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URBAN MOBILITY AND SOCIAL EXCLUSION: THE TRANSPORT SYSTEM IN

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URBAN MOBILITY AND SOCIAL EXCLUSION: THE TRANSPORT SYSTEM IN
THE METROPOLITAN REGION OF RIO DE JANEIRO

A THESIS APPROVED FOR THE
COLLEGE OF INTERNATIONAL STUDIES

BY

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A Portrait of Daily Commutes

V

V lives in Padre Miguel, a neighborhood in the West Zone of Rio de Janeiro. He is in his early 20s and a student at the Federal University of Rio de Janeiro, attending courses every evening at the Praia Vermelha campus. He is also working as an intern during the day in Flamengo.

V's commute starts with a short walk to the Mocidade/Padre Miguel train station, where he catches the train in the direction of Central. The trains are usually extremely crowded in the mornings, and it is not uncommon for him to have to wait for a second train to pass, which may take up to 10 minutes to come. He never gets a seat, he says. And in the off chance one comes available, he generally leaves it for someone else. He says that there is an attitude among riders that students should not sit since the government subsidizes their fares. V seems to disagree with this logic, stating that his fare is paid by his internship and not the government. "But it is kind of a moot point. There are never any seats in the morning." Despite being overcrowded, V says that at least all of the trains on his line[1] have air conditioning now.

After a 45 minute train ride V arrives at Central. From there he can change to either a bus or the Metro to get to his internship in Flamengo. Although a bus would be less crowded, he opts for the Metro because it is faster and nicer, with subways passing every 2-3 minutes. He rides the subway to the Flamengo station and then finishes his

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[1] Train Line: Central-Santa Cruz

journey with a 5 minute walk to his job. In total, he says the trip is 40 kilometers and takes about 1 hour 20 minutes. If he was to take the bus from Central, the total time increases to over 2 hours.

From work V takes and a bus to the university. He says that it usually takes about 20 minutes and is generally not crowded.

After classes V starts the journey back home. This direction, he takes the bus to Central (he leaves after 10pm so there is little traffic) and then the train. He generally catches the last train, which he says tends to be crowded but is never full. He also has to wait longer for the train to leave the station (up to 20 minutes). Plus, after 9:00pm there are only trains that stop at every station (as opposed to direct trains). After about 45 minutes he disembarks at the Guilherme da Silveira station, which is 1.5 kilometers from his house. Although it is not the closest station, he has to get off here because the Padre Miguel station is unsafe at night. From here he either walks home or is picked up by his father who drives him home.

In total, V spends more than 3 hours per day on public transportation, at a cost of R$ 19.10 per day. Assuming 22 workdays per month, V spends R$ 420.20 per month just to get to and from work and school. This is just over 50% of the monthly minimum wage, which is currently R$ 800/month.
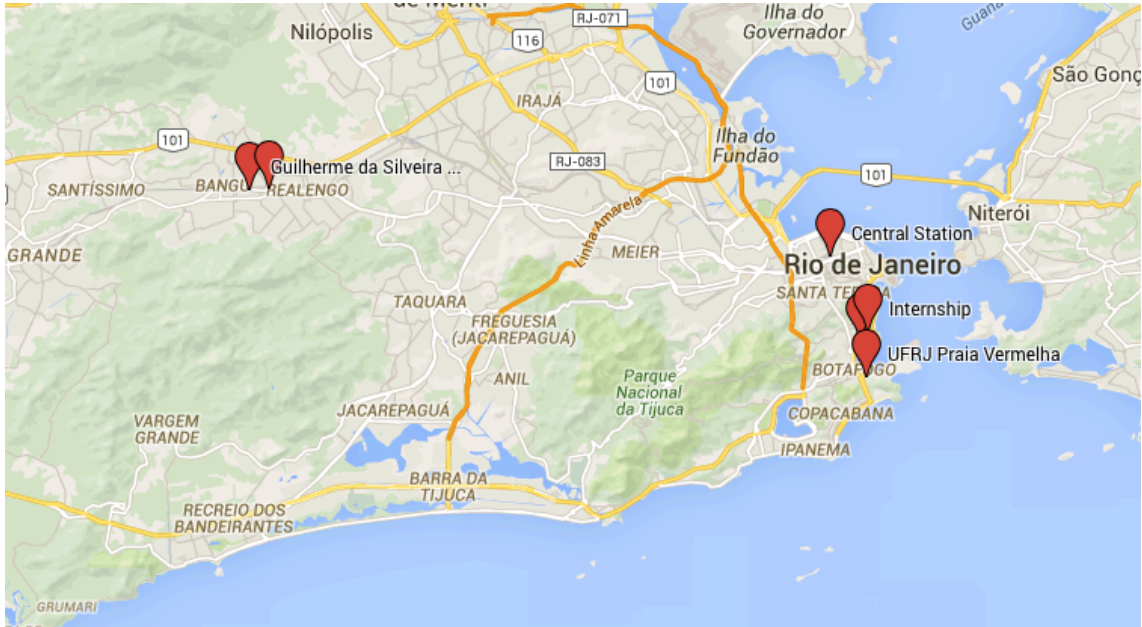
Figure 1. Map of V's Home-Work-School Commute

A

A is mid career professional working in IT in Ipanema. He lives in the working class neighborhood São Gonçalo (across the bay) and drives to work every day. When asked about his commute, A said that he generally leaves home at 8:00am and it takes him anywhere from 50 minutes to 2 hour and 20 minutes to arrive at work in Ipanema. Between 50 minutes and 1 hour and 20 minutes he classifies as "good traffic;" 1 hour and 20 minutes to 1 hour and 45 minutes, "busy traffic;" 1 hour 45 minutes to 2 hours and 20 minutes, "really bad traffic." Once in Ipanema he parks his car on the street, generally paying about R$ 6. He says that parking is usually easy because people who live in Ipanema all leave in the morning to drive themselves to work. The only exception is in the summer, when it can be more difficult. Going home takes less time, but can still take up to 2 hours if he leaves work during the peak of rush hour (around 6:00pm). He normally leaves after 7:00pm.

In total A says he spends around R$ 750 per month just on his transport to and from work. Again, assuming 22 workdays per month, the cost breakdown is as follows:

130 BRL/week on gasoline (ethanol) x 4 weeks = 520

3.70 BRL bridge toll Niteroi-Rio x 22 = 81.40

11 BRL/month for the convenience of using automatic payment at toll = 11

6 BRL/day for parking = 132

TOTAL = R$ 744.44[2]

Although costly, there are several reasons A chooses to drive himself instead of taking public transportation. He says when it comes to public transportation from his house he has two options. He could take a "frescão"[3] until Centro and then take the Metro to Ipanema. He says this option is ok from a time and comfort level, but it nearly the same price as driving himself, without the convenience. The "frescão" costs R$ 11.50 and the Metro is R$ 4.10.[4] This adds up to R$ 31.20 per day, or R$ 686.40 per month.

His other option of public transportation would be to take a bus from his home to the boat terminal in Niteroi, cross the bay by ferry, walk from the Rio boat terminal at Praça XV to the Carioca metro station, and then take the metro to Ipanema. When asked about this option he simply said, "forget it. I would spend my whole life going to work by boat every day."

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[2] This amount does not include wear and tear on the car.
[3] "Frescao" is a special bus that is much higher quality and makes fewer stops. It is easily recognizable by its dark blue color and only one door at the front of the bus.
[4] The fares are not integrated so each must be paid in full.
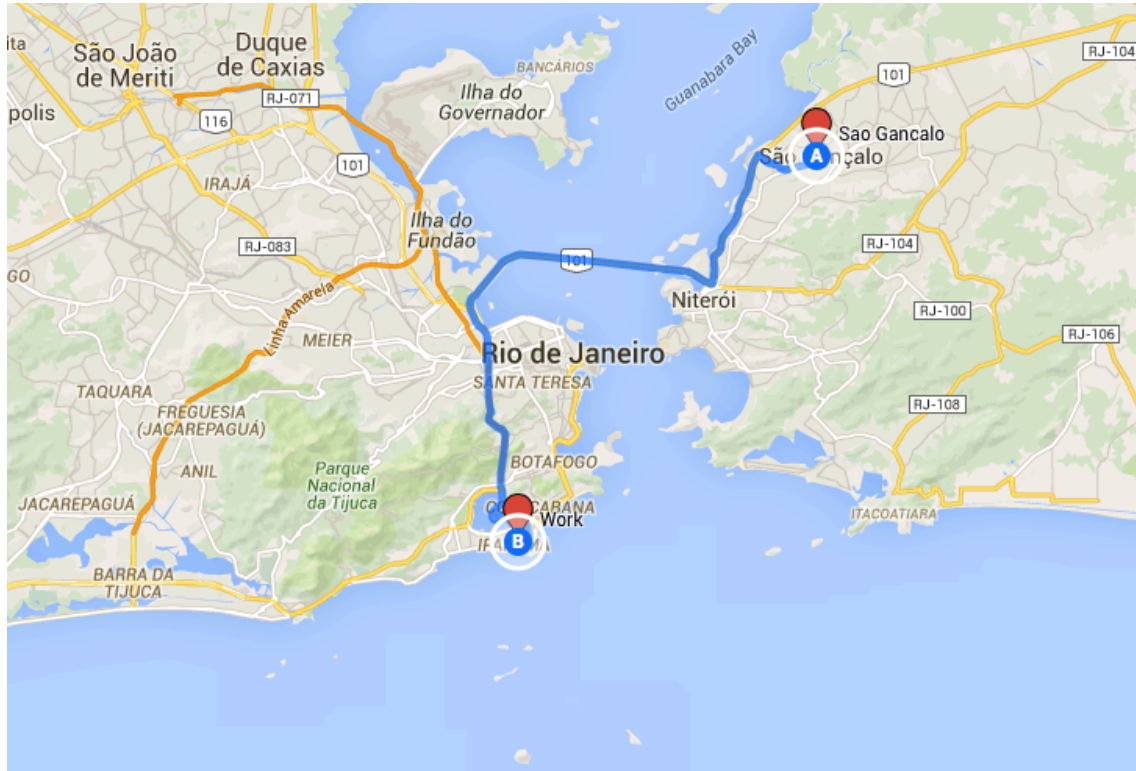
Figure 2. Map of A's Home-Work Commute

R

R is a late 20s professional, working as an analyst at an oil and gas consultancy

firm in Centro. He lives in Ipanema and takes the Metro to and from work everyday.

He says that on his typical morning he wakes up around 8:00am and leaves for work

between 8:20-8:30am. He walks from his apartment to the General Osório Metro

Station, about 10 minutes, takes the subway until Cinêlandia (the first stop in Centro),

and then walks 2 minutes to his office, which is only a block from the Cinêlandia

Square. In total, his trip is 30 minutes and costs R$ 8.20 per day. When asked about

the quality and comfort of his trip, he says it is fine, but complains about the heat. In

the morning, he always gets a seat[5] and passes the time on his rides to work by drawing.

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[5] General Osório is the first stop on the line, where the line originates.

