, it acknowledges that grassroots participation in mass transportation regulation policies is a practice that is neither common nor effective in Brazil, making it a challenge to be surmounted, along with the equally challenging task of constructing – absent any excellent finished models – the best blend of regulatory attributes for each specific situation.

CHAPTER 1

MOBILITY: A SYSTEMIC APPROACH

Renato Balbim[1]

1 INTRODUCTION

A polysemic term, the concept of mobility – as this paper attempts to explain – is still commonly confounded with other concepts and ideas, such as circulation, accessibility, traffic, transit and transportation. However, its use in the sciences in general is more recent than these other terms, and its appearance did not replace any of them.

The concept of mobility arose in order to throw fresh light on new social transformations that have become more important as the social divisions of labor have deepened during the past few centuries.

This concept of mobility has acquired different shapes and can be deployed for assorted purposes and explanations. Daily mobility entails residential mobility and mobility of labor, and more recently, symbolic mobility. Other forms of mobility include: commuting, tourism and recreation, extending as far as nomadism and even immobility.

All types of mobility are related systemically to the social and territorial division of labor and to modes of production. These modes of production shape the social and territorial space at many different scales, requiring modern human beings to plunge deeper into the life of relationships, including with objects, which become more numerous and portable. In the course of history, the appearance and predominance of movement became one of the most important key elements to define individuals and societies.

The place of staying, of residence, of work, also the place of production, etc, tend to fall behind the explanation and organization capacities of relationships. That happens due to the relative importance of mobility in the modern world, to the extent that a person may be instantly and simultaneously in different places, even without any physical movement. In other words, even places are becoming defined not only by their intrinsic characteristics, but also by the mobility status

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of the people occupying them and the networks that they access and manipulate from these points.

Based on these elements, which will be explored in greater detail below, this paper attempts to demonstrate the thesis that mobility – in the many different forms this concept encompasses – takes place systemically, with various types of mobility determining and defining the conditions for the exercise of all the others, at the individual level with personal travel strategies, as well as at the scale of society and its daily routines.

The experimental idea underpinning this essay is to illustrate each of the main types of mobility and then display through factual examples, showing how each of these types is systemically inter-related, allowing, hampering, encouraging and transforming the content and meaning of all the other types of mobility. Quite correctly, this publication includes empirical analyses that corroborate the hypotheses, theses and assays presented here.

In addition to this more theoretical and methodological discussion, this chapter also underscores the relevance of studies and practical projects that take into consideration the complexity of urban, social and economic policies in an integrated manner. This paves the way for the effective transformation of the configuration and organization processes of mobility systems.

However, it is first important to offer a brief overview of the main pathways of knowledge that lead to mobility becoming one of the core concepts of modern urban planning. To do so, a brief preliminary glance explores the word "circulation", its appearance and development as urban circulation, through to the advent of modern urban planning, which is grounded in the concept of mobility.

2 MOBILITY IN MODERN URBAN PLANNING

The concept of circulation seems to have appeared for the first time in 1628, at that time referring only to the movement of blood around the body. Lavoisier applied this concept in a more complex manner, together with breathing, in the XVIII century; he mentioned the "circulation system" for the first time.

It was through the generalization of circulation paradigms – particularly theories emphasizing the importance of fresh air during the 19th Century – that a broad range of in-depth alterations swept primarily through the cities of Europe, driven mainly by concepts related to public health, civil engineering and urban planning.

At that time, this movement counterbalanced unhealthy living conditions: proponents of fresh air urged proper ventilation as a source of purification, giving rise to the earliest town planning recommendations for broader, straighter streets,

unbroken lines and more open prospects. In that era, the health of human beings was viewed as dependent on their surroundings and living conditions.

The concept of circulation was applied to explain urban movements only after these scientific revolutions, linked largely to the appearance of modern and social medicine. These were focused on disinfecting urban areas, providing basic services for people in general and workers in particular, introducing housing regulations and ensuring well-ventilated downtown districts, in addition to ensuring sanitation in prisons, hospitals and public places.

Economics began to use the concept of circulation from the late 18th Century onwards, when the idea of monetary value began to prevail over bartering and swapping. Through all these innovations, touched on only briefly here, the circulation of goods, people, air, water, etc., became viewed as beneficial, spurring the economy and saving resources with advantages for health and the environment, opening up opportunities and even fostering cultural and social diversity, to some extent.

It was through the abilities of Ildefons Cerdà, an engineer, jurist, and economist who became an urban planner and politician, that these concepts of circulation gathered momentum. Circulation began to shape his concerns about mobility as a core concept of modern urban planning, or urban planning as a science. He addressed these concerns in the Barcelona Extension Plan (1868), which was followed by his General Theory of Urbanization.

Mobility or (even back then) the idea of the life of relationships, structured by a framework of urban streets and thoroughfares,[2] made Cerdà's urban plan the first example of a city scientifically planned for an assemblage of movements. To clarify: until that time, cities had been designed in order to allow movement, but of a different type – generally within neighborhoods or in else journeys outside urban boundaries.

Urban planning was not viewed as a science, but rather as an art, grounded in classical thinking that subordinated street network designs to architectural requirements, not thinking functionally in order to ensure and potentiate the many different kinds of urban circulation.

The appearance of streets was guided by religious, social, cultural, political and symbolic practices, with Renaissance cities opening up thoroughfares and squares to showcase its monuments, politics and power. Florence was an icon of this art since its early days during the 17th Century. In general, the Italian Baroque did not break away from this system, following the same artistic precepts and lines as

2. The cross-streets in the Cerdà Plan form the internal circulation areas within each block (manzanas) and public circulation areas, re-creating rural scales in modern cities, enhancing interpersonal exchanges and meetings.

Renaissance urban planning, firmly tied to Christian architecture and symbols, as seen clearly in the Sixtus V design for Rome and the opening up of thoroughfares for processions. In the same way, Versailles, the royal palace of Louis XIV and also the urban icon of the French Baroque, on which all roads are converged, did not respond to any functionality, but only to strengthen the exercise of power.

And finally, at the end of the 19th Century, Vienna – at that time probably the most culturally important city in the world – became the stage for a clash of urban ideals. The protagonists included modernist Otto Wagner (who redesigned the Ringstrasse, lined by buildings reflecting and streamlining movement) and theoretician Camillo Sitte – who still favored the monumental aspect of the city and its shapes as the driving factor behind urban planning as art (Schorke, 1988; Mumford, 1998).

The battle won in Vienna by "urbanism of movement" in the end of 19th Century, inspired urban planning as a science, and was the crown of the transport system's revolution. In the same time, the city was witnessing the deepening of social division of labor and the complete functionalization of time and space. The creation of new areas with exclusive functions connected by public transportation gave rise to new mobilities and immobilities, many of them predicted, foreseen and analyzed by Cerdà in the Barcelona Extension Plan.

The geographer Max Sorre also addressed the importance of mobility for the modern city and urban lifestyles brilliantly during the 1950s. This author saw a clear difference between the rural and urban worlds, rooted in the creative powers of circulation linked to the existence of cities and their historical development.

For Sorre (1984, p. 116), "participating in a life of extensive relationships creates this atmosphere for which the words 'civility' and 'urbanity' were coined." In the view of a geographer, he said, the city is not an accident in the landscape, but rather, "the physiognomy of its features is the material, long-lasting expression of the urban lifestyle (genre de vie), dominated by the activity of circulation in contrast to rural lifestyles."

For those unfamiliar with geographical terminology, lifestyle (genre de vie) is a combination of techniques deployed in a particular place by a specific organized society in order to ensure its reproduction. The elements forming the lifestyle of each group reach an even balance that ensures its internal cohesion, while at the same time guaranteeing its long-lasting survival, which is one of the key characteristics of any lifestyle.

In other words, Sorre wanted to say that circulation, movement, is the trait shaping not only the trails and tracks essential of modern cities, but also the features and characteristics of social relationships, as states in the

Athens Charter (Le Corbusier, 1968).[3] Going even further, Sorre concludes that movement is the characteristic that gives urban life cohesion, this way of living that makes us identify, to some extent, with anyone else living in a city. The set of possibilities and constraints that result in movements of people, things, ideas and values (symbolic as well) in the city constitute urban mobility, reflecting the urban nature of each location.

3 BUT WHAT IS MOBILITY?

The concept of mobility springs from the influence of classical mechanics, where flows follow the logic of proportional attraction to masses and inversely proportional to distances. In the social sciences, the focus of this concept has always been to connect traffic with society that makes traffic more intense each day.

However, the concept of mobility extends well beyond the idea of physical movement, as it introduces its causes and consequences into the analysis: in other words, mobility is not limited to an action. Instead of separating movements from a wide variety of individual and group behaviors found in daily life stretching back into history, the concept of mobility attempts to integrate the action of movement – whether physical, virtual or symbolic – with the circumstances and positions of individuals and society.

To some extent, mobility is related to individual determinations: wishes, motivations, hopes, constraints, requirements, etc. But its logic is explained only through a joint analysis of these individual determinations and constraints in terms of the real and virtual possibilities presented by society, and also as a function of the place in life where this materializes. In other words, mobility takes into account the organization of space, together with economic, social and political conditions, lifestyles, symbolic contexts, accessibility characteristics and scientific and technological development.

Very succinctly, in the social sciences, mobility designates a set of motivations, possibilities and constraints that influences flows of people, goods and ideas in terms of projection and realization, obviously in addition to movement per se, which alone is only the expression of mobility.

For example, someone may feel that they have little or no mobility, although their mobility rating may be relatively high in terms of the number of trips taken each day. This feeling may be caused by the ongoing repetition of these trips, fettering rather than freeing the person. Alternatively, this may result from low incomes that subject people to daily commuting routines that curtail their knowledge of the city, lowering their expectations of social mobility or progress that would –

3. To access the Athens Charter, see: <www.portal.iphan.gov.br/uploads/cartadeatenas.pdf>.

should this materialize – result in residential mobility, new urban status, different commuting strategies, etc. This is the characteristic explored in this paper: the concept of mobility is not only polysemic, it is also systemic.

4 SYSTEMIC MOBILITY

In order to endow this broad range of types of mobility and their systemic nature with greater coherence, it is important to examine the accepted meanings of this concept. For example, Max Sorre (1955) mentions the existence of an "essential mobility" that is translated by ongoing pressure imposed by the boundaries of the "oekumene" in order to match it to livable land.

But just what does that mean? Essential mobility refers to human eagerness to move around and explore new worlds. "Oekumene" is the word used to describe the inhabited world, transformed by human action. In other words, essential mobility explains the human desire to expand the boundaries of the world. Without this essential mobility, asks the author, how can we explain the jumbled mix of elements characterizing the various parts of the Earth? This same essential mobility continues to drive human beings even beyond the Earth, making the "oekumene" transposable.

In turn, Isaac Joseph (1984) outlined the existence of three core mobilities. The first is the human characteristic of the ability to move, engaging in joint experiences and meetings. The second mobility relates specifically to the urban habitat, as the outcome of a specific link between social mobility and residential mobility, which could be called daily mobility. Lastly, the third is what Georg Simmel (2004, p. 465-467) calls mobility without movement, reflecting the versatility of urban dwellers and their ability to keep pace with fashion and changing lifestyles, shifting and morphing without moving from one place to another, with all movements intensified by the speed of money. "*Consequently, the spreading of fashion, both in breadth as well as speed, appears to be an independent movement, an objective and autonomous force which follows its own course independently of the individual*" (Simmel, 2004, p. 465).

In the Critical Dictionary of Geography edited by Brunet, Ferras and Théry (1993), mobility is defined as a type of movement expressed by a change in position, either geographical or social. According to these authors, there are various types of mobility: social mobility appears through social classes, which are actually income classes or merely external indicators of income, invoked only in an upward direction and with varying levels of difficulty, depending on the society in question. This is closely linked to professional mobility, which consists of changing occupations, while job mobility usually reflects the average length of time spent by an employee in a single company. This may well be understood more accurately as

a type of behavior related to the labor market, rather than an intrinsically human aspect or condition such as the choice of profession and the resulting ripple effects on the set of conditions that affect other types of mobility.

Social, professional, essential and symbolic mobility conform the essential types of social mobility that occur besides physical displacement. But the social mobilities are rather intrinsically related to what might be called spatial or geographic mobilities, which imply moving from place to place.

In turn, the various types of geographical mobility may be systematized through a grid based on the temporal and spatial dimensions of movement, with the temporal dimension divided into: a) recurrent movement with the intention of returning shortly (return trips); or in contrast: b) non-recurrent movement with no intention of returning shortly (linear movement). The spatial dimension is also divided into two types: *i*) trips within the location of life; and *ii*) trips outside the location of life, to other cities, countries, etc.

This results in four types of geographical mobility: daily mobility (internal cyclical movement); residential mobility (internal linear movement); travel and tourism for business and pleasure, in addition to seasonal work (external cyclical movement); and migrations (external linear movement), as shown below.

TABLE 1

Geographical mobilities

Movement	Recurrent Brief, returning shortly	Non-recurrent Lengthy or not returning
Within the location of living	Daily mobility	Residential mobility
Outside the location of living	Travel and tourism (pleasure and work)	Migrations

Elaborated by the author.

Other than these four types of movement, sedentary lifestyles (immobilism) and nomadism must also be taken into consideration, which are more radical forms of spatial mobility that will not be addressed here. However, other authors in this publication quite properly underscore the importance of considering relative immobilism as a specific expression of mobility.

Each type of mobility is strongly connected to the others, leading to the idea that the flows and vectors of different types of mobility are not stand-alone, instead establishing links of causality, complementarity, substitution, incompatibility, etc.

5 GEOGRAPHICAL MOBILITIES AND SOCIAL TEMPORALITIES

Each of the four types of geographical mobility corresponds to specific social temporalities. For example, daily mobility corresponds to brief daily temporalities paced to the social rhythms of daily life, recurrent, repetitive and implying a return

each day to the place of origin. This repetition establishes lifetime habits shaping spatial practices that are mechanisms of reproduction in daily life.

Spatial practices encompass the set of daily commutes and the strategies contrived in order to materialize them, organized by the space-time budgets that we draw up in order to define our strategies in compliance with specific sets of possibilities and constraints. These sets constitute the subject of studies, analyses or understandings of daily mobility.

Many authors address daily mobility as urban mobility. However, this term does not ensure an accurate portrayal of the facts. As mentioned previously, the lifestyle analyzed here is urban, and all types of mobility mentioned here are also urban, from start to finish. Consequently, it is important to be well aware – particularly for ensuring the development of more accurate knowledge – that the concept of "everyday" per se is prompting lengthy discussions in the human sciences (Balbim, 1999),[4] therefore lending a variety of accepted meanings and conceptualizations to "mobility" in this case.

Business and pleasure trips are also fairly brief, extending beyond a single day and taking place outside the life location and with the intention of returning. They may also be considered recurrent because, on returning from a journey and with each new trip, a build up of new experiences will overlay permanent living conditions.

In turn, the temporality of residential mobility is linked to the individual course of life: changes in places of residence alter all pre-existing conditions, as we are largely defined by our relationships with the objects around us, which differ by the places where we stay, neighborhoods, streets, etc. This is consequently definitive, as it redefines people's living conditions and the life histories of people.[5]

Residential mobility may be measured directly by monitoring the real estate market, and may also be assigned in various ways, one of which is electoral geography. For example, in the City of São Paulo, Brazil, there is an entire historical sequence underpinning the electoral map in this state capital, with a wealthy right-leaning core surrounded by poverty-stricken outskirts with ballot-box preferences tending more to the left.

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4. As an introduction to this discussion, see: Berman (1987); De Certeau (1996); Di Méo (1991); Harvey (1993); Lefebvre (1968 and 1981), among others.

5. Particularly noteworthy among several authors focusing on the importance of the place of residence for constructing lifestyles and spatial practices is Lefebvre (*op. cit*.). The contributions of Abraham Moles (1983) to psycho-geography and, more specifically, his references to the layers that surround and complete the subject of the action in terms of practices, are also noteworthy. The practice is established in relation to the place where the subject is rooted, his place of residence. Moles lists the following players to be taken into consideration: the skin, or clothing as a second skin; the sphere of gestures, or free movement; the bedroom as a visual barrier to the outside world; the home as a legal barrier acknowledged by society; the block or the street as a nearby place of reference; the urban center, as a remote place of reference; the region, as a set of places that can be visited through brief return trips; the nation, a recent, frail entity where laws and languages are deployed; and the world.

Apparent for decades, this electoral geography implies low residential and mobility rates in the city, resulting in what are called "shoo-in constituencies". According to Pierre Bourdieu,[6] it might even be said that this is an example of "reified social space" in physical space, meaning that a "naturalization effect" is noted, as social realities have a "durable inscription" in physical space, with their transformations being "difficult and costly" (Bourdieu, 1997).

This low mobility is due to several factors that together encourage people to put down roots in certain places, opting for specific types of transportation and fixed routes throughout the city. By curtailing possibilities, this makes their austere lifestyles even more limited, penning people – particularly the very poor – in particular parts of the city. Adopted systemically, mobility shrinks across the board as a function of urban structure (as in São Paulo) as well as Brazil's macro-economic and social conditions, socio-spatial segregation, housing and real estate sector structuring, etc.

In turn, migration is a type of mobility that causes marked changes in individual identities, with its temporality linked to a broad set of aspects of life. Also definitive and independent of a possible return, migrants' life expectations and possibilities are normally limited to their new living contexts, often clustering in specific neighborhoods where their communities are formed, such as the China-towns found in many Western cities. In this situation, other types of mobility are closely defined by the migrant status of these populations.

There are several definitions and accepted uses of the term, "mobility". As shown, derivations are related, in one way or another, to the length of the journey, the places to which journeys lead (origins and destinations), and the economic, technical and symbolic resources deployed to drive these movements, with the physical and/or social. The temporality of each type of mobility shapes its subjects and their history, as well as space, particularly if understood – as defined by M. Santos – as an "unequal accumulation of times" (1996).

6 MOBILITY AS A SYSTEM AND THE CITY

The links between each type of mobility raise the hypothesis that all types of journeys, trips and commutes take place within an imbricated system where each type of mobility leads onto another mutually in daily life and also throughout people's lifespans and the histories and conditions of places.

6. Our attention was drawn to this aspect by Cleandro Krause. I thank my friend, research colleague and fellow-organizer of this publication for his meticulous reading that, more than merely picking up errors, taught and indicated new paths and interpretations. Any remaining gaps or mistakes are due solely to the limitations of the author.

In other words, the planning and materialization of each journey and type of mobility (daily mobility, migration, travel, tourism, residential, etc.) is guided by the needs, complementarities, impositions, accesses and impediments related to all other types of mobility, whether geographical or social, at the individual level or at the social scale.

Let us assume that the history addressed here takes place within a single framework, which is geographical space. Furthermore, this history of movements is also the history of each individual person. The connection between the history of individual movements and the history of movements in geographical space is formed by what another geographer, Peter Hägerstrand, called "time-space path".

Time-space path are the routes that we write throughout the course of our lives. Through these paths, the "routes used", together with associated objects, actions and places experienced, different individual aptitudes are deployed for mobility. This is a characteristic of human beings, particularly in contemporary times.

Looking at daily mobility through individuals or families, for example, their time-space paths must be taken into consideration in order to ensure a full understanding of the life history and formation of the subjects of these actions, including their own values and the values found within the socio-spatial contexts that surround them. Aspects that may not be forgotten include physical fitness; living conditions in the home; and available, accessible, affordable and selected means of transportation, together with their own wishes and desires.

The construction of a framework grounded on this broad-based set of factors will result in a portrait of the mobility status of individual persons, while at the same time offering unique overviews of the contexts within which they live. Constructing a framework grounded on this complexity and for society as a whole will result in a wide-angled landscape of the city itself.

In addition to appearing within each subject who prepares and implements individual time-space strategies each day, the systemic characteristic of mobility forms lies mainly in the fact that all types of mobility begin at the same place, the origin of the movement, which is where people stay.

Daily, residential or social mobility, travel, tourism or migration, all share a single point of origin of movement: a place that is physical, as well as social and symbolic. Thus, analyzing the specific conditions of the place of the individual, the family, the social group or the place viewed as a city or the parts of the metropolis, will bring in countless descriptive elements for any type of mobility: daily, residential or social, commutes to and from work and all the other types of mobility mentioned here.

Furthermore, mobility – this human condition *par excellence* – is also a practice of social insertion, an essence of people's lifestyles in relation to living conditions. Mobility leads to insertion in job markets, social life, cultural occasions, religious events, etc. It materializes only within a social space that gives it meaning and structure.

For example, daily mobility does not curtail relationships with other types of mobility, in addition to being clearly associated with other types of spatial mobility due to the conditioning factors associated with the space of action where it is put into practice.

Thus, there appear to be at least two possibilities to clearly demonstrate the association between spatial and social mobility. One assumes that all movement in physical space implies moving through or surmounting a social space. For instance, it is known that forced mobility – which is daily mobility normally related to work using a specific type of transportation along certain routes at regular times – reflects equally specific social status. Accordingly, switching from mass to individual transportation, for example, ushers in transformations not only in the spatial characteristics of mobility, but also triggers a change in social status, a step in social mobility, viewed as upwards in most places.

The second possibility considers social mobility as defined in classic sociology through class, as well as social and professional status, together with their progress over time, within a context of unequal urban development and the distribution of facilities and services, along with differing appreciations of spaces, thus also implying an alteration in the geographical conditions of mobility.

In this case, a shift in social status – such as higher income, for example – may lead to residential mobility or an alteration to daily mobility conditions – such as a different means of transportation – or alterations to obligations and daily schedules that require new routes that may involve other parts of the city, perhaps structuring an entire new set of factors that condition the deployment of types of spatial mobility.

Let us return to this issue. If spatial mobility were not linked to social mobility, would it still be as appropriate to talk about inequalities, fragmentation or social and spatial segregation in order to explain the different realities at a single location? Or would daily mobility, residential mobility, tourism and migrations express social mobility in some way through disclosing a type of "symbolic capital" associated with the means of transportation used or the places visited (outings to the countryside or traveling abroad, for example).

The point here is that the mobility strategies underpinning travel options reciprocally imply all the other mobility strategies, as well as their implementation.

7 MOBILITY AND PUBLIC POLICIES

The importance of the use and implementation of the concept of systemic mobility is crucial for urban policies. Initially because systemic mobility defines mobility as a policy synthesis, particularly urban. Second, because it does not consider urban planning through only its fixed points, it gives the necessary value to urban flows of all types. Above all, it allows consideration of the necessary new tools that could transform socially unjustifiable urban patterns and standards, which include precarious housing and social and spatial segregation.

There could be many examples of policies better adapted to realities and needs, grounded in this concept. We will examine discussions between outlying towns in metropolitan regions and metropolises or core cities.

Thinking beyond investments only in transportation systems, creating access routes to urban centers and thereby upgrading and multiplying the conditions for exercising daily mobility for all, funding could be channeled to new core areas everywhere, leading to a new everyday mobility reduction policy focused particularly on shorter commutes.

This approach would undoubtedly have strong effects on social mobility through lower transportation costs and better access to jobs, recreation and education, resulting in real gains for family incomes, upgrading areas and making property markets more dynamic, with all the positive and negative outcomes resulting from these shifts.

As an example, it is worthwhile to reflect on home rental markets in Brazilian towns and cities. Residential rental markets have grown steadily weaker since the mid-20th century in terms of providing access to housing. Renting has been demoted at the institutional level by the well-known "myth of owning one's own home." But what are the results of encouraging more and more people to pursue home ownership?

Initially, significant amounts of family budgets are earmarked for property ownership, while these savings could be spent in other ways, including the enhancement of other aspects of life, such as education.

Second is the fact that people invariably become less mobile within urban contexts once their places of residence become firmly established over the longer term. As home ownership is a widespread ambition, the origins of large numbers of trips do not alter, while the odds are high that destinations will change during lifetimes. As a result, daily mobility will alter, while other forms of mobility may well be frozen in place.

Furthermore, within the general context of urban mobility, where the job markets are becoming more flexible, for example, if the points of origin for worker

commutes are difficult to alter, any changes in company locations or means of production could well overload transportation infrastructures called upon to be functional in terms of destination flexibility despite unchanging origins, at massive costs to society in general.

When rental markets are lean, expensive and hard to access, residential mobility is curtailed, frequently burdening family budgets and cities as a whole due to diseconomies. A government-subsidized rental policy – such as that deployed in countries like France, the USA and Germany – allows and encourages people to live closer to their jobs. Additionally, it also allows them to move in the course of their lifetimes – from work through to retirement – to areas in the city that are better adapted to different stages in their natural life cycles.

Some examples and principles are presented here, in the hope of helping urban planners to consider mobility as one of the key conditions for understanding cities in the modern world. This sheds an obsolete view of the city structured on arrivals and departures at fixed points, such as homes, workplaces and consumption hubs, with the mere distribution of objects used to explain cities and guide urban planning activities. In other words, waiving the need to understand the flows that enliven and transform the configuration of objects, while still preserving their forms.

8 RECENT TRANSFORMATIONS IN DAILY MOBILITY

Guided by concerns for urban planning and management practices and the desire to move beyond mere theorizations that could underpin new scientific research projects, the intention here is also to highlight some recent changes in daily mobility resulting from transformations in other aspects of life in society, and reinforce the systemic nature of the concept.

For Raffestin (1993, p. 201), there are two types of mobility: circulation (transfers of people and goods) and communication (transfers of information). In all transportation, circulation and communication occur simultaneously. However, this author notes: “if it is true that the circulation network and the communication network formed, or almost formed, a single unit, contemporary technology has split them apart.”

Becoming simultaneous and instantaneous, communications overlay and anticipate circulation. From this perspective, Raffestin works with the idea that the all strategy integrates mobility and therefore performs a function between communication and circulation. The latter is visible in flows of people and infrastructure projects that are assumed to shape their order, to some extent constituting the image of power, according to the concerns of this author.

Assuming – like Michel Foucault – that the idea of power is to see without being seen, this leads to an understanding of the reason why communication has become so important in contemporary society as, according to Raffestin (1993, p. 202) "it can *be just simulated*". This would indicate that communication is now the true source of power, to the detriment of circulation that used to organize the world in the past.

This is the main transformation in daily mobility, controlled through communications and information, currently deployed through informatics processes. Communication and information play central roles in the space of organization and control, including urban matters. However, circulation does not become less important by being edged to the "outskirts", instead bearing witness to the efficacy of communication and information, serving as an expression of their purposes.

Nevertheless, circulation and communication are not separate entities, and far less are they mutually exclusionary in daily life. To the contrary, taking the development of the telephone as an example, it was initially thought that this new type of communication would lessen the need for people to travel, as trips would be replaced by telephone calls. However, widespread acceptance of this system (with mobile telephones following in its footsteps) actually increased up the number of face-to-face contacts. In fact, said Ascher (1998), the possibility of entering into communication, contacting and staying in contact with other people through the telephone fostered the development of economic relationships among businesses, as well as contacts and shared activities among individual people.

Since the 1990s, Ascher has been suggesting that time "saved" through contacts using telecommunications is being used for other trips prompted by different motivations. "As though there was a core mobility, incomprehensible…" (Ascher, 1998, p. 311). In other words, one of the transformations within the context of daily mobility is its strengthening, driven by new communication technologies that expand the universe of the "life of relationships".

An overview of changes at the daily mobility level during the past few decades may be summarized as follows: to an increasing extent, daily mobility is broader and multi-faceted, and consequently less predictable, but nevertheless more regulated, controlled and organized.

This statement seems to be true for almost everywhere in the world, with its transformation logic tightly linked to consumer society and changes in the means of production at each location. Moreover, revolutions have also taken place in transportation techniques, along with changes in urban expansion patterns (deconcentration and peripheralization) and job markets (greater involvement of women, shorter working hours, working from home), leading to sweeping multiplication and de-synchronization of social time, with schedules that are increasingly

more complex and multiple, followed through innovations in the fields of communication and information that have already transformed human relationships completely, as previously mentioned. All these factors consequently multiply life opportunities in cities, with daily mobility becoming increasingly denser, at least for those endowed with rights to the city.

However, even dialectically, it is clear that the development of information and communication that is opening up an increasingly broader range of opportunities also paves the way for tighter regulation and organization of everyday trips. Decisions on where to go, how to get there and what routes to take are no longer made by each of the subjects engaged in the action individually. Instead, they are guided by their information devices that are simultaneously and instantly interconnected to the same dynamic databases of daily life and the configuration of urban space, which therefore control and organize sets of movements, or at least have the ability to do so.

Looking back at the recent past, it cannot be forgotten – particularly within the current context of cities striving to return to more humane urban living conditions – that the main change in daily mobility is related to speed of movement. During the 20th Century, this rose from a walking pace of 4 to 6 kilometers an hour to an average speed of 50 to 60 kilometers an hour. A real quantum shift, this ushered in sweeping changes in locations of life, completely transforming their structures.

In countries where towns and cities appeared long before the widespread dissemination of automobiles, urban areas are still considered from the standpoint of contiguous structures, together with density and clustering. Many people still defend these characteristics as intrinsic to the concept of urbanity, forgetting that this is a dated and location-specific view of the urban framework. What other ways of classifying and disseminating structures of urbanity could be conceptualized within the context of hyper-mobility? Returning to Sorre (1955), who associated urban life with circulation, meaning the life of relationships, might the automobile be the end of the idea of the city? Unfortunately, it seems as though this is not a statement that can be made in a simple or hurried manner, striving merely to reinforce criticisms of countless negative aspects imposed by automobiles on society.

The progress of travel technologies means that there was no longer any need to cluster activities and services at a single location. Urban planning, cities, their residents and businesses shifted from the logic of physical proximity to the logic of temporal proximity. The automobile then began to administer its own urban model. Some authors mention urban growth as the outcome of more land becoming easily available through the range of the automobile, related to the wishes of some social players to benefit from the opportunities opening up to them, while government authorities refrain from opting between the logic of individual appropriation and the logic of collective use of space.

Transformations and mobility impose new visions of the city, not taking density and continuity as essential factors for interactions. Issues such as segregation, for example, are no longer related only to specific properties, areas or neighborhoods. With faster means of transportation, segregation materializes through private cities, gated communities, poverty-stricken ghettos and wealthy enclaves, all clearly separated within sprawling urban areas.

Transformations and mobility take on the meaning of individualization, characteristic of our times and contemporary society. Thus, to an increasing extent, "secondary mobilities" (Ascher,1998), related to recreation and shopping, reshape the contours of society, shifting from a problem related to collective urban facilities to a problem related to individual equipment and facilities. The same technology that allows smartphones to pinpoint amenities, facilities and services in our surroundings, adapted to each individual preference, in fact requires this individual city even more that, as could only be the case, becomes collectivized in the co-presence of individuals sharing a greater collective identity, with locations suggested by Internet browsers.

Alterations to aspects that have no direct links to mobility may also trigger changes in travel habits. For some (Obadia, 1999; Wiel, 1999; Vergely, 1993), there is an entire sociological field to be explored on romantic mobility, friendly mobility, cultural mobility, etc. In some countries, routes selected for social get-togethers are among the aspects taken into consideration when planning slum upgrade projects.

Among changes in daily mobility, consideration must also be given to the new roles children play in today's society. Children's days are packed with activities that are relatively independent of their parents' schedules; this is also underpinned by transformations in communications.

All these changes are transformations that take place in the way of life and the life of relationships as a whole. As daily mobility is a tool for constructing networks within society, any alteration to the life of relationships causes ripple effects on mobility.

The fact is that we have shifted from Fordian mobility (with most trips taking place during clearly defined periods of time in the course of the workday) to a more flexible model where a variety of trips have their own specific rhythm, times and means of transportation.

This does not mean that commuting will vanish, although, prompted by a wide variety of factors related to technical, social, economic, cultural and regulatory issues, among others, it will certainly shrink in proportion to other types of trips.

The processes transforming daily mobility include the fact that trips are no longer viewed as merely a means of reaching a destination, or even as time wasted between two productive situations. Once again, communication and information have completely changed the nature of time spent commuting. Desired by many, we can today talk about space-time contexts housing multiple activities with specific qualities. As many people and enterprises want, "wasted" or "lost" time could be retrieved by consumption, mainly through smart phones.

Pursuing this commercial eagerness, means of circulation and people are increasingly better equipped with technical devices that were found only in homes or offices until quite recently. The telephone is an icon, accessing the internet and its infinity of services, as well as countless applications that promise to turn lengthy trips and traffic jams into times of pleasure and entertainment. At the same time as someone personalizes a vehicle in an intimate manner, that person also links and integrates it as a point in a network open to the world. This multiplicity of mobile and connected devices allows closer intertwining of social places, creating a dense set of temporalities.

Transformations within the context of mobility and clear links to consumption have also resulted in the appearance of new professions. For example, geo-marketing is a technological tool based on geo-referenced information systems (GIS) that locates and classifies consumers, in addition to the circulation of products.

Geo-marketing specialists pursue multiple goals by processing information: they offer entrepreneurs clear overviews of their technical networks and distribution chains, define the exact locations of investments, centralize and process information, gather data and design tools to improve communication with the consumer, in places that consumers are found. These data are the basis of that support GIS for marketing purposes, that aims to pinpoint places favored by target consumers, and discover the characteristics of their mobility patterns and consumption habits.

However, this hyper-mobile world ushered in by information is not yet available to everyone. The flexible, intensified mobility of people living within the new market, with all its demands, contrasts with the relative immobility of the vast majority of the jobless, or people employed in more traditional sectors of the economy.

Nevertheless, even in traditional sectors or largely unskilled jobs – such as housemaids, repairmen and cleaners in general – mobile telephones rapidly proved to be an essential tool for their work. Connected to the rest of the world, workers gain flexibility, opening up possibilities for new relationships with fuller schedules and – at least theoretically, disregarding the specific characteristics of some cities – enhance mobility.

It is in this way that everyday life becomes increasingly more organized through personal mobility within the city as a whole, as the life of relationships becomes more intense, including between places and technical devices. Daily life becomes increasingly more planned, scheduled, controlled and defined by time that can be portioned out accurately in finely-scanned space.

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CHAPTER 2

THE SIGNIFICANCE OF MOBILITY IN THE DEMOCRATIC CONSTRUCTION OF THE CITY

Jorge Luiz Barbosa[1]

1 METROPOLITANIZATION OF SPACE AND MOBILITY MEDIATION

Movements of goods, money and people became necessary with the advent of the town, above all when urban contexts became prerequisites for the joint production of social life. Towns grew into cities, and many of them become huge metropolises. They encompassed – or induced – the appearance of many other towns in an expanded fabric of distinct and distinctive arrangements of geographical space.

Mainly from the 1970s onwards, we have been faced by the socio-spatial phenomenon known as the *metropolitanization of space* (Veltz, 1996; Ascher 1998; Laucourt, 1999; Pinson, 2011; Lencioni, 2013). There is a certain consensus in the literature that metropolitanization is related only to the expansion of major cities, expressed in material terms through intense and dense flows of people, capitals and goods that in turn foster territorial urbanization. It is also important to underscore that the *power of metropolitanization*, as stressed by authors such as Veltz (1997) and Laucourt (1999), is the outcome of economic globalization and the restructuring of the financial system, particularly when they began to fuel selective urbanization processes.

The issue under discussion is a reconfiguration of the production and organization of urban space under the general conditions of the urbanization process, although subject to the specific characteristics of a time of the hegemonic reconstitution of globalised capitalism. This is the sense in which Sandra Lencioni (2013) conceptualizes metropolitanization as a process that accentuates the homogenization of space, intensifying its fragmentation and altering the hierarchical tiering of places. Furthermore, as stated by this author, it is accompanied by or prompts infrastructure development, such as circulation networks and supplies of public utility services, as well as information and communication networks (Lencioni, 2013, p. 31).

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For us, this metropolitanization of space takes on the meaning of urban differentiation. This is because not all cities and all places in the city – despite the expansion of the urban fabric – play leading metamorphic roles in the production of space. These are spatial characteristics specific to the metropolis that are deployed through acts of command, management and financing of corporate structures, government institutions, outreach organizations and private enterprises that expand in segments of metropolitan territory:

> The metropolitanization process materializes and keeps pace with the constitutive movement of the metropolis as a special moment in the process of accumulation, tailored to its demands, which explains the development of the urban fabric outwards from the center into outlying areas, with differing contents in these extension processes (Carlos, 2013, p. 38).

Spatial hierarchies are established through contradictory processes of affirmation underpinning core economic and political aspects, where the market and the state play hegemonic roles in the implementation and administration of the expansion of the urban fabric. We may thus speak of complex urban systems that encompass positions of financial, productive and technical command and control within the complex web of relations and actions among cities:

> The diverse parts of the city are distinguished by differences in their respective technical and information densities. Technical objects of some type form the foundation for use values and exchange values in different parts of the city. It may be said that, viewed within their technical reality and rules of use, infrastructures regulate behaviors and thus choose possible players (Santos, 1996, p. 306).

It is precisely under the aegis of the affirmation of the core roles played by production, consumption and regulation that the widely-differing geographical locations of fixed enterprises (industrial, financial, banking, technical, commercial, real estate) disclose strategic meanings for the urban reproduction of the market. However, such agglomerations have generally been subject to the logic of accumulation each type of capital, implying uneven investment distribution and consequently the necessary mediation of relations between fixed locations and flows established through core economic aspects (and the technical densities of circulation networks). It is at this decisive moment of metamorphosis in the relation between the location and geographical distribution of actions that that mobility takes on a special meaning.

Pinson (2011) considers metropolitanization as a multiform and contradictory phenomenon that subjects cities to dilation, expansion and diversification of mobility processes. In fact, the manner of producing/administering/consuming urban space that we call *metropolitanization* requires means and deploys mediation for materializing the order of flows that are coherent with the location and

geographical distribution of economic enterprises. This process involves not only circulation devices, but also distinct mobility mediation actions.

We consider mobility mediation to be the control and management of spatial scales that involve flow movements and their different speeds. As noted by Santos (1996), movement outranks rest in the contemporary world, making the daily mobilization of workers, capitals and goods a sphere that is just as important as the production sector. The mastery and management of the spatial scales of flows shapes devices that underpin the materialization of businesses, consequently becoming a requirement for the urban mode of capital reproduction.

Having become decisive for the materialization of capital in space, movement gains its urban *empiricity*. Railroads, streets, avenues and highways begin to form an urban support morphology for public transportation machines, whilst simultaneously constituting a more or less explicit battlefield involving the State, the market, and, evidently, the residents of cities and metropolises.

The arrival of other interests in the spatial arrangements of movement requires other *possible players* to be taken into consideration in the urban framework of metropolitanization flows, mainly because extensive urbanization implies the establishment of neighborhoods of homes with diverse circulation and densities of mobility demand. Dwellers in suburbs and urban outskirts begin to build up expectations, demanding daily accessibility to workplaces and urban services and ushering in another dimension for the significance of scales of movement. It is within this social screen of perspectives that mobility gains a conceptual meaning and is embedded in social practices, resulting in its acknowledgement as a conquest in the field of the right to the city (Herce, 2009).

2 NEW SPATIAL CONDITIONS FOR MOBILITY IN UNEVEN TERRITORIAL URBANIZATION

To a large extent, the metropolitanization of the city has meant the construction of territorially-expanded peripheral areas. In the metropolises of Latin America, urban expansion has meant a process that deepens socio-spatial inequality, with sprawling urban outskirts being the most striking example.

Territorial urbanization in Brazil is a good example of a process that exacerbates social inequalities. From a country with a largely agrarian population, Brazil became mosty urban during the brief period of five decades. This process peaked during the 1970s, when urban residents began to outstrip rural dwellers (56% to 44%), due to massive waves of migrants leaving the countryside for major urban hubs. At the moment, according to the 2010 Demographic Census conducted by the Brazilian Institute for Geography and Statistics (IBGE), 84.35% of the Brazilian population lives in urban areas.

Industrialization made decisive contributions to the pace of urbanization and urban concentration of wealth and population. However, it must be added that cities were also subject to the surplus outflows, increased profits, and widespread expansion of other capital segments (banking, finance, trade, real estate and services), making urbanization a resource for the extended reproduction of private wealth.

As an urban phenomenon underpinned by the reproduction of capital through spatial tiering, fragmentation and homogenization processes, metropolitanization proved to be one of the deepest expressions of surging urban inequalities. In a brilliant paper published in 1991, geographer Fani Davidovich[2] already presented a critical approach to territorial urbanization as a radical context of social inequality:

> In Brazil's metropolitan segment, problems are growing, some structural, that economic growth has not resolved: they are pockets of poverty, unemployment and underemployment, hordes of the hopeless and homeless who represent a variant of the Daily Urban System that consists of commuter trips by the workforce. In fact, this is a segment of the employed population engaged in poorly-paid activities with low productivity that stays in downtown districts through the week, unable to pay for transportation over the long distances between homes and workplaces and returning home only on weekends. This workforce is a clear expression of the perverse relationships established between metropolitan centers and outlying suburbs, highlighting the contrasts between modern communication flows and the anachronism of workforce flows (Davidovich, 1991, p.129).

The growth and expansion of outlying urban areas are the most striking products of unequal territorial urbanization. The speculative and clustering activities of financing and real estate capital – keeping urbanized downtown areas as their business, with land suitable for urbanization held in reserve – have forced poorer workers to settle in neighborhoods and subdivisions with incomplete and inadequate urban facilities. In fact, Kowarick (1979) felt that the formation of Brazilian metropolises was generally characterized by unfairness in terms of access to services for collective consumption, particularly transportation. Inequality took on a territorial configuration:

> The lack of access to public transportation services and inadequate urban mobility condition among the poorest underpin the phenomenon of unequal opportunities and spatial segregation, resulting in the social exclusion of people living far away from downtown districts. The main impacts of this situation adversely affect basic social activities: work, education and recreation (Gomide, 2006, p. 242).

The movement of people has become yet another social demand ushered in by the metropolitanization of space, spurred by job market requirements and the increasingly precarious housing market. Added to this perverse equation is

2. Revista Brasileira de Geografia, v. 53, n. 2, 1991. IBGE.

the availability of access to public utility services that are distributed unevenly throughout the city, forcing urban workers to become even more dependent on commutes. It is in this sense that several authors highlight public transportation as a fundamental tool for combating poverty and inequality (Andrade, 2000; Gomide, 2007), particularly when 44.3% of the Brazilian population still depends on public transportation for their daily commutes.

Studies on the topic of mobility from the standpoint of citizenship reveal a role that is becoming steadily more important in the living conditions of the population, especially through inclusion in family budgets, with transportation services absorbing some 20% of family incomes (Family Budget Survey, 2008/2009 IBGE).

The very poor quality and effectiveness of public transportation, together with long distances between downtown districts and outlying suburbs, account for the phenomenon of *time imposed* on individual and collective lives, meaning time spent commuting that steals away moments of rest, recreation, study and pleasure, among so many other moments that complete us as human beings (Barbosa, 2014).

Taking as an example commutes in high-density metropolitan regions with transportation infrastructure and clustered businesses, such as São Paulo, Rio de Janeiro and Belo Horizonte, it is possible to observe the time workers spent commuting, shown in the following table:

TABLE 1
Worker commutes in selected metropolitan regions

Metropolitan regions	Percentage of workers with commutes lasting for more than an hour
Belo Horizonte metropolitan region	19.99
BHMR outskirts	23.18
Rio de Janeiro metropolitan region	28.63
RJMR outskirts	32.41
São Paulo metropolitan region	28.56
SPMR outskirts	25.50

Source: Census, IBGE, 2010.

There is a perverse blend of physical distances and social gaps that build up into social inequality for accessing job opportunities, cultural destinations, healthcare facilities, education and cultural destinations. We undoubtedly live in a society that is deeply marked by the territorial divisions of rights, reproduced unceasingly through unequal mobility on urban scales. This phenomenon triggers overlapping conflicts (economic, social, technical and political) on the agenda of struggles for the right to the city, as mobility is a decisive factor for materializing the possibilities offered by the city as a place for conducting social life. For Mongin (2006),

these conflicts steer the issue of cities towards triple imperative: establishment of the location in its collective nature, the necessity of mobility in order to avoid territorial enclosures, and the collective participation of its residents in political action.

Social demands for mobility bring the hegemonic spatial characteristics of fixed enterprises into discussion, while at the same time constituting a public sphere for political struggles pursuing the mastery and social control of large-scale movements. Mobility, mobilization and space are part of the same demand for the transformation of the meaning of the city and society itself. It is from this standpoint that contemporary social concerns are transposed into the desire for mobility (both social and spatial) among individuals and groups in the city, as stated by Berman (2007). And like Henri Lefébvre (1969), who announced in his seminal work on the right to the city entitled *Le Droit à la ville*, that *transporting* was steadily becoming just as important as *inhabiting*.

3 MOBILITY AS A CONDITION FOR THE APPROPRIATION AND USE OF SOCIAL ASPECTS OF URBAN SPACE

In classic works by Robert Park (1925), a well-respected researcher and founder of the Urban Sociology School in Chicago, social mobility (defined as rising social, economic and cultural status) was explicitly associated with the ability of individuals and groups to travel around the city. The issue was that the movement of people in the city ranked as a determining factor underpinning deeper insertion into US society.

It must be stressed that mobility does not mean simply a nicer trip from one place to another in the city in order to engage in economic, social or cultural activities, etc. The act of moving – and being in movement – is endowed not only with objective dimensions of movement, but is also closely related to the subjective expression of urban reproductions of social relationships.

> The movements of people (and things) all over the world and at all scales are, after all, full of meaning. They are also products and producers of power. I want to make an analytical distinction here between movement and mobility (…). (Creswell, 2006, p. 2)

Mobility brings us into contact with attention caused by unequal space use and appropriation relationships. Thus, when addressing the issue of mobility, we must necessarily insert it into the context of spatial power where people and things move – and are moved – between and within locations, places and territories. Mobility takes on a political meaning, as argued by Levy (2011), because in the field of mastery of space, it enters into the *composition of individual social capital*.[3]

3. The composition of individual social capital is related to the subjective dimension that potentiates his insertion into the world. Social capital is thus a potential aspect of life acquired in different spatial areas through meetings with other individuals and access to symbolic assets (education, culture, art, techniques) that are gathered together at different places. This explains why mobility is crucial for the socially organic composition of individual capital.

The unequal urban status of the existences and imperatives of the socio-spatial division of work are clustered into distinctive types of location and distribution of goods and services, allowing responses to the qualitative demands of urban life through the possibilities of moving around the city. Other than jobs and housing, opportunities for education and culture, for example, are not available as social rights to all citizens, even when open to the public, due to the limited mobility of certain social groups:

> Tell me the speed at which you move and I will tell you who you are. If you have nothing more than your own feet to get around on, you are excluded because, for the past half century, the vehicle is a symbol of social selection and a condition for participating in national life (Illich, 2005, p. 52).

Mobility conditions defined by travel speeds and provided by vehicles (particularly automobiles) help reproduce unequal relationships among individuals, groups and social classes. Thus, mastery and management of the geographical scales of social arrangements establish the position of each of us in cities undergoing metropolitanization. We are consequently drawn into the *economy of fast flows* in terms of access to material and symbolic goods and services enshrined at locations. However, above all they mediate who we are through the geographical scales in which we live. Although the compression of space and time is a characteristic of the modern period, as Harvey insists, this is certainly not an experience open to all men and women dwelling in our cities.

This is why contemporary discussions of mobility highlight the issue of discretionary spatial characteristics of the economy of fast flows under the aegis of the arrangement of places and territories, as well as constituting a public sphere of political dispute. After all, mobility is closely linked to places where we come and go, live and work, celebrate and be happy. Consequently, it is also related to status, allowing appropriation, use and dwelling in spatial units with social significance for us, and for others who are different from us. As mentioned by Harvey, this is mobility as the right to produce the space of the city:

> The right to produce space greatly outstrips the capacity to circulate in a pre-organized, spatially structured world. Beyond this, it means the right to reconstruct spatial relationships (shapes, communication resources and territorial rules) that transform space into an absolute framework of action in an aspect that is far more malleable in terms of social life (Harvey, 2004, p. 329).

It is in the direction proposed by Harvey that the meaning of *transportation* becomes a decisive political action for sweeping away *territorial enclosures*, and thus vital for the material proclamation of the collective status of places.

4 RE-INVENTING MOBILITY IN ORDER TO DEMOCRATIZE THE METROPOLIS

Upgrading means of transportation and their support facilities (railroads, highways, waterways and cycle paths) are decisive steps for ensuring mobility, particularly when taken in safe and effective ways, financed by the state, and with effective public control. The democratization of mobility requires transformations in the urban conditions of social life, including a territorial about-turn for investments in urban neighborhoods lacking equipment and services (social, educational, cultural, safety and healthcare) that underpin the dignity of human beings and which must be distributed in ways that eliminate discretionary classifications of human beings grounded on the race, ethnicity, gender, or age, of individuals and social groups (Barbosa, 2014).

The necessary investments are not limited to the objective conditions found in favelas, low-income suburbs, and outlying urban areas, but also encompass symbolic allocations that foster acknowledgement of these districts as powerful factors for life in society, rather than just precarious metropolitan hangers-on.

However, there are key issues that cannot be handled only through sector-specific policies or more effective public transportation planning. As Loboda and Miyazaki show, (2012, p. 258), promoting urban mobility requires critical thought on how its uses are structured and urban settlement occurs, thereby indicating the best way of ensuring access for residents to the benefits offered by the city, instead of merely thinking about means of transportation, traffic control and network flow.

It is quite clear that conditions established by the market and incomplete state actions related to transportation policies impose constraints on urban mobility. These constraints are harsher when they affect more vulnerable social groups and territories where rights are curtailed through social and economic conditions and the racialization of socio-spatial relationships. Consequently, when addressing the topic of mobility, we are not referring only to trip lengths or how efficiently the highway system transports people. Cardoso and Matos (2007, p. 95) highlight a new dimension of mobility as a socio-spatial practice:

> Urban accessibility depends on interactions between land use and transportation, constituting an important indicator for social exclusion (...). Along these lines, as an integral and fundamental part of the dynamics and functioning of cities, accessibility becomes an element contributing to the quality of urban life through facilitating access to urban services and goods for the population, in addition to underpinning the feasibility of bringing them closer to economic activities.

This does not mean that mobility consists only of easy access to urban goods and services, although this is encompassed by its process. Mobility is a socio-spatial process that allows travel to different places as the embodiment of rights as social subjects. We are examining here not only the technical and

economic possibilities of commuting, but rather the movements of social players in the city and the broader-based meanings of mobility for shifting social relationships. In other words, having access to places does not necessarily mean altering the status of customers and consumers that keeps people subordinate to the state and the market.

It is clear that the economic, technical and cultural complexities of metropolises foster the intensification and differentiation of commuting modes and thus also buttress the multiplicity of uses, experiences and representations of space. Considering the metropolis as a spatial mosaic of different social practices, its players cannot fail to demand freedoms corresponding to the multiplicity of urban experiences generated through movements at different speeds, as noted by Levy (2001, p. 10):

> We live in a world that moves at different speeds. This is an unparalleled phenomenon. From a gentle stroll to a supersonic aircraft, our environment may be seen as overlapping spaces, each of which is defined by a type of link between places (means of transportation, speeds, flow intensity etc.) with no communication or exchanges necessarily being required among these different webs. We can thus move from one space to another, but there is a risk that each of them constitutes a stand-alone world, shared but separate from others in our practices and imaginations (Levy, 2001, p. 10).

Being engaged in fast flows, or even with better accessibility to places, does not necessarily represent social sharing. Fast means of transportation often hamper experiences of the city in all of its myriad aspects. We drive past places (and people) as though they were merely landscape sets. What is important is to shorten distances through speed. And – obviously – overcome the time shortages imposed on us by the voracious consumption of goods. This is the real god of speed: the market.

The *economy of fast flows* is home to today's exacerbated individualism that is centered on production, ownership and massive use of private automobiles, even building up the false impression that their commutes are safe and effective, holding cities hostage to their business and lifestyle reproduction requirements.

We can no longer fool ourselves about our choices related to speed, comfort and safety when we demand, select and use specific means of transportation. The ratio between trip time costs and distances is inscribed in complex and deeply unequal social relationships, above all for subjects we identify indiscriminately as users.

It is not surprising that users of automobiles and public transportation do not have the same perceptions of time and space, despite living in the same city.

Updating the meaning of mobility as the construction of social sharing means investing in the meaning of places through their collective nature, as proposed by Mongin (2006). To do so, a more generous set of political actions is both urgent

and necessary, focused on society, as well as the material nature of our daily relationships to the symbolic level of our encounters in the city. Inventing or reconstituting integrated communication between places undoubtedly means appropriating areas in the metropolis that are currently dominated by hegemonic devices that reflect social, cultural and bodily distinctions in rights. This consequently urges a move away from the city split into archipelagoes by places of origin through urban segregation and gentrification.

This is why Cresswell (2006) stresses that mobility has two faces: corporeal and social. It is people – men and women – who travel through space and time with their bodies, spurred or constrained by economic structures, social significances and cultural representations. The movement of people is also loaded with subjective aspects that serve as blocking, limiting or welcoming devices for bodies at locations, places and territories in the city. Paraphrasing Illich (2005): *Tell me who you are and I will tell you what mobility you will have*!

Mobility follows the path of socio-cultural relationships with the other, the different, the strange. We may even state that the contradictions inherent to the two faces of mobility described by Cresswell appear to us as the most perverse of the conditions of subjects concealed in the territorial backlands of rights, whether appearing in outlying urban areas, ghettos, favelas or distant suburbs.[4]

Consequently, a mobility policy must ensure that people fading invisibly into the remote distances of time and space can leapfrog over the barriers raised against them, mobilizing them to live and travel in areas that are more central in economic, social and cultural terms, and above all to invent multiple spatial options for overcoming territorial distinctions in social, economic and cultural rights. It is through mobility that the underprivileged move on to the social stage, making their voices heard through political actions that pursue the democratic sharing of the city as a public space.

5 FINAL REMARKS

It is possible to ensure that urban mobility becomes an important key for construing metropolitanization as a contradictory and unequal unit in the production of urban space and contemporary urbanization, mainly because it raises the issue of the significance of the hegemony of the *economy of fast flows*, while at the same time becoming a public sphere for political disputes over urban space production.

4. People living in favelas located in downtown metropolitan districts are subject to reduced urban mobility, similar to the residents of remote suburbs and outlying urban areas. In fact, constraints are imposed not only by physical distances and social gaps that hamper their movements in the metropolis. There are corporeal constraints and symbolic constraints that also hamper the free mobility of men and women in the city. Healthy adult men travel and are transported through the city far more than women. Aspects related to gender, race, ethnicity and age are also significant when addressing the deployment of mobility in contemporary cities.

Mobility is a socio-spatial practice that allows members of society to travel to different places as an embodiment of their rights. It is not only the technical and economic possibilities of transporting people that are under discussion, or even the vital territorial about-turn in government investments. The positions of social players entering the political scene are endowed with a significance that is broader-ranging than the shift in socio-spatial power relationships. As recalled by Massey (2000), this is not simply a matter of some people moving around more than others, but rather the fact that the mobility of some social groups means weakening and curtailing the lives of other people.

The democratization of mobility corresponds to the renewed construction of the city, making this a shared project: a place with a collective nature that is enhanced by generous encounters of living and being in the world. The conquest of mobility is firmly associated with the resignification of the city as a public space.

Mobility as mediation transforming the production of space means expanding the use of the city in social terms, as a public asset. Calling for the diversification of mobility must signify the radical democratization of the conditions for human existence, above all introducing innovative experiments in social well-being to Brazilian metropolises.

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CHAPTER 3

EVERYDAY URBAN MOBILITY, URBAN SEGREGATION AND EXCLUSION

Eduardo Alcântara de Vasconcellos[1]

1 INTRODUCTION

The rapid increase in urban growth that swept through Brazil from the 1950s onwards was accompanied by deep-rooted changes in mobility systems for passenger travel. Travel in motorized vehicles gradually increased, particularly private automobiles and buses. Investments in government actions were channeled almost exclusively towards boosting the number of trips by these modes, without ensuring the feasibility of other transportation modes that could share the public right of way destined for transportation. This severely undermined the quality and safety of travel on foot and by bicycle, with sharp increases in road space consumption, trip durations and energy spent on mobility, as well as emissions of pollutants.

In addition to mobility policies, decisions on urban land use and occupancy were determining factors for introducing or extending spatial segregation for lower-income segments of the population, with increased isolation and greater barriers to accessing the city, jobs and public services.

This article initially analyzes this process by presenting general information on mobility and Brazilian cities with more than 60,000 inhabitants in 2012. The data show that urban mobility is moving steadily towards a split between transportation modes in which motorized options have become dominant. More recently, the use of private motorized options (automobiles and motorcycles) has overtaken the use of public transportation options. Section 3 analyzes social and economic factors affecting human mobility, while Section 4 examines the metabolism of mobility, represented by consumption and impacts related to mobility for each income level of society. Finally, Section 5 explores mobility policies in Brazil over the past few decades.

2 EVERYDAY MOBILITY IN BRAZILIAN CITIES

Among the 438 Brazilian municipalities with populations of 60,000 inhabitants or more in 2012, 62.7 billion trips were taken (classified by main transportation mode), reaching some 210 million trips a day. Most trips (25.1 billion)

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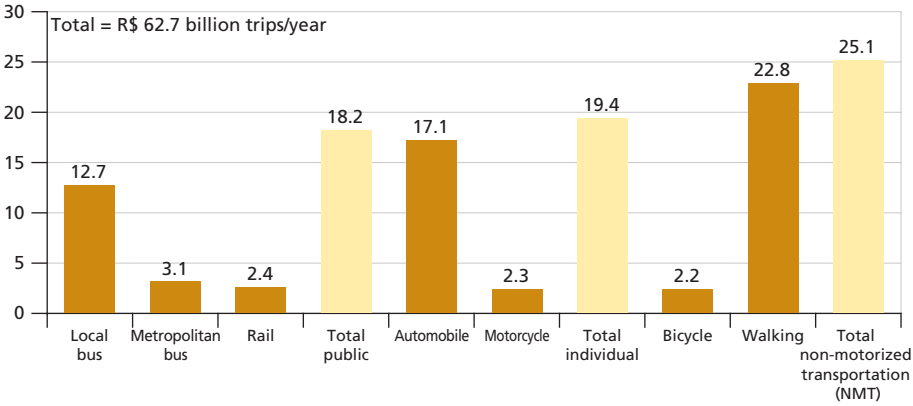
were on foot and by bicycle, followed by individual motorized transportation – automobiles and motorcycles (19.4 billion) – and public transportation options (18.2 billion) (graph 1).

GRAPH 1

Trips x year by main transportation mode (billion trips) in cities with more than 60,000 inhabitants – Brazil (2012)

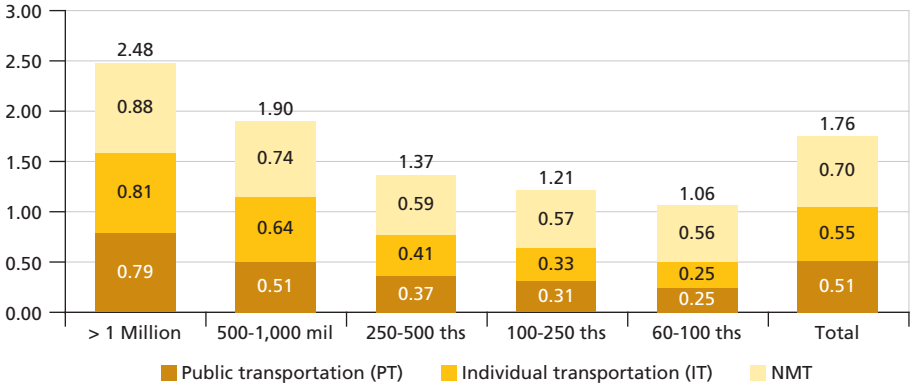


Source: ANTP (2012).

This number of trips reflects a mean mobility of 1.76 trips per inhabitant, per day. When this mobility is estimated by municipality size, large variations appear: it ranges from 2.48 per capita daily trips in cities with more than a million inhabitants to 1.06 in cities with 60,000 to 100,000 inhabitants, as shown in graph 2.

GRAPH 2

Mobility x inhabitant, city size and transportation mode in cities with more than 60,000 inhabitants – Brazil (2012)

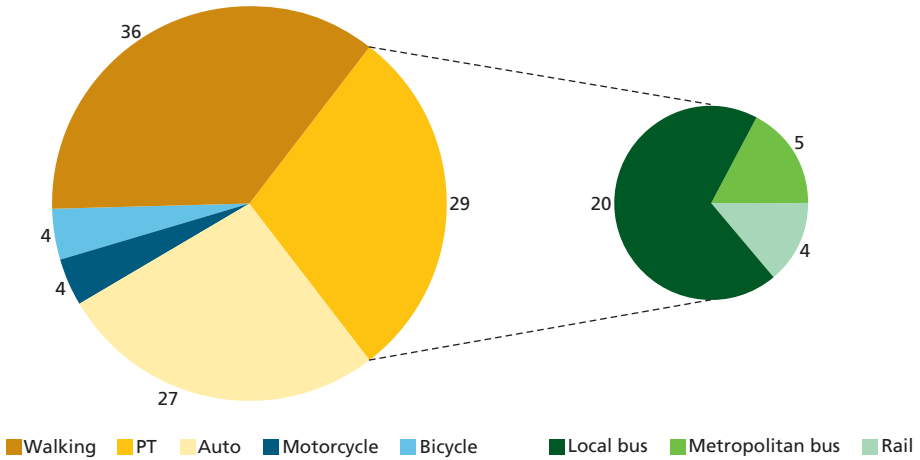


Source: ANTP (2012).

Most (40%) of these trips were on foot and by bicycle, using non-motorized transportation (NMT). This figure has an inverse relationship with municipality size, explained by shorter distances, income constraints and the presence or not of public transportation (PT) systems, more commonly found in large cities. The second most used mode was motorized individual transportation (IT) at 31%, followed by public transportation (PT) systems, which account for 29% of trips on average in Brazil, mainly by bus (graph 3).

GRAPH 3

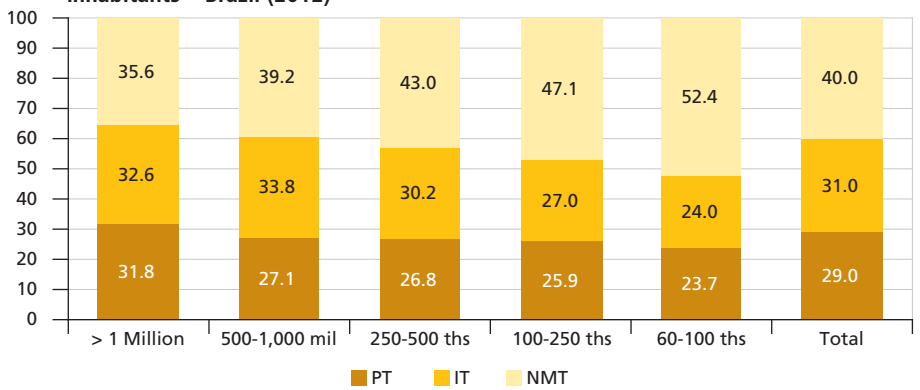
Trips by transportation mode in cities with more than 60,000 inhabitants – Brazil (2012)



Source: ANTP (2012).

GRAPH 4

Transportation modes by municipality population in cities with more than 60,000 inhabitants – Brazil (2012)



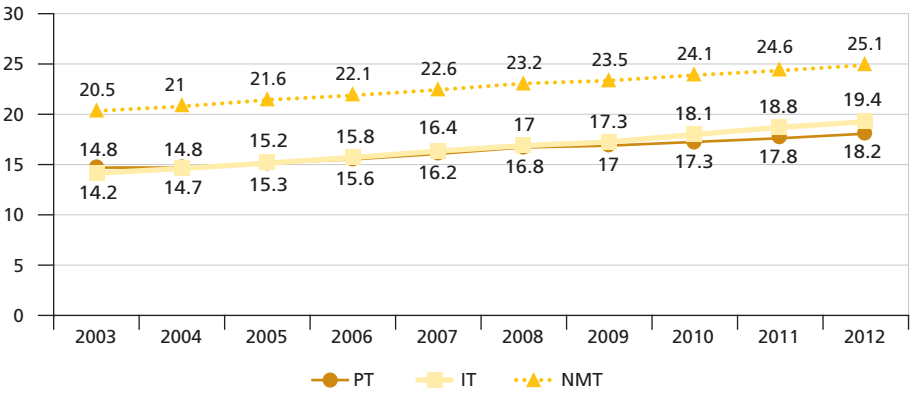
Source: ANTP (2012).

When trips are classified by municipality size, it becomes apparent that public transportation trips shrink steadily as urban population decreases, from 32% in larger municipalities to 24% in smaller towns (graph 4). The use of individual transportation (automobiles and motorcycles) also drops in similar proportions, from 33% to 24%. In contrast, the proportion of trips made by Non-Motorized Transportation (bicycles and on foot) rises in smaller municipalities, up from 36% to 52% percent sign.

It is also important to note the historic trend in this process through the data on the proportion of trips made by the different transport modes in cities with more than 60,000 inhabitants. Graph 5 shows that the use of individual motorized modes (automobiles and motorcycles) rose more than the use of public transportation between 2003 and 2012, although non-motorized options remained dominant.

GRAPH 5

Individual and public transportation modes in total numbers of daily trips in cities with more than 60,000 inhabitants – Brazil (2012)



Source: ANTP (2012).

3 ECONOMIC AND SOCIAL CHARACTERISTICS OF MOBILITY

The characteristics of mobility consists basically of individual and family factors that may be understood as social characteristics, in addition to external factors that are generally economic, together shaping the conditions within which trips take place and mobility materializes.

Noteworthy among the individual and social factors influencing people's mobility are age, physical condition, gender, education and – logically – personal family incomes.

People at "productive" ages, meaning those who are more deeply engaged in work and school, leave their homes more often and move around the city more

freely. Regarding travel to school, most of these trips are made by youngsters and on foot. These flows relate to the physical distribution of the public education network, where schools are scattered throughout neighborhoods. Commutes to work mainly involve people between 18 and 50 years old, while the elderly tend to go out less. In the São Paulo metropolitan region (MR), the highest mobility rates are found between 15 and 39 years of age, even when adding together different reasons for trips, such as travel to work and education.

Gender affects mobility, as different tasks are shared between men and women in every society. Until the 1980s, this aspect was apparent in Brazil mainly because men worked outside the home, while most women took care of their homes and children. This reality has been changing as women steadily began to move into the formal and informal job markets. However, mobility is still higher among men than women: for example, men travel an average of 2.1 trips a day in São Paulo, compared to 1.8 trips for women. Further, some walking trips of less than 500 meters are not counted in origin and destination surveys, probably lowering the real share of women in these trips, as some of them take place near their homes, particularly those linked to household chores that are still handled mainly by women.

Education also affects mobility, as people with greater access to formal schooling are normally engaged in more activities outside the home. In the São Paulo metropolitan region, the mobility index for people who are illiterate or who had not completed their primary education was 1.57 trips a day in São Paulo, compared to 2.73 trips for university graduates (CMSP, 2008). The corresponding figures for Rio de Janeiro are 1.68 and 2.60 (SETRJ, 2013).

Income also affects trip patterns, defining the funds available for accessing different transportation modes. In a low-income family, limited resources are used to pay for public transportation options, while middle-class families incur large expenses related to private automobiles. In the São Paulo metropolitan region, individual mobility varied in 2007 between 1.54 and 2.70 trips a day (75% increase) respectively for people with lower and higher incomes (CMSP, 2008); in Salvador, the figures found through a survey in 2012 were 1.44 to 2.0 (67% increase) (Oficina Consultores, 2013). This pattern is typical of the developing countries, exacerbated in Brazil by massive disparities in income and deep-rooted socio-spatial segregation that forces for people to live far away from jobs and schools (the main destinations of their trips), with less accessibility to means of transportation.

It is important to note that trips on foot drop as income rises, although still remaining present even in high-income families. Mobility via public transportation modes increases as far as mid-level income brackets, and then drops as mobility using automobiles rises quickly as family incomes increase.

It is also important to ascertain levels of immobility, meaning the number of people who do not move around on an average day: in the São Paulo metropolitan region, immobility was higher (36%) for women than men (27%) for the same reasons as mentioned above.

Some family characteristics intervene in the mobility of their members, such as children and age. A single person has different mobility requirements from a childless couple; similarly, couples with children present different mobility needs. Later, when their children leave home, mobility needs will shift once again for people remaining in the home. Life cycles and family structures also affect income levels, in addition to the role played by each family member in daily tasks; all of these elements contribute to definitions of mobility levels. On the other hand, mobility is severely affected by the costs and supply of different transportation modes. Buses are the main type of public transportation options in Brazil – in cities with more than 60,000 inhabitants, buses carry 86% of public transportation passengers (ANTP, 2012). Although the impacts of constant fare increases are eased by transportation vouchers, which registered (formally employed) workers receive since 1985. These workers pay out no more than 6% of their income on transportation (the rest is paid by their employers); however, most passengers remain unprotected, as self-employed workers have no rights to this benefit.

This means that fare increases outstripping inflation caused many hardships for much of the Brazilian population: between 1995 and 2003, bus fares rose 60% higher than inflation, pumped up largely by rising diesel oil prices, and accompanied by a drop of more than 30% in demand for public transportation options in major Brazilian cities (Ipea, 2011).

On the other hand, the selection of transportation mode also depends on comparisons of the advantages and disadvantages offered by available options. Although several factors may be involved in these comparisons, two of them are paramount: direct costs and travel times. Looking at the three most widely-used motorized options in Brazil – buses, motorcycles and automobiles – table 1 shows that motorcycles and automobiles offer massive advantages over buses for travelling nine kilometers in a large Brazilian city. The first advantage is trip time: 36 minutes by bus, 22 minutes by car and only 15 minutes by motorcycle. In terms of cost, using a car is only 20% more expensive than the bus fare, while the cost of a motorcycle is only 30% of a bus fare.

In other words, the signals sent by Brazil's mobility policy clearly encourage and invite people to opt for motorcycles or automobiles instead of buses. It is important to stress that this is possible only because society does not charge car drivers the real costs that the use of this mode incurs to society as a whole (this topic is discussed in greater detail in Section 3).

TABLE 1
Bus, automobile and motorcycle costs for a 9 kilometer trip in a large Brazilian city (2014)

Transport	Direct cost		Time	
	R$	Ratio	Minutes	Ratio
Bus[1]	2.7	1	36	1
Automobile[2]	3.2	1.2	22	0.6
Motorcycle	0.9	0.3	15	0.3

Source: ANTP (2012).
Prepared by the author.
Notes: [1] Full fare.
[2] Fuel + proportion of parking fee (10% of odds of paying R$ 5.00).

Another determining factor is the location of the destinations to which people wish to travel. Distances between places of origin and destinations depend on where people live, which is strongly associated with income. In most Brazilian cities, lower-income families live in outlying areas where lower land and housing costs fit their budgets. In larger cities, this results in very long daily commutes. Furthermore, mobility is also affected by the opening hours of the destinations in question, which may not be compatible with the times that people have to be at work, particularly for those with longer commutes between home and work, who are usually poorer.