On the way home, he says it is very crowded and he always stands. Still, he arrives

home by 7:00pm everyday, spending just over an hour on his round trip commute.
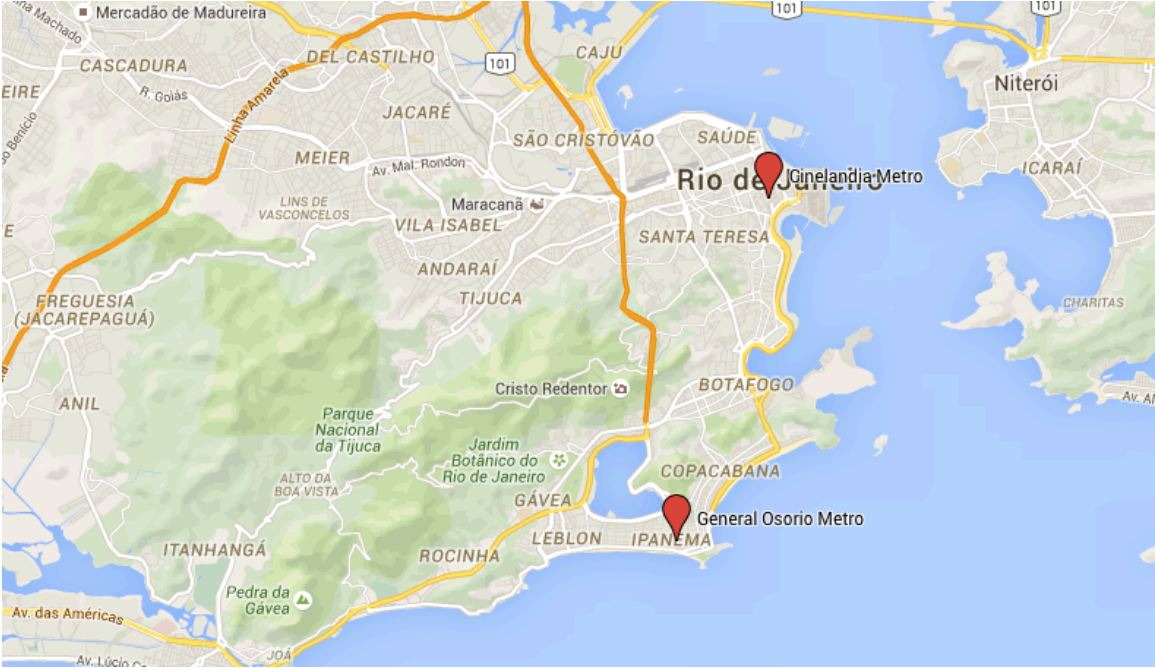
Figure 3. Map of R's Home-Work Commute

D

D lives in the municipality of Magé, part of the area known as the "Baixada

Fluminense." The municipality has grown rapidly, tripling the number of inhabitants

over the past fifty years (IBGE b.). It is a working class area, with over 50% of the

population coming from the "classe C" or "classe D."[6]

D works as a nanny/domestic helper for two different households in the South

Zone of Rio, one in Ipanema and the other in Leblon. In order to arrive at her job by

8:00am, she starts her commute at 4:30am every morning. After a string of rapes in her

neighborhood, she and the neighbor ladies leave their houses together every morning to

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[6] In Brazil, social class is defined by income and is categorized in an A-B-C-D-E
system.

walk to the bus stop. She says she generally waits up to 20 minutes for the bus to pass, but gets a seat since it is so early. After about an hour-long ride, she gets off the bus in Duque de Caxias and walks to the Gramacho train station. Here she gets on the train and rides until Central. At Central she switches to the Metro Line 1 and rides to the final stop, General Osório. From there, she switches to the Metro Bus and gets off further in Ipanema or rides to the final stop in Leblon, depending on which house she is working at that day. In total, the trip takes about 3 hours.

At 5pm, she starts the journey again in the opposite direction. However, because it is rush hour and everyone is trying to leave the city, everything is much more crowded and takes longer. She waits in a long line to catch the Metro Bus, just to get on a packed Metro and then a packed train. She normally arrives home between 8:30 and 9:00pm.

In total, D spends nearly 7 hours and R$ 21.20 per day on her home-work commute. Using the "Bilhete Unico" card, she pays the maximum, R$ 6.50, for the intermunicipal bus and the train. However, since only one transfer is allowed on the card, she must pay the Metro fare in full, an additional R$ 4.10.[7] This adds up to R$ 466.40 per month. Her employers cover her transport costs, a practice that is customary in the city.

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[7] The Metro and Metro Bus are covered by one fare.
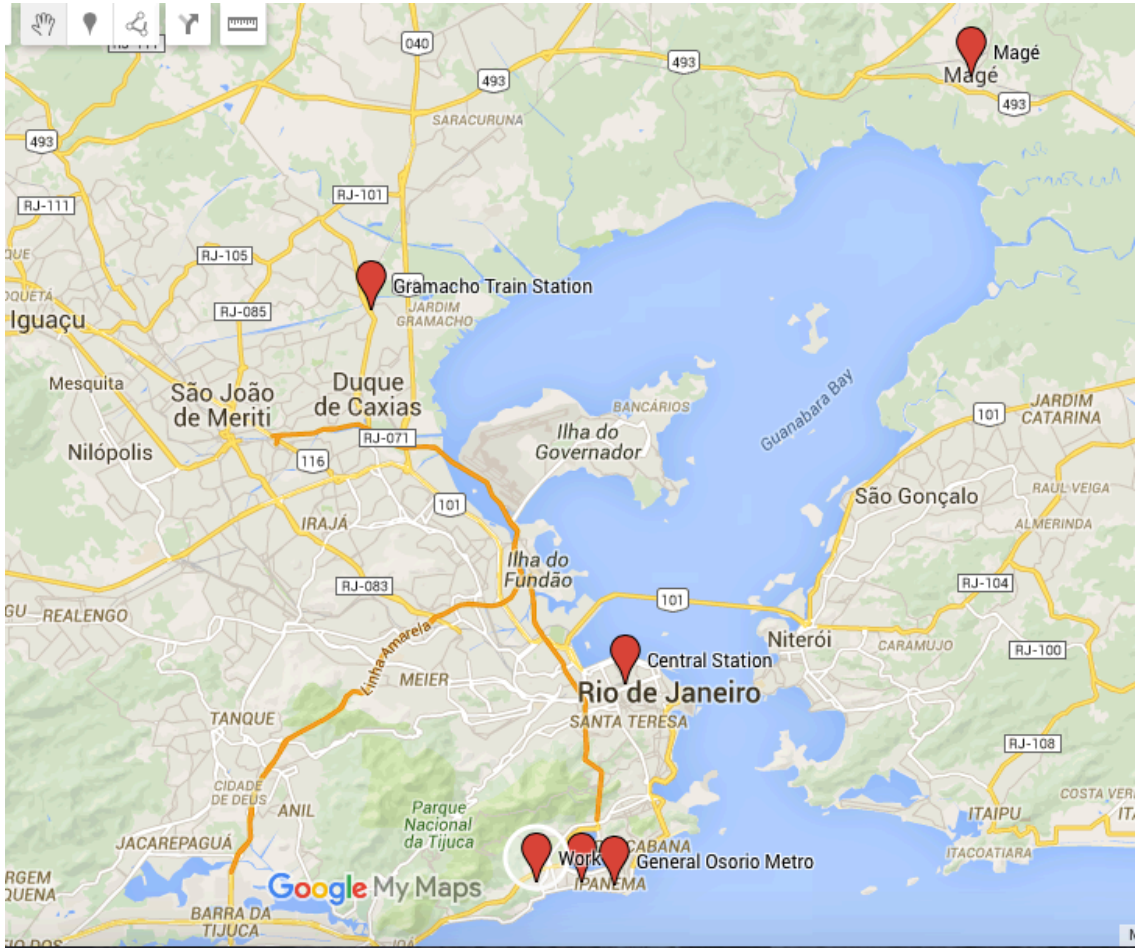
Figure 4. Map of D's Home-Work Commute

Introduction

The Metropolitan Region of Rio de Janeiro's (RMRJ) urban mobility system directly affects the quality of life of its inhabitants and its visitors, and it raises debates about the design and management of transport systems and land use adopted by the government. The debate surrounding this issue gained momentum on the national scene with the outbreak of demonstrations in June 2013, which led hundreds of thousands of people to protest in more than one hundred cities around Brazil. Protests started with outrage over the increase in the fare price for public transportation, especially in light of

the poor quality of service. In Rio, the Free Fare Movement (MPL) led the charge,
arguing not only that the increased fare was abusive, but that all fares act as a barrier to
urban mobility.

According to the Index of Urban Wellbeing, prepared by the Observatory of the
Metropolises[8] in 2013, among 15 metropolitan regions in Brazil, Rio de Janeiro
received the worst rating for the "urban mobility aspect," being below the national
average in all dimensions examined (Ribeiro and Ribeiro 2013). Below is a map
showing the levels of mobility within the metropolitan region, dark blue being the best
and dark red being the worst.
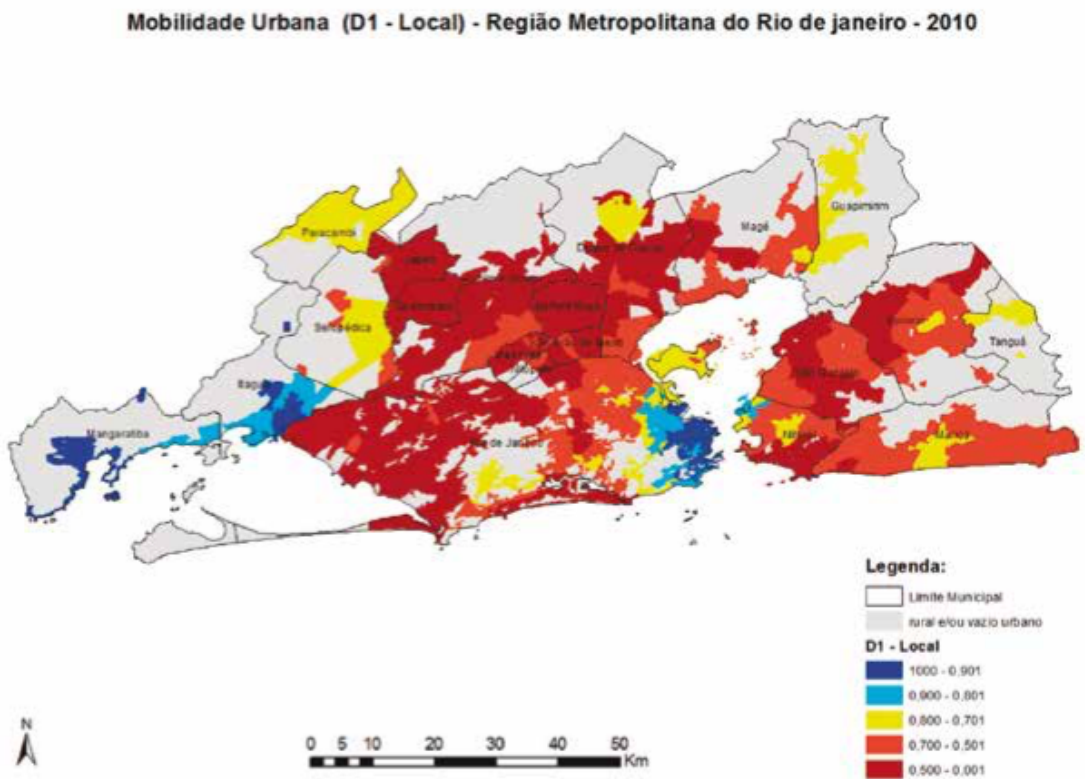
Figure 5. "Urban Mobility - Metropolitan Region of Rio de Janeiro - 2010"
(Ribeiro and Ribeiro 2013)

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[8] *Indice de Bem-Estar Urbano pelo Observatório das Metrópoles*

Because urban mobility is a factor that if not managed effectively can negatively affect the population's quality of life, building a strategic and sustainable transport system is an important feature for the development of society. A 2010 study of the RMRJ found that when comparing average incomes of similar workers, in terms of education, color, sex and type of occupation, who reside in areas with varying degrees of urban mobility, income differentials can reach 22.8% (Ribeiro and Silva 2010). Thus, movements within and around the city are not only a technical matter of traffic engineering, but have economic and social implications as well. The difficulties faced by citizens in their daily commutes create barriers, especially for the poorest, who generally live far from the areas that contain the best opportunities for work and study.

The most notable result caused by the existence of a poor public transport system is that the process of social exclusion is further aggravated (Pero and Mihessen 2012). For Kenyon, Lyons and Rafferty, social exclusion is "the process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or in part to insufficient mobility in a society and environment built around the assumption of high mobility" (Kenyon, Lyons and Rafferty 2001, p.210). Therefore, urban mobility becomes a precondition for social inclusion, or the participation of citizens in the society (Farrington and Farrington 2005). In this sense, "social exclusion is not due to a lack of social opportunities but a lack of access to those opportunities" (Preston and Raje 2007, p.153).

In this paper, I evaluate urban mobility in the Metropolitan Region of Rio de Janeiro, giving special consideration to the public transport system, in order to answer

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the question of whether or not Rio's mobility system leads to greater social inclusion or exclusion. My work fits into the larger academic scholarship on the Right to the City, which is a radical call for a transformed and renewed right to urban life. It is "the right to create a different, inclusive and livable city, [and] requires the formulations and appropriations of these different uses of spaces by civil society; citizens taking control of urban planning" (Lefebvre 1996, p. 173). Although urban planning encompasses many aspects, mobility is a foundational concern. If addressed properly it can serve to bring society together and contribute to the participation of the population in local development. Addressed properly in this sense means not in isolation. Urban mobility should be seen in a comprehensive manner, requiring not only transport related solutions, but also solutions relating to land use and planning. However, when mobility is restricted, as in Rio, there is no social inclusion, and for those not included, there is no real right to the city. The mobility system in the RMRJ does not serve those who are most in need of it. Instead, the poor public transport system further aggravates social exclusion.

In the first chapter I will briefly discuss the Right to the City and Rio de Janeiro's emergence as a metropolitan region, looking specifically at the resulting spatial configuration of its growth. The second half of the chapter looks at the urban mobility indicators of the metropolitan region.

The second chapter examines the principal modes of transportation in the city, briefly discussing their history and the quality of their service today.

The third chapter discusses the social impacts of urban mobility and accessibility.

The fourth and final chapter looks at the fight for a better transport system, offers policy recommendations and the conclusion.

The Right to the City

The Right to the City is a concept first developed by Henry Lefebvre in his 1968 book, *Le Droit à la Ville.* He created it as a reaction to problems that modern urbanization produced in the city, such as urban sprawl and social segregation. Today, it is one of the more important concepts in urban scholarship and has been enriched by some of Lefebvre's contemporaries, such as Harvey, Soja, Dikec, Marcuse and Mitchell (Ockman 1992). In its original conception, "the right to the city cannot be conceived of as a simple visiting right or as a return to traditional cities. It can only be formulated as a transformed and renewed right to urban life" (Lefebvre 2000, p. 158). At its core, the Right to the City is the right to inhabit the city, the right of everyone to participate in all aspects of social life.

Others have gone even further. For Harvey,

"the right to the city is far more than the individual liberty to access urban resources: it is a right to change ourselves by changing the city. It is, moreover, a common rather than an individual right since this transformation inevitably depends upon the exercise of a collective power to reshape the processes of urbanization." (Harvey 2008)

Dikec stresses the element of collective restructuring of the city in his definition as well.

"The Right to the City implies not only the participation of the urban citizen in urban social life, but, more importantly, his or her active participation in the political life, management, and administration of the city… The right to the city, therefore, is not simply a participatory right but, more importantly, an enabling right, to be defined and refined through political struggle. It is not only a right to urban space, but to a political space as well, constituting the city as a space of politics." (Dikec 2001, p. 1790)

As presented above, in the same way that the development of the city impacts people's right to the city, the right to the city impacts a city's development. They both also stresses people's role as political beings, with the ability to make and change the cities in which they live.

Using the above definitions, there are a large number of social movements all around the world who have appropriated the idea of the Right to the City for their various causes. According to Marcuse, it "has become a major formulation of progressive demand for social change around the world" (Marcuse 2009, p. 246). One such group is the Free Fare Movement, MPL, who invokes the idea of the Right to the City in its fight for a better and more just transport system. However, what makes the MPL different from other groups who use the concept is that in Brazil the idea has been written into law.

The City Statute (Federal Law 10.257, passed in 2001) is premised in the Right to the City and seeks to regulate the full development of the social functions of the city and urban properties. One of it key elements is

> "democratic management, i.e., the city population participating in the urban management, establishing a series of instruments and deliberative and consultative bodies, through which the civil society, especially the historically marginalized and politically and economically excluded groups, can participate in the decision-making process regarding the cities' future." (Junior, Zarate and Emanuelli 2014, p. 14)

Therefore, the MPL is not only invoking the concept of the Right to the City, but a Constitutionally guaranteed right as well.

The Emergence of the RMRJ

Since the second half of the twentieth century, Brazil has established itself as an urban country, in which the major urban areas have either continuously grown, or at least maintained their populations. Although Brazilian cities do not have the same dramatic demographic growth registered in past decades, both the 2000 and 2010 censuses registered over 80% urban population in the country as a whole, which corresponded to 160 million urban residents in 2010 (IBGE a.). These 160 million people are spread over 5,000 municipalities in Brazil, and about 32 million live in the metropolitan regions of Rio de Janeiro and São Paulo. Furthermore, the United Nations estimates that the country will reach 90% urbanization rate in the next 5 years (Maciel 2014).

Not only has the last 50 years been characterized by the permanence of population concentration in major cities, there has also been the emergence of new urban centers around the country. Despite differences in the various metropolitan regions, it is possible to map a general trend of territorial expansion. "From the 1950s until the late 1980s, Brazil experienced a developmental period marked by the expansion of cities without basic infrastructure and with poor living conditions, the informality and self-building resulting from this marked the Brazilian development model" (Junior, Zarate and Emanuelli 2014). Additionally, in all cases, the peripheries have had higher growth rates than the urban centers. Yet, the centers have maintained the highest concentration of jobs, putting extra pressure on these areas. Thus, the trend over the last several decades is an increase in urban sprawl, with a considerable

decrease in urban population density (Ribeiro, Silva and Rodrigues 2011; Rodrigues 2012).

> "The regulatory planning, founded on the belief that the drafting of the urban policy should happen under a technical sphere of public administration, instead of reverting this picture, accentuated its effects. The technocratic management fuelled a process characterized by the private appropriation of public investments and the segregation of large population groups in favelas, tenement houses and peripheric subdivisions, excluded from the consumption of urban goods and essential services." (Bassul in Junior, Zarate and Emanuelli 2014)

The case of the Rio de Janeiro metropolis, the second largest in terms of population size in Brazil, is no different. Rio has also experienced this trend of strong urban expansion, with urban population density in decline. With over 11 million people distributed in 21 municipalities, overall population growth has been about 1% per year for the past 20 years (IBGE b.). However, while this statistic confirms some demographic stability, it falls short in that it does not show the spatial distribution of growth. If it did, it would show high growth rates in most peripheral areas.

This growth in the periphery has helped to consolidate Rio de Janeiro as a metropolitan city, marked by the frenetic pace of movement of both people and goods. However, it also made the question of urban mobility increasingly challenging. Since the 1950s, the bus had become the most used mode of public transportation. The government favored buses over the tram system, which started in the late 1800s, because of their lower initial investment and the ability to easily create new routes as the city spread. Still, formal transport modes were not able to meet demand, especially in the periphery, leaving an opening for informal modes to emerge. These informal

modes, mainly vans, "pirate" buses and motorcycles taxis, spread rapidly during the 1990s.[9]

According to an article published by the *O Globo* newspaper in November 2000, alternative transportation carried more passengers than the metro and the train, totaling about 550,000 passengers per day, with about 8,000 vehicles. According to data provided by the secretary of transport of the city of Rio de Janeiro, the number of vans registered in the city hall exceeded 8,350 vehicles (Barbosa, Ferreira and Filho 2003).

Starting in the late 1990s, the government tried to start regulating, formalizing and integrating the informal transport sector to mixed success. In 2008 the state government issued new regulations for "low capacity transport," which states that vans cannot compete with buses and fares must be at least 10% higher. Additionally, vans must carry least 16 passengers, be air conditioned, and drivers must licensed.

> "Despite the efforts to formalize these services, the great majority of vans continue to operate informally, because the rules are not fully obeyed. Under this state regulation, a total of 639 vans have been licensed. However, according to information from the main actors involved in informal transport, the total fleet in operation in the entire state (excluding the city of Rio) is around 3,500, revealing the continuing situation of prevailing informality." (Balassiano and Alexandre 2013)

In 2010, the municipal government of Rio began implementing its own set of regulations and licensing schemes. However, like the state regulations, rules are not fully obeyed, and there are many more vans operating in the city than are registered. The only exception is the "South Zone" of Rio, in which all vans were prohibited after

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[9] Informal "kombis," or small vans that carry 10-15 passengers, were used to connect the favelas to the city center since the early 1980s (Brasileiro 1999).

the kidnapping, brutal rape and beating of two foreign tourists who tried to take a van

from Copacabana to Lapa in April 2013 (BBC Brasil 13 April 2013).

Another factor that has complicated the issue of how to create an effective urban

transport system are the political overlaps between the different levels of government.

Political boundaries of local authorities (municipalities) often do not coincide with the

functional or economic structure of the metropolitan area. This creates an environment

in which city ("prefeitura") leaders have to plan and finance infrastructure, including

transportation, in a metropolitan area where local ("municipal") leaders may have their

own agendas and infrastructure plan.

Land Use

"Land use and transport are mutually dependent… The characteristics of the transportation system determine *accessibility*, or the ease of moving from one place to another. Accessibility in turn affects the *location* of activities, or the land use pattern. The location of activities in space, together with the transportation resources connecting them, affects daily *activity patterns*, which in turn result in travel patterns. These *travel patterns,* expressed as flows on the transport network, affect the transport system... [Thus,] a change in land use will affect transportation, just as transportation affects land use." (Giuliano in Hanson 2004, p 239-240)

If this relationship is not properly planned for, a chaotic situation generated by

the imbalance between supply and demand can result, causing constant congestion and

difficulties in the movement of people and goods (Campos 2013).

Brazilian cities have gone through decades of intense and accelerated

urbanization, often without planning, which resulted in highly undemocratic,

fragmented and unsustainable spaces. The result of this lack of urban planning and

control over the dynamics of land use and occupation was the development of socially,

economically and territorially unequal cities. These cities do not have an adequate

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distribution of activities or equitable access to public services, job opportunities, housing and leisure. This has caused grave consequences for mobility as a whole, especially for people with lower income (Apparicio 2013).

Because of the horizontal and scattered sprawl of urban land use, distances increased and people began to live further and further away from their places of work and other essential activities. Thus, the number and length of trips per capita per day has increased. Several studies of Brazilian cities show that in large urban centers roads take, on average, 70% of public space and carry only 20-40% of the population (Vieira 2013). This imbalance in spatial configuration allows the emission of tons of pollutants into the air and long traffic jams, which reduce the flow of traffic and increase the travel time of people; both of these significantly reduces quality of life and the period of rest after the work day (Ibid).