This means that mobility is severely curtailed for lower-income people, with less access to opportunities such as jobs, education and public utility services. Further, urban planning rarely considers any possibility of encouraging the occupancy of more central areas by poorer families, reinforcing socio-spatial segregation.

4 THE METABOLISM OF MOBILITY

The joint analysis of the consumption and impacts of mobility reveals its metabolism, represented by relationships among the different social groups moving around the city. Income is the strongest variable for determining the mobility practices people adopt; that is why income is selected here to examine differences between types of consumption and impacts of mobility.

The intention here is to analyze what is consumed in order to achieve mobility, or mobility consumption, distinguishing who pays from who actually benefits. This requires addressing two types of mobility consumption: *who consumes* and *who pays*, from the standpoint of the territorial or transit areas, as well as energy and time, in addition to direct costs and investments, particularly in infrastructure.

Urban land consumption by road systems may vary from 6% in poor and densely populated cities in the developing countries, up to 20% in Europe, and 50% in cities dedicated to automobiles, such as Los Angeles and other cities in the

United States (Vasconcellos, 2001). In regular grid-type systems, streets are around a hundred meters apart, resulting in an average land consumption of 20%. But the bill is paid by society as a whole, while in many cases, it is private automobiles that benefit the most, even to the detriment of public transportation options. The amount of room used by a person in a public thoroughfare depends on the transportation mode, its speed, and for private vehicles, the length of time it is parked. The total area required by a car to park at home, at the office and when shopping was estimated at 372 m^2 in the United Kingdom – which is three times larger than the average British home (Tolley and Turton, 1995). The space needed to park and move around by bus, bicycle and automobile per person varies from 3 m^2, to 21 m^2, and 90 m^2, respectively (Vivier, 1999). Looking at average road space consumption in major Brazilian cities, people and automobiles occupy 80% to 90% of drivable lanes on thoroughfares (Ipea/ANTP, 1998), meaning that a person in a car consumes 25 times more room than the amount needed by someone in a bus.

Another essential characteristic of this consumption is that automobiles park for free on most Brazilian streets, which are public facilities for collective use; in other words, a reasonable amount of public space is handed over at little or no cost to a single person who uses an average area of 12 m^2 for the length of time that a car is left parked in the street. In the São Paulo metropolitan region, around 1.5 million automobile drivers parked their vehicles in the streets every day in 2007, at no cost. Considering a market fee of at least R$ 8 to park for two hours, this free service offers an implicit subsidy of R$ 4.4 billion a year. Massive differences are found when the distances covered by families every day are calculated by income levels. For trips on foot, distances are similar at 2 to 3 kilometers a day. But for public transportation options, distances increase up to the middle income levels, and then drop, while distances always increase with income: in São Paulo, there is a 1:4 ratio between the lowest and highest income levels for linear distances x trip. In other words, a striking difference in the use of space for travel purposes by families is already clear, based on income.

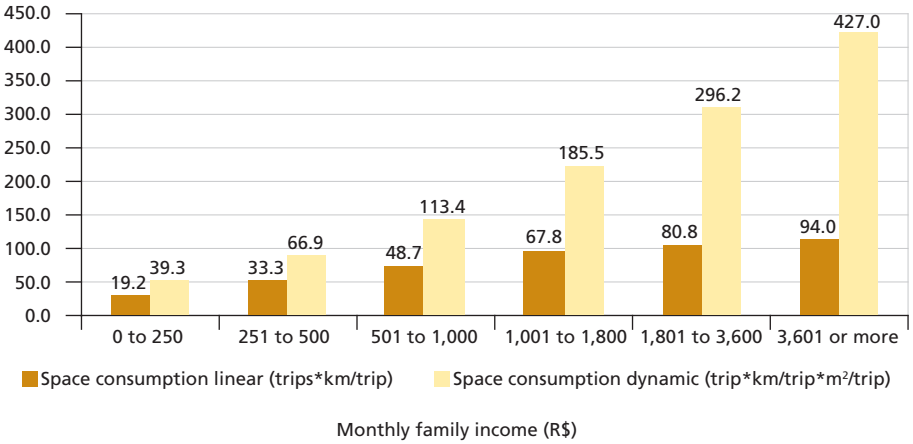
When linear distances are multiplied by the specific individual space needed by each transportation mode (representing "dynamic" space), differences between income brackets become even clearer: a higher income family consumes eleven times more road space a day than a lower income family (graph 6), without even taking into consideration the room needed to park the automobile and differences in space consumption resulting from different vehicle speeds.

The most important conclusion for public policy purposes is a public asset represented by road space that is not distributed evenly among people, with deep inequities in use. Consequently, calling road system investments democratic and "equitable" is a massive myth in Brazilian cities. In fact, this is undoubtedly

the most powerful myth deployed to justify indiscriminate road system expansion. Collective investments in road infrastructure for cars tend to offer countless times more benefits to a select group of individuals, i.e., the wealthy, who travel more over longer distances in private automobiles.

GRAPH 6

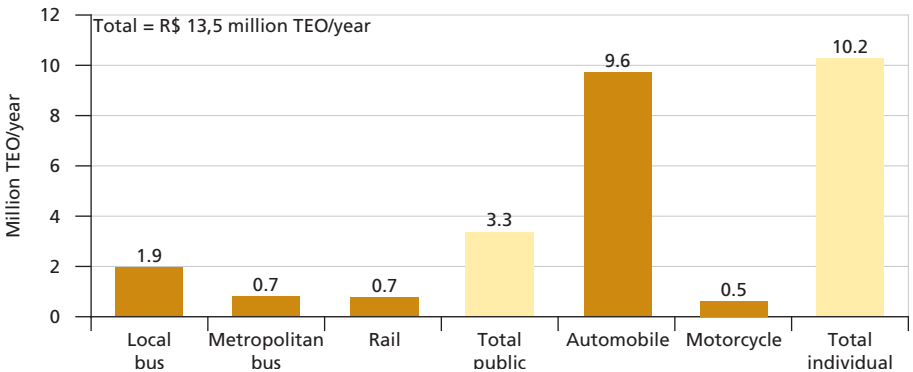
Linear and dynamic space consumption and family incomes – São Paulo MR (1997)



Source: CMSP, 1998 (special tabulation by the author).

GRAPH 7

Energy consumption for mobility, cities with more than 60,000 inhabitants, Brazil (2012)



Source: ANTP (2012).

Obs.: IT: individual transportation; PT: public transportation (municipal and metropolitan buses, trains and subways); TOE: tons of oil equivalent.

Motorized transportation consumes huge amounts of energy in all countries and cities. In Brazil, most of the energy used for mobility – 13.5 million tons of oil equivalent a year – consists of diesel oil, automotive gasoline and ethanol

fuelling cars, motorcycles and buses, with electricity holding a very small share. Graph 7 presents total energy consumption by individual and public transportation modes in Brazilian cities with more than 60,000 inhabitants, showing that private transportation consumes more than three times the energy used by public transportation options.

The amount of time consumed varies greatly, depending on the transportation mode selected and the distances covered. Trips on foot are usually quite short (most of them no more than one kilometer), and last an average of 15 minutes. Average trip times on public transportation options are always longer than car trips (table 2).

TABLE 2
Average trip time by main transportation mode in three Brazilian metropolises

Transportation	Minutes/trip		
	São Paulo 2012	Rio de Janeiro 2011	Salvador 2012
Public	67	42	62
Individual	31	33	40
Non-motorized	16	14	18

Sources: CMSP (2008) for São Paulo, STRJ (2013) for Rio de Janeiro and Oficina Consultores (2013) for Salvador.

A comparison of time consumed by families of different income levels shows that the amount of time spent each day by a high-income household is twice that of its low-income counterpart (table 3). Although higher income people travel more rapidly in automobiles, their total time consumption is higher, due to larger numbers of trips.

TABLE 3
Time consumption and family incomes, São Paulo MR (2007)

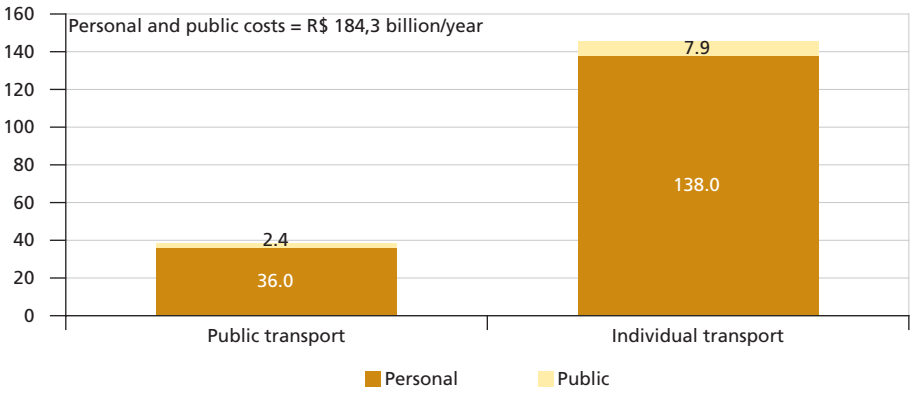
Monthly family income (R$)	Trip time per day (hours)	
	Household	Per person
Up to 760	2.5	0.7
760 – 1,520	3.4	1.0
1,520 – 3,040	4.1	1.2
3,040 -5,700	4.7	1.3
More than 5,700	5.0	1.4

Source: prepared by the author, based on CMSP (2008).

The consumption of economic resources by people and the state may be divided into the direct costs incurred through travel (fares, maintenance etc.) and costs related to the foundations underpinning mobility, particularly the installation of infrastructure and equipment.

Direct mobility costs may be divided between personal costs and public costs. Personal costs are fares paid by passengers and direct costs incurred for individual motorized transportation (automobiles and motorcycles), as well as fuel and parking. Direct public costs encompass the upkeep of road infrastructure and public transportation terminals. Graph 8 presents the figures for Brazilian cities with more than 60,000 inhabitants in 2012.

GRAPH 8
Personal and public costs, public transportation and individual transportation, Brazilian cities with more than 60,000 inhabitants (2012)



Source: ANTP (2012).

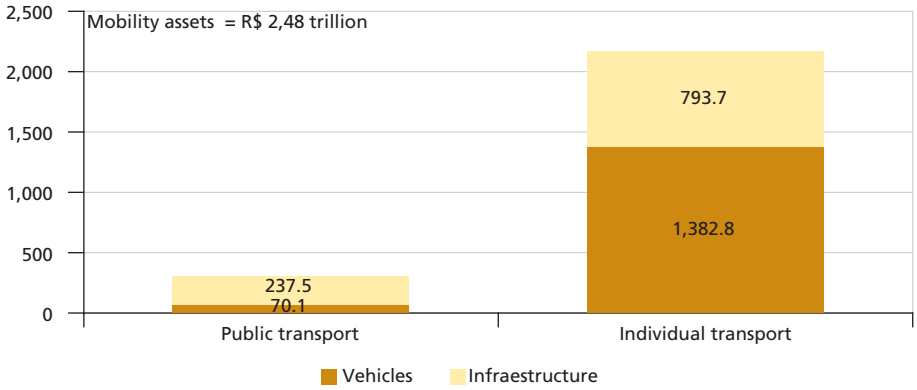
The overall estimated costs reached R$ 184 billion, with R$ 145.9 billion for individual transportation (79.2%) and R$ 38.4 billion for public transportation options (20.8%). The highest costs are personal, incurred for individual motorized vehicles (automobiles and motorcycles), followed by the operating costs of public transportation options. Among public costs, those related to individual modes are more than triple the costs of public transportation options, as the physical consumption of road space by individual vehicles is far higher than that of public transportation vehicles.

Other important costs in social and economic analyses of mobility are the estimated investments needed to underpin mobility. These investments were estimated for vehicle acquisition (for public and private use) and for road system construction, as though these assets have to be purchased or built now.

Graph 9 shows that accumulated investments in Brazilian cities with more than 60,000 inhabitants reached R$ 2.48 trillion in 2012, with the purchases of individual motorized vehicles incurring the largest costs (R$ 1.38 trillion or 56% of the total), followed by road construction (R$ 794 billion or 32% of the total). Meanwhile, public transportation options were the least expensive (9.6%

of the total for infrastructure and 2.8% of the total for vehicles). This means that Brazil spent more than three times as much on streets used by automobiles as on road systems used by public transportation options. Recalling that much of the road system is used as free parking by automobiles (item 3.1.2), the lack of balance in these investments becomes even clearer.

GRAPH 9
Mobility assets in cities with more than 60,000 inhabitants – Brazil (2012)



Source: ANTP (2012).

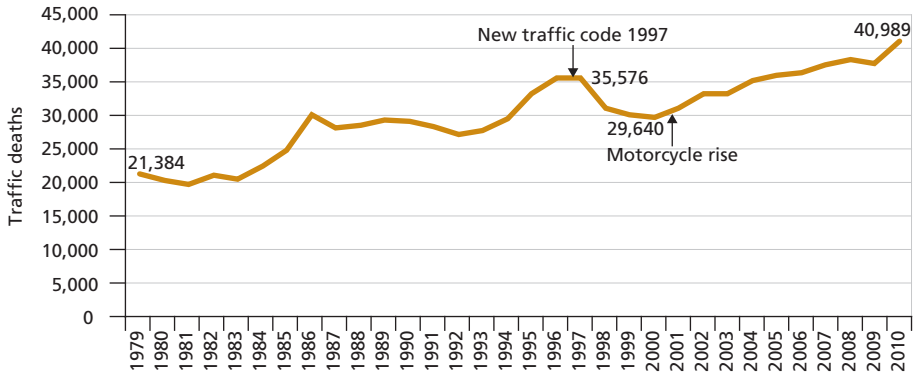
Based on the mobility metabolism analysis, it is now time to focus on the impact of mobility. Using an analysis similar to the one just carried out for consumption (which aimed to determine who consumes and who pays for mobility), the impacts of mobility will now be examined to determine *who causes* these impacts and *who suffers from them*.

The most important impact of mobility is related to traffic safety, meaning the living conditions of people while in movement. The approach adopted here is based on the following widely accepted assumptions: one relates the severity of a traffic accident to the body masses and speeds involved in a crash. This means that large vehicles driven at high speeds have the greatest potential for injuring people. At the other extreme, pedestrians, cyclists and motorcyclists are the most vulnerable users, lacking physical protection beyond their own bodies.

Brazil has always had high traffic accident rates. Graph 10 shows that the estimated total number of deaths in Brazil in 1979 (21,384) rose to 35,576 in 1997 (up 66%), after which it began to drop, with the entry into effect of the 1997 Brazilian Traffic Code (Código de Trânsito Brasileiro, CTB). However, the rising popularity of motorcycles – particularly as the economy improved during the first decade of the 21st century and access to consumer credit became easier – triggered an increase in the number of deaths, reaching 40,989 in 2010.

Accident rates in Brazilian cities are very high compared to those in the developed countries. In historical terms, pedestrians have long been the main victims of fatal traffic accidents, reaching 47% of the total number of deaths in 2000 (MS, Datasus). However, this situation changed as the popularity of motorcycles rose exponentially. In 2007, the number of injuries to motorcycle riders and passengers as a percentage of the total number of traffic victims reached 39.9% in Vitória, 52.3% in Rio Branco and 59.3% in Palmas (Legay et al., 2012); by 2010, motorcycles were already the main cause of traffic deaths in Brazil (33% of the total).

GRAPH 10
Traffic deaths, Brazil (1979-2010)

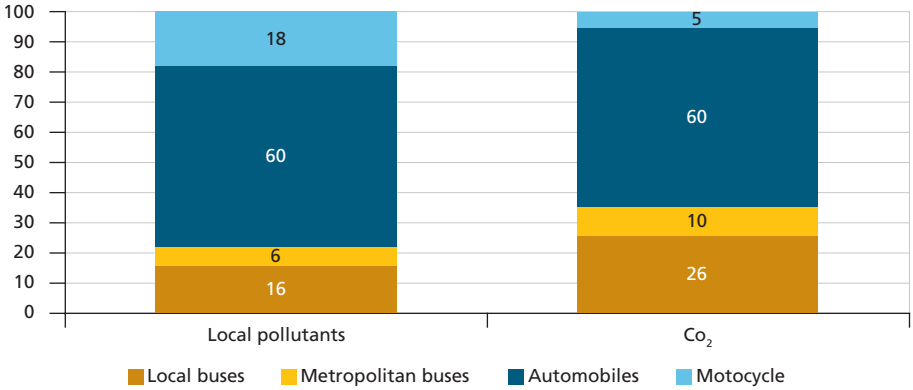


Source: Vasconcellos, 2013.

Impacts on air pollution must be analyzed from two perspectives: pollutant emissions directly affecting human health, known as "local" pollutants such as carbon monoxide (CO), hydrocarbons (HC), nitrogen oxide (NOx), and particulate matter (PM), in addition to greenhouse gases (GHGs) that affect air temperature, weather and climate, particularly carbon dioxide (CO_2), among several other gases. One of the major causes of air pollution is vehicles that burn fossil fuels such as gasoline, diesel and natural gas, as well as ethanol, which also emits local pollutants and CO_2.

Graph 11 shows that the largest amounts of local pollutants are emitted by automobiles (60%), followed by motorcycles (18%). For CO_2 emissions (greenhouse effect), automobiles account for most emissions (60%), followed by buses (26%).

GRAPH 11
Pollutant emissions in cities with more than 60,000 inhabitants, Brazil (2012)



Source: ANTP (2012).

The quality of urban life is severely affected by transportation choices, particularly the use of motorized vehicles, as they can turn a peaceful neighborhood into an unsafe, noisy and polluted environment. This occurs when social relationships among people break down or are truncated, especially when roads carrying vehicles driving at more than 30 kilometers an hour slice through residential areas with large numbers of pedestrians, creating what is known as the "barrier effect" (Appleyard, 1981). In the specific case of Brazil, these impacts are found throughout much of its urban territories, with no distinctions related to family incomes, reflecting the high priority given to the flow of motorized traffic. It was only from the 1980s onwards, when high-income gated communities began to appear, that this barrier effect was mitigated for a very small portion of the population.

Among the worst impacts of road use by motorized vehicles are traffic jams, which lead to increases in all the other negative impacts, particularly pollution, while also squandering other valuable assets. In fact, traffic jams are nothing more than overloaded road capacities that greatly extend trip durations, due to extremely low driving speeds.

In fact, the definition of a traffic jam is more complex than this, as this term involves high levels of subjectivity. The usual idea (which is physically quite evident) relates to the concept of "time lost" by people, but it is hard to measure exactly what is "lost". The most commonly used engineering parameter compares actual trip time along a road with what would be the "ideal" time (for example, with few vehicles in the streets), but this is clearly subjective and requires the

construction of very broad thoroughfares that would be empty for much of the time. This is why another concept arose, based more on economics, suggesting that traffic jams should be measured by the losses that a vehicle causes to others when entering a street, taking into consideration the amount of congestion that users are willing to accept (defined through specific surveys). In other words, durations longer than "acceptable" constitute traffic jams, rather than comparisons between actual and "ideal" times.

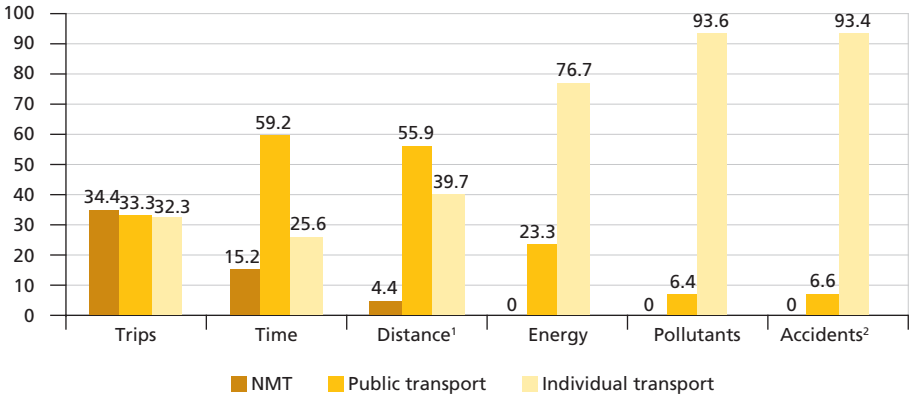
Regardless of the criteria used, the fact is that interactions among vehicles lower their speeds, raising the important issue of who can "delay" others and when. In the developing countries, excessive use of automobiles in cities results in massive road space consumption, delaying the public transportation vehicles that carry much of the population. In other words, the negative impacts of the choices made by a few weigh heavily on the mobility conditions of many others.

Furthermore, lower bus speeds mean that these vehicles carry fewer passengers in any given period, increasing the number of buses and drivers needed to render the same services, and thus resulting in higher fares. In Brazil, a study showed a 16.8% hike in bus operating costs in São Paulo (Ipea/ANTP, 1998). With worsening traffic conditions in this city from the early years of the 21st century onwards, the impacts are far greater today. Similarly, introducing a mobility system with many motorized vehicles significantly extends pedestrian trip times, due to long waits at traffic lights controlling vehicle flows.

In brief, calculating mobility consumption and its impacts by user income brackets discloses the "metabolism" of mobility, indicating who consumes resources and who pays for them, in addition to who causes and who suffers from the consequences of these negative impacts. Although this social and economic mobility analysis may be conducted at the micro-scale of a home, it is far more useful at the macro-scale of an entire city.

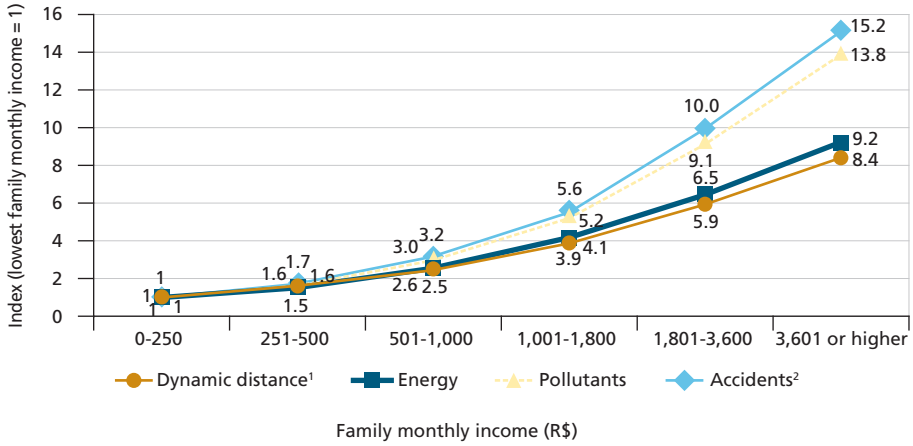
Graphs 12 and 13 present the 2007 metabolism data for the São Paulo metropolitan region (Vasconcellos, 2005, adapted). Graph 12 shows that private motorized transportation mode account for far higher energy consumption, with much heavier pollutant emissions and many more crashes (as the most vulnerable road users, pedestrians were rated as victims rather than causes of accidents). Graph 13 displays the massive disparities among people in different income brackets: those with higher incomes opt for types of consumption and impacts that are 8 to 15 times higher than the figures for those with lower incomes.

GRAPH 12
Mobility metabolism by transportation mode, São Paulo MR (2007)



Notes: [1] Linear distances x trip (considering only trip length rather than area used by the transportation mode).
[2] accidents caused (assuming that pedestrians are not included as causing accidents, as they are the most vulnerable and are legally protected by the Brazilian Traffic Code).

GRAPH 13
Mobility metabolism by transportation mode, São Paulo MR (2007)



Notes: [1] Dynamic distances (kilometers travelled x area occupied by the transportation mode x person).
[2] accidents caused (assuming that pedestrians are not included as causing accidents, as they are the most vulnerable and are legally protected by the Brazilian Traffic Code).

5 URBAN DEVELOPMENT AND MOBILITY POLICIES

With a few rare exceptions, Brazil's urban development processes have been characterized by disorderly land occupancy. This laissez-faire situation had effects in two realms: land use and location of activities. Freedom in terms of land use resulted from the absence or weakness of urban planning regulations, with irregular

inspections and light or even no penalties. For the purposes of discussing mobility, the consequences include a broad range of unhealthy uses and the generation of undesirable traffic flows.

Along with rising land costs and limited alternatives, freedom of land use spurred settlements in hazardous areas with unsuitable topography or alongside streams and rivers, in areas far from essential destinations, including districts offering goods and public utility services, thereby greatly extending trip times and distances. In many places, this type of settlement has overloaded road systems, with adverse effects on flows of people and goods.

Urbanization surged in Brazil mainly between 1950 and 2000, when an additional 43 million people poured into the eleven largest metropolitan areas. Urbanized areas expanded by 4,100 km^2 and the average urban radius expanded by an average of 80%, resulting in lengthy commutes for people living in outlying districts (Vasconcellos, 2013).

Regarding different social groups, the impact of these policies clearly benefited the middle and higher income brackets, a minority of Brazilians during the period under analysis. The construction of space for automobiles was actually the construction of space for the middle classes, which used their cars with increasing frequency in order to ensure social and economic reproduction. This lifestyle was constantly encouraged and supported by civil servants who created and implemented public policies, most of whom were also in higher income brackets. While outlying areas continue to be settled by poorer families, middle-class neighborhoods thrived closer to city centers, where this new lifestyle could be enjoyed in greater comfort.

On the other hand, when policies are analyzed from the standpoint of the roles played by people in traffic flows that are seamlessly related to their social, political and economic conditions, some very important conclusions can be reached.

The simplest roles played in traffic flows – using natural means such as walking or simple mechanical options such as bicycles – were ignored by mobility policies in Brazil, while roles requiring motorized vehicle use received close attention, but at differing levels of priority.

As industrialization surged, along with rapid urban development, two types of users were taken into consideration: users of public transportation options and users of automobiles. Their presence in these policies was solid, broad-ranging and permanent, creating a "polarization" in actual practice. When these two types of motorized traffic appeared together in policy documents, public transportation was invariably declared a higher priority (EBTU, 1981; Geipot, 1985). But nothing could have been further from reality than these merely rhetorical statements, and bus lane construction policies never reached their quantitative or qualitative targets.

However, during the more recent phase of this policy – from the 1990s onwards – another private transportation mode was included in these proposals: motorcycles.

This leads to a summary of the ways in which governments have responded to the mobility needs of the users of various transportation mode: *Pedestrians and cyclists: mobility scorned.*

In countries such as Brazil, most people move around on foot for much of the time. However, since the emergence of the first mobility policies in Brazil to the end of the first decade of the 21st century, walking through the streets was completely ignored as a transportation mode. People on foot or riding bicycles were "invisible" players in traffic flows, never included in government policies. These users occupied their space autonomously. The denial of the importance of walking began long ago with the legal stipulation that sidewalk construction and maintenance are the responsibilities of the landowner. This means that sidewalks were never viewed as part of traffic systems, a position that began to change only with the 1988 Traffic Code. This attitude resulted in sidewalk systems that are very deficient in terms of quality and continuity, with many streets having no sidewalks at all. Gaps for vehicles to enter parking areas under buildings on sloping streets turn sidewalks into irregular stairways that are uncomfortable and hazardous. No planning or support was ever directed towards cyclists, imposing on them the hazardous task of pedaling between large vehicles driving at high speeds.

5.1 Public transportation passengers: mobility provided, but unstable

Public transportation has always been crucial for economic development in Brazil, as a means of delivering workers to workplaces. However, authorities and operators in charge of public transportation (usually bus-based systems) have usually provided the bare minimum in all aspects of service quality, delivering deficient services that do not meet users' needs. These systems were created around the need to deliver people to their jobs every day and take them home again at the end of their shift. This happened in all large cities in Brazil, regardless of economic development levels. A mechanized phenomenon that was vital to production and accumulation processes, it had no organic links derived from the political importance of public transportation passengers – always extremely limited. In contrast to policies focused on individual transportation options, those addressing public transportation put forth only the least amount of effort possible needed to take actions essential for the daily operations of these services. Similar to many other spheres of Brazilian society, public transportation policies have become shrouded in myths and justifications attempting to ease the suffering and deprivation of their passengers, resigned to their fate.

The mobility of urban train passengers was handled very poorly during the early decades of urban expansion, triggering widespread protests that finally forced Brazil's dictatorship to introduce massive changes to train services in Rio de Janeiro during the 1970s. The history of the Central do Brasil rail system clearly demonstrates the lack of care and respect for the poor and dispossessed that is so typical of Brazilian society (Moisés and Martinez-Allier, 1997; Nunes, 1982). It was only with the introduction of the São Paulo subway system that rail users were finally respected, offered high quality services for the first time in Brazil from 1974 onwards, and it was only from the mid-1990s onwards that some rail systems began to upgrade the comfort and safety offered to their passengers.

Although regulated, public transportation options have never been viewed by economic elites as a "public" service, but rather as part of the "market"; authorities seeking to implement bus lanes have often been required to provide the necessary infrastructure, with similar demands never imposed on suggestions for extending road systems to benefit automobile use. While systems designed for automobiles have expanded exponentially, those dedicated to buses have remained very limited. Further, the treatment of public transportation as a second-class commuting option – a type of "negative pedagogy" deployed to lower the value of public transportation in the view of society – has also contributed significantly to this outcome. The constantly poor quality of these services shaped a negative image of buses that later took shape as a cultural characteristic. Society was taught to disdain public transportation options, viewing them as a "necessary evil" until individuals were able to upgrade to motorcycles or cars.

5.2 Motorcyclists: user-imposed mobility

As motorcycle use was almost negligible in Brazil until the 1990s, the interests of their users gained political clout only after decisions were taken to encourage a ownership of these vehicles, mainly during that decade. During the Traffic Code approval procedures in 1997, the government vetoed a proposed ban on driving between vehicle lanes. After this, the first large group of motorcycle users in Brazil – express delivery riders known as *motoboys* – wove between vehicle lanes, behaving in ways that intimidated other drivers. Lacking appropriate education requirements and training facilities for motorcyclists, their mobility was established under extremely dangerous conditions, grounded largely on their lack of respect and prudence. With other road users equally unprepared to cope with motorcyclists, who were allowed to drive alongside large vehicles travelling at high speeds, this behavior led to the largest social disaster in Brazilian traffic history: indemnities have been paid out for the deaths of 220,000 motorcycle users, together with 1.6 million indemnity payments for lifetime disability between 2000 and 2012 (Lider Seguradora, 2014).

5.3 Automobile drivers and passengers: mobility protected and praised

Automobile users drove onto Brazil's roads in significant numbers a few years after the auto-assembly sector was established during the 1960s. Brazil's ballooning fleet – owned by members of society with higher incomes and wider influence – had massive impacts on transportation policies, which were designed to make cities more car-friendly. Particularly under Brazil's military dictatorship, when incomes were heavily concentrated, new middle classes appeared that depended on automobiles, giving rise to "middle-class cities" where these social groups could drive cars in ample comfort (Vasconcellos, 1999). High priority given to individual transportation and cars continued through the decades from 1970 until today, underpinned by a wide variety of economic and political factors, two of which are particularly noteworthy: the massive ideological power and influence of car-dependent middle classes and the economic relevance of this industry, in terms of maintaining the health of the Brazilian economy, as well as bringing in taxes for the government. In practice, the state became both partner and hostage to this industry, receiving in 2010 R$ 37.8 billion in assorted taxes: Industrialized Products Tax (IPI); State Goods and Services Circulation (ICMS) Tax; Social Integration Program (PIS); and the Social Security Financing Levy (Cofins) in 2009 (Anfavea, 2010).

5.4 Taxi drivers: mobility courted

Cab owners have long enjoyed solid government support and subsidies, with long-standing laws protecting individual proprietors, plus generous tax breaks and other exemptions. In major cities, these subsidies are absorbed by higher-income social groups who can pay taxi fares. In São Paulo, annual subsidies of R$ 250 million benefit high-income social groups in 90% of cases, who are also more likely to have automobiles at home. This stance persists as, although cabs handle only a very small number of daily trips, their drivers have massive political clout, since they come into close private contact with their passengers, endowing them with ample power to influence public opinion in social groups with higher incomes. This is why they are courted and supported by local politicians.

6 CONCLUSION

An analysis of mobility policies deployed in Brazilian cities since the 1950s clearly shows that massive urban growth and the advent of huge metropolitan areas have been accompanied by the appearance of mobility systems that are neither fair nor sustainable. The available transportation modes have been treated unequally, assigning top priority to automobiles, reflected mainly in investments in road system expansion. Public transportation options have been set up at minimal levels of efficiency, enough to carry people to and from their jobs each day but with evidently poor quality and accessibility. Walking and cycling have been simply abandoned or

ignored in plans and projects, while a laissez-faire situation in urban land markets and the absence of adequate urban master plans have exacerbated geographical isolation and exclusion for lower-income social groups.

In terms of mobility characteristics and their impacts, it is clear that most urban space and energy is absorbed by automobiles, a mode that historically has been used by a small proportion of the population. In terms of impacts, most pollutant emissions and traffic deaths have been related to car use. An analysis of this distribution of consumption and impact by income levels – mobility "metabolism" – highlights the massive gaps between social groups: people with higher incomes cause impacts that are up to 15 times higher than the mobility related impacts of lower income groups.

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CHAPTER 4

INTEGRATED PLANNING, SPATIAL ORGANIZATION AND SUSTAINABLE MOBILITY IN THE CONTEXT OF BRAZILIAN CITIES

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Marcela da Silva Costa[2]
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1 INTRODUCTION

In historical terms, until the advent of motorized means of transportation, the sizes of cities were limited by times and distances that could be covered on foot (or alternatively by vehicles drawn by animal traction). As this process is addressed in other chapters of this book, only a few brief references to this matter are needed here, emphasizing that under these conditions, prior to the 19th century, towns with a radius of more than five kilometers were the exception rather than the rule (as discussed by Davis et al., 1972).

Initially, the higher speeds of motorized vehicles allowed trip times to remain the same as when walking, although covering significantly longer distances.[4] This characteristic naturally led to the expansion of contiguous urbanized areas (in some cases, even not contiguous, but interdependent). One of the problems of this urban expansion model is that the excessive numbers of motorized trips saturated existing thoroughfares as well as those built over the years in response to steadily rising demands for road space.

This physical expansion of cities seems to be an irreversible trend, mainly because it is also a consequence of steep population growth all over the world during the past two decades – a topic that provided the plot for a recent international bestseller (Brown, 2013). Within this context, all the planning challenges today lie in minimizing the negative effects of a combination of excessive urban sprawl and its dependence on motorized means of transportation (or on the other hand, the inability to support current commuter patterns efficiently and effectively with non-motorized modes). Consequently, this is not simply a matter of transportation

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4. For more information on this topic, see Banister (2012).

planning, employing the traditional approach proposed during most of the 20th century. Nor does it only involve just urban planning, if it is not associated with the issues of mobility and circulation.

What is suggested as an alternative for planning sustainable cities today is the effective introduction, into a specific region, of the concept of sustainable mobility, which extends beyond isolated planning processes for land use, circulation or transportation. But what exactly is sustainable mobility? Can this concept contribute to sustainable urban development? How? Is this a real need that cannot be postponed? From when onwards? Are there appropriate tools for this planning process? Possible answers to these questions will be discussed in this text, which is organized into four other sections. The first presents a preliminary discussion of what sustainable mobility actually consists of, followed by an examination of the need for planning tools and instruments to measure current conditions and the desired levels of mobility pursued through public policies. Finally, some elements are presented and discussed that should be included in a Sustainable Urban Mobility index. This document highlights aspects related to integrated planning and spatial organization, based on the approach adopted through a specific index – the Index of Sustainable Urban Mobility (I_SUM) – and a discussion of the findings obtained through its use for six Brazilian cities.

2 SUSTAINABLE URBAN MOBILITY

According to UN-Habitat (2013), rising concerns over climate change, higher fossil fuel prices, traffic jams and social exclusion have prompted renewed interest in exploring the relationship between mobility and urban form. Nevertheless, most cities, particularly in the developing countries and emerging economies, continue to assign high priority to motorized transportation and the construction of road-based urban infrastructure for these vehicles.

Similar to what happened in almost every country in the world during the 20th Century, the issue of urban mobility was and is still addressed in Brazil as a matter of providing transportation services. Planning initiatives in Brazil are characterized by a steady stream of public transportation and road planning, frequently unrelated. There is also a lack of continuity, as local governments rarely forge ahead with proposals and projects that were being implemented by their predecessors, particularly when aligned with different political parties. As this generally occurs in situations with limited resources, it naturally leads to wasted funds, exacerbated by the lack of social controls. The situation becomes even worse when noting that environmental issues are not taken into consideration properly by urban transportation planning in Brazil.

In short, the planning mentioned in the previous paragraph is characterized by the supply of infrastructure for road transportation. The hallmarks of this planning strategy, building huge expressways, assigning high priority to individual vehicles instead of public transportation, and the lack of coordination between urban and transportation planning, lie at the root of the severe mobility problems found today in Brazilian cities. This mismatch between urban and transportation planning left a gap that has rarely been bridged, according to the Transportation Policy Integration Studies Group (Geipot, 2001).

The worsening of mobility-related problems caused by this fragmented view of the city and its transportation systems prompted the development of a new urban mobility paradigm under different names: sustainable transportation, sustainable mobility, human transportation and citizen mobility, among others (Brasil, 2005a). Regardless of the nomenclature, its focus is on enhancing people's quality of life through more accessible cities, with fewer social inequalities, and that respect the environment. This necessarily takes place within the context of a systemic and integrated approach to mobility.

According to Seabra, Taco e Dominguez (2013), the construction of the sustainable urban mobility concept is rooted in discussions held over the past few decades, grounded in the sustainable development concept. This has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). For Boareto (2008), sustainable urban mobility is the outcome of a set of transportation and circulation policies designed to ensure ample, democratic access to urban areas by assigning high priority to non-motorized and public transportation in an effective, socially inclusive and ecologically sustainable manner, based on people rather than vehicles.

In addition to the establishment of the Ministry of Cities in 2003, other initiatives have proven essential for the development of these new mobility paradigms in Brazil. For example, the City Statute (2001) lays down the guidelines for urban policies in Brazil at the federal, state and municipal levels, while also introducing the requirement of Integrated Transportation Plans (later changed to Transportation and Mobility Master Plans – PlanMob) for cities with more than 500,000 inhabitants. These plans must form part of the Municipal Master Plan, or must at least be compatible with it, implying that mobility policies must be aligned to Municipal Development Plans (Brasil, 2005b).

These advances culminated in the approval and entry into effect of Brazil's National Urban Mobility Policy, which established the following guidelines (Brazil, 2012):

- integrated planning (urban development, housing, basic sanitation, land use planning and management);
- integration between urban transportation modes and services;
- mitigation of the environmental, social and economic costs of moving people and cargoes around the city;
- scientific and technological development;
- use of renewable energy and energy sources that emit fewer pollutants;
- public transportation projects that support territorial structuring and foster integrated urban development;
- integration between twin cities along national borders (this guideline will not be addressed in this document).

3 SUSTAINABLE URBAN MOBILITY PLANNING

Municipalities must consolidate this new and broader-ranging mobility-planning concept through their Transportation and Mobility Master Plans (PlanMobs). These Plans thus constitute tools for implementing urban mobility policies, establishing guidelines, instruments, actions and projects focused on the organization of areas of circulation, together with traffic management and public transportation services. Drawing up these plans consequently requires detailed diagnoses of urban mobility conditions in cities, underpinning guidelines and steering government actions over the short, medium and long terms. To do so, specific tools are needed that can provide feedback on this reality, in addition to setting goals and monitoring actions over time. This topic has been discussed by countless authors, including Berger (1998), Gudmundsson (2000; 2004), Gudmundsson, Wyatt and Gordon (2005), Johnston (2008), Litman (1999), Maclaren (1996) and Miranda et al. (2009), for example.

Among the tools that can be used for this purpose is the index of Sustainable Urban Mobility (I_SUM), which was developed at the São Carlos School of Engineering, São Paulo University (Costa, 2008; Rodrigues da Silva, Costa e Ramos, 2010). A tool for monitoring sustainable urban mobility and assessing the impacts of public policies, this index was structured on the basis of concepts identified in eleven Brazilian State capitals through workshops that gathered together professionals from many different fields of action, linked to municipal bureaus, municipal and regional administration entities, government enterprises and traffic and transportation management and inspection entities.[5]

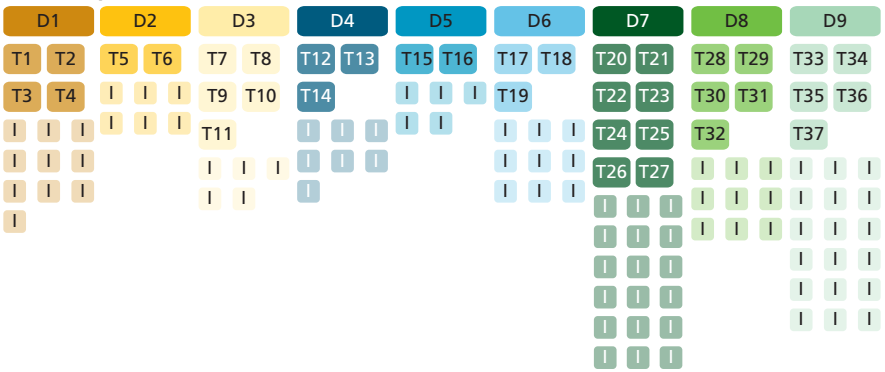
5. For further details, see Rodrigues da Silva, Costa e Macêdo (2008).

This index consists of a hierarchy of criteria that cluster together 9 domains, 37 themes and 87 indicators. Its weighting system can identify the relative importance of each criterion and for each dimension of sustainability (social, economic and environmental). The index makes it possible to assess the impact of actions in different areas for all three dimensions of sustainability, in addition to identifying the indicators with the greatest impacts on the results of the I_SUM at the global and sector levels. The hierarchy of criteria reflecting links established among the elements in the index is shown in figures 1, 2 and 3.

FIGURE 1
Hierarchical levels of the Index of Sustainable Urban Mobility (I_SUM)

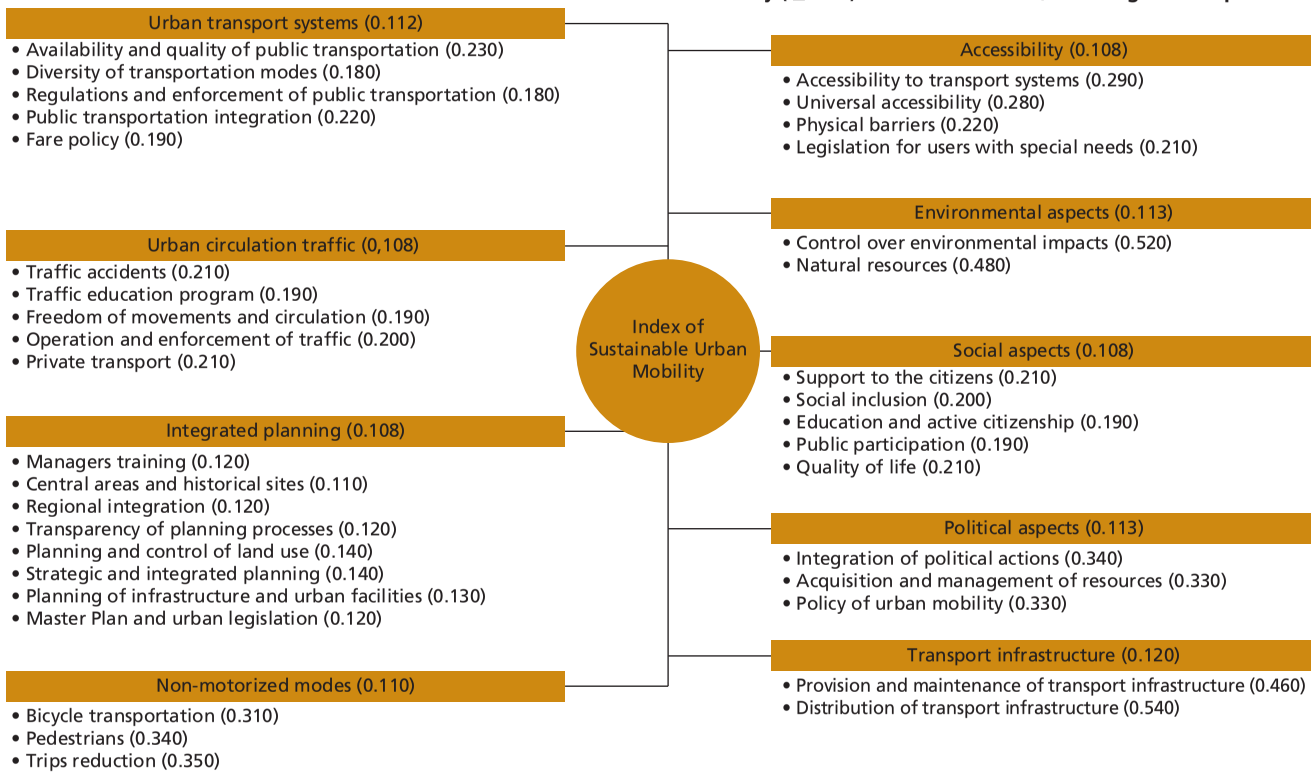
Elaborated by the authors.

FIGURE 2
Complete schematic structure of the index



Elaborated by the authors.
Note: [1] The elements identified as follows: D: domains; T: themes; and I: indicators.

FIGURE 3
Schematic model of the nine Domains of the index of Sustainable Urban Mobility (I_SUM) with its 37 Themes, including their respective weights



Elaborated by the authors.

The I_SUM indicators were identified through two sets of information: a benchmark baseline consisting of urban indicators derived from systems developed in Brazil and other countries (around 2,900 indicators), and the set of indicators obtained in workshops held in eleven Brazilian State capitals. The criteria weights were defined by a panel of specialists in the urban planning, transportation, mobility and sustainability fields in Brazil and other countries of North America, Europe and Oceania. This ensured that there were no links to one specific geographical context, theoretically forming a neutral weight system that could be used in a variety of situations.

The I_SUM is calculated through a Guide of Indicators and a calculation spreadsheet developed specifically for assessing the index (Costa, 2008). The Guide of Indicators contains all instructions for calculating the 87 indicators that constitute the I_SUM (definitions, measurement units, benchmarks, relevance, and contributions to index results, weights, databases and data sources) as well as the methodology and criteria of standardization procedures, including the indicator assessment scales. The standardization process is necessary, as the values characterizing the criteria are not comparable to each other and are frequently represented through different scales, undermining the feasibility of their immediate aggregation. They are thus standardized to a single value scale. In order to calculate the I_SUM, the standardization process for the criteria consists of obtaining a standardized score for the indicator values, defined between the minimum and maximum limits of 0.00 and 1.00 respectively. These values correspond to the international standards disseminated in the literature, with limits proposed by the researcher and other references, allowing an overall assessment of the situation represented by each indicator.

Once the values have been standardized between 0 and 1, the next stage consists of grouping these indicators in order to obtain values for the global and sector indexes. The I_SUM aggregation method consists of a weighted linear combination where criteria are combined through a weighted average, allowing them to be offset against each other. The aggregation method thus allows good and bad criteria to be offset against each other.

The index also presents assessment scales for each indicator, for checking performance against pre-set targets (assessment over time) and conducting comparative analyses among different geographic regions. Due to these characteristics, the index may be used for drawing up integrated urban mobility policies as well as policies focused on specific domains and dimensions. In both cases, pinpointing areas that are more deficient allows planners and managers to assign priorities and orient their policies and strategies appropriately, especially when funds and resources are in short supply, hampering the implementation of broader-based actions.

The complete structure of the I_SUM, with a detailed description of its 9 *domains*, 37 *themes* and 87 *indicators*, together with their respective weights, may be found in the original work by Costa (2008), as well as in some subsequent studies addressing applications based on the index (for example, Miranda, 2010; Mancini, 2011; Azevedo Filho, 2012; Oliveira, 2014; Rodrigues da Silva et al., 2015).

4 URBAN PLANNING ELEMENTS INTEGRATED WITH MOBILITY PLANNING

Indicator-based planning may offer an overview of elements influencing urban mobility and their levels of influence in terms of the concept of sustainability (through weights assigned to domains, themes and indicators, as is the case with the I_SUM). Based on this and for the purposes of this chapter, it is interesting to explore how different tiers in the hierarchy proposed for the I_SUM integrate urban planning with transportation planning (or mobility, in a broader sense). In this case, the natural approach is to initially acknowledge that there is a *domain* dedicated specifically to Integrated Planning, which consists of 8 *themes* (shown in figures 1, 2 and 3) that are broken out into 18 *indicators*, as shown in chart 1. Although other domains and themes also address related issues, this is the one that best synthesizes the type of integration examined here. Although the designations of the *themes* usually allow fairly direct interpretations of what they are designed to assess, the same cannot be said about the denominations of the *indicators*, which is why this table presents a definition of each of these *indicators*.

CHART 1
Detailed definitions of the *8 themes* and 18 *indicators* in the Integrated Planning domain of the Sustainable Urban Mobility index (I_SUM)

Themes	Indicators	Indicator definition
Managers training	Expertise of technicians and managers	Percentage of technical staff and managers of urban planning, transportation and mobility entities with university degrees, out of the total number of employees of these entities in the reference year.
	Training for technicians and managers	Number of hours of training and capacity-building *per capita* offered to the technical staff and managers in urban planning, transportation and mobility areas during the reference year.
Central areas and historical sites	Vitality of the central area	Measurement of city center vitality at two separate times, based on the number of residents and the number of jobs in retail and services sectors in this area.
Regional integration	Intercity partnerships	Existence of inter-municipal government consortia for providing urban and metropolitan transportation infrastructure and services.
Transparency of planning processes	Transparency and responsibility	Existence of regular formal publications by local governments on matters related to infrastructure and services, as well as transportation and urban mobility plans and projects.
Planning and control of land use	Vacant land	Percentage of vacant or unused areas in the urban area of the municipality.
	Urban growth	Ratio between the area of new projects (for different uses) planned or being implemented in regions endowed with transportation services and infrastructure, and the area of new projects in regions that have not yet been developed, with no transportation infrastructure.
	Urban population density	Ratio between the total number of inhabitants in the urban area and the total urbanized area of the municipality.
	Mixed land use rate	Percentage of urban areas earmarked for mixed land use, as defined by municipal laws.
	Illegal settlements	Percentage of urban area consisting of informal or illegal settlements.

(Continues)

(Continued)

Themes	Indicators	Indicator definition
Strategic and integrated planning	Integrated urban environmental and transport planning	Existence of formalized cooperation between government entities in charge of transportation planning/management and urban planning/environmental issues for drawing up integrated strategies designed to upgrade urban mobility conditions.
	Implementation and sequence of planned actions	Transportation and urban mobility programs and projects implemented by local governments during the reference year and continuity of actions undertaken.
Planning of infrastructure and urban facilities	Parks and green areas	Green urban areas (parks, gardens, green areas) per inhabitant.
	Urban facilities (schools)	Number of public and private schools offering early childhood education and primary schooling per 1,000 inhabitants.
	Urban facilities (hospitals)	Number of healthcare facilities or primary healthcare units (Government Health Clinics) per 100,000 inhabitants.
Master Plan and urban legislation	Master Plan	Existence and year of preparation/update of Municipal Master Plan.
	Urban legislation	Existence of urban planning legislation.
	Actual application of urban legislation	Enforcement by the local government of compliance with urban planning legislation.

Elaborated by the authors.

As these indicators provide results in different measurement units, a standardization process is needed, as mentioned in the previous item, in order to gather them together into a single index. To do so, reference tables were drawn up that result in a standardized score (in this case, between 0 and 1). An example of this step is presented in table 1 for one of the indicators listed in chart 1: the *Mixed Land Use Rate* indicator.

TABLE 1
Example of a reference table for obtaining standardized scores for the index of Sustainable Urban Mobility (I_SUM) indicators – specifically the *Mixed Land Use* Rate indicator

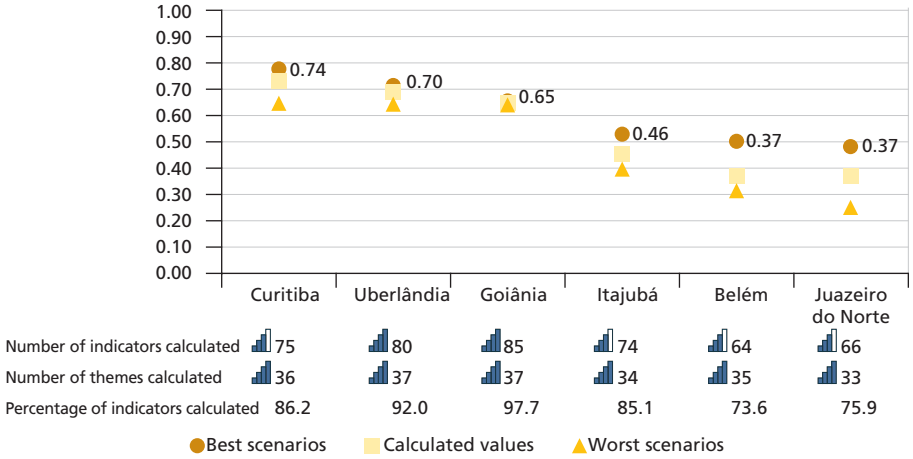
Standardized score	Reference values Percentage of the municipal urban area where mixed land use is permitted/encouraged, with activities that are compatible with each other and with residential use
1.00	More than 75%
0.75	75%
0.50	50%
0.25	25%
0.00	0% – Municipal urban planning legislation does not allow mixed land use, establishing zones that are exclusively residential, commercial, industrial or institutional, resulting in intensive sectorization of urban areas.

Elaborated by the authors.

5 PORTRAIT OF INTEGRATED PLANNING IN BRAZILIAN CITIES BASED ON THE I_SUM

Considering the specific interest of this study in the contributions of integrated planning to ensuring sustainable mobility, the findings presented here were obtained through applying the I_SUM in some Brazilian cities. It should be noted that under the *Integrated Planning* domain, this index encompasses institutional planning aspects as well as spatial organization elements, which is why it is aligned with the purposes of the analysis presented here.

GRAPH 1
Results of the index of Sustainable Urban Mobility calculations for the six cities assessed



Elaborated by the authors.

The I_SUM values found for the six cities studied are summarized in graph 1. As shown, through a comparison of the global I_SUM results for each city, it is noted that Curitiba, Uberlândia and Goiânia perform far better than Itajubá, Belém and Juazeiro do Norte, with even the worst estimates (the poorest results for the indicators not calculated)[6] for the first group being better than the best estimates (taking the best results[7] for the indicators not calculated) for the second group. It is noted that cities with the highest number of indicators not calculated present higher variations and consequently less "accuracy" in the final results of the index. In another comparison of the performances of the same cities, this time by I_SUM domain, shown in graph 2, it is clear that the performance in the Integrated Planning domain is strongly and directly linked to the global results of the index. Thus, the three cities with the highest global values are exactly those with the best performances in the Integrated Planning domain (despite reversed positions for Goiânia and Uberlândia).

As the discussion here is focused on the issue of integrated planning, and these are aspects explicitly represented by a domain of I_SUM, figure 4 presents in detail the standardized scores obtained for the indicators in this domain in the six cities analyzed. A more meticulous analysis of the results of the standardized scores helps to identify some interesting aspects for the discussion underway. Initially, aspects related to organizational or institutional structures will be addressed.

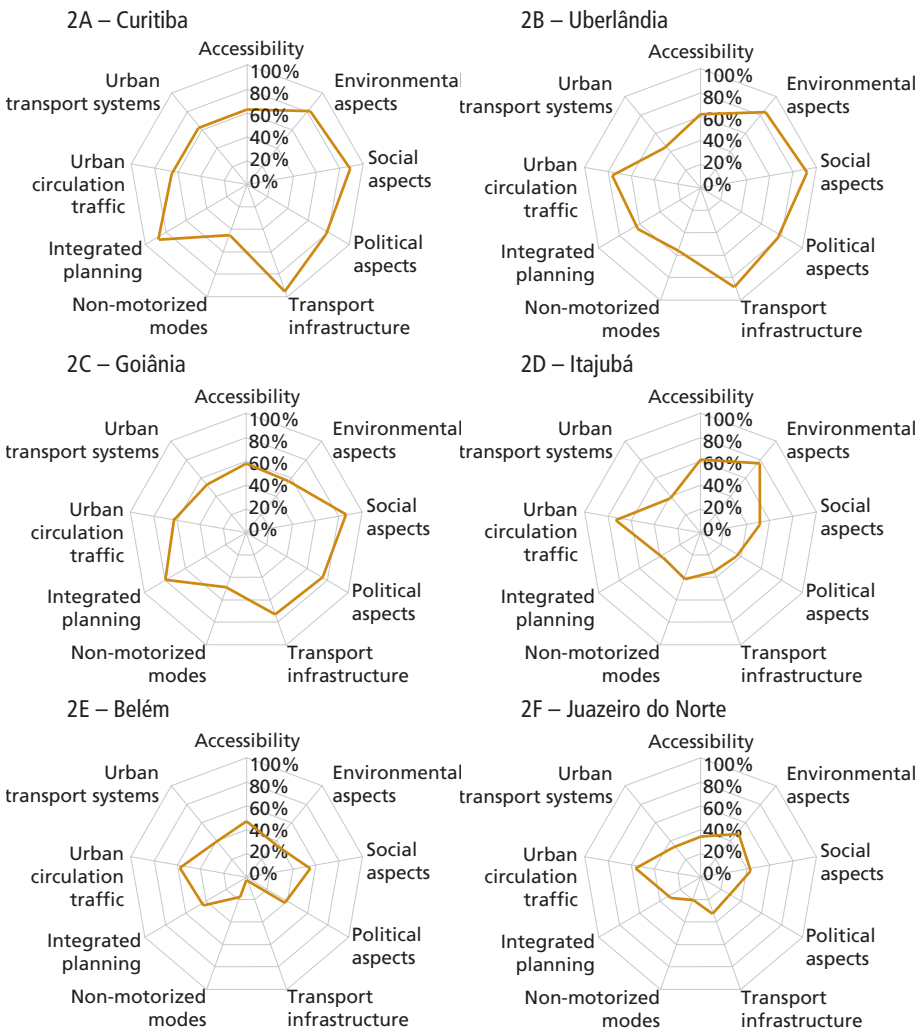
The first point is related to the best-performing indicator in the six cities as a whole, which is *Urban Legislation*. As shown in figure 4, all six cities analyzed performed well for this item, even the two with the lowest global index assessment.

6. Each indicator not calculated for the six cities: Curitiba (12), Uberlândia (7), Goiânia (2), Itajubá (13), Belém (23), Juazeiro (21); was assigned a minimum value (zero), after which the Global I_SUM was calculated.

7. Each indicator not calculated for the six cities: Curitiba (12), Uberlândia (7), Goiânia (2), Itajubá (13), Belém (23), Juazeiro (21); was assigned a maximum value (one) after which the Global I_SUM was calculated.

Also related to this theme, the indicator showing compliance levels with urban planning legislation was equally well assessed, although in this case it was not possible to calculate this indicator in Belém, due to operational difficulties.[8] The *Master Plan and Urban Legislation* theme was also supported by a specific indicator on the existence of Master Plan, where four of the six cities reached the maximum scores. The remaining two – which are smaller – presented standardized scores that were merely reasonable (exactly in the middle of the scale between 0 and 1).

GRAPH 2
Performance of six cities in five Regions of Brazil for each of the nine domains of the index of Sustainable Urban Mobility



Elaborated by the authors.

8. For further details on calculations for Belém, see the study by Azevedo Filho (2012).

Another theme that scored well overall is the one that addresses manager training, formed by two indicators. The top performer here was Curitiba, with maximum scores for the *Expertise of technicians and managers* and *Training for technicians and managers*. Goiânia also ranked high for this theme, although scoring lower than Curitiba for the first indicator (upper part of figure 4). Although Uberlândia and Itajubá have highly-qualified staff, it seems that little attention is paid to building up their capacities. The fact is that, based on a comparison of the values in graph 1 and figure 4, there seems to be a direct link between the qualifications of technical staff and managers and the status of sustainable mobility in the cities under analysis.

Highly-qualified technical staff and managers perhaps also help explain the good performances of Curitiba and Uberlândia (as well as Goiânia, to a lesser extent) for the two indicators related to the Strategic and Integrated Planning theme: *Integrated urban, environmental and transport planning* and *Implementation and sequence of planned actions*. Bringing up the rear here was Juazeiro do Norte, with a standardized score of 0 for both indicators.

Two other themes, each with a single indicator, reflect the management characteristics present in the Integrated Planning domain. The *Regional Integration* theme, with the *Intercity partnerships* indicator, and the *Transparency of planning processes* theme, with the *Transparency and Responsibility* indicator. For both cases, Curitiba and Goiânia performed outstandingly in contrast to the poor performance of Juazeiro do Norte and Itajubá (as shown in figure 4).

The elements characteristic of spatial organization are represented in the Integrated Planning domain by the following themes: *Planning and control of land use, Planning of infrastructure and urban facilities, and Central areas and historical sites*. The set of five indicators for the first theme reflect government capabilities for controlling urban land occupancy in pursuit of the interests of society: *Vacant land, Urban growth, Urban population density, Mixed land use rate* and *Illegal settlements.* The second set (three indicators) reflects civil service concerns over upholding environmental quality (*Parks and green areas*) and accessible supplies of basic urban facilities (*Schools and hospitals*). The final theme has only a single indicator: *Vitality of the central area*, measured on the basis of the number of residents and jobs in the central area at different times.

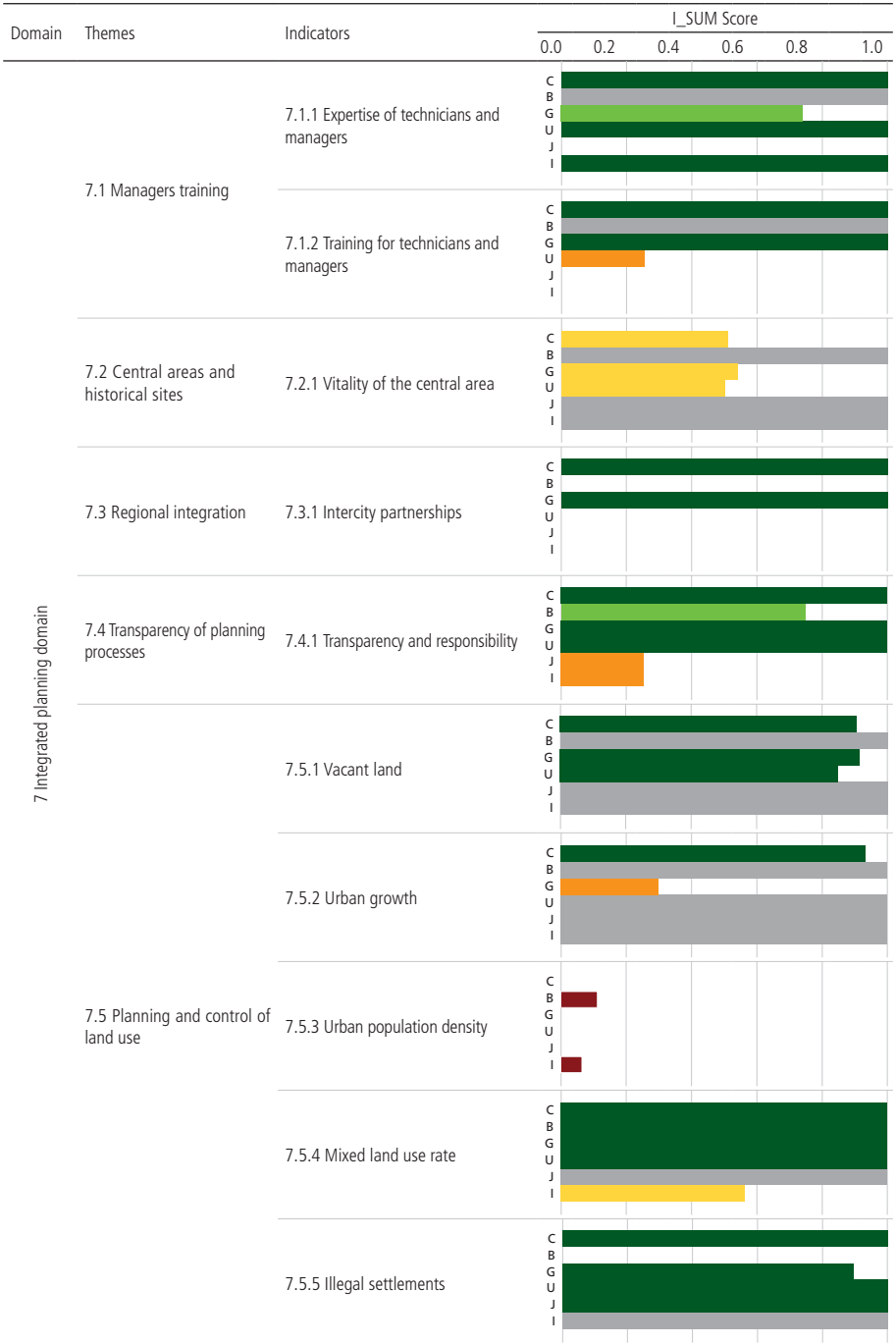
For the first two themes, the best-performing indicator was the *Mixed land use rate*, for all six cities, with maximum scores of 1.00 by Curitiba, Goiânia, Belém and Uberlândia, with a fair performance by Itajubá. This indicator was not calculated for Juazeiro do Norte. The next best-performing indicator was *Illegal settlements*, particularly in Curitiba, Uberlândia and Juazeiro, with very high scores of 1.00. Goiânia had a slightly lower value (0.90), which still indicates a good situation, showing that only 7% of urban areas consist of informal or illegal settlements with squatters. The value rose to 52.4% in the lowest scoring city, Belém, which received a score of zero. This indicator was not calculated for Itajubá.

Two indicators – *Vacant land* and *Urban growth* – were calculated only for Curitiba, Goiânia and Uberlândia, with scores close to the maximum value for the first indicator (*Vacant land*). This fact certainly derives from the high scores received by these cities in the set of organizational indicators clustered under the Master Plan and Urban Legislation theme. The *Urban growth* indicator was calculated only for Curitiba and Goiânia, with performances rated as excellent in Curitiba and critical in Goiânia. This seems to indicate that, although endowed with fine-tuned urban planning legislation, Goiânia is unable to follow the indicator's suggestion of directing urban growth toward areas with transportation services and infrastructure.

All six cities scored very low for the *Urban population density* indicator, even Juazeiro do Norte and Belém, which have high demographic densities (15,824 and 10,034 inhab./km² respectively) compared to the other cities under analysis. This may indicate the need to review the reference values for this indicator (or the manner in which density is calculated – gross *versus* net, for example), as its purpose is to assess population concentrations in areas that are well endowed with urban infrastructure, in addition to urban expansion control. This had already been observed by Miranda (2010) in Curitiba, which is a city shaped by Transit Oriented Development principles. Despite high occupancy coefficients in areas close to public transportation corridors and of lower densities elsewhere, this city scored poorly for this indicator at 0.00.

In general, the cities did not perform well for the *Parks and green areas* and *Urban facilities (Schools and hospitals*) indicators, with only Goiânia noteworthy for *Parks and green areas* and Juazeiro for *Urban facilities (schools*). The *Vitality of the central area* indicator was calculated only for Curitiba, Goiânia and Uberlândia, with fair performances by all three cities.

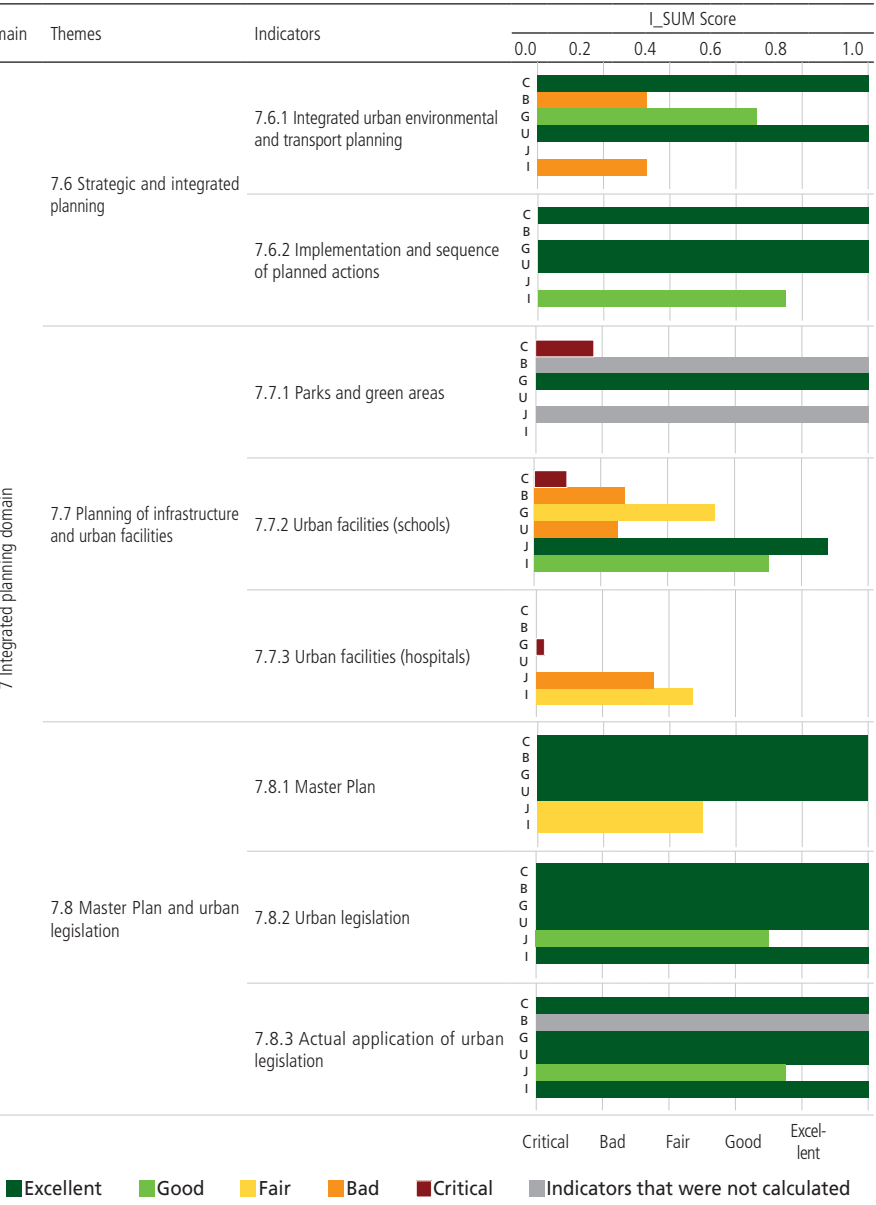
FIGURE 4
Detailed classification of all I_SUM indicators by city



(Continues)

(Continued)

Domain	Themes	Indicators	I_SUM Score
7 Integrated planning domain	7.6 Strategic and integrated planning	7.6.1 Integrated urban environmental and transport planning	
		7.6.2 Implementation and sequence of planned actions	
	7.7 Planning of infrastructure and urban facilities	7.7.1 Parks and green areas	
		7.7.2 Urban facilities (schools)	
		7.7.3 Urban facilities (hospitals)	
	7.8 Master Plan and urban legislation	7.8.1 Master Plan	
		7.8.2 Urban legislation	
		7.8.3 Actual application of urban legislation	



Elaborated by the authors.

Obs.: The horizontal bars represent the cities of Curitiba, Belém, Goiânia, Uberlândia, Juazeiro do Norte and Itajubá (top to bottom) by indicator. Segments with no bars indicate scores of zero.

6 FINAL REMARKS

Sustainable urban development necessarily requires integrated planning of physical, economic, social and institutional aspects of urban growth. Within this context, as a broad-ranging diagnostics tool, the I_SUM strengthens analyses that are well-adapted to the suggested purposes, even if some indicators in other domains were not addressed.

An analysis of the indicators for the Integrated Planning domain applied to a group of Brazilian cities underpinned assessments of two crucial aspects. From the institutional organization standpoint, cities seem to be striving to adapt to new regulatory instruments, in addition to the new urban mobility management structure recommended at the federal level. This is evidenced by better performances by the cities under assessment for indicators related to the expertise and training of managers, preparation of master plans and the creation and application of the range of urban legislation. However, this progress does not seem to be sufficient to ensure a good overall performance by the cities in terms of the underlying requirements of urban sustainability.

Poor or fair performances were affected by – among other factors not under discussion here - spatial difficulties, where positive or negative aspects may be observed. The positive aspects lie in the mixed land use rate and illegal settlements indicators, with most of the cities under analysis (except Itajubá) showing good results for the distribution of urban activities (at least from the legal standpoint or as covered by urban planning legislation), as well as good results for controlling squatters and illegal settlements within urban boundaries.

Negative aspects are related to neglected or even abandoned areas in old city centers (particularly for larger cities), urban expansion in areas lacking infrastructure, and especially poor distribution of green areas and basic urban facilities such as schools and hospitals.

It should be noted that spatial aspects are the outcomes of decades of uncontrolled urban growth, with public facilities clustered in privileged neighborhoods and the peripheralization of residential areas, especially for low-income residents. These actions culminated in a social and spatial segregation model that is widely prevalent in cities all over Brazil, exacerbating urban mobility problems. As a result, location-specific short-term actions are often unable to offset the impacts of this lengthy track record of misguided urban policies.

Even if unable to produce immediate results, urban and integrated transportation planning appears to be a valid path to sustainable mobility, as it is grounded on systemic and coordinated treatment of elements that were previously dispersed throughout the fabric of the city. Analyzed through a specific tool such as the I_SUM, integrated planning spotlights issues that are crucial for all Brazilian cities. While progress has been made in terms of how to equip cities with the mechanisms and instruments needed for the adaptation to new legal and institutional contexts, much still remains to be done in order to raise current urban standards, and improve the environmental attributes of cities while enhancing the quality of life of their residents.

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CHAPTER 5

THE CITY AS RESULT: UNINTENDED CONSEQUENCES OF ARCHITECTURAL CHOICES

Vinicius M. Netto[1]

Economists are familiar with systems that lead to aggregate results that the individual neither intends nor needs to be aware of, the results sometimes having no recognizable counterpart at the level of the individual.
Thomas C. Schelling (1969, p. 488).

New threads are being woven all the time, making changes continuous and smooth. But from the point of view of its effect on form, change only becomes significant at that moment when a failure or misfit reaches critical importance – at that moment when it is recognized, and people feel the form has something wrong with it.
Christopher Alexander (2002, p. 44).

1 INTRODUCTION[2]

Perhaps the greatest challenge faced by urban planning in Brazil is not one that involves problems that can clearly be seen to result from conditions or decisions about the production of space (such as fragility of infrastructure or segregated housing production), which are worrying enough. My main argument here is that one of the great difficulties might really lie in problems that are less visible: the unintentional consequences of everyday actions that occur silently and we imagine not to exist or not to matter; in other words, the *unintended* consequences of production of space when it is appropriated. I will argue that these accumulated effects will generate problems that are really systemic and abnormalities that will affect the city as a whole in its continuity, with repercussions on other systems, such as the environmental and the social.

I will introduce a series of examples of these unintended consequences by employing the insights from an unorthodox economist Thomas Schelling, and show how individual actions and decisions can lead to unintended and undesirable results on a large scale. The city will be shown to be full of silent chains of implications similar to the collective phenomena examined by Schelling. When someone choses to live in a gated community, for example, looking for comfort and security, they do not necessarily want to generate a pattern of segregated areas in the city or harmful effects on the urbanity of its public spaces, but that is what ultimately happens. By choosing to live in an isolated building with extensive gardens this person is not

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consciously wishing to reduce the opportunities for finding businesses in the local neighbourhood, but that is what such architecture leads to, for recognisable reasons. The walls chosen for protection should not lead to increased risk of crime in the surrounding streets, but that is what walls can do by discouraging the presence of pedestrians.[3]

These choices might begin to hinder the use of her or his own neighbourhood, leading to greater reliance on motor vehicles. When someone takes their car to go to places of consumption or the workplace, they don't want to encounter traffic congestion, but that is exactly what they are contributing to; they don't want to generate emissions that will accumulate over time and the planetary scale of motorisation to contribute towards global warming, but that is precisely what they are doing.

This essay focuses not on the intentional effects of actions and decisions taken by urban actors, which have been addressed inextensive criticism for decades. Instead, this essay is concerned with showing a different order of effects: *the silent effects of actions – produced at one level or another – without actors knowing how these actions combine to create problematic consequences for groups and contexts*. Because these effects are silent, accumulating over time and capable of taking root in urban and environmental spaces, a conscious effort is needed to make them visible. My argument will involve the following steps:

- consideration of Schelling and his ideas and examples of the unintended collective consequences of intentional individual choices;
- introduction of urban examples of dynamics such as those described by Schelling;
- a closer look at implications that are more experienced than discussed in urban life in Brazil: *the consequences of fixation on one architectural model* for the city and life in the city;
- consideration of the reasons and values governing the choice of this model of architecture and the *fragmentation of landscape* – together with its implications in the form of urban abnormalities;
- finally, bearing in mind the seriousness of these findings, discussion of the need for closer ties between technical-scientific, normative and economic spheres, together with the use of research aimed at improving the quality of debate about the relationship between architecture, the functioning of cities and urban legislation – through a more systematic understanding of the urban effects of architecture.

3. See Hillier and Sahbaz (2012); regarding the situation in Brazil, see Vivan and Saboya (2012).

2 THE UNINTENDED CONSEQUENCES OF INDIVIDUAL CHOICES

My conjecture is that the interplay of individual choices [...] is a complex system with collective results that bear no close relation to individual intent.
Schelling (1969, p. 488)

The idea that individual actions and preferences might create unintended collective results was one of the contributions of Thomas C. Schelling – a contribution for which he won a Nobel prize in 2005. Schelling's pioneering approach recognised the emergence of patterns that were quite different from those covered by interactions themselves. In the late 1960s Schelling stated that collective phenomena such as urban segregation can happen *even if* people do not want it to, demonstrating mathematically that if the residents of a city wanted a third of their neighbours to be similar to them, for example (teachers wanting a third of their neighbours also to be teachers, say), they still would end up by creating a segregated pattern of residential location. The only way for this theoretical urban system to achieve this desire of having a third of neighbours who are similar would be to create a city of socially homogeneous areas, which are therefore socially and spatially segregated.

> These situations, in which people's behaviour or people's choices depend on the behaviour or the choices of other people, are the ones that usually don't permit any simple summation or extrapolation to the aggregates. To make that connection we usually have to look at the system of interaction between individuals and their environment (Schelling, 1978, p. 14).

In other words Schelling is aware that actors do not necessarily have the same intentions. Theories of the rationality of action or choices usually suggest that the idea that people pursue objectives in the same way – seeking to minimise effort or maximise comfort, say – is *purposive behaviour*. But Schelling suggests that our aims are also related to other people and their behaviour, and can be limited by that collective environment. Our behaviour would therefore be contingent – depending on what other actors are doing and on circumstantial conditions – things that add uncertainties to the processes we experience.

> [It may or not] occur to me that I am part of your problem as you are part of mine, that my reaction to the environment is part of the environment, or that the quantity or number I am responding to is the sum of the reactions of other people reacting like me… people are reacting to a totality of which they are a part (Schelling, 1978, p. 78).

Schelling is concerned with understanding how the behaviour of different individuals can lead to patterns that are not desired collectively, and to the ways in which we respond to and influence the behaviour of others: "People are responding to an environment that consists of other people responding to their environment, which consists of people responding to an environment of people's responses" (Schelling, 1978, p. 13-14). The definition of "motives" therefore includes a *social*

dimension: actors do not define their motives in isolation, without the influence of other actors, consciously or otherwise. *Neither do actors know the full extent of the implications of their acts and decisions.* We tend to believe that we are dealing with conscious decisions within the limits of our information about our environment. This understanding of the limitations of vision and contingencies in which actors are immersed without realising it – being immersed in their context without a view of the whole, without a *God's eye view,* which is impossible for us – allows Schelling to recognise that collective patterns can emerge in directions that are simply unpredictable and undesired. Which is precisely why those patterns need to be observed:

> the entire aggregate outcome is what has to be evaluated, not merely how each person does within the constraints of his own environment. [T]he most interesting question is not how many people would like to change [their decisions]; it is whether some altogether different (…) arrangement might better serve the purposes of many, or most, or all of them. How well each does for himself in adapting to his social environment is not the same thing as how satisfactory a social environment they collectively create for themselves (Schelling, 1978, p. 19).

The view suggested by Schelling has to be able to relativize the patterns emerging collectively and create awareness of the benefits brought to the system as a whole. This makes sense precisely because many views and theories have made such emergence natural, understood as a priori situations that are necessarily good for a system (social, economic or urban, for example).

The idea that emergent patterns are naturally reasonable is found in theories of self-organisation or of the "invisible hand". Schelling shows that there is no guarantee that a self-organising process necessarily leads to the best scenario or to scenarios that are even appropriate to the whole, because of the contingencies that affect the interactions of actors and their implications. Schelling's attention to these implications is what singles him out from any other self-organisation theorist.

Schelling suggests exercises to clarify this point: imagining other, counterfactual scenarios that allow us to make comparative assessments, for example, looking at differences of collective loss and gain that might appear between scenarios. He believes that we need to recognise the large-scale implications, how they relate to the intentions of agents and what they contribute to the continuity of the (urban or social) system as a whole. "And sometimes the results are surprising". Schelling warns against "jumping to conclusions about individual intentions from observations of aggregates, or jumping to conclusions about the behaviour of aggregates from what one knows or can guess about individual intentions" (Schelling, 1978, p. 14).

We have to understand the unintentional consequences as being free from an agenda or the initiatives of planning – they are consequences that are *not necessarily* intentional, and sometimes the result of quite opposite intentions.

What Schelling has to teach us about the systemic implications of individual acts can tell us something about urban processes.

3 SCHELLING-TYPE URBAN EMERGENCES

Discussion about the consequences of actions and decisions might sound vague and abstract – something that does not necessarily happen or might simply disappear in time. But a series of phenomena that occur silently may have effects that are strong enough to disrupt their social, material and ecological environments.

3.1 Territorial segregation

One of the issues that singles out Schelling's ideas in the social sciences was his approach to segregation, demonstrating mathematically that even social systems in which segregation has not been organised or planned from the top down, in which people prefer *not* to be segregated, can easily lead to segregation. There is a considerably spatial element to this model of segregation, based on proximity and vicinity. For example, his model suggests that in a city where inhabitants prefer to live in a neighbourhood in which 50% of inhabitants are from the same social group, 80% of its areas eventually become completely socially homogeneous. Even if people do not want segregation, the only way of accommodating their locational wishes, in interaction with those of other people, leads ultimately to segregation.

Territorial segregation is shown to be a more than proportional consequence of individual wishes to live near those of a similar social level. It should be noted that these observations are not intended to naturalise segregation, but point instead to something that is subtle but also very strong: our interactions create dynamics that can lead to consequences much greater and more serious than we might expect – consciously or otherwise.

If we really want to understand segregation and self-segregation, we need to consider those collective dynamics and unconscious motives. In a context like that of Brazil, in which a strong feeling of social difference is added to these dynamics of individual satisfaction and collective consequences, the potential for territorial segregation can be explosive. Here, much stronger motivations exist than those denounced by Schelling, such as fear of violence, the need for status or pure racial and class prejudice (which are strong precisely because they are silent).

Segregation in that kind of context becomes part of a dynamic similar to what another brilliant economist, Gunnar Myrdal (1957), called "circular accumulative causation", resulting in city that is strongly fragmented spatially and socially. Territorial space becomes a way of restricting contact between the socially different.[4]

4. See: Netto (2014).

And the greater the forces of segregation, the clearer, more common place and violent will be the spatial resources and facilities (such as gated communities) and techniques (such as surveillance cameras and private security firms, etc.) for achieving them.

3.2 Fragmented street networks and low accessibility

Brazilian cities have the most fragmented street networks in the world (Medeiros, 2013). This lamentable status is due to the production of an urban environment according to individual decisions about the planning of areas – paying little attention to the importance of a system. The resulting "patchwork" pattern, as it is termed by Medeiros and others, derives from the connection of sections of partial urbanisation without considering the role of each in forming the whole. This collage approach, without an overall view, naturally involves great discontinuity between streets: very few streets take on the important role of tying parts together and to the whole. The effect of this discontinuity can be perceived by comparing a real urban setting with counterfactual scenarios. Its consequences can be seen in the traffic flow on the few streets capable of connecting different areas. The dependence of many urban activities (including residence) on this fragile, minimally accessible framework ends up overloading it even further (Netto and Saboya, 2013).

3.3 Congestion and the possible unintentional effects of BRTs

One of the classic examples of the unintentional consequences of individual choice is that when someone takes their car out of the garage to go to work they do not wish to cause traffic congestion or environmental pollution, but those are the accumulated consequences of that decision. Actors might prefer to use their vehicle out of personal convenience – comfort, shorter journey time, privacy, security – and certainly want to take advantage of those benefits. But mass selection of that option ends up removing the originally intended qualities.

I fear that the current fashion for BRTs (Bus Rapid Transit) may be unable to reverse this problem – and may even create other unintended effects. Like the 1970s concentration on highways, the BRT system is focused on the "global" scale of the city. Bus stops and traffic lights in bus lanes need to be spaced to achieve efficiency in terms of speed and produce potential barriers between the two sides of the urban area they cut across. When streets are discontinuous and interrupted by BRT corridors, the principle of permeability of the urban fabric, which historically leads to city blocks ranging in size from 100 to 200 metres (Siksna, 1997; Netto, 2016; Hillier, 2012, p. 140), is broken. There is a price to all this: it might lead to problems for pedestrians seeking to make use of the natural permeability of the urban fabric: greater difficulties in moving across intersections (due to distances between crossing points on streets with bus lanes) and risks (due to the greater speed of these buses).

Impact on pedestrian movement might also lead to impacts on local microeconomic life: reduced pedestrian mobility might lead to a breakdown in commercial use of the street. There is a potential clash between a solution for the global mobility of the city and pedestrian mobility and local vitality: this risk has been little examined. The possible unintended effects are ignored in the mass propaganda surrounding BRTs as a universal solution – at least a solution for countries with fewer resources for more suitable mass-transport systems – and are in urgent need of research. At the moment we are reproducing a transport model before fully understanding the extent of its effects on other urban subsystems, such as pedestrian movement and the possibility of interference between decisions designed on a global scale and their implications on local systems. Once again the self-centred reasoning of one field can cause collateral damage to others. Schelling strikes again.

3.4 Urban sprawl

The recent 2014 UN Habitat study shows that urban sprawl has increased in spite of the debate about its environmental implications. A series of factors can be identified as causing urban sprawl in Brazilian cities: *i*) unrestrained conversion of non-urban areas into urban ones and the addition of new land areas often creating empty interstitial spaces; *ii*) institutional and legal approval for new areas of urbanisation in the fragile context of planning and land development, subject to exclusively economic agendas; *iii*) the absence of legal codes centred on urban form and performance of urban form, creating patterns of very low density and compactness etc.[5]

Patterns that are more thinly spread require considerable public investment in sanitation and transport infrastructures and lead to increased journey times and commuter costs. This process also tends to increase land values in empty interstitial areas, which encourages retention of such sites for speculative reasons and leads to artificial scarcity of land for occupation, which might result in further increases in land values (Vivan and Saboya, 2012).

The Brazilian city offers other examples. Large-scale unintended consequences should of course be looked at in a dynamic setting, as movements that might eventually mitigate part of the previous damage. Clogged roads lead to people choosing other routes, which might lead to congestion on other streets or to better traffic distribution if the fabric allows, or might cause people to make greater use of bicycles, if they feel suitably protected. Demand for a product might cause price increases, which might reach a threshold that stops people buying it, forcing prices down again. These movements and counter-movements, which can certainly move in many directions, are real echoes of self-organisation.

5. See: Netto and Saboya (2013).

Prices are social conventions and, like many phenomena of the economy, are more volatile. But phenomena also exist whose materiality fortifies and restricts those movements: when low wages lead to self-built homes and the progressive emergence of informal settlements or *favelas*, those areas will most likely not disappear if family wages increase and self-building stops. Once constructed, a BRT bus lane will tend to remain for a long time. A fragmented street network might have impacts on pedestrian and vehicle movement for centuries. It is not easy for a segregated spatial pattern to become socially heterogeneous. Unlike the economy, the city offers many examples of Schelling-type processes that *will not easily be subject to change or reversal.* The material way in which they take shape forces them to remain, causing impacts throughout the time of their existence, which is precisely why they demand great attention and care. Actions of city-making demand responsibility.

Added to all this is an emerging pattern in Brazilian cities, which is shaped by individual decisions in the choice of architectural models that favour particular social and political trends.

4 ARCHITECTURE AND LIFE IN THE PUBLIC SPACE

Historically, cities have maintained a continuous fabric of buildings and blocks, able to offer everyday activities relatively close together – an efficient way to stimulate the social and microeconomic life of neighbourhoods and streets, even outside urban centralities. Multi-storey and multifamily architecture is an important factor in this sense, particularly in medium and large-scale cities. In Rio de Janeiro it accounts for 37.62% of home types (with 54% for houses and 6.78% for houses in a community/condominium). The proportion in Southern Brazilian cities Florianópolis and Porto Alegre is 37.77% and 46.66% respectively.[6] If we include multi-storey architecture for commercial activities, this consideration will be even more important. If the principle of the urban economy establishing a relationship between location and density is correct – and everything suggests that it is[7] – then multifamily buildings respond to the demands of a micro-economy and potential for intensification in urban social networks. Architecture expresses these forces, and will substantially shape the form of the cities.

But in recent decades, the real estate standards have changed in Brazil: the traditionally favoured type of multi-storey building juxtaposed around public spaces was replaced with an "isolated type" of architecture: a building characterised by being disconnected from neighbouring buildings and set back from the street – built not like conglomerations, but as isolated distributions of buildings surrounded by

6. In Rio de Janeiro, 90.61% of urban addresses are residential; in Florianópolis, the figure is 90,79%; in Porto Alegre, 91.14%. Source: Censo Demográfico 2010: CNEFE – Cadastro Nacional de Endereços para Fins Estatísticos.

7. There have been extensive examples of this principle, since Alonso (1964). Our own research found evidence of this relationship.

parking lots, walls and railings.[8] In order to compensate for the wide surrounding spaces, this typology is associated with verticalism. It has become the dominant feature in city-making. Decades of replication of this type of building have left their marks on the Brazilian urban landscape: fragmentation and vertical growth, a decline in the use of public space and withdrawal of micro-economic activity to shopping centres and malls (figure 1).

FIGURE 1
Recent architectural models reproduced in Aracaju and Natal, capitals in the Northeast of Brazil

Source: Google Street View.

I will bring now a brief overview of the results of a study conducted in the city of Rio de Janeiro, with convergence with studies in other two Brazilian capitals, Florianópolis and Porto Alegre. But in order to do so, the investigation of the relationship between architectural form and the conditions of emergence of life in the public space and the expression of a local micro-economy needs first and foremost to consider the context in question.

5 THE PARTICULARITY OF CONTEXT: EXAMINATION OF THE URBAN PATTERNS OF RIO DE JANEIRO

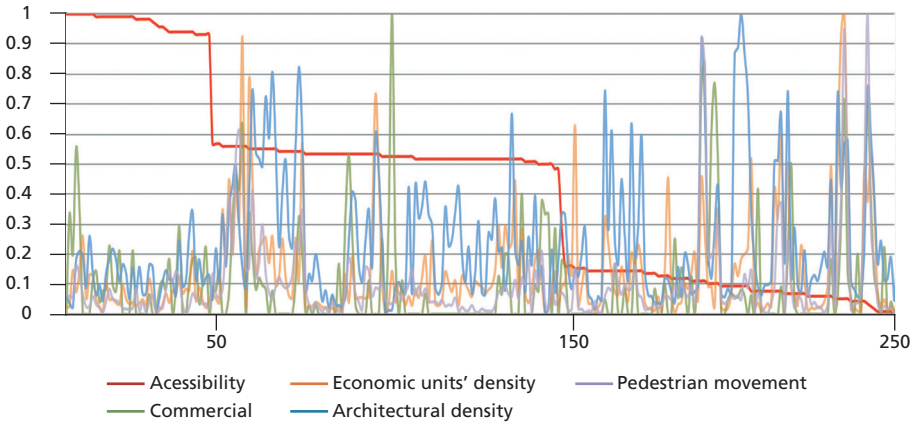
We have designed a way of understanding the interplay of the relationships between architectural form and factors of social and micro-economic life in particular contexts based on what we call analysis of the *convergence of urban patterns* (Netto et al., 2012).Urban systems are hybrid and involve different material qualities: the production of structures like buildings and street networks, the establishment of activities and the emergence of location patterns, pedestrian movement and the emergence of movement patterns. These material qualities are closely related in the urban phenomenon, and they seem to have quite distinct timeframes. The street network is something that seems to remain for centuries. The mass of buildings is the production of years and tends to remain for decades until it is replaced. Activities have a more volatile durability, sometimes lasting months, years or even centuries; patterns of activity locations can also take years or decades to become noticeable. Pedestrian movement emerges daily and is quickly structured into hierarchies and patterns.

8. See: Gehl (2010); Jacobs (1961).

The principles of spatial economics and configurational studies suggest that these patterns or subsystems naturally tend to align themselves – indeed these theories assume such alignment, including alignment between distance and location of activities (since Alonso, 1964) and pedestrian movement, accessibility and location (Hillier, 1996). But our examination of these patterns in Rio de Janeiro showed such alignment to be inconstant – a "work in progress" subject to cyclical changes (Netto et al., 2012; Krafta and Netto, 2011). Analysis of the topological accessibility of the street network in Rio shows that the core of accessibility has migrated to the North Zone and has not yet manifested itself in the form of centres or levels of concentrated activities and densities. Rio is a strongly divergent city today. A simple method of comparing normalised values of accessibility, densities, location of activities and pedestrian movement shows this relative divergence between urban subsystems in 250 street segments (sections between corners) selected randomly (graph 1). Accessibility (in red) is modelled in a way to decline gradually in three levels (high, medium and low accessibility), while the other patterns vary and tend to become more intense in areas of medium and low accessibility (business *locations* in green; *density of economic units* in orange; *building density* in blue and *pedestrian movement* in purple). Patterns demonstrate some similarity in their spatial distribution – with the remarkable exception of greater densities in areas of low accessibility, and vice-versa – quite simply breaking with the principles of the configurational theories about the relationship between accessibility and location.

GRAPH 1

Convergence and divergence of urban patterns: commercial activities, density of economic units, building density and pedestrian movement

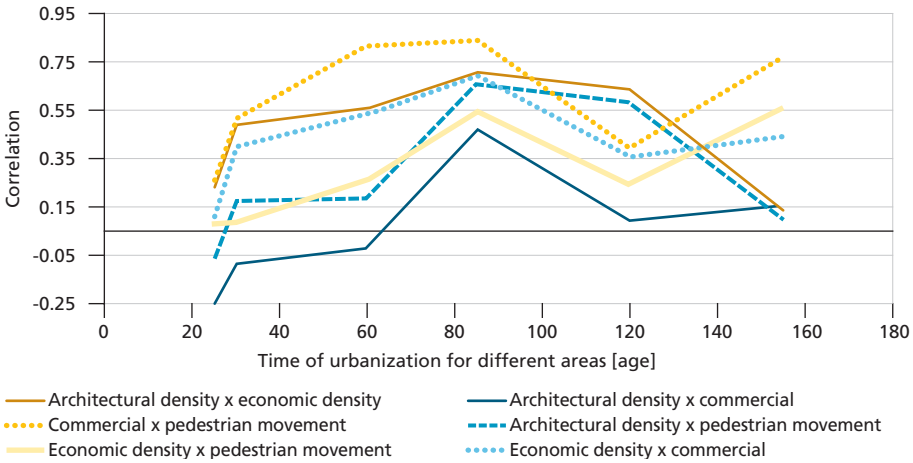


Elaborated by the author.

A second form of analysis explores the relationship between these patterns: how much they coincide in space and time. Graph 2 shows Pearson's correlations between pairs of urban subsystems, varying according to the duration of urbanisation of areas of Rio de Janeiro (from 20 to 160 years). The correlations increase consistently over time, converging increasingly until reaching high values in areas of about 90 years old (Copacabana, Gávea, Urca) and 150 years (Botafogo and Flamengo) in South Rio. Central areas of around 120 years (Porto and Santa Tereza) show a falloff, suggesting a divergence between their patterns and therefore instability. This might include the observation that Rio's central area is in fact currently experiencing the tension of change, with the emergence of new property developments. Younger areas in West Rio (Barra da Tijuca, Recreio) and North Rio (Grajaú, Anil, Freguesia, Pechincha and so on) are also less convergent. In general, the 24 areas analysed show a progressive alignment of patterns in time, until they begin to diverge again, possibly related to periods of chains of replacement of buildings and the resulting interference caused by the relationship between this and the other urban subsystems.

GRAPH 2

Convergence/divergence between urban patterns demonstrates cyclical performance in time



Elaborated by the autor.
Obs.: The South Zone of Rio shows a greater level of convergence.

Lower-accessibility streets in Rio's South Zone manifest greater convergence between the other patterns – taking time to align its subsystems, change them and probably align them again. Armed with this initial analysis of contextual particularities in the city of Rio de Janeiro, we can look more closely at the relationships between architecture, pedestrian movement and the materialization of micro-economic activities in different architectural contextures.

6 THE RELATIONSHIP BETWEEN ARCHITECTURAL MORPHOLOGY AND PEDESTRIANS

We analysed 24 areas in the city of Rio de Janeiro with 250 street segments and about 3,800 buildings in three sample sets defined by different accessibility (high, medium and low) based on shortest paths in the street network measured topologically.[9] In Florianopolis, we observed 169 street segments and 1,036 buildings (Saboya et al., 2015), and 330 segments and 4,000 buildings in Porto Alegre. We also observed population densities in these areas, and carried on systematic observations of pedestrian movement in six periods of time (2 minutes and 30 seconds each, six times a day) during the typical workday. We first consider how the distribution of architectural types in the areas analysed coincides with the presence of groups and static people in the public space and street-level activities of buildings. Statistical correlations, based on the Pearson coefficient, range from zero and -1 or +1 (perfect negative or positive correlation) and reveal signs of performance differences. The correlations are statistically significant and their values and signs corroborate our hypotheses (table 1).

TABLE 1
Architectural types and pedestrians: Pearson correlations ($p < 0.01$) in all areas and in areas with low accessibility

Area/accessibility level	Architectural type	Pedestrian variables		
		Pedestrian movement	Static groups	Static people
All areas	Continuous	0.187	0.341	-0.367
	Isolated	-0.232	0.244	-0.243
Low accessibility	Continuous	0.328	0.447	0.407
	Isolated	-0.342	-0.469	-0.415

Elaborated by the author.

Let us now consider the relationship between architectural types and of pedestrians. What happens to pedestrian movement with different proportions of architectural types in the street? Streets *where the continuous type occurs in more than 50% of sites tend on average to have more than twice as many pedestrians than in the isolated type* (table 2).

TABLE 2
Comparison between pedestrian averages in street segments with a predominance of > 50% of continuous and isolated types and the ratio of averages.

Areas		Average of pedestrians in segment		Ratio
Accessibility level	*p*-value	Continuous type	Isolated type	Continuous/isolated
All areas	0.003	15.13	7.02	2.16
Low accessibility	0.004	20.15	7.40	2.72
Medium accessibility	0.144	14.44	6.31	2.29
High accessibility	0.294	7.40	6.44	1.15

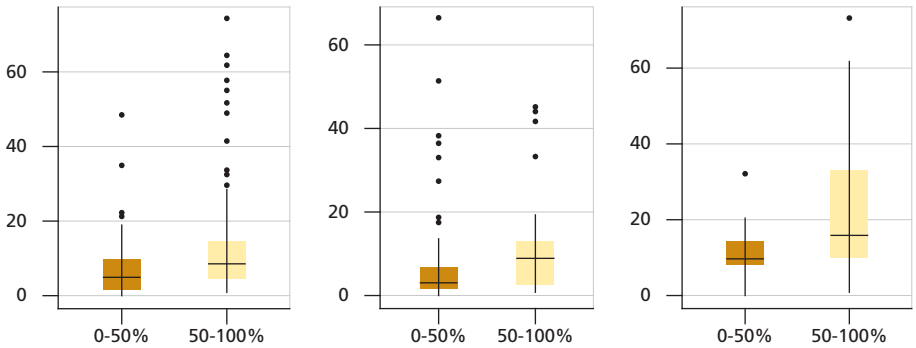
Elaborated by the author.

9. We analysed accessibility with software Depthmap (UCL). For details, see Netto (2014) and Saboya et al. (2015).

Although other factors – the so-called confounding factors (other characteristics associated with the morphology of the type) – might explain this behaviour, the relationships noted below are quite persuasive, involving a package of characteristics that define architectural types and their capacity to perform in a more or less convergent manner with the presence of pedestrians and micro-economic activity. The consistency of these results – since we have found these averages in three cities analysed – is intriguing, given their statistical significance. The absolute numbers of pedestrians present in streets where the continuous type is dominant suggest its superior urban performance (graph 3).

GRAPH 3

Pedestrian averages in street segments with presence of continuous types in Rio de Janeiro, Florianópolis and Porto Alegre



Source: Netto, Saboya and Vargas.

Obs.: Pedestrian averages in street segments with presence of <50% and >50% of continuous types and their graphic representation (box plot).[10]

6.1 The effects of façade continuity on pedestrians

Our hypotheses predict a relationship between facade continuity on city blocks and what happens in public space, and also at the street level: measured as the ratio between the sum of façades and the sum of lateral setbacks between buildings, continuity reduces distances and friction of movement and therefore attracts more pedestrians. The analysis shows this behaviour in relation to degree of predominance, with more than 50% of the side of a city block (table 3).

10. The box plot graph shows the dimension of data or their spread. The line inside the boxes is the median, the intensity of values including 50% of observations. The lower horizontal line in the box shows the limit of the first quarter (25% of observations) the upper horizontal line shows the third quarter (75% of observations). The lower the height of the boxes, the more concentrated and similar are the observed intensities. The points above the boxes are discrepancies, i.e., observations very different from the others.

TABLE 3
Comparison of pedestrian averages with street segments of Continuity Index less than 50% and more than 50%, and the ratio between them, in Rio as a whole and areas of different accessibility

Pedestrian movement	*p*-value	Continuity index < 50%	Continuity index > 50%	Ratio
All areas	0.747	9.833	13.866	1.41
Low accessibility	0.754	7.458	16.874	2.26
Medium accessibility	0.489	13.000	13.749	1.06
High accessibility[1]	-	-	7.193	-

Elaborated by the author.
Note: [1] High-accessibility areas demonstrated no segments with Continuity Index of < 50%.

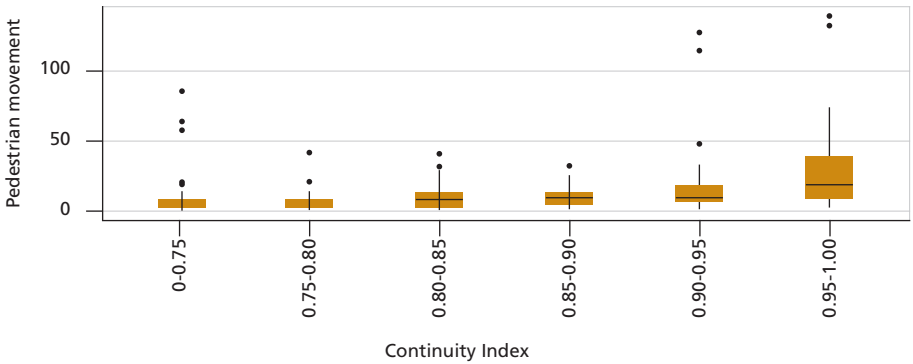
Low-accessibility areas (with greater convergence between urban patterns, except accessibility) generally display stronger coincidence between aspects of architectural format and social and micro-economic factors. When the façade-continuity indices are broken into different intervals of predominance, we can see more specific behaviour, particularly a considerable increase in pedestrian movement when reaching an index greater than 90% of the side of a block. The box plot graph emphasizes median values and removes the weight of outliers, which increase the average on each band. The greater the continuity index, the greater the levels of pedestrian movement (table 4 and graph 4).

TABLE 4
Façade continuity and pedestrians: averages in street segments with different Continuity Indexes[11]

Intervals of continuity index (%)	Number of segments	Average pedestrian movement
0% ⊦ 75	67	8.69
75% ⊦ 80	34	7.19
80% ⊦ 85	45	10.42
85% ⊦ 90	33	10.87
90% ⊦ 95	29	19.93
95% ⊦ 100	42	28.40

Elaborated by the author.
Obs.: Looking now at the Pearson correlations, the distance between buildings displays negative correlations with pedestrians and public activities (lateral setback). The same applies to the distance between faade and street (frontal setback – table 5).

GRAPH 4
Façade continuity and pedestrians: averages in street segments with different Continuity Indexes – box plot



Elaborated by the author.

11. The spread of percentages is based on aggregation of a number of segments with regards to distribution and recognition of patterns.

TABLE 5
Pearson correlations ($p < 0.01$)

Areas/accessibility levels	Architectural characteristic	Pedestrian variables		
		Pedestrian movement	Static groups	Static people
All areas	Continuity Index	0.268	0.315	0.242
	Frontal setback	-0.276	-0.321	-0.178
	Lateral setback	-0.189	-0.253	-0.195
Low accessibility	Continuity Index	0.418	0.430	0.462
	Frontal setback	-0.424	-0.393	-0.395
	Lateral setback	-0.331	-0.346	-0.376

Elaborated by the author.

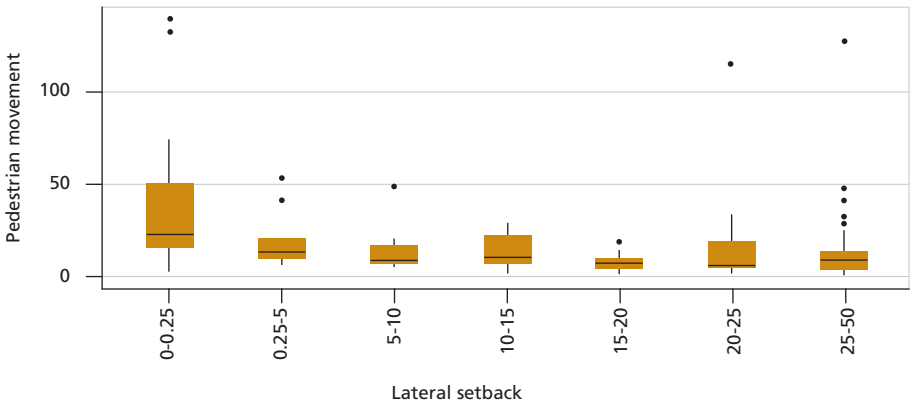
Despite the possible presence of confounding factors, the relationship between *lateral setback and pedestrian movement* in Rio is truly interesting (table 6). Converting numbers from the initial pedestrians counts per 2 minutes 30 seconds to pedestrians per minute, the analysis of average distances between buildings in blocks (street segment) shows that pedestrian movement decreases as distance increases, from around fifteen pedestrians per minute in situations with average distances lesser than 2.5 m, to about three pedestrians for distances between 15-20m.

TABLE 6
Lateral setback and pedestrian movement in 250 street segments ($p < 0.001$)

Lateral setback (metres)	Number of segments	Average pedestrian movement (2 minutes and 30 seconds)
0 ⊢ 2.5	23	37.70
2.5 ⊢ 5	8	19.63
5 ⊢ 10	9	14.35
10 ⊢ 15	17	13.05
15 ⊢ 20	16	7.63
20 ⊢ 25	13	19.10
25 ⊢ 50	68	12.05

Elaborated by the author.

GRAPH 5
Lateral setback and pedestrian movement in 250 street segments ($p < 0.001$)



Elaborated by the author.
Obs.: The box plot graph shows the median trend more clearly, without the influence of outliers.

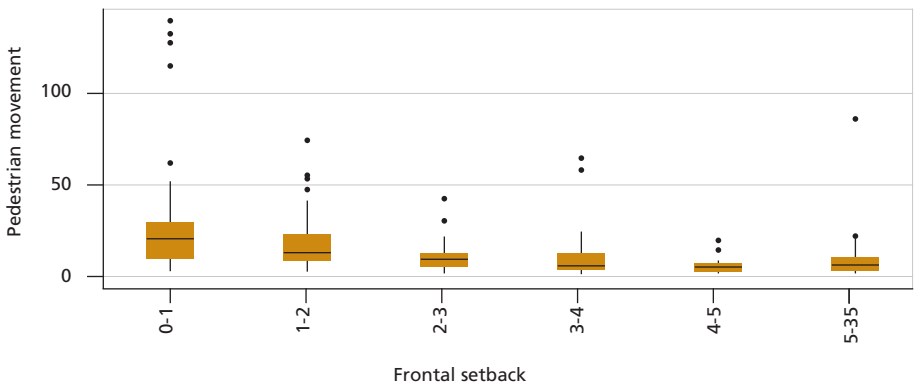
The same tendency can also be seen for *frontal setback* (tables 7 and 8). We also observed a reduction in pedestrian movement for increasing distances between building and the street: from 11.5 moving pedestrians per minute in situations with average distances lesser than 1m, to 2.3 pedestrians for distances greater than 5m. These are interesting empirical traces of the tensions of proximity between the built form and pedestrian movement.[12]

TABLE 7
Frontal setback and pedestrian movement in 250 street segments ($p < 0.001$)

Frontal setback (metres)	Number of segments	Average pedestrian movement (2 minutes and 30 seconds)
0 ⊦ 1	28	39.68
1 ⊦ 2	11	18.41
2 ⊦ 3	9	6.44
3 ⊦ 4	14	5.94
4 ⊦ 5	10	4.12
5 ⊦ 35	29	5.89

Elaborated by the author.

GRAPH 6
Frontal setback and pedestrian movement in 250 street segments ($p < 0.001$)



Elaborated by the author.

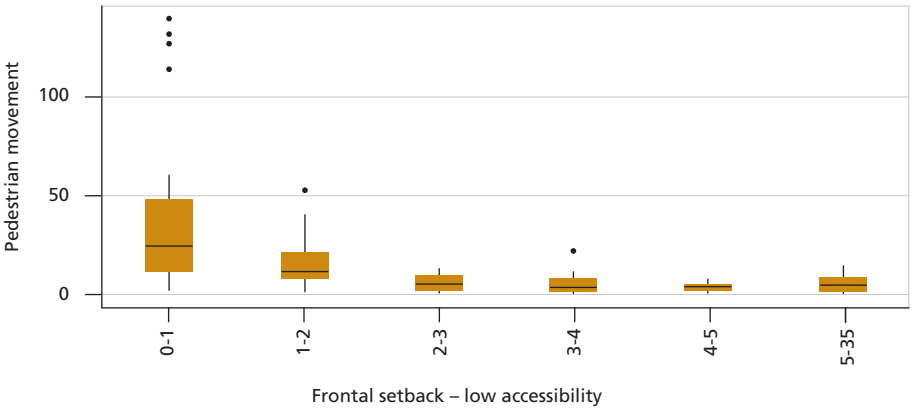
TABLE 8
Frontal setback and pedestrian movement in low-accessibility areas ($p < 0.001$)

Frontal setback (metres)	Number of segments	Average pedestrian movement (2 minutes and 30 seconds)
0 ⊦ 1	49	28.6
1 ⊦ 2	34	18.4
2 ⊦ 3	40	9.6
3 ⊦ 4	37	10.1
4 ⊦ 5	25	4.7
5 ⊦ 35	65	7.9

Elaborated by the author.

12. See: Netto (2016).

GRAPH 7
Frontal setback and pedestrian movement in low-accessibility areas ($p < 0.001$)



Elaborated by the author.

7 ARCHITECTURAL EXPRESSIONS OF THE LOCAL MICRO-ECONOMY

The micro-economy expresses itself at the local level, engaging with final consumers through architecture. But it can only do so if certain architectural conditions are present: building morphologies able to engage with people in situations of daily behaviour. The local micro-economy was considered as basic categories of urban activity involving final consumption (namely, residential, commercial, service or institutional) both at street level and on upper floors. We measured *diversity* through Shannon's (1948) information entropy, considering the number of different categories taken into account and how evenly entities (i.e. buildings and their uses) are distributed amongst categories. The diversity index increases when the number of categories and evenness increases.[13] Urban areas in which categories are present in equal shares contain the highest diversity index. Negative correlations were found between the isolated building types and the presence of trade and services. There also seems to be a decline in diversity of street-level activities: the isolated type has positive correlations with street-level residence. These trends are more impressive in low-accessibility areas (table 9). Other items more frequently associated with the isolated type are also shown to have weaker correlations with the presence of commercial activity at street level, such as walls (-0.569 correlation with shops and -0.458 with diversity).

13. Where P is the proportion of entities belonging to the i types in the dataset.

TABLE 9
Pearson correlations between activities and types in different accessibility conditions ($p < 0.001$)

Area/accessibility level	Architectural type	Street-level activity		
		Residential	Shops and services	Diversity
All areas	Continuous	-0.132	0.153	0.233
	Isolated	0.201	-0.214	-0.282
Low accessibility	Continuous	-0.413	0.422	0.428
	Isolated	0.446	-0.449	-0.456

Elaborated by the author.

Our study also shows the historical effects of fixation on the isolated type: correlations show a *decline in the diversity of activities* at street level over time (-0.267) and the increased presence of walls (0.374), together with an *increase in typological diversity* (0.182). Contradicting the Jacobs hypothesis (1961), *typological diversity*, with a growing presence of new buildings (isolated type in this case), has contributed to *reducing micro-economic diversity in the streets*.[14] This does not mean that the micro-economy is "smaller", but that its appearance is reduced in the fabric of neighbourhoods and concentrated in other places, probably shopping centres.[15] Naturally, the percentage of sites with shops tends to be small (in Rio 7.56% of plots involve activities other than housing, livestock, teaching and healthcare). This percentage is spread across a network of streets with great urban capillary action, with a central role in the life of local neighbourhoods.[16]

But the main problem here is *to break the convergence between accessibility patterns and location of commerce, by preventing the emergence of a street's commercial potential due to the choice of architectural type.* Which is exactly what can be seen in Brazilian cities, with implications. The reduced presence of trade in the fabric of the street and its concentration in particular points, also points to a trend of increased distances and family dependence on motor vehicles for daily consumption. Finally, the high percentage of residential streets would also tend to be more attractive for pedestrians if any potential for densification in multi-storey buildings does not occur via the isolated type, which is usually accompanied with street-level homes, walls or fences.

Completion of this analysis will consider the question of densities itself. The addition of tower-block groups on a previously empty area will clearly increase the density and possibly the range of activities in the area. But that does not in itself establish suitable urban performance, especially when compared with other

14. Our findings show similarities with those of Gordon and Ikeda (2011) on the positive impact of horizontal densities (Jacobs densities).
15. This tendency aligns with that detected by Carmona (2014) and others about the fragility of the mixed-use street in English towns.
16. See: Hillier (2012); Carmona (2014).

architectural scenarios, as this study shows. Density is a key factor for pedestrian movement and commercial presence and diversity – but in similar density (and accessibility) conditions, the typology makes a difference. *The continuous type has positive correlations with density* (unlike the isolated type), in line with Martin and March's demonstration (1972) of the superior performance of compact city blocks compared with blocks of volumes that are isolated to absorb density with less height.

These findings also show that the power of context over material properties can neither be ignored nor assumed a priori, as is often the case. Neither of these vectors can be discarded. Empirical research carried out in three state capitals in Brazil showed considerable convergences (different types generally have high correlations with pedestrian movement, positively or negatively, particularly in low-accessibility areas) and interesting intensity differences concerning the role of high accessibility in relation to the role of architecture. The results of the present study of three Brazilian state capitals may not be generalizable, but they do allow the prediction that on the one hand the universality of architectural influences has local variations, even though certain architectural features are repeated in different contexts. On the other hand, *context does not appear to completely determine* this raw material of the social (the co-presence of actors in the public space) and the driving force of the urban (in the shape of micro-economic activities and movement), as a relativist position would suggest. The weight of context – including material and symbolic aspects – therefore also requires empirical demonstration. Indeed, this makes the problem even more interesting. We need to consider this reasoning and include the *contingent*, which depends on the circumstances and behaviour of other actors – the uncertain. And we have to face the challenge of understanding what the active causalities and weight of unpredictability in play are.

Summing up, the results corroborate our hypothesis that *urban vitality permeates architectural form.* We know that space and form matter, but our research recognises that architectural type is the key part of the relationship and is deeply associated with use of the urban space. Co-presence and micro-economy materialised along the channels of accessibility, in a convergence that is apparently cyclical, provide potential for informal contact in public spaces, increasing the probability of exchange and the meeting of requirements locally (Gordon and Ikeda, 2011; Bettencourt, 2012),and intensification and local materialisation of networks of interaction. Co-presence is therefore the material condition for the development of forms of material and communicational interaction, as Allen demonstrates (1977; 2007). And this is where isolated architecture performs worse, with possible chain of reactions on a broader scale.

8 FIXATION ON AN ARCHITECTURAL MODEL AND ITS LARGE-SCALE CONSEQUENCES

Could it be that the producers of space have intended these implications? Might there be an agenda of architecture "against society" or against the environment? I would like to think it is unlikely that producers of space deliberately plan to remove pedestrians from the streets or local shops from neighbourhoods, to encourage general dependence on motor vehicles or contribute to the negative effects of emissions. But such effects will be produced by intentions about the building (such as self-segregation) or by drafting legislation as a way of ensuring this architecture. Looking closer at these implications, how has isolated architecture become the predominant form of real-estate production, giving birth to a particular urbanisation pattern? I would position the origin of this process in two rationales that have converged in considerable synergy: *real-estate production* and the *property market.*

8.1 The logic of real-estate production

Some of the criteria governing architectural choice from the producers' point of view have been:

- *Verticality*: plan reproduction on a number of floors, reducing construction costs for each floor while maximising sales values (higher level apartments are more expensive) – a highly advantageous formula for the construction company.
- *Standardisation of sizes, material and equipment* to ensure reduced costs with economies of scale.
- *Replication* of similar projects on plots of suitable scale – generic solutions irrespective of context; the model in fact shapes contexts for re-siting operations. When the site allows, designs replicated in series lead to progressive reduction of project costs (100% of the design value is charged for the first building, 75% for the second and 25% for the other buildings in the group).
- *Imposition of siting aspects* for buildings, with distances determined by mobility of cranes and other construction facilities.[17]

Clearly, it is unlikely that an architectural type based on such criteria, fixed on the object and not on its urban implications, can generate groups of buildings suitable for different aspects of performance and landscape.

8.2 The logic of the property market

Values governing the actors involved in "supply and the end consumer" of architectural space and which serve as vectors of standardisation now defined by market interests, include:

17. This final item was suggested by Andrea Kern in a personal communication.

- *A sense of fear and search for security.* Fear can be exploited as a resource for product innovation and creation of demand, leading to the obsolescence of typologies without the elements of the isolated building, fenced and disconnected from the rest of the block. Yet the *exploitation of fear is fallacious*: the isolated building that supposedly protects the resident inside also contributes to emptying the streets in its own surroundings, making occupants more susceptible to crime conditions in public space. Empirical data confirm this impression in the Brazilian context (Vivan and Saboya, 2012).
- *Pursuit of status and exclusive facilities*, in the creation of attractive "packages" for lifestyles based on new features that appear constantly (such as gourmet spaces, web spaces etc.) accessed exclusively by the socially similar, which is an ethically questionable component.
- *Typification of taste*, obtained through interviews with predefined target publics. Producers consider the standardisation of taste and architectural style as a key factors in minimising investment risks. Tastes are influenced by actors and by advertising itself. Values and preferences revolve around *demonization of density, the public space and the mixing of social groups.*
- *Pursuit of proximity with the socially similar*, remembering that this preference does not necessarily imply rejection of other social strata.

Another point here concerns the consumers, who are also subject to chain reactions. As Schelling has shown, *(consumer) decisions affect new decisions*, which can acquire the power to influence architectural and urban patterns.

A well-constructed harmonisation exists between a type of architecture based on verticality, standardisation and replication that benefits the rationale of production, and the production of lifestyles based on disconnection with the public and the creation of demand. But this powerful alignment is indifferent to its effects in other urban subsystems, such as pedestrian appropriation of the city and local networks of microeconomic exchange. The only way of justifying production criteria based exclusively on reduced construction costs and sales' risks as guidelines for architectural form would be to claim that such criteria are able to create good building performance in any other aspect. But it would be over-optimistic to hope that factors that offer the best economic performance in construction and sales would naturally be replicated in other, more systemic, dimensions of performance. My point echoes Schelling's in claiming that there is no reason to expect this amazing coincidence: these dimensions work with different factors and their convergence would depend on the performance of factors and variables that are at least shared by them. *Urban form resulting from the accumulation of economically efficient solutions on the individual level of the building will probably not lead to the best urban performance*. The procedure simply leaves out too many variables.

This problem recalls what Alexander (1966; 2002) suggested about the tendency for analytical categorisation, a form of reasoning that isolates components and establishes hierarchies that disconnect plans from interactions that form a phenomenon between it and its context. Once these connections are lost, acts or production focused only on one category can lead to effects that are not noticed in many other categories or subsystems, as Schelling demonstrates. In fact the interference between non-systemic conditions in construction and systemic conditions in which each building plays a part when occupied might continue to echo throughout the whole working life of the building – except that it will be modified and adapted within the material requirements of the play of urban interactivity.

Clearly, this model of architecture and urbanisation does not imply a "space against society", however. Indeed, it expresses codes of convergence among construction and sales advantages for fields of specialist and self-centred actors, and lifestyles reproduced by actors in a state of demand and pursuit of individual advantages derived from micro-segregation, which they consider positive. The fact that new consumers have a preference for this architecture does not mean that it performs better. It might simply indicate that it meets the interests and conditions of context, such as failing to offer typological variety, ignorance of the implications of architecture on the part of consumers (implications unknown by architects and planners) and the apologetic association between architectural styles and segregated lifestyles, supported by the status of the private car. The key issue is to understand that these codes lead to urban trends that overflow into other dimensions and chains of cause and effect that can no longer be ignored.

8.3 Urban trends as chain reactions

The city is formed by a discrete system of different types of constructed items. Urbanisation can be seen as a stochastic process, when imbalance of actors' preferences leads to greater imbalance until achieving the predominance of a pattern, in a process that Arthur (1994) describes as path dependence. The pattern resulting from the concentration of possibilities of form is the city itself. Some of the various processes are quite visible.

- *Fragmentation of the urban landscape*. A trend that can be seen clearly but is generally ignored precisely because it is everywhere. The hugely powerful, self-referential logic of production and sales ultimately shapes: *i*) the practices of architects, who absorb and replicate the precepts of a non-systemic rationale, unaware of the extent of negative implications; *ii*) urban legislation; and *iii*) the city itself. Although it does not just consist of uncoordinated individual actions, the fragmented landscape reflects the predominantly splintered logic of the actors, which is centred on the individuality of their decisions and actions, and disconnected from and unconcerned with their systemic consequences when materialised. All of this is mirrored in the Brazilian urban landscape.

- *Urban pathologies.* The unintentional effects of choosing an architectural type, paraphrasing Csikszentmihalyi (1997, p. 319), tend to be revealed only later, when choices have been fixed and we resign ourselves to the idea that they are here to stay. However, they define cities as entangled in incompatibilities, and operating at a standard that is lower than possible or desirable. This decline is only noticed if we construct other, contrafactual, scenarios and compare them with the real scenario. Otherwise it remains invisible and ignored. The implications of objects conceived in isolation, as if context and systemic insertion did not matter, become causal forces, with impacts even on ecosystems, as shown by Montezuma et al. (2014).

FIGURE 2
The city is the mirror: accumulated results of a logic of production centred on the object – Natal and São Paulo

Source: Canindé Soares.

9 CONCLUSIONS: PLANNING AND THE LIMITS BETWEEN FIELDS OF PRACTICE

The associations of actors in material relations show that we have to be aware of views that fail to assess the collective results of individual actions. I often think that two words will suffice to counter the idea that self-organisation leads inevitably to patterns of best performance at any moment and under multiple viewpoints of collective performance: *Thomas Schelling.*

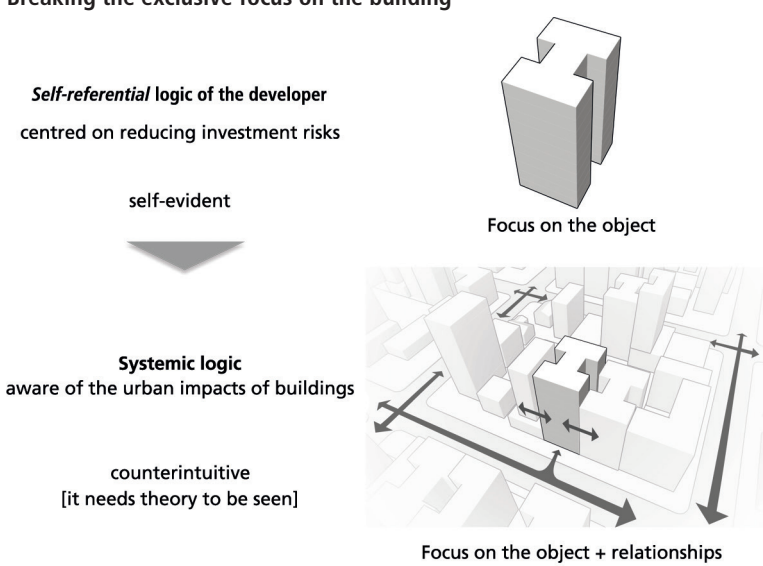
> I am going to argue that there is no presumption that the self-serving behaviour of individuals should usually lead to collectively satisfactory results (p. 25). Nobody claims that the system reaches optimal results (…) Things don't work out optimally for a simple reason: there is no reason why they should. There is no mechanism that attunes individual responses to some collective accomplishment (Schelling, 1978, p. 32).

The consequences of the urban processes described here might suggest that the producers of urban space decide consciously to create such systemic impact and pathologies, as if these producers together have some kind of anti-urbanity plan.

What I have sought to show is something much more subtle and more likely than that: that the negative effects arise even *without* any conspiratorial plan. The overall result is not designed by a group of actors – it is the result of rationales focused on their actions, objects and consequences. This makes the problem harder to address, since the actors are unaware or unconcerned about the implications that follow. A plan can be confronted, countered and replaced by new actions. But it is hard to convince anyone that their individual action, added to other similar ones, has problematic consequences over time and on other scales.

Yet I do not believe that the solution can come from a single actor who is supposedly aware of the problem, such as the state or local government. The decisions of this actor also tend to be tied to self-reference and to a partial logic. In practical terms, no actor has the material conditions to reverse the externalities produced by the actions of others. Change needs more than a rupture imposed from the top: it requires change in individual actions.

FIGURE 3
Breaking the exclusive focus on the building



Elaborated by the author.

But how is it possible to break a pattern that arises out of the partial rationale characteristic of actors specialising in the production of space? Is it possible to change behaviour through technical and normative approaches, for example? These questions involve the debate between fields of society engaged in the production and appropriation of space. Let us consider the first setting of debate: between different specialist actors or those with different roles, the arenas of construction companies, architects and planners, and the public that uses the architecture.

"Almost by definition, the members of a field are devoted to advancing the hegemony of their domain, without much regard for the rest of the culture […] Left with a carte blanche, every field naturally wants to control as many of the resources of society as possible" (Csikszentmihalyi, 2013, p. 322-3). Csikszentmihalyiwarns that social fields tend to resist the attempts of other fields to assess their contributions from the viewpoint of the common good, in contrast with their internal criteria. Specialist from the social fields often claim autonomy and prerogative of practices, based on the legitimacy assumed in their technical discussions, and evoking notions such as freedom of expression, scientific or academic freedom, integrity of their field, and so on. We are all caught up in this reasoning and tendencies to self-defence and affirmation. These fields need to confront each other in the public sphere, mutually questioning their practices; mutually debating, defining, and redefining limits of practice and decision.

The problem is that there are imbalances: *when one field shifts away from the others and almost exclusively begins to direct the social and material process in which it acts.* Decisions about the form of the city can today be seen to have shifted almost exclusively to construction companies – a field of reasoning that tends to stifle other actors' discussions in the technical debate, such as those of architects and planners which are governed by aesthetic values of good form, urban criteria such as the vitality of the public space and other items that are hard to objectify. Power differences exist between the roles of construction companies, which drive the process of (financial) production of the city *a priori*, and those who plan interventions *a posteriori.* But in addition to these differences, the defeat of planners and architects is also a technical defeat, because judgement is governed by the absolute objectivity of the measurable. Recognising that this form of judgement has been a strong aspect of our culture since Weber saw its signs in the late 19th century and shows no signs of weakening, *the field of architects and planners will continue to be overcome as long as it fails to provide equally objective arguments* – such as precisely measuring the problems arising from decisions emanating from a single social field, like that of the construction companies.[18]

These conflicts can be understood as what the sociologist Niklas Luhmann calls *autopoiesis*, the process by which systems produce their own structures.[19] Talcott Parsons says that Luhmann sees historical creations such as the legal system and the economic system as specialist subsystems, forms of self-observation and social reproduction. Subsystems can be seen with mutual limits to their actions. Fields that only act self-referentially can cause damage to other fields and to the performance of the system as a whole. Greater balance to interactions can only come from public engagement with other fields: not top-down vigilance by some

18. See Weber (1958; 1978).

19. Luhmann (1995) explores the concept of *autopoiesis* considered by the biologists Humberto Maturana and Francisco Varella.

centralised agency, which would rigidify a society or city (as we might derive from Alexander's topological view in "A city is not a tree"), but instead *agencies interacting in more equal dialogue*, able to address the criteria of each field and engage in the production of broader criteria that can recognise other interests and the city as a whole. Not just the vertical top-down and bottom-up rationales that seem to have taken over urban thinking today, but instead *horizontal monitoring*, communicative engagement and definitions negotiated between fields. This involves fields acting as limits between themselves, in public engagement that can overcome the self-referentiality of each one. Indeed, I would suggest that this is a healthy expression of self-organisation. Self-organisation does not need to be reduced to a new version of the "invisible hand" over the fragmenting actions of actors: theoretically, it offers space for the emergence of agencies that act in relation to others.

There is no reason why the organisation of *planning subsystems* cannot be seen as part of this autopoietic process: subsystems that emerge historically and are spaced to monitor and address the balance and imbalance that cause loss for the majority or for the system as a whole. Well equipped planning agencies could carry out these operations based on comparisons between factual and contrafactual scenarios. Of course, the construction of these scenarios requires technical and scientific knowledge. And planning agencies communicate in the form of institutionalised rules, such as planning regulations, which are in theory related to conditioning the action of constructors of space and focused on mitigating the interference and negative effects of urban production and operation. But for this there needs to be knowledge that is capable of anticipating and preventing this interference, these effects and problems.

Another field of specialisation is needed here, focused on creating knowledge and the instruments that can produce a more accurate reading of real scenarios, and provide support to the development of contrafactual scenarios for establishing comparatives and guiding decisions. This includes actors involved in research gathered together in academia and in agencies – and their potential in feeding into practices of urban monitoring and designing the formal criteria of the production of space. Criteria designed by bringing together actors from technical-scientific spheres and the normative sphere would in principle be less tied to producers' fixation on the object and on immediate gain. Other actors should also feed this process: the users of the urban space, introducing information collected heuristically in its context. This recognition of the diversity of urban agencies would tend to lead to an increase in the number of variables governing the norms and decisions of production – variables capable of representing more actors and interactions in a city.

This description suggests the importance of systematic communication between actors and fields of practice, also arranged in institutionalised, public channels, as a way of allowing the perception of the chains of effect in urban production and the fact that the effects of architecture do not end with the building any more than they are found in spreadsheets of construction costs. Broader criteria, closer to the real complexity of the interactions in which buildings play a part, perceived or otherwise, would emerge more easily based on dialogical considerations that can recognise more aspects of the building-city relationship – perhaps with an eye towards bottom-up reversal of the current process of fragmentation and loss of diversity and urban performance. It also suggests the constant need for *rethinking urban legislation*, as a way of recognising the problem of potential (intentional and unintentional) negative effects of architectural patterns of the present. These effects will not disappear if we close our eyes or ignore their existence.

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CHAPTER 6

MODERN BRAZILIAN ARCHITECTURE AND THE AUTOMOBILE: THE MARRIAGE OF THE CENTURY

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The protests throughout Brazil in June 2013 made it very clear to us all that the current urban development model is no longer sustainable, in three of its key dimensions: economic, social and environmental (Lara, 2013; Holston 2013). From the economic standpoint, automobile production incentives are very close to the inflection point, if they have not already slipped past it unnoticed. This is because – despite being an important industrial and commercial sector – automobiles impose significant impacts on other sectors of society, and especially on healthcare through Brazil's Unified National Health System (SUS) and the National Social Security Institute (INSS), as well as on productivity, through time wasted in traffic jams. These impacts should prompt us to consider investing heavily in a more advanced public transportation system. From the environmental standpoint, there is no need to waste words to describe the effects on our planet caused by emissions resulting from the combustion of fossil fuels (Vanderbilt 2008; Maas 2009). And from a social standpoint, if we were to look ahead to a fair, productive and healthy society as our main development goal, automobiles would certainly have little to contribute to this project of the future.

So why are we so bound to these machines? How was the hegemony of the automobile built during the 20th Century, and what can we do to dismantle this process in the 21st Century?

To answer these questions, it is necessary to understand the place the automobile holds in contemporary imagination. It seems as though Jaime Lerner was quite right when he said that we are faced by a challenge that is very similar to the battle against smoking: both are habits deeply ingrained in the social awareness of the entire planet that must be discouraged due to the harm they cause to society. Shattering the glamorous link between drivers and their cars seems to be the challenge of our generation, just as the previous generation shattered the glamorous link between smokers and their cigarettes.

However, in order to do so, we must understand how this relationship of identification has grown up between human beings and their favorite means of transportation, powered by combustion engines.

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What is the relationship between the hegemony of modern architecture and the hegemony of the automobile in Brazil?

We are already well aware that Brazilian architecture is utterly modern, with all its contradictions (Cavalcanti and Correa do Lago, 2005; Lara, 2002). But, just in case, we can use a brief numerical sophism to explain the modernity of the built environment in Brazil. Offering a brief quantitative overview: Brazil had only two million urban homes in 1940, compared to 35 million today. That same year, Oscar Niemeyer designed the Grande Hotel de Ouro Preto and settled the argument that had been underway between proponents of the Academiscist and Modernist schools of thought since the late 1920s – obviously in favor of the latter – which will be discussed in greater detail below.

Going back to the numbers, if we assume that everything built in Brazil after the 1940s was strongly influenced by the modernist movement, then 95% of our built space is modern. To a greater or lesser extent, for better or worse in terms of quality, it is still nevertheless eminently modern. It therefore becomes crucial to discover: exactly which modern spatial values are still impregnated in our constructed surroundings, and what are the problems that still persist? What distortions have occurred during the past fifty years? Furthermore, the qualitative impacts of this dissemination are far broader, which is where this rubber and metal machine, commonly known as the automobile, comes in the play,

When we look at the history of modern architecture, we realize that the roots nourishing the predominance of circulation over all other urban functions stretch back to the 19th Century. The key concept underpinning the construction of the modern world has always been tightly linked to the development of mobility. During the late 19th Century – even before the automobile was invented – the issue of mobility was already starting to reshape cities, with Paris being the best example, under the administration of Eugene Haussmann between 1853 and 1870 (Kirkland, 2013). As though responding directly to the Communist uprising of 1948, Haussmann linked public sanitation tenets urged by the newly-hatched positivist school of philosophy to the issue of mobility, opening up dozens of kilometers of spacious boulevards cutting through the narrow medieval streets that still formed the heart of the city (Barer, 2000, Malet, 1973). This was the launch of a new urban planning model based on broad avenues whose routes demolished the cramped hovels that were home to the poorest sectors of the population, clearing land for property development ventures that were to transform entire districts of major metropolises throughout the following century. Although not yet invented when Haussmann changed the face of Paris, the automobile would soon be included as the preferred machine in this equation.

Still in the streets of Paris, Gustave Trouve was experimenting with a vehicle powered by electricity back in 1881. Sixteen years went by between the end of the

Haussmann Administration and the invention of what was to be acknowledged as the first automobile: the Benz, in 1886. Paris was so eager for this new machine that Carl Benz sold more of his *motorwagens* in France than in his native Germany. During the last decade of the 19th Century, Daimler started up operations, as well as Peugeot, Diesel and Studebaker. But another decade would go by until Oldsmobile in Michigan started to work with an assembly line in 1902 that slashed assembly costs and times, using a process that was later to be '"borrowed" and improved by Henry Ford, from 1908 onwards. During the first decade of the new century, 10,000 automobiles were built, while during the next ten years (1911-1920) a further six million automotive vehicles took to the road, 80% of them in the United States. Growth expanded exponentially until the Wall Street Crash in 1929, when annual production topped five million units (Ingrassia, 2010).

It is certainly not surprising that this mobile machine invasion influenced all forward-looking urban development proposals at that time. In 1914, the Italian architect Antonio Sant'Elia published his *Manifesto of Futurist Architecture*, suggesting a city dominated by huge residential blocks divided by broad highways. Between 1920 and 1923, Swiss-born French architect Charles-Édouard Jeanneret-Gris (better known as Le Corbusier) published a set of manifestoes and designs for the city of the future, where automobiles played a leading role (Conrads, 1970). One of his most famous houses is called Maison Citrohen (1922), paying tribute to Citroen cars and celebrating precisely this idea of the home as a "living machine" that is just as efficient and elegant as an automobile.

Cars had become indissolubly entwined in the history of architecture, with the hegemony of these new machines rooted in the infant science of urban planning, and was firmly established in 1933 through the Athens Charter. Drawn up by Europe's leading modern architects at the Congrès International d'Architecture Moderne (CIAM), the Athens Charter urged the separation of housing, work and recreation, all connected together (obviously) by automobiles (Mumford, 2000). The ideas shaping modernization and the future were seated firmly on a four-wheeled combustion engine.

In the 19th Century Brazil showed little interest in infrastructure projects. During the rule of Emperor Pedro II, (1840-1889), a large amount of government funding went to subsidizing private enterprise and handing out concessions for projects designed to streamline outflows of agricultural produce (railroads in São Paulo and ports in Porto Alegre, Santos, Recife, Fortaleza and São Luís), while also equipping the army to defend Brazil's territorial integrity and repress domestic unrest. The fastest-growing city in Imperial Brazil, Rio de Janeiro absorbed a few projects focused on water supplies and upgrading its docks, as this was the largest port in Brazil. Mobility – particularly for workers – was not a priority, as slavery ensured a workforce that was always nearby, sleeping in basements or slave quarters of larger estates.

The absence of investments in mobility during the 19th Century is highlighted by the massive movement and logistics difficulties faced by the Brazilian Army during the Paraguayan War (1864-1870) and the Canudos uprisings (1896-1897) in Brazil's newly fledged Republic. Coinciding with the repression of the Canudos rebellion in the late 19th Century, the inauguration of Belo Horizonte (the new capital of the state of Minas Gerais) was intended to replace the old mining capital of Ouro Preto (founded two centuries earlier), after bitter political battles between Republicans determined to wrest control of the capital of Brazil's most populous State from the "Monarchists" in Ouro Preto. At the technical level, the selection of the site of this new city was steered by its location: a neutral place between the coffee-growing South and the cattle-ranching North. The report drawn up by sanitation engineer Aarão Reis mentioned a temperate climate and abundant water as advantages of this site at the foot of the Serra do Curral hills.

The ground plan for Belo Horizonte consisted of an orthogonal network of streets overlayed on a diagonal grid of avenues, closely attuned to the Positivistic urban planning tastes of the late 19th Century. Streets twenty meters wide and avenues thirty-five meters across were the state of the art for a city heading into the 20th Century, with easy circulation, good ventilation and adequate natural lighting. As work began in 1895, Aarão Reis suggested that the streams that were such an attractive feature of that site be left to follow their natural courses through city blocks (Barreto, 1996). But political leaders were not at all charmed by the idea of allowing untamed nature to run freely through the regular modern blocks of the city, particularly as this would cut back on the areas of the lots to be sold or donated by the state government. Since the 19th Century, a good river is a buried river in Belo Horizonte: a short-sighted approach that is still being deployed, even in the 21st Century. Although there were very few automobiles in Belo Horizonte during the 1900s, road surfacing and channeling nevertheless won the day.

Even before the proclamation of Brazil's First Republic (1889-1930), public health engineers were already engaged in discussions over urban intervention models. On the one hand, André Rebouças had drawn up a plan for urban expansion and upgrades that preserved wellsprings and water-courses, with housing making some concessions to nature (Trindade, 2011). On the other hand, Francisco Pereira Passos proposed broad avenues cutting through the cramped streets of the colonial capital, in order to improve in circulation (Benchimol, 1990; Chalhoub, 1996). André Rebouças left Brazil with the royal family in 1889, and Pereira Passos waited twenty years to become mayor and implement his plan between 1904 and 1906.

Looking at the generous boulevards laid by Pereira Passos, it is clear that these interventions – preceded by a removals and demolitions program that caused the well-documented Vaccine Revolt – was intended to streamline connections between the emerging South Zone of the city, and the downtown area where all its

businesses were still tightly clustered (Chalhoub, 1996). An interesting footnote here is that the urban renewal projects implemented by mayor Pereira Passos used asphalt surfacing for the first time in Brazil, apparently foreseeing the imminent arrival of thousands of automobiles.

The next few years saw the arrival of famous US car manufacturers in Brazil: Ford opened a dealership in São Paulo in 1919, followed by General Motors in 1925. In 1920, Brazil's future President Washington Luiz (1926-1930) was elected governor of São Paulo state with the slogan: to govern is to build roads. In 1930, the first major urban plan for the city of São Paulo laid out a complex web of radial and axial avenues cutting through the city. Still today known as the Avenues Plan, the ideas of Prestes Maia would spur the expansion of São Paulo at a dizzying rate (Toledo and Kuhl, 1996).