The RMRJ today and Urban Mobility Indicators

The Metropolitan Region of Rio de Janeiro (RMRJ) was created in 1974 with the merger between the states of Rio de Janeiro and Guanabara and was originally composed of 14 municipalities. Since then, the region has gone through several changes before arriving at its current configuration. As of 2013 the RMRJ consists of 21 municipalities, which are home to 74.39% of the state's population, or 12,177,231 inhabitants (CEPERJ 2013).
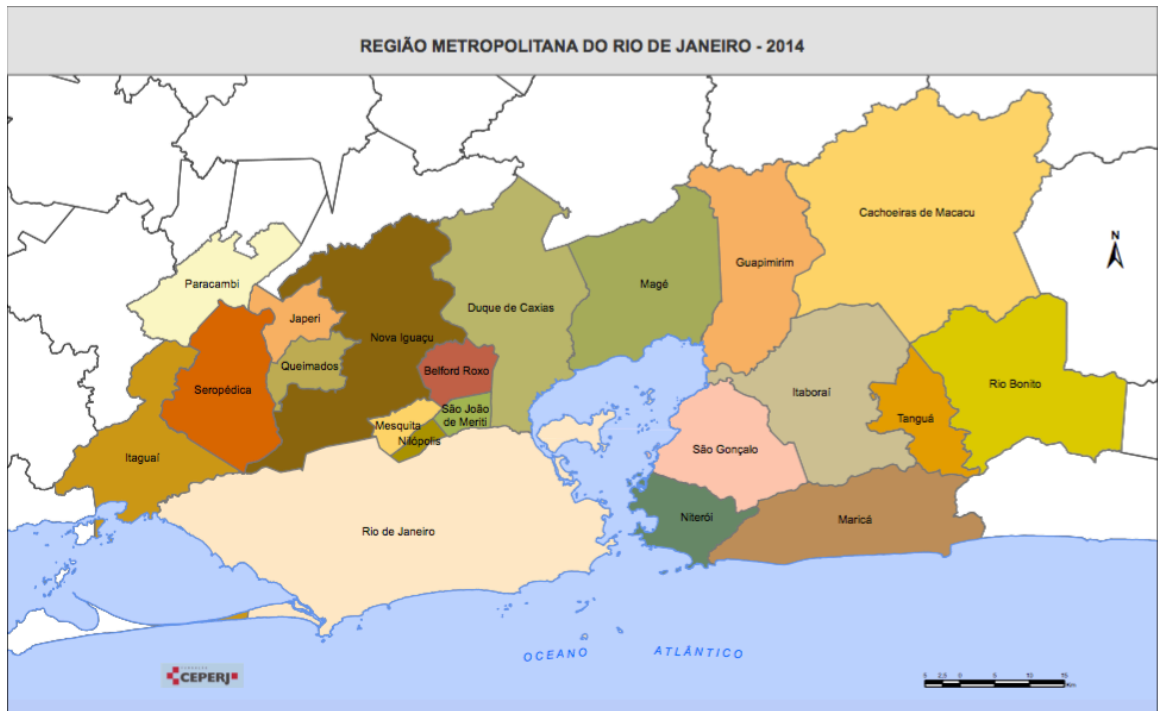
Figure 6. "Metropolitan Region of Rio de Janeiro - 2014"
(CEPERJ 2013)

According to 2012 data from CEPERJ, 77.96% of formal jobs in the state are generated in the RMRJ. Of these, 73.94% (or 2,572,044 formal jobs) are generated in the capital (Rio de Janeiro municipality). This leaves a huge number of citizens, those living in municipalities other than Rio de Janeiro, because they are priced-out of the capital due to extremely high real estate prices, who need to make long commutes from outlying towns in order to have access to employment in the capital (Ibid).

The concentration of economic activity in the capital presents numerous challenges for public management, not only with regard to urban mobility, but also to other areas of social life. Due to the large number of jobs, study, leisure and shopping options, there are flows of people starting from different locations that are all moving towards the capital. These flows must be supplied with efficient and sufficient modes of transport that meet the various demands.

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Growth of the Car and Motorcycle Fleet

Worsening urban mobility conditions are strongly linked to the choices people make about what type of transportation they use and the incentives granted by the government to private transport at the expense of public transport. In this sense, the growth in the number of private vehicles is an important indicator to be analyzed.

The number of cars in the RMRJ reached 3,017,406 units in 2012, an increase of almost 80% relative to the number of existing cars in 2001, which was 1,743,553 units.[10] Cars represent approximately 72% of the vehicle fleet in the region (Ribeiro 2013). As for the number of motorcycles and scooters, the data are even worse. In 2001 the number of motorcycles and scooters in the metropolitan region was 98,209 units; in 2012 there were 472,591 units, an increase of 377% (Ibid).

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[10] Here it should be noted that a large number of vehicles on the road are taxis. The city of Rio, just the capital, has an estimated 33,000 taxis, or 1 taxi for every 190 people. However, they are expensive and therefore not a viable option for the daily shifts of most of the population (Rangel 2016).
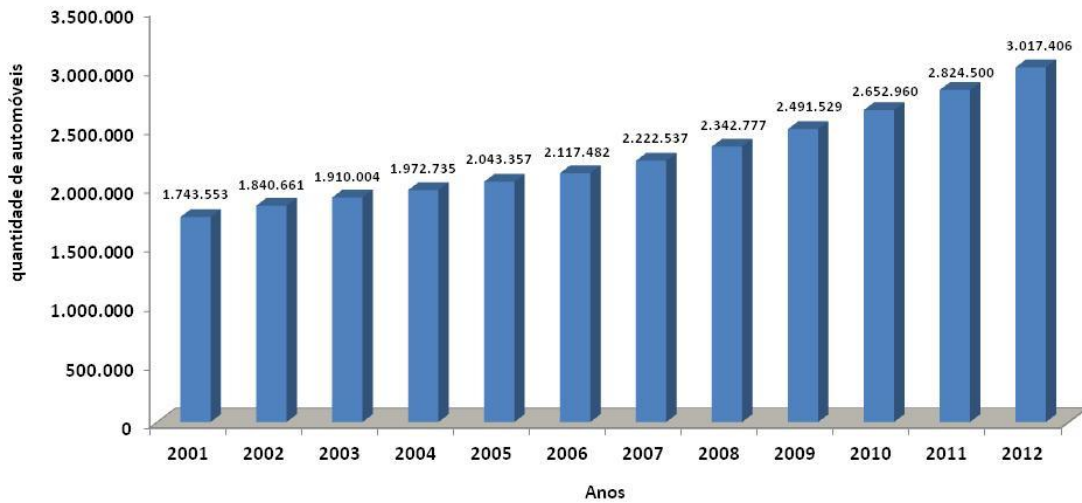
Figure 7. "Automobile Fleet - RMRJ (2001-2012)"
(Ribeiro 2013 – data from DELTRAN-RJ)
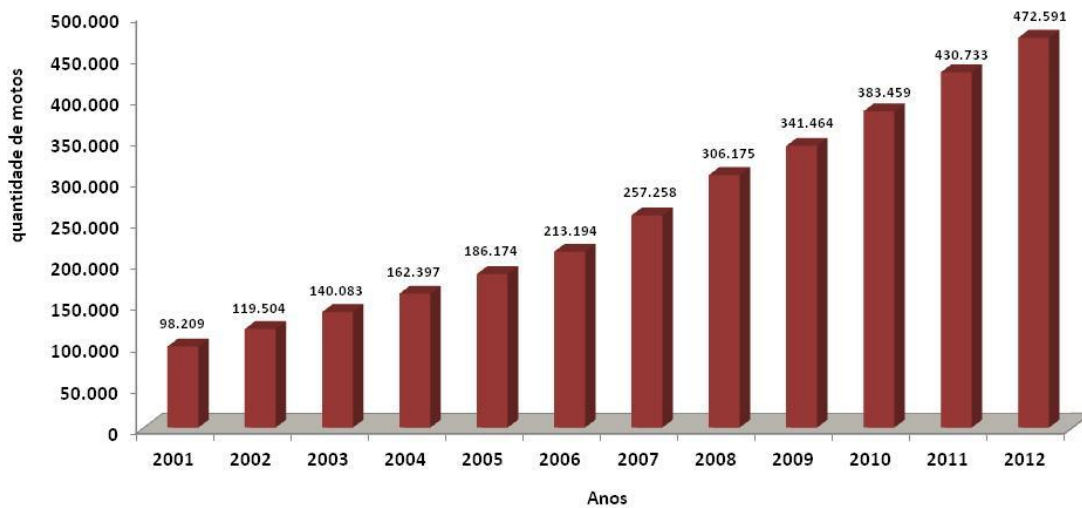
Figure 8. "Motorcycle Fleet - RMRJ (2001-2012)"
(Ribeiro 2013 – data from DELTRAN-RJ)

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Despite the considerable growth in motorization rates, much of the population of the region still does not have a private vehicle. This implies that the motorization rate still has much more potential for growth in the coming years, which would lead to worsening conditions of urban mobility and movement. According to a 2012 PNAD report, only 40.9% of households in the state of Rio de Janeiro owned a private vehicle (car or motorcycle) (IPEA 2013).

Due to the growth in income of the poor, and measures that facilitate access to credit, the increase in the private vehicle rate was expected. However, it remains the responsibility of the government to develop policies that promote public transportation in order to mitigate the negative externalities caused by the rapid and substantial increase in the number of private vehicles. Policies should aim at making public transportation *more* attractive when compared with individual motorized transport.

Home-Work Commute Time

One of the most studied aspects of urban mobility is the time spent commuting between the home and workplace, which is reflected in the wide availability of data on the topic. This is of central concern because the welfare of the citizens is directly affected by traffic conditions in the city. Thus, commute time should be a central theme of urban transport policy (Ibid).

In the Metropolitan Region of Rio de Janeiro (RMRJ), 1,241,438 people per day commute to and from work and/or school in cities other than where they live

(IBGE 2012).[11]

Datum shows that there is a great disparity in the spatial distribution of schools and day care centers between the cities in the metropolitan region. This causes a large proportion of students from the periphery to need to travel to other cities to study. The government pays for students to take public buses to and from school. The area most affected by this in the RMRJ is Mesquita with 25.2% of the population attending school or daycare in other cities. Other municipalities with large numbers of commuting students are Tanguá with 16.7%, São João de Meriti with 15.6%, Nilópolis with 15.4%, Maricá with 15%, Guapimirim with 14.7%, and Belford Roxo with 14.5%. This shows that different areas of the city have varying access to schools and daycare centers, with the capital having the most options.

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[11] All of the following commute times are based on the *Pesquisa Nacional por Amostra de Domicílios* (PNAD), conducted by IBGE, which has provided this data annually since 1992.
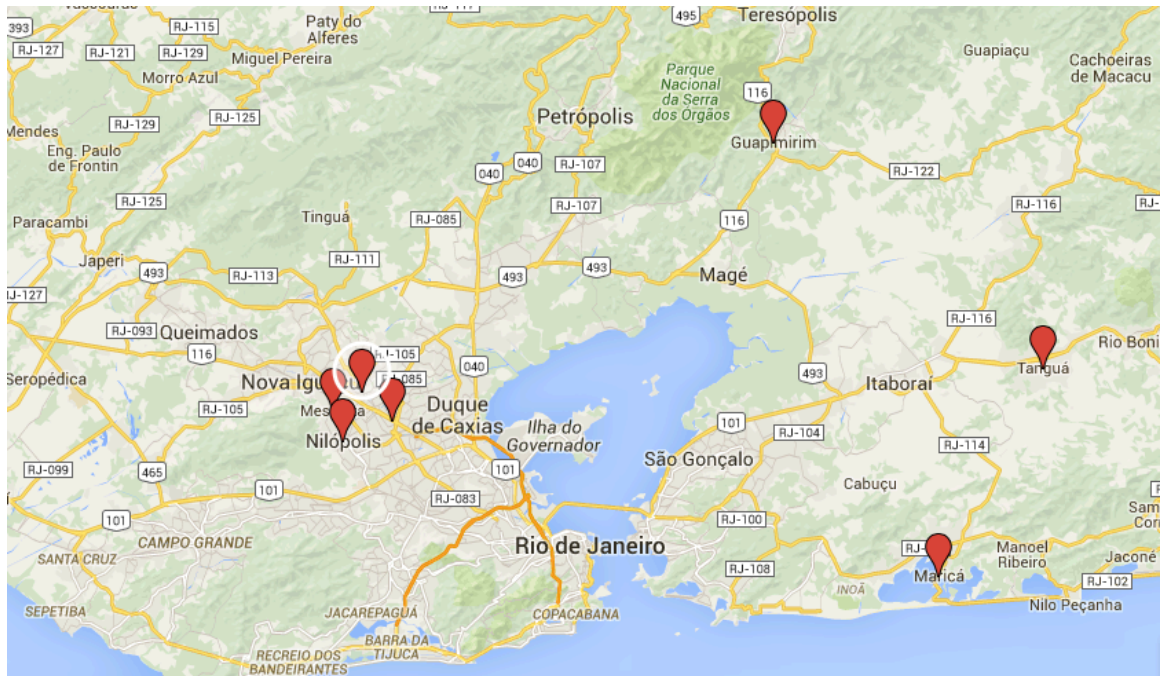
Figure 9. Map of Areas with the Fewest Schools and Daycare Centers in the RMRJ

In the whole of the RMRJ, 1,002,518 people work in municipalities other than their municipality of residence. This means that about 18.8% of all workers in the metropolitan region have to travel to other cities in order to work (Ibid). Regarding job opportunities, the city of Rio de Janeiro receives the most residents from other cities due to the large concentration of formal jobs, mainly in the center, "Centro." 65.4% of citizens who work outside their municipality of residence work in capital (Machado and Mihessen 2013). Considering only the periphery of the city, the percentage of workers with jobs outside their home municipalities jumps to 38.7%. Considering only the Baixada Fluminense, the percentage is 41.4% (IBGE 2012).