At that time, the link between road infrastructure and territorial expansion was already established in Rio de Janeiro (with the Agache Plan – 1929) and São Paulo (with the Prestes Maia Plan – 1930) in better areas designed for higher-income families, with automobiles being a fundamental part of this equation (Stuckenbruck, 1996; Villaça 1998). The urbanization of the Southwest vector of São Paulo and the Southern zone in Rio de Janeiro follow this concept to the tee, as clearly demonstrated by Flavio Villaça (1998). Until the 1930s, trams drove the expansion within a radius of three to five kilometers from downtown areas, followed by the automobile, which powered outward urbanization processes from that decade onwards. As using private automobiles for transportation became a priority and municipal budgets were earmarked for funding road infrastructure to an increasing extent, Brazil's elite left the core areas where they lived at the turn of the century and moved out to new subdivisions some ten kilometers away, in an urban flight process whose economic impacts have not yet been properly analyzed. The diametrically opposite vectors (Northeast in São Paulo and Northwest in Rio de Janeiro) became home to hordes of low-income workers through a real estate development process that turned country estates into mass housing sub-divisions that also involved massive amounts of money, although with less intensive investment in road infrastructure at the private and public levels. The sequence of urban protests prompted by fare increases between 1923 and 1947 clearly reveals the inequalities inherent to this process (Pamplona, 1991).

While Rio de Janeiro and São Paulo were heading up automobile-driven territorial expansion processes, it was in placid Belo Horizonte that the combustion engine on four wheels was to find its place of honor in the nation's imagination. In October of 1940, physician Juscelino Kubitschek was appointed the city's mayor by Minas Gerais state governor Benedito Valadares. This young mayor soon realized that public sanitation projects and building highways and streets would be great ways of boosting his popularity and bringing in funds for subsequent

campaigns. His predecessor, Otacílio Negrão de Lima, had built a dam in the northern vector of the city that formed an artificial lake at Pampulha, drying up the downstream marshes where the municipal airport of the same name would be built. When Juscelino Kubitschek took office as mayor, he encountered a problem at City Hall: Negrão de Lima and Benedito Valadares had invited real estate tycoons to invest in the development of the area around this lake, but three years after inauguration, the lots were not selling as well as expected. No matter how attractive its landscape, nobody wanted to move twelve kilometers out of town to Pampulha. However, the new mayor had no doubts and opened up a broad avenue lined with Imperial palm-trees between Pampulha and the northern boundary of the city at that time, seeking a modern architect to design some public buildings and facilities that would make Pampulha more attractive to the local upper class.

During his attempts to save Pampulha from this imminent real estate disaster, Kubitscheck was chatting one day with his colleague, the mayor of Ouro Preto, who spoke very highly of a young architect from Rio de Janeiro who had designed a new hotel for this historic town. Knowing that this architect would be visiting Ouro Preto a few weeks later, mayor Kubitscheck invited him to a meeting in Belo Horizonte. Just 33 years old, young Oscar Niemeyer was already the *enfant-terrible* of Modernist architects in what was then the capital of Brazil, having worked on the design of the Ministry of Education and Public Health (1936) and the Brazilian Pavilion at the World's Fair in New York (1939). His design for the Grande Hotel de Ouro Preto was the first project in which his ultra-modern lines were recalibrated in order to blend seamlessly with the 18th Century urban fabric of Ouro Preto. From his directorship at the National Artistic and Historical Heritage Institute (Iphan), Lúcio Costa asked his pupil Oscar Niemeyer to use ceramic tiles on the roof, replacing vertical sunshades with wooden latticework, and opting for square rather than rounded columns, following traditional colonial designs (Lara, 2002; Cavalcanti 1995). Although accepting the first two suggestions, Niemeyer used square columns only on the facade, retaining his original round designs for the interiors. The Grande Hotel de Ouro Preto was the missing piece needed by the Modernist architects of Rio de Janeiro to win the battle with the supporters of more classic aesthetics who urged an architectural style more closely attuned to Brazil's past. By introducing a modern building in the heart of a town that played a leading role in colonial Brazil, Niemeyer and Costa establish the legitimacy of re-reading the past as a frame for the project of the future that they had already mastered. With their authority over the past severed (the Iphan was set up in 1937 by the Modernists), there was little the Academicists could do, other than watch the vibrant explosion of modernity that was Brazil during the 1940s and 1950s, extending all the way to April of 1960 and the inauguration of its futuristic capital, Brasília.

But before moving on to Brasília, we must talk a little more about the Grande Hotel de Ouro Preto and our key topic: the automobile. More attentive readers will have already realized where I am heading. Built during the 18th Century, Ouro Preto was certainly never designed to handle automobiles. All its main buildings were constructed right on the street, with their doors opening directly onto its sidewalks. The Grande Hotel designed by Niemeyer in 1940 ushered in a new design. For most visitors viewing it from the square with the Casa dos Contos fountain, its most eye-catching feature is still the broad ramp curving up from the street, designed specifically for automobiles. Continuing its course, the main hotel building is split, so cars can drive off the ramp underneath it, protecting its guests from the rain. Only then does another ramp appear, narrower, inviting visitors to walk up to the reception lobby and other public areas of the hotel. Even back in 1940, one of the key buildings for understanding modern Brazilian architecture clearly displays a protagonism of the automobile that was completely inexistent until then. Designed during the 1930s, the Ministry of Education and Culture (MEC) was photographed exhaustively with the latest Ford, Buick and Chevrolet models of the day. The same occurred with the Santos Dumont airport. But none of them invited automobiles to drive right into the building, like the Grande Hotel de Ouro Preto.

Let us return to the momentous meeting between Kubitschek and Niemeyer. Legend has it that the mayor spent an entire afternoon walking around the dam with the architect, asking him to sketch out some designs and come back to Belo Horizonte. Well aware of the get-up-and-go spirit of the mayor, this young architect worked through the night, and by dawn the next day, he already had several drawings to present. The almost-as-young mayor (38 years old in 1940, Kubitschek was five years older) approved his ideas right there and then, with work beginning a few months later at Pampulha, where Niemeyer planned a hotel, a casino, a chapel, a social club and a small events venue. Although the hotel never got off the drawing-board, the other four buildings flowed smoothly into the history of world architecture, displayed at the Museum of Modern Art (MoMA) even before their completion in 1942 and featured in all modern architecture compendia since then.

There is no need to remind Brazilian readers of the ripple effects of this lakeside meeting on the history of Brazil from 1940 onwards (Carranza and Lara, 2015), particularly as we will soon be exploring Brasília: the futuristic city conceptualized by this pair of inspired dreamers. A good example is the Casino building (today the Pampulha Art Museum). Perched on a small peninsula and surrounded by water on three sides, the casino building is connected to the rest of the city by an automobile upramp on the right, balanced by a downramp on the left, and framed by gardens designed by Roberto Burle Marx. At the top of the ramp, a generous canopy protects visitors from the weather, welcoming them into the building. Similar to the Grande Hotel de Ouro Preto, there is no specific

pedestrian entrance or any separation between car lanes and walkways. The casino was designed for guests arriving on four wheels, with no other options.

At the Pampulha Chapel, automobiles were relegated to a lower level of importance: although cars can be driven right up to the door of the church, this is not the usual route. Nowadays, only brides are allowed to alight right in front of the chapel porch, and it seems unlikely that this was different in the past. It is hard to imagine lengthy processions of cars filled with the faithful on their way to Sunday mass. But even here, cars were not forgotten.

Among the many works of art commissioned to embellish the city's buildings and turn them into icons – which they really are – the most eye-catching is the tiled panel on the rear wall of the Pampulha Chapel, designed by Cândido Portinari. While the faithful pray facing a painted mural, thousands of passers-by driving along the banks of the lake can appreciate this Portinari tilework masterpiece. The work of a Communist architect (some would like to remind us…) the best part of this design has its back to the priest, facing out to the entire city. There is nowhere to pause and examine this interesting feature, as the nearby square is many meters higher and largely unrelated to the panel. Instead, there is a thoroughfare. Even the angle between the panel and the road was designed to maximize the view for people driving by at speed. Although Brazilian architecture and urban planning had long been enchanted by the combustion engine on four wheels, it was at Pampulha in 1941 – 1942 that Oscar Niemeyer endowed this relationship with the appropriate form and glamour.

Between 1942 and 1955, Juscelino Kubitscheck and Oscar Niemeyer formed a partnership that was to change the face of the nation, and a significant component of this new image was the automobile as a symbol of modern Brazil.

It was not by chance that Kubitscheck placed so much importance on the automobile industry. A industry with massive impacts along the entire production chain and closely associated with the concept of the modern world, it fitted his developmentalist and privatist vision of the future like a glove. Although today we have a very narrow, lackluster idea of the Kubitscheck administrations, it must be recalled that he was presented as a democratic alternative to the labor movement headed by Vargas, João Goulart, and Brizola. In contrast, his center of gravity lay with capital, rather than the workers. If his administration is today seen as progressive and transformative, it is because this emphasis on the image of modernity was extremely efficient, rather than considering any ways of sharing our wealth or providing real benefits for the workers (Fonseca, 2009).

And none of Kubitscheck's accomplishments fit more seamlessly into this drive towards modernity than its meta-synthesis: the construction of Brasília. Designed as a development vector for Brazil while also drawing the attention of society, there was no way that Brasília could fail to be the automobile city *par excellence*.

Looking back to 1956, when Kubitscheck took office as Brazil's president, the political context in Rio de Janeiro was one of turmoil. He was elected with only 36% of the votes, while his Vice-President João Goulart represented other political forces that were far from aligned with Kubitscheck's Social Democratic Party of Minas Gerais state. The construction of Brasília was thought to provide a catalyst for political maneuverings that allowed the newly-elected President not only to complete his term of office, but to do so with high approval ratings.

The idea of building a new capital city in the heartland of Brazil had been under discussion since Brazil declared its independence from colonial rule in 1822. During the late 19th Century, the Cruls[2] Commission was sent to the high inland plains of the Planalto Central specifically to survey possible areas for a new federal capital. The area demarcated by Luis Cruls in 1892 was then shown on all official maps of central Brazil, until Kubitscheck returned to this matter during his 1955 campaign. Once in office, he acted rapidly and started up the construction of this new city, with the contest to select its urban plan launched on September 30, 1956. By coincidence, President Kubitscheck signed Decree 39,412 just three months earlier, setting up the Automobile Industry Executive Group (Geia). Although the roots of Brasília and Brazil's automobile industry stretch faintly back into the 19th Century, both were effectively solidified by visionary President Juscelino Kubitscheck in 1956.

Until 1951, automobiles were shipped into Brazil from abroad, either complete or as parts for local assembly, with extremely low local content levels, accounting for 15% of foreign expenditures by the Brazilian Treasury. In 1952, President Getúlio Vargas banned the importation of parts when similar items were manufactured locally, helping Brazil's nascent auto-parts industry find its feet. In 1953, he banned the entry of complete vehicles, and during the next two years, Mercedes-Benz and Volkswagen set up assembly plants to compete with Ford, GM and Studebaker, which were already established in Brazil. With a market expanding at more than 10% a year, there was no dilemma between imports (impacting the foreign trade balance) and boosting local content.

2. Headed by engineer Luis Cruls, this expedition set out in 1892 to document and locate a site for the construction of a new capital in the heartland of Brazil.

This was the economic context President Kubitscheck found when he took office on January 31, 1956. An automobile enthusiast since his days as the mayor of Belo Horizonte, he worked quickly to attract foreign investments in auto-assembly, while also striving to step up local content levels in this sector. That same year, he inaugurated the Mercedes-Benz truck assembly line on September 28, and he saw Romi-Isettas roll out of the plant in Santa Bárbara do Oeste with 70% local content. Two months later, a party at the Copacabana Palace Hotel launched the DKW light truck made by Vemag, with 60% of its weight consisting of locally-manufactured parts. During the next few years, automobile and truck production with local content levels of over 70% dominated the Brazilian market.

At this point, it seems that a word of criticism is needed for Brazilian architecture and urban history studies: all their authors have discussed Brasília as a city dominated by the automobile without linking up the dots between the construction of this new capital city and the industrial policy adopted with equal enthusiasm by the Kubitscheck administration. If he commissioned four outstanding buildings at Pampulha (largely to help property developers sell plots of land in what was then a remote suburb), might Brasília have been designed similarly to some extent, boosting demands for automobiles and thus pumping up the market for Brazil's expanding auto-industry sector? We can't say that Brasília was created in order to boost demands for automobiles – it is much more complex than that, but there is also no doubt that the symbolism of modernity for this new capital city fitted seamlessly into the president's plans to incentivize growth for this industrial sector.

Looking at other entries in the Brasília design contest, it is clear that most of the prize-winners leaned on the automobile as heavily as the selected design submitted by Lúcio Costa. An honorable exception is the project presented by brothers Marcelo and Maurício Roberto (ranked in fourth place), which treated cars as purely recreational vehicles, with all inter-city travel by monorail, escalators, people-movers or buses (Braga, 1999).

There is little point in wondering to what extent the Lúcio Costa plan revered the automobile, as only one of the seven prize-winning designs did not do so. What is important is to understand Brasília and all 20th Century urban planning in Brazil as a massive paean to the automobile as a hegemonic machine in the construction of mobility. Other urban solutions, if any, were rapidly swept away by the power of the links constructed between architecture, modernity and the four-wheeled combustion engine, commonly known as the automobile.

At a time when the depletion of this model is quite clear, the question arises: How should we design cities today so that, in fifty years' time, we will have more efficient and less aggressive mobility structures, enhancing relationships between human beings and their surroundings? How can we shatter the relationship of

glamour and identification that we have with the automobile, instead developing healthier and more sustainable values such as walking and cycling, sitting on a bench in a square simply interacting with other people: simple actions that I believe are fundamental to society that are ruined each day by the overwhelming presence of four-wheeled combustion engines.

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CHAPTER 7

STRATEGIC MASTER PLAN FOR THE CITY OF SÃO PAULO: ANALYSIS OF TRANSIT-ORIENTED DEVELOPMENT STRATEGIES

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Gabriel Tenenbaum de Oliveira[2]
Aline Cannataro de Figueiredo[3]

1 INTRODUCTION

Founded by Jesuits in 1554, São Paulo has been swept by changes during the past 150 years, and is now home to almost twelve million inhabitants and the hub of the metropolitan region encompassing 39 municipalities with a population of more than 20 million people (IBGE, 2014). Forging ahead with its ongoing planning process, the city has now drawn up its III Strategic Master PlanPDE-SP (PSP, 2015a), which is intended to guide the urban development of this municipality through to 2030. Brazil's urbanization processes speed up significantly during the second half of the 20th Century. In the São Paulo metropolitan region (MR), demographic growth rose more steeply in surrounding municipalities (graph 1), spurred by the peripheralization of the population and the resulting urban sprawl (Maricato, 2001). While the population of the city of São Paulo rose by 90% between 1970 and 2010 (up from 5.9 to 11.3 million inhabitants), the number of people living in the nearby municipalities constituting the São Paulo MR soared by 281% (up from 2.2 to 8.3 million inhabitants) (IBGE, 2015).

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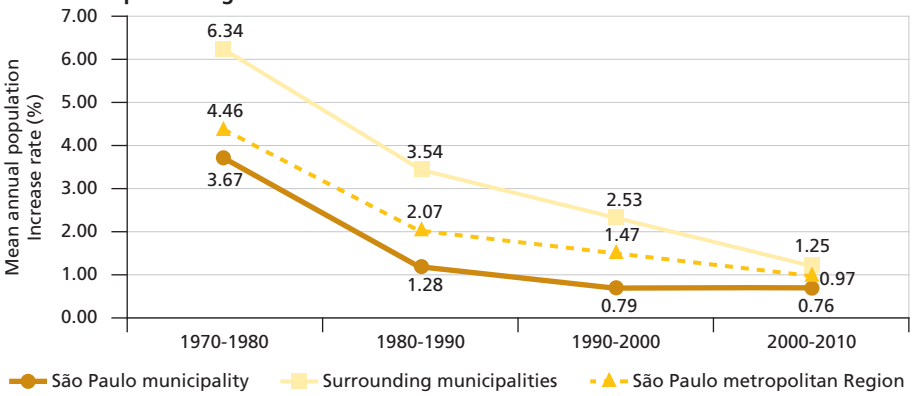
GRAPH 1

Annual demographic growth rate in the city of São Paulo, nearby municipalities and the São Paulo MR, consisting of nearby municipalities currently encompassed by this metropolitan region

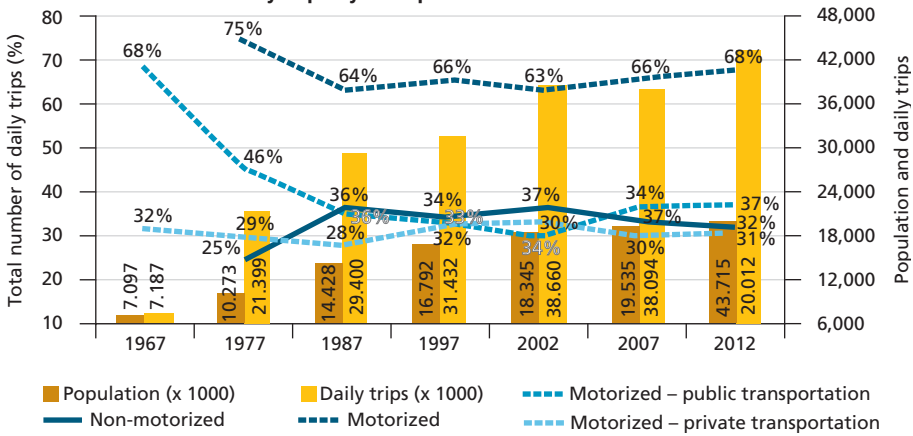


Source: Prepared by the authors from Demographic Census data (IBGE, 2015).

The consolidation of this type of urban settlement was underpinned on the one hand through automobile use by the wealthier classes (Castells, 2009) and rising investments in road transportation. On the other hand, for lower-income segments of the population, this was the outcome of an intensive, ongoing expansion process characterized by self-built homes, unaccompanied by a housing policy that provided an adequate response to these needs. As a result, large numbers of families settled along public transportation arteries and in outlying areas (Maricato, 2003), generally lacking urban infrastructure and other facilities (Souza, 2003). This type of urban expansion resulted in poorly balanced land use (Portugal et al., 2010), with unequal distribution of incomes, jobs and access to essential urban services (Motte-Baumvol and Nassi, 2012), along with shrinking populations in, and underuse of, better-consolidated central areas.

This gap between housing and opportunities had negative impacts on urban mobility and quality of life. Motorized commutes played a leading role in the total number of daily trips, with similar proportions for private cars and public transportation (graph 2). This is reflected in the amount of time spent by São Paulo MR residents in their home x work commutes, which has been increasing since 1992, reaching an average of 42.8 minutes in 2009 (Ipea, 2013).

GRAPH 2
Total number of daily trips by transportation mode in the São Paulo MR



Source: Prepared by the authors from data in the Origin-Destination Survey conducted by the São Paulo Subway (Cia. Metrô-São Paulo).

However, over the past few years, data in the Origin-Destination (OD) Survey conducted by the São Paulo Subway (Metrô-SP) have indicated a shift in this population peripheralization and job opportunity clustering processes. From 2007 through to 2012, population growth was higher for the first time in the extended downtown area, while more jobs were generated in the municipalities constituting the São Paulo MR, except for the city of São Paulo (Paiva, 2014).

Along the same lines, this Strategic Master Plan proposes a new urban planning model that is "more humane, bringing jobs and housing closer together and endowing the city with new balance" (SMDU-SP, 2015), thus offering a valid response to mobility problems, while structuring the process of achieving an even balance in access to opportunities. This plan is seamlessly aligned with urban development models that take contemporary social and environmental variables into consideration, which have been under discussion since the 1990s.

Particularly noteworthy among them is the Transit-Oriented Development (TOD) model, which has already been explored and deployed in many different realities and contexts all over the world. This model encourages tight-packed, mixed-use land occupancy close to high-capacity transportation stations (ITDP, 2014). It allows for equal access to opportunities in territorial terms, avoids long commutes and encourages contexts that foster more intensive social interactions (Oliveira et al., 2014). In other words, this is a model that can be applied in São Paulo, in order to obtain the goals of its Strategic Master Plan.

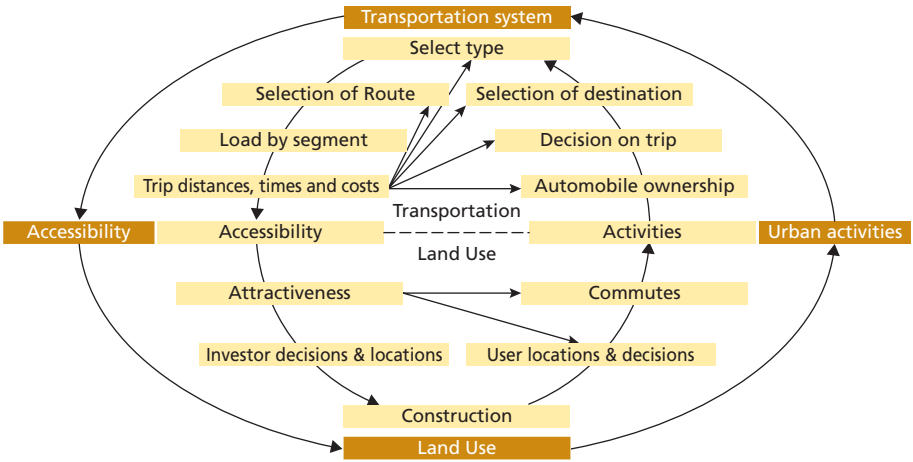
This paper analyzes the strategies set forth in the Strategic Master Plan for the city of São Paulo in the light of the principles underpinning the Transit-Oriented Development model. Section 2 introduces the TOD concept; Section 3 presents the preparation process of the PDE-SP; Section 4 analyzes the main strategies addressed by this plan based on TOD principles, closing with remarks and recommendations related to this master plan.

2 TRANSIT-ORIENTED DEVELOPMENT

According to Pauley and Pedler (2000), urban planners are well aware of the direct links between transportation, urban land use and occupancy. The underlying assumption that the spatial separation of urban activities triggers transportation requirements for people and goods is the basic principle for analyzing transportation demands. Recognition of this inter-relationship (figure 1) leads to the land use-transport feedback cycle concept, as summarized:

- land use distribution (residential, industrial, commercial and others) defines the location of urban activities such as housing, work, education, shopping and recreation;
- the distribution of urban activities requires travel (spatial interactions) on public transportation systems, bridging distances between the places where activities take place;
- the distribution of public transportation system infrastructure opens up opportunities for spatial interactions and may be measured as accessibility;
- the distribution of accessibility in space guides location decisions, thereby triggering changes in land use and occupancy patterns.

FIGURE 1
Land use – transport feedback cycle diagram



Source: Adapted from Pauley and Pedler (2000).

From the 1950s onwards, following a paradigm rooted in Europe that spread through many other countries (including the United States and other Latin American nations), the modernist model was the main urban planning guideline followed in Brazil. Through its territorial arrangement tools, this model lead to excessively specialized use of urban space, triggering the need for automobile parking in new buildings. By assigning high priority to this type of transportation, the modernist model contributed to the spread of urban sprawl by failing to link urban occupancy to structural accessibility supported by high capacity public transportation options (Martins et al., 2004; Lentino, 2005; Barandier Júnior, 2012).

According to Martins et al. (2004), as cities adapted to private automobiles, with low capacity public transportation systems affected by many external factors (external or indirect costs), they lost the ability to foster development balanced evenly between transportation supplies and demands, committed to environmental, financial and social sustainability. As mentioned by Barandier Junior (2012), this resulted in the widespread dissemination of a disjointed urban planning model.

For Banister (2008), the sustainable mobility paradigm[4] constitutes an alternative to traditional transportation planning, exploring urban complexity and tightening links between transportation options and land use. The main concern

4. According to the definition proposed by the Ministry of Cities (2004): "Sustainable Mobility may be defined as the outcome of a set of transportation and circulation policies designed to ensure broad-ranging democratic access to urban areas through assigning high priority to non-motorized and mass means of transportation in an effective manner that does not cause spatial segregation, is socially inclusive and ecologically sustainable. In other words, based on people rather than vehicles."

of transportation planning, in terms of tailoring the physical dimensions of the system (infrastructure and traffic) to current demands, must be offset by including the social dimension (people and proximity). The need for planning models responding to these concerns is well defined by Bettencourt (2015):

> The challenge for the modern science of cities is to define urban issues of merit, seeking integrated solutions that deploy natural urban dynamics that foster human development and economic growth while avoiding unintentional negative consequences such as violence, exclusion or pollution (Bettencourt, 2015).

From the 1990s onwards, aligned with the emerging paradigm associated with sustainable mobility, some planning proposals arose, focused on the integration of these urban development variables, including the TOD concept. Disseminated mainly through the book entitled "The Transit Metropolis: a global inquiry" by Cervero (1998), this concept urges development that is evenly balanced in territorial terms for cities, with faster commutes and shorter trip distances while ensuring fair access to urban opportunities and encouraging active means of transportation (walking and cycling) as well as public transportation options. According to Suzuki et al. (2013):

> Well-integrated transit and land development create urban forms and spaces that reduce the need for travel by private motorized vehicles. Areas with good access to public transit and well-designed urban spaces that are walkable and bikeable become highly attractive places for people to live, work, learn, play, and interact. Such environments enhance a city's economic competitiveness, reduce local pollution and global greenhouse gas emissions, and promote inclusive development. These goals are at the heart of transit-oriented development (TOD), an urban form that is increasingly important to sustainable urban futures (Suzuki et al., 2013).

Goodwill and Hendricks (2002) stressed that the TOD concept is associated with development processes located close to public transportation system routes and stations, blending complementary land uses (residential, commercial, services, recreation and others) with an environment that encourages non-motorized transportation (walking and cycling).

In order to assess initiatives and acknowledge best practices associated with the TOD concept, the Technical Committee – set up under the aegis of the Institute for Transportation and Development Policy (ITDP) and consisting of internationally renowned specialists – established the TOD Standard (ITDP, 2014), based on its deployment in cities all over the world and the experience of organizations engaged with urban mobility issues. This tool defines eight assessment principles that synthesize the concept, as shown in table 1 below.

TABLE 1
TOD Assessment Principles as proposed by the ITDP Standard

Principles	Description
Walk	Walking is the most natural, healthiest, cleanest and lowest-cost means of transportation over short distances, in addition to forming a necessary component of most trips using public transportation options. Walking is or can be the most pleasant and productive way of moving around the city, provided that there are other people in its streets and the desired resources or services are located conveniently. Requiring a certain amount of physical effort, walking is also highly sensitive to environmental conditions.
Cycle	A healthy, low-cost transportation option that is also emission-free, cycling offers the convenience of door-to-door trips and the same route and time flexibility as walking, together with the same range and speed as many local public transportation options. Bicycles and other human-propelled means of transportation – such as rickshaws – brighten the streets and step up the use of mass transport options.
Connect	Short, direct routes for pedestrians and cyclists require a tightly woven network of roads and streets, with small, permeable blocks. This is particularly important for pedestrian trips and better access to public transportation stations, whose users may be discouraged by access routes requiring more deviations. A dense web of roads and streets offering multiple route possibilities to a wide variety of destinations may well make walking or cycling options more interesting and pleasurable. More frequent street crossings, narrower roads with slower traffic flows and larger numbers of pedestrians encourage local trade and other street activities. An urban fabric that is friendlier to pedestrians and cyclists than cars also encourages non-motorized transportation and public transportation options.
Transit	Public transportation connects up and integrates faraway neighborhoods for pedestrians. Easy, nearby access to high-capacity transportation options – such as railroads, metros, ferryboats or buses – is a pre-requisite for qualifying a system under the TOD Standard. High-Capacity Transportation ensures fair and efficient urban mobility, underpinning dense, compact urban development patterns. Many different types of public transportation must be provided, responding to the entire range of urban public transportation requirements, including low and high capacity vehicles, cabs, rickshaws, articulated buses and trains.
Mix	In areas with well-balanced blends of users and complementary activities (such as homes, workplaces and local shops), many daily trips are short and can be easily walked. Different uses at different peak times keep the streets safe and busy for longer periods, encouraging pedestrians and cyclists while underpinning a vibrant human environment with people want to live. There is also a greater possibility of attaining an even balance between outbound and inbound commutes, resulting in more efficient operations for public transportation systems. Different types of housing in a broad range of prices allows workers to live close to their jobs, thus preventing low-income residents who depend more heavily on low-cost public transportation from being edged out towards more remote areas and thus potentially encouraged to depend more on motorized vehicles. The two performance goals of this principle are thus supplying an evenly-balanced blend of land uses and an equally well-balanced range of income levels among residents.
Densify	In order to observe urban growth in dense and compact ways, cities must grow vertically (centripetal development or densification), instead of horizontally (centrifugal development or sprawl). On the other hand, high transit-oriented urban densities trigger demands a high capacity transportation services, with equally high frequencies and collectivities; as part of a virtuous circle, they help generate funds for investing in system upgrades and expansions. Density tailored to public transportation system capacity results in busy streets full of people, making areas around stations into lively, active, vibrant and safe places. Density triggers demands for a wide variety of services and amenities, helping local shops thrive. However, it is important to pay close attention to population density limits, including requirements such as access to natural light and ventilation, parks and other open areas, preservation of natural resources and protection of cultural and historical assets.
Compact	The basic organizational principle of urban densification is compact development. In a compact neighborhood or city, many different activities and uses are located conveniently close to each other, been advising the time and energy needed to benefit from them while maximizing potential interactions. With shorter distances, compact cities need less infrastructure at lower costs, while shielding rural areas from urban occupancy, ideally set aside as farmlands or areas under environmental preservation. Excellence in urban design and planning standards is a key requirement for the compact city.
Shift	When cities are shaped in compliance with the seven principles listed above, individual motorized transportation becomes largely unnecessary in daily life. Walking, cycling and catching high-capacity public transportation are easier and more convenient options that can be supplemented by a broad range of other types of public transportation and rented or leased vehicles, thus requiring less road space and generating fewer negative effects on society as a whole. Large amounts of scarce and valuable resource – urban areas – can be retrieved from streets, roads and parking lots that are no longer necessary, becoming available for repurposing in ways that are more productive in social and economic terms.

Source: ITDP (2014).

The principles established by the TOD Quality Standard will be used to guide the analysis of the strategies defined in the Strategic Master Plan for the city of São Paulo.

3 STRATEGIC MASTER PLAN FOR THE CITY OF SÃO PAULO

The Strategic Master Plan for the city of São Paulo (PDE-SP) was promulgated through Municipal Law n. 16,050/2014, replacing Municipal Law n. 13,430/2002, which set 2012 as the deadline year for the materialization of its guidelines. The previous administration attempted to conduct a review in 2007, prompting conflicts with organized civil society over the conduct of this participatory process. The draft bill presented by the Executive Branch was declared invalid by the Courts in 2008, in a lawsuit filed by civil entities. As a result, the Administration headed by Mayor Fernando Haddad accepted the challenge of rewriting this plan.

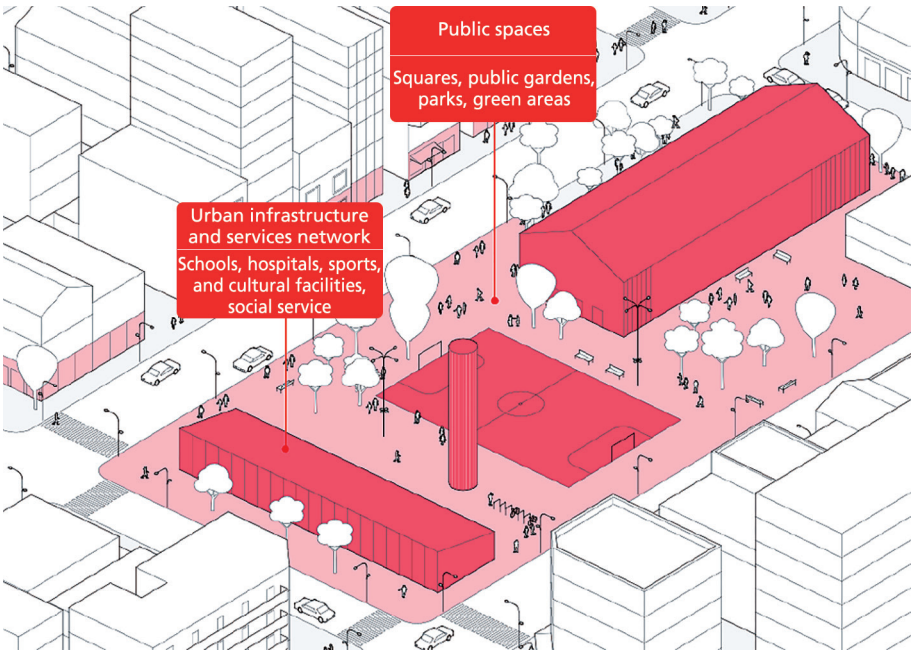
The main municipal urban policy tool for São Paulo, this plan was drawn up by its Municipal Urban Development Bureau (SMDU-SP), with the involvement of other sector-specific bureaus and departments, in addition to local leaders and representatives of civil society. The review of this plan was included in the 2013-2016 Target Program as Target 120, encompassed by urban policy actions addressed under the umbrella objective of "implementing the regulatory framework for urban development in a participatory manner" (PSP, 2015b).

The participatory process was particularly noteworthy in the course of drawing up this plan, with sixty public hearings and many discussions, workshops and meetings, attracting 25,000 attendees and 10,000 contributions. Although this plan is promulgated through a law, close attention was paid to the language used to present it to society. An illustrated version (figure 2) presents the guidelines in an informative manner, with this intention clearly expressed in the following excerpt:

> The impacts of the PDE-SP on the city and the daily lives of its people are enormous, and will increase steadily. This is why the purpose of this publication is to present its content in language that ensures easier understanding for all. The more widely it is known and accepted by citizens, the closer we will come to its effective implementation during the next sixteen years it will remain in effect. Therefore, we are increasingly moving towards a new urban policy and government paradigm: governing for citizens and with citizens (SMDU-SP, 2015a).

The Urban Administration Portal (SMDU-SP, 2015a) provides access to information and opens up greater possibilities for input from local residents. Presenting the full Strategic Master Plan (complete with the maps used during its preparation), this portal also explains the preparation processes for other laws that supplement it (Zoning Law; Works and Buildings Code; Regional Plans for Neighborhood Councils and District Plans) in addition to other initiatives for the city.

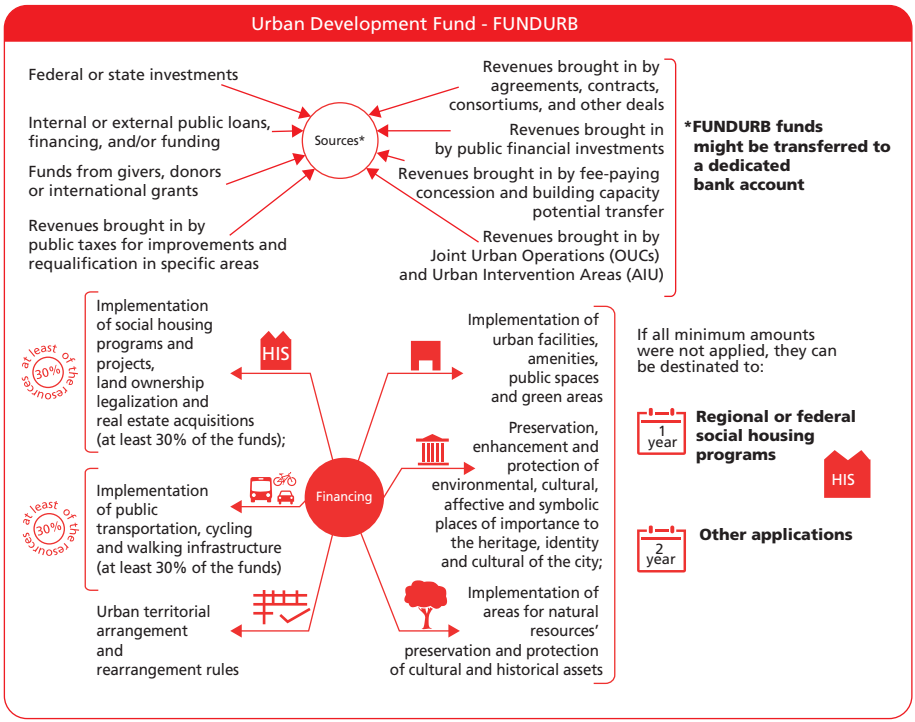
FIGURE 2
Example of an illustration used to explain the plan



Source: SMDU-SP (2015a).

This plan establishes the composition of the Municipal Urban Policy Council, with a majority of seats assigned to civil society and extended duties and responsibilities, the structuring of the Public-Private Council for managing the Urban Development Fund (Fundurb), and the regulation of the PDE-SP Monitoring System. It also addresses the allocation of Fundurb financing (figure 3), particularly earmarking 30% for social interest housing and 30% for investments in urban mobility (active transportation and public transportation facilities). These steps will help consolidate the Urban Transformation Structuring Corridors proposed by this plan.

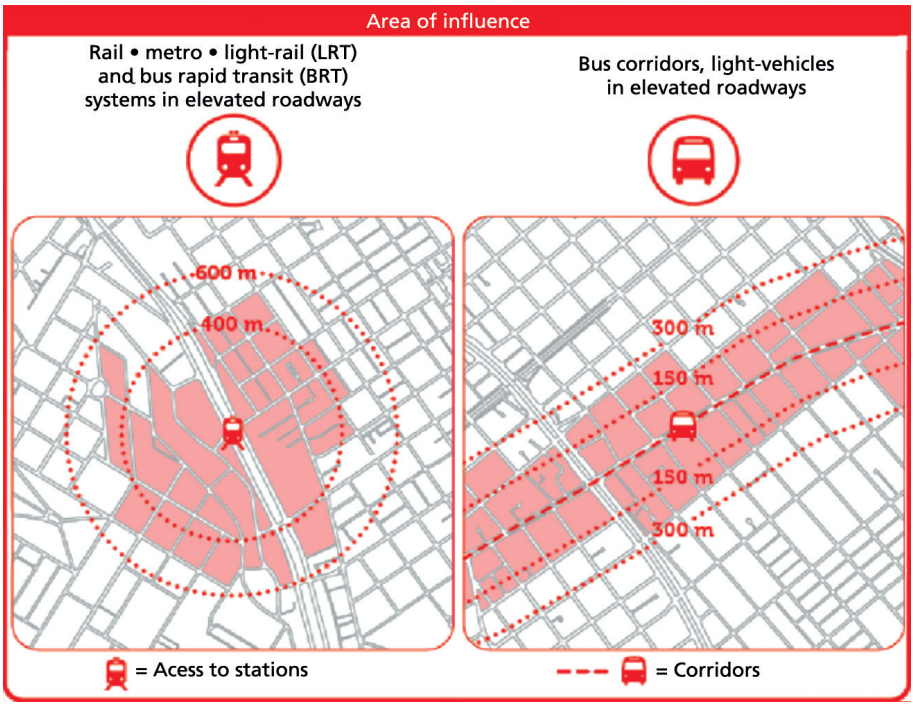
FIGURE 3
Sources and allocations of funding by the Urban Development Fund (Fundurb).



Source: SMDU-SP (2015a).

The Strategic Master Plan for the city of São Paulo is structured on ten strategies that address territorial arrangements and the extension of social control and participation tools, presented in Annex A. Some of these strategies are directly correlated to the principles underpinning the concept of Transit-Oriented Development (TOD), striving to rationalize urban development through guided growth in areas endowed with solid infrastructure, especially public transportation. The definition of Urban Transformation Structuring Corridors, associated with traffic corridors that have already been implemented or are on the drawing board for the city, synthesize this urban development model, in terms of territorial planning (figure 4).

FIGURE 4
Illustration of strategy: foster urban growth near public transit facilities



Source: SMDU-SP (2015a).

The new Master Plan ushers in technical and political progress in the development of São Paulo, encouraging broader social engagement in decisions that guide the future course of the city. By promulgating the law (effective through to 2030) that establishes the sustainable urban development guidelines and parameters for the city, this plan may well constitute an important public policy tool, not only for São Paulo, but also for other Brazilian municipalities by serving as a precedent.

4 ANALYSIS OF THE STRATEGIES DEFINED IN THE PDE-SP

The strategies and steps defined by this plan that guide urban development in the city of São Paulo have similarities with the eight principles underpinning the Transit-Oriented Development concept, as presented in the TOD Standard (ITDP, 2014). Outstanding among these strategies are:

1. Spread urban production gains throughout society;
2. Ensure the right to decent housing for people in need;
3. Boost urban mobility;

4. Enhance urban life in neighborhoods;
5. Steer urban growth towards neighborhoods close to public transportation;
6. Reorganize metropolitan dynamics;
7. Foster the economic development of the city.

The similarities between these PDE-SP strategies and the principles underlying the TOD concept are set forth below.

4.1 Spread urban production gains throughout society

As a major step related to this strategy, the PDE-SP established a Floor Area Ratio of 1 for the entire city of São Paulo, in order to bring in private funding through fees paid for the award of public utility concessions, to be invested in urban upgrades for situations where this ratio is exceeded. This ensured alignment with the "created land"concept, which juggles (through counterpart benefits and offset advantages) the possibilities of more intensive land use in terms of construction potential and greater building density with the ratio of public infrastructure, facilities, facilities, amenities and spaces in the region surrounding the development.

This is a step toward the implementation of areas offering satisfactory levels of accessibility through *public transportation* corridors with the potential to attract other activities, along the Urban Transformation Structuring Corridors defined by the Strategic Master Plan.

Complying with the allocation established by Article 340 of the plan for Fundurb funding (30% for building government housing projects and 30% for investments in mobility), the improvements implemented through this step contribute to transit-oriented urban development in different ways. If addressing environmental quality in areas set aside for pedestrians and cyclists, they encourage *walking* and *cycling*; they may also underwrite infrastructure upgrades (such as basic sanitation) in regions where *denser occupancy* is desired, underpinned by the public transportation network.

Another step fostering Transit-Oriented Development is setting aside strategic areas for the application of instruments that guarantee the social function of urban property. Already encompassed by the Cities Statute, these tools are intended to lower the number of unused properties, with the PDE-SP making provisions for Compulsory Subdivision, Construction and Use (Peuc) and Time-Scaled Urban Land and Building Taxes (IPTU).

According to information provided by the Municipal Urban Development Bureau of São Paulo (SMDC/SP, 2015b), the initial stage the deployment of the Peuc and Time-Scaled IPTU, as proposed in the PDE-SP, began in 2014 with the

identification and notification of property owners in the Centro and Água Branca Joint Urban Operations areas, as well as Special Social Interest Zones (Zeis) 2, 3 and 5. However, based on the track record of using these tools in São Paulo, Costa (2015) notes that it is still too early to assess the success of these steps. Specifically with regard to the deployment of the Peuc, this author highlights the challenge, as an example, of linking it to housing policy, in order to ensure that expropriated properties are used for low-income government housing projects, thereby ensuring compliance with the social function of property ownership and extending the right to the city.

Despite the challenges of deploying these tools, rating the central area of São Paulo and other districts along public transportation arteries as strategic areas encouraged denser occupancy and more compact development at these locations. If the urban properties and plots of land offered to society through these tools were to be allocated to low-cost government housing projects, they would support the diversification of urban land use in areas where business, trade and services prevail (downtown, for example), while also fostering income diversity and encouraging the use of public transportation through easier access (proximity).

In addition to socializing the private gains associated with urban output, these steps would ensure fair access to urban opportunities in São Paulo, through housing with good urban and social conditions for low-income segments of the population that are generally more vulnerable to mobility problems.

4.2 Ensure the right to decent housing for people in need

The PDE-SP doubles the areas designated as Zeis, defining their locations in better-structured parts of the city, such as central areas and along public transportation trunk lines. This step consolidates mixed land use in areas where business activities, stores and services prevail, encouraging residents to opt for public transportation through easier access (proximity). This step may help break away from the spatial segregation pattern that edges poorer segments of the population towards the outskirts of the city, while enhancing their quality of life by providing better access to urban opportunities and reducing the need for long trips.

Paragraph 2 of Article 44 of the PDE-SP stipulates that, in Special Social Interest Zones (Zeis) 1, 2, 3 and 4 (figure 5), at least 60% of the total constructed area must consist of low-income government housing projects for Bracket 1 families (earning between one and three minimum wages), in addition to other aspects related to compliance with the minimum constructed area by income bracket. Although this percentage is significant, with larger areas earmarked as the Zeis, the potential impact of these steps on the housing shortage of 227,000 homes in the city of São Paulo in 2009 (Habisp, 2010), can be properly assessed only after the preparation of the Municipal Housing Plan (PMA) and the approval of the

Zoning Law (Lpuos) that will establish the urban planning parameters for these zones in São Paulo.

Allocating 30% of Fundurb financing to government housing programs and projects, together with land ownership legalization and real estate acquisitions, are steps that improvethe feasibility of this strategy. At the same time, Edict n. 56/Sehab. G/2015 establishes the terms for cooperation between the municipal and federal government for implementing low-income housing projects through the *Minha Casa Minha Vida* (MCMV, *My Home My Life*) public housing program, financed by the Home Leasing Fund (SAR) and the Social Development Fund (FDS).

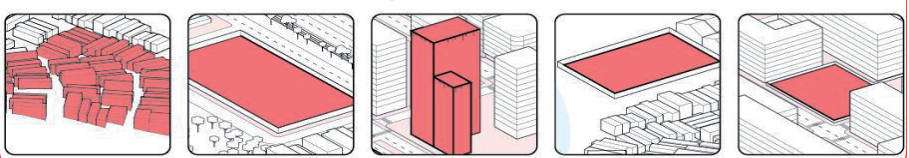
Establishing a Solidarity Quota for developments located along the Urban Transformation Structuring Corridors may also contribute to *denser occupancy* and *socioeconomic diversity* along public transportation corridors. This consists of donating part of the project resources (constructed area, land or Fundurb financing) to low-income housing projects. In this case, the Solidarity Quota is defined in order to obtain the completion certificates for large-scale real estate projects (Article 111), donating 10% of the calculable constructed area to projects covering more than 20,000m^2 (Article 112).

FIGURE 5
Types of Special Social Interest Zones addressed by the PDE-SP

Special Social Intererest Zones (Zeis): classification

The areas designated as Zeis are mostly dedicated to low-income housing. There are five types of Zeis:

Zeis 1	Zeis 2	Zeis 3	Zeis 4	Zeis 5
Areas occupied by people from the poorer segments of the population, living in illegal squatter settlements as favela slums	Tracts of land underused, with informal ocupation, non ubanized or rated as vulnerable, steering urbanization	Consolidated urban areas with a good supply of public services and amenities, but with the presence of underused, abandoned, degraded properties	Tracts of land underused, suitable for being urbanized, located in environmental protection areas	Large tracts of land underused or not occupied, located in consolidated urban areas with a good supply of public services and amenities.



Source: SMDU-SP, 2015a.

4.3 Boost urban mobility

This strategy plays a key role in the promotion of Transit-Oriented Development in São Paulo. Extending its urban public transportation network encourages the use of *public transportation* and consequently ensures easier access for its residents to the opportunities offered by the city.

Allocating 30% of the Urban Development Fund (Fundurb) to the implementation of sustainable transportation infrastructure (active and public transportation modes) has the potential to encourage the use of *public transportation*, as well as *cycling* and *walking*. Laying sidewalks that are adequately sized and well designed along bus corridors and their area of influence encourages passengers to walk and catch public transportation.

Through public investment in infrastructure upgrades and plans focused on enhancing the quality of life of local residents, landowners obtain higher prices for their properties. The Urban Development Fund channels this added value back to government coffers. The revenues brought in through Fee-Paying Concession Awards (one of the urban planning tools deployed under the PDE-São Paulo) are among the sources of income of this fund.

Consisting of representatives of the Government and Civil Society, the Fund Management Board is responsible for the approval of the plan and the allocation of funds, in addition to establishing its operating rules and conditions, while also overseeing fund use. The fund release form completed by any government entity intending to use these amounts must define the purpose of the funds from among the high-priority options listed in Article 339 of the PDE-SP, which include low-income housing programs, public transportation systems, bicycle paths, pedestrian walkways and upgrades of corridors, thoroughfares or hubs.

However, potential use of Fundurb financing for projects that effectively enhance urban mobility will depend on the amount of funding brought in, the quality of the projects presented and the fund management and oversight capabilities. In order to attain its goals to the full extent of its potential in terms of urban arrangements and better mobility, several issues still need to be resolved. These issues include: ensuring a steady and foreseeable flow of funds, stepping up budget implementation capacities, and assessing and overseeing projects financed by this fund.

4.4 Enhance urban life in neighborhoods

Along with the firming up of *mixed land use* in São Paulo neighborhoods through introducing complementary activities and shortening distances between homes and jobs, it is also vital to cut back on travel needs and trip length. Overlapping urban activities in neighborhoods encourage people to *walk* and *cycle*, thus ushering in *lifestyles that are less dependent on individual motorized vehicles* (cars and motorcycles).

The Regional Council District Plans and Services Network layouts[5] support the feasibility of development that is more evenly balanced in territorial terms, thus

5. The Services Network consists of public and private facilities supplying healthcare, education, culture, recreation, sports and social welfare services in the municipality. One of the steps proposed by the PDE-SP to upgrade the quality of life in neighborhoods is to interconnect this facilities network through plans and actions discussed with society.

minimizing trip distances for local residents. Similarly, one of the strategic objectives of the Urban Transformation Structuring Corridors is to upgrade existing hubs and encourage a broader range of businesses, stores, services and jobs (Article 23, I) particularly on the fringes of urbanized areas where sprawling residential districts post low Human Development Index ratings – known as Urban Vulnerability Reduction and Environmental Vulnerability Reduction and Rehabilitation Macro-Areas – in order to shorten distances between homes and jobs (Article 15, § 2 II and Article 27, § 2 II). The steps encourage the establishment of lifestyles tailored to local scales within neighborhoods, thus fostering the use of active means of transportation.

Neighborhood plans and the projects to be implemented as proposed by the PDE-SP play vital roles in adapting environmental conditions in ways that encourage *walking and cycling*, creating urban areas that are better *connected* and thus ensuring easier travel over short distances. However, urban design projects with functional and aesthetic attributes that are tailored to the needs of local communities are needed to achieve this. The municipal government is responsible for the creation of these plans, under District Council supervision (Article 324) and with the direct participation of the Municipal Participatory Councils (Article 325) which may play active mobilization roles focused on proposals for neighborhoods. Consequently, the participation of social organizations (such as residents associations) in these processes may be decisive to ensure the quality and legitimacy of the projects.

4.5 Steer urban growth towards neighborhoods close to public transportation

The definition of Urban Transformation Structuring Corridors, associated with public transportation corridors for territorial planning and public transportation operations, synthesizes the Transit-Oriented Development concept. Establishing urban planning parameters that support *denser occupancy and mixed land use* along public transportation arteries may well have positive effects on urban development dynamics in São Paulo, which are still associated with ever-expanding urban sprawl with outlying areas offering little infrastructure and poor access to their low-density populations. However, *compact* development that paves the way for equal access to urban opportunities through reducing travel needs and shortening trips still depends on the successful materialization of these public transportation corridors.

The territorial arrangement rules defined by the PDE-SP spotlight the leading role played by the urban transformation structuring corridors. In fact, the maximum Floor Area Ratio (FAR) of 4.0 is set aside for locations within the areas of influence of these corridors, while other parts of the city (except for Joint Urban Operations areas and Special Social Interest Zones) are subject to a coefficient ceiling of 2.0. Defined as the ratio between plot size and building area, the Floor

Area Ratio is one of the key urban planning parameters for defining population density and activity concentration levels.

However, floor area ratios established for affordable housing units (25%) and social housing units (50%) along Urban Transformation Structuring Corridors may reach 7.0%. This decision *leads to denser occupancy and social and economic diversity* along structuring corridors.

Another important urban planning parameter in this field is the maximum units x lot quota, which establishes the minimum number of residential units for new projects. Denser residential occupancy along urban transformation structuring corridors optimizes land use in easily-accessible areas while also contributing to *denser usage rates* for public transportation networks.

Establishing public areas designed specifically for human beings, with mixed use incentives, active streetfronts[6] and facilities for public use that encourage social interactions among local residents, is an important step for ushering in local-scale lifestyles that encourage people to *walk* and *cycle*. As shown by the TOD Standard (ITDP, 2014), active street fronts frame lively, vibrant pedestrian areas where activities spur further actions that make walking an attractive and safe choice. These amenities result in public areas that encourage social interactions and community life, instead of private recreational options. Although they are important features of real estate development projects, over-valuing private recreation facilities tends to weaken the roles democratic and socially diverse public areas play in urban life.

Discouraging automobile use in areas that are well served by public transportation is a crucial step towards sustainable mobility. The PDE-SP is moving steadily ahead in this direction through eliminating minimum parking requirements for real estate ventures in areas of influence of the Urban Transformation Structuring Corridors, together with a ban on parking in street-level vacant areas between lot boundaries and buildings, and in roofed areas of floors with building entrances, up to a limit of fifteen meters (Article 78). If the maximum number of parking spaces for residential and non-residential use is exceeded, these areas are ranked as included in the project's Gross Floor Area (Article 80).

Nevertheless, despite nearby public transportation arteries, in order to establish *lifestyles that are less dependent on individual motorized vehicles* along Urban Transformation Structuring Corridors, even more incisive steps could be taken in terms of parking policies. According to Kodransky and Hermann (2011), this aspect should be managed with a parking "inventory" in each district, rather than by dividing urban space into public and private segments: on-street and off-street

6. According to the definition in the illustrated version of the PDE-SP, active street fronts are lined by stores, services, or facilities opening onto the street, humanizing public sidewalks through contact with ground-floor amenities in buildings.

parking. Setting limits for parking for each specific district, based on observed demands, results in better control over motorized trips and a clearer definition of the best fee-charging strategy for these facilities, which may also bring in additional funding for investment in the city.

Imposing constraints on the parking inventory for each district is particularly important for areas around public transportation stations, being desirable for areas along backbone routes, for example. This policy encourages drivers to switch to public transportation options, thus ensuring the operating success of these systems, necessarily accompanied by encouragement for non-motorized, active transportation modes.

Kodransky and Hermann (2011) listed the following recommendations, for defining parking policies that contribute to sustainable mobility:

1. Eliminate the requirement for a minimum number of parking in each building (already encompassed by the PDE-SP).
2. Set limit for parking inventories by district (including public and private areas).
3. Cut back on parking areas around public transportation stations, especially medium and high capacity systems.
4. Charge street parking fees tailored to market conditions, in order to ensure compliance with performance standards such as occupancy rates.
5. Consider creating areas with benefits associated with parking facilities, whose revenues can be reinvested in the city.
6. Introduce parking supply technology, in order to offer consumers and administrators greater operating flexibility.
7. Repurpose parking areas for users more in the interest of society, including sidewalks, cycle paths, bus lanes and recreation facilities.
8. Design parking areas that are seamlessly integrated with buildings and urban surroundings, in order to avoid dead zones or blocking pedestrian walkways.
9. Include parking policies in public transportation planning for metropolitan regions.
10. Introduce innovative parking management practices through government initiatives boosting urban vitality, together with demand management, air pollution control, climate changes and financing.

4.6 Reorganize metropolitan dynamics

When considering urban development in the city of São Paulo, it is vital to reach out to the municipalities that constitute its metropolitan region, as their urban, economic, environmental and social dynamics are all closely integrated.

Recently, the Metropolis Statute (Law n. 13,089, promulgated on January 12, 2015) laid down the planning, administration and implementation guidelines for public functions of common interest in metropolitan regions. Under this Statute, the PDE-SP and the master plans for the other 38 municipalities in the São Paulo metropolitan region must consolidatetheir proposals into an Integrated Urban Development Plan for this region, to be approved by a state law.

Although approved before the Metropolis Statute, the PDE-SP is fully compliant as it takes metropolitan dynamics into consideration through one of its strategies, defining guidelines for land use and occupancy in the Metropolitan Structuring Macro-Area. However, these guidelines are valid only for the São Paulo municipality.

Based on 2010 data, the massive number (1.9 million) of daily commuters in the São Paulo Metropolitan Region (Emplasa, 2014) underscores mobility as a function of metropolitan interest.

As noted by the Instituto de Pesquisa Econômica Aplicada (Ipea, 2014), metropolitan flows and commutes led to the establishment of the São Paulo MR, which may well explain the existence of sector-specific public transportation entities linked to the São Paulo state government that operate in the metropolitan area. The Metropolitan Transportation Secretariat (STM), which implements transportation policies for the São Paulo MR, supports the integration of several public transportation systems: the Companhia do Metropolitano de São Paulo (Metro), intermunicipal transportation through the Empresa Metropolitana de Transportes Urbanos de São Paulo (EMTU) and trains through the Companhia Paulista de Trens Metropolitanos (CPTM).

The institutional framework of the São Paulo MR also includes a Metropolitan Planning Agency (Empresa Paulista de Planejamento Metropolitano – Emplasa) that organizes, plans and implements decisions taken by the São Paulo MR Development Council, whose seats are held by representatives of the 39 metropolitan municipalities and the state government.

However, as noted by Ribeiro et al. (2015), the challenge to be surmounted for effective metropolitan governability is to align functional metropolitan areas with the metropolitan territory endowed with political representation. The Integrated Development Plan addressed in the Metropolis Statute could well serve as a catalyst for social and political movements pursuing common metropolitan objectives, leading to the transformation of functional metropolitan areas into political territories.

Ensuring metropolitan governability through a plan and political representation for the municipalities encompassed by the São Paulo MR supports and makes possible the implementation of the actions envisioned by the PDE-SP. In turn, São Paulo's experience could help orient and inspire the master plans for other metropolitan municipalities, aligned with the Integrated Urban Development Plan stipulated by the Metropolis Statute.

In fact, the functional area extends beyond the São Paulo MR, as this region is part of what is known as the macro-metropolis, gathering together a cluster of urban hubs that are interlinked through a network of economic and social relationships whose center is the city of São Paulo. This network encompasses the São Paulo, Campinas, Baixada Santista, Vale do Paraíba and Litoral Norte Metropolitan Regions as well as non-metropolitan conurbations (Jundiaí and Piracicaba) and the Bragantina and São Roque micro-regions. These 173 municipalities were home to 73.9% of the total State population in 2010, accounting for 82.5% of the State gross domestic product (GDP) and 27.3% of the Brazilian GDP, encompassing some 50% of urbanized areas in São Paulo state (Emplasa, 2015).

The definition of a metropolitan structuring macro-area is a positive step that encourages *compact* urban development, rationalizing trips by people and goods between the city of São Paulo and other metropolitan municipalities, enhancing the quality of life for local populations and underpinning economic gains for a broad range of production sectors. In addition to fine-tuning the relationship between housing supplies and jobs, this also contributes to production arrangements that potentially benefit from economies of location.

Repurposing underused industrial plots of land in riverbank and railroad border sectors in order to enhance urban areas buttresses sustainable mobility as they are located in urban areas that have already been firmly consolidated. However, attention must be given to ensuring adequate supplies of public transportation system infrastructure in riverbank regions (Tietê and Pinheiros) where higher occupancy densities are planned.

Encouraging people to live in the downtown district and fostering job generation in the development backbone sector are steps intended to foster *compact and mixed use* development, offering better access to urban opportunities and reducing commutes. With regard to the development backbone sector, it is important to stress that job generation incentives for demarcated areas around bus terminals are linked to better public transportation conditions, which is an essential step for ensuring a context that is *less dependent on private automobiles*.

Urban intervention projects and the many different urban restructuring and arrangement tools available for their implementation (joint urban operations, urban intervention areas, local structuring areas, urban planning concessions and integrated

urban planning re-organization) are vital steps for firming up the development of the metropolitan structuring macro-area. These tools must ensure adequate access to urban opportunities, particularly for lower-income segments of the population.

4.7 Foster the economic development of the city

Encouragement for structuring the linear and core hubs network may well contribute to evenly-balanced development throughout the city of São Paulo *(blend* of activities and residential uses), boosting the dynamics of its economy by offering advantages to production sectors through economies of location. This step fosters *compact* urban development linked to downtown areas and the *public transportation* network, with better access to urban opportunities while minimizing long commutes.

Establishing subsidiary hubs associated with a broad variety of economic activities (economic development incentive perimeters, strategic economic development hubs, science and technology parks and industrial and economic development zones) facilitates the emergence of lifestyles scaled to neighborhoods, resulting in short trips that encourage the use of *active transportation*, thus becoming *less dependent on private automobiles.*

5 CLOSING REMARKS

In historical terms, the development of the city of São Paulo was characterized by steadily expanding urban sprawl, with the peripheralization of its population, from the second half of the 20th Century onwards. This development pattern is now changing, with the downtown population on the rise, along with job opportunities opening up in municipalities surrounding the São Paulo metropolitan region. However, its aftereffects are still apparent through patchy housing supplies and urban opportunities that still skew mobility patterns (division between means of transportation, trip times and distances), adversely affecting the quality of life for people living in these communities.

The outcome of an innovative participatory planning process within the context of Brazil's state capitals, the Strategic Master Plan for the city of São Paulo defines a set of urban development strategies within a sixteen-year timeframe beginning in 2014. This paper analyzes these strategies from the standpoint of Transit-Oriented Development (TOD), an urban development model fostering sustainable mobility by integrating urban planning (land use and occupancy) with transportation planning, striving to establish a city that is more evenly balanced in terms of access to urban opportunities.

In order to assess the strategies, the eight principles defined in the TOD Standard (ITDP, 2014) were used: *walk, cycle, connect, transit, mix, densify, compact* and *shift,* all discouraging individual motorized trips.

The analysis shows that some of the PDE-SP strategies are directly correlated to the principles underpinning the TOD concept, striving to rationalize urban development by guiding growth in infrastructure areas, especially public transportation. Using current and planned public transportation corridors to defining the Urban Transformation Structuring Corridors, synthesizes this urban development model in terms of territorial planning.

The following correlations are particularly noteworthy among these strategies:

1. *Spread urban production gains throughout society*: the definition of Floor Area Ratio 1 for the entire city, in order to bring in private funding through fee-paying concession awards in order to underwrite urban upgrades may well ensure the feasibility of improving conditions for pedestrians and cyclists, while aligning urban infrastructure with denser occupancy levels for buildings and populations. The urban transformation structuring corridors, with proximity encouraging public transportation system use. Further, firmer emphasis on the deployment of guaranteeing the social function of urban property (Peuc and Time-Scaled IPTU) – already addressed in the City Statute – in downtown districts and along public transportation arteries boosts occupancy densities while fostering compact development in these areas. If linked to housing policies, these tools may also ensure good urban spatial locations for low-income segments of the population, while also fostering income level diversity;
2. *Ensure the right to decent housing for people in need*: expanding areas earmarked as Special Social Interest Zones (Zeis), establishing the solidarity quota and implementing it in structured parts of the city with pre-existing infrastructure, such as downtown districts and along public transportation arteries, may help consolidate mixed land use in areas where business, trade and services prevail, encouraging the use of public transportation through easier (closer) access. Allocating 30% of Fundurb financing to government housing projects is an important step for the implementation of this strategy. Moreover, this constitutes a major counterweight to the long-established peripheralization of lower-income segments of the population within the municipal development context;
3. *Boost urban mobility*: expanding the public transportation network and allocating 30% of Fundurb financing to investments in sustainable transportation infrastructure (public and non-motorized) could encourage

the use of public transportation, as well as cycling and walking, through easier (closer) access and better use of urban space;

4. *Enhance urban life in neighborhoods*: overlapping urban activities within a single district (mixed use) encourages cycling and walking, while also paving the way for lifestyles that are less dependent on individual motorized vehicles (cars and motorcycles);

5. *Steer urban growth towards neighborhoods close to public transportation*: the definition of urban transformation structuring corridors that link territorial planning to current and planned public transportation corridors throughout the city synthesizes the TOD concept. Introducing a maximum Floor Area Ratio (FAR) higher than permitted levels for the rest of the city, together with the maximum units x lot quota, fosters denser occupancy with mixed land use and compact development along these main corridors. It is vital to set aside public areas that usher in neighborhood-scaled lifestyles that encourage people to walk and cycle, while also strengthening the role played by public areas as social interaction venues. The plan moves ahead here through a parking policy that eliminates the minimum parking requirement;

6. *Reorganize metropolitan dynamics*: the steps associated with this strategy may foster compact development within the São Paulo MR, offering fairer access to urban opportunities and minimizing the need for lengthy commutes. Although encompassing only the municipal area, the strategy is closely aligned with the Metropolis Statute, which stipulates that the master plans for municipalities within the São Paulo MR must ensure that their proposals are closely aligned;

7. *Foster the economic development of the city*: this strategy supports compact development in downtown areas and the public transportation network. Establishing subsidiary hubs linked to different types of economic activities encourages lifestyles scaled to neighborhoods, requiring only short trips that encourage active transportation, with less dependence on private automobiles.

Although the PDE-SP presents proposals that are conceptually appropriate for fostering Transit-Oriented Development (TOD) in São Paulo, the implementation of its strategies and steps is a challenge for the municipal government, breaking away from an urban development pattern that has emerged over the past few decades. Consequently, the following recommendations are suggested for the effective implementation of the strategy is analyzed in this paper:

1. *Extend public discussions and heighten awareness among the population of the benefits associated with these strategies*: in order to ensure that these strategies and steps are long-lasting, with the PDE-SP viewed not as a government project, but rather as a plan for the entire city, wide-ranging public discussions and awareness-heightening actions spotlighting their potential positive impacts must be encouraged. Publishing an illustrated leaflet on the strategies and steps encompassed by the plan was a smart way of encouraging public discussions. However, in order to ensure that the people of São Paulo have a better understanding of these topics and are able to recognize the benefits for the city, supplementary steps are required, timed to coincide with political and election schedules.

2. *Consolidate the participatory planning process for the development of other urban planning tools in this municipality*: although the participatory planning process for the PDE-SP was innovative within the context of large Brazilian cities, it nevertheless still requires further consolidation in terms of preparing other urban policy tools in São Paulo (including the Zoning Law, Works and Buildings Code, Regional Council District Plans and Neighborhood Plans), in order to legitimize and encourage public support for its proposals. The changes in the law n. 272/2015 (Zoning Law) through amendments proposed by representatives of the municipal legislative power, including subjects related to some of the main achievements of São Paulo's Strategic Masterplan (i.e. parking limits and housing units minimums along transport corridors) weakens the participatory process and creates uncertainties regarding the achievements related to the promotion of sustainable mobility;

3. *Encourage private sector participation in support of TOD*: the role played by the private sector in the development of the city of São Paulo is very significant, and its participation as an active agent in proposing TOD projects must be encouraged. Consequently, the municipal authorities must engage in dialogues with the sector in order to outline strategies, encourage the presentation of proposals, setting up partnerships, reaching agreement on assigning high priority to public assets and providing attractive conditions for the mobilization of private funding;

4. *Consolidate governance, technical skills and institutional leadership for the adoption of TOD principles***:** the PDE-SP construction process undertaken by the SMDU-SP has clearly demonstrated that, to ensure strategies and guidelines that are closely aligned with the TOD model, institutional leadership and governance is required, in addition to the technical skills needed to draw up proposals and discuss them, and effectively convey

and adjust them through participatory processes. In order to extend TOD principles to future urban projects and the activities of other sector-specific and inter-sector bureaus, it is imperative to fine-tune and replicate that these key elements in the planning process;

5. *Effective integration among urban development and sanitation policie***s:** the consolidation of the urban transformation structural corridors, with densification along transport corridors, synthesizes the Transit-Oriented Development concept and could contribute significantly to the promotion of sustainable mobility in the city of São Paulo. However, the implementation of these structural corridors must include the necessary sanitation infrastructure capacity to avoid negative environmental and social impacts. Chapter IV, Title III, of PDE-SP indicates the need for the preparation of a Municipal Sanitation Plan and its consideration in the city's urban development process. The city government needs to ensure the effective integration of urban development and sanitation policies through the monitoring, synergy and information exchange with public water utility company (Sabesp).

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ANNEX A

TABLE A.1
Strategy, steps and targets – Strategic Master Plan for the city of São Paulo

	Strategies	Steps	Description of steps	Targets	PDE
1	Spread urban production gains throughout society	Floor Area Ratio = 1 throughout the city	The benefits created by revenues brought in through constructing more than 1x the lot area should go to the population of São Paulo and must revert to the community through investments in citywide urban upgrades such as public facilities, squares, transportation, drainage and housing.	• Cut back on vacant land not fulfilling social functions. • Take back abandoned properties and reallocate them to social purposes. • Implement the solidarity quota. • Deploy fee-paying concession awards at market value, restated annually.	• Title ii. Chapter ii. Article 27 – 88. • Title ii. Chapter iii. Article 90 – 173.
		Construction calculation by market value	Updating calculations of financial compensation for building above the basic limit established for the entire city, based on figures closest to land market prices, through establishing the Land Value Registry for Fee-Paying Concession Awards.		
		Tools – social function of property ownership	Reduce the number of unused properties failing to fulfill their social functions by deploying tools such as Compulsory Subdivision, Construction and Use (Peuc) and Time-Scaled Urban Land and Building Tax (IPTU).		
		Strategic areas for the deployment of the social function of property ownership	Definition of strategic areas for the deployment of tools fostering the social functions of property ownership: downtown, Special Social Interest Zones (Zeis) 2, 3 and 5, areas along public transportation arteries, Joint Urban Operations (OUC), consolidated urban areas and large tracts of land in areas rated as vulnerable.		