Looking at individual cities, as opposed to the large areas mentioned above, the largest number of workers with jobs in other municipalities are in: Mesquita (60%), Japeri (56.1%), Belford Roxo (52.6%), Queimadas (52.2%), Nilópolis (52.1%) and São João de Meriti (48.9%). On the other hand, only 2.5% of Rio de Janeiro residents work

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outside the municipality (see graph below). Clearly the concentration of jobs in the

capital is detrimental to the periphery.

GRÁFICO 6 | DISTRIBUIÇÃO DOS TRABALHADORES OCUPADOS POR LOCAL DE TRABALHO Fonte: Elaboração própria a partir do Censo Demográfico de 2010.
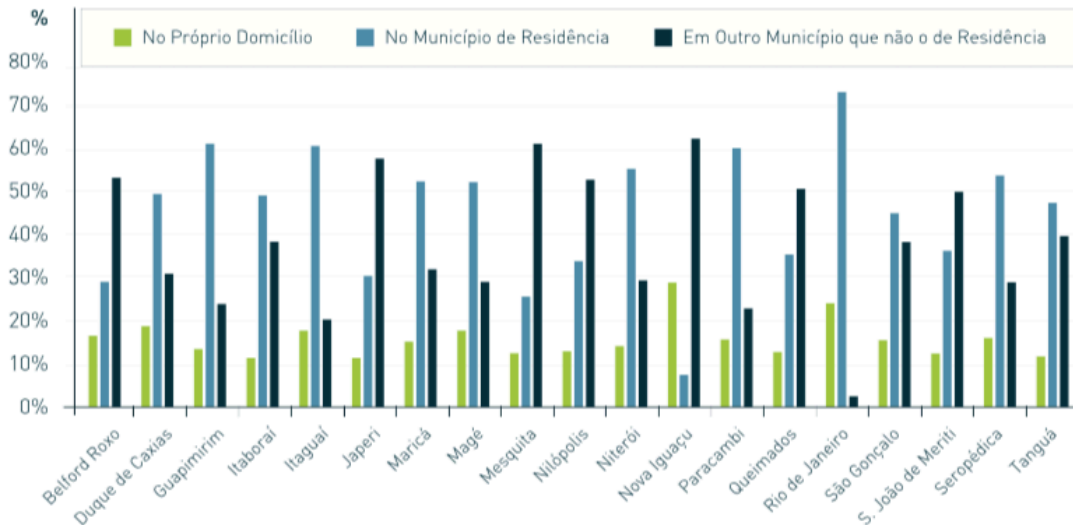
Figure 10. "Distribution of Employed Workers by Job Location"
Green- "In their own Home." Light Blue- "In their municipality of residence." Dark
Blue- "In a municipality other than the one in which they live."
(Observatório Sebrae/RJ 2013)

Looking at only the commutes between peripheral cities and the capital, the

most affected cities (in number of people) are: Duque de Caxias (118,971), Nova

Iguaçu (109,611), São João de Meriti (84,247), Niterói (75,325), São Gonçalo (70,124)

and Belford Roxo (68,468) (IBGE 2012). This high number of commutes to the capital

is directly related to the difficulty of securing employment in the periphery and the lack

of effective public policies and incentives for companies to take a business interest in

these peripheral cities. This reinforces the need for more attention be paid to the

Baixada Fluminense in the development of employment policies and urban mobility,

due to the large amount of people who have to travel every day to other cities to get to work.

Despite large numbers of commuters going into the capital, the largest number of daily commuters in the RMRJ is between the cities of Niteroi and São Gonçalo, which involves the displacement of 120,329 people per day (IBGE 2015). This suggests policymakers should pay more attention to the mobility conditions between these municipalities, which have long been given promises of the construction of a metro line, Line 3, which would go under the Guanabara Bay. However, the project has never gotten off the ground.

Between 1992 and 2012, there was an increase of 7.8% in daily commute times in the RMRJ, whose average went from 43.6 minutes to 47 minutes (IPEA 2013). This indicates that the numerous investments in urban mobility over the two decades were not effective in reducing or improving commute times. The most recent IBGE survey also shows that residents of the RMRJ lose more time in traffic than in any other metropolitan region in Brazil.

The National Household Survey (PNAD)[12] also shows that the proportion of people who make long commutes, those lasting more than an hour, increased from 22.2% to 24.7% in the same period (Ibid).

According to the 2010 census, this increase especially impacts the people living in the Baixada Fluminense, and consequently the poorest population, where 34.7% of the population takes more than 60 minutes to get to work. 25.3% of residents of the capital take more than one hour (IBGE 2012).

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[12] *Pesquisa Nacional por Amostra de Domicílios (PNAD)*

GRÁFICO 3 | DISTRIBUIÇÃO DOS TRABALHADORES OCUPADOS PELO TEMPO DE DESLOCAMENTO NA IDA AO TRABALHO – MORADORES DA CIDADE DO RIO E DA PERIFERIA DA RMRJ   Fonte: Elaboração própria a partir do Censo Demográfico de 2010.
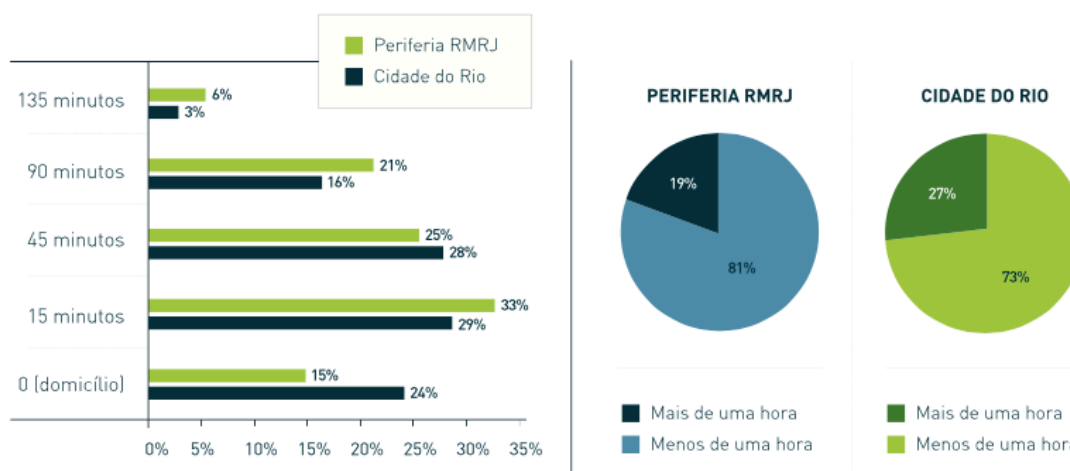
Figure 11. "Distribution of Employed Workers by the Travel Time to Work - Residents of the City of Rio and the Periphery of the RMRJ"
(Observatório Sebrae/RJ 2013)

When home-work trip times (in minutes) are given for individual cities, the residents of Japeri (71), Queimadas (62), Belford Roxo (60), Nova Iguaçu (58) and São Gonçalo (52) face the longest trip averages (average trip time in minutes given in parenthesis) (Machado and Mihessen 2013).

In contrast, travel times for the prime areas of the city are much less. Residents of neighborhoods such as Copacabana, Botafogo, Humaitá, Lagoa, Leme, Urca, Flamengo, Laranjeiras, and Ipanema take, on average, between 27 and 38 minutes to get to work. In general, workers who take less time to get to work are those who live in the pricey "South Zone" or the city center. The main exception among affluent neighborhoods is Barra da Tijuca, whose residents take on average 56 minutes to get to work (Machado and Mihessen 2013).

As for the residents of the neighborhoods Bangu, Santa Cruz, Vila Kennedy, Realengo, Sepetiba and Paciencia, the home-work commute takes 56-64 minutes on

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average (Machado and Mihessen 2013). This shows that the inefficiency in the spatial distribution of jobs is not restricted to the metropolitan level. It is also, quite sharply, within the territorial limits of the capital itself. This causes the inhabitants of the poorest areas to make long journeys to work, since they are far from their place of residence. It is also an indication that the available transport system gives ample privilege to prime areas. These prime neighborhoods are endowed with greater transport options, specifically the metro, which is only in the capital. These options also tend to be of higher quality, newer, air conditioned, more frequent, etc. Thus, it can be concluded that the inefficiency of the urban mobility system hampers the poorest citizens' access to the labor market, serving as a vector for social exclusion.

The recent increase in commute times and the number of people who face these long journeys to get to work are associated primarily to the increase in motorization rates. Higher rates of vehicle ownership were driven by economic growth in the region and urban spread and the establishment of residential neighborhoods in more remote areas, which led to increased distances between the homes and places of work, study and public functions. The large size of the RMRJ and the complexity of the urban transportation system are also factors that negatively impact mobility (IPEA 2013).

ÁREA DE PONDERAÇÃO	MIN.	ÁREA DE PONDERAÇÃO	MIN.	ÁREA DE PONDERAÇÃO	MIN.
Sepetiba	64.14	Madureira	48.73	Complexo da Penha	41.72
Paciência	61.62	Coelho Neto	48.65	Del Castilho	41.61
Guaratiba	61.09	Marechal Hermes	48.62	Vidigal e São Conrado	41.57
Barros Filho	60.03	Oswaldo Cruz	48.49	Ilha do Governador	41.10
Ricardo de Albuquerque	59.81	Vila da Penha	48.32	Maré	41.05
Vila Kennedy	59.31	Vigário Geral	48.23	Rocinha	40.80
Santa Cruz	58.31	Brás de Pina	48.16	Paquetá	40.74
Senador Camará	58.02	Curicica	47.95	São Cristóvão	40.38
Cosmos	57.39	Cordovil	47.87	Bonsucesso	40.34
Bangu	56.93	Todos os Santos	47.69	Manguinhos	40.33
Senador Vasconcelos	56.52	Inhaúma	47.52	Cosme Velho	40.20
Barra da Tijuca	56.43	Abolição	47.50	Jardim Botânico e Gávea	40.04
Guadalupe	56.36	Jardim América	47.34	Andaraí	39.85
Realengo	56.15	Irajá	47.00	Vila Isabel	38.18
Inhoaíba	55.88	Lins de Vasconcelos	46.78	Jacaré	37.89
Santíssimo	55.07	Penha Circular	46.41	Jacarezinho	37.83
Anchieta	55.05	Rio das Pedras	46.36	Ipanema	37.66
Campo Grande	54.28	Tomás Coelho	46.14	Tijuca	36.65
Pedra Miguel	53.80	Maricá	46.06	Caju, Gamboa, Santo Cristo e Saúde	36.06
Honório Gurgel	53.72	Penha	46.03		
Vila Valqueire	53.05	Itanhangá	45.91	Lagoa	35.56
Praça Seca	52.77	Quintino Bocaiúva	45.48	Benfica	34.10
Pavuna	51.75	Vicente de Carvalho	45.44	Maracanã	33.22
Magalhães Bastos	51.21	Deodoro	45.38	Santa Teresa	31.99
Rocha Miranda	50.63	Olaria	45.30	Centro	31.53
Bento Ribeiro	50.55	Colégio	44.92	Praça da Bandeira	31.34
Recreio dos Bandeirantes	50.30	Complexo do Alemão	44.85	Rio Comprido	31.13
Parada de Lucas	50.06	Acari	43.82	Estácio	30.90
Jacarepaguá	49.81	Cidade de Deus	43.65	Copacabana	30.71
Vaz Lobo	49.61	Grajaú	43.55	Botafogo	29.53
Méier	49.47	Engenho da Rainha	43.52	Humaitá	29.09
Cascadura	49.41	Vargem Grande	43.26	Leme	28.72
Engenho de Dentro	49.37	Cachambi	43.22	Urca	28.25
Pilares	49.29	Ramos	43.05	Flamengo	27.81
Vista Alegre	49.07	Engenho Novo	42.35	Laranjeiras	26.69
Piedade	49.01	Leblon	42.04	Catete	26.12

Table 1. "Average Home-Work Travel Time of Employed Workers Living in the City of Rio"
(Observatório Sebrae/RJ 2013)

Chapter 2: Modes of Transportation

Between 2003 and 2012 the State Secretary for Transportation conducted research called the "Origin and Destination Survey" in which they sought to understand how people make their trips depending on the means of transport available to them (Relatorio 4 2013). The table below shows the percentage of daily trips that were made via each transportation mode in 2012.