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	Strategies	Steps	Description of steps	Targets	PDE
2	Ensure the right to decent housing for people in need	Special Social Interest Zones (Zeis).	Doubling Zeis areas earmarked for the construction of social interest housing (government housing projects), including in well-located regions in central districts and along public transportation arteries.	• Implement the housing policy. • Reduce the housing shortage. • Assign high priority to population segments earning up to 3 minimum wages. • Undertake land ownership legalization in squatter settlements. • Ensure permanent sources of funding. • Define the guidelines for the Municipal Housing Plan (PMH).	• Title ii. Chapter ii. Article 44 – 60. • Title iii. Chapter vii. Article 291 – 300
		Priority services – up to 3 minimum wages	Emphasis on assisting families with monthly incomes of up to 3 minimum wages (Government Housing Projects 1), which constitutes most of the housing shortage in São Paulo, in Zeis 1, 2, 3 and 4, byallocating at least 60% of the total constructed area to this income bracket.		
		Solidarity quota.	Introduction of the solidarity quota, which sets aside the equivalent of 10% of the gross floor area of new large-scale property developments for government housing projects.		
		Funding – Fundurb and urban social interest housing projects	Allocation of at least 30% resources of the Urban Development Fund (Fundurb) and 25% of the revenues brought in by Joint Urban Operations (OUCs) and Urban Intervention Areas (AIU) to purchases of well-located tracts of land and housing construction program subsidies.		
		Land ownership legalization	Expansion of land ownership legalization tools in order to ensure full access to the city for people living in illegal squatter communities and favelas.		
		Municipal housing plan	Definition of Plan guidelines, making provision for housing shortage analyzes, land supplies, costs and sources of financing, as well as housing construction and renovation programs and criteria, together with land title legalization and urbanization of squatter settlements.		
3	Boost urban mobility	Public transportation incentives	Mass public transportation system extensions and upgrades, including bus lanes, ensuring easier access to different parts of the city and shorter daily commutes.	• Assign high priority to public transportation, bicycle paths and pedestrian walkways. • Upgrade mobility conditions and integration among means of transportation. • Discourage the use of individual motorized transportation. • Shorten travel times for the population. • Draw up the Municipal Mobility and Infrastructure Plan. • Encourage car-sharing and pooling in order to reduce the number of vehicles on the road.	• Title II. Chapter II. Article 75 – 84. • Title III. Chapter V. Article 225 – 264.
		Mobility funding – Fundurb	Allocation of at least 30% of the resources held by the Urban Development Fund (Fundurb) to the implementation of public transportation options, bicycle paths and pedestrian walkways.		
		Broad sidewalks	Make provision for broad sidewalks along major public transportation corridors: at least five meters wide along bus corridors and three meters in their areas of influence.		
		Municipal urban mobility plan	Definition of guidelines and deadlines for the participatory preparation of the Plan, encompassing analyzes of current conditions, actions required to extend, upgrade and integrate transportation systems, monitoring mechanisms and incentives for actions easing environmental impacts.		
		New mobility systems	Acknowledgement of new mobility system components, such as logistics and freight, waterborne transportation options, and car-sharing, in order to structure a well-articulated and efficient commuting matrix.		

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	Strategies	Steps	Description of steps	Targets	PDE
4	Enhance urban life in neighborhoods	Neighborhood core preservation	Preservation of urban and environmental quality and lifestyle dynamics within neighborhoods through height constraints, limits on the number of floors and denser construction occupancy.	• Encourage active street-fronts. • Expand social and urban facilities networks: education, healthcare, sports, culture, social welfare and food safety. • Draw up the regional council district plans and neighborhood plans through participatory approaches. • Increase the number of parks in the city: 167 parks proposed. • Eliminate minimum parking requirements.	• Title II. Chapter II. Article 85 – 88.
		Mixed land use	Encouragement for mixed use buildings (shops, services and facilities) to shorten distances between jobs and homes, while enhancing urban life in public areas, especially sidewalks.		
		Regional council district plans	Preparation of plans for each Council District, drawn up jointly with society in order to interconnect sector-specific policies at the neighborhood level, such as housing, urban mobility, environment, health, education and culture, through urban intervention projects.		
		Neighborhood plans	Upgrading public services and areas through local projects drawn up on participatory bases, streamlining flows of pedestrians and cyclists while also installing urban facilities, facilities and street lighting, in addition to planting trees and boosting the local economy.		
		Social facilities network	Interconnecting the expansion of networks of existing facilities and equipment providing culture, healthcare, education, sports, recreation and social welfare services, while also looking ahead to their expansion through plans and actions discussed with society, in order to ensure even distribution of these amenities throughout the city.		
5	Steer urban growth towards neighborhoods close to public transportation;	Urban transformation structuring corridors	Demarcation of strategic areas toguide urban development along public transportation arteries (including bus lanes, metro routes and train lines), where urban planning parameters are deployed that foster their optimization and humanization.	• Foster denser residential occupancy and urban activities along public transportation routes. • Upgrade current urban hubs and encourage the appearance of new centers. • Ramp up supplies of social interest housing and urban and social facilities around public transportation routes. • Upgrade urban life with broader sidewalks and encouragement for trade and services, together with street-friendly urban and social facilities. • Discourage garage parking.	• Title II. Chapter II. Article 75 – 84. • Title III. Chapter V. Article 225 – 264.
		New backbone routes	Definition of new urban transformation structuring corridors underpinning the expansion of public transportation networks, subject to the same urban design rules as the current arteries.		
		Humanized public areas	Upgrading public areas through urban planning and tax incentives encouraging the construction of mixed use buildings, active streetfronts and areas for public use, in addition to establishing minimum sidewalk widths.		
		Ceiling on garage parking	Discouraging automobile use in projects close to major mobility corridors by imposing limits on the number of parking not rated as constructed areas.		
		Maximum units x lot quota	Housing densification along public transportation arteries by establishing the minimum number of residential units to be built in new projects, in order to optimize land use in well-located areas.		

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	Strategies	Steps	Description of steps	Targets	PDE
6	Reorganize metropolitan dynamics	Riverbank and railroad border sectors	Acknowledgement of riverbanks and railroad track borders as strategic metropolitan development zones when clustering production facilities undergoing transformations. These areas must be addressed by urban projects focused on upgrading the quality of life of the local population.	• Link up municipalities in the metropolis through corridors, strategic areas for returning to more evenly balanced dynamics. • Upgrade the quality of life with urban projects. • Indicate strategies for handling under-used areas. • Define urban planning and tax incentives for bringing jobs to economic development incentive perimeters.	• Title II. Chapter I. Article 8 – 26.
		Development corridor sector.	Encouragement for economic development through urban planning and tax incentives to generate jobs and income along major thoroughfares running through areas with ample housing and few jobs.		
		Central area sector	Consolidation of Centro as the center of the entire metropolitan area, ensuring the means needed for enhancing its dynamism and increasing the amount of housing, particularly homes designed for low-income segments of the population.		
		Urban arrangement and restructuring projects	Preparation of Urban Intervention Projects (PIU) jointly with society, in order to guide structural transformations in specific parts of the city, ensuring better land use and paving the way for environmental and urban planning upgrades.		
7	Foster the economic development of the city	Economic development incentive perimeters	Generation of jobs and income in heavily-populated districts served by major thoroughfares and public transportation options, through the deployment of urban planning and tax incentives spurring non-residential uses.	• Distribute job supplies evenly throughout the city in strategic economic development hubs. • Protect current industrial areas and open up new areas able to attract investments in production activities. • Explore the potential of creative abilities and scientific and technical expertise in creative economy hubs and science and technology parks. • Promote the infrastructure needed for sustainable development.	• Title III. Chapter I. Article 175 – 192. • Title III. Chapter III. Article 1196 – 198.
		Strategic economic development hubs	Setting up strategic economic development hubs in heavily populated but jobless areas that offer potential for introducing economic activities.		
		Linear and core hub networks	Strengthening the current network of subsidiary hubs, such as historical downtown areas, neighborhood centers, shopping areas and malls, together with linear hubs such as public transportation arteries.		
		Science and technology parks	Setting up science and technology parks in order to open up new opportunities for urban development through incentives for uses focused on knowledge production and the installation of business complexes targeting economic and technological development.		
		Industrial and economic development zones	Demarcating areas to protect places with functioning industries and predominantly industrial zones (ZPI) while encouraging modernization and the expansion of activities compatible with new municipal land and production conditions in economic development zones (ZDE).		

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	Strategies	Steps	Description of steps	Targets	PDE
8	Include the environmental agenda in the development of the city	Rural zone	Demarcation of rural zones underpinned by a new, multi-functional concept: in addition to growing food and providing water, maintaining biodiversity and rendering environmental services through conservation units, they are also recreation areas that feature eco-tourism, agro-ecology, organic farming and job generation.	• Extend green areas, with 167 proposed parks. • Conserve and rehabilitate the environment and the landscape, banning new subdivisions for urban purposes in the Urban Containment and Sustainable Use Macro-Area. • Establish the Sustainable Rural Development Hub. • Defining the guidelines for the Integrated Municipal Environmental Clean-up Plan.	• Title II. Chapter II. Article 69 – 74 • Title III. Chapter II. Article 193 – 195. • Title III. Chapter IV. Article 199 – 224. • Title III. Chapter VI. Article 265 – 290.
		167 proposed parks	Demarcation of 167 new parks, in order to expand green and open air places in the city, making it more humane and better balanced in environmental terms. These new parks will be added to the existing 105 parks, with all of them becoming special environmental protection zones (Zepam).		
		Municipal parks fund	Introduction of an unparalleled joint financing mechanism linking civil society and government authorities together in order to acquire the parks planned in the PDE, with City Hall matching citizen donations R$ 1 x R$ 1.		
		Payment for environmental services (PSA)	Introduction of a new tool for rewarding owners or holders of properties acknowledged for preserving areas rendering significant environmental services that are important for the sustainability of the city, including water production and organic farming, while also preserving biodiversity and remaining patches of Atlantic rainforest.		
		Sector-specific environmental management policies	Drawing up a policy interconnecting water supply, sewage and drainage systems with integrated solid waste management, thus ensuring universal access to basic sanitation services.		
9	Preserve urban assets and highlight cultural initiatives	Landscapes and areas of cultural interest (TICP)	Promotion of cultural, educational and environmental initiatives in areas with large numbers of spaces and activities that are important for the cultural identity and heritage of the city by establishing TICPs.	• Integrate and articulate municipal cultural assets. • Encourage grassroots participation in identifying, protecting and appreciating cultural assets. • Support the preservation of cultural assets by introducing urban planning benefits such as construction potential transfers.	• Title II. Chapter II. Article 61 – 68. • Title III. Chapter IX. Article 310 – 317.
		Special culture preservation zones (Zepec)	Demarcation of urban areas set aside for the preservation, enhancement and protection of cultural, affective and symbolic places of importance to the heritage, identity and cultural life of the city. To do so, the PDE-SP defines four types of Zepec that converse with specific situations and challenges, including a new category: Zepec-APC.		
		Urban landscapes	Enhancing the value of urban landscapes through their acknowledgement as environmental assets and essential elements of the city's identity, ensuring individual and social comfort through establishing guidelines for drawing up the landscape arrangement and protection plan.		
		Culture tools	Inclusion of tools for identifying, protecting and enhancing the value of cultural assets, such as listing and registration of heritage sites, cultural landscapes and immaterial assets, together with transfers of the right to construct.		

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	Strategies	Steps	Description of steps	Targets	PDE
10	Strengthen grassroots participation in decisions on the future of the city	Urban Development Fund (Fundurb)	Composition (50% private / 50% public) of the Fundurb Management Board, with five government representatives and five remembers representing civil society, appointed by the urban policy, housing, urban mobility and environment councils.	• Ensure ongoing, decentralized and participatory planning processes. • Disclose documents and release information to the population on the implementation of the Master Plan. • Council district plans of action updated every four years.	• Title III. Chapter VIII. Article 301 – 264. • Title IV. Chapter I – V. Article 318 – 359. • Title IV. Chapters I, II, III, IV and V. Article 318 – 393
		Municipal Urban Policy Council (CMPU)	Definition of the composition of the CPMU, which is the entity in charge of studying and proposing implementation guidelines for the Municipal Urban Development Policy, with a majority of directly-elected representatives of civil society.		
		City conference	Regulation of the municipal conference of the city of São Paulo, to be held every three years, where society can assess, discuss and propose alterations to its Urban Development Policy.		
		Management councils	Provision on setting up the Management Council (50% private / 50% public) for Joint Urban Operations (OUC), Urban Intervention Areas (AIU) and Urban Planning Concessions, in addition to regulating grassroots participation in the Zeis management councils, whose main responsibility is to approve Urban Upgrade Plans.		
		Participatory councils	Definition of the roles played by municipal participatory district councils in planning and monitoring processes for local actions, such as regional council district plans, neighborhood plans and urban intervention projects.		
		Monitoring system – PDE	Regulation of the monitoring system, with the participation of society, offering access to documents and information on the plan implementation process, thus allowing social control and fine-tuning.		

Source: Prepared by the ITDP based on SMDU-SP (2015a).

CHAPTER 8

A POSSIBLE APPROACH TO THE CONCEPT OF MOBILITY AND TWO CASE STUDIES: THE MARÉ AND THE COMPLEXO DO ALEMÃO FAVELAS

Jailson de Souza Silva[1]
Eliana Souza Silva[2]
Renato Balbim[3]
Cleandro Krause[4]

1 INTRODUCTION

Participating in this collective project, which aims to reflect on the topic of urban mobility in a systemic manner has prompted us to understand urban space as a totality in constant production, a highly complex system of objects and actions and their multiple values.

The topic of mobility is addressed here on the basis of actions and studies that we – Jailson de Souza Silva and Eliana Souza Silva – have undertaken with slum dwellers and residents of poor outlying urban areas, focused on the right to the city. In fact, our social origins, professional experiences and socio-political activities carried us through the following urban territories: the University, where we work professionally; favelas, where we come from and still serve as activists; and the South Zone,[5] where we currently live; in addition to civil service positions in government entities, etc. We thus believe that, as defined by Jailson de Souza, Jorge Barbosa and Marcus Faustini (2013), we are typical "new *cariocas*": people eager to live in and experience Rio de Janeiro as fully as possible, being endowed with full rights to access the entire set of amenities, facilities, services and territories that constitute this urban social world.

1. PhD in education sociology; associate professor at the Fluminense Federal University, founder and director at the Observatório de Favelas.
2. PhD in social work; director at the University-Communities Division, DIUC, PR-5, Rio de Janeiro Federal University (UFRJ), founder of the Redes de Desenvolvimento da Maré.
3. Tenured researcher at the Department of Regional, Urban and Environmental Studies and Policies, Institute for Applied Economic Research.
4. Tenured researcher at the Department of Regional, Urban and Environmental Studies and Policies, Institute for Applied Economic Research.
5. A wealthy area with the highest Human Development Index (HDI) ratings in Rio de Janeiro.

Two "ultra-new "cariocas" made contributions to the analyses and conclusions presented here: Ipea researchers Renato Balbim and Cleandro Krause. Balbim and Krause formed the team conducting research in the Complexo do Alemão during an urban upgrade project, especially for the implementation of the first cable car in Brazil to be used for public transportation. Their surveys with local residents on symbolic representation of mobility highlight the importance of this topic for understanding the quality of mobility in diversity and multiplicity of cities.

The key concern of everyone involved was to contribute to the present publication, particularly in view of its plurality of authors, by presenting an unusual concept of the "right of the city", one that encompasses the right to mobility. We prepared a paper in which we list (in the next section) conceptual proposals on what has been guiding our reflections on mobility and that, to a certain extent, been guiding our socio-political interventions and studies of the territories where we act.

This text is written more in the style of an essay, rather than a traditional academic paper, because – other than the topic and the foundation of everyday life underlying the analysis – we have striven for many years to write for a public extending beyond that of our peers in universities and research centers. Although the language we use is no less precise, there is more concern for fluidity and understanding among readers, with no loss of accuracy, which is the paramount value of academic papers.

In Section 3, we present a sample survey conducted in the Maré favela, exploring mobility among its residents.[6] In this item, we highlight the data, together with a synthesized analysis of their physical mobility. This allows readers to add their own independent views and analyzes of this topic. Consequently, this study provides original data on the topics selected for this book, gathering this information in the largest cluster of *favelas* in Rio de Janeiro – commonly known as the Maré – consisting of sixteen poor communities running alongside the Avenida Brazil in the Leopoldina district. The sprawling Maré complex is home to 129,700 people crammed into 41,000 homes, according to the 2010 Census (IBGE)[7], equivalent to some 9.3% of all slum dwellers in Rio de Janeiro, according to this Institute.[8]

6. See: Silva, Silva and Marinho (2014).

7. The data released by the Brazilian Institute for Geography and Statistics (IBGE) do not include the Marcílio Dias community, which is among the sixteen areas indicated.

8. According to IBGE, there were 1,393,314 people living in substandard settlements at 2,227 locations in 2010. Data obtained from: <http://biblioteca.ibge.gov.br/visualizacao/periodicos/92/cd_2010_aglomerados_subnormais.pdf>.

The Maré research project was conducted in 2014 by three Civil Society Organizations in the Public Interest (Oscips):[9] Maré Networks (Redes da Maré),[10] Favela Observatory (Observatório de Favelas)[11] and the Centre for Excellence and Innovation in the Automotive Industry (Ceiia).[12] Among other valuable information, the survey shows very limited movements for its residents throughout the city as a whole, confirming the extent to which the dynamics of public transportation functions and symbolic urban barriers have historically contributed to this low circulation level, which we underscore in our reflections on mobility.

As an empirical and methodological counterpart to the Maré sample survey, Section 4 presents a study conducted by Ipea in the Alemão slum complex, using the focus group technique in order to obtain the symbolic content and representations of the future of these communities through the eyes of their residents, together with expectations prompted by new public transportation facilities either promised and/or being implemented at the time of the survey in 2010. It is important to note that, in contrast to the Alemão slum complex, the Maré cluster has not yet benefited from any urban interventions that are as comprehensive and concentrated.

We sincerely hope that the proposals listed here will add to those made by the other authors of this book, presenting a view of the city that is comprehensive, engaged and propositional in this collective work, affirming the right of all its residents to full mobility.

2 RIGHT TO URBAN MOBILITY

The current concept of mobility is commonly used to define two types of movements: *physical mobility* consisting of citizens moving through its territories; and *social mobility,* reflected in increasing or decreasing social and economic status. Having confirmed these objective processes, their causes must be sought, together with their consequences and/or impacts, among other aspects. Although we understand and acknowledge the importance of these concepts, we believe that the concept of mobility must be expanded, as addressed in this collective work that encompasses mobility related to home and work, as well as migrations,

9. Portuguese acronym for Civil Society Organization in the Public Interest (Oscip).

10. The Maré Networks (Redes da Maré) is an institution working mainly in the sixteen low-income communities constituting the Maré slum cluster since the 1990s, with projects structured on five core aspects: territorial development, knowledge production and communication, education, art and culture, and public safety, and security.

11. The Favela Observatory (Observatório de Favelas) is an organization focused on the production of social technologies, concepts, methodologies related to urban policies that benefit slum dwellers and residents in poverty-stricken outlying areas.

12. Centre for Excellence and Innovation in the Automotive Industry (Centro para a Excelência e Inovação na Indústria Automóvel – Ceiia), a Portuguese organization focused on the construction of technological innovations in the field of physical mobility.

etc. However, this must also encompass the entire process of belonging and the production of meetings among social beings in the polis/city.

From this perspective, the city is perceived as a territory extending beyond its multiple economic, cultural, geographical and political definitions, with a plurality of encounters arising from the identity differences of subjects: the "us" and the "them". In this sense, the main indicator of the level of complexity, wealth and cosmopolitanism of this unique living space is the intensity of the plurality of the meetings and possible links among its residents, and between these residents and the institutions forming the city – what Max Sorre (1984) defined as the life of relationships.

The assumption underlying the experiences of subjects in urban territories is what H. Lefebvre called the right to the city (1991). We believe that its deployment is based on three structuring rights from which most of the others derive: freedom to differ; conviviality; and equality in human dignity.

We understand the right of freedom to differ as being the possibility of social beings living in compliance with the expressions of their own choices, individual preferences and objective belonging. This means that the state – as an institutional expression of the collective will and order – must ensure citizens the right to live as far as possible in compliance with the standpoint of *authenticity* affirmed by Rousseau (1999).

At the same time, the state must curtail individual rights under certain circumstances in order to protect collective rights. Aspects related to the scope of state, over the bodies, languages and other practices of individuals have been core aspects of social struggles at least since the French Revolution, especially in the contemporary world, where they continue to cause controversy to an even greater extent. Issues such as abortion, divorce, same-sex marriage, religious freedom, drug use, psychiatric hospitalization, parental rights and minimum wages, for example, split society and impose stresses on the state, prompting clashes, demonstrations and protests among different social groups and beings.

The right to *authenticity* requires acknowledgement of the status of citizens by institutions, as they cannot be treated as mere functional subjects or products. For the same reason, the right to freedom extends beyond the standpoint of the individual, requiring the necessary acknowledgement and legitimation of differences, ensuring that social beings are not stigmatized or discriminated against because of their ethnic, social, geographical, sexual, racial, cultural and/or economic characteristics. This specific right to the city thus requires moving away from the historical transformation of differences into hierarchical ways of reproducing inequality. In fact, we are still living in a social reality where being

black, female, disabled, homosexual, and/or living in slums or poor outlying areas imposes a broad range of constraints on the full exercise of fundamental rights in the city.

The right to conviviality is another core element in the right to the city, rooted in the third of the basic citizens' rights established by the French Revolution: fraternity, the least understood and most rarely discussed of them all, according to A. Badiou (2012). We understand conviviality as meaning the need for institutions – from families through to the state, encompassing schools, religions and political parties – to ensure that people's humanity is acknowledged, legitimized, protected and stimulated. Moving beyond the Hobbesian view that man is a wolf to man *(homo homini lupus*), conviviality requires people to be taught to respect and legitimize the choices and practices of others, even though they might not agree with them.

Extending beyond mere tolerance of differences, conviviality implies creating mechanisms of solidarity and civility that contribute to the well-being of all, similar to the solidarity of networks and on-site events, defined by Milton Santos as the place where solidarity occurs.

This conviviality, these on-site actions of solidarity, define modes and uses, generating many different values: cultural, economic, social, anthropological etc., which are symbolically appropriated. Within this context, and taking the reality of a favela as an example, public facilities and government infrastructure are integral elements of a place, and must be upheld through the acknowledgement of their public nature, and remain open to, and designated for, all citizens. This also includes the immaterial factors of regulations that address the use of these spaces and their practices by different and distinct citizens. Specifically, this entails the protection of the more vulnerable among them – especially children, the elderly and the disabled – while also encouraging brotherly and civilized treatment of possible differences in values.

This is why everyday contact with *different individuals* is vital. Consequently, the more plural a territory in economic, cultural, educational, social, ethnic and age-related terms, the more inventive, plural and democratic it can be, with tighter-knit networks of solidarity, complementarity and conviviality. In order to achieve this, institutions must take steps to strengthen human and social links without losing the necessary respect for the individual freedom of their subjects.

In terms of the right to equality it is necessary to move beyond the classic views that have long guided the sociopolitical and economic propositions. In fact, the acceptance of inequality by liberals as a natural state has been questioned, mainly from a Marxist perspective on individual control of asset ownership. Concerns

over curtailing the freedom of individuals in order to ensure that they do not exploit workers, for example, have become more important than ensuring the well-being and potential inventive powers for all.[13] This situation has resulted in the construction of totalitarian regimes dominated by state mechanisms designed to shape, repress and harm human individuality.

The failure of socialist experiments does not mean accepting the oppression and exploitation that characterize inequality as a natural element of the capitalist order. Addressing this dilemma in an innovative manner means acknowledging that the assumption of the equality in today's world may not be upheld simply by economic logic, but should rather be based on ethics: society must strive to ensure a basic level of equality for all citizens, underpinned by the principle of human dignity and materialized through guaranteeing fundamental individual rights. Naturally, this level of dignity and rights is historical, constantly reshaped by social, economic and cultural development processes.

Two examples of this proposition are presented here, one negative and the other positive. First, on the positive side, through actions undertaken by federal, state and municipal governments in Brazil, the state has invested around R$ 1 billion in upgrading the Alemão slum complex, which is the second largest cluster of favelas in Rio de Janeiro. This process included the construction of a cable car that was not among the requests of local residents, costing around R$ 300 million. On the other hand, only 30% of this complex has basic sanitation, which is a long-standing demand among its residents. The funding spent on the cable car could have solved many, if not all, of the local sanitation problems. If the intention of the state entities was to ensure the dignity of these residents, their demands should have been heard and the core purpose of the intervention would have responded to these needs.

Another example illustrating the right to equality through human dignity is apparent in the *Bolsa Familia* cash transfer program through family allowances. This income transfer policy set up by the Federal Government is intended to ensure a minimum income for the poorest families in Brazil, currently assisting some 20% of the Brazilian population. However, a significant segment of local public opinion, particularly among the wealthiest sectors, has adopted a discourse that is deeply critical of this program, claiming that it turns its beneficiaries into "layabouts" and "parasites". In this case, the responsibility of the state for ensuring minimum conditions needed for the survival of needy citizens is not appreciated or even acknowledged. These examples demonstrate how the battle

13. This refers to the the ability of individuals to use their entire potential in order to experience their rights and possibilities to the fullest extent.

for the acknowledgement of the universal right to human dignity is still being fought in Brazil at the level of the state as well as within society.

The right to urban mobility – which is the cornerstone topic of this chapter – is a material expression of the three structuring rights described above. Under the proposition that we present, mobility is assured through a set of access options to many different types of facilities, amenities and experiences throughout the city. Physical mobility, meaning the dynamic of everyday movements of subjects through the city by means of transportation, is certainly an important structural condition, although merely preliminary, to ensure the right to full mobility for everyone in the city. Curtailing this mobility may foster the replication of inequality, with urban space relegated to the status of a commodity.

In this case, there is clear acknowledgement of urban territory with the status of a commodity to be exploited by capital, rather than as a living space replete with experiences, personal predilections and subjective preferences. There are two assumptions, the first, hegemonic, is that the city should exist in order to reproduce capital, with urban territories organized in ways that rank them by an economic logic; in complete contrast, the other assumption acknowledges the *polis* as a material expression of the lives of its residents. Past experiences, the history and memory of settlements, individual links to places and the ways in which they expressed the signification of this belonging are affirmed and defended by advocates urging the assumption of the right of the city as the foundation of urban social life.

Considered as a commodity, the city will gradually become a place of social and economic barriers where pluralities of experiences, social, cultural, economic and educational conditions are suppressed, clustering into territories that are home to the "same," offering little contact with "others," generally limited to the tightly tiered framework of the world of work.

However, there is another way in which the city can be considered and experienced, based on the assumption of acknowledging that all citizens must be ensured the full right to explore and experience its entire area, public facilities and amenities, building up use values instead of simply exchange values. We call this the right to symbolic mobility – and it is not a trivial matter.

The fact that cultural centers, malls, art galleries, universities or poor neighborhoods such as the favelas, for example, are public areas in all their diversity does not imply a widespread feeling that everyone can go there freely. This is due not only to subjective constraints mentioned by the subjects, but also objective and/or symbolic devices that offer access to certain social areas only for people complying with certain entry requirements.

There is an entire set of experiences in Rio de Janeiro demonstrating constraints and controls on space, particularly malls and certain neighborhoods. Two occurrences highlighted these restrictions. The first took place during the early years of this century, led by militants belonging to the Homeless Workers Movement (MTST) in Rio de Janeiro: eager to headline their struggle to obtain land in the still largely rural West Zone, under the leadership of an activist known as Erick, dozens of women and children belonging to this movement swarmed through a mall in the chic South Zone. The presence of these shabbily-clad people, clearly poor and with a social and ethnic profile typical of dwellers in poor settlements, prompted widespread discomfort, with stores closing and security guards moving into action while the police were called. When asked what they were doing there, the people said simply that they had gone to the mall to just wander around, as this was a public area – or maybe not? By the time they had eaten their (cheap) mortadella sandwiches (brought from home) in the food court, these "demonstrators" had hit the headlines throughout Brazil.

A not-dissimilar experience has been occurring, mainly in Rio de Janeiro and São Paulo, since 2013 onwards, known as *rolezinho* flash mobs: hundreds of youngsters (mostly from poor outlying areas) converge where they are often seen as threats, subject to a wide variety of constraints and embarrassments.

Similar problems have also been identified among students entering public universities under racial quota policies. Surveys have shown that there are no effective differences in performance between quota students and others at graduation. Clearly prejudiced allegations that they will lower the level of excellence of public universities still echo loudly through their halls, even among researchers who use scientific approaches to legitimize their positions in academic and social circles. In this case, objective data and fact-based judgments are completely ignored.

From this standpoint, two other assumptions related to the arrangement of urban space/time also curtail full right to mobility. One arises from the utilitarian and productivistic view directing the distribution of public transportation in Rio de Janeiro. Because of this view, regulatory agencies allow private operators – of modes such as ferryboats, buses and the subway – to cease rendering their services after specific times of night. This has broad-ranging adverse effects on the right to recreation and culture for example, especially among young people living in outlying areas. The assumption is that public means of transportation are provided for workers, mainly those employed during the day, rather than for citizens in a wider sense.

Over the past few decades, especially since the military dictatorship, the Brazilian state has assigned high priority to individual transportation, or public transportation routes that mainly traverse more prosperous neighborhoods. This is undoubtedly another factor that has deepened segregation and curtailed the right to the city for many segments of its population. Examples include the lack of a rail transportation option on the Rio-Niterói Bridge (1974); the construction of the Yellow Line Expressway (1997) for individual road transportation, rather than a subway, which was a project viewed as mandatory by the government for the XV Pan-American Games (2007); the decision to build a subway line out to the Barra da Tijuca district, home to around 300,000 largely middle-class people (inauguration scheduled for 2016) instead of turning the train network in the Baixada Fluminense into a subway system serving around 3.7 million people living in these outlying municipalities that are among the poorest areas in the Rio de Janeiro metropolitan region.[14]

These examples show that physical mobility policies in Rio de Janeiro, as well as other major Brazilian towns and cities, will become more democratized only when these policies acknowledge the importance of symbolic mobility for all throughout in the city. Once this is established, public transportation will no longer be just ways of moving from specific locations – the "same" – to other equally specific places, but will rather become tools fostering cultural encounters throughout the city, between the "us" and the "them", the "others", the "different".

To complete this section, we believe that the issue of mobility, in its full scope, is for projecting the construction of a more humane, fraternal and fair city. However, in order to achieve this, steadily increasing public transportation facilities – the path urged by all those pursuing a sustainable polis – will not be enough. At the same time, we must also make progress on ensuring the rights of all, particularly people living in areas that are remote in social, economic and geographical terms, to access the services, amenities, and facilities offered by the city in its entirety. To do so, we have to advance in terms of ensuring educational, cultural, economic and social mobility – and should we fail to do so, we will continue to live in a city where state and market resources are distributed in ways that replicate inequality and impose tighter constraints on the individual rights of low-income social groups.

14. See: Demographic Census, Brazilian Institute for Geography and Statistics (IBGE).

3 BASIC REMARKS ON THE MARÉ SLUM CLUSTER AND THE LOCAL SURVEY ON PHYSICAL MOBILITY

3.1 Exploring the urban rights of Maré residents

During the past few years, we have worked on several projects examining social practices and representations in Rio de Janeiro, together with their impacts on the lives of its slum dwellers.[15] What has become apparent through these studies is that there are two basic paradigms for representing these areas and their residents. We define the first as a "paradigms of absence": through socio-centric judgments,[16] low-income territories are characterized by what they do not have, their shortfalls and deficiencies.[17] From this standpoint, slums will always be dominated by stop-gaps and make-do solutions, fated to take on the characteristics of surrounding neighborhoods through the establishment of formal areas as a parameter.

In turn, favela dwellers – especially young people – are viewed as potential criminals. As a result, actions addressing their needs focus on attempts to make them productive and useful for the market, generally for work in poorly-paid jobs requiring few skills. Even when educational and cultural activities are proposed in these areas, they are intended mainly to ensure closer compliance with the rational standards of the formal job market – rather than extending the repertoire, space and time of local residents – while encouraging the acceptance of the usual ways in which the urban world is organized, including its territorial and social barriers.

Another possible way of construing the social practices found in favelas is what we define as a "paradigm of power", through which we underscore the value of inventiveness underpinning the construction of solutions that ensure basic services, facilities and amenities for living in the city, together with multi-faceted aesthetic expressions from local residents prompted by their specific urban experiences. From this perspective, the structural constraints and problems found in favelas are not ignored or unknown. Instead, this perspective attempts to construct an approach grounded more on strategies for coping with the challenges presented by these areas, within a historical context of strong "hostility" from the state and the "superior circuit of the economy" (Santos, 2004) in relation to the demands of local residents. The long-established practices of people living in the Maré slum complex are good examples of this approach. Like many other slum dwellers in Rio

15. Silva (2002; 2003); Silva and Barbosa (2005); Silva, Barbosa and Faustini (2013); Silva (2012).

16. Socio-centrism is a specific way of analyzing the social world through parameters, judgment values and ways of organizing daily life that ignore possible meanings and directions in the practices and perceptions of other social groups. This view is generally characteristic of dominant social groups in relation to slum dwellers and people living in poor urban outskirts.

17. Not by chance, the media and much of the population of Rio de Janeiro designate favelas in general as "underprivileged or needy communities", turning an adjective into a noun.

de Janeiro, over the past few decades they have managed to obtain a set of urban services, facilities and amenities that significantly enhance the quality of urban life in these communities, through political wheeling and dealing underpinned by grassroots mobilization drives – a real triumph, particularly when considering the stance generally adopted by the state and the formal market denying these rights. This steadily-improving access to urban rights can be divided into three generations:

1. The first generation of achievements dates back to the initial settlement of the community, characterized by struggles to remain on the land and obtain access to basic structural services such as water and electricity, streets and sidewalks, schools, day-care centers and health clinics. Although a necessary factor in this context, safety and security are rights that have been historically ignored by the state, leaving the way open for gangs to privatize control of public areas and hampering the right to free movement for local residents;
2. The second generation of rights sought by slum dwellers pursuing their consolidation as places to live encompassed land ownership legalization; expanded supplies of educational, healthcare and welfare services; improvements in infrastructure services; access to cultural amenities and vocational training facilities; and more orderly battles urging greater respect for human rights.
3. The third generation of struggles by local leaders and grassroots organizations is focused on the construction of integrated development processes that include the rights to full mobility and public safety for citizens; conditions ensuring access to art and artistic output; and, in brief, acknowledgement as subjects endowed with full rights in the city, all without ceasing to appreciate the value of earlier accomplishments.

This process is expressed through the ways in which local residents, together with other slum dwellers, are affirming their status to an increasing extent as political players in the city who construct repertoires, provisions, deployments and strategies that allow them to contribute to the construction of a fully democratic and humane city.

3.2 Sample survey of physical mobility in the Maré slum cluster

Within the context outlined above, the mobility survey conducted in the Maré slum complex attempts to understand how its residents assure their right to move around freely in fifteen of its sixteen communities, and in the city as a whole. This study is encompassed by the production of knowledge of this region undertaken since the 1990s by members of two organizations: the Redes da Maré and the Observatório de Favela.

Although located strategically within the city and cut through by three main thoroughfares (Avenida Brasil, the Yellow Line and Red Line Expressways), this is not enough to ensure extended physical mobility for the residents of this region, in terms of access to the city as a whole, or even other low-income communities constituting the Maré complex.

From the standpoint of upgrading the mobility conditions of slum dwellers in Rio de Janeiro, concern with this topic prompted the two organizations mentioned above to invest in an investigation of physical mobility in the Maré complex, through a partnership with the Centre for Excellence and Innovation in the Automobile Industry (Ceiia). This materialized in the form of a quantitative survey[18] that initially focused on gathering information on travel profiles in the Maré cluster and elsewhere in the city, together with the perceptions of local residents on this topic.

The findings of this survey – the first of its kind in the Maré complex – will be added to other ongoing initiatives, such as the Maré We Want Forum. Set up by sixteen residents' associations and other local organizations, since 2009 the forum has been discussing and drawing up proposals that have been included in the construction of the Maré Territorial Development Plan.

The purpose of this sample survey was to identify mainly quantitative information on the topic of urban mobility for local residents, focused on transportation options within this cluster of low-income communities and elsewhere in the city, while also exploring identification and perceptions of means of transportation. Conducted between April 5 and 18, 2014, the fieldwork encompassed fifteen of the favelas constituting the Maré cluster: Conjunto Esperança, Conjunto Pinheiros, Salsa e Merengue, Vila dos Pinheiros, Vila do João, Baixa do Sapateiro, Morro do Timbau, Conjunto Bento Ribeiro Dantas, Nova Maré, Nova Holanda, Parque Maré, Parque Rubens Vaz, Parque União, Roquete Pinto and Praia de Ramos.[19] The criteria for respondents to participate in the survey were: living in the Maré cluster and being over 16 years of age.

18. This urban mobility survey sampled in the Maré slum cluster (Amostra de Mobilidade Urbana na Maré) was scheduled for publication in April 2015, offering more detailed data and denser information on the methodology used and the dataset as a whole, together with a preliminary analysis.

19. Although encompassed by the 30th Administrative Region, the Marcílio Dias community is not a formal part of the bairro Maré cluster and shares no geographical boundaries with its other communities, which was why it was not included in this study.

MAP 1
Favelas in the Maré cluster and data sampling areas

Source: Google Maps.

The respondents in this non-probability sample study were selected through quotas, as this type of selection offers the benefit of more homogeneous groups that ensure the identification of all groups in the sample. In order to select participants through quotas, the initial step was to identify the composition of the population by known characteristics, either assumed or estimated, that would be relevant for the topic and analysis. For the sample, the following characteristics were listed: the domicile, gender and age bracket of the respondent. The population information for each low-income community researched, other than gender and age bracket, was referenced to data drawn from the 2010 Demographic Census conducted by IBGE.

For the domicile criterion, quotas were based on territories in the fifteen favelas in the Maré cluster examined by the survey, grouped into four collection areas for the purpose of presenting the findings. The definition of these data collection areas took into account their geographical locations and proximity. The proximity criterion observed the existence of main or secondary access roads channeling the convergence of commuter flows from each community and possible gaps in residential occupancy, resulting in these communities being grouped as follows

Area 1: Nova Holanda, Parque Maré, Parque Rubens Vaz and Parque União.

Area 2: Baixa do Sapateiro, Morro do Timbau, Conjunto Bento Ribeiro Dantas and Nova Maré.

Area 3: Conjunto Esperança, Conjunto Pinheiros, Salsa e Merengue, Vila do Pinheiros and Vila do João.

Area 4: Roquete Pinto and Praia de Ramos.

Four respondent age brackets were defined: 16-24 years old; 25-44 years old; 45-64 years old; 65 years old or more.

Table 1 presents the total number of residents in the Maré cluster over 16 years old, with totals by gender and age bracket, collection area and domicile.

TABLE 1
Total number of residents in the maré cluster over 16 years old, with totals by gender and age bracket, collection area and domicile

Area	General	Gender		Age bracket			
	Maré	Women	Men	16-24	25-44	45-64	+65
Maré – overall	94,035	48,303	45,732	21,613	45,103	21,571	5,748
Area 1 – total	38,528	19,724	18,804	8,849	18,732	8,545	2,402
Nova Holanda	10,964	5,682	5,282	2,665	5,125	2,469	705
Parque Maré	8,920	4,617	4,303	2,014	4,104	2,099	703
Parque União	14,713	7,503	7,210	3,280	7,623	3,086	724
Rubens Vaz	3,931	1,922	2,009	890	1,880	891	270

(Continues)

(Continued)

Area	General	Gender		Age bracket			
	Maré	Women	Men	16-24	25-44	45-64	+65
Area 2 – total	15,137	7,804	7,333	3,338	6,784	3,824	1,191
Baixa do Sapateiro	5,846	2,983	2,863	1,281	2,590	1,482	493
Conj. Bento R. Dantas	2,494	1,247	1,247	513	1,242	601	138
Morro do Timbau	4,821	2,545	2,276	942	2,077	1,319	483
Nova Maré	1,976	1,029	947	602	875	422	77
Area 3 – total	32,862	16,827	16,035	7,705	16,079	7,443	1,635
Conjunto Esperança	4,146	2,149	1,997	877	2,017	1,065	187
Conjunto Pinheiros	3,091	1,638	1,453	650	1,414	847	180
Salsa e Merengue	4,843	2,541	2,302	1,282	2,384	990	187
Vila do João	9,811	4,926	4,885	2,370	5,035	2,011	395
Vila do Pinheiros	10,971	5,573	5,398	2,526	5,229	2,530	686
Area 4 – total	7,508	3,948	3,560	1,721	3,508	1,759	520
Praia de Ramos	2,185	1,178	1,007	495	1,004	516	170
Roquete Pinto	5,323	2,770	2,553	1,226	2,504	1,243	350

Source: IBGE – Demographic Census, 2010.
Note: The grouping of the census sectors in these favelas was handled by the Redes da Maré and Observatório de Favelas organizations.

Ten field researchers conducted interviews in all the classes of each collection area, with pro rata quota distribution. Table 2 shows the distribution of the interviews in each collection area by quota for domicile, gender and age bracket.

CHART 2
Number of interviews by area and domicile, gender and age bracket

Area	Women				Men				Overall total
	16-24	25-44	45-64	+65	16-24	25-44	45-64	+65	
Area 1 – total	49	98	49	18	49	97	46	13	419
Nova Holanda	15	29	15	5	16	26	13	3	122
Parque Maré	11	21	12	6	10	21	10	3	94
Parque União	18	38	16	5	17	40	18	5	157
Rubens Vaz	5	10	6	2	6	10	5	2	46
Area 2 – total	44	88	56	21	43	85	49	15	401
Baixa do Sapateiro	17	31	22	8	17	34	18	7	154
Conj. Bento R. Dantas	7	17	9	3	7	15	9	2	69
Morro do Timbau	11	28	19	8	12	25	16	5	124
Nova Maré	9	12	6	2	7	11	6	1	54
Area 3 – total	50	95	52	14	46	96	49	10	412
Conjunto Esperança	7	12	9	2	6	15	6	2	59
Conjunto Pinheiros	4	9	7	2	4	9	5	1	41
Salsa e Merengue	8	15	7	2	8	13	6	1	60
Vila do João	14	28	15	3	14	28	15	2	119
Vila do Pinheiros	17	31	14	5	14	31	17	4	133
Area 4 – total	47	88	50	16	42	84	41	12	380
Praia de Ramos	13	26	17	6	12	24	13	4	115
Roquete Pinto	34	62	33	10	30	60	28	8	265
Maré – overall	190	369	207	69	180	362	185	50	1,612

Source: field research.

3.3 Synthesized analysis of the general findings of the urban mobility survey in the Maré cluster

Used as a reference in this survey striving to identify means of transportation in the Maré slum cluster and outside its boundaries, exploring views of how the local population moves around, the word "mobility" attempts to simplify an understanding of this study. For an across-the-board analysis of mobility in the Maré cluster, we feel it is necessary to understand the types of insertion, circulation and belonging to social, cultural and consumption networks among respondents in the Maré complex and the city. Consequently, in this study, we present basic information on the transportation conditions for residents in this region, as it interacts with other parts of the city.

The general reading of the research data leads to the inference that circulation in the city of Rio de Janeiro as a whole is an important and necessary practice for residents of the Maré cluster, finding that almost 87% of them rate this action is very important in their daily lives. The demand for transportation to other parts of the city is prompted mainly by commutes to and from work, as well as for recreation and study, all seeking access to public services viewed as better quality than those available in these communities, particularly those related to healthcare. Almost 47% of the respondents stated that they travelled outside this region on at least five days of the week.

Looking at commuting times, almost 56% of the respondents spend up to half an hour travelling to or from the places that they access most frequently, while more than 14% state that a one-way commute takes at least an hour and a half. This is an interesting aspect finding; although this region is located close to the heart of the city, some eight kilometers from the CBD in the Centro district, this proximity still does not ensure shorter commute times.

Another finding of this study is that more than 81% of the residents know how to ride bicycles, and almost 40% of residents own bicycles, noting that there are neighboring areas accessible by this means of transportation. However, there is a striking discrepancy between men and women using this means of transportation: 92.8% of the male respondents knew how to ride a bicycle, while almost 70.6% of the women did not know how to do so. The data show that women will travel around the city and ride bicycles less than men, with older men riding them less than their younger counterparts. These phenomena are not prompted by any physical constraints, as almost 93% of the respondents stated all that there were no difficulties in this field. This indicates that this limitation is rooted in the characteristics of insertion in the world of work and the unfavorable conditions of public space in these favelas, both of which have negative consequences for the movements of women and seniors.

Along the same lines, it is particularly noteworthy that women travel around far less than men in the Maré cluster, which may indicate that gender relations still restrict women to their homes to a striking extent. This may stem from the need to take care of their offspring, and engaging in social practices that tend to be limited to their neighborhoods, such as working in local stores, shopping and getting together with others at meeting places such as churches. In this chart, 28.5% of the respondents – generally female and the elderly – stated that they travelled outside the Maré cluster no more than once a week. The extent to which elderly women move around the city is far lower than the average figure for these communities.

It is important to stress that, despite the central location of the Maré slum cluster, the urban world of Rio de Janeiro is generally not easily accessible to its residents, with the data indicating objective constraints on physical mobility, especially among the elderly, who travel very little around the city with lives that tend to be limited to their home communities and neighborhoods. It is clear that the physically disabled are subject to even more severe constraints. Above all, it is well-known that current public transportation and traffic conditions do not encourage movement around the city in general, to the extent that 36.5% of the respondents found no positive factors whatsoever when scoring the means of transportation used in their daily lives. A relevant fact in the demographic structure of Rio de Janeiro and Brazil is the rapidly ageing population. The need for integrated services with actions that extend mobility and encourage healthy lifestyles requires immediate investments to ensure that the senior citizens of the future are not forced to suffer the current constraints imposed on the daily lives of the elderly, not only in the Maré cluster but in other low-income communities as well. As people less eager to ride bicycles are found in this age bracket, it is clear that upgrading the conditions for the elderly to move around more freely must be addressed through upgrading the quality of streets in general, offering means of transportation appropriate for this age bracket. In this case, from the standpoint of physical mobility, improving comfort and safety levels for cyclists could significantly alter this chart, while also ushering in healthier and more sustainable lifestyles for the steadily expanding elderly population of Rio de Janeiro.

For the purposes of this study, it is important to note that more than a quarter of the respondents stated that the region they visit most frequently outside the Maré cluster is the neighboring Ramos district (which includes Bonsucesso), while almost half make frequent visits to districts in the Leopoldina Zone, of which the Maré cluster is a part. As these areas are easy to access by bicycle, it seems clear that investments in cycle paths linking these communities to neighboring areas could well introduce significant improvements in the quality of circulation for local residents, enhancing the core status of the Maré cluster in the Leopoldina region. Until the feasibility of the solution is assured, the installation of a network

of cycle paths and the bike-rental system in place elsewhere in the city in the Maré cluster and nearby areas would be a valuable public policy. These services could be particularly useful to more than 12% of the respondents who currently cover segments of their commutes on foot by choice. It seems to us that these people would tend to ride bicycles if they were able to do so, especially if they had access to safe streets and secure bicycle racks.

Looking at local transportation conditions, an upsurge in the use of cars and motorcycles in the Maré cluster is well-known. This is also a matter that should be addressed by public policies, and particularly City Hall, through regulating the movements of these vehicles and ensuring adequate parking facilities. To an even greater extent, it would be important to introduce constraints on their use, in which case cycle paths and bicycle racks built alongside BRT (bus rapid transit) stops would be key factors for boosting bicycle use instead of driving automobiles. These urban facilities could pave the way for the progressive integration of different regions throughout the city through cycle paths integrated with other means of transportation, particularly trains, the subway, and BRT routes.

The fact that significant numbers of people are afraid to ride bicycles under hostile street conditions in the Maré cluster and nearby areas is a relevant factor, showing that potential bicycle use (including electric cycles) could increase significantly if the government introduced a bold cycle path construction policy. Although very few respondents use bicycles regularly for transportation purposes, one out of every four would be interested in using this means of transportation if the objective conditions were favorable, particularly as this option would be faster, healthier and more nimble, with lower costs.

Building bike racks in commercial areas throughout the Maré cluster – especially close to core shopping areas in each of these low-income communities – would streamline circulation flows among them, while also boosting trading activities and discouraging the use of other means of transportation that threaten pedestrian safety, particularly motorcycles and automobiles. In fact, the data indicate that the population of Area 2 regularly visits shopping areas in Areas 1 and 3. These demands must be presented to City Hall in order to guide the construction of local cycle paths.

A significant aspect is the relatively low percentage – under 45% – of respondents with free travel passes or discount for public transportation. Further investigation is required to discover the reason for this low use of public transportation subsidies. This may be due to the fact that few people travel distances that justify the use of public transportation, or low numbers of workers in registered jobs that provide travel vouchers by law; other reasons may be that they find it hard to apply for their own free passes or discounts due to complex paperwork,

which would be a barrier for residents who experience greater difficulties in visiting government offices. Nevertheless, with the levels of movement among these residents, especially to and from nearby communities and the downtown CBD, this information reinforces the perception that investments in alternative means of transportation, especially bicycles, would be an effective way of lowering expenses in the daily lives of local residents.

4 COMMENTS ON MOBILITY IN FOCUS GROUPS HELD IN THE COMPLEXO DO ALEMÃO

An iconic intervention in the Complexo do Alemão under the aegis of the Favela Urbanization Growth Acceleration Program (PAC) is related directly to everyday mobility, as well as other types of mobility in this area, particularly social mobility, with this low-income region opening up to the city and/or vice versa, with enhanced penetration for the city in general, particularly visitors, adding dynamism to specific markets and boosting expectations of new capital flows.

Through reports on the focus groups held with Complexo do Alemão dwellers between July and October 2010 with different stratification (age, gender etc), Ipea was able to draw up a type of typology for the range of ideas on mobility found among its residents.[20] This typology was based on the identification of strong and recurring elements in three sections of a common discussion guide used to steer the focus groups, addressing broader aspects of this intervention. The first section of the guide addresses the cable car; the second discusses street-widening and alley-paving activities; and the third explores PAC projects and ease of movement, in addition to possible future integration among people living in these communities.[21]

Comments and messages from the various groups and some specific residents can be categorized into at least seven ideal types. The first explores the usefulness of the cable car; the second relates infrastructure directly to tourism in this favela; and the third addresses the issue of the symbolic and physical boundaries reached by this cable car. Next, messages can be grouped together that reflect: fear or nervousness about using the cable car; remarks indicating a wide variety of changes resulting from use of this mode; comments reflecting the direct induction of changes

20. The following text is the outcome of an analysis of ample social materials acquired through a partnership between Ipea and Caixa Econômica (Federal Government savings bank) set up to prepare an assessment chart for the Growth Acceleration Program (PAC) interventions in the Alemão slum complex. This survey was conducted by the following Ipea technical staff: Carla Coelho de Andrade; Cleandro Krause; João Carlos Magalhães, Maria da Piedade Morais; Maria Martha Cassiolato; Renato Balbim (Coordinator); Roberta Vieira; Rute Imanishi and Vanessa Nadalin.

21. This section analyzes the discourse resulting from the replies of members of twelve focus groups to the following question: "What do you think about the cable car? Does it respond to the interests of people living in the Alemão Complex?", with the following question introduced during subsequent discussions: "Do you think that widening streets and paving alleyways will improve access and transportation?", and finally asking "We have heard that people are moving around more in this Complex after the Growth Acceleration Program (PAC) projects, with closer integration among people living in these communities. Do you feel that you now have more freedom to move around in this complex? What is the difference between moving around in these communities and outside them?"

through circulation infrastructure; and finally statements and messages indicating the enhanced value of the area through this transformation of the mobility system.[22]

The topic of the *usefulness* of specific transportation infrastructure – in this case, a cable car which was the first of its kind in Brazil used for public transportation – ushers in a series of doubts about its use by residents individually and their specific needs, as well as by groups of residents segmented by place of domicile, other means of transportation used, and characteristics related to age, gender and activity. Initially, it was clear that the expected usefulness of this cable car for the community as a whole depends on the location of its stations in relation to people's homes. This does not mean simply proximity, but rather it is based on the fact that these stations are located on hilltops and are thus used more by people living nearby, and to a lesser extent by those whose homes are located on hillsides and in valleys. In other words, there are frequent reports from residents who do not find it useful, as this means of transportation is intended only for hilltop dwellers, which are less densely populated than neighborhoods lower down the hills with easier access. Its expected usefulness is also greater among people commuting outside this complex by train to and from the Bonsucesso station, which is also one of the cable car terminals. This point discloses an expectation of closer links between this favela and the rest of the city, which are found in the original concept of this government program.

> "For example, there are people who ride motorbikes. I (…) ride up and down by motorbike, but I am young. So what about older people? It is more difficult for them. They will not jump onto a motorbike, only if they are younger. And the Kombi vans are very full. They have to be packed, in order to drive up, they must be full. (…). So I can think that the cable car will really be a place for the elderly, where they can sit more comfortably, and so on."
>
> "Surely, because anyone way up there will not have all the work of coming down here."
>
> "Another thing, most of the people here live in the lower part of the community, the population is denser here in the lower part of the community, and the upper part is far more sparsely populated, I don't mean very few, negligible, there is a reasonable number of people."
>
> "[They do not need the cable car] because the homes that were close to its routes were demolished in order to build it. So who is going to go up and then down?"

22. In general, based only on the number of times each of the topics appears directly in the discourses, it may be said that the order these topics are listed above reflects the level of importance of each of them, with usefulness ranking first, followed by boundaries, fear, transformations and induction, with value enhancement rated last. The issue of tourism that would be encouraged by the cableway appears in countless remarks across these topics, sometimes meaning tourism for local residents or their relatives living outside this Complex, as well as tourism in the traditional sense. However, it is felt that this aspect does not constitute a specific topic per se.

"It goes direct from the [shanty town on the] hill to the train, right? And from there it goes to lots of other places, with one thing connecting to the next."

"It's just for show – it's for you to ride on sometimes, which is nice. But it's not something that is useful, necessary."

"There are kids who will love it, right? The kids…"

There are many other comments that, in addition to questioning the usefulness of the cable car due to its route, which does not serve most of the residents in this complex, also indicate that its planning failed to consider or recognize the formal and informal transportation networks already in place. This means that the previous means of transportation are still being used instead of the cable car, and are not integrated with it.

"There's no lack of transportation around here, but maybe it lacks quality."

"The Kombi van that drives down [Nova] Brasília goes right by our door, just like here. And the cable car is far away."

"No, not for me. (...) It's better to catch a bus. The advantage here is easy transportation, you can go everywhere."

"I think that some sort of transportation on the ground, a bus, a van, a motorbike, a cab, whatever, is cheaper and would be far more feasible than a cable car."

The expectations of usefulness were sometimes subject to questions about other investment options that would offer greater benefits to local residents.

"They should have done this project without the cable car, doing something for the community. Why the cable car?"

"The cable car was built because [...] and other people from the community went there to Medellín and saw that they have solved the problem of violence there; they felt that if they were really going to analyze this aspect, the community would be truly vulnerable, because they opened up streets, they stripped the hill, so they really could do away with violence, but for them to do away with violence, they must engage in violence."

The topic of *boundaries*, particularly symbolic frontiers, which is dear to the hearts of people living in segregated areas, was also well prominent in their memories of constraints on mobility prior to this urban upgrade. Terms such as "wall" and "divided city" were mentioned. It should also be recalled that these areas, particularly the Morro do Adeus and Morro do Alemão hills, were controlled by rival gangs prior to this project and during the early days of its implementation. With regard to boundaries defined by groups holding power in parallel to the state, it must be noted that the cable car cut through the previous logic by establishing direct connections among neighboring areas that had been split among different factions for many years.

> "There was a wall that no one crossed. "O Adeus" was a wall. Nobody could cross it."
>
> "Before, it was like, for the love of God, don't go through Itararé. Go right around the world, but don't go anywhere near there, as it's dangerous."
>
> "Me too, I have some folks who live in São João de Meriti, my in-laws, and they wouldn't drive through Itararé here, even in a car. But after I told them that it was all really nice, there was like a mini-mall with some stores, then she came and we went there. She was amazed to see how nice those little stores were there […] So I took her there, and we ate a snack. Then she called her husband and son and said you have to go there with me […] Stop then we stopped on the side and I went up to show it to them. We came up here on Baiana [hill] to show them the cable car and how attractive it was. So this shows that they don't have to be so scared, and now she even drops in at home there, which she would never do before. She spent ten years without going to my home, and she even comes up here on Baiana. This is what is happening, together with the progress that is coming in with the changes."
>
> "This will get rid of that [bad] image."
>
> "It will get rid of the black flag and raise the white flag."

This innovation in transportation infrastructure also prompted *fear* or caution among the population, uncertain about its safety. Fear of riding the cable car preceded experience of its use, expressed as a first impression by residents (generally women) right at the start of several of the focus groups.

> "There are people who are scared. Before it's inaugurated, there are people who are already afraid of riding in it, of falling, or of getting stuck halfway and swinging."
>
> "Someone is just riding up the hill and suddenly a shoot-out begins. It could hit the cable and the cable falls, and everyone dies. This is what I am afraid of."
>
> "The reason I don't want to ride on the cable car, you know why? Because if they laid down the asphalt and it starts to rain, imagine me up there in that thing, with me stuck there, when it rains. Oh no. This is why I am afraid."

The following comments form a no less important set of references on direct and objective *transformations* related to other physical mobility conditions, especially street widening, paving, etc.

> "There was no way you could even walk there, there was no blacktop, it was all potholes, a real mud puddle. And if you go there now, you can walk from one end to the other, it's all surfaced […]. Where the worst parts were in there, now you see motorbikes all around, people riding bikes, driving cars, because everything is blacktopped. It's a thousand times better than the way it was."
>
> "Well, I think that what they were saying, I don't know if it's true, is that buses are going to come in there along Joaquim Queiroz [street]. This is really interesting, and it's very important. It will offer accessibility to lots of people. Work, safety, security."

Nevertheless, these construction projects are imposing some constraints on mobility:

"They are widening the streets and closing off alleyways."

"With this construction work that they did, it is higher, as they put steps in all the alleys, all the alleys have steps – but what if there is a disabled person in a wheelchair, what can they do? Will they go out (…) Down the stairs in the wheelchair […]. Only a few of them have little ramps, because the local residents spoke up and asked for them, saying that there is someone with special needs living there. To put in that ramp, they had to call in an engineer, a supervisor, foreman, all that paperwork. Can they put it in, it's not in the original design, then there are discussions here, discussions there and finally, after much hemming and hawing, they built a ramp. All the alleyways have steps. All of them. It's steps that just go on forever."

The following quotes disclose expectations that the cable car would *usher in* other changes in this complex, especially new services. There were also expectations that Peace Police Units (UPPs) would be set up, linked to the cable car somehow.

"(...) It opens up your eyes, the view of everyone. Oh man, a cable car, hey! I'm going to open a snackbar, a restaurant, because that cable car is going to be a smash hit."

"I believe […] the cable car is going to pump up tourism, people are going to want to open up little stores, all sorts of businesses. A supermarket, here we don't have supermarkets. Can you imagine one right here, really close to the complex!"

With regard to the *enhanced value* of the area, it is interesting to note that these expectations are related to the idea of attractive appearance, especially the panoramic view, as well as the idea of modernity deriving from the implementation of the cable car specifically, or the interventions of the Growth Acceleration Program (PAC) in this complex in general.

"In terms of the cable car, I see this very much as a matter of aesthetics. Looking good. I do not really see it as transportation."

"It's good, it's a little more attractive than the rest over there, with that cable car there, it looks a little nicer."

"I think it's attractive. It's adding extra value to our assets. [...] This is why we have to improve where we are and tried to live better socially."

"There's a beautiful view from up there."

5 CLOSING REMARKS

The city explored here, although not physically uniform, taking the example of favelas in Rio de Janeiro – historically segregated places surrounded by countless physical and symbolic barriers and hurdles – beyond its merely spatial configuration is a single, unique city, a city that likes itself, a polis whose main activation component is the right to mobility.

But as we have attempted to demonstrate, mobility is not approached here in the usual way, meaning the physical or social movements of classes and groups. Instead, mobility is viewed as a set of relationships in the field of everyday life, closely aligned with the underlying idea of the use of the city as a mechanism for enhancing and effectively implementing the right to the city.

For this concept of the right to mobility and the city, it is vital to move beyond symbolic issues related to social processes and aspects related to dwelling places within the city that stigmatize and discriminate against people living in favelas, within their own neighborhoods and elsewhere.

The implementation of transportation facilities and infrastructure, together with social and economic guarantees underpinning their use, is merely a single step – although vitally important – for ensuring mobility. However, as shown by the two field surveys presented above, the relevance of symbolic issues carries much weight for the effective implementation of other possible types of transportation that may prove appropriate, such as cycle paths or even a cable car.

In the specific case of the Maré slum cluster, located close to downtown Rio de Janeiro, a particularly noteworthy aspect is that women and the elderly move around far less than the average figures, showing that physical and social barriers found in Brazilian society, as its towns and cities in general, seem to rise to more daunting levels in areas burdened by segregation.

An analysis of the daily movements of residents in the Maré slum cluster shows that large numbers of trips take place within its boundaries. On the other hand, there are also strong and quite natural links between this slum cluster and the downtown CBD, albeit with poor quality transportation systems. Despite the proximity between these two urban extremes, it is interesting to note that public policies have not yet focused on non-motorized means of transportation, particularly walking and cycling.

Looking at the analyses of the content produced by focus groups conducted with residents of the Alemão slum complex, in symbolic terms, ideas are presented on opening up this complex to the rest of the city, which is a situation apparently quite different from that of the Maré cluster, probably because it is located much further away from the heart of the city.

However, there is also clear and expected appreciation of the people who live there, in addition to the enhanced value for the landscape and places of residence, pumped up by more dynamic daily life with more people in circulation, and with a long-awaited boost to the local economy. This discloses the intensification of the life of relationships as a crucial mechanism for sweeping away social barriers.

Nevertheless, an across-the-board analysis of this project leads to the following conclusions: *i*) the mobility options for the PAC interventions were not properly discussed and agreed with local communities, which might explain why their current use falls below expectations; *ii*) the integration of current mobility systems (both government-run and informal) with these new systems was not taken into consideration for the intervention project; *iii*) demands for other mobility situations could have provided more benefits (opening up or widening valley-bottom streets etc); and finally, *iv*) the possibilities of integration between the favela and the formal parts of the city (non-favela, non-informal housing) were curtailed by the possibilities of immediate access to high-capacity transportation options. An example of this was the governmental choice of connecting the cable car to a single train line going downtown instead of the subway network that could lead people to areas with even more jobs opportunities, such as Rio's South Zone (Zona Sul).

Based on the everyday movements of residents in the Maré slum cluster and the expectations and representations of people living in the Complexo do Alemão regarding their physical and symbolic mobility conditions, when analyzing planned interventions as well as facilities and amenities that have already been implemented, it seems as though investments in urban mobility in these regions have not yet responded to the concerns of the segments of society benefiting directly from these actions.

With this brief analysis, we are eager to contribute to the production of cities that are no longer divided, with residents who are no longer trapped and immobilized by physical, economic or symbolic issues. In other words, we are eager to contribute to the construction of a city with the right to full mobility.

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CHAPTER 9

TRANSBORDER MOBILITY: BETWEEN THE DIVERSE AND THE EPHEMERAL[1]

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1 INTRODUCTION

Brazil's border areas consist of strips of land 150 kilometers wide running parallel to its national boundaries (Law n. 6,634, promulgated on May 2, 1979). Rated as strategic regions, they are 15,719 kilometers long, marking the dividing lines between eleven Brazilian states and ten countries in South America, encompassing municipalities sharing and not sharing these borderlines (Brazil, 2005).

Borderline towns often consist of transborder urban agglomerations (often called twin, peer, or bi-national towns, among others), meaning towns with uninterrupted settled areas, extending from one side of the border to the other, where it is possible to observe "not only entwining of the urban characteristics of both towns; but also, there is an intermingling of the history and lives of their peoples" (Oliveira, 2010). These towns are particularly noteworthy for bringing people together through family, work, or consumption relationships, as well as social and cultural interactions, paradoxically constituting "zones of identity uncertainty" (Ferrari, 2012).

These are the gateways through which crowds of people enter (and leave) the country, due either to changes in domicile – migrants – or in daily commutes to work, study or engage in other activities linked specifically to consumption, access to services, recreation, or even perpetrating illegal acts, such as drug trafficking, smuggling, or fleeing to/from Brazil. The latter two are the most strongly

1.The basis of this paper is a research report titled *Estudos sobre políticas públicas para regiões de fronteira e metodologia de estudo de regiões de fronteira* (*Public policy studies of border regions and study methodology for border regions*) and it presents studies on public policies and study methodology for border regions (Report 1). This report was prepared by the authors as part of the Mercosur and Border Regions Project, Networked Research Platform, Institute for Applied Economic Research (Ipea), November 2013.

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associated with transborder status, overshadowing the daily lives of law-abiding Brazilians and migrants.

These daily transnational commuters[4] are the people addressed by this analysis, which focuses on transborder mobility and is grounded on information related to international migration and travel to/from Brazil and abroad in order to work and/or study in towns other than their places of domicile.[5]

2 BORDERS AND MOBILITY

Borders establish relationships among nation states, separated by physical or abstract boundaries, together with the everyday connections built up through daily experiences arising from the expansion of settlements and the dynamics of their economies. Whether real or theoretical, these historically institutionalized lines fade away under the interactions that underpin the actual shaping of these areas.

Although frequently fenced off by a wide variety of immigration and emigration control, borders and boundaries reflect and foster inter-relational dynamics and inter-dependencies that extend beyond formality, in actions that can overstep barriers to the existence of these dynamics and dependencies, in ways that may be legal or not. For Machado (1998, p. 1), while "the juridical boundary of the territory is an abstraction, generated and sustained through institutional actions intended to ensure effective control of the territorial State, thus constituting a tool of separation between sovereign political units; the border is a place of communications and exchanges." Boundaries and border controls are triggered by sets of circumstances, like a switch that allows or forbids (Raffestin, 1986).

Consequently, borders mean separation, demarcation and even obstacles; they rarely indicate encounters, meetings, mutual enrichment and friendship (Rochefort, 2002). Their importance as a subject for study is due not only to economic or political bias, but from another standpoint: "that of constituting a region for privileged interactions that does not acknowledge relationships among its peoples" (Ferrari, 2012).

Instead of obstacles, borders should rather be zones of contact, places of competition and complementary qualities, areas for administering interactive situations. According to Oliveira (2009, p. 4), "border status imposes mobility on people in any social class at different levels of intensity, legitimizing the mechanisms of complementarity." Thus, border areas may serve as drivers for development,

4. Translator's note: in this paper, "commuters" refers to travel for work or study.

5. Information provided by the Brazilian Institute for Geography and Statistics (IBGE, 2010), among other data and references.

transition zones, places of contact and networking, "with special liveliness and their own dynamism."

The Eclac Report (2012) states that networks built up between origins and destinations through historical and cultural links among peoples of different origins are a striking and persistent trait among the more mobile borders of Latin America. But the report also notes that, as a result, they are also places where interactions may be limited, due to a wide variety of factors that trigger and replicate disputes. They are consequently areas where specific problems and vulnerabilities are observed:

> But beyond the distinguishing characteristic of having been born on one side or the other of a national boundary, border areas pre-date the establishment of national States and the latest demarcation of their political territories. They are also shaped by the stable cement of family networks on each side of the border, resulting from steady streams of two-way traffic over the years (Eclac, 2012, p. 91).

Twin cities bridging national borders that are engaged in supplementary urban functions and economic activities may give rise to bi- or even tri-national structures, with interconnected production activities and territorial transformations (Ciccolella, 1997; Oliveira et al., 1999; Chiarella, 2012). However, even in areas settled as a single unit, border tensions may still prevail, many of them extending back into history, in addition to – even more importantly – asymmetry between the sides, with significant inequality. This underscores the vital role played by the State in the formulation and implementation of integration policies that take into account the specific characteristics of the mobility of the economies and populations in these areas, with these policies viewing "spatial displacement as part of the social mobility and survival strategies of the population" (Martine, 2005, p. 3).

A reflection of inequalities among countries as well as economic and social shifts among them, international migrants run up against barriers at borders, which are nevertheless open to flows of capitals and goods. Even considering the advantages and benefits of migration, labor market needs are circumstantial, and immigrants are always viewed as "temporary" (Sayad, 1998).

Failure to update migration policies and a lack of clarity in State actions results in large numbers of illegal migrants with no documentation. This also allows international mobility to be a conduit for trafficking in human beings, intimidation and persecution, particularly when those involved are refugees, displaced persons, or other categories of the excluded due to economic or political reasons, natural catastrophes or war, all of which are found in strips of land along Brazil's borders. Ineffective government actions and failure to view migratory movements as a social issue, subject these people in movement to others who frequently strip them of their human rights, turning them into stateless people.

While international treaties urge integration policies that are still far from becoming a reality (Diniz, 2014), interaction enables an everyday experience and links border peoples, without ensuring economic or cultural convergence among them. These interactions are fueled by differences between countries, and may be viewed as cyclical, increasing as differences become more marked.

Examining this ongoing cross-border interaction, Alegria (2009) wondered whether these daily experiences built up among peoples, cultures and religions in their everyday routines, made even more complex by their intensive mobility, are creating a new culture, a possibility of transborder citizenship, or whether they are simply blurring differences and bridging gaps, forming a vivid mosaic overlaid by a separate layer that is not the outcome of interaction, and far less integration, but rather blends aspects of the diversity found in these areas, as a result of the relationships established through the quest for alternative ways of surmounting stumbling-blocks that hamper daily survival. Alegria (2009, p. 358) proposes that there are physical and urbanistic influences on both sides of the border, as well as values and identities. *"Interaction carries influence so that one side of the border resembles the other, with regional identities flourishing in transborder areas."* However, these influences and identities are not tied or even exclusive to a single place, but also appear in other towns and places.

Hiernaux-Nicolas (2006, p. 164) asked whether mobility, at this time of swift changes in time and space, alters the way in which identities are constructed. In his view, society is moving towards, at one extreme, the "transformation *of traditional identities into mobile identities*", and at the other, he questions if "*identities are starting to disappear due to mobility".* Taking commutes to and from work as a reference, this also shows that the imaginary link to a place of origin and a possible return that permeates studies of migrations, loses its meaning, faced by the rising penetration of communication technology use in the transnational lives of migrants. Its strengthening links with their places of origin, even over long distances, while at the same time transforming migrants into "tourists" in their places of origin, with attitudes of "nostalgia, missing what was left behind". He closes with a key question: Does this really consist of the construction of mobile identities or mobility without identity (and the quest to find it)?

In border areas, this is a question that addresses diverse identities in movement that are being reinvented as new transborder identities.

3 INTERNATIONAL MIGRANT MOVEMENTS

Brazil's 2010 Demographic Census showed that 491,645 emigrants left Brazil for destinations in 193 countries all over the world.[6] Most of these emigrants consisted of women (53.8%) with the main age bracket between 20 and 34 years old (60%). There were 268,295 immigrants registered, with returning Brazilians, accounting for 65.7% (176,200 people); 29% were foreigners and 5.4% were naturalized Brazilians.

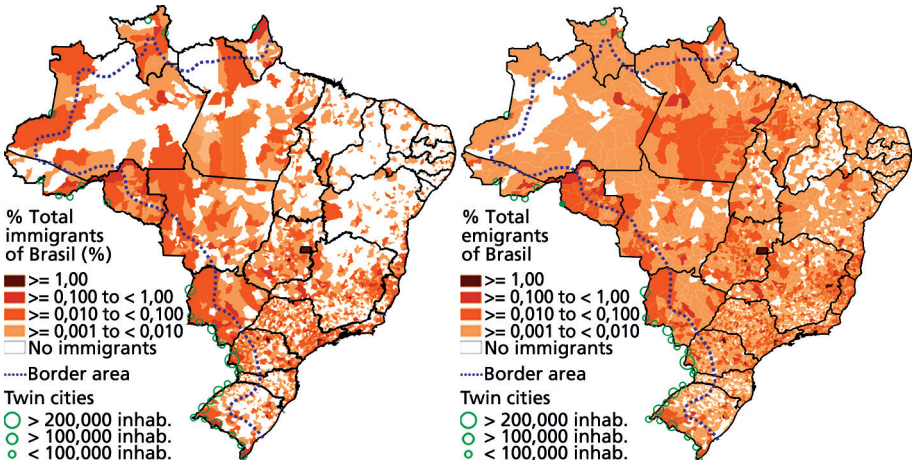
The international financial crisis and the positive performance of the Brazilian economy were major magnets attracting foreign immigrants to Brazil, whose numbers rose during the last inter-census period, also influencing the return of Brazilians living abroad. Additionally, migration from the Latin American countries also increased, continuing the process that had become more intensive in the 1990s, which Baeninger (2000) stressed was underpinned by transborder travel to metropolitan areas (particularly Bolivians and Peruvians) as well, as from countries not sharing a common border with Brazil, such as Chile.