Transport Mode	Number of daily trips (in thousands)	%
Bus (municipal and intermunicipal)	8,452	37.4
On Foot	6,634	29.4
Car	3,765	16.6
Metro	665	2.9
Train	568	2.5
Bicycle	546	2.4
Motorcycle	170	0.8
Boat	105	0.5

Table 2. **Percentage of Daily Trips in the RMRJ Made via Each Mode of Transportation**
Table my own. (Relatorio 4 2013- data from Origem e Destino survey)

Personal Vehicles- Car and Motorcycle

The production and use of automobiles has increased in recent decades due to incentives given by governments to automotive industries, facilitating access to credit

and construction of the necessary infrastructure. Other indirect measures have had a great impact on the choice of individual transport are wide freedom of movement and very low cost annual licensing (Vasconcellos 2013).

The most noticeable result of a mobility system that favors the automobile is large amount of land occupied by the system of roads. Estimates suggest that infrastructure intended for motorized transport consumes at least 20% of urban land. This percentage does even take into account the areas designated for public parking, which act as subsidies paid by the entire population to vehicle owners (Vasconcellos 2014). Other studies, with more comprehensive definition of what constitutes "infrastructure intended for motorized transport" put the percentage of urban land used much higher (Duarte, Sanchez and Libardi 2007).

Arguably, roads are not intended only for cars. Buses, trucks, and other vehicles also use them. However, in the city of Rio de Janeiro, automobiles occupy approximately 74% of roadways, according to research conducted in 1998. For this reason, they are the main focus of the analysis on urban mobility in societies that encourage their use as a mode of transport. The same survey found that a car user takes up a space that is about twelve times larger than that of bus users (Vasconcellos 2014).

Thus, to the extent that the roads occupy a large part of urban territory, the need arises to build more and more roads in order to meet the growing number of cars. This is not only an extremely costly and resource intensive process, it also increases commute times as the population moves further away from the city center. In addition, the spreading out of cities contributes to lower productivity of public transport since it reduces population density. This means that buses have to travel longer distances and

carry fewer people, which increases cost. The more spread out the city, the higher the price of public transport fare (Ibid). Similarly, access to public transportation becomes quite limited in the suburbs, whose residents generally do not have options when it comes to what kind of transport they will take.

As for motorcycles, the main problem is not related to the amount of required road space, but with their high rate of accidents (discussed below) and the fact they are extremely pollutant. Emissions per passenger (motorcycle) are almost twice the emissions of a car passenger and 32.3 times the emissions of a bus passenger (Silva 2014). Therefore, an individual's attempt to solve his/her mobility problem results in costs to be paid by all citizens.

There is a strong governmental component to the increased use of motorcycles in Brazil. Public officials defend their proliferation without any concern for additional safety precautions due to the belief that increased motor vehicle use is necessary for the industrialization of the country and that motorized citizens represent societal progress (Vasconcellos 2014). In this context, it is reprehensible that the federal government has continued to support, since the 1990s, and their linking the rise of the poorest classes with increased motorcycle use. Silva (2014) adds another component to the discussion, political campaign finances. He argues that the economic and political power of car manufacturers come from the ample financial support they give to politicians. These contributions end up being a key factor for political leaders to avoid reducing government incentives to private transport, again handicapping public transport.

Deaths and Hospitalizations Resulting from Accidents Traffic and Operation Lei Seca

The number of traffic deaths in the RMRJ has made several swings since 2002. In 2002, 1,769 traffic deaths were recorded. In 2013, the number was down to 1,643 people, a drop of 7.6% (Rio de Janeiro 2015).

In the same period, the population of the RMRJ went from 11,195,875 to 12,177,231 people, an increase of approximately 8.7%. Therefore, even with this relatively high population growth, which was also accompanied by a further growth in motorization rates, the number of traffic fatalities had a small decrease (IBGE 2002; CEPERJ 2013).

Looking at data that links traffic deaths and population growth, the percentage drop in death rates is even larger, as would be expected. In the period 2002-2013, the death rate per 100 thousand people in the RMRJ fell from 15.8 to 13.5, down 17%. However, only data from the city of Rio de Janeiro contributed to this improvement. In the capital, the death rate dropped from 19.3 to 14.8 per 100 thousand during this period. The periphery and the Baixada Fluminense held steady at 11.9 deaths per 100 thousand people in both 2002 and 2013, and 9.9 deaths per 100 thousand in 2002 and 10 deaths per 100 thousand in 2013, respectively (Rio de Janeiro 2015; CEPERJ 2013).

While the RMRJ saw a decrease in this indicator, data for the country as a whole registered an increase in the number of traffic deaths per 100 thousand people between 2002 and 2012. The number of deaths increased from 18.7 to 22, an increase of 20.3% (IBGE 2002; IBGE 2012).

In 2009, the first year in which Law 11.705, known as Lei Seca, or dry law, was implemented the entire year, 1,343 traffic deaths were recorded in the RMRJ. This was

a 12.3% drop over the previous year (Rio de Janeiro 2015). However, a direct link cannot be made between the adoption of the law and the fall in the number of deaths since there was further decrease in the number of deaths in traffic accidents between 2006 and 2007 (21.5%), and Lei Seca did not exist. In addition, in 2010, the second full year of this law, the number of traffic deaths grew. 1850 people died in traffic deaths that year, a increase of almost 38% (Ibid).

Despite the rigorous implementation of Operation Lei Seca, which fines and suspends the license for one year of those violating the zero tolerance policy in regards to drinking and driving, there was no significant reduction in traffic deaths in the RMRJ that can be directly linked to the law. Drivers can choose to opt out of taking a breathalyzer, in which case they lose their license for one year (though many continue to drive) and must pay a fine of R$ 1,915.40 (Siga Recursos 2013). The reduction in the number of deaths in this period was observed only within the capital, which has the highest occurrence of Lei Seca blitzes. In addition, there are other factors that may have contributed to keeping the number of fatal traffic victims from increasing. Increased congestion, lower vehicle speeds, better safety standards and features on newer vehicles could also have contributed (Monteiro 2014).

Moreover, the improvement in the data does not necessarily indicate that traffic in the RMRJ is safer. Despite the small decline in death rate per 100 thousand inhabitants between 2002 and 2013, the number of hospital admissions due to traffic accidents went from 7,417 to 8,016 in the same period, 2002 to 2013 (Rio de Janeiro 2015).

The municipalities of the Baixada Fluminense (except for the municipalities of Itaguaí and Seropédica) registered the most rapid growth in the number of hospital admissions from traffic accidents. The municipalities with the most drastic increase were Duque de Caxias, where hospital admissions for traffic accidents went from 560 in 2002 to 733 in 2013; Nova Iguaçu, which went from 146 admissions in 2002 to 840 in 2013; and São João de Meriti, with 129 admitted in 2002 and 324 in 2013 (Ibid).

Still, there was a slight improvement in the number of hospitalizations per 100 thousand inhabitants in the metropolitan region as a whole (66.5 to 65.8). Again, as with the number of deaths, this was due to positive data from the capital, where the number of hospitalizations from traffic accidents went from 83.5 to 63.9. The periphery and the Baixada Fluminense had a marked worsening in this regard. Hospitalizations jumped from 46.7 to 68 per 100 thousand in the periphery and from 36.1 to 70.5 per 100 thousand in the Baixada Fluminense during the period (Ibid). This indicates that the traffic in these regions is more dangerous and that government action has been focused on improving only the capital. More attention from policy makers should be paid to this problem in order to develop strategies for combatting it.

In the case of motorcycles, their proliferation has led to an increase in motorcycle related accidents and deaths. From 2002 to 2013, their share of total transport deaths in the RMRJ more than doubled, from 6.6 to 13.3% (Ibid). Nationally, the number of deaths from motorcycle accidents went from 1,421 in 1996 to 14,666 in 2011, an increase of 932.1%. The share of traffic accident deaths involving a motorcycle represented 4% of the total in 1996 and 33.9% in 2011 (Waiselfisz 2013).

Despite the large increase in motorcycle related deaths, pedestrians are still the most frequent victims of transport accidents. Looking at who is most likely to fall victim in accidents, in 2013 41% of traffic accident fatalities in the RMRJ were pedestrians, which is a drop from 2002. However, pedestrians remain the main victims of traffic accidents, which highlights the need to continue to promote better security conditions and safer space in order for this mode of transport to be fully realized, especially given the importance of foot transportation to urban mobility.

Percent of Total Transport Deaths by Mode in the RMRJ, 2002 & 2013

■ 2002   ■ 2013

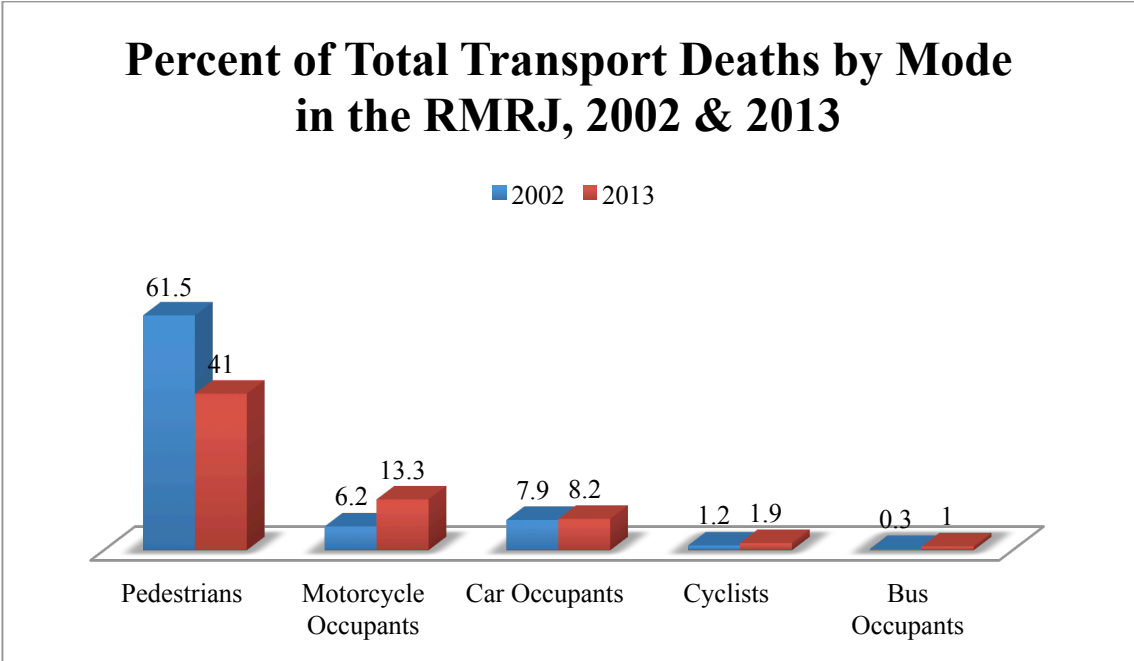| Mode	2002	2013
Pedestrians	61.5	41
Motorcycle Occupants	6.2	13.3
Car Occupants	7.9	8.2
Cyclists	1.2	1.9
Bus Occupants	0.3	1

Figure 12. Percent of Total Transport Deaths by Mode in the RMRJ, 2002 & 2013
* Graph my own. (Rio de Janeiro 2015)

Non-Motorized Modes of Transportation

Walking

In Brazil, much human displacement takes place on foot, generally as a complement to other modes of transportation. However, the government has

systematically underestimated this mode of transport and has not developed public policies to improve the quality of pedestrian spaces. This is evidenced by the legislation of most municipalities, which treats the sidewalk differently from other components of the road system (Malatesta 2013).

The construction and maintenance of roads intended for motor vehicles and bicycles are the government's responsibility. However, the government does not regulate sidewalks. Instead, each resident is responsible for the space located in front of his/her house (apartment building, condominium, etc.), which leads to irregularities (Silva 2014). This hampers walking in the city, and for those with difficulties walking, or those using wheelchairs, many urban areas become simply impassable. It must be taken into account that accessibility for people with mobility restrictions is not limited to the possibility of entering a specific place or vehicle, but extends to the ability to move around the city using the various modes of transport system. The sidewalks are the most sensitive point, as every trip either ends and/or begins on them (Duarte, Sanchez and Libardi 2007). Despite official resident responsibility, the government should ensure that its citizens have access to walking spaces.

Malatesta (2013) argues that the legislation dealing with sidewalks provides property owners the sense of ownership of the space intended for pedestrians, making common the installation of things that impede and discourage walking. As a result of poor quality, narrow, and impeded sidewalks, the number of falls associate with them is high. A study by Gold (2012) pointed out that about 171,000 people fall every year on the sidewalks in the Metropolitan Region of São Paulo (MRSP). Medical costs and social costs of these falls reach the impressive amount of R $ 2.9 billion per year.

The lack of appropriate pedestrian spaces, has contributed to the high number of pedestrian deaths discussed above. The most problematic areas in the center and northern zone of the city, where there are not enough walkways going over major avenues such as Linha Amerela and Avenida Brasil. Instead of crossing at a raised footbridge, or "passarela," people wait for a break in the traffic to dash to the center divider and then to the other side.

Figure 13. Photos of "Passarelas"
Linha Amerela (left) and Avenida Brasil (with a motorcycle going across it - right).
From Observatório de Favelas website and Crônicas dumas Viagens Wordpress.

Bicycling

The main advantages of the bicycle, which can be used both for transportation and leisure, are its low price, low cost of maintenance of, and ease of use. The bicycle also boasts health benefits for its riders and eases environmental and traffic strains put on a city by motorized vehicles. The bicycle is the most used vehicle in the world, with a strong presence in developing countries in Asia and even in some developed countries like Japan, Germany, the Netherlands and South Korea (Vasconcellos 2012).

According to the Brazilian Association of Industry, Trade, Import and Export of

Bicycles, Parts and Accessories (ABRADIBI)[13], there are about 80 million bicycles in Brazil. Despite the large number of bicycles, the bike is not strongly encouraged as a means of transport, likely because they are seen as a low-class mode of transportation. Bicycle commuting's major disadvantages are the disregard of drivers and the lack of adequate road infrastructure in most cities, a factor that is aggravated by the failure of the government to solve this problem (Ibid).

In order for the bicycle to be adopted effectively as a mode of transportation, it must be integrated with other transit modes (Tendencias 2013). This is done through the construction of facilities such as bike racks, and the opening of the metro and buses for bicycles. These measures would allow people to travel part of their daily commute by bike (Duarte, Sanchez and Libardi 2007). However, only 12 metro stations allow bicycles to enter and be stored. At these stations bike can be brought on and off the train during off peak hours. Bikes are not allowed on Metro Buses. The train system has a similar arrangement. There are specific stations that allow bicycles to be left and stored securely during the day. However, bicycles are only allowed on the trains during the weekends. The most integrated mode of transport for the bicycle is the boat between Rio and Niteroi, which allows bicycles to be brought onboard at any time without an additional cost. On the other end of the spectrum is the bus, which does not allow bicycles to be brought onboard at any time. This lack of integration has prevented the bike from becoming a real alternative within the urban mobility system, causing it to be viewed more as a leisure option.

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[13] *Associação Brasileira da Indústria, Comércio, Importação e Exportação de Bicicletas, Peças e Acessórios*

The city has attempted to improve the biking conditions in recent years, promising to add 450 kilometers by 2016. The most impressive of these paths, the Tim Maia bike path, runs along the beach and then high above rocky coastline, connecting the south zone and the west zone from Leblon to Barra da Tijuca[14]. These regions have been difficult to access previously because only a busy beachfront road that does not have a sidewalk and a tunnel, in which bikes are not allowed, connect them.

Although the situation is improving for cyclists, there is still a long way to go before it is a viable transport option for a large segment of the population. Older bike paths, such as the ones in the neighborhood of Botafogo, can be quite dangerous. They often share sidewalk space with pedestrians and are impeded by trees, posts, and broken sidewalks. Another issue is the lack of regulation of the bike paths. It is normal for cars to be parked in them and for trucks and cars to use them as loading/unloading zones for goods and passengers. Still another issue is the question of security on bike paths. Right after the opening of the Tim Maia bike path, there was a string of assaults (Goulart, Ramalho and Ouchana 2016). Other problem areas include the Aterro do Flamengo bike path and the path that crosses through the new tunnel from Botafogo to Copacabana. Both are notorious for bike assaults, the assailants generally wielding knives or throwing rocks at the cyclist in order to stop them, rob them and steal their

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[14] On April 21, 21016, only three months after its inauguration, a 50 meter section of this new coastal bike path fell into the ocean killing 3 (2 confirmed dead and one missing at sea). This has caused public outcry and opened a new debate on how public money for infrastructure projects is being spent and the quality of these projects. The cycle path cost R$ 44 million (G1 21 April 2016).

bike.[15] These problems have led many more "serious" cyclists to opt for riding in the

road, which brings its own dangers. Drivers, particularly taxi and bus drivers, drive

aggressively and do not pay attention to bikers, whom they consider a nuisance.

A paradox of the recent expansion of bike lanes is that they are almost

exclusively in the wealthier parts of the city. Yet, it's the poorest who are most likely to

bike as a mode of transportation. Currently, there is no bike path, or safe route, that

connects the northern suburbs to the center of the city.

Public Transportation

Buses

In Brazil, as in other developing countries, buses are the principal mode of

public transportation. Their relatively low cost makes and easy implementation give

them a relative advantage over more expensive and resource intensive systems such as

trains and subways, despite these systems being more efficient and less polluting

(Vasconcellos 2012).

The Brazilian population has always suffered from the poor condition of buses,

which are uncomfortable, hot, noisy, vibrate aggressively and are often crowded, even

at none-peak times. These conditions reflect inefficient management. Bus companies

are not even able (or perhaps not motivated) to provide the appropriate number of

vehicles for times of increased use, especially in relation to buses that serve peripheral

areas of large cities (Vasconcellos 2014).

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[15] Another example that gained widespread media attention was the brutal stabbing
death of a cyclist riding on the Lagoa in the early evening in May 2015 (G1 22 May
2015).

The lack of an adequate number of buses combined with the high fare prices, which are not reflected in the quality of service, has created a system of disrepute. Thus, citizens who can afford it opt for private transport. This has the effect of worsening public transport even more, because with fewer people using it, its productivity is decreased, causing an increase in fare price and worsening of mobility conditions for the poorest people (Ibid).

The sharp drop in demand for public buses that has occurred since the mid 1990s confirms this finding. The National Association of Public Transport Companies (NTU)[16] found that bus usage decreased significantly in nine Brazilian capitals from1995 to 2013: from an average of 473.7 million passengers per month in these cities to 329.8 million passengers (NTU 2014; Maciel 2014). In order to combat this trend, special bus lanes, called Bus Rapid Transit, or BRTs, have been created in hopes of improving the quality of bus transport. These were first implemented in 1974 in Curitiba, followed by several others in cities such as Porto Alegre, São Paulo, Manaus, Recife and more recently, Rio de Janeiro (Vasconcellos 2014).

Another issue with public buses is a lack of adequate signaling, directions, and maps that allow people inside the vehicle to know where they are. People waiting at the bus stop also lack information on what bus lines will pass and at what time. This leads to widespread confusion and inconvenience for people wishing to take a bus from somewhere they are unfamiliar with. In response, a group in Porto Alegre started an initiative called, "Que Ônibus Passa Aqui?" (Which bus stops here?). They posted stickers on the bus stops and locals collectively wrote down exactly which routes pass

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[16] *Associação Nacional das Empresas de Transportes Públicos*

that stop. The idea was so popular that it spread to cities around the country, including

Rio (Steeds 2014).

As of April 2016, Google Maps now offers real time tracking of some buses and

the metro, allowing passengers to better estimate when they should leave home and total

travel time (UOL 11 April 2016). However, Google has so far not been able to keep up

with the changing bus routes, ever-increasing fares, and other interruptions or changes

in traffic.[17] This has created a space for entrepreneurial innovation. A new phone

application has just been launched in Rio to try to fill this gap. The app "Without Car"

(*Sem Carro*) uses geolocalization to map out the best routes for those circulating the

city without a car (O Globo 25 April 2016).

Buses- the New System

In 2010, in response to the urban mobility crisis, highlighted by the added

pressure and demand put on the city's transport system by the upcoming mega-events

(principally the World Cup and 2016 Olympics), the Mayor of Rio de Janeiro, Eduardo

Paes, introduced a new model for the bus system. The new model would open bids, not

for single or isolated lines as had been done in the past, but the system as a whole. The

city would be split into five major "regional transportation networks," to be operated by

four major consortia.

For the first 100 years of bus service in Rio, the system was managed in a

chaotic, individual manner, with the city granting individual routes to companies in the

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[17] For example, some roads change the flow direction of traffic during peak time.
Google Map routes, especially those dealing with public transportation, are not reliable,
and their suggested bike routes can be utterly dangerous.

form of permissions. Additionally, the structural network of lines was old and not befitting the current demands of the citizenry. For these reasons, as well as the high cost of taking the bus, alternative transportation (vans and kombis) became more widespread throughout the city. The fact that lines were managed individually also led to predatory competition between the companies. There were often duplicate lines running on the most profitable routes, creating an excess in some areas and a shortage of buses in other, less profitable areas. Beyond being chaotic, the structure of the system at the time gave to city little power to intervene on the companies' operation. Nor did the permissions have clear quality standards, which led uneven coverage and low quality of service. To address these issues, there was a complete redesign of the bus system in 2010. The 45 companies operating the thousands of buses in the city in 2010 would be replaced by a system that divided the city into 5 regions, operated by 4 consortia.