In 2010, the distribution of international immigrants in Brazilian municipalities reached 12.5% in border areas; 21.2% for municipalities not in border areas, but in states with international borders; and 66.3% for other Brazilian municipalities. In transborder urban agglomerations, foreigners predominated (50.5%) the total number of immigrants. Among other municipalities on borderlines and strips, the distribution was close to the proportions for Brazil as a whole, with more than 60% Brazilian-born.

When mapping Brazilian municipalities by the proportion of international emigrants and immigrants in their populations in 2010 (figure 1), it was noted that: *i*) only twelve municipalities posted more than 1% of emigrants in their populations, that together these make up 29.5% or 145,000 international emigrants; other municipalities, many of them located in border areas, posted between 0.01% and 0.10% of emigrants in their populations; *ii*) for immigrants, only eleven municipalities posted more than 1%, for a total of 34.5% of total immigrants, or 92,600; Foz do Iguaçu is the only border town with this level of immigration (more than 1% of the total population), while most municipalities forming transborder urban agglomerations (or twin cities, according to Brasil, 2005) posted figures of between 0.10% and 1%.

6. International emigration data refer to the universe addressed by the 2010 Demographic Census; international immigration is based on a set date (place of residence on July 7, 2005). A more detailed analysis of this information may be found in Cardoso, Moura and Cintra (2012).

FIGURE 1
Distribution of international immigrants and emigrants in Brazilian towns – Brazil 2010



Source: IBGE (2010); Brasil (2005).
Prepared by: Ipardes.

Foz do Iguaçu is also the only municipality in a transborder urban agglomeration with more than 0.5% foreign immigrants in its population, with these immigrants accounting for 36.9% of total inflows. Other municipalities in transborder urban agglomerations with more than 0.10% foreigners in their population account internally for more than 50% of total inflows of foreign immigrants. Particularly noteworthy among them are Tabatinga (93.9% of incoming foreign immigrants), Chuí (87.5%), Sant'Ana do Livramento (71.9%), Ponta Porã (60.5%) and Manaus (70.4%).

The group of municipalities where emigration topped 0.10% was rated as extremely important because of these high migratory volumes. The main destinations for this group were analyzed and mapped, with those in South America being particularly noteworthy in this analysis. Among the total number of emigrants, 51.4% were going to countries in Europe, 26.4% to countries in North America, 8.9% to countries in Africa and 7.9% to countries in South America. The main destinations in South America are Argentina (22.2%), Bolivia (20.4%) and Paraguay (12.7%) – table 1.

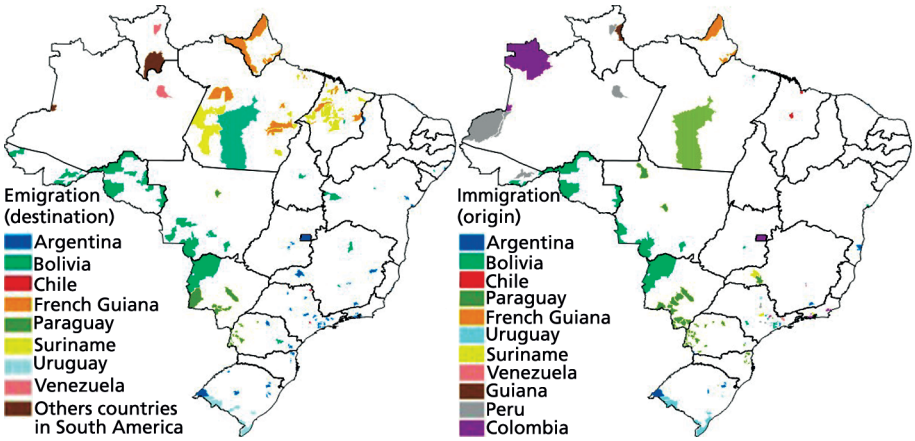
TABLE 1
Destination of emigrants and origin of immigrants for the South American countries and their shares - Brazil (2010)

Destinations	Emigrants	Total emigrants (%)	Immigrants	Total immigrants (%)
Argentina	8,631	22.19	8,084	11.93
Bolivia	7,919	20.36	15,651	23.09
Paraguay	4,926	12.67	24,610	36.31
French Guiana	3,822	9.83	1,072	1.58
Colombia			3,255	4.80
Suriname	3,416	8.78	572	0.84
Chile	2,533	6.51	2,674	3.95
Venezuela	2,297	5.91	1,892	2.79
Uruguay	1,703	4.38	4,326	6.38
Peru			4,224	6.23
Other countries in South America	3,643	9.37	1,415	2.08
South America	38,890	100	67,775	100

Source: IBGE – Demographic Census (emigrants: data for universe; immigrants: set date (place of residence on July 31, 2005).
Prepared by: Ipardes.

Emigrants to South America come from larger towns and cities, to a greater extent. Among the few border towns contributing to these figures, Foz do Iguaçu is particularly noteworthy, with significant participation also from state capitals in Northern Brazil, such as Boa Vista, Rio Branco and Macapá. In terms of proportions, in 239 municipalities more than 75% of the total number of emigrants are headed for South American countries; they account for 11.7% of the total number of emigrants travelling to countries in South America, with Boa Vista being particularly noteworthy (972 people, 82.5% travelling to countries in South America). Many are small towns in states with international borders, characterized by low-volume flows (figure 2). In states with international borders, the main destinations are neighboring countries, which suggests emigration through contacts and transfers, possibly consisting, at least partially, of foreigners returning to their homelands.

FIGURE 2
Main emigration and immigration flows to/from countries in South America – Brazil (2010)



Source: IBGE (2010).
Prepared by: Ipardes.

For immigration to Brazil, the main places of origin were Europe (29.7%) and Latin America (27.1%). Predominant among contributor countries were the United States (52,100 immigrants/19.4% of the total), Japan (41,000/15.3%) and Portugal (21,600/8.1%), in addition to Paraguay (24,600/9.2%) and Bolivia (15,600/5.8%).

Together, Paraguay and Bolivia accounted for 59.4% of flows in South America (see table 1 and figure 2); Argentina contributed 11.9%; and among the other countries, Chile – although not sharing a common border with Brazil – was particularly noteworthy at 4%. The map showing the main flows for municipalities with more than 0.10% of the total number of immigrants reproduces the behavior of emigration, with evident mobility among neighboring countries.

The 925 municipalities with immigrants from South America posted total inflows of 67,775 people, of which 36% were in municipalities where South Americans topped 75% of the total number of immigrants. Similar to international emigrants, immigrants from South America also accounted for the largest proportion of the total number of immigrants in border towns.

The figures consequently allow a different pattern to be distinguished for the profile of migrants in transborder urban agglomerations and border areas, where the presence of Latin Americans is more marked, particularly from neighboring countries. In these parts of Brazil, rather than a change in domicile, there is travel within reasonable distances of places of origin, indicating the possibility that contacts are not broken, with personal links of identity maintained through

regular exchanges. This is similar to moving to a new house in a different district but in the same town, when occurring in transborder urban agglomerations, or for properties in large rural tracts of land in border areas.

Looking beyond the figures, it must be recalled that there is an estimated contingent of some 20% of illegal migrants, many of them undocumented, who avoid census agents, fearful of reprisals (Milesi and Andrade, undated). There are also significant and rising numbers of refugees in Brazil, with Colombians particularly noteworthy among the South Americans, accounting for 14.2% of the estimated number of refugees in Brazil in 2009, according to information from the National Committee for Refugees (Conare). At the moment, there is a steadily increasing stream of Haitian refugees entering Brazil through Acre, following a tortuous route through South America in their quest for decent living conditions.

Each region offers specific characteristics that attract, retain or repel flows of migrants or commuters. For example, Amazonia State, with its many common borders is currently suffering from the effects of opening up this region to major foreign corporations eager to explore and exploit its resources, as well as steadily advancing transnational highways, among other major projects that mobilize large workforces.

Aragon (2014) distinguishes specific characteristics for flows in different parts of this region, triggered by local economic and political processes. Among the Andean nations, international migration is spurred by oil extraction activities, huge concessions awarded to multinational corporations, agribusiness and wildcat mining operations, in addition to international flows of displaced persons from Colombia, forced out of their homes by guerilla warfare and the drug trade. Among the countries to the North of Brazil, wildcat (illegal) gold-mining predominates, particularly in in French Guiana, ranked as a European territory in the Amazon region. Rodrigues (2006) emphasizes the attractiveness of Bolívar State (Venezuela), which is a major hub for heavy industry, while the economy of Roraima State (Brazil) – which shares an international border – is based on an incipient primary sector. He also underscores the presence of human trafficking along this border, as Venezuela is a gateway through which women and girls are shipped out to other centers, such as the Dominican Republic and Europe.

In Brazilian Amazonia, some immigrants originate in Paraguay and other countries sharing common borders with Brazil. Migrants from Peru tend to settle mainly in towns along the border and larger urban centers in this region, working as street peddlers and perhaps eventually opening small businesses (Aragon, 2014; Rodrigues, 2006). Bolivians settle almost exclusively in the border towns of Acre,

Rondônia and Mato Grosso States;[7] the Colombians opt for transborder urban agglomeration such as Tabatinga, Letícia (Colombia) and Santa Rosa (Peru), Manaus, and São Gabriel da Cachoeira, which is right on the border; immigrants from Venezuela and Guiana settle mainly in Roraima State; while those from Suriname and French Guiana opt for Pará and Amapá States. Migrants from Paraguay prefer municipalities in Mato Grosso and Rondônia States with large rural populations.

The same close-knit movements are found along Brazil's southern borders, with significant exchanges between Paraguay and Paraná/Mato Grosso do Sul States, as well as large numbers of Argentinians and Uruguayans in Rio Grande do Sul State (see figure 2), with the opposite also occurring.

Aragon (2014, p. 11) stresses that several indigenous groups are also encompassed by this frequent mobility, particularly when national borders cut through their tribal lands, "travelling back and forth, regardless of these borders. Others may change countries permanently, but their indigenous rights are not respected when they arrive in Brazil, where they are simply considered foreigners."

4 COMMUTER FLOWS, EVERYDAY INTERACTIONS AND TEMPORARY/ PASSENGER FLOWS

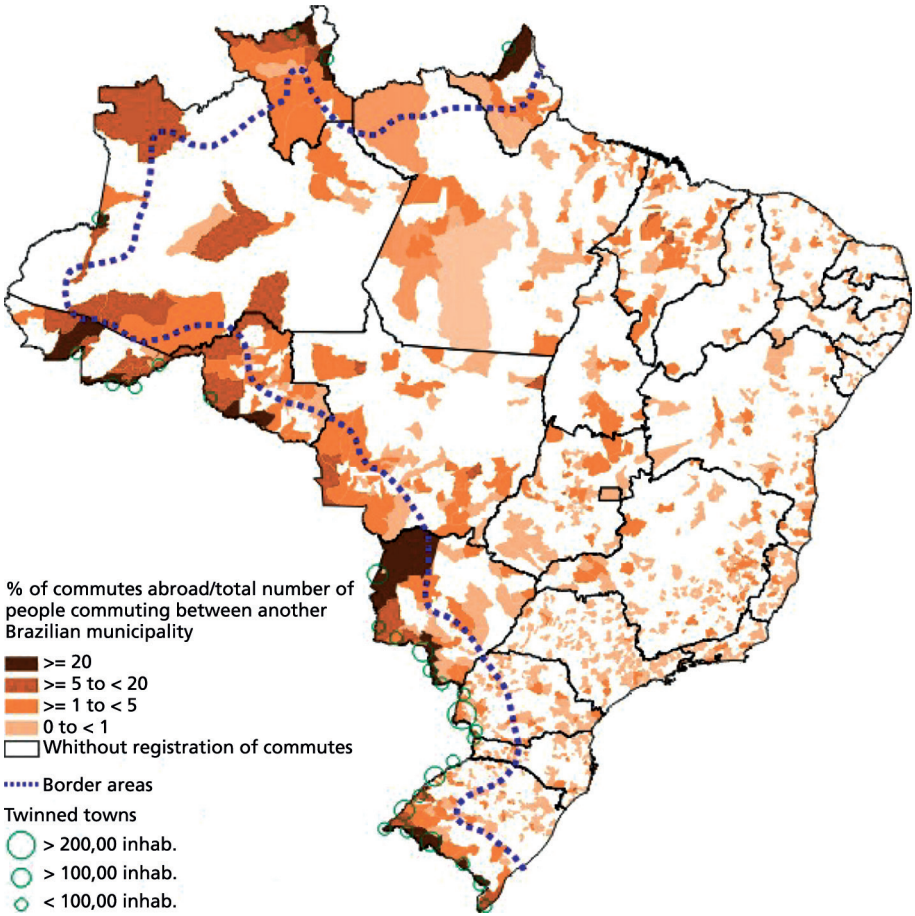
Flows of people working or studying in foreign countries are also significant. Viewed as commuters, they are not considered as migrants, as no change in domicile is involved. They are also not limited to daily flows, as they include longer trips between departure and return dates. Unfortunately, for international movements, Brazil's Demographic Census records only outflows from Brazilian municipalities.

Data drawn from Brazil's 2010 census indicates that 34,975 people commuted from Brazilian municipalities in order to work outside the country; 34,335 left to study; 741 were engaged in both activities abroad. Others commuted to study in Brazilian municipalities, while working outside the country. Added together, all these trips abroad result in 72,302 people involved in these movements.

These flows originate in major urban hubs, with 14.85% leaving São Paulo, and only ten other municipalities with over 1% of the total figures. These eleven municipalities account for 45% of commutes abroad, with 18.9 percentage points consisting of border towns. In particular, Foz do Iguaçu (9.10%), Sant'Ana do Livramento (3.84%), Ponta Porã (2.91%), Chuí (1.75%) and Tabatinga (1.3%), present mobility patterns that are similar to migrations in municipalities encompassed by transborder urban agglomerations (figure 3).

7. Analyzing transborder migrations between Bolivia (Tarija and Potosi regions) and Argentina (Salta and Jujuy regions), the Eclac Report (2012) describes a process that dates back to pre-Colombian times, limited to this transborder region. More recently, this process has been accompanied by another path, covering greater distances towards the Argentine capital. Both processes occur similarly in Brazil.

FIGURE 3
Outbound commuter trips for study and/or work abroad – Brazil (2010)



Source: IBGE (2010); Brasil (2005).
Prepared by: Ipardes.

Similar to the findings of analyses of migratory movements, these commutes reflect significant flows throughout border areas and along borderlines, in terms of the numbers of people as well as their proportion of total flow volumes. It is important to stress that there is no similar data available from neighboring countries. If inflows of people working and/or studying in Brazil were included, the number of people in transit would be considerably higher.

There are several examples of workers commuting each day between border towns, many of them undocumented, with no citizen's rights or job guarantees. Based on an analysis of the Mato Grosso do Sul State border, Oliveira (2010)

demonstrated the existence of actions shared by Brazilians, Bolivians and Paraguayans, encouraging the use of labor on both sides, allowing services to be rendered more intensively.

Oliveira (2006) stresses that these flows, among others, constitute people interacting in specific regions in order to perform essential activities, which require the definition of labor and mobility policies, in addition to other steps to ensure free transit. At the common border between Brazil, Colombia and Peru, he mentions a situation that is also found in other locations: "the triple border serves as a place of residence and also as an inbound and outbound gateway in all three directions. Although very close, each country has its own specific contexts in the social, political and economic sectors that are determining factors in migration itineraries," consequently steering commutes for local populations.

If better transportation and communication conditions facilitate transborder mobility of people and goods, they also facilitate immaterial and symbolic exchanges through which "cultures and identities transcend their places of origin, merging into hybrids to the extent that it is increasingly harder to pinpoint their roots" (Rodrigues, 2006, p. 197). At the same time, local identity benchmarks are core factors in everyday interactions. As noted by Chiarella (2012, p. 13), in the transborder complex that encompasses Assis Brasil, Iñapari (Peru) and Bolpebra (Bolivia),[8] it is possible to distinguish Bolivian, Peruvian and Brazilian inhabitants from "border Bolivians", "border Peruvians" and "border Brazilians".

> This statement shows that state images are unable to dilute local references. States draw borderlines on maps, but this does not mean that such demarcations are really effective for the peoples who live there. Apparently immutable borders are in practice questioned by the populations who share these boundaries.

For Brazil's border with Paraguay, the possibility has even been raised of establishing a "*Braziguayan* area", highlighted by Sprandel (2006, p. 144) in the thesis of Souchard (2001),[9] meaning "a place that is not completely Paraguayan, nor just a westward extension of the heartlands of Brazil, but rather a region of contact among local, national, micro-regional and even global territorial structures."

Another type of mobility – visitors to transborder urban agglomerations – interferes in the everyday relationships and administration of these areas. Tourist attractions, shops and businesses in general underpin intermittent stays by floating populations that sometimes outstrip the number of residents in these agglomerations.

8. It is worthwhile noting that the name of this municipality is made up of the initial syllables of the countries forming the triple border: BolPeBra – Bolivia, Peru and Brazil.

9. SOUCHARD, S. *La formation d'un espace brésiguayen dans l'Est du Paraguay*. Migrations pionnières brésiliennes et organizations socio-spatiales dans l'Oriente du Paraguay. Potiers, 2001. Thesis (PhD in Geography) – Université de Poitiers, *In*: OLIVEIRA (2006).

In the largest transborder urban agglomeration encompassing a Brazilian town (Foz do Iguaçu, together with Ciudad del Este in Paraguay and Puerto Iguazú in Argentina), the presence of iconic attractions such as the Iguassu Falls and the Itaipu hydropower complex, along with transborder trade, makes this area a major international travel destination, fuelling disputes over the administration of this region. Ongoing difficulties caused by the complexity of a local government submissive to specific dynamics shaped by the international nature of this region are exacerbated by this large floating population, whose demands are rated as top priority, nudging the basic needs of permanent residents into the background.

Kleinke et al. (1997) use the metaphor of "paradise of others", stressing that the benefits of adopting this recurrent priority are detrimental to local communities. They also admit that the internal mobility of people living in these agglomerations pursuing opportunities arising alternately on either side of the border creates "ephemeral Edens." They thus describe an Eden as being "for people living in the complex who can grasp territorially mutant opportunities, and a paradise for others living outside the complex who, although often causing negative impacts, nevertheless generate jobs and income through tourism, shopping and business". (Kleinke et al., 1997, p. 162)

In this context, responsibilities are diluted and border peoples are deprived of core rights. This results in areas open to symbolic constructions that almost always emerge from the juxtaposition of diversity and dispute. Once again taking as an example the transborder urban agglomeration consisting of Foz do Iguaçu, Ciudad del Este and Puerto Iguazú, mentioned by Montenegro and Béliveau (2006), after 2001 it became a metaphor for grey zones and places under the unforeseeable threat of "global terrorism." Among other reasons, the presence of a sizable Arab population[10] (the second-largest in Brazil) made it a target for articles in the domestic and international press, where it was portrayed as a transnational area subject only to the loosest of state controls.

5 A PLACE WHERE POLICIES ARE ABSENT

An analysis of the data confirms a dimension of transborder mobility between Brazil and the other countries in South America, underpinned by migratory flows and commutes, among other movements. This dimension requires the conceptualization and implementation of appropriate policies, tailored to the specific needs of these regions, particularly in terms of migration, mobility, work, education, culture, citizens' rights and citizenship. Migratory movements recorded in border areas encompass large numbers of people and municipalities, reflecting an unceasing

10. Among immigrants from Arab League countries in 2010, 27.02% went to São Paulo, with Foz do Iguaçu absorbing 22.52%, mainly Lebanese, followed by Syrians.

quest among countries sharing common borders and suggesting that interactions are occurring among their peoples. Commutes repeat these heavy flows in border areas, which are even more intense in transborder urban hubs, confirming interactive links between peoples. Undertaken mainly for work and study purposes, these trips spur consumption and demand, with greater access to urban facilities, paving the way for cultural exchanges while exploring different values and customs. In extreme cases, this also indicates a quest for rights that becomes blurred on both sides of the border, rights that are often not attained due to inadequate policies.

This ceaseless mobility turns border areas into unbroken spaces that result from the survival strategies and everyday interactions of their peoples, fragmented and lacking practices and policies of integration. These lengthy strips of land, unstable and apparently similar, are built up through a patchwork of differences, blending traits that reflect the diversity of these peoples and giving rise to a hybrid culture with fleeting, mobile identities that are neither dissimilar nor recurring, but are rather reinvented.

Omnipresent along their inner edges, national borders are theoretical lines that hamper the daily routines of local residents, turning these regions in two zones of uncertainty for many of them. These zones are also shaped by asymmetries between countries with different characteristics and interests, generally failing to consider the specific characteristics and needs of the daily lives of their peoples.

Major problems arise from the absence of policies tailored to the presence of populations in movement. Temporary, provisional and foreign even in their homelands, these populations are thus vulnerable to material manipulations in their collective minds. An Eclac Report (2012) acknowledges the scattered nature of policies addressing migrant populations, hindering the full enjoyment of their rights. This is exacerbated by distances between border areas and decision-making hubs, as rising crime exposes migrants to greater risks, leaving them more vulnerable to human trafficking, the sex trade, violence against women and forced displacement.

> The legal instruments of international law have gradually acknowledged the problem of migration, at the same time as national legislations have been steadily adapting to national standards, although at different paces and depths. (…) Nevertheless, the main stumbling-block is a lack of coordination with local governments, undermined by the traditional weakness of the state in this type of region. (…) Faced by the absence of public policies, civil society organizations often constitute the only welfare network on which migrants can rely, which has given them much legitimacy and qualifies them to represent these this population to the authorities, serving as its spokespersons and claiming its rights (Eclac, 2012, p. 94)

However, delegating these responsibilities to civil society organizations also leaves these people vulnerable to conflicts of scale, fragmenting state or federal actions and leading to inconsistent dialogues between countries, agents and the

people in charge of integration practices and policies, thus undermining the feasibility of a shared agenda for solving problems and ensuring access to rights.

As no-man's lands, transborder areas are fuelled by (dis)advantages for their travelers, under a dialectic of ambiguities, of ends and beginnings, legal and illegal, that is expressed in a single transitory place where belonging exists and does not exist. The border peoples belong to this place, and they are the most legitimate spokespersons to discuss key aspects of their needs and their inter-cultural characteristics, dealing with conflicts of scale when making decisions, eliminating the lines that separate them and effectively turning these divided regions into a single area that is well-equipped to develop into a transborder territory.

The public policy agenda must give top priority to addressing constraints on mobility and difficulties that hamper the materialization of a unique social and economic region. Policies must be drawn up that ensure free transit, employment and assistance with work; migration policies must give consideration to the specific characteristics of cultural groups and their income conditions, thereby removing communities from the hands of non-official labor supply networks that function through violence, silence and fear of reprisals; policies should ensure personal documentation with unique identification numbers for people and vehicles in border areas; and international agreements on specific cooperation projects should extend opportunities for legal immigration and settlement in Brazil.

The importance and presence of the state must be reinforced, in an effective and strategic way, in order to sweep away the idea of a mosaic wall of neighboring pieces of independent countries. Policies must be drawn up that transpose borders and boundaries, accepting the diversity and multicultural realities of these regions, open not only to flows that bring people and places closer together, but also ensuring that inclusion occurs in the same dynamic, with undeniable access to rights and the deployment of extended citizenship. Through this interpretation, and related to migration and mobility policies, regional and economic development and integration policies are also vital.

From the academic standpoint, there is the challenge of understanding the border as a new theoretical category, producing national data that is compatible and comparable among countries; addressing migration and commuting is a complex system that is not limited to just migrants, their countries of origin and their destinations, or factors that attract and repel them, but instead requires multidimensional construal. Profiles must be defined, together with reasons for travel, in addition to the types of common and complementary activities among countries (social, economic, functional), social networks already in place and major mobility routes, all of which provide input for tailoring these policies to the specific characteristics of transborder regions.

Concurrent and complementary actions focused on migrant rights undertaken by international organizations, civil society and governments require cooperative links to be built up among them. A new migration act is also needed to protect and assuring the rights of migrants within the context of the social and cultural integration of Latin America, and address migration as a social issue that involves human rights.

To achieve this, concepts must be defined. The legal concepts of nation and sovereignty are already unable to encompass transborder relationships. This necessitates the acceptance of a new citizen, different from the citizen of a country; constructing the concept of extended citizenship, the citizenship of peoples, their existence in places, extending beyond the concept of nationality; ensuring the dignity of mobile segments of the population travelling through these regions, with little social clout and trapped by fear, vulnerability and the specter of undocumented status. In other words, the concept of national borders must be transformed, as it is inhospitable and merely stresses the dominant role of the nation, instead pursuing the utopia of Jacques Derrida (2001), who suggested that border towns be welcoming places and free territories that embrace their status as places of transit while providing supportive settlements for refugees.

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CHAPTER 10

MOBILITY IN BRAZILIAN METROPOLITAN REGIONS: MIGRATION AND COMMUTING PROCESSES

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1 INTRODUCTION

During the past decade, according to data from Brazil's 2010 Demographic Census, there has been an upsurge in the number of people commuting each day to jobs in municipalities where they are not residents. According to this Census in 2010, 12.8% of the employed Brazilian population ten years of age or over more worked outside their municipality of residence. Moura, Delgado and Costa (2013) demonstrated that more than half of Brazil's municipalities posted commuter flows of this type in 2010 involving a thousand people or more, travelling in or out of municipalities. Although widely disseminated nationwide, this is a process that is basically associated with the expansion of urban agglomerations in Brazil, particularly metropolitan regions (MR), made possible by extended networks of public and private transportation. Along these lines, the Brazilian Institute for Geography and Statistics (IBGE, 2015, p. 15) notes that expansion within urban agglomerations occurs in response to two different logics: "that of jobs located in the center of urban agglomerations, and that of housing, in terms of expanding outlying areas that are home to increasingly large numbers of workers."

The increase in this type of travel has gained importance within a context where the types of population mobility in Brazil that involve change of domiciles are undergoing sweeping changes. Referring to these processes, which began during the 1980s and 1990s, Magalhães et al. (2014) stress that short-haul migratory flows (intra-regional and intra-state) have increased in importance during the

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past few decades, as mobility has increased, with more migratory trips recorded in personal travel through Brazilian territory. According to Tavares (2014, p. 1), flows are becoming more fragmented, with distinct social and economic influences affecting mobility, and mobility has in turn become essentially urban.

Although some authors (Moura, Branco and Firkowski, 2005; Carvalho and Rigotti, 1998) emphasize the need to distinguish between these two types of population mobility – migration and commuting – the intrinsic nature of movements underscores the undeniable need to seek connections between them, particularly with regard to physical expansion processes of urban agglomerations, as stated by other authors (Cunha, 2012).

In addition to exploring theoretical production that address these two types of travel, particularly by examining factors that are associated with the changing nature of these processes in Brazil, this paper intends to measure and describe how the migration and commuting processes have shaped urban expansion in major metropolitan regions, as well as examine the relationship between them.

Providing support for this topic, some specific issues must guide the analysis. What is the proportion of population segments – migrants and non-migrants – for commuter flows in each metropolitan region? What are the commuting rates for these various segments of the population? Among immigrants, is there any difference in their share of commuter flows based on whether they originate from within the metropolitan region or come from other areas or states? Does this proportion change with type of commuter flow (center/outskirts, outskirts/center, outskirts/outskirts)?

Other more general questions also require deeper reflection: do intra-metropolitan migrants opt for more remote neighborhoods, which probably have lower cost and better quality housing in metropolitan expansion areas, while maintaining their work, study (and also consumption) links with central municipalities,[5] and consequently accepting daily commutes? Or is it only new, non-metropolitan migrants who are forced to live in outlying municipalities due to housing cost constraints, forced to cope with the difficulties of commuting to central municipalities for work or study? Do non-migrants form a majority for this type of mobility? Do they prefer to commute, instead of migrating within an urban cluster, therefore keeping the places where they live quite separate from the places where they work or study?

5. In this paper, "central municipalities" or "centers" refers to the main municipality of a metropolitan area of Brazil, e.g., the city of São Paulo is the central municipality of the São Paulo metropolitan region, which encompasses numerous municipalities. "Outskirts" refers to the other municipalities of the region. "Commutes" refers to travel between municipalities, which are geographical units of Brazil that correspond to administrative and political boundaries, and the basis upon which the Demographic Census collects information on mobility.

This chapter uses empirical data obtained from microdata in the 2000 and 2010 Demographic Census. The spatial boundary adopted in this investigation consists of the institutionalized areas of twelve metropolitan regions, compliant with the classification presented in the study on Regions of Influence in Cities (*Regiões de Influência das Cidades* – Regic, 2007; IBGE, 2008), as follows: Belém, Belo Horizonte, Curitiba, Fortaleza, Goiânia, Manaus, Porto Alegre, Recife, Brasília,[6] Rio de Janeiro, Salvador and São Paulo.

The reference population consisted of persons employed on the labor market in metropolitan regions, as the object of this mobility study is the link between migration and commuting to and from work. Although variations occurring between 2000 and 2010 were taken into account in these population groups as a whole (migrants and commuters) the links established between them are based on data from the last Demographic Census.

For migrants, the researchers decided to work with a population living for less than ten years in the municipality of domicile. This option was prompted by awareness that the type of question used for the analysis – last stage or fixed date – could affect the results of the analysis. For example, Rigotti (2008, p. 6), states that for some approaches, such as those focused on the workforce, "questions on duration of residence and last place of residence are crucial", as they are related to the last migration stage.

2 THE ISSUE OF IMMIGRATION AND RISING COMMUTER MOBILITY IN BRAZIL

During the second half of the 20th century and the first decade of the current century, a lengthy redistribution of the population occurred throughout Brazilian territory, characterized by the appearance of some dominant trends in terms of major population flows (Brito et al., 2012), recurring over several decades. The Northeast and, to a lesser extent, Minas Gerais state, may be viewed as Brazil's main work force reservoirs, with the Southeast and the constantly expanding agricultural frontiers in Northern Paraná State, together with the Center-West and Northern regions, constituting the main destinations for these population flows.

During the first major phase, which extended from the years after World War II through to the 1970s, this process was characterized by heavy population concentration. Between its two main driving forces – industrialization and agricultural expansion – the latter predominated in terms of the size of the mobilized population. According to Baeninger (2012), this was a time of heavy flows of migrants streaming into Southeast Brazil, fuelled by the steadily increasing rural

6. Because Brasília's region encompasses more than one federal state, it was institutionalized as an Integrated Region of Development (Região Integrada de Desenvolvimento – Ride). This Ride, presented as one metropolis, will be treated equally together with the group of other institutionalized metropolitan regions.

exodus to urban areas, with migrants gathering mainly around Brazil's major metropolitan areas.

However, mainly from the 1980s onwards, this type of migration vanished, due to changes that resulted in a certain level of population dispersal nationwide. While this decade and the subsequent one were characterized by Brazil's lengthy economic restructuring and adjustment process, dimming the attractions of labor markets in major metropolitan regions – fundamentally in São Paulo and Rio de Janeiro metropolitan regions – these were also the years in which the results of territorial dispersal of economic activities (which started back in the 1970s) began to appear, particularly for industry.

Referring to the first of these economic factors, Rigotti (2014) shows that the after-shocks of the economic crisis tarnished the relative allure of Brazil's major metropolitan regions as migrant magnets, although its largest one – the São Paulo MR – never lost its status as Brazil's main population redistribution hub during any of the subsequent decades (Baeninger and Peres, 2011).

On the other hand, Baeninger (2012) feels that the dispersal of Brazil's production sector not only helped keep populations in other parts of the country, but also spurred the appearance of significant flows of migrants into these areas. Conducting his analysis on an inter-state scale, this author stresses that Demographic Census data show that the 1980s go down in migration history as the time when the largest number of Brazilian states posted positive balances in their population exchanges.

It must be added that the redistribution of the Brazilian population was also driven by specific demographic factors functioning concomitantly with social and economic changes. According to Rigotti (2014), dropping fertility with less natural population growth affected demographic dynamics in several parts of Brazil, with a stronger initial impact felt in more economically dynamic areas. Furthermore, because of lower fertility, birthrates became less important to population growth, and migrant exchanges at various scales became a crucial factor for explaining the redistribution of the Brazilian population during the last twenty-five years of the 20th century.

This is not the place to present details of variations in regional flows over the past few decades, which has been well portrayed by the above-mentioned authors. Instead, it is important to draw attention to the changes that characterize new migration patterns in Brazil.

Synthesizing these changes, Brito et al. (2012, p. 21) state that:

> Historical datasets covering the second half of the XX century and the first decade of the XXI century reveal this apparent paradox: changes in migration patterns and

> maintenance of main migration routes. In fact, the routes remain, but almost all of them present an innovation: in addition to outflows, there is also a significant backflow. The numbers of immigrants and emigrants are tending to even out, except for rare exceptions. This is a fundamental change in the migration pattern that prevailed through to the 1970s, as there are no longer states or regions that are major origins or destinations of massive migrant flows.

According to these authors, the regional inequalities that have always triggered population shifts are still present, but mobility patterns have become more complex. Flows of migrants returning to their regions of origin have become more important in population shifts, accounting for some 20% of inter-state or fixed-date immigrants recorded during the last three Demographic Censuses (Brito et al., 2012).

Moreover, short-term moves are also on the rise, undertaken immediately prior to the Demographic Census, during the previous five years or less. The weight of this type of migration has almost tripled during the last three decades, reaching 28.34% of the total number of last-stage immigrants living for less than five years at their current places of residence[7] (Brito et al., 2012).

The importance of long-distance inter-regional flows has dropped in the total number of trips, but major metropolitan regions – São Paulo and Rio de Janeiro – and the Goiânia and Brasília metro regions still attract appreciably large flows of this type. On the other hand, intra-regional exchanges reflecting social and economic dynamics at the regional level now carry greater weight in inter-state exchanges, with this phenomenon observed in Northeast and Southern Brazil.

Throughout Brazil's entire urbanization process, its metropolitan regions[8] were vital destinations for domestic migration. In fact, as recalled by Brito (2006), urbanization and the spatial clustering of the Brazilian population during the second half of the 20th century took place simultaneously with the formation of major metropolitan agglomerations. Despite a drop in the relative share held by these areas in Brazil's total urban population during that period, they are still home to a significant proportion of this population (around 40% in 2000, living in the twelve spatial units taken into consideration by the authors).

Furthermore, Brito (2006) points out that the consolidation of Brazil's metropolitan agglomerations during the past few decades, underpinned mainly

7. Note that the data on both types of migration were calculated for different populations: return migration for fixed-date inter-state immigrants, and short-term migration for last stage migrants living in the State for less than five years.

8. After the promulgation of Brazil's 1988 constitution, there was a proliferation of special units institutionalized as metropolitan regions. However, studies of Brazil's urban network have shown that the metropolitanization phenomenon is basically limited to nine units defined in the 1970s, in addition to three urban agglomerations (Goiânia, Brasília and Manaus) ranked as metropolises by the City Areas of Influence Survey (Regic, 2007; IBGE, 2008). The studies consulted here tend to use this classification when referring to metropolitanization, distinguishing them from other units institutionalized as non-metropolitan urban agglomerations.

by their ballooning outskirts with growth rates outstripping those of central municipalities, also accounts for the largest increases in metropolitan populations for most of these cities. The author lists factors explaining this greater role by urban outskirts, which warrant particular attention due to their relevance to the issues addressed in this paper. According to Brito, "three factors explain this reality: first, plummeting birth rates among women, which have certainly dropped more steeply in centers than in outlying areas; second, but certainly more important, intra-metropolitan flows of migrants, with balances favorable to urban outskirts; third, the migration balances between each agglomeration and the rest of Brazil have been more favorable for outlying areas (Brito, 2006, p. 228)." These factors, particularly the latter two, are related to the logic of urban expansion, while housing space – which does not necessarily coincide with the location logic of production activities – gives rise to the massive gap between housing and jobs.

Cunha et al. (2013) suggest that the mismatch between population settlement areas and the location of job opportunities may be addressed on a macro basis by considering processes of housing space production and those leading the location of production activities, as well as at the micro level, focused on individual preferences that are possible for some population segments, through amenities associated with residential choices.

For some of Brazil's major urban areas, particularly the São Paulo metropolitan region, migration and commuting are also connected at another spatial scale resulting from relationships built up among a variety of population arrangements (Cunha et al., 2013; IBGE, 2015).

With respect to the changes that migratory processes are undergoing, some interpretations emphasize the decrease in internal migration. But other author authors claim that migratory flows are still significant, and that the changing profile of migrants provides new challenges in terms of theory and policy formulation (Rodríguez, González and Martínez, 2012).

These authors highlight that, despite falling indexes of urban primacy in some countries, large cities of Latin America are still growing relative to the total population of the region, from 11% in 1950 to 32% of the total regional population in 2010. This fact contradicts hypotheses of the decentralization of population, and highlights the role of large cities in the context of globalization. Even with reduced migration rates, these cities are experiencing growth rates for short-distance and intra-agglomeration migration that are higher than rates of population growth. These processes are responsible for the peripheral growth that characterizes Latin American cities (Rodríguez, González and Martínez, 2012).

It is quite clear that these changes are not a specific characteristic unique to Brazil, but are also found in other Latin American countries. Long-distance flows

are becoming less important, overtaken by short-distance and international flows, as well as commuting movements. This is synthesized in the study by Rodríguez (2013, p. 89):

> In conclusion, the current context of spatial redistribution of the population is different from that of the previous century, when the region reshaped its territorial settlement pattern for its populations, through massive waves of internal migration. Fuelled by rural-urban migration, urbanization was one of them; the others, also broad-ranging, were the exodus from historically underprivileged settlement areas, waves of immigrants seeking metropolitan areas, and flows into areas with low demographic density. The first of them persist, although much weaker; the third is no longer widespread, due to the loss of appeal of some metropolitan areas; and the fourth continues, although intermittently and on a lesser scale, without the official backing it enjoyed in the past.

Among the reasons explaining the drop in internal migration flows in the Latin American countries, Rodríguez (2013) highlights an increase in commuting, either daily or for other periods, recorded in the countries under analysis. The concept of commuting encompasses a type of population movement that is on the rise in Brazil, mainly in metropolitan areas, but also extending into smaller urban agglomerations.[9]

Commuting has also acquired importance in Brazil, within a context where other types of population mobility have been subject to sweeping changes. Referring to these processes, which began during the 1980s and 1990s, associated with Brazil's economic restructuring and adjustment period along with the rising internationalization of its economy, Magalhães et al. (2014, p. 174) note that:

> Within this context, at the domestic level and within the last three decades, massive differences continue among migration processes in different parts of Brazil, between states and also within states. However, the importance of shorter-distance migratory flows is on the rise, together with intra-regional and intra-state movements, with more migratory stages and re-emigration including return migration and commutes.

In Brazil, the number of people travelling to another municipality to work and/or study more than doubled during the past decade, involving 15.4 million people in 2010.

Moura, Delgado and Costa (2013) underscore the spatial complexity of these movements, as almost all municipalities record inflows and outflows. Through a migration efficacy indicator, the authors developed a classification system that highlights the leading role played by municipalities in population exchanges:

9. Moura, Branco and Firkowski (2005) draw attention to the fact that two-way trips are called migration or mobility in the literature, supporting the latter as it is a type of travel undertaken with a certain regularity, generally every day, without involving any change of domicile to another municipality, also accepted by Carvalho and Rigotti (1998), who exclude from migratory movements trips within the same region that do not imply setting up permanent residence at some other location.

outbound, two-way and inbound.[10] Almost 60% of registered departures originated in outbound municipalities, but even municipalities identified as inbound also post posted significant outbound traffic, reaching almost 20% of the total. On the other hand, outbound municipalities also post inbound flows at 20% of the total inflows recorded in Brazil. There is also a significant group of municipalities with evenly-balanced inflows and outflows of people, giving rise to their two-way classification.

Concerns over the commuting phenomenon fall within international discussions of city characteristics at the start of the century, with several authors attempting to qualify the social and spatial changes, materialized through urban forms that are in increasingly wider-spread in territorial terms.[11] Moura, Branco and Firkowski (2005) affirmed that this logic may be observed in Brazilian urban agglomerations, while drawing attention to the fact that peripheralization in Brazil (and other developing countries) is strongly associated with the segregation of poverty and ramshackle urban infrastructure.

As commuting is a type of travel that differs from those associated with migratory processes, Cunha et al. (2013) highlight an important hypothesis, whereby commuting in major urban complexes is related to rising intra-metropolitan migration processes, as moving to outlying municipalities in search of housing is triggering new commuter flows, thus proposing a joint study of these two phenomena. The same line is followed in the study by Brito and Ramalho (2014) of the effects of intermunicipal migrant status on the probability of commuting to and from work, conducted in the Recife MR. For these authors, "the empirical findings lead to the inference that workers with a recent history of migration are more likely to commute in the Recife MR. After considering the influence of a set of social and economic factors, as well as others related to place of domicile and location in addition to controlling the interdependence between commuting and migration, the average treatment effect (ATE) suggests that migrant status results in a 13.4 percentage point increase in the odds of a typical worker commuting" (Brito and Ramalho, 2014, p. 15).

10. Municipalities are classified related to the predominant direction of travel *i)* an *outbound* municipality, where trip origins predominate. Given that there are likely few jobs in these places, many of these are "bedroom communities;" *ii) inbound* municipalities, where trip destinations predominate because of a concentration of jobs or educational facilities; or *iii) two-way* municipalities, where there are similar numbers of trips trip origins and destinations. (Moura, Delgado and Costa, 2013).

11. Moura Branco and Firkowski (2005, p. 122) mention some concepts that have been attempting to address these changes: city-regions (Scott et al., 2001), metapolis (Ascher, 1995) and exopolis (Soja, 2002) are a few examples. Cunha et al. (2013) attempt to characterize this phenomenon in the São Paulo macrometropolis on a spatial scale that encompasses several metropolitan areas within this city.

3 SIZING POPULATION MOBILITY IN METROPOLITAN REGIONS: 2000-2010

In general, the employed population growth rates in the regions under analysis are quite high between 2000 and 2010, although in most metropolitan regions, this was not due to increased migration (table 1). In addition to passive growth, the main influences are some demographic factors and other aspects related to the labor market: relative growth of the economically active population (PIA);[12] higher activity rates due to higher job market entry levels, particularly among women; and even higher employment rates due to the sharp drop in joblessness during the decade.

TABLE 1
Employed population, proportion of immigrants and annual growth rate by metropolitan regions (2000-2010)

Metropolitan region	Employed population						
	Total		Proportion of immigrants[1] (%)		Growth rate (%)		
	2000	2010	2000	2010	Total	Migrant	Non-migrant
Manaus	541,361	862,220	19.1	13.9	4.76	1.48	5.35
Belém	692,333	950,843	22.5	14.5	3.22	-1.22	4.18
Fortaleza	1,084,365	1,585,827	18.7	12.2	3.87	-0.49	4.63
Recife	1,104,499	1,484,673	18.2	13.2	3.00	-0.27	3.55
Salvador	1,157,445	1,622,506	16.0	12.6	3.44	1.01	3.80
Belo Horizonte	1,768,767	2,433,251	23.7	15.8	3.24	-0.85	4.19
Rio de Janeiro	4,203,964	5,328,900	13.6	9.7	2.40	-0.97	2.80
São Paulo	7,204,014	9,479,401	20.0	13.5	2.78	-1.22	3.52
Curitiba	1,199,499	1,681,455	27.8	18.0	3.44	-0.99	4.70
Porto Alegre	1,606,359	2,030,124	20.7	16.1	2.37	-0.20	2.91
Goiânia	778,269	1,146,499	32.5	23.1	3.95	0.46	5.22
Brasília[2]	1,176,526	1,808,851	31.1	22.2	4.40	0.92	5.38
Total	**22,517,401**	**30,414,550**	**20.3**	**14.2**	**3.05**	**-0.54**	**3.73**

Source: IBGE – Demographic Census.
Notes: [1] Immigrants mean the entire population living in the municipality of residence for less than ten years.
[2] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride).

The proportion of immigrants in the total number of employed people dropped sharply during the past decade in metropolitan regions as a whole, down from 20.3% in 2000 to 14.2% sign in 2010.[13] However, this drop in immigrant participation is explained only partially by the reduction in migrant flows.

12. PIA is from the Portuguese *População em Idade Ativa*.
13. In 2010, the participation rate for last stage immigrants in inter-municipal movements reached 15.9% of the total employed population in Brazil.

In fact, the number of employed immigrants dropped slightly (-0.54% per year.), with the actual numbers varying from 4.6 million in 2000 to 4.3 million by the end of the decade. But this shrinking share mainly reflects the dynamics of the job market, mentioned above, which absorbed heavy inflows and expanded by close to an additional eight million people in the twelve metropolitan regions, with this fact related to the increase noted among non-migrants, which is a population group presenting an annual growth rate of 3.73%.

There are some regional differences in the weight of immigrants in the employed population that remained constant in both Demographic Censuses that in addition to reflecting the main migrant routes in Brazil highlighted in the literature, were also related to different phases in the metropolitanization of each metropolitan region,[14] as well as the inclusion of these regions in Brazil's recent economic expansion process. The metropolitan regions with the highest share of immigrants in the composition of the employed population for 2000 and 2010 are Goiânia (32.5% and 23.1%), Brasília (31.1% and 22.2%) and Curitiba (27.8% and 17.9%), with the lowest shares noted in Rio de Janeiro and Salvador.

Despite negative growth rates for employed immigrants, they nevertheless hold a relevant share in the total number of employed persons. In 2010, this proportion varied from 9.7% in the Rio de Janeiro MR to 23.1% in the Goiânia MR, with growth in this segment of the population found only in Brasília region (0.92% per year during the decade), as well as the Goiânia MR (0.46% per year) and a few other metropolitan regions with lower proportions of immigrants in the total number of employed people, such as Salvador (variation of 1.01% per year) and Manaus (1.48% per year).

In the metropolitan regions as a whole, the number of employed people commuting to work in municipalities other than their place of residence in 2010 reached almost 5.5 million people (table 2). The growth rates of this segment of the population in all metropolitan regions are higher than those observed for the total employed population (see table 1), confirming that the rising number of commutes as a way of accessing the job market noted during the past decade was widespread in these regions, with the number of commuters more than doubling in four of them – Manaus, Salvador, Fortaleza and Brasília.

14. For example, the consolidation processes of the metropolitanization of São Paulo and Rio de Janeiro are older, including the intra-regional redistribution of the population among their various municipalities. In these cases, although still remaining Brazil's main migration magnets, the proportion of the immigrant population tends to be lower in the population as a whole, due to the high populations in these regions.

TABLE 2
Number of job-holders commuting to work, proportion of immigrants and annual growth rates by metropolitan region (2000-2010)

Metropolitan region	Job-holders who commute						
	Total		Proportion of immigrants (%)		Growth rate (%)		
	2000	2010	2000	2010	Total	Immigrant	Non-migrant
Manaus	3,277	13,010	35.5	27.6	14.78	11.92	16.06
Belém	81,051	136,051	45.5	26.5	5.32	-0.24	8.38
Fortaleza	75,941	153,060	38.0	21.8	7.26	1.49	9.66
Recife	247,197	402,367	29.2	19.9	4.99	1.03	6.20
Salvador	66,051	154,469	31.1	26.2	8.87	7.02	9.50
Belo Horizonte	348,441	552,333	40.3	25.3	4.71	-0.04	6.96
Rio de Janeiro	741,832	1,038,143	23.1	15.5	3.42	-0.62	4.31
São Paulo	1,044,859	1,693,966	35.0	22.9	4.95	0.57	6.64
Curitiba	186,509	337,746	46.0	26.3	6.12	0.35	9.35
Porto Alegre	320,776	474,066	29.8	22.4	3.98	1.04	4.97
Goiânia	109,007	204,665	55.7	34.2	6.50	1.45	10.61
Brasília[1]	122,008	307,617	64.1	31.2	9.69	2.08	16.11
Total	**3,346,948**	**5,467,493**	**34.6**	**22.7**	**5.03**	**0.71**	**6.65**

Source: IBGE - Demographic Census.
Note: [1] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride). Once again, there was a sharp increase among non-migrants, which accounted for more than 90% of the variation posted during the decade in the metropolitan regions under analysis. However, there are some noteworthy aspects related to immigrant performances. The first is that the growth rates for commuter immigrants were positive in most regions, particularly Manaus, Salvador and, to a lesser extent, Brasília. The second point is related to the proportion of immigrants in the total number of commuters. Despite a sharp drop during the decade, the share held by immigrants in this type of travel is far higher than their proportions in the total number of job-holders, suggesting that this segment of the population may well be more likely to commute to work.

As noted for the total number of employed persons, there are regional differences in terms of the proportion of immigrants in the total number of commuters. But these differences, which were more marked in 2000, shrank significantly during the decade. The shares held by immigrants are higher in the two metropolitan regions with larger proportions of employed immigrants, namely: in the Brasília (64.1% in 2000, and 31.2% in 2010) and in the Goiânia metropolitan region (55.7% in 2000, and 34.2% in 2010). Additionally, Curitiba was also noteworthy with a high share in 2000 (46.0%) and Manaus in 2010 (27.6%) (see table 2).

For the former, the reason for commuting is triggered by the dynamics of their urban-regional arrangements, meaning two units linked into a single spatial arrangement (Moura, 2009). For Curitiba, this is the outcome of marked periferalization of its downtown area and the concentration of job-generating activities in this area. In Manaus, this is prompted by a dynamic job market that attracts a workforce that is starting to settle in outlying areas beyond its municipal borders, appearing largely during the past decade; this is the case of a new urban agglomeration with a small peripheral area that is still in formation.

By transforming the relationships among commuter groups and employed people as into rates, showing the share held by the former in each segment of the population, it becomes apparent that commuting has increased in all the metropolitan regions, with these rates being higher among immigrants for both periods. However, it was among the non-migrants that the rates rose most steeply, which was noted in most of the metropolitan regions (table 3). In other words, mobility reached a significant level also in the non-migrant population.

TABLE 3
Travel to work by migration[1] status and metropolitan region (2000-2010)

Metropolitan region	Commuting rate for the employed population (%)					
	2000			2010		
	Total	Immigrant	Non-migrant	Total	Immigrant	Non-migrant
Manaus	0.6	1.1	0.5	1.5	3.0	1.3
Belém	11.7	23.7	8.2	14.3	26.2	12.2
Fortaleza	7.0	14.2	5.3	9.7	17.3	8.5
Recife	22.4	36.0	19.4	27.1	41.0	24.9
Salvador	5.7	11.1	4.7	9.5	19.7	8.0
Belo Horizonte	19.7	33.4	15.4	22.7	36.2	20.1
Rio de Janeiro	17.6	30.0	15.7	19.5	31.0	18.2
São Paulo	14.5	25.4	11.8	17.9	30.4	15.9
Curitiba	15.5	25.7	11.6	20.1	29.4	18.0
Porto Alegre	20.0	28.7	17.7	23.4	32.5	21.6
Goiânia	14.0	24.0	9.2	17.9	26.4	15.2
Brasília[2]	10.4	21.4	5.4	17.0	24.0	14.3
Total	**14.9**	**25.3**	**12.2**	**18.0**	**28.7**	**16.1**

Source: IBGE - Demographic Census.
Notes: [1] Migrants are considered to be anyone with less than ten years residence in their municipalities of the domicile.
[2] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride).

Metropolitan regions with the highest commuting rates among immigrants are Recife (36% in 2000, rising to 41% in 2010) and Belo Horizonte (33.4% rising to 36.2%). The lowest rate was found in Manaus, although this too is increasing (up from 1.1% to 3.0%). Another noteworthy aspect was the fact that commuter rates among immigrants in Goiânia and Brasília were lower than those noted for the metropolitan regions as a whole (25.3% in 2000, and 28.7% in 2010), in contrast to the level found for employed immigrants who commute, shown in table 2. In other words, although immigrants in these two urban agglomerations form a significant proportion of people who commute to other municipalities, no more than a quarter of the immigrants in these regions are involved with this type of mobility.

In general, this set of indicators prompts doubts about the hypothesis associating higher commuting rates with migrant populations, as migration does not seem to explain the increase in commuting over the period, despite higher migrant commuting rates. Commuting rates have also been increasing among the employed, becoming an important strategy for non-migrants as well.

4 MIGRANT ORIGINS, COMMUTER FLOW TYPES AND LINKS TO MUNICIPALITIES OF ORIGIN

In this item, the analysis is limited to data taken from the 2010 Demographic Census, in an attempt to identify patterns related to immigrant origins, whether in the same metropolitan region or not, as well as commuter flow types and the links established in the course of their work by intra-regional immigrants with their municipalities of origin.

In 2010, most job-holders were non-migrant, reaching 85.1% of the total number of people employed in the metropolitan regions. Among employed immigrants, 5% were intra-regional in origin and 8.6% were non-regional (table 4). This predominance of non-regional origins among immigrants is found in almost all metropolitan regions, but with more even distribution in the Rio de Janeiro, Belo Horizonte, Porto Alegre and Recife metropolitan regions, with Recife being the only place where intra-regional immigrants outnumbered those from outside the metropolitan region in the employed population.

TABLE 4
Percentage distribution of the employed population that commutes, and commuting rates by migration status and metropolitan region (2010)

Metropolitan region	Employed population [1] (%)			Commuting job-holders [1] (%)			Commuting rate			Total
	Non-migrant	Immigrant		Non-migrant	Immigrant		Non-migrant	Immigrant		
		Intra-regional	Non-regional		Intra-regional	Non-regional		Intra-regional	Non-regional	
Manaus	85.5	2.3	9.9	72.0	8.0	19.2	1.3	5.2	2.9	1.5
Belém	85.0	4.5	9.6	72.6	14.3	12.0	12.2	45.6	17.8	14.3
Fortaleza	87.4	3.5	8.4	77.4	13.0	8.7	8.5	35.8	10.0	9.7
Recife	86.3	6.5	6.4	79.4	12.9	6.7	24.9	54.1	28.5	27.1
Salvador	87.0	3.3	8.9	73.1	13.6	12.0	8.0	39.2	12.9	9.5
Belo Horizonte	83.6	6.8	8.6	73.9	16.3	8.7	20.1	54.4	23.1	22.7
Rio de Janeiro	89.8	4.2	5.1	83.8	11.0	4.2	18.2	50.9	16.3	19.5
São Paulo	85.9	4.9	7.8	76.2	14.9	7.7	15.9	54.6	17.5	17.9
Curitiba	81.5	5.7	11.5	72.9	14.5	11.3	18.0	51.3	19.7	20.1
Porto Alegre	83.5	7.5	8.0	77.1	14.5	7.6	21.6	45.0	22.2	23.4
Goiânia	76.1	5.5	16.4	64.8	16.4	17.4	15.2	53.4	18.9	17.9
Brasília[2]	75.7	5.2	16.2	63.5	15.1	16.0	14.3	49.1	16.8	17.0
Total	**85.1**	**5.0**	**8.6**	**76.2**	**14.0**	**8.4**	**16.1**	**50.3**	**17.6**	**18.0**

Source: IBGE: Demographic Census.

Notes: [1] Some job-holders could not be classified by migration status, either because they were unknown during a critical phase, or due to absence of information on their municipalities of origin.

[2] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride).

The opposite occurred with the origins of employed immigrants who commute. For the metropolitan regions as a whole, intra-regional trips accounted for 14.0% of the total amount of travel, compared to 8.4% originating outside the region; the ratio between these proportions is equivalent to stating that for each 100 commuting immigrants, sixty-three were from the metropolitan region itself. The heavier proportion of intra-regional commutes is noted in most metropolitan regions, except for Manaus, Goiânia and Brasília, with the last two presenting an almost even distribution.

The greater likelihood of intra-regional immigrants commuting to work is even more apparent in the commuting rate, showing that, other than Manaus, between 35% and 55% of intra-regional immigrants who work do so in municipalities other than those in which they live; for the twelve metropolitan regions as a whole, this rate reaches 50%. The rates for immigrants from outside the metropolitan regions were not significantly different from those observed for the non-migrant population.

This study has shown that commuting has become more important for accessing work in metropolitan regions. But what are the directions of these flows? In all the metropolitan regions, the main flows originate in outlying municipalities, travelling towards centers. The heavier the weight of these flows, the more they reflect the peripheralization of settlement processes, with economic activities concentrated in centers (table 5). Except for Salvador (29.3%) and Manaus (22.9%), these flows encompassed more than 50% of job-holders in all the other metropolitan regions. Particularly noteworthy was the Brasília (85.5%) and the Goiânia metropolitan region (78.1%) as, although constituting an urban-regional complex, both cities are nevertheless the most representative of a movement that may be considered a standard pattern for simple urban agglomerations.

TABLE 5
Percentage distribution of commutes by flow type (2010)[1]

Metropolitan region[2]	Commute flow type					
	Outskirts/ center[2]	Outskirts/ outskirts	Center/out-skirts	Other MR	Outside MR	Total
Manaus	22.9	3.0	19.1	1.3	53.6	100.0
Belém	66.6	9.1	8.9	1.3	14.0	100.0
Fortaleza	58.2	17.9	13.1	1.4	9.4	100.0
Recife	63.2	19.9	9.8	0.6	6.5	100.0
Salvador	29.3	23.5	30.9	4.1	12.3	100.0
Belo Horizonte	62.4	21.3	11.7	0.8	3.8	100.0
Rio de Janeiro	61.4	29.1	4.7	0.9	4.0	100.0
São Paulo	50.9	35.5	8.6	0.5	4.5	100.0

(Continues)

(Continued)

Metropolitan region[2]	Commute flow type					
	Outskirts/ center[2]	Outskirts/ outskirts	Center/out-skirts	Other MR	Outside MR	Total
Curitiba	66.0	13.2	15.4	1.1	4.4	100.0
Porto Alegre	52.0	36.8	6.2	0.5	4.5	100.0
Goiânia	78.1	2.8	8.1	3.2	7.8	100.0
Brasília[3]	85.5	4.2	4.3	2.1	3.9	100.0
Total	**58.5**	**26.3**	**9.1**	**1.0**	**5.3**	**100.0**

Source: IBGE: Demographic Census.

Notes: [1] This table is based only on commutes to "Other municipalities" when identified; for all metropolitan regions, the identification level tops 90%, except for Brasília (67.1%).

[2] "Center" refers to the municipality that is the center of the metropolitan region (also previously referred to as "central municipalities" in this text).

[3] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride).

Also noteworthy are exchanges among municipalities on the outskirts of the same urban area (outskirts/outskirts movements), which account for 26.3% of commutes in the metropolitan regions as a whole. In three of them – Rio de Janeiro, São Paulo and Porto Alegre – this percentage is even higher, peaking at 36.8% in the latter city. This flow type indicates broader-ranging dynamics among outlying municipalities, reflecting greater decentralization of activities within the metropolitan area.

Another important flow type carries people from centers in metropolitan regions towards their outskirts. In five of them – Manaus, Fortaleza, Salvador, Belo Horizonte and Curitiba – this flow type accounts more than 10% of total commutes, peaking in Salvador (30.9%), possibly due here to the attractions of the Camaçari Petrochemical Complex.

For two flow types involving outlying municipalities (outskirts/outskirts and center/outskirts), a remark is required on their importance in the São Paulo MR. For the former flow type (outskirts/outskirts), São Paulo is one of the areas with the heaviest proportion in the total number of commutes, adding that this MR accounts for 42.5% of all trips of this type recorded in the twelve metropolitan regions addressed by this study. Commutes center/outskirts account for only 8.6% of commuter flows in the São Paulo MR, although constituting 30% of this type of mobility found in the metropolitan regions as a whole.[15]

Two other flow types – to another MR and to outside the MR – are presented in table 5. Although playing a less important role in the metropolitan regions as a whole, they are significant indicators of a trend towards new spatial arrangements that extend beyond the demarcated boundaries of the metropolitan areas, or even on the larger scales of urban networks.

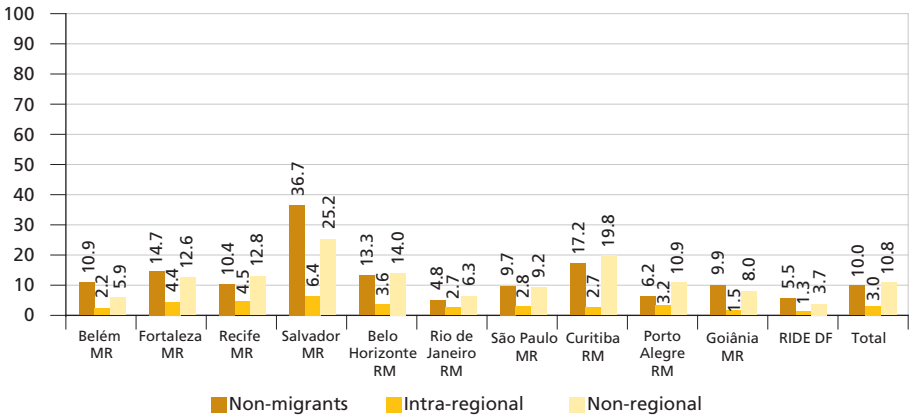
15. This figure (30%) is additional information and is not included in the tables in this paper.

With regard to flows to another MR, the Goiânia MR and Brasília are particularly noteworthy, as well as for flows outside the metropolitan region, which may be related to the configuration of the urban-regional complex that links these two urban areas in Center-West Brazil. Flows outside metropolitan regions are more important in the cities of North and Northeast Brazil, particularly Manaus,[16] Belém and Salvador, where this flow type accounts for more than 10% of all trips recorded in each of them. As mentioned, this may indicate urbanization extending beyond metropolitan boundaries that may be linked to incongruent aspects in the demarcation of the MR, as well as to the sphere of influence of this urbanization, particularly in the Salvador MR, where this may reflect the dynamics of the urban-regional complex formed with the Feira de Santana urban area.

When considering the migration status of the employed population involved in commuter flows, some specific characteristics may be highlighted. For all three categories – non-migrant, intra-regional immigrant and non-regional immigrant – the most important flow consists of trips from urban outskirts to center (graph 1), with this type of flow the most significant in all the metropolitan regions for intra-metropolitan immigrants. Except for the São Paulo and Salvador metropolitan regions, non-regional immigrants hold the lowest share of this flow type.

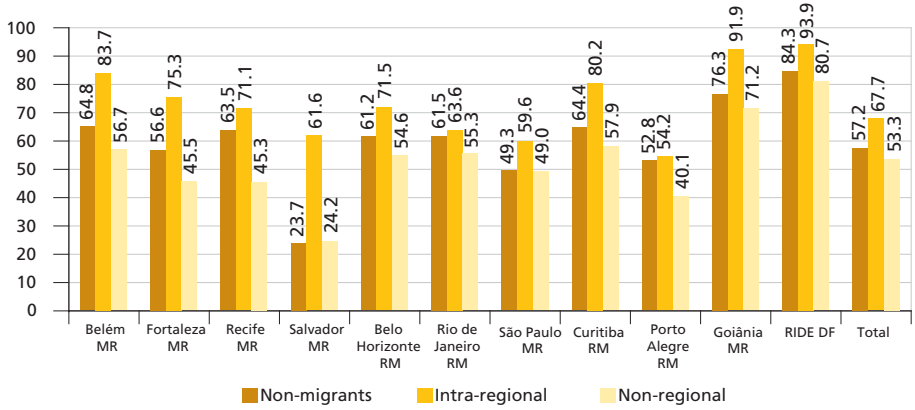
GRAPH 1
Proportion of flow types in total number of commutes in metropolitan regions by migration status (2010)

1A – Center/outskirts flow

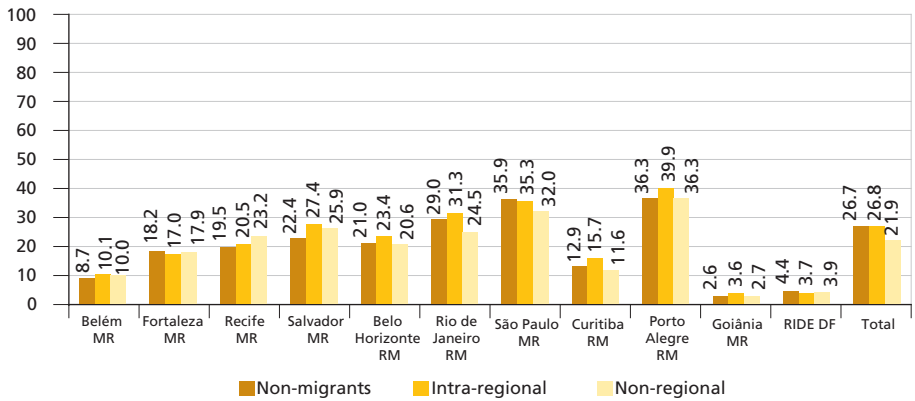


16. In a recent (2015) study by the Brazilian Institute for Geography and Statistics (IBGE), Manaus was included in the highest urbanization tier, although classified as an isolated municipality that does not constitute an urban agglomeration.

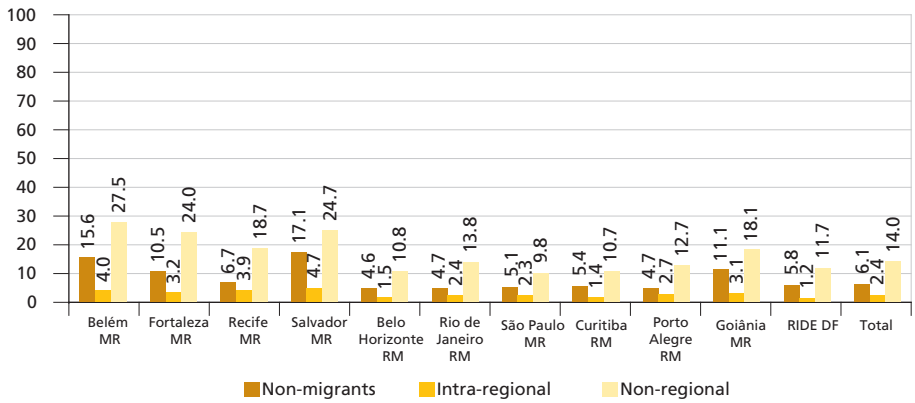
1B – Outskirts/center flow



1C – Outskirts/outskirts flow



1D – Outside MR flow



Obs.: The data for Manaus are not shown in the graph, as the estimates obtained through microdata taken from the Demographic Census are very low for flow type and migration status, subject to significant sampling errors. The same reason, the Other MR flows were clustered into the Outside the MR category.

For outskirts/outskirts flows, there is almost no difference among the three migration categories, regardless of the proportion of this type in each MR. For the other two flow types, intra-regional immigrants account for only minor shares, while non-regional immigrants predominated in flows outside the MR for all the cities studied, and was almost the same as the share held by non-migrants in center/outskirts flows. For the latter type of flow, Salvador stands out not only for the proportion (> 30%) of this flow type in total regional trips, but also for the predominance of non-migrants in this flow type.

Finally, attempts were made to discover whether or not the municipalities where immigrants work are the same as their previous municipalities of residence. Additionally, among those working in the same municipalities of origin, the type of commute flows were also examined.

Most intra-regional immigrants work in the same municipalities that they lived in prior to moving, reaching 62.4% of the total flows for this migrant status in the municipal regions as a whole (table 6). This proportion drops in better-consolidated metropolitan regions such as Rio de Janeiro, Porto Alegre, Recife and São Paulo, which were the only cities posting less than 60%. For less-developed metropolitan regions, the percentages are extremely high, peaking in Goiânia (86%) and Manaus (81.5%). As the Demographic Census contains information only on the municipality of origin, rather than the work status of people when they lived there, there is a hypothetical possibility – found in the literature on population mobility – that in these cases, people used to live and work in the same municipality, but had to migrate for unknown reasons,[17] although without losing previous links to their jobs, which seems to be more the case for migration between center/outskirts areas.

Among the total number of non-regional immigrants, 94.2% work in municipalities other than those of their prior residence, indicating that they have lost links with their places where they are originally from, at least in terms of jobs. It is very likely that these non-regional immigrants were working in another municipality within the same MR where they lived at the time of the Census. Manaus posts the lowest percentage (61.3%), which may suggest more recent migration seeking work in this metropolitan agglomeration. Among the total number of immigrants (intra-regional and non-regional), 41.6% work in their municipality of origin, and 58.4% in another municipality.

17. The Demographic Census did not explore the reasons for moving residences, but the most likely hypothesis is that these moves were prompted by issues related to access to land/housing, which depends on the operating conditions of urban property markets, with rising values in municipal areas triggering the quest for alternatives in outlying districts of metropolitan regions. To a lesser extent, there are also families that moved out of town in search of better places to live, in this case including many members of the middle and upper income segments of the population.

TABLE 6
Percentage distribution of commuting immigrants during the decade by migration status and links between previous municipalities and work (2010)

Metropolitan region	Migration status and links between previous municipalities and work								
	Intra-regional immigrant			Non-regional immigrant			Total		
	Works in previous municipality of residence	Works in municipality other than that previous residence	Total	Works in previous municipality of residence	Works in municipality other than that previous residence	Total	Works in previous municipality residence	Works in municipality other than that previous residence	Total
Manaus	81.5	18.5	100.0	38.7	61.3	100.0	53.4	46.6	100.0
Belém	79.0	21.0	100.0	13.9	86.1	100.0	49.8	50.2	100.0
Fortaleza	77.6	22.4	100.0	13.1	86.9	100.0	52.4	47.6	100.0
Recife	58.2	41.8	100.0	8.7	91.3	100.0	41.6	58.4	100.0
Salvador	68.3	31.7	100.0	11.9	88.1	100.0	42.5	57.5	100.0
Belo Horizonte	65.0	35.0	100.0	4.3	95.7	100.0	44.3	55.7	100.0
Rio de Janeiro	53.1	46.9	100.0	6.8	93.2	100.0	40.4	59.6	100.0
São Paulo	58.7	41.3	100.0	3.0	97.0	100.0	40.0	60.0	100.0
Curitiba	67.3	32.7	100.0	4.6	95.4	100.0	40.4	59.6	100.0
Porto Alegre	54.8	45.2	100.0	6.3	93.7	100.0	38.5	61.5	100.0
Goiânia	86.0	14.0	100.0	7.7	92.3	100.0	46.5	53.5	100.0
Brasília[1]	77.9	22.1	100.0	3.7	96.3	100.0	39.8	60.2	100.0
Total	**62.4**	**37.6**	**100.0**	**5.8**	**94.2**	**100.0**	**41.6**	**58.4**	**100.0**

Source: IBGE - Demographic Census.
Note: [1] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride).

Migrants working in their municipality of origin travelled mainly from outskirts/center (75.7%), meaning that they moved out of the city center to live in an outlying municipality, while continuing to work downtown (table 7). In this case, the Brasília and the Goiânia metropolitan regions posted the highest percentages at 92.8% and 89.1% respectively. Outskirts/outskirts commutes account for only 16.6% of migrants that work in the same municipality that they previously resided in. However, atypical behavior appears in Manaus, where only 41.3% of immigrants worked in the same municipality as their former places of residence, commuting from the outskirts to the center, while 46.7% travel outside the MR.

TABLE 7
Percentage distribution of commuting immigrants during the decade by links between municipalities of origin and work and commuter flow types (2010)

Metropolitan region	Links between municipalities of origin and work and commuter flow types											
	Works in previous municipality of residence						Works in municipality other than that of previous municipality of residence					
	Outskirts/center[2]	Outskirts/outskirts	Center/outskirts	Other MR	Outside MR	Total	Outskirts/center	Outskirts/outskirts	Center/outskirts	Other MR	Outside MR	Total
Manaus	41.3	0.0	11.0	1.0	46.7	100.0	14.4	2.2	17.9	4.1	61.4	100.0
Belém	81.3	4.5	1.7	0.8	11.7	100.0	62.1	15.6	6.0	1.0	15.3	100.0
Fortaleza	79.8	7.4	3.0	1.8	7.9	100.0	45.6	28.6	12.8	1.7	11.3	100.0
Recife	76.0	13.1	3.8	1.7	5.4	100.0	52.7	27.4	9.8	1.1	9.0	100.0
Salvador	72.9	9.8	4.5	3.0	9.8	100.0	23.0	39.6	23.0	3.0	11.4	100.0

(Continues)

(Continued)

Metropolitan region	Links between municipalities of origin and work and commuter flow types											
	Works in previous municipality of residence						Works in municipality other than that of previous municipality of residence					
	Out-skirts/ center[2]	Out-skirts/ outskirts	Center/ outskirts	Other MR	Outside MR	Total	Outskirts/ center	Outskirts/ outskirts	Center/ outskirts	Other MR	Outside MR	Total
Belo Horizonte	81.2	12.8	2.7	0.7	2.7	100.0	53.3	30.3	10.7	1.1	4.6	100.0
Rio de Janeiro	64.8	27.5	3.1	1.3	3.3	100.0	59.0	30.8	4.1	1.0	5.1	100.0
São Paulo	72.5	22.4	2.6	0.5	2.0	100.0	44.7	42.5	6.6	0.6	5.7	100.0
Curitiba	85.0	8.0	2.1	1.0	3.8	100.0	60.8	18.0	15.4	1.2	4.6	100.0
Porto Alegre	60.0	32.2	2.4	0.8	4.7	100.0	42.9	42.8	8.0	0.6	5.7	100.0
Goiânia	89.1	1.3	1.3	1.6	6.7	100.0	74.8	4.8	7.8	3.6	9.0	100.0
Brasília[1]	92.8	1.4	1.1	1.3	3.4	100.0	83.8	6.1	3.5	2.8	3.8	100.0
Total	**75.7**	**16.6**	**2.6**	**1.0**	**4.1**	**100.0**	**52.7**	**31.5**	**8.3**	**1.2**	**6.4**	**100.0**

Source: IBGE: Demographic Census.
Notes: [1] The regional unit of Brasília was institutionalized as an Integrated Region of Development (Ride).
[2] "Center" refers to the municipality that is the center of the metropolitan region (also previously referred to as "central municipalities" in this text).

There were fewer immigrants working in municipalities other than where they live: 52.7% commute from the outskirts to the center and 31.5% travel among outlying municipalities. The Salvador MR stands out for migrants commuting between the city center and outlying municipalities, while Manaus stands out, with 61.4% of commute destinations outside its MR.

5 FINAL REMARKS

This study strives to identify possible links between immigration processes and the expansion of commuter mobility among workers in major metropolitan regions in Brazil. The changes that have reshaped migratory processes over the past few decades, according to the literature, include a certain slowdown in flows towards these urban areas, although they have not lost their status as major magnets for migrants.

The numbers of immigrants in the labor markets of these metropolitan regions fell slightly during the past decade, with their relative proportion in the workforce as a whole dropping more sharply. This is probably due to labor market dynamics that allowed not only the absorption of immigrants but also resident segments previously excluded from this market to an even greater extent, and is probably related to women workers. Although migratory flows have slowed, it cannot be forgotten that this process involved more than four million people during the decade, ushering them into the job market.

When assessing the participation of immigrants in the segment of the employed population that must travel to other municipalities in order to work – commuter trips – the findings were similar to those recorded for the entire labor

market. This study found an increase in the number of commuting immigrants and a sharp drop in the proportion of this category relative to commuting job-holders as a whole. More than 90% of the increase in the number of people commuting to work was due to the increase noted among non-migrants – people living for ten years or more in the municipalities where they were registered with the Census.

These findings lead to a relativization of the importance of migration in explaining the recent dynamics of metropolitan job markets, including the hypothesis relating the increase in commuter mobility to intra-metropolitan migration processes.

Initially, as mentioned, immigration processes, whether intra-metropolitan or not, still involve large numbers of job-seekers. To a greater or lesser extent, in all the metropolitan regions except for Recife, the number of non-regional immigrants in the job market exceeded their intra-regional counterparts, denoting the powerful appeal of these urban areas.

Individual migration track records appear to be associated with some identified commuter mobility patterns. Immigrants post commuting rates that are higher than those of non-migrants, although these figures may be influenced largely by the behavior of intra-metropolitan immigrants; as shown, half of this segment of the population that moved from homes in their cities works in municipalities other than those in which they live.

In terms of the predominance of commutes from outlying areas to central municipalities for all job-holders in almost all the metropolitan regions, the various types of migration seem to characterize the commuter flows to which workers are related. Intra-regional immigrants are involved mainly in commutes from outlying areas to metropolitan centers, with almost two thirds of them working in their previous municipalities of residence, experiencing the typical disassociation highlighted in the literature between places of work and places of residence.

With a commuting rate that is closer to that of non-migrants, non-regional immigrants share a greater participation in flows outside the metropolitan region, or commutes from central municipalities to outlying areas. Coming from parts of Brazil other than the regions in which they currently live, these immigrants seem to have lost work links with their places of origin, as only 5% of them stated that they worked in their municipalities of origin.

The perceived dynamics suggest that the physical expansion of metropolitan agglomerations through ongoing processes that increase and decrease land values in certain parts of the city trigger intra-regional migratory flows, maintaining the dissociation between home and work, which in some cases results in commutes, with longer distances to be covered in others. These movements are prompted by

housing costs as well as the quest for better living conditions. In addition to these dynamics, according to the analyzed data, new non-metropolitan immigrants settle directly in outlying municipalities without first going through the initial stage of living in central municipalities, as noted at the start of the peripheralization process of Brazil's urban areas.

At the same time as strong links are found between immigrants and commutes, significant growth is also noted for non-migrants in these movements. Considering shifts in migratory movements, the commuting rates for these two categories may well draw closer together over the medium term.

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CHAPTER 11

IMPACTS OF REGISTERED JOBS AND URBAN LOCATION ON WORK COMMUTES: AN INTRA-URBAN ANALYSIS OF FIVE METROPOLITAN AREAS[1]

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1 INTRODUCTION

Housing locations in intra-urban areas derive from a set of factors, encompassing family decisions, corporate decisions and labor relations arising from economic activities. Furthermore, spatial configurations and historical developments also result in a set of urban facilities and infrastructure that also influence family decisions on where to live.

This paper focuses on the issue of work, with much of the Brazilian job market split between formal (registered with benefits) and informal (unregistered without benefits) employment.

It is important to stress the expansion of registered jobs on the metropolitan labor market, which is a relatively recent process. During the 1990s, Ramos[4] (2002) highlighted an increase in casual work in metropolitan areas. However, the proportion of employees in the informal sector shrank from 2003 through to 2012 (Ipea/MT[5] p. A29, 2014). Nevertheless, this increase in formal employment did not encompass poorly-educated workers living in non-metropolitan areas (Barbosa Filho and Moura, 2012) with registered work available more easily to higher-income segments of the population.

This paper attempts to analyze and measure different types of urban appropriation by individuals, depending on the types of jobs that they hold, in an attempt to prove possible tradeoffs made between housing location and transportation costs. This assumption of substitution is the core principle underpinning the monocentric urban model proposed

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4. Available at: <http://goo.gl/DUsmUX>.
5. Available at: <http://goo.gl/ALdp4J>.

by Alonso, Muth and Mills (Nadalin, 2011), where people choose to live closer to their workplaces in order to shorten their commuting times.

The hypothesis is that formal (registered) jobs would lessen the need to live closer to the workplace with shorter commutes, compared to informal (unregistered) workers earning similar incomes. This analysis addresses five metropolitan regions (MR), not necessarily monocentric, one in each macro-region, defined as a case study: Belém, Salvador, São Paulo, Porto Alegre and Brasília (Federal District Integrated Development Region – Federal District and surrounding areas).

The issue addressed by this paper is highly relevant and up-to-date, as commuting times are rising steadily, along with the expansion of formal employment in major Brazilian cities. Prompted by the distribution of this type of employment link, this chapter attempts to understand the commuting characteristics of this group of people. Future public policies that seeks to reduce traffic congestion and its costs must pay close attention to commuting patterns of formal and informal workers, as well as the logic of their location in metropolitan contexts.

In addition to this introduction, this paper is divided into seven sections. The second section presents the construct underpinning the paper's hypothesis, together with its justification. Section 3 offers a brief review of the literature, highlighting work that indicates variables to consider when characterizing the commuting patterns of the group addressed by this paper. Section 4 presents the methodology developed for this project, identifying the variables used in the model, while Section 5 offers a descriptive analysis of the urban location of homes, employment links and incomes. Section 6 undertakes an econometric analysis of the urban areas listed above ascase studies, relating travel times to the individual and family parameters of people commuting to and from their jobs each day. The final section contains the conclusions of this paper.

2 FORMAL EMPLOYMENT AND URBAN LOCATION

The monocentric city model developed by Alonso, Muth and Mills (AMM) (Nadalin, 2011) assumes that families choose where to live on the basis of their incomes, distances between their homes and central business districts (CBDs), and the costs of commuting to jobs clustered in these downtown areas. Together, these decisions shape the bid-rent curve, which shows how much a family is willing to pay to rent a plot of land at a specific location. Consequently, the location of family homes is the outcome of a set of decisions steered not only by income, but also by commuting costs between home and the workplace.

It is worthwhile to mention the work by Abramo (2007), which shows that families pay far more attention to positive external factors deriving from interactions with other nearby families, and real economic opportunities, than to downtown commuting costs.

Further, Flores (2006) notes that poor spatial adjustment[6] functions through three mechanisms: *i*) distances between job supplies and demands resulting in external factors that nibble away at net incomes; *ii*) prejudices and stigmas adversely affecting people living in certain areas, limiting the spatial scope of this group to jobs in places outside their areas of residence; and *iii*) asymmetrical information on job availability, as minority groups are able to access information only through formal routes, such as classified advertisements and employment agencies, thus curtailing the capillarity of their activities.

Consequently, when considering the relation between transportation costs and decisions on where to live, external factors linked to interactions with neighbors and spatial mismatches between jobs and homes, access to employment for poor and vulnerable segments of the population is limited not only by their social status, but also by their location within metropolitan areas. This means that access to work – especially formal (registered) jobs that ensure a set of social and labor benefits for workers – directly affects the location of people in urban areas and the ways in which they relate to their neighbors.

Along these lines, a "cumulative circular course" effect may be noted, as described by Myrdal (1957 apud Lima and Simões, 2009), through which interconnections between the social system and exogenous effects shape and intensify the specific phenomena in a circular process. In this process, the state serves as an element that is exogenous to the system, either by creating social welfare policies, providing urban infrastructure or housing, and stirring or soothing current conflicts. When this exogenous force fails to act positively, a negative circular effect appears, where poverty, the spatial concentration of vulnerabilities and meager job openings worsen intra-urban inequality.

Consequently, the residents of underprivileged areas tend to continue at the same level, or their living conditions may deteriorate even further due to their neighborhoods, which have similar characteristics. Following this line of logic, moving one's home (residential mobility) to a better-developed district would constitute a high-potential step towards social change, as the exogenous effects of the characteristics of the new place of residence could generate positive external factors for the family as a whole.

In terms of the formal job market and the spatial distribution of housing, the cumulative, circular cause process and spatial mismatches adversely affect commuting times for specific areas if the resident workforce profile does not fit closely to

6. As noted by Ihlanfeldt and Sjoquist (1998), the spatial mismatch hypothesis initially included a strong racial component, structured on three assumptions: *i)* the creation of demands for jobs shifted from places with largely black populations to suburban areas with high growth rates; *ii*) racial discrimination in housing and mortgage markets, which hampered the ability of the black population to move closer to workplaces; and *iii*) prejudice among consumers, insufficient information on job opportunities, and poor public transportation between minority living areas and places with surging employment.

available work. Registered jobs tend to be further away from homes, especially for lower-income segments of the population, due to the spatial clustering of formal employment opportunities.

Consequently, this chapter explores the hypothesis that registered jobs (jobs in the formal sector) relativize the need for well-located homes, meaning in this case living close to work, especially for lower-income segments of the population, with direct effects on daily commuting times.

In the specific case of Brazil, informal (unregistered) employment is directly related to income, meaning that registered workers earn higher incomes than those in the informal sector (IBGE,[7] 2014). Overall, the mean monthly income earned from their main jobs by people over sixteen years old nationwide is R$ 1,921.00 (±US$ 480) for registered workers and R$ 1,093.00 (±US$ 273) for their unregistered counterparts: a mean difference of 75% (*op. cit.*, p. 140, 2014).

It is important to remember that, under Brazilian Labor Law, employers must cover the commuting costs of their employees through travel vouchers. This benefit is assured to the portion of the population in formal work relationships. These additions to their incomes may prompt people to forgo including travel times and costs when deciding on where to live, as the extra amounts resulting from this subsidy are included in family incomes.

An indicator reflecting the importance of this subsidy for low-income segments of the population appears quite clearly in the analyses of outlays for public and private transportation presented in the Family Budgets Survey, examined by Carvalho and Pereira (2012). At the nationwide level, a link was found between income and spending on transportation, reflecting a certain inequality in mobility among the population.[8] The first income decile spends more of the family budget on transportation than the last decile (21.83% and 15.77% of family incomes respectively). Looking at the public and private transportation expenditure categories, outlays are equivalent for the first decile, with almost no difference (respectively 10.3% and 11.53% of income), while the last decile spends only 0.71% on public transportation options and 13.83% on private transportation. Consequently, should a person in the first decile be employed in the formal sector of the economy, this 10.3% may be considered as an amount available to the family, as travel vouchers form part of family incomes, while the incomes of unregistered workers do not include this component.

7. Available at: <http://biblioteca.ibge.gov.br/visualizacao/livros/liv91983.pdf>.

8. Yet another example of commuter inequality in Brazilian Metropolitan Regions, according to Pereira and Schwanen (2013), based on the National Household Sampling Survey (Pnad), is the shrinking ratio between worker incomes and travel times: the higher the income, the shorter the travel time. The commute time for the lowest income decile is 20% higher, on average, than that of the highest income decile.

3 INTRA-URBAN MOBILITY AND OPPORTUNITIES

Analyzing the issue of urban mobility is certainly a challenging task, particularly as it involves many different factors, including home and job locations, as well as the availability of public transportation infrastructure. Furthermore, consideration must be given to aspects influencing choices by families of where they live and work. This section presents studies addressing this topic.

Issues of space and urban structures are among the factors that determine trip times and types of commutes. Along these lines, Villaça (2011) rebuts the classic monocentric city model where the poor population lives in underprivileged outlying areas, while more prosperous segments reside closer to downtown areas, instead proposing a more complex urban structure that better reflects segregation, with income being one of the main means of highlighting this.

We have seen several studies that show how decisions on where to live are shaped by many different factors, such as income and transportation costs, the spatial location of families in neighborhoods and housing costs, as well as the relative location of homes and jobs. However, in order to analyze real-life cases, the principle of substituting commute times for housing costs underpinning the AMM model must be extended in order to analyze polycentric cities as well. This paper is grounded on an understanding that metropolitan clusters may well encompass subsidiary hubs that complement metropolitan areas. In these regions, each municipal hub is a potential core district that will be upgraded through relations defined on the basis of people's homes and their workplaces.

On the other hand, transportation is generally a means of accessing the city and, if available and affordable in spatial or financial terms, it is a way of creating opportunities to increase income by allowing people to move beyond the spatial boundaries of their immediate neighborhood, accessing services, facilities, amenities and realities that differ from those in their everyday lives.

In a study of metropolitan regions in the United States, Glaeser et al. (2008) noted that individual transportation costs were among the reasons steering decisions on where to live for lower-income segments of the population, thus encouraging them to opt for areas with better public transportation infrastructure. In this study, the authors also found that public transportation was twice as, to three times more, important than individual income for explaining the location of povertyin US metropolitan areas.

Other authors rate transportation as a way of reducing poverty, with links to the dimension of individual and collective well-being. As an example, Gannon and Liu (1997) mentioned two approaches: direct and indirect. The direct approach links the formation of social capital (education and healthcare facilities) to better

accessibility, along with easier access to social and economic opportunities, including services and the labor market. The indirect approach requires more efficient resource allocation, particularly within the global and systemic mobility context. According to these authors, high transportation costs lead to spatial, social and economic exclusion for the poor.

In order to measure the issue of mobility, commute times and vehicle ownership are particularly noteworthy among a range of possible indicators, used by Pereira and Schwanen (2013). These authors use the following justifications for the importance of commute times in transportation and mobility analyses: *i*) impacts on forms of social and economic organization of urban space (Alonso, 1964 apud Pereira and Schwanen, 2013); *ii*) effects on individual and corporate decision-making processes related to homes and workplaces (Gordon et al.,1991 apud Pereira and Schwanen, 2013); and *iii*) as a possible indicator for analyzing inequalities (Crane apud Pereira and Schwanen, 2013).

Exploring the relevance of residential segregation and employment opportunities in urban areas, Ribeiro, Rodrigues and Corrêa (2010) conducted a study of seventeen Brazilian cities in order to identify territorial effects by using factor analysis techniques to examine the links among the following dependent variables: *i*) unemployment situation; *ii*) weakness of employment links – whether self-employed workers pay social security dues, whether domestic workers are registered or unregistered, and if unregistered workers pay social security dues; *iii*) income from main job. Additionally, the authors use the following variables as controls: gender, age, education, market connections, per capita household incomes and attitudes towards education in the home. The findings of this study (Ribeiro, Rodrigues and Corrêa, 2010) indicate a heterogeneous intra-urban labor market resulting from living areas, linking individual opportunities to the opportunities of their places of residence, with few opportunities related to places with low social capital.

In another study, Ettema et al. (2007) noted that – in addition to social and demographic factors such as gender, job status, presence of children in the home and car availability, as well as job characteristics such as commutes types and durations (Gliebe and Koppelman, 2005; Zhang, Timmermans and Borges, 2004), location-specific factors (high and low density neighborhoods) also shape the ways in which people travel and allocate their time in space. These factors are important as different contexts offer their residents different time allocation opportunities or constraints.

In an analysis comparing realities in the United States and the United Kingdom, Giuliano and Dargay (2006) relate vehicle ownership, trip distance and land use, using regression techniques. The main findings for both countries were: *i*) higher incomes are linked to longer trips; *ii*) being employed implies lengthier

commutes; *iii*) increased density has a negative effect on distances covered; *iv*) the presence of automobiles implies lengthier commutes; and *v*) not being in a metropolitan area shortens trip distances in the United States.

As a case study of a developed country, the issue of unregistered labor does not appear. Including employment/unemployment analysis does not provide any information on the issue of formal (registered) jobs and commutes, as travel by jobless people seeking work is quite different from trips by informal (unregistered) workers. This prompts the need for a specific analysis of this aspect in Brazil.

Earlier studies underscore the need to consider metropolitan areas – whether more or less polycentric – in addition to more complex types of spatial and income segregation. Mobility is a complex topic, and it must be emphasized that each study explores an element influencing this phenomenon. In other analytical paradigms, there are studies spotlighting more elements, other than those already mentioned. Nevertheless, the literature analyzed here underscores the importance of public transportation as a means for accessing the cities and the opportunities that it offers, particularly for poorer segments of the population. It thus appears valid to focus on two factors that influence mobility: urban location and formal (registered) labor relations.

4 EMPIRICAL APPROACH

The hypothesis explored in this survey was tested through alinear regression model that assessed the determining factors for commuting to work, including the urban location of individuals and distance to the workplace, in addition to a set of independent variables identified in reference literature. We then explain in greater detail how this literature relates these variables to trip durations. This survey uses secondary data from Brazil's 2010 Population Census.

It should be noted that this is an econometric model designed to conduct an exploratory analysis of the data, not derived from a theoretical model striving to identify all the variables involved in this phenomenon and their causal links. Important dimensions not encompassed by the Population Census are not taken into consideration, including trip mode: walking, bicycle, automobile or public transportation.

This chapter uses the weighting areas of the population census within official metropolitan districts as the reference for the spatial location of families, calculating the distance between the center of each weighted area (WA) and the CBD of the core municipality of the metropolitan region.[9]

9. The CBDs are established on an *ad hoc* basis by the authors of this paper, as the municipal boundaries are taken from a Territorial Mapping and Location Registration Research Project (*Mapeamento das unidades territoriais, cadastro de localidades*) conducted by the Brazilian Institute for Geography and Statistics (IBGE) and available at: <http://goo.gl/2oHe6x>. Accessed on: June 11, 2015.

In addition to Euclidean distances from the CBD and municipal border, the analysis also addresses the metropolitan location of the domicile – as either central or outlying (Pereira and Schwanen, 2013; Giuliano, 2003; Giuliano and Dargay, 2006).

The commute time variable to be explained by the econometric model was adjusted, making this categorical variable continuous from the midpoint among the time categories listed in the questionnaire.

For the *income variable*, the incomes of people stating that they worked during the period were used. Income brackets were defined using the minimum monthly wage as reference, allowing direct comparisons with public housing policies, in addition to streamlining analyses of the effects of registered employment links for lower-income segments of the population making heavier use of travel vouchers.

The dimension of poverty is also important this constitutes supplementary income information that may influence people's commuting patterns. Consequently, *family vulnerability* will be assessed through the income dependence relation – in other words, the extent to which the family depends on the income brought in by the head of the household.

As proposed by Ettema, Schwanen and Timmermans (2007), Giuliano (2003), and Giuliano and Dargay (2006), the model considers the *presence of an automobile* or motorcycle in the home.

For *formal jobs*, a concept is used similar to the one proposed by Ribeiro Rodrigues and Corrêa (2010) in terms of formality (registered employment) and informality (unregistered work). The informal job sector consists of individual workers in the informal sector, other than the self-employed,[10] not paying dues into the government-run social security system.

Additionally, only jobs actually within the metropolitan region were taken into consideration, discarding people living in regions that indicated they worked in some other municipality outside the metropolitan region of reference or in another country. The analyses presented in section 5 and 6 address workers with positive financial incomes commuting to work every weekday. Other than for tables 1 and 2, the analyses do not encompass workers engaged in economic activities within their own homes.

10. Self-employed workers were ranked in the same category as workers in the informal sector, due to similarities in income distribution and payment of social security dues.

5 EMPLOYMENT LINKS AND URBAN INSERTION IN THE METROPOLIS IS UNDER ANALYSIS

In the five regions under analysis, 10.565 million workers are registered in formal jobs, with 4.405 million people in the informal sector. Table 1 shows the variations in informal jobs by worker income levels. Proportionately, unregistered workers are clustered in lower income brackets: 70.7% of workers earning less than half a minimum monthly wage (MW) are not registered. Similarly, among more than 4 million casual workers, 43.3% earn up to one minimum monthly wage, compared to only 15.4% of registered workers.

TABLE 1
Total number of workers by income bracket. Set of metropolitan regions: Belém, Salvador, São Paulo, Porto Alegre and the Federal District (2010)

	Up to 0.5 MW	0.5 - 1 MW	1 - 3 MW	3 - 10 MW	More than 10 MW	**Total**
Formal	221,284	1,405,188	5,846,831	2,413,527	678,551	**10,565,381**
Informal	535,107	1,371,285	1,879,785	535,544	84,100	**4,405,821**
Informal (%)	70.7	49.4	24.3	18.2	11	**29.4**

Source: 2010 Census.
Elaborated by the authors.
Obs.: In order to calculate the total number of employed persons, only those with positive financial incomes were taken into consideration, commuting to work each day in the same metropolitan region that they live in, or those performing economic activities in their homes.

Table 2 shows how these workers are distributed in each metropolitan region under analysis. The workforce in the largest mega-city in Brazil, the São Paulo metropolitan region, is on a far larger scale, as its total number of workers far outstrips the other regions examined in this paper. Nevertheless, its informal employment rate is among the lowest, below even the figures for Porto Alegre. In simple terms, regions with lower mean incomes post higher informal employment rates, except for Brasília, with a higher mean wage for its workers, and a midline casual employment rate.

The number of people working from home is certainly not a negligible phenomenon; to the contrary, it is commonplace and evenly distributed in each region. The proportions of people working from home does not vary widely, hovering between 21% and 24%.[11] Finally, among unregistered workers, a slightly higher proportion work out of their homes. With only minor variations among the metropolitan regions, this information on informal jobs is of much interest, as it may be assumed that unregistered workers operate mainly out of their homes.

11. The 2007 survey on trip origins and destinations for the São Paulo subway found 10.1% proportion of "working from home" for this metropolitan region, which is far lower than the 27.4% found by the 2010 Population Census. The total number of 9,065,974 jobs recorded in the survey does not differ greatly from the figures in the 2010 Population Census. See: <http://goo.gl/SQxxVi>. Accessed on: June 17, 2015.

TABLE 2
Descriptive statistics for workers in Belém, Salvador, São Paulo, Porto Alegre and Federal District – Brasília (2010)

	Belém	Salvador	São Paulo	Porto Alegre	Federal District
Total no workers	828,508	1,528,149	9,111,724	1,887,246	1,615,575
Total no unregistered workers	380,121	514,004	2,495,276	499,426	516,994
Unregistered workers (%)	45.88	33.64	27.39	26.46	32.00
Mean worker incomes (R$)	1,226	1,333	1,847	1,583	2,123
Total number of people working from home	197,240	362,210	2,325,387	400,324	348,760
People working from home (%)	23.81	23.70	25.52	21.21	21.59
Unregistered people working from home (%)	31.19	30.74	32.43	30.84	28.95

Source: 2010 Census.
Elaborated by the authors.
Obs.: In order to calculate the total number of employed persons, only those with positive financial incomes were taken into consideration, commuting to work each day in the same metropolitan region where they live, or those performing economic activities in their homes.

For the other dimensions explored by this paper, table 3 offers a comparative overview of the metropolitan regions under examination. With regard to urban location, distances to the CBD of each metropolitan region and workplaces varied widely, reflecting geographical and topographical differences, as well as one or more job-clustering hubs.

TABLE 3
Urban location, mobility, employment and income in Belém, Salvador, São Paulo, Porto Alegre and the Federal District (2010)

	Belém	Salvador	São Paulo	Porto Alegre	Federal District
Distances to CBD (km)	10.91	23.10	17.62	22.91	29.3
Distances to CBD – registered workers (km)	10.25	22.24	17.46	22.78	27.14
Distances to CBD – unregistered workers (km)	11.82	24.88	18.14	23.38	34.55
Distances to workplace (km)	7.74	8.5	11.51	8.6	19.58
Distances to workplace-registered workers (km)	7.71	9.05	11.67	8.92	19.85
Distances to workplace-unregistered workers (km)	7.79	7.36	11.05	7.59	18.99
Commute time (min.)	33.54	40.12	47.5	31.83	37.79
Commute times -registered workers (min.)	36.04	42.87	49.72	32.63	39.35
Commute times-unregistered workers (min.)	30.02	33.86	40.79	29.17	33.95
Workers living nearby (%)	32	22	41	63	29
Unregistered workers living nearby (%)	34	25	41	64	38

Source: 2010 Census.
Elaborated by the authors.
Obs.: The statistics are based on the mean variables, considering only workers with positive financial incomes, commuting to work each day in the same metropolitan region where they live.

A very interesting aspect is that the mean distance traveled by workers to the São Paulo CBD is the second shortest of all, although this metropolis is far larger than the others by number of workers, although not by geographical size. The only possible explanation is that this metropolis is more densely populated than the others, with more compact urban structures. In Brasília, longer distances traveled to the CBD and workplaces are not surprising, due to the satellite towns and nearby municipalities that have sprung up around the Brazilian capital, far away from the original planned area that encompassed its CBD and nearby neighborhoods.

For the distance to workplace variable, São Paulo ranks second, indicating that people travel more, despite living closer to the CBD. This reversal may also indicate that jobs are better distributed in spatial terms, scattered throughout employment hubs other than the CBD, due to the economic dynamics of this metropolis. Porto Alegre and Salvador apparently follow this same logic, with the largest differences between mean distances to their CBDs and mean distances to workplaces.

Commuting times vary significantly among these cities, ranging from 32 to 47 minutes. On the one hand, there is a scale effect in metropolitan regions, where tighter clusters generate longer traffic jams. As a result, larger cities (such as São Paulo) post lengthier commutes, with shorter trips in smaller cities such as Belém. On the other hand, multi-hubbed cities also tend to have shorter commutes. As a higher percentage of workers in metropolitan regions live outside the main municipality in Porto Alegre, it seems likely that jobs are also more evenly distributed, which would help explain its short mean commute times.

Exploring the issue of employment links, it is noted that registered workers have lengthier commutes and live further away from CBDs than their unregistered counterparts in all these metropolises. This proves one of the hypotheses addressed in this paper, which is that travel vouchers for registered workers encourage them to accept housing options that are further away from their jobs, resulting in longer trips. If this is true, the commute times of registered employees should be longer than those of unregistered workers.

Interestingly, registered and unregistered workers are not tightly clustered in the core municipality or surrounding areas, as a percentage of unregistered workers living in surrounding areas is very similar to the percentage of all workers living in surrounding areas. Brasília merits special attention; it is an unusual scenario with more unregistered workers living nearby in municipalities outside the Federal District boundaries, due to the striking aspect of satellite towns and spatially-motivated income inequalities.

6 TIME-RELATED DETERMINING FACTORS FOR INTRA-METROPOLITAN TRIPS

Multiple linear regression was used to analyze the trip time determining factors in the Federal District and all the metropolitan regions under analysis, together with their surrounding areas, in order to identify links between the dependent and independent variables of the model, also showing the significance of their determining factors. Based on the methodology defined in Section 4, variables were identified leading to the following equation, which was estimated through ordinary least squares, using the SPSS software:

$$\begin{aligned} Yi = {} & \beta_0 + \beta_1 Dist_{work} + \beta_2 Dist_{CBD} + \beta_3 Core + \beta_4 Informal + \\ & \beta_5 Motorcycle + \beta_6 Car + \beta_7 Dep + \beta_8 Income_2 + \beta_9 Income_3 + \\ & \beta_{10} Income_4 + \beta_{11} Income_5 + \beta_{12} Rent + \varepsilon_1 \end{aligned} \quad (1)$$

Where the dependent variable is the commute time and "Dep" indicates dependence on income, the "$Income_2$" to "$Income_5$" binary variables indicate income brackets or 0.5 MW to 1 MW, 1 MW to 3 MW, and 3 MW to 10 MW. Indicating the lowest income bracket to 0.5 MW, income $variable_1$ was omitted. The variable "$Dist_{work}$" indicates the Euclidian distance (km) between the home of a person to its workplace municipalities and the variable "$Dist_{CBD}$" the Euclidian distance to the metropolitan CBD. The "Core" is a binary variable that indicates if a person lives at the administrative center of the metropolitan region or on its outlying area. The "Informal" is a binary variable and indicates if a person is an unregistered employee. The automotive vehicle ownership is identified by the binaries variables "Car" and "Motorcycle". The variable "Rent" refers to the housing status if a person rents or lives in some other type of home situation - either owned or borrowed[12].

The findings of the regression analysis are presented on the basis of commute times calculated through the estimated model parameters applied to the characteristics of a reference worker. All the variables are statistically significant, except the last income bracket for Belém and Porto Alegre. The commute time estimated for this reference worker is then compared to its variations when one of the dependent variables changes. For binary variables, for example, the commute time of a reference worker owning an automobile is compared to the commute time of a worker with the same characteristics who does not have a car.

We stress that reference worker characterizations vary significantly among the metropolitan regions. The reference values for the continuous variables are their respective averages, presented in table 4.

12. The borrowed expression refers when someone else who owns a house and lends it to another person. Others similars expressions could have the same comprehension such as gift apartments" or "rent-free tenancies."

TABLE 4
Reference worker characterization by metropolitan region

	Belém MR	Salvador MR	São Paulo MR	Porto Alegre MR	Federal District and surrounding areas
Distance work (average)	6.06	6.22	9.87	5.78	20.68
Distance CBD (average)	9.74	23.44	16.27	19.58	24.69

Source: IBGE, 2010.
Elaborated by the authors.
Obs.: The statistics refer to the mean values of the variables. Only workers with positive financial incomes were taken into consideration, commuting each day to work in the same Metropolitan Regions in which they live.

In order to categorize the reference worker by the binary variables, the proportion of all individuals with a specific characteristic was used, as shown in table 5. Thus, when a metropolitan region presents a proportion of more than 50%, this was rated as a characteristic of the reference worker. In order to identify income brackets, those with the largest proportion of workers were used, not necessarily encompassing more than half of them.

TABLE 5
Total number of people with specific characteristics – selected metropolitan regions (2010)
(In %)

Metropolitan regions	Core area resident	Rented homes	Owns motorcycle	Owns automobile	Unregistered worker	Income brackets [a]				
						1	2	3	4	5
Belém MR	66	14	12	26	41	7	35	41	13	3
Salvador MR	77	19	9	33	31	8	33	41	14	4
São Paulo MR	56	22	12	59	25	2	13	57	22	5
Porto Alegre MR	35	15	16	59	23	3	16	58	19	4
Federal District and surrounding areas	70	27	13	59	29	4	22	45	21	9

Source: IBGE (2010).
Elaborated by the authors.

$$Y_i\text{^}= 36.4= 34.2+ 0.06*6.06 + 0.06*9.74 + -6.38*1 + -6.07*0 + -5.71*0 + -3.54*0 + 2.25*0 +5.85*0 +7.62*1 +5.22*0 -0.44*0 -2.84*0 +0$$

Altering only the unregistered work variable from “0” to “1”, the estimated reference worker commute time drops by 6.07 minutes: 16.68% shorter at 30.32 minutes. In this case, equation (1) becomes:

$$Y_i\text{^}= 30.32= 34.2 + 0.06*6.06 + 0.06*9.74 + -6.38*1 + -6.07*1 + -5.71*0 + -3.54*0 + 2.25*0 +5.85*0 +7.62*1 +5.22*0 -0.44*0 -2.84*0 +0.$$

TABLE 6
Regression findings of travel time for unregistered work, housing status and vulnerability variables compared to reference workers – selected metropolitan regions

Metropolitan regions	Unregistered work		Housing status		Vulnerability	
	Variation (%)	(min.)	Variation (%)	(min.)	Variation (%)	(min.)
Belém	-16.68	-6.07	-5.85	-1.81	2.33	0.72
Salvador	-12.38	-4.60	-4.30	-1.60	2.16	0.80
São Paulo	-16.22	-7.33	-5.52	-2.49	2.35	1.06
Porto Alegre	-7.71	-2.28	-7.79	-2.08	-0.72	-0.19
Federal District	-18.69	-5.03	-6.80	-2.71	0.94	0.37

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.
Obs.: These comparisons were based on the reference workers and the regression parameters estimated for each metropolitan region (Annex 1). The variation is given by alterations to the variables under analysis.

These are the findings for all the metropolitan regions and the other commute time variables. It is noteworthy that among the variables analyzed, employment links are in the group with the strongest impacts on home-to-work commute times, together with incomes, metropolitan location and distance to work.

In all the metropolitan regions, commute times to unregistered jobs were shorter, proving one of the hypotheses explored by this research. Travel vouchers available only to registered workers may mean that their unregistered counterparts live closer to the places where they work, with shorter travel times. Another plausible hypothesis is that the higher wages earned by registered workers allow heavier expenditures on lengthier commutes.

6.1 Housing status

Housing status shows whether a person rents or lives in some other type of home – either owned or borrowed. In all the metropolitan regions, trip times for employees with all reference worker characteristics living in rented homes are 5.85% to 7.79% shorter (table 6). This behavior underscores a perception that renters are more open to change than homeowners, due to their housing status in terms of distances between homes and workplaces. The spatial mobility inherent to work and more flexible housing status opens up a set of choices that allow better adjustments to the spatial needs of families, with repercussions on commute times.

6.2 Family vulnerability

For the purposes of comparing vulnerability and dependence on income, a dependence value of 1 was used, benchmarked to reference workers. In general, this indicator had little effect on trip times in all the metropolitan regions, which were lengthier, except in Porto Alegre (table 6).

6.3 Automotive vehicle ownership

Vehicle ownership is defined by the presence of an automobile or motorcycle in the home. The impacts of this component are among the strongest for reducing commute times in the metropolitan regions under analysis (table 7). In all these cities, motorcycle ownership shortened commute times.

TABLE 7
Regression findings of travel time for motorcycle and automobile ownership variable compared to reference workers – selected metropolitan regions

Metropolitan areas	Motorcycle		Automobile	
	Variation (%)	Time (min.)	Variation (%)	Time (min.)
Belém	-16.26	-5.04	-8.47	-2.62
Salvador	-5.68	-2.11	-9.34	-3.47
São Paulo	-9.88	-4.46	+9.27	+4.61
Porto Alegre	-12.23	-3.26	+13.99	+4.34
Federal District	-9.87	-3.93	+8.41	+3.66

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.
Obs.: These comparisons were based on the reference workers and the regression parameters estimated for each metropolitan region (Annex 1). The variation is given by alterations to the variables under analysis, namely: the presence of a motorcycle or automobile in the home. The reference workers for São Paulo, Porto Alegre and the Federal District own automobiles.

As reference workers in the São Paulo, Porto Alegre and the Federal District metropolitan regions own automotive vehicles, the impact of this variable was calculated for the absence of an automobile in the home, thus altering the interpretation and resulting in longer trip times. For the other cities, the transition from homes without automobiles to those with automobiles resulted in shorter commute times. Although use was not measured, the availability of these assets allow their potential use, resulting in the difference noted in the analysis.

6.4 Space-related variables

The spatial effect is broken down into two continuous variables: one related to metropolitan location based on distances between homes and the main CBD, with the other addressing distances between homes and municipal areas where workers are employed. Additionally, consideration was given to the location of the domicile, in either the core municipality or surrounding areas. Based on the literature, negative effects on trip times are expected, with shorter distances to metropolitan employment hubs and distances to municipalities where people work, in addition to homes located in downtown districts.

6.4.1 Resident in outlying metropolitan districts

This variable produced some of the strongest impacts on commute times in the metropolitan regions. For all of them, workers living in the core municipalities reported shorter trip times, except for Salvador (table 8).

TABLE 8
Regression findings of travel time for living in core municipality variable compared to reference workers – selected metropolitan regions

Metropolitan areas	Variation (%)	(min.)
Belém	-31.23	-14.06
Salvador	11.54	3.84
São Paulo	-9.14	-4.54
Porto Alegre	-9.93	-2.94
Federal District	-21.74	-11.08

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.
Obs.: These comparisons were based on the reference workers and the regression parameters estimated for each metropolitan region (Annex 1). The variation is given by shifting from not resident to resident in core municipalities.

6.4.2 Distances from weighted home area centroids to metropolitan CBDs

As this is a continuous variable, its impact refers to the reference worker distance comparison for a single ten kilometer increment, with 95 percentile distance alterations.

All the metropolitan regions presented shorter trip times when moving ten kilometers away from the metropolitan CBD, in addition to the reference worker distance, with the other variables remaining unchanged, such as distance to work (table 9). In other words, if two people each live a kilometer away from their workplaces, the person living closer to the CBD will have lengthier commute times. Possible reasons for this include longer traffic jams in streets leading to downtown areas and also perhaps job decentralization in metropolitan areas.

TABLE 9
Regression findings of travel time for urban location variables compared to reference workers – selected metropolitan regions

Metropolitan Areas	Distance to MR				Distance to work			
	10 km		95th percentile		10 km		95th percentile	
	Variation (%)	(min.)	Variation (%)	(min.)	Variation (%)	(min.)	Variation (%)	(min.)
Belém	-28.16	-8.72	-44.86	-13.89	72.27	22.38	84.63	26.21
Salvador	-12.56	-4.66	-31.93	-11.85	40.64	15.08	76.53	28.40
São Paulo	-8.99	-4.06	-16.88	-7.62	42.33	19.12	69.34	31.32
Porto Alegre	-14.11	-4.18	-44.15	-13.08	50.17	14.86	96.68	28.64
Federal District	-5.87	-2.34	-33.95	-13.54	26.86	10.71	56.54	22.54

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.
Obs.: These comparisons were based on reference workers and regression parameters estimated for each metropolitan region (Annex 1). The variation is given by a ten kilometer alteration in the distance, together with workerdistance in the 95th percentileof this variable.

Furthermore, the commute times of people living the average distance away with those represented by the 95th percentile for distance (table 10) in order to offer a comparison with workers living almost on the boundaries of these metropolitan areas. This relativizes impacts resulting from the specific characteristics of the areas under analysis, as ten kilometers may be far in Belém but not in Porto Alegre, for example. This is clearly apparent when analyzing the values for workers in the 95th percentile presented in table 10.

TABLE 10
95th percentile reference value for the following variables: distance to work and distance of the CBD (km)

	Belém MR	Salvador MR	São Paulo MR	Porto Alegre MR	Federal District and surrounding areas
Distance to work (95th percentile)	17.77	25.05	26.25	25.05	41.73
Distance to CBD (95th percentile)	25.67	48.86	35.05	50.86	82.55

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.

Commute times based on 95th percentile distances step up the impacts of this variable for reference workers. Nevertheless, there are still differences for each city (table 9).

It is important to stress the variation between the two analyses undertaken – increases in fixed distances and effects of location in outlying metropolitan districts. Cities that sprawl more widely[13] present larger variations between these two analyses, reaching 478% in the Federal District and surrounding areas and 213% in the Porto Alegre metropolitan region. In both these cases, urban sprawl and the resulting low population densities reflected more widely scattered urban development, leading to the possibility that workers are more closely tied to outlying municipalities than CBDs as places of employment.

6.4.3 Distances from weighted home area centroids to CBD in workplace municipalities

In contrast to the behavior noted for the territorial location of homes, the relation between distances from homes to CBDs in workplace municipalities, measured from weighted home area centroids, is more homogenous for the cities under analysis, with this variable having the strongest impacts on trip times. Like the previous component, the comparison is based on a single ten kilometer increment in the distance between the home and workplace CBD, as well as the relative distance for the 95th percentile, and its interpretation must take into account the fact that the distances between homes and metropolitan CBD remain unchanged.

13. The footprints and populations of the metropolitan regions and the Federal District and surrounding areas analyzed are: *i*) Belém MR – 3,566,222 km² and population of 2,581,661 inhabitants; *ii*) Salvador MR – 4,375,123 km² and population of 3,919,864 inhabitants; *iii*) São Paulo MR – 7,946.84 km² and population of 20,284,891 inhabitants; *iv*) Porto Alegre MR – 10,346.00 km² and population of 4,181,836 inhabitants; and *v*) Federal District and surrounding areas – 56,433.60 km² and population of 4,118.154 inhabitants.

For the fixed in kilometer increment and the 95th percentile, impacts on trip times in metropolitan regions were positive for longer distances to work.

7 INCOME

The effects of income on trip time analysis is grounded on the assumption that higher incomes are correlated with shorter trip times. In general, regardless of the metropolitan area, reference workers earning between one and three minimum wages posted lengthier commute times than other income brackets. The difference is greater for lower and higher incomes, meaning the extremes (table 11).

TABLE 11
Regression findings of travel time for income brackets compared to reference workers – selected metropolitan regions

Metropolitan regions	Class 1 – up to 0.5 MW		Class 2 – 0.5 to 1 MW		Class 4 – 3 to 10 MW		Class 5 – more than 10 MW	
Belém	-21.01%	-6.51	-3.67%	-1.14	-6.61%	-2.05	-18.17%	-5.63
Salvador	-8.57%	-3.18	-1.32%	-0.49	-7.01%	-2.60	-10.79%	-4.00
São Paulo	-22.86%	-10.33	-3.19%	-1.44	-6.38%	-2.88	-11.86%	-5.36
Porto Alegre	-16.48%	-4.88	-0.82%	-0.24	-13.83%	-4.10	-22.01%	-6.52
Federal District	-26.42%	-7.11	-3.28%	-0.88	-15.14%	-4.08	-27.38%	-7.37

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.
Obs.: These comparisons were based on the reference workers and the regression parameters estimated for each metropolitan region (Annex 1). The variation is given by alterations to reference worker income brackets.

The influence of income on trip times reflect social and economic status, as well as spatial location. The greatest reductions in trip times occurred in the lowest income bracket – possibly because of poor access to transportation services, due either to their (un)availability or for financial reasons – and for the highest earners who can afford private transportation, with better spatial location, as already noted above.

8 CLOSING REMARKS

This chapter analyzes the relationship between commute times, employment links and the urban location of homes in major Brazilian cities. The chapter aims to achieve a better understanding of how these variables interact, thereby paving the way for the creation of public mobility policies focused on specific groups.

The decision to analyze five metropolitan regions proved a necessary step. Each region displayed its own specific characteristics in terms of their job markets (unregistered labor and worker income levels) as well as the urban configurations. The urban location patterns of registered and unregistered workers were analyzed within their specific metropolitan contexts. A related issue requiring further

in-depth examination is the spatial distribution of jobs, to discover whether they are tightly clustered or spread out among multiple hubs. This dimension was not analyzed here, although circumstantial evidence indicates that it is important to justify many of the differences noted in these cities.

The empirical analysis of information taken from Brazil's 2010 Population Census showed that income, urban location, employment links and vehicle ownership are the variables with the strongest impacts on the commute times of metropolitan workers. Formal (registered) employment implies shorter commute times, with this finding apparent not only in the mean commute times for these two groups, but also in the multiple regression analysis, as a control factor for the other variables.

For income, greater reductions in commute times were noted for reference workers in the lowest and highest income brackets of this analysis. Among workers earning up to 0.5 minimum wages, shorter times are due to budget constraints, while briefer commutes for top-bracket earners result from their locations within the metropolis, as well as their financial status.

The impacts of urban locations on worker commute times were aligned with expectations: downtown residents posted shorter trip times than those living in neighboring towns, while longer distances to workplace CBDs resulted in lengthier commute times. The multiple regression highlighted the effect of distance from the metropolitan CBD, with distances from workplace municipalities remaining constant. Consequently, shorter commute times were found further away from metropolitan hubs, when distances to workplace were held constant. Possible reasons may well include heavier traffic in downtown areas, and a possible decentralization of jobs, which may be scattered more widely throughout metropolitan areas.

The hypothesis that formal (registered) employment leads people with mid-level incomes (under 0.5 MW and up to 10 MW) to a specific appropriation of metropolitan space is proven in this chapter, either because they live further away or have lengthier commutes. Specifically in terms of time, investment policies focused on public transportation infrastructure, along with the rationalization of public transit operations, helps upgrade the mobility conditions of this specific segment of the population.

For unregistered workers, shorter commute times and living closer to their jobs may be related to families deciding to live closer to these workplaces. Nevertheless, for earners in the lowest income bracket, trip durations are related more to an inability to pay fares and limited job opportunities near their homes. Specific policies are required for this group, breaking away from the "circular causality" effect and opening up access to the city for members of this group. Individual or

systemic transportation system subsidies could well be suggested as valid alternatives for this segment.[14]

Other policies – including better opportunities for finding formal employment, more housing units in downtown areas, and investments in non-motorized mobility infrastructure – are all valid alternatives for improving the urban location of this segment of the population in major Brazilian cities.

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ANNEX 1

TABLE A.1
Estimated regression coefficients for metropolitan areas

	Belém		Salvador		São Paulo		Porto Alegre		Federal District	
R2	230 (a)		.259(a)		.309 (a)		.417(a)		.365 (a)	
R2 Adjusted	0.053		0.067		0.095		0.174		0.133	
Variables	Coefficients	t	Coefficients	t	Coefficients	t	Coefficients	t	Coefficients	t
(Constant)	34.20	183.67	32.84	139.74	29.70	312.78	33.31	202.59	41.65	245.92
Distance_work	0.06	55.56	0.08	68.24	0.45	544.39	0.75	371.00	0.35	292.12
Distance_CBD	0.06	11.35	-0.14	-29.26	0.21	136.69	-0.38	-203.27	-0.19	-129.41
Core	-6.38	-68.49	7.75	51.23	6.88	230.05	-2.24	-27.55	-8.65	-119.88
Informal	-6.07	-82.36	-6.27	-60.34	-8.68	-289.79	-3.01	-48.62	-6.52	-111.73
Motorcycle	-5.71	-54.57	-3.50	-24.90	-4.69	-124.33	-3.62	-56.41	-5.24	-70.91
Car	-3.54	-38.61	-2.18	-19.20	-5.02	-177.22	-4.49	-82.23	-4.74	-79.74
Dep	2.25	17.89	2.13	13.25	3.97	81.94	0.54	5.34	2.94	30.81
Income2	5.85	41.40	3.29	17.98	9.62	108.33	5.13	32.28	7.78	53.39
Income3	7.62	52.08	4.35	22.69	11.58	134.88	5.65	36.33	9.18	63.20
Income4	5.22	29.10	4.14	18.03	7.69	84.45	1.90	11.15	2.20	13.85
Income5	-0.44	-1.71	4.26	14.65	3.08	29.23	-0.13	-0.51	-5.87	-33.02
Rent	-2.84	-29.07	-2.65	-22.87	-4.05	-131.74	-3.05	-42.13	-3.80	-66.00

Source: Regression findings by the authors, with data from Brazil's 2010 Population Census.

CHAPTER 12

URBAN INSERTION OF GOVERNMENT HOUSING PROJECTS: EVERYDAY MOBILITY AND LAND USE[1]

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1 INTRODUCTION

Since 2007, the Brazilian Government has been implementing a policy that channels massive investments in infrastructure through its Growth Acceleration Program (*Programa de Aceleração do Crescimento* – PAC). Although funding for favela upgrades was included, investments in urban infrastructure were not initially among the main priorities of this program. However, the situation changed drastically from 2009 onwards, followed by the launch of the second Growth Acceleration Program (PAC-2)

1. This is a condensed version of the Discussion Paper 2176 published by Ipea on the basis of field surveys in Rio de Janeiro and São Paulo conducted by Pedro Torres, Gabriel Schvarsberg, Luc Nadal and the LabCidade staff at FAU/USP, coordinated by Professor Dr. Raquel Rolnik with the assistance and revision of Álvaro Luis dos Santos Pereira, Ana Paula de Oliveira Lopes, Fernanda Accioly Moreira, Júlia Ferreira de Sá Borrelli, Luanda Villas Boas Vannuchi, Luis Guilherme Alves Rossi, Luciana Royer, Rodrigo Faria Gonçalves Iacovini, Vitor Coelho Nisida, Décio Rodrigues Nunes Junior, Lucas Pacobahyba, Gabriel Oliveira, Juliana de Castro, Juliana Muniz and Ana Nassar. Field surveys in Uberlândia and the respective analyzes were handled by staff and students from the School of Architecture, Urban Planning and Design at the Uberlândia Federal University, consisting of Simone Barbosa Villa (Consultant), Débora Cristina Araújo (Student, Graduate Studies Program in Architecture and Urban Planning) and Ana Beatriz Miquelutti de Oliveira, Ellen Vanessa Soares Pereira, Ernesto Melo, Gabriela Caetano Buiatti, Henrique Inocêncio Borges, Larissa Oliveira Castilho, Lucas Eduardo Bueno Dantas, Rafael Gonçalves, Raquel Silva Nascimento Oliveira and Talita Pereira de Araújo (Graduate Students in Architecture and Urban Planning).

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in 2010. This shift was reflected through investments in urban mobility projects, with a total of R$ 143 billion announced for PAC-2, PAC Copa and the Mobility Pact.[9]

In 2009, the Brazilian Government launched the Minha Casa Minha Vida (MCMV – in English, *My Home My Life*) public housing program that mobilized funds since then at unprecedented levels in Brazil. The program was designed to lessen a housing shortage estimated at 5.5 million units (Pasternak and D'Ottaviano, 2014), and funds were earmarked for the construction of public housing projects. The initial goal of this program in 2009 was to build one million homes, with this target raised by the [Dilma] Rousseff Administration to two million, and then to three million in 2014. This housing subsidies policy paved the way for families to move into their own homes in urban areas, with three monthly Income Brackets: up to R$ 1,600 (income bracket 1), R$ 1,600 – R$ 3,275 (income bracket 2) and R$ 3,275 – R$ 5,400 (income bracket 3). The lack of homes for income bracket 1 families accounts for 90% of Brazil's housing shortage (Maricato, 2012).

In addition to addressing this housing shortage, the roots of this program also include an explicit economic goal. Encompassed by the PAC, the MCMV is part of a strategy created in response to the 2008 global credit crunch, and was designed to boost economic growth while generating jobs and income through the construction industry. In practice, these twin targets resulted in higher priority for construction speed and unit quantity, to the detriment of quality, in terms of the location, design and planning of these homes (Cardoso, 2013). Consequently, while the MCMV Program has indeed delivered significant numbers of housing units at affordable prices, there is nevertheless a rising tide of criticism over the quality of these units. More specifically, the link between providing social housing at affordable prices, locations and options for accessing the city seem to have generally been neglected, with the negative effects of this program accentuating the social segregation of low-income families. In fact, this program has been replicating the missteps of Brazil's housing policy since the 1960s, when property construction and ownership transfers were defined as the only strategy for addressing housing shortages (Bonduki, 2014). The location of major public housing projects in Rio de Janeiro – such as Cidade de Deus and Vila Kennedy – underscore the periph-eralization of low-income housing of that earlier period.

An analysis of the locations of developments implemented for MCMV income bracket 1 shows that most of these housing complexes were built as residential-only projects on the outskirts of Brazilian cities, far away from areas that concentrate opportunities and public services, requiring lengthy commutes and reinforcing a situation of social and spatial segregation that is examined in this paper. For example, more than 66,000 housing units were contracted in Rio de Janeiro, with a goal of

9. Available at: <http://www.pac.gov.br/noticia/193f78a6> and <http://goo.gl/e0ogTi>.

100,000 by the end of 2016. Of these, 50% were earmarked for income bracket 1 families (Rio de Janeiro City Hall, 2014) with 53% of all units handed over to families in this income bracket located in the West Zone. People living in these complexes and using public transportation to the more prosperous South Zone or the Centro business district – where most registered jobs and services are located – face commutes of up to four hours a day (Cardoso, 2013). By June 2013, contracts had been signed for the creation of 64,600 housing units in São Paulo, with 34.1% of these earmarked for income bracket 1 families. Analyzing the distance from the two main hubs offering jobs and services (Praça da Sé and Avenida Berrini), it was apparent that MCMV income bracket 1 complexes are located at mean distances of 26 – 28 kilometers from the areas that concentrates the opportunities in the city (Marques and Rodrigues, 2013). Out of 6,636 housing units delivered in Uberlândia, 62.87% went to income bracket 1 families; a further 6,008 units have been contracted or are under construction for families in income brackets 1 and 2 (Uberlândia City Hall, 2015). These developments are scattered through outlying areas all around the city, mainly in the West Sector, recalling that municipal laws were altered in order to expand urban perimeters, which allowed sub-division of the tracts of land on which most of these projects were built.

Together with the design of these developments, this geographical distribution exacerbates the territorial segregation of low-income families, triggering many different impacts on the mobility and quality of life of their members. Moreover, this public housing production logic has also imposed costs on society as a whole, with more funding needed to extend infrastructure facilities out towards these peripheral areas, in parallel to longer commutes, traffic jams, air pollution and road safety challenges.

It is thus necessary to assess the extent to which moving into the homes offered by MCMV projects proved positive for their residents, from the standpoint of location, cost and quality of life. This is a crucial factor for Rio de Janeiro, for example, where the MCMV Program is the only resettlement mechanism for families removed from high-risk areas in order to make way for sweeping changes underwritten by massive investments that are changing the face of the city. It is also worthwhile analyzing the characteristics of the developments implemented so far, in order to assess the challenges of urban insertion, striving to highlight steps that could foster progress through not only building homes but also providing good quality urban settings for their residents.

In order to address these challenges, we present a case study of five income bracket 1 developments: two in Rio de Janeiro, two in São Paulo and one in Uberlândia. These case studies are intended to provide input to reassess core elements related to the quality and costs of MCMV developments, as well as aspects related to urban mobility and access to the city. The following sections present

the methodological grounds used, and the resulting findings of, these case studies, together with proposals for more effective ways to address the challenges of mobility and accessibility noted in the course of the study.

2 METHODOLOGY

Different criteria guided the selection of developments in each municipality. In Rio de Janeiro, this choice was based on the contrast between what is rated as one of the best projects in terms of location, with easy access to public transportation in an area that is already consolidated with supplies of services and facilities, and one of the most remote MCMV developments, located far from transportation, services and other amenities. In São Paulo, developments were selected where the Right of the City and Public Space Laboratory at the School of Urban Planning and Architecture, University of São Paulo (LabCidade, FAU/USP) have already engaged in research activities. In terms of location and transportation, both developments present intermediary situation comparing with the two projects in Rio de Janeiro, located in better consolidated outlying areas with relatively good transportation options and access to local sub-centers. In Uberlândia, a development was selected that is typical of most of the housing projects built by the MCMV in that city: in an outlying district that is segregated by a highway and offers few urban amenities and connections to surroundings areas.

The researchers first obtained general information on each of the selected developments. Next, the researchers administered a survey with their residents, through a questionnaire designed to explore their views of the changes introduced by moving away from their old homes. The questionnaire addressed issues such as alterations in use of means of transportation, time spent commuting, transportation and housing costs, availability of local recreation facilities, services and stores, in addition to resident satisfaction. The surveys of people living in Rio de Janeiro and São Paulo were conducted between April and July 2014, with teams of six to eight researchers at each complex. During this period, 299 families were interviewed, for a total of 1,079 people. The surveys in Uberlândia were conducted by a team of nine researchers interviewing a total of sixty families (228 people) between November and December 2014.

These developments were also analyzed through the MCMV Income Bracket 1 Urban Insertion Assessment Tool developed by the Institute for Transportation and Development Policy (ITDP) in partnership with the LabCidade – FAU/USP. This tool draws from two sources: the Transport-Oriented Development (TOD) Standard developed by ITDP,[10] and second, the concept of "urban insertion," defined here as the way in which housing units interact in urban areas, taking

10. Available at: <http://goo.gl/tWzxEJ>.

into consideration the location, the adaptation to the terrain, their connections to infrastructure facilities, the availability of public utility services and links with nearby public areas and buildings.[11]

The Urban Insertion Assessment Tool is designed to evaluate the urban insertion of an MCMV housing unit construction project prior to its implementation, thus providing input for project approval processes. Moreover, this tool also helps to: clarify the public and private players involved in project development, assessment and approval criteria; define the best design and establish the location and manner of implementation of the development; focus on establishing access to public areas; foster sociability and pedestrian traffic; and improve access to public transportation and the public amenities, jobs, commerce and services that are essential for urban life. This tool also assesses the extent to which each development improves or worsens social and spatial segregation in Brazilian cities.

The Urban Insertion Assessment Tool is divided into three themes with nine indicators (chart 1) with the following scores: Good, Acceptable or Insufficient. For the development to achieve satisfactory urban insertion, all the indicators must be rated as at least Acceptable. If any of the indicators are ranked as Insufficient, the development must be set aside for review of the unacceptable items. This tool was deployed in the developments selected by the ITDP Brazil and LabCidade, together with the Uberlândia Federal University, through field visits, map analyses and online research.

CHART 1
Urban Insertion Assessment Tool – themes and indicators

Theme	Indicators
1. Transportation	1. *Transportation options:* number of different public transportation routes accessible.
	2. *Transportation frequency*: frequency and operating hours of lines of public transportation identified.
2. Supply of public facilities, commerce and services	3. *Daily uses*: day-care centers, public kindergartens, open areas for recreational purposes, markets selling fresh foods.
	4. *Occasional uses:* public primary school, secondary school and/or technical school, public health clinic with urgent care facilities, drug stores, sports facilities, supermarket, lottery store or ATMs.
	5. *Sporadic uses:* public hospital, civil service center, university or college, banks.
3. Design and urban integration	6. *Relation to the surroundings:* percentage of the perimeter of the development or adjacent complexes adjacent to an urban neighborhood.
	7. *Block size:* mean block size for the development or set of adjacent developments, and all immediately adjacent blocks.
	8. *Opening to public spaces*: number of pedestrian access points for each 100 meters of boundary between the private areas of the development or adjacent development and public streets with pedestrian sidewalks.
	9. *Pedestrian circulation network:* assessment of the pedestrian circulation network of the development(s) and access routes to bus stops and/or stations providing access to the transportation system.

Source: ITDP.

11. Translator's note: although the term "urban insertion" ("inserção urbana") does not exist in English, the translator decided to use a literal translation; this term, as it is used in this chapter, encompasses several concepts related to spatial location, urban integration and design, access to transportation as well as other public services and amenities.

Additionally, an extension of the Urban Insertion Assessment Tool was proposed in order to include an evaluation of access to formal employment, based on company records in the Annual Information Report released by the Ministry of Labor and Employment (Rais-MTE), with two indicators: *i*) number of formal jobs available with wages of up to R$ 1,600/month (family income ceiling accepted by the program in income bracket 1 in 2013) reachable by a public transportation trip of between 30 and 60 minutes;[12] as no information was available in Uberlândia on the duration of public transportation commutes, a period of up to fifteen minutes by car was used; and *ii*) the percentage of accessible jobs as described above in proportion to the total number of registered jobs in each municipality with wages of up to R$ 1,600/month in 2013.

Commuting times to employer firms were calculated through the Google Maps webtool. Tentative isochrones (lines along which commute times are the same) were created that correspond to each of the commute durations adopted, from each housing project. The number of companies in each of the isochrones was then calculated and, through cross-referencing these figures with the database on employees and their wages, the number of jobs was obtained. These analyses were conducted in Rio de Janeiro, as the two housing complexes under analysis are located in very different intra-urban contexts, and also for Uberlândia, in order to obtain a diagnosis for a mid-sized city (or regional hub) that could be compared with the figures for a metropolis.

3 CASE STUDIES: MAIN FILDINGS AND ANALYSES

3.1 Characterization of housing complexes studies

3.1.1 Rio de Janeiro

Located around eight kilometers from the CBD and the history-rich center of Rio de Janeiro, the *Bairro Carioca* housing project, also known as "Triagem," is located alongside train and metro lines that connect at the station with the same name. The development's surrounding area is also served by several regular bus lines, ensuring good public transportation. This development was designed to house families living in high-risk areas in several different parts of Rio, together with other families that meet the criteria of MCMV income bracket 1 approval process.[13] The 2,240

12. These commuting times correspond to those used for Indicators 4 and 5 respectively. In addition to using the same indicator parameters as the Urban Insertion Assessment Tool, attempts were also made to ensure compatibility with information drawn from the National Household Sampling Survey (Pnad, IBGE).

13. The selection process for bracket 1 families is based on nationwide criteria that include monthly family income levels as a priority for families living in high-risk areas, families headed by women and families of people with special needs. In addition to meeting these criteria, families must be registered with municipal governments and comply with local requirements, after which their names are entered for a random draw. Beneficiaries may not choose the locations of their future homes.

housing units are built on a tract of land covering 12.2 hectares and is expected to house 8,896 residents. Furthermore, the *Bairro Carioca* project was designed as a development with complementary uses, including a market, restaurant, drugstore, beauty salon, day-care center, fitness center, health clinic and primary school, in addition to an educational community center (*Nave de Conhecimento*) equipped with a laboratory, an auditorium and a library.

Built in a greenfield area and located on the Estrada dos Palmares in Santa Cruz, in Western Zone of Rio de Janeiro, the six apartment blocks forming the *Jesuítas* is one of the most remote housing project of the MCMV program in the city. The development is six kilometers from the center of Santa Cruz, which is in turn some fifty kilometers from downtown Rio, 46 kilometers from the South Zone and 33 kilometers from Barra da Tijuca. The Santa Cruz district lies at the end of Avenida Brasil, the main highway running between the North Zone and West Zone, alongside the terminals of two (respectively) medium and high capacity public transportation systems (Transoeste Bus Rapid Transit system and the Supervia urban train network). The West Zone – where this development is located – is a low-income region with high unemployment and poor public utility services.[14] Since 2009, Santa Cruz has been on the cutting edge of the urban frontier, where rural landscapes are shrinking and new property developments rub shoulders with small ramshackle farms.

Once completed, the six apartment blocks at Jesuítas will offer 2,718 units that are expected to house around 10,000 people. These apartment blocks are classified by the origins of the families who will live in them: three will house families moved from favelas and high-risk areas, while the other three will be set aside for families completing the standard MCMV process. Two apartment blocks were selected for the field survey because of possible differences in perceptions among their residents: Cascais, whose residents completed the standard MCMV process, and Coimbra, families from slums and high-risk areas.

When it was inaugurated in April 2012, the area around this development offered no commerce, services or other urban amenities. When the survey of its residents was conducted in April 2014, the researchers noted that small informal commerce had appeared in the development, as well as a public school and health clinic were constructed on the Estrada Palmares, some 500 meters away from the closest apartment block.

14. Among the 126 districts in Rio de Janeiro, Santa Cruz ranked 119th by the Human Development Index (HDI) in 2010.

3.1.2 São Paulo

The Residencial Iguape housing project is located in the Itaquera district in the West Zone of São Paulo some 22 kilometers from the Avenida Berrini and around 15 kilometers from the Praça da Sé, which are the two main city's hubs. Located in a relatively well consolidated area, this project is endowed with good public transportation, including several bus lines and fast access to the metro. Inaugurated in January 2013 with 300 units, it is expected to house 1,200 income bracket 1 residents selected through the standard MCMV process. In addition to relatively good public transportation, the surrounding area also offers plenty of commerce and other amenities.

Located in the Sapopemba district, also in the West Zone of São Paulo[15] and inaugurated in 2011, the *Residencial São Roque* was one of the first MCMV income bracket 1 buildings in this municipality, located some 19 kilometers from the Avenida Berrini and around 15 kilometers from the Praça da Sé. Similar to the Iguape project, São Roque is also relatively well served in terms of transportation options travelling towards major city's hubs.

Of the 300 units delivered, 158 units were intended for residents in high-risk areas, with the remainder allocated to families completing the standard MCMV process.

3.1.3 Uberlândia

Located in the East Sector of Uberlândia, the Loteamento Jardim Sucupira subdivision is part of a residential district (*Bairro Residencial Integração*), together with three other subdivisions, accessed from the Rodovia BR-452 highway running between Uberlândia and Araxá, 7.5 kilometers from the city center in the Praça Tubal Vilela square. This subdivision was approved by the city Council in 2004, with part of it included in the Special Social Interest Zone in 2011, where 270 single-family units were built, each covering 38.02 m^2, handed over in 2011 to families completing the standard MCMV process.

This subdivision includes a public primary school, two kindergartens, a family health clinic, a prison and a re-educational detention center for young offenders. Commuters catch buses to downtown areas through a centralized distribution system with five integration terminals (Central, Umuarama, Planalto, Santa Luzia and Industrial District) where these lines are integrated, redistributing the flow. The residents of Jardim Sucupira have only a single bus line with three stops along a route ending at the Central Terminal, and the remaining two lines serving this subdivision are some two kilometers away from the development.

15. Data released by the IBGE in 2000 showed that, according to the HDI, Sapopemba ranked 78th among the 96 districts in São Paulo.

3.2 Field survey findings[16]

This section presents analyses of the behavior of the variables researched in the field that together lead to the conclusion that the appropriation of the city takes place in different ways among the developments examined. Important reasons for these differences, include the location of these homes and the characteristics of the commutes (means of transportation, costs, duration etc.) undertaken by their residents.

3.2.1 Exploring resident profiles

An examination of the social and economic characteristics of people living in the developments under study reveals similarities derived from the people's positions in society, regardless of the city where they actually reside. On the other hand, there are exceptional situations that also warrant closer attention.

Starting with the age of the residents, a comparison presents a relatively even distribution: in all the complexes, the largest group consisted of adults (45% to 63%), followed by children, adolescents and finally the elderly. However, most residents are at active ages, indicating that they are deeply involved in activities outside the home, triggering greater demands for transportation than children and the elderly (Vasconcellos, 2005).

In terms of these activities, the complexes presented relatively similar percentages of residents working or studying during the previous thirty days: 63% to 78%. These data show that most residents at active ages are actually studying or working and therefore need to access their places of work or study every weekday.

In terms of their income, the data reflect similarities among the developments, confirming that the vast majority (between 80% and 90%) of residents in the case studies in Rio de Janeiro and São Paulo were in fact encompassed by MCMV income bracket 1, consisting largely of people with incomes of up to 3 minimum wages (MW). These data show that most of these housing units have been allocated to families qualifying under the income ceiling established by the MCMV program for these developments. Furthermore, this also reflects a financial situation where variations in transportation and housing costs have significant impact on family budgets. However, two somewhat different situations must be stressed: at Iguape, 53% of the residents stated that they had no incomes, due to the high proportion of students and schoolchildren in the sample, while there was a large contingent (around 45%) of residents earning more than three minimum wages at Sucupira, with no homes without incomes at this development in Uberlândia.

16. The full reports on the analyses briefly presented here are available in the Ipea Discussion Paper.

3.2.2 Vehicle ownership and commuting to work

Although the population is relatively homogenous in terms of income at all four developments in Rio de Janeiro and São Paulo, the percentage of people owning cars varied significantly (between 4.5% and 44% of the residents). A comparison among the housing complexes shows that the motorization rate in São Paulo is higher for these residents than their counterparts in Rio de Janeiro. Meanwhile, the motorization rate is even higher in Uberlândia, at around 70%. The Bairro Carioca and Coimbra apartment block of Jesuítas (Rio de Janeiro), whose residents were people moved from high-risk areas and informal settlements presented the lowest motorization rates (4.5% and 11% respectively). The proportions of families completing the formal MCMV selection process were higher, with the current motorization rate keeping pace. This indicates the possibility of a link between previous housing conditions and vehicle ownership. Notably, the data did not indicate any clear links between income and vehicle ownership.

Most of the residents of these developments used public transportation and walking to travel to and from work. Except for the São Roque development, where there was no variation in the types of transportation used after moving into the housing units provided by the MCMV Program, for all the other case studies, it became apparent that their residents made less use of active transportation options (walking or cycling), using motorized options more frequently. People living in the Bairro Carioca, Jesuítas and Iguape complexes began to use public transportation more frequently, with a significant increase in higher-capacity options (metro, train and BRT). However, individual transportation increased the most at Sucupira, particularly cars. It is worthwhile noting here that there are no trains or metros in Uberlândia; other explanations may include infrequent bus services and roads that discourage cyclists, with tricky highway crossings. The use of private motorized vehicles (motorcycles and automobiles) did not drop in any of the cases, with increased car use at the Bairro Carioca and Iguape developments, despite being ranked as the best located in terms of easy access to public transportation.

An examination of the locations of these developments in their respective cities suggests that the shift towards motorized transportation options is prompted mainly by longer distances between these new homes and employment centers.

3.2.3 Commuting times to and from work

Moving into the homes provided through the MCMV Program had quite different effects on the municipalities under analysis in terms of commuting times to and from work.

Residents living in the São Paulo complexes actually gained time through shorter commutes; the mean travel times to work each day shrank by 8% at Iguape and 12% at São Roque, which is compatible with their location in well-consolidated areas with reasonable supplies of commerce and services as well as access to public transportation. These findings indicate potentially positive progress in the quality of life of these residents, with more time to devote to other activities.

Two quite different results were found for the developments in Rio de Janeiro, also due to their location. At Jesuítas, there was a 39% increase in mean daily commutes to work related to the logic of a housing-only project on the outskirts of the city, in an area that is still growing, and disconnected from commerce, services and other amenities. Commuting times remained unchanged in Bairro Carioca, due largely to the fact that many of these residents were resettled from areas relatively close to their new homes, with good supplies of services and transportation options available in close proximity of the new development.

The duration of daily commutes rose by around 11% at Sucupira. Although far closer to the center of Uberlândia than the distance between the Jesuítas complex and main hubs of Rio de Janeiro, the two developments shared some characteristics: poor connections between these two projects and public transportation options, in addition to locations.

Reports from residents indicated that most people moving into these new complexes were informal workers, mainly in the civil construction and services segments, and changed jobs when they arrived. Within this context, people living in the Jesuítas homes face greater difficulties in finding work, due to the development's location in a less consolidated area. This information requires further investigation because – as the job accessibility analyses indicate (see section 3.4) – this suggests that location is an extremely important factor, as people living in more remote projects with unconsolidated surroundings are more severely affected in terms of access to formal and informal jobs.

3.2.4 Alterations to transportation and housing outlays

Moving into their new homes resulted in higher mean transportation costs for the residents of all the MCMV projects, with diverse effects on housing outlays.

The sharpest increase in transportation costs occurred at the Jesuítas development, up 156% after moving in, followed by 89% at Sucupira, 31% at Iguape, 11% at Bairro Carioca and 1% at São Roque. These figures are directly related to a shift from active transportation to motorized options that are more expensive, with adverse impacts arising from the implementation logic of these developments, which sought lower land acquisition costs by opting for cheaper properties in outlying urban areas.

Housing costs varied widely, dropping in São Paulo but rising in Rio de Janeiro and Uberlândia, after moving into the MCMV housing units. The Bairro Carioca is particularly noteworthy with the highest increase (up 139%), followed by Jesuítas (51%) and Sucupira (12%). The increase in housing costs in Rio de Janeiro occurred because some of the beneficiary families came from self-built homes in informal settlements where they paid no monthly maintenance fees or utility bills for water and electricity, now having to bear these costs in the MCMV units. Despite its remote location, the absolute value of the mean housing costs in the Jesuítas complex is 38% higher than in the Bairro Carioca.[17]

In contrast, the developments analyzed in São Paulo posted a steady drop in housing costs, down 10% at São Roque and 24% at Iguape, largely because most of their residents were previously living in rented apartments. Consequently, moving into these new housing units at subsidized prices resulted in lower outlays for these families.

3.2.5 The proportion of transportation and housing expenses in the family budgets of residents

The impacts of alterations to transportation and housing expenditures on family budgets varied widely, depending on the project. Bearing in mind the benefits gained in terms of access to formal housing and looking ahead to the proportion of transportation and housing outlays relative to overall family budgets, moving into these MCMV houses was not a positive step only for the Jesuítas residents, whose family expenses increased for transportation (+14%) and housing (+11%). For people living in the other developments, there were few changes in the proportion of transportation costs for family budgets, while housing expenditures fell for the residents of São Roque and Iguape, they rose at Bairro Carioca because residents there had previously lower costs when living in informal settlements.

However, this analysis changed when comparing the proportion of these outlays in a combined transportation and housing costs index that stipulates that the sum of these outlays should not exceed 45% of family budgets, based on a 30% ceiling for housing and 15% for transportation.[18] While the mean figures for the Bairro Carioca and Iguape complexes remained below the stipulated ceilings for the aggregate index, reflecting the separate figures for the housing and transportation components, the sharp increase in transportation costs for people living in the Jesuítas project, and persistently high housing costs for the residents

17. A possible explanation for these higher costs would be higher monthly condominium fees paid by residents of the Jesuítas complex; this information was not available and requires further investigation.

18. This index was drawn up by the Center for Neighborhood Technology (CNT), with a 45% ceiling usually adopted in the United States. For the Bairro Carioca, we assume that this move was positive despite higher costs, as transportation and housing outlays together remained at the ceiling of 45%.

of São Roque resulted in index values higher than the recommended levels. At Sucupira, the overall index remained higher than recommended both before and after moving between homes, with these outlays distributed differently: higher transportation costs and lower expenditures on housing.

3.2.6 Satisfaction with new homes

At all the developments, most (56% to 75%) residents stated that they preferred their new locations. An analysis of the reasons behind this preference showed that access to formal land with ownership titles and greater safety and security were the factors mentioned most frequently, indicating appreciable benefits compared to their previous housing situations. People living in the São Paulo developments also emphasized the central location and easy access to public transportation, indicating an awareness of improvements in these aspects. When asked what could be done to make these house complexes even better, demands for more recreation areas and commerce were particularly noteworthy. At the more remote projects (Jesuítas and Sucupira), residents emphasized the lack of educational facilities, while people living in the two complexes in Rio de Janeiro wanted more public transportation options.

3.2.7 Satisfaction with available transportation options

Perceptions of transportation costs options varied widely by municipality. The residents of the complexes in São Paulo scored these aspects higher, once again indicating a perception of better transportation provision after moving into their new homes. However, an awareness of the need for improvement is apparent at all the projects, in terms of the number of routes and more frequent bus services. Even at the Bairro Carioca – located in an area with several commuter options, including buses, commuter rail and the metro – residents tend to have negative views on the urban design of the project, feeling that it hampers easy access to transportation and complaining about poor quality pedestrian facilities that are perceived as unsafe and insecure.

3.3 Findings: urban insertion analysis

An analysis of these five housing projects by the Urban Insertion Assessment Tool shows that the original designs presented by the property developers would not have been approved at the implementation stage if urban planning aspects related to location, integration with their surroundings and urban design had been assessed in greater depth. The worst case is Jesuítas, where none of the indicators obtained satisfactory scores, followed by Sucupira, with only two indicators rated as sufficient. The others offer good access to transportation facilities, with low scores in terms of integration with their surrounding areas and urban design.

CHART 2
Urban insertion assessment of projects under study

Findings – urban insertion assessment of projects under study theme	Indicator	Findings				
		Bairro Carioca (Rio de Janeiro)	Jesuítas (Rio de Janeiro)	Iguape (São Paulo)	São Roque (São Paulo)	Sucupira (Uberlândia)
1. Transportation	1. Transportation options	Good	Insufficient	Good	Good	Insufficient
	2. Transportation frequency	Acceptable	Insufficient	Acceptable	Acceptable	Insufficient
2. Supplies of public facilities, commerce and services	3. Daily uses	Acceptable	Insufficient	Acceptable	Acceptable	Insufficient
	4. Occasional uses	Good	Insufficient	Insufficient	Insufficient	Insufficient
	5. Sporadic uses	Good	Insufficient	Insufficient	Acceptable	Insufficient
3. Urban Integration and Design	6. Relationship to the surroundings	Insufficient	Insufficient	Acceptable	Acceptable	Acceptable
	7. Block size	Insufficient	Insufficient	Insufficient	Acceptable	Good
	8. Opening to public spaces	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient
	9. Pedestrian circulation network	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient

Source: Field survey; drawn up by the authors.

According to basic information on the project designs and as previously indicated by resident perceptions, the deployment of the tool confirmed that supplies of services and amenities in the Jesuítas area are not able to meet daily, occasional and sporadic needs, while the characteristics of the urban design of this development neither foster access to urban facilities or public areas, nor pedestrian circulation and personal interactions. The designs of the complexes in São Paulo and Uberlândia offer acceptable levels of relationships with surrounding areas, while the block size at Jardim Sucupira was ranked as good, as this is a subdivision. On the other hand, similar to the Jesuítas, the Bairro Carioca failed to obtain acceptable levels for any of the Urban Integration and Design indicators. It must also be stressed that none of these projects posted satisfactory scores for the public spaces and pedestrian circulation network indicators, highlighting the extent to which these aspects were neglected during the planning and implementation of these MCMV housing complexes.

These findings show that location is one of the crucial elements for implementing a development with good urban insertion, with this characteristic almost completely ignored for projects such as Jesuítas and Sucupira: the isolation and the option for a single-use complex segregates their residents even more, with transportation costs imposing added burdens on family budgets. However, despite its importance, good location is still not enough to ensure decent urban insertion.

More specifically, it is crucial to ensure supplies of amenities, commerce and services that can meet the needs of local residents, as well as an urban design fostering pedestrian circulation, interactions among people and access to public areas. Assessments of the Bairro Carioca, Iguape and São Roque case studies show that these characteristics were also disregarded, resulting in housing projects that – although well located in terms of transportation – are poorly integrated with their surroundings. These deficiencies increased the need for commutes and hampered the daily travel of their residents, while also reducing access to facilities, goods and services.

3.4 Findings – analysis of access to formal employment

The researchers analyzed ease of access to formal jobs for both cases in Rio de Janeiro, as well as the Uberlândia project. As expected, there is a striking contrast between the two developments in Rio de Janeiro: in just thirty minutes, Bairro Carioca residents opting for public transportation can reach places clustering 5.31% of total formal jobs (with wages of up to R$ 1,600) in this municipality; a sixty-minute commute takes them to almost half (45.4%) of these jobs available in 2013. A comparison of the Bairro Carioca and Jesuítas cases shows that a thirty-minute commute from the former encompasses 172 times more jobs than can be reached from the latter; and 32 times more jobs in sixty minutes. In Uberlândia – where data on commuting times using public transportation was not available – almost half (46.1%) of the jobs in this municipality in the same wage bracket can be reached within fifteen minutes by private vehicle, with the same length of time needed to reach the city center from the Jardim Sucupira housing project.

4 CLOSING REMARKS

Since its 2009 launch, the MCMV mass housing program has significantly impacted the growth dynamics of Brazilian cities. Although the program receives positive satisfaction ratings from residents, the findings of the case studies examining income bracket 1 housing developments built by the private sector show that their characteristics fail to comply with the best land use and Transportation Oriented Development practices (TOD). This was particularly true in terms of alignment with urban policies, effective responses to location challenges for new developments, access to the city, urban design and integration with their surroundings.

By focusing on everyday mobility, the findings of the survey underscore the idea that providing homes is not just a matter of building houses or apartments, but must also provide access to the resources and opportunities offered by the city, which implies mastering urban insertion and ensuring physical, economic, social and cultural integration with urban fabrics and frameworks. Along these lines, the findings reaffirm that the MCMV program has successfully built houses, while lagging behind in terms of constructing cities (Rolnik, 2012). Moreover, its effects

on constructed urban contexts indicate that it is reinforcing an urbanization model grounded on expansion with social and spatial segregation, giving rise to a series of costs that impact the society as a whole.

In order to address these challenges, urban insertion principles must be taken into consideration when reviewing the program specifications, including guidelines to ensure: *i*) that MCMV projects are located in urban areas equipped with infrastructure, offering access to commerce, services and jobs, in order to reverse the trend towards social and spatial segregation; *ii*) that new developments are located in areas endowed with good quality public transportation, in terms of reliability and regularity, in addition to upgrading public transportation services in areas where MCMV housing developments have already been built; *iii*) mixed use for new projects and more remote developments that have already been built, making them self-sufficient, with less commuting required; and *iv*) new projects are designed, and existing developments redesigned, in order to encourage pedestrian and bicycle traffic, thereby fostering more sociable transportation modes.

In addition to these principles, the challenges pinpointed in the analyzed developments highlighted the need for a tool with a set of guidelines and metrics able to measure the quality of urban insertion of new social housing projects. This tool must be able to guide the players in charge of planning and designing new complexes, whether privately-owned corporations or non-profit entities, as well as to provide input for the decision-making processes of the people in charge of approving MCMV projects. The Urban Insertion Assessment Tool developed by the ITDP and LabCidade offers a method for meeting these needs, and its deployment in the five case studies presented in this paper highlights its potential for attaining this goal, particularly considering that it can also include specific indicators for job access.

The Urban Insertion Assessment Tool will also enable actors to challenge the different criteria leading to the implementation of social housing programs and the production of the city. It is important to remember that the prevailing model adopted by the MCMV – grounded on housing units built by private companies – is just one very specific way of dealing with Brazil's housing deficit. Other approaches – exemplified by self-construction and self-management projects headed up by non-profit organizations with ample grassroots participation – have resulted in projects that are integrated more closely with their surroundings and better adapted to the needs of their beneficiaries.

Within this context, it is vital to explore the potential for promoting the implementation of developments through the MCMV-entities option (focused on self-managed housing production) in order to assess the possibilities for expansion of this model. Furthermore, approaches need not necessarily be limited

to building new housing units with full ownership; although generally associated with higher costs, the use of downtown plots of land and buildings could result in lower spending for governments and users through eliminating or reducing needs for heavy infrastructure construction needed to bring basic utility services to more remote areas. Consideration must also be given to welfare leasing initiatives with subsidized rents that ensure the right to housing without transferring property ownership, a solution that is widely used in Europe and the United States.[19]

Finally, the urban insertion challenges faced by MCMV projects are also related to the twin targets of this program, which is designed to reduce housing shortages while boosting the economy through the civil construction sector. In practice, the pursuit of these two goals has resulted in the production of large quantities of housing to the detriment of design, location and urban integration, which have all been edged into the background. This is why the use of the assessment tools and implementation method reviews proposed in this paper are crucial to foster the political discussions needed to reevaluate the operation, institutional arrangements and governance of this program. Such a reevaluation is needed in order to make good use of the opportunities to build more harmonious cities in terms of quality of life, urban mobility and development.

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6.1 Questionnaire used for survey of residents

Appended to the paper

ITDP
Instituto de Políticas de Transporte & Desenvolvimento

Pesquisa Lincoln Institute for Land Policy e Fundação Ford

O Programa Minha Casa Minha Vida e a Mobilidade Urbana
Rio de Janeiro e São Paulo

QUESTIONÁRIO COM POPULAÇÃO

Entrevistador:_____ **Número do Questionário:** _____

IDENTIFICAÇÃO

Nome do empreendimento:_	
Apartamento: Bloco:	
Nome do Entrevistado:	Data da entrevista:
Morador reassentado/deslocado da área (nome):	Horário de início:
Data da mudança da família para o imóvel (mês/ano):	Horário de término:

I – COMPOSIÇÃO FAMILIAR

1. Quadro: composição familiar

	1.1 Primeiro nome	1.2 Posição familiar	1.3 Sexo	1.4 Idade	1.5 Estado civil	1.6 Trabalha atualmente	1.7 Possui alguma deficiência
1							
2							
3							
4							
5							
6							
7							
8							

Legenda

Posição familiar	Sexo	Idade	Estado civil	Trabalha atualmente	Pessoa com deficiência
1. Chefe 2. Cônjuge 3. Filho(a) 4. Enteado(a) 5. Neto 6. Pai/mãe 7. Sogro(a) 8. Irmão(ã) 9. Outro parente 10. Agregado	1. M 2. F	Número de anos ou meses	1. Solteiro 2. Casado 3.Divorciado 4. Viúvo 5. União consensual	1. Sim 2.Não	2. Não 3. Motora 4. Cadeirante 5. Mental 6. Visual 7. Auditivo 8. Mudez 9. Múltipla

II. TRABALHO, ESTUDO, RENDA E TRANSPORTE

2. Quadro: trabalho, estudo e transporte [USP/Instituto de Pesquisa e Planejamento Urbano e Regional (IPPUR)/ITDP]

Primeiro nome (transcreva os nomes do quadro anterior na mesma sequência)		2.1 Trabalhou/ estudou nos últimos trinta dias?	2.2 Ocupação (atividade principal)	2.3 Local onde exerce ocupação/ trabalho (LEIA AS ALTERNATIVAS)	2.4 A escola/trabalho está situada(o) onde: (LEIA AS ALTERNATIVAS)	2.5 Meio e tempo de transporte – Casa Atual					2.6 Meio e tempo de transporte – Casa Anterior				
						2.5.1 Meio de transporte usado no principal deslocamento até escola/ trabalho	2.5.2 Meio utilizado para chegar ao principal deslocamento	2.5.3 Tempo médio do principal deslocamento (só ida)	2.5.4 Tempo gasto para chegar ao principal deslocamento (só ida)	2.5.5 Tempo total de deslocamento de casa até o local de trabalho/ estudo (só ida)	2.6.1 Meio de transporte usado no principal deslocamento até escola/ trabalho (RM)	2.6.2 Meio utilizado para chegar ao principal deslocamento	2.6.3 Tempo médio do principal deslocamento (só ida)	2.6.4 Tempo gasto para chegar ao principal deslocamento (só ida)	2.6.5 Tempo total de deslocamento de casa até o local de trabalho/ estudo (só ida)
1															
2															
3															
4															
5															
6															
7															
8															

Legenda para preenchimento

Ocupação (atividade principal)	Local onde exerce ocupação/trabalho	A escola onde estuda está situada:	Meio de transporte	Tempo médio de deslocamento (para a escola)	Tempo gasto para chegar ao principal deslocamento (casa- escola-casa)	CÓDIGOS PARA TODO O QUESTIONÁRIO
Descreva a atividade ou 99. Não se aplica	1. No domicílio 2 .No bairro 3 .Outro bairro QUAL? 4. Outro município	1. No bairro 2. Outro bairro QUAL? 3. Outro Município	(Aquele em que realiza a maior parte do percurso, em termo de distância) 1.Ônibus comum 2. BRT/corredor exclusivo 3. Metrô 4. Trem 9. Bicicleta 5. Van/Kombi 10. Transporte escolar público 6. A pé 11. Transporte escolar privado 7. Carro 12. Mototáxi 8. Moto 13. Outros	PREENCHER NA TABELA DIRETAMENTE O VALOR COMO INFORMADO PELO ENTREVISTADO (CÓDIGOS ABAIXO APENAS PARA TABULAÇÃO) 1. Até trinta minutos. 2. De 30 a 45 minutos. 3. De 45 minutos a uma hora. 4. De uma hora a uma hora e meia. 5. De uma hora e meia a duas horas. 6. Mais de duas horas.	PREENCHER NA TABELA DIRETAMENTE O VALOR COMO INFORMADO PELO ENTREVISTADO (CÓDIGOS ABAIXO APENAS PARA TABULAÇÃO) 1. Até quinze minutos. 2. De quinze a trinta minutos. 3. De 30 a 45 minutos. 4. De 45 minutos a uma hora. 5. Mais de uma hora.	1. SIM 2. NÃO 99. NÃO SE APLICA. 00. NÃO SABE N.R. quando o entrevistado não respondeu

3. Quadro: transporte e renda [USP/IPPUR/ITDP]

Primeiro nome (transcreva os nomes do quadro anterior na mesma sequência)		3.1 Qual a despesa com transporte (custo diário, casa- escola/trabalho-casa incluindo transporte secundário e transferências)		3.3 Quantas vezes por semana realiza essa viagem?	3.4. Bilhete único	3.5 Renda mensal (R$)	3.6 Participa de programa de transferência de renda	3.7 Custo mensal com moradia para a família (aluguel, condomínio, prestação, contas)	
		3.1.1 Da casa anterior para escola/trabalho	3.1.2 Da casa atual para escola/trabalho					3.7.1 Moradia anterior	3.7.2 Moradia atual
1									
2									
3									
4									
5									
6									
7									
8									

Legenda para preenchimento

Despesa com transporte (custo diário)	Viagens por semana	Renda mensal (R$) (não incluir transferência de renda)	Participa de algum programa de transferência de renda?		Custo mensal com moradia (aluguel, condomínio, prestação, contas)	CÓDIGOS PARA TODO O QUESTIONÁRIO
			RJ	SP		
R$___	1. Uma 2. Duas 3. Três 4. Quatro 5. Cinco 6. Seis 7. Sete	R$_____	1. Não 2. Bolsa Familia 3. Renda Melhor 4.Outra_____	1. Não 2. Bolsa Familia 3. Renda Cidadã 4.Outra_____	R$___	1. SIM 2. NÃO 99. NÃO SE APLICA. 00. NÃO SABE N.R. quando o entrevistado não respondeu

4. Alguém da família possui outra demanda de deslocamento além do trabalho? {IPPUR}

Primeiro nome	Atividade	Local onde exerce a atividade:	Meio de transporte			Bilhete Único	Tempo médio de deslocamento	
							Ida	Volta

Legenda para preenchimento

Local onde exerce a atividade	Meio de transporte	CÓDIGOS PARA TODO O QUESTIONÁRIO
1. No domicílio 2 .No bairro 3 .Outro bairro QUAL? 4. Outro município	(Aquele em que realiza a maior parte do percurso, em termo de distância) 1. Ônibus comum 2. BRT / corredor exclusivo 3. Metrô 4. Trem 5. Van/kombi 6. A pé 7. Carro 8. Moto 9.Bicicleta 10. Transporte escolar público 11. Transporte escolar privado 12. Mototáxi 13. Outros	1. SIM 2. NÃO 99. NÃO SE APLICA. 00. NÃO SABE

5. Se o deslocamento secundário é feito a pé ou de bicicleta: [ITDP]

5.1. Há caminhos confortáveis e seguros para o trajeto a pé entre o condomínio e a estação/ponto do transporte principal? (apenas se respondeu 6 no item 2.5.2)

1. Sim 2. Não

5.2. Há vias confortáveis e seguras para o trajeto de bicicleta entre o condomínio e a estação/ponto do transporte principal? (apenas se respondeu 9 no item 2.5.2)

1. Sim 2. Não

5.3. Há bicicletários seguros e suficientes para guardar a bicicleta próximo à estação/ponto do transporte principal? (apenas se respondeu 9 no item 2.5.2)

1. Sim 2. Não

6. A mudança de endereço influenciou a rotina de algum membro da família no tempo e custos com transportes? [USP]

16.1 Primeiro nome	16.2 Tempo de deslocamento (casa-trabalho-casa) (IDA E VOLTA)			16.3 Custos com transportes (colocar o valor em reais, não a variação)		
	1. Aumentou (minutos)	2. Diminuiu (minutos)	3. Não alterou	1. Aumentou (R$)	2. Diminuiu (R$)	3. Não alterou

7. Possui carro ou moto? [ITDP]

1. Sim qual? _____ 2. Não

7.1. (Se sim) Foi adquirido antes ou após a mudança para o condomínio? [ITDP]

1. Antes 2. Após

7.2. (Se sim) Parou de utilizar o transporte público? [ITDP]

1. Sim 2. Não

por que? _____

8. Qual o tempo aproximado de espera do transporte coletivo? [USP]

1. Até quinze minutos.

2. Entre quinze e trinta minutos.

3. De trinta minutos a uma hora.

4. Mais de uma hora.

III. SEGURANÇA E TRANSPORTE [ITDP]

9. Transporte e segurança no trânsito [ITDP]

Considerando a segurança do trânsito (pavimentação adequada, sinalização, respeito às leis de trânsito e à velocidade, treinamento do motorista etc.), em uma escala de 1 a 10 - onde 1 é muito inseguro e 10 é completamente seguro:

9.1. Como você classificaria o nível de segurança do percurso de sua casa até a estação/ponto do transporte principal?_____

9.2. Como você classificaria o nível de segurança do trajeto feito no transporte principal? _____

10. Transporte e segurança pessoal [ITDP]

10.1. E com relação à segurança pessoal (assalto, violência etc.) como você classificaria o nível de segurança do percurso de sua casa até a estação/ponto do transporte principal? _____

10.2. E no trajeto feito no transporte principal? _____

IV. URBANIDADE

11. O seu bairro e/ou região é atendido pelos seguintes tipos de comércio e/ou serviço? (*leia as alternativas*) [ITDP]

Serviços	Existência de Serviços			Se afirmativo		Onde utiliza (se é informal, informar)		
	1. Sim	2. Não	3. Não sabe	1. Utiliza	2. Não utiliza	Condomínio	Bairro (onde)	Outro bairro (qual)
1. PADARIA								
2. HORTIFRUTI								
3. AÇOUGUE								
4. MERCADO								
5. FARMÁCIA								
6. BANCO								
7. LOTÉRICA								
8. CARTÓRIO								
9. FEIRA								

12. Há opções de lazer no interior do empreendimento ou no bairro? [ITDP]

a. Sim b. Não

Se sim,

12.1. O quê?_____

12.2. Onde? a)interior do empreendimento. b) Bairro (localização):_____

12.3. Frequenta? a. Sim b. Não

12.4. Se não, por quê?_____

V. AVALIAÇÃO DO MORADOR (SATISFAÇÃO)

13. O que o sr.(a) gostaria que tivesse no conjunto habitacional? [USP]

_____

_____

14. Na sua avaliação, esse condomínio é violento/perigoso? [USP]

1. Sim 2. Não

15. O sr.(a) considera que aqui é mais violento/perigoso que sua moradia anterior? [USP]

1. Sim 2. Não

16. O sr.(a) prefere morar: [USP]

1. Na moradia atual

2. Na moradia anterior

Por quê? _____

17. O sr.(a) considera o custo do transporte: [ITDP]

a) alto b) razoável c) baixo

18. As opções de transporte aqui são: [ITDP]

a) boas b) insuficientes c) muito fracas

19. Na sua avaliação, o que deveria melhorar no sistema de transporte? [ITDP]

20. Entre as opções abaixo escolha, em ordem de importância, as três que o sr.(a) considera mais necessárias para a melhoria das condições de transporte: (*marcar 1, 2 e 3*) [ITDP]

1. Reduzir valor da passagem.
2. Maior frequência de ônibus.
3. Maior diversidade de linhas para acessar locais na cidade não atendidos pelas atuais.
4. Melhorar integração com transporte de alta capacidade (metrô, trem, BRT).
5. Melhorar o treinamento dos motoristas.
6. Construir corredores para reduzir o tempo de viagem.
7. Construir ciclovias para poder ir de bicicleta ao trabalho/escola.
8. Bicicletário seguro nas estações de metrô/trem/BRT.
9. Tornar o caminho de casa ao ponto/ estação mais confortável e seguro.

VI – ANOTAÇÕES COMPLEMENTARES

CHAPTER 13

REGULATING URBAN BUS SERVICES IN BRAZIL

Alexandre de Ávila Gomide[1]
Carlos Henrique Ribeiro de Carvalho[2]

1 INTRODUCTION

Widespread protests all over Brazil in June 2013 spotlighted the issue of urban mobility on the public agenda, more specifically that public transportation fares were seen as high when compared to the quality of the services, particularly regarding buses, which is the main mode of motorized urban transportation in Brazil.

These protests prompted an analysis of how these services are regulated by the government and, more specifically, how fares are defined, together with the resulting impacts on transportation supply, territorial arrangements and social controls. The first section of this chapter presents the main arguments justifying the regulation of these services. Section 2 describes the main regulatory variables for these activities, discussing their impacts on territorial arrangements and supply conditions, while section 3 explores public participation in the regulatory policy for these services. Section 4 concludes this chapter with an overview of the challenges facing the regulation and organization of these public services, which are essential to society.

2 WHY REGULATE URBAN PUBLIC TRANSPORTATION?

There is no single straightforward argument justifying state regulation of urban bus services. In fact, this regulation is underpinned by an entire set of reasons ranging from technical to political.

In terms of economic theory, particularly the economics of well-being, the justification for regulating certain specific activities lies in the inability of the market to supply goods or services efficiently at prices that correctly reflect the benefits and cost the society. This inability is called a market defect which – for public bus

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transportation – would consist mainly of the existence of *network economies* and the presence of *external factors* (Gomide, 2004).[3]

Network economies – also known as external network factors or economies of density – occur when a new link in a service network enhances its usefulness for other users. For urban bus transportation, the denser the network is, the more frequent the services are (and thus their supply), leading to a lower mean cost per passenger carried.

However, the presence of network economies leads to the need for planning and coordination by the state in order to integrate these services in specific areas, as costs drop for both suppliers and users when they are provided in integrated ways. Moreover, integrating these services enhances macro-accessibility to goods and opportunities offered by urban life.

If the costs of a line running from a specific place of origin to a given destination are high compared to demand, integrated operations can lower costs for the system as a whole, with better access for passengers to different locations within an urban area. When operated without regulations, services tend to result in oversupplies, with incentives for each company to step up its offers of services as much as possible, in order to expand its market share, with negative effects on service costs, prices charged, traffic conditions and mobility for the population in general.[4]

External factors appear when an activity causes negative or positive effects for others, but the activity does not internalize the costs or benefits that it generates. For costs, this would consist of negative external factors; for benefits, positive external factors. As prices do not correctly reflect the costs or benefits for society in these situations, the market will produce in quantities that are inefficient.

For urban mobility, traffic jams, accidents and pollution caused by intensive automobile use are examples of negative external factors (as drivers do not internalize the social costs resulting from their decisions to drive their cars through specific parts of the city or at certain times of day). On the other hand, mass transportation generates positive external factors, due to the positive effects resulting from its use (in terms of less air pollution and fewer traffic jams), which is one of the reasons justifying investments in the sector.

Despite these technical arguments, and no matter how rational they may be, the fact is that interventions in these activities are also handled through political decisions, taken quite legitimately in response to the demands of society. In other words, in a democracy, society must participate in political choices, rather than merely technical decisions.

3. For more arguments justifying the economic regulation of these activities, see Santos and Orrico Filho (1996).
4. Experimental deregulation of these services took place in Chile during the 1980s, exemplifying this (Cepal, 1988).

3 REGULATORY VARIABLES AND THEIR IMPACTS ON PUBLIC TRANSPORTATION CONDITIONS AND TERRITORIAL ARRANGEMENTS

Some regulatory variables are presented below, selected from the specialized Brazilian and international literature (Gomide, 2004; European Commission, 2008), in order to construct a reference framework to analyze new regulatory models that are being implemented by Brazilian towns and cities. An attempt is made to group these variables by the impacts generated under the conditions of quality, economic efficacy of supply and territorial arrangements.

3.1 Quality, productivity and economic and financial performance

This group presents the regulatory variables that impact the quality, productivity and economic performance of the system, thereby reflecting directly on the fares charged to users. In-depth discussions of some of these aspects are needed at this time, when Brazilian society is demanding better quality services and lower fares.

3.1.1 Entry criteria

Ownership of urban bus companies in Brazil is mainly private, with only a few government-owned enterprises operating in some cities.[5] Under Brazilian law, concessions or permits for private businesses to render public utility services must be tendered out using competitive criteria, established by Law 8,987/1995 as follows: lowest fare for the public service to be rendered; highest bid, in situations where the operator makes a payment to the grantor authority to win the concession; best bid from a technical standpoint, in situations where a fixed price established in the tender; or a combination of all these criteria.

Market entry criteria affect fares paid by passengers. When the highest bid criterion is adopted, payment of the economic benefit received by the grantor authority is transferred indirectly to users. In other words, the fare to be charged by the operator will encompass not only the cost of rendering the service, but also the amount to be paid by the private operator to the government. In two tenders (1998 and 2008), Belo Horizonte used this criterion (highest award bid).

The lowest fare criterion (aligned with the technical requirements underpinning the purpose and adequacy of the services) may allow more moderate fares as, assuming that the tender is really competitive, bidders will strive to present the lowest possible figures for the fares, in order to obtain the right to earn a profit from the activity.

5. There are government bus operators in a few Brazilian cities, particularly Porto Alegre (Carris) Goiânia (Metrobus) and Brasília (TCB).

However, if the government authority lacks adequate regulatory capabilities, the lowest fare criterion may pave the way for opportunistic behaviors through which a company submits a low-value bid in order to obtain the contract, while intending to increase it during the concession period through fare review procedures. This criterion generally relates to a policy that separates the rate of remuneration for the operator from passenger fares stipulated by the government authority. This approach was adopted by São Paulo in its 2004 tender.

3.1.2 Purpose and duration of contracts

Contracts with private operators in Brazil are generally limited to assets associated directly with service operations (fleet, workforce and garages), although there are situations in which construction and/or maintenance of infrastructure may be included. The problem with including these elements in agreements with private operators is the added burden imposed on fares if no other sources of funding are stipulated for asset upkeep and investment amortization.

Historically, investments in infrastructure are underwritten by government budget funding, with no impact on fares paid by passengers. However, there are some recent exceptions: in São Paulo, system operating costs encompass outlays on infrastructure upkeep, offset through allocations of funds for that purpose. Some of the new BRT systems, including the one in Belo Horizonte, also transferred part of the responsibility for station upkeep to private operators, which affected service costs and consequently fares.

New contracting possibilities created through Public-Private Partnerships (PPPs) merit attention. These partnerships are recommended for situations where passenger fares are too low to cover operating costs and investment amortization, requiring additional funding to do so. In Japan, for example, the feasibility of investments in subways was ensured through real estate operations around stations through PPPs. In São Paulo, Subway Line 4 is a PPP through which the state agreed to underwrite investments in infrastructure while the private operator provided investments in rolling stock and systems. In Belo Horizonte, the Barreiro terminal was built by the private sector under a PPP, with a land grant where a mall or business center could be built.

The duration of these agreements must be related to the type of investment and assets deployed to render the services. As the duration of the award may well be shorter than the useful life of the assets in question, they must be open to reversion, such as vehicles that can be resold or used in other markets. However, this does not apply to assets such as garages, which cannot be easily transferred should the company leave the market. This may curb competition at the time of the tender, due to competitive advantages held by companies already in place on the market, or high departure costs when the agreement expires.

It has been claimed that shorter durations spur companies to seek greater efficiency, as another tender may be run once the contract expires (Orrico Filho et al., 1995). For investments in physical infrastructure (civil engineering projects) or special vehicle technologies, it is vital to tailor the duration to the economic lifespan of the investments, in order to avoid adverse effects on reasonable fares.

Agreements reached through tenders conducted in São Paulo and Belo Horizonte were signed for ten-year terms, and capital investments were limited to vehicles and garages. In Curitiba, this period was established at fifteen years, due to the profile of the system, which uses special vehicles (articulated and bi-articulated vehicles). Another important aspect is the possibility of extending the agreement. The conditions for such extensions must be set forth in the tender announcement and stipulated in the contract, based on criteria related to service quality and user satisfaction. The first agreement in Belo Horizonte was not extended, while the contract in São Paulo was extended for a shorter period of five years, and is currently still in effect.

3.1.3 Operational supply planning

In historical terms, two very different situations have been noted in Brazil in terms of competence for operational service planning. In cities with well-structured administrative entities, government entities generally assume full responsibility for specifying the services (itineraries, timetables, vehicle technologies, etc.). On the other hand, the contrary is also found, when government authorities are completely absent from planning tasks and even service oversight and inspection. Here, the operators are responsible for all service specifications and operations. Both these situations may affect the quality and even the economic balance of the systems.

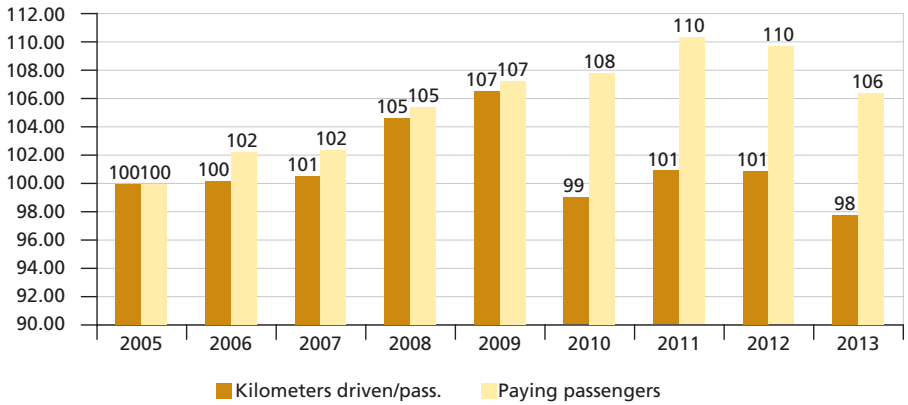
In the former scenario, adjusting the services may be more sluggish, due to larger gaps between planning and operations. Moreover, it is harder for government authorities to cut back on supplies, when necessary, due to greater political resistance which may, over the long term, lead to lower productivity and economic imbalance.

For the latter, user losses consist of poorer service quality, as private operators tend to curtail supplies (thus cutting costs) in order to boost their profits. More recently, with services awarded by area (see item 3.2), there is a trend towards establishing shared responsibility for defining operating parameters. This offers private operators the freedom to specify service items, with the approval of government authorities that then oversee the outcomes through service quality targets and indicators.

An interesting example is the quest for economic and financial balance pursued by the system in Belo Horizonte since the second tender. Graph 1 shows the shifts in balance between supply (kilometers) and demand (paying passengers) since the

alteration to the agreement in 2008, which gave operators greater freedom to specify services and thus pursue higher productivity for the system, by seeking higher passenger demand and making fewer trips. When adopting this model, care must be taken to avoid downgrading supplies in the quest for higher system productivity by cutting back trips and increasing passenger density; this is handled through quality indicator monitoring by the Belo Horizonte Transit Authority (BHTrans).

GRAPH 1
Number of paying passengers and kilometer output by the Belo Horizonte bus public transportation system (index figure: demand and kilometers in 2005 = 100)



Source: BHTrans.

3.1.4 Remuneration model

Operators may be remunerated directly or indirectly (Cadaval et al., 2005). For the former, they are reimbursed directly through the fares paid by passengers; for the latter, an entity (government, private or mixed-ownership) collects the income and then distributes it in compliance with pre-set criteria, normally based on a production unit such as distances driven in kilometers or the number of passengers carried.

The direct remuneration model[6] has the advantage of sparing the government the expense of administering the revenues (collection and transfer), as well as covering any short-term financial shortfalls, which will be borne directly by operator cashflows. However, the downside is that it hampers network planning and management, as any changes to the lines (reorganization, introduction or elimination) will trigger direct variations in operator profits. This is the model that is most widely used in Brazil.

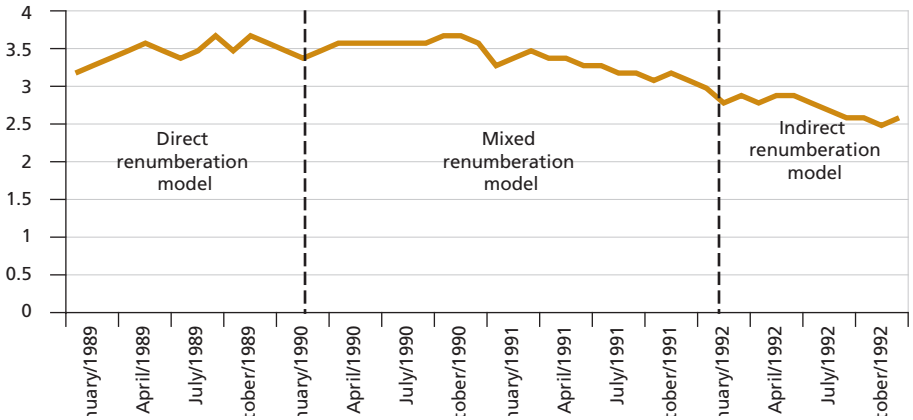
6. Translator's note: this is also known as a "net-cost" contract.

On the other hand, indirect remuneration offers the advantage of endowing the government with full network planning and management control. Where it has been adopted, indirect remuneration by kilometer driven has upgraded service quality through larger fleets, more lines and more kilometers driven (Gomide, 2004) with benefits for mobility system users as a whole. However, as remuneration is not linked to demand, this model has encouraged companies to step up supplies constantly, regardless of demand, thus introducing cost-revenue imbalances.

Experiments using indirect remuneration by kilometer[7] have been conducted in the past in São Paulo, Belo Horizonte and Curitiba, all of which subsequently shifted to direct remuneration due to the countless financial deficits generated by this option: revenues usually failed to keep pace with rising outlays caused by larger fleets and kilometers driven. Graph 2 illustrates the sharp drop in productivity for this system in São Paulo during the early 1990s, when it shifted from direct remuneration to indirect remuneration per kilometer driven. The resulting financial imbalances required frequent increases in government subsidies paid out to the operators.

GRAPH 2

Public transportation system productivity in São Paulo, measured by the Passenger-Kilometer Index (PKI) during the 1990s



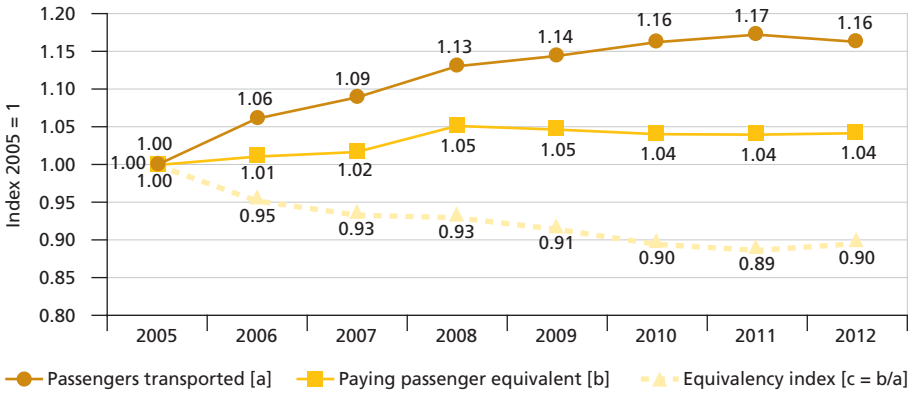
Source: Mendonça (1997).

In order to cope with constant shortfalls caused by the gap between revenues (passengers carried) and expenditures (fleet and kilometers driven), some cities – including São Paulo – switched from kilometer-based remuneration to the number of passengers carried. The problem here is that the number of passengers carried in São Paulo was not related to the income brought in by the services, as some

7. Translator's note: this is also known as a "gross-cost" arrangement.

passengers are carried free of charge, while others travel on integrated routes using more than one line, thus not paying a second fare, although the operators were remunerated for these passengers. Should this result in a situation where the paying passenger curve remains below the carried passenger curve, due to free passes and integrated routes – which did in fact occur in São Paulo – the outcome will be financial imbalance, as government outlays will rise faster than fare revenues (graph 3). In this city, these imbalances were corrected through higher government subsidies, rising from around 10% of system costs in 2005 to some 25% in 2013.

GRAPH 3
Number of paying passengers, passengers carried and the resulting equivalence index



Source: São Paulo Transit Authority (SPTrans).
Elaborated by the authors.

Since the 2012 tender for its system, Brasília has also worked with the model based on remuneration per passenger carried, through a remuneration fare that was determined through a technical analysis. As the public fare was established at a level lower than the operator remuneration fare, government subsidies are required, currently estimated at around 40% of system costs, topping R$ 600 million (± US$ 150 million) a year, severely undermining the sustainability of this model from a fiscal standpoint.

On the other hand, one of the major advantages of the indirect model is easier implementation of fare integration policies. From the user standpoint, and particularly for lower-income passengers, integrating the entire transportation network greatly extends the range of possible destinations (macro-accessibility), thus opening up opportunities offered by the city in terms of jobs, education, healthcare and recreation.

The upsurge in the number of passengers carried in São Paulo since 2005 reflects user gains ushered in by its time-based integration policy, whose feasibility is underpinned by the indirect remuneration model based on the number of passengers carried.

In turn, Belo Horizonte also adopted a model with remuneration based on paying passengers, through which – in contrast to São Paulo – integrated passengers pay full fares for the first segment of their trip and half fares for the second segment, through a sequenced integration payment system. As a result, as remuneration is direct, the first segment operator receives the full fare, while the subsequent operator receives half fare, with the opposite occurring during the return trip.[8] This mechanism is designed to iron out imbalances caused by revenue losses resulting from large numbers of integrated (and unpaid) trips, thus mitigating the need for subsidies.

3.1.5 Ways of setting, adjusting and reviewing fares

Pursuant to Brazil's Concessions Act (Law 8,987/1995, Article 9), fares will be set by "bearing in mind the constant value of the winning bid submitted in the tender". Nevertheless, by accepting the use of other sources of revenues in order to ensure reasonable fares, the Concessions Act allows the operator's remuneration fare to differ from the fares charged to passengers (Grotti, 2002). In turn, this allows the public fare to be established at the discretion of the municipal government, with the difference between the remuneration fare made up through non-fare revenues; budget allocations; alternative, complementary or ancillary sources of income; or associated projects.

Nevertheless, most Brazilian cities establish passenger fares by dividing the overall estimated operating costs of the services (including capital costs, depreciation and taxes) by the number of paying passengers (mean cost model).

Since its bus public transportation was system tendered in 2004, São Paulo has worked on the principle that public fares need not necessarily be equivalent to remuneration fares, even when remuneration is based on the number of passengers carried, as provision is made for non-fare sources of income that can finance service operations. During the bidding procedure, eight operating sectors were established for which the consortia submitted bids with remuneration values per passenger carried, regardless of whether or not they were paying passengers.

This approach means that each bidder presented a specific value that could be lower than the public fare established by City Hall for the entire system. This model laid the foundations for introducing the city-wide integration system with time-based flat fares (*Bilhete* Único) through which passengers could transfer several times within a two-hour period, paying a flat fare. As operators were remunerated for each passenger carried (remuneration fare), it was in their own interest to step

8. This is based on the principle that the first operator receives a full fare, and a half fare for the second operator on the outward trip, with the opposite for the return trip, ensuring that the system is evenly balanced in terms of income distribution.

up the number of passengers carried, whether on integrated trips, free passes or paying fares.

The fare-setting methodology suggested by the Brazilian Transportation Planning Enterprise (Geipot[9]) during the early 1990s (which is still used by cities all over Brazil) assumes that the operator must be reimbursed for all costs incurred, plus a rate of return on invested capital (opportunity cost). However, this methodology is open to criticism: one problem is the difficulties government authorities encounter in calculating the actual service operating costs, as these are incurred in-house by the companies, resulting in asymmetric information between regulators and regulated enterprises.[10]

Another criticism is that this method recommends that new vehicle prices be used as references for calculating remuneration on capital and other items of expenditure (parts and accessories, depreciation of machinery and equipment, and general overhead), which encourages over-investment in vehicles compared to other important inputs (Averch-Johnson effect), thus resulting in sub-optimum fleet use, among other consequences.

Because of these criticisms, the fare-setting methodology based on the price defined in the tender is intended to ensure that services are rendered at low prices, in addition to providing incentives for efficient corporate production, as prices that are pre-set in the contracts encourage cost-cutting. However, the use of this method may encourage operators to slash costs in pursuit of extraordinary profits, to the detriment of service quality.

In terms of fare-setting strategies (see item 3.2), prices charged to users may vary by distance, trip duration, service use (single trip or integrated commutes) or social status, such as lower fares for schoolchildren and students (Cadaval et al., 2005). Discounts and free passes granted to specific segments of society are almost always financed by other users through cross-subsidies, affecting final fare levels and thus impacting outlays on transportation for lower-income families.

Fare increases (generally implemented annually) may be based on recalculating service operation outlays through costs spreadsheets and, more recently, by means of parametric formulas based on general or sector-specific price indexes. The use of parametric formulas is intended to simplify the process, reducing the administrative efforts required by the Geipot spreadsheet (1995) and its adaptations. However, this creates the risk of weakening the government's cost oversight structure.

9. Translator's note: this is an autarky of the Federal Government that provides services related to transportation planning.
10. In economics, asymmetrical information is a phenomenon that occurs when two or more agents agree on an economic transaction, if one of the parties involved is endowed with qualitative and quantitative information that is superior to that held by the other party.

CHART 1
Parametric formulas for fare increases in selected Brazilian cities

City	Starting date of new method	Composition of basket of indexes
São Paulo (remuneration fare adjustment)	2004	Labor: 50% Diesel: 20% Vehicles: 15% IPC/FGV (inflation rate): 15%
Belo Horizonte	2008	Labor: 40% Diesel: 25% Vehicles: 20% Distance driven: 5% Overhead: 10%
Goiânia	2007	Formula linked to diesel price, worker wages, National Consumer Price Index (INPC), Column 36 issued by the Getulio Vargas Foundation (FGV) and the Passengers Carried x Kilometer Index
Uberlândia	2007	INPC (inflation rate): 50% Diesel: 25% Equipment and vehicles: 25%
Brasília	2012	Diesel price: 20% INPC (inflation rate): 50% Vehicle price FGV: 20% IGP-DI (inflation rate): 10%

Source: contracts signed in selected cities.

With a longer time-frame (every four or five years) the fare review process consists of reassessing the operating and capital costs functions of the companies and estimating demand growth rates. In order to avoid problems with the Geipot methodology, some cities adopted the Cashflow method, which is intended to maintain an even economic and financial balance for rendering services for the duration of the agreement through adjustments to the break-even fare calculated by the amounts of allocated and planned investments, operating costs, paying passenger demands and revenues, in addition to tweaking the parametric formula. The value of the investment is preserved through the Internal Rate of Return (IRR), which keeps the present value of cash inflows equal to the present value of cash outflows, for the business as a whole.

This review period was established at four years in Belo Horizonte, while São Paulo did not stipulate any specific duration, with the government and the operators free to request reviews at any time, based on changes in the initial conditions. The government has a period of thirty days to analyze requests submitted by operators.

The method used in Belo Horizonte to analyze the maintenance of an even economic and financial balance in the fare review process is based on the Internal Rate of Return (IRR), with external auditors hired to handle this. During the first review period (2008-2012), the auditors assessed to the internal rates of return using two main scenarios: *i*) taking into consideration investments in the new

BRT system (called Move); and *ii*) disregarding investments in this BRT system. For the first scenario – which is what actually occurred – it was found that the internal rates of return (discount rates) were lower than those in the tender bid, requiring a 3% fare increase at that time. If there had been no investments in this new BRT system, the IRR calculation would be far higher (3.03 p.p.) than the tender, indicating overly high profits for the operators and the need for a real reduction in fares.

TABLE 1
IRR for the transportation operation scenarios in Belo Horizonte

Operation scenarios	IRR
Initial balance under the agreement	8.95%
Basic operating scenario with the BRT	8.58%
Basic operating scenario without the BRT	11.98%

Source: Young (2014).

The question that still remains and must be addressed by mobility systems is: Why must passengers bear the costs of investment and system upgrades through higher fares if society as a whole also benefits from improved public transportation services?

3.1.6 Quality and productivity incentives

Controlling the quality of the services rendered is one of the goals of regulation. Pursuant to Article 10 of Law 12,587/2012, which establishes the National Urban Mobility Policy (PNMU) guidelines, public transportation service agreements must set targets to be reached by operators, together with their control and evaluation tools.

These mechanisms may include financial incentives through bonus-penalty systems linked to operator remuneration, in order to boost service quality. They may also be based on user satisfaction surveys and/or operating parameters to be obtained, such as comfort, safety, security and reliability ratings, among others.

For example, Curitiba works with a quality indicator that may cut operator remuneration by up to 3%. This indicator analyzes punctuality, user satisfaction with services, vehicle breakdowns, vehicle inspections and fines or other penalties imposed on the company.

As a result, service efficiency becomes a goal to be pursued constantly, with part of the gains in productivity attained by the operators being transferred to their users, as established in Articles 9, §9 and §10 of Law 12,587/2012.

The Passenger-Kilometer Index (PKI)[11] is the productivity indicator most commonly used: the higher the PKI, the lower the fare. During a recent fare review, Belo Horizonte adopted a calculation method under which gains in productivity must be split evenly between operators and users (fares), albeit without providing detailed information on how these gains are calculated. The firm handling the 2012/2013 audit suggested a methodology based on the cost/revenue ratios at the start and end of the period under examination. Should this ratio rise, the increase would constitute a gain in productivity and would be used constantly to calculate fare alterations. However, this ratio actually dropped, indicating that there were no gains and consequently no need to lower the fares.

3.1.7 Financing/underwriting operations

The manner in which operations are financed and underwritten directly affects the fares charged to users. In Brazil, as previously mentioned, the main basis of financing is fare revenues, with only a few cities supplementing these amounts with government budget allocations. As the number of users drops steadily due to individual motorization (through automobiles and motorcycles), the service financing base shrinks, undermining the financial sustainability of these essential services.

Public transportation subsidies may be allocated to operators or users. The user subsidy system is already in widespread use in Brazil through travel vouchers issued by companies to their employees. However, as this benefit is limited to registered employees in the formal sector, it does not encompass the out-of-work and unregistered or casual workers in the informal sector.

However, there are claims that indirect subsidies are awarded without improvements in service quality or increases in the number of passengers carried (Cepal, 1988; Glaister, 1993). Non-fare revenues used to underwrite subsidies may come from fuel taxes, fees for travelling along busy thoroughfares (urban tolls), and/or other activities related to transportation (Ipea, 2013).

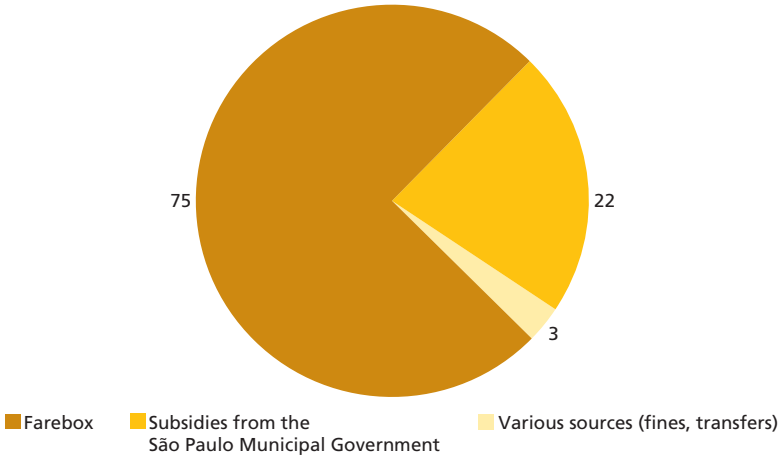
As previously mentioned, urban bus service operations are financed almost completely by fare revenues in Brazil. São Paulo is an exception, with some 25% of its system revenues consisting of government subsidies and other assorted revenues, as shown in graph 4. To some extent, this characteristic is related to the model used here, with indirect remuneration for operators that is unrelated to fare revenues.

In Belo Horizonte, non-fare revenues are not significant. A financing program for low-income schoolchildren and students[12] is not particularly significant in the broader context, while ancillary revenues brought in through advertising and commercial exploitation of fixed assets are also close to negligible.

11. PKI is derived by dividing passengers transported by kilometers travelled.

12. There are no free bus passes for schoolchildren and students in Belo Horizonte, but City Hall pays the fares for low-income pupils in the public school network.

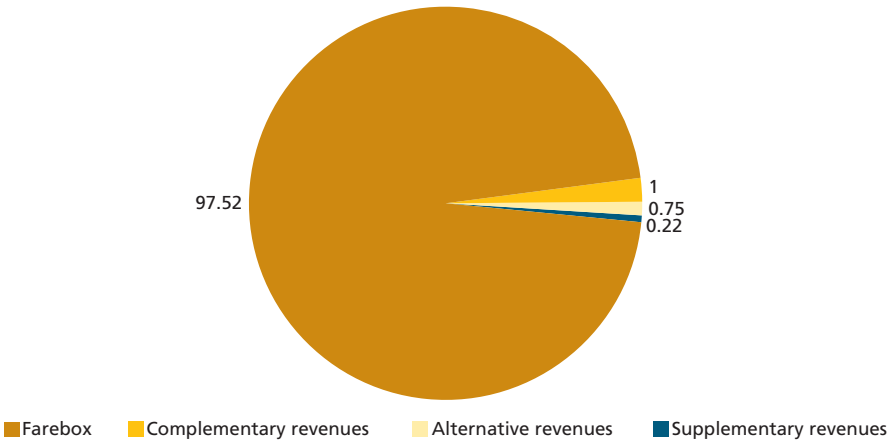
GRAPH 4
Urban bus system revenues in São Paulo (May 2014)



Source: website, São Paulo Transport Transit Authority (SPTrans).

Some cities – such as Brasília – subsidize services through external financing of free passes, with local government outlays on public transportation subsidies for bus passengers estimated at around 40% of total system costs, reaching over R$ 600 million (± US$ 150 million) a year.

GRAPH 5
Urban bus system revenues in Belo Horizonte (2009-2012)



Source: Young (2014).
Obs.: Alternative revenues: bus advertising; complementary/ancillary revenues: expired and not re-validated credits, and ticketing service fees.

3.2 Regulation and urban space

The manner in which these services are organized also forms an important part of the regulatory process, and have impacts on urban areas. Brazilian cities have expanded considerably over relatively brief time spans, indicating the need for frequent reviews and adjustments of public transportation networks from the standpoint of time as well as the spatial layouts of available services.

The organization of public transportation service suppliers may spur neighborhood density or contribute to the decentralization of everyday activities (work, study, etc.) which can spread to other parts of the city. However, depending on the regulatory model, institutional barriers may hamper the implementation of the necessary interventions.[13]

3.2.1 Organization of services

Basically, urban bus services must be organized by routes or by geographical area. For the former, the government establishes the routes and delegates operating rights in these segments to companies, planning the entire network and specifying the levels of services to be rendered by the operators, including frequency and headway. The problem with this model is that once these routes have been assigned, private operators feel that they are the "owners" of these lines. Spatial alterations trigger disputes among operators, as they necessarily restructure to balance of the supply of services as initially designed. Under more rigid models of bus route awards, passenger interests are frequently marginalized by the need to maintain an even balance among operators.

When organized by geographical area, companies are free to introduce spatial adjustments as desired, as their impact on the balance between supply and demand occur only in the area awarded to a specific operator. Furthermore, operations planning is the responsibility of each operator in its respective area, with the government defining general service quality levels, integration conditions and fare policy.

Another noteworthy aspect of spatial regulation of services is the size of the operating area or sector. Very small concession areas give rise to the same disputes over route awards, while also curtailing gains in scale. As such, there is a trend in Brazil to handle public transportation with multiple operators,[14] operators often create consortia for geographical areas that function as a single company, administering and sharing out revenues within their respective concession areas.[15]

13. For example, concessions awarded by bus lines hamper changes to itineraries prompted by new land use developments, due to disputes among operators. Another example is fare policy, which may also intervene in urban development (these topics are discussed in subsequent items).

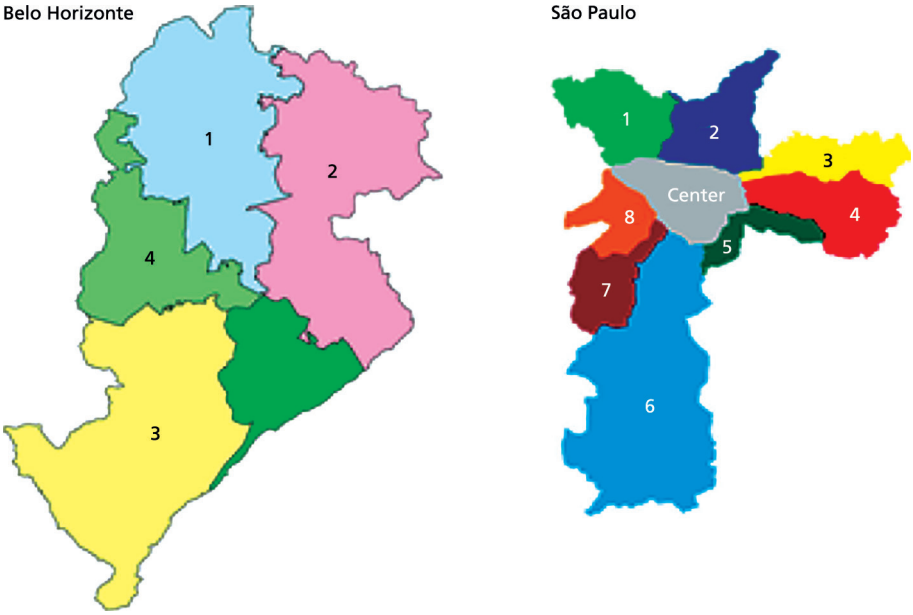
14. As public bus transportation in Brazil began with smaller vehicles known as *lotações* running along specific lines, this resulted in countless bus companies being set up (Galhardi, 2007).

15. There is also a variation on the route-based model through which the Government leases a fleet of vehicles and allocates them to the service network as planned, remunerating companies for mean output in terms of kilometers driven.

An important aspect of the concession model is related to services running through large sectors, in addition to operations in core areas where most lines converge. In Porto Alegre and Goiânia, these operations are delegated to government-run transportation enterprises. In general, in cities with no public transport operators, a pool of companies or a specific consortium may be set up to handle cross-sector services, like a virtual transportation segment.

The first cities to tender out their systems on the basis of operating segment models handled by consortia were Belo Horizonte (1998 and 2008) and São Paulo (2004), with Belo Horizonte establishing four geographical areas for these operations and São Paulo opting for eight areas (figure 1).

FIGURE 1
Public transportation operating areas in Belo Horizonte and São Paulo



Source: Belo Horizonte (1998 e 2008) and São Paulo (2004).

Another important aspect of regulation by operating area is the existence of one or more trunk corridors, where appropriate infrastructure must be provided for high-capacity vehicles in exclusive lanes, together with bus stops, stations and terminals endowed with large-scale operating capacities. These facilities link up with other transportation services, boosting the macro-accessibility of the system and allowing users to travel to many different destinations through integrated routes.

Although operators are free to draw up their own service specifications under area concession models, aspects linked to high-capacity corridor operations and the

integration matrix at connection points are also important regulation parameters. Area award agreements must address the possibility of encouraging the implementation of high-capacity systems in the future.

For example, before implementing its Move BRT system along its main northern thoroughfare, Belo Horizonte conducted a tender by area for the future implementation and operation of a BRT system. Subsequently, the economic and operating parameters defined for this new system were initially queried by the Federal Prosecutor's Office[16] but then accepted as an amendment to the agreement.

In contrast, Brasília tendered out a system that failed to stipulate bus lane operations with doors on the left sides of the vehicles along one of its main thoroughfares: the Estrada Parque Taguatinga (EPTG). The operator purchased conventional buses that were not compatible with the technology planned for this high-capacity system, effectively invalidating R$ 300 million (±US$ 75 million) invested in this public transportation corridor.

Although they are not specifically tools for the economic regulation of public transportation *per se*, urban development plans, guidelines and laws play leading roles in fine-tuning public transportation use. For example, major public transportation corridors offer more seats and better connection points with other services and routes, leading to the logical expectation that policies focused on higher urban population density could lead to mixed land use (residential and commercial) development along the corridors. This is the principle underpinning Transit Oriented Development (TOD),[17] which can spur more dynamic growth and development along high-capacity public transportation routes.

A good example of this is the new Strategic Master Plan for São Paulo, which lays down the basic guidelines for urban development, and was recently approved by the City Council. Under this Plan, urban density will increase in areas close to subway and monorail stations, as well as light rail and bus corridors, with construction permits issued for taller buildings in these areas. However, authorization for additional garages in these regions may be granted on a fee-paying basis, with 30% of the revenues resulting from payments for permission to extend constructed areas being allocated to investments in mobility, among other mechanisms to encourage the use of public and non-motorized transportation options, instead of individual motorized transportation.

16. As there was a radical shift in the operating design of the system, the Federal Prosecutor's Office initially felt that a specific tender would be needed for this system, despite belonging to an operating area already defined during an earlier bidding process.

17. TOD – Transit Oriented Development, an approach whose principles have been adopted recently by several cities all over the world: Bogotá, San Diego, Toronto, Vancouver, Ottawa, etc.

Other important aspects of broader-ranging regulation of urban space are policies that decentralize economic activities. For example, in the Federal District and Minas Gerais state, moving government offices to outlying areas introduced the conditions needed for their development, while making optimum use of existing public transportation capacity by generating high-volume commutes in the opposite direction of major rush-hour traffic flows. For example, these counter-flows are estimated to top 10,000 peak-period subway trips in the Federal District,[18] once the new City Hall Complex opens, with its inauguration scheduled for 2015.

3.2.2 Fare-setting strategies

Fare-related regulatory aspects may also influence urban mobility systems and spatial arrangements. In Brazil, the quest for streamlined operational controls have allowed flat fare policies to prevail for public transportation systems (Cadaval, 2005). Even with the introduction of electronic ticketing systems that would solve operating difficulties, few fare diversification policies have appeared. To the contrary, São Paulo mixed a flat fare policy with time-based integration[19] after the electronic ticketing system was introduced, providing a fare policy benchmark for other municipalities.

Despite the social slant of this policy, which follows the logic of affordable fares that benefit the mass of low-income residents of poverty-stricken urban outskirts living far from wealthier employment centers, this approach also drives urban sprawl, with effects on transportation costs and mobility conditions. As transportation costs remain unchanged in family budgets, property developers are encouraged to seek out distant areas with lower land prices for mass-market housing projects that are steadily more remote from economic hubs. Another important point is that shorter trips tend to be more expensive under flat fare policies, thus reinforcing the economic dynamics of more developed areas, as travel costs are the same for a quick trip to nearby stores or an outing to more developed and attractive areas.

Consequently, a zoned fare policy may offer a solution for these situations, with higher fares for areas that are further away from business or shopping hubs. This would encourage denser settlement in neighborhoods closer to core areas, which should be reflected in the Master Plan for the city.

The London bus system is an example of a zoned fare policy: the city is divided into nine fare zones with different prices for each origin-destination pair, by zone. In Japan, Tokyo is another interesting example, with even its subway systems charging fares based on boarding and destination locations, so that longer

18. The authors calculated this estimate based on the numbers of workers and users that will circulate each day through the premises of these new government headquarters.

19. Possibility of travelling on other integrated lines without paying a further fare within 120 minutes.

trips are more expensive. In addition, many major cities have implemented public transportation management systems that allow metropolis-wide policies to be implemented, in contrast to Brazilian cities which have two tiers of administration lacking institutional, municipal or metropolitan integration.

4 CITIZEN PARTICIPATION IN URBAN BUS REGULATORY POLICIES

Brazil's 1988 Constitution extended citizen rights and institutionalized several channels for society to participate in the life of the state by including social participation mechanisms in federal and local public policy decision-making processes (Rocha, 2008).[20]

In terms of urban policies, particularly those related to urban mobility, the Cities Statute (Law 10,257/2001) and the Urban Mobility Act (Law 12,587/2012) introduced tools for materializing the principle of social participation in the democratic administration of the city. For example, Articles 14 and 15 of Law 12,587/2012 assure public transportation passengers the right to take part in planning, oversight and assessment of local service policies through collegiate entities, ombudsman offices, and public hearings and consultations, in addition to other systematic communication, evaluation and accountability procedures.

Similarly, an increase in a city bus fares in São Paulo triggered the protests that spread nationwide in July 2013, clearly reflecting the demands of organized society to participate effectively in decisions on transportation services.

However, social participation in regulatory policies for public transportation by buses is not a common practice in Brazilian cities. Only a few municipalities have set up Municipal Transportation Councils, with no systematized data available on the use of public hearings or consultations for discussing fare policies and planning for these public utility services in Brazil.

The 2001 Basic Municipal Data Survey (Munic) found municipal transportation councils in only 4.9% of Brazilian municipalities. Among them, 69.6% had held meetings during the period covered by this survey, ranging from "very frequent" (51%) to "irregularly" (25%). According to the survey's report, this shows that many of these councils are either inactive or barely functional. Among the municipal transportation councils in place, 76.1% allocate seats evenly between government entities and representatives of civil society. The following edition of this survey (Munic, 2012) indicated an uptick in the percentage of Brazilian municipalities with these councils, reaching 6.4% and rising to 76.3% for cities with populations of over 500,000 inhabitants (table 2).

20. Available at: <http://goo.gl/ojBmkp>.

TABLE 2
Brazilian municipalities with municipal transportation councils (2012)

Regions and classes by size of municipality	Municipalities	
	Total	With municipal transportation councils (%)
Brazil	5,565	6.4
North	449	5.8
Northeast	1,794	3.2
Southeast	1,668	6.9
South	1,188	11.8
Center-West	466	3.9
Municipalities by population size		
Up to 5,000	1,298	1
5,000 – 10,000	1,210	2.4
10,001 – 20,000	1,388	2.4
20,001 – 50,000	1,054	6.5
50,001 – 100,000	327	22.6
100,001 – 500,000	250	43.6
Over 500,000	38	76.3

Source: Munic, 2012/IBGE.

Corroborating the findings of the Munic Survey, a study by Indi (2014) indicated that the effective operationalization of grassroots participation in public passenger transportation policy decision-taking processes remains a challenge in Brazil, requiring political and institutional maturity.

When analyzing the effectiveness of public hearings as a mechanism to foster social participation in discussions of the Urban Transit Services Concession Award Plan for Towns around Brasília, Maia (2015) reached the conclusion that they did not contribute effectively to reshaping the policy under analysis.[21]

In terms of transparency and access to data, only thirteen (just over a third) of 38 Brazilian municipalities with more than 500,000 inhabitants had disclosed the costs spreadsheets (on which fares were based) on the Internet by March 2014 (Iema, 2015), despite nationwide protests in July 2013 and the Access to Information Act (Law 12,527/2011).

5 CONCLUSIONS

Tendering public transportation operations is becoming a reality in Brazil, creating opportunities to upgrade the services offered to the population by organizing the regulatory framework for the sector and integrating it more closely with urban planning, in order to foster more logical and efficient urban mobility systems.

21. Available at: <http://goo.gl/ueOI2G>.

It seems that there is no optimum regulatory framework for urban transportation services, with each location necessarily selecting the best combinations of regulatory attributes, tailoring regulations to its social, territorial and economic needs and specific characteristics. This means that, before defining a regulatory model, authorities must study market conditions and public transportation operations, in addition to assessing major political, social and economic factors, in order to reach the targets set for the economic performances of these systems, the quality of the services they render, the spatial layouts of their networks and the channels for social participation and control of these services.

The principles of reasonable fares, social participation and enhanced service quality must be assigned top priority when drawing up regulatory models for urban passenger transportation services, as these services are vital for low-income communities in major urban centers. Consequently, mechanisms that once received little attention now appear to have greater potential for drawing up regulatory models. These include: non-fare financing for operations and service organization and remuneration models that ensure better compliance with urban changes, participation in social controls over these services, meeting quality targets and transfers of gains in productivity to users, among other aspects. Added to this are recent advances in urban space regulations and tools such as Transit Oriented Development (TOD, which interact with transportation planning activities, thereby enhancing mobility conditions for the population in general.

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