In the new system, companies would have to meet specific requirements in order to operate. For example, in the south zone there was an excess of lines and fleets. There was predatory competition, which led to many routes being duplicated. There were also concerns about the quality of the service and waiting times, especially during low demand hours. The new system would also try to reduce distances between stops. Each company had to submit a project proposal outlining how they would manage the region. The winners would have until the beginning of 2016 to reformulate the routes and update their fleets (Rio Onibus 2013).

In 2010 the city opened the bidding for four of the five regions. In order to bid on the operation of a region, companies had to meet a long list of requirements. As

many individual companies could not meet the financial and technical conditions set by the city, they were allowed to form consortia. However, only one company has the legal control over the whole region. Bidding companies had to have been in operation for at least five years prior to the bid and have an operating fleet of at least 1000 vehicles per day. Additionally, companies had to agree to regulations dealing with: fuel and environmental standards; security- installing GPS and cameras in every bus; accessibility- adapting all buses and terminals to meet accessibility standards; use of the single ticket system, "Bilhete Unico;" training for all drivers and "cobradores"[18] (Ibid).

In the end, only 8 of the 41 one companies who submitted bids followed the rules correctly, drawing criticism for the complexity of the bidding process. Others complained of possible collusion among companies and an investigation was opened by the prosecutor's office. However, the process was allowed to continue and the four consortia were chosen, each winning a 20-year concession contract (Magalhaes 2012).

The city in now divided into 5 major regions of operation, 4 of which are operated by private consortia and 1 that is considered "common use." The first area of operation includes the downtown ("Centro") and the port areas. This region was not auctioned off and is considered common use, as a destination for all other regions. The operation of internal bus lines in this region was given to INTERSUL, who also operates region 2. The second region includes all of the "South Zone" (Zona Sul), Santa Teresa, and Tijuca. Region 3 is operated by Internorte and encompasses all of the "North Zone" (Zona Norte). Region 4 is operated by the Transcarioca consortium and

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[18] "Cobradores" are the person who takes the fare money and unlocks the turnstile on the bus.

includes Barra da Tijuca, Recreio, and Jacarepagua. The fifth region encompasses other

neighborhoods in the "West Zone" (Zona Oeste) and it operated by Santa Cruz.
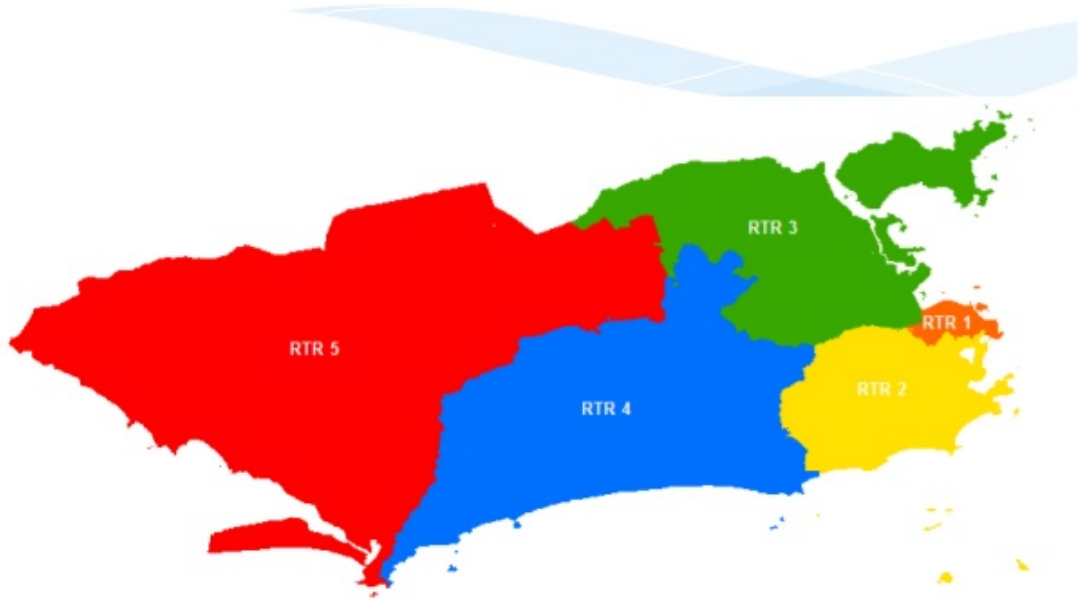
Figure 14. Map of "the Division of the City"
(Rio Onibus 2013)

Until the middle of 2015, combining all regions, there were 703 lines in

operation, accounting for about 16 million trips traveling a distance of more than 700

million kilometers per year. The bus fleet consists of 19,000 buses with average bus

age of 3.5 years. More than two-thirds of public transport trips in the city were made

via bus.

Since mid-2015, the system has again undergone huge changes, as the plans

from 2010 are finally being implemented throughout the city. As changes are still

ongoing, it is not possible to comprehensively evaluate the impacts of the new system. However, initial reactions have been mixed.

Although fleets are in the process of being updated, many buses are still without air conditioning and functioning wheelchair lifts. As of the beginning of this year, only 70% of buses in the city of Rio were air conditioned (Goulart 2016).

Another common complaint is the payment system. Older buses had a "cobrador" to receive cash payments. Newer buses have eliminated this person, forcing the bus driver to be responsible not only for driving, but also for taking cash payments and unlocking the turnstile. This downsizing has had a negative effect on the drivers, who now have more responsibilities, as well as decreased the quality of service. It has slowed service since the driver cannot begin driving until after he or she takes the cash payments and makes change. The idea was to incentivize more people to use prepaid cards. Prepaid cards are only available to purchase and reload at a few locations around the city, making them an unlikely option for tourists or the casual (i.e. infrequent) bus rider.

However, the principal complaint is about the new routes and the cutting tens of lines. The new route map called for extensive line cuts, especially in the south zone. Although this has helped to alleviate some traffic congestion, it has led to longer wait times, overcrowding, and the need to make more bus changes (Raiter 2015). Many of the lines coming from the northern suburbs into the south zone were gotten rid of, forcing people to first go to Central station in downtown and then change to a bus serving the south zone. Coming from the west zone, riders must go to Rio Sul shopping

center in Botafogo, and then catch another bus to reach other south zone neighborhoods or "Centro." This necessitates more connections and thus longer total travel times.

Another concern with more connections is with payment. As of now, the single ticket system, "Bilhete Unico," allows for one bus change within two hours at no additional cost. If a person now needs to makes two or more connections in order to arrive at their destination, this is an additional cost to the user for a service that is already expensive.

Figure 15. "Bilhete Unico" Card
From Bilhete Unico website.

Metro

With respect to rail transportation (train and metro), the greatest challenge to creating a large network is the associate cost and resources required, especially when the construction is underground. Costs can vary greatly depending on the geological characteristics of the soil, if it is necessary to evict residents, and other factors that can increase the budget (Silva 2014).

Just for comparison, the 16 kilometers of Rio de Janeiro's Metro Line 4 are estimated to cost R$ 8.5 billion, or about R$ 531 million per kilometer. The BRT (bus rapid transit) Transoeste exclusive bus corridor connecting Santa Cruz/Campo Grande

to Barra da Tijuca (Jardim Oceânico) will stretch 58 kilometers, at a total *estimated* cost of R$ 1 billion. In this case, the cost per kilometer of BRT will be approximately 32 times lower than the cost per kilometer of metro (Magalhaes 2012; Rio de Janeiro 2014). Both are scheduled to be completed by the start of the Olympics in 2016.

When the estimated passenger demand is taken into account for both the Metro Line 4 and the BRT Transoeste, the difference is even more evident. The Metro line 4 is expected to serve 300,000 users per day; the BRT Transoeste forecasts 230,000 passengers per day. So, there was an investment of R$ 29,333 for each passenger per day taking the Metro Line 4 between Barra da Tijuca and Ipanema, and only an R$ 4,347 investment per daily passenger of the BRT Transoeste route (Rio de Janeiro 2014; Rio Onibus 2013). This shows the privileged status granted by the government to the richest areas of the city, which are provided with the fastest and most comfortable means of transportation.

In addition to the huge costs involved, it is important to emphasize that the mere construction of subway lines is not sufficient to decongest the traffic of a city and reduce or stop the economic losses from traffic jams. It takes a number of other measures to discourage people to use individual transport (Silva 2014).

Today the Metro has 35 stations in operation, distributed over 2 lines and 35 kilometers (21.75 miles) of track (note that Central-Botafogo path is shared by both Lines 1 and 2, this stretch was counted only once in measurement of kilometers)[19]. The

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[19] The Rio de Janeiro metro was inaugurated on March 5, 1979, by then governor Faria Lima. It consisted of only 4.3 kilometers of track and 5 stations near the city center (Gloria, Cinelândia, Presidente Vargas, Central, Praça Onze). There were 4, 4-car trains, which circulated every 8 minutes between the hours of 9:00am and 3:00pm. Still, it carried an average of 60,000 people a day in the first 10 days, or over

Metro serves 460,000 people a day. In comparison, the New York City subway system

has 422 stations, 375 kilometers of track (233 miles), and carries, on average, 5.6

million riders every weekday (MTA website).

500,000 total passengers (Metro Rio "Historia"). The station with the most traffic was Cinelândia, with more than one third of all passengers entering or exiting at the stop.

In December, the hours of operation were extended to 11:00pm, and the following year, two more stations were added, Uruguaiana and Estacio. The same year, 1980, the four trains each added two additional cars, for a total of 6 cars each.

In January 1981, the Carioca station opened. Catete, Largo do Machado, Flamengo, and Botafogo would go on to be opened later in the year, completing the southern portion of Line 1. In 1982, the northern portion of Line 1 was completed with the opening of Alfonso Pena, São Francisco Xavier, and Saens Pena. Line 1 would not see another addition until more than 15 years later. In 1998 the Cardeal Arcoverde station opened, linking Copacabana to the system. In 2003, the second station in Copacabana, Siqueira Campos, opened, and a "Surface Metro" (Metro Bus) was added to connect the station to Leblon and Barra (The "surface metro" does not have an additional cost- is included in the price of the metro fare). In February of 2007 the final stop in Copacabana, Cantagalo, was inaugurated. The same year, a "Surface Metro" was added that connected the Botafogo station with the Gavea neighborhood. In December 2009, General Osório was opened, linking the Ipanema to the system. The "Surface Metro" to Leblon and Barra were moved to General Osório as well. Since 2009, no new stations have been added to Line 1, although 5 stations are currently under construction. The five additional stations have been under construction since 2010 and will be called Line 4.

In November 1981, Line 2 was inaugurated with the opening of the São Cristovão and Maracanã stations. There was also a free bus that connected São Cristovão (Line 2) to the Estacio station (Line 1). In 1983, the Maria da Graça, Del Castilho (Cidade Nova), Inhaúma, and Irajá stops were added to Line 2. In 1988, the Triagem stop was added, followed by Engenho da Rainha in 1991. After five years of no additional stations, two new stations opened in 1996, Tomas Coelho and Vicente de Carvalho. In 1998, the northern section of Line 2 was completed with the reopening of Irajá (closed in 1985 due to an accident) and the opening of Colégio, Coelho Neto, Acari-Fazenda Botafogo, Engenheiro Rubens Paiva, and Pavuna. In 2009 Line 2 was connected to Line 1 via the Central station, eliminating the need to take a bus transfer between the two lines. In 2014, Uruguai station was opened, the northern most stop on the line.

In 2005, the "Integrated Express" system was inaugurated, which added 12 Metro bus lines leaving from various stations and serving nearby neighborhoods (not covered by the Metro itself). Neighborhoods served by these special lines are: Urca, São Cristovão, Caju, Cosme Velho, Vila Isabel, Andaraí, Usina, Grajaú, and Cidade Universitaria. These buses have an additional charge beyond the Metro fare.

Figure 16. Map of the Metro Rio System
From Metro Rio website.

As can be seen in the map above, Rio's metro system resembles more of a 'Y' than a true network, where various parts of the city would be connected to the center via different lines. This will only worsen with the opening of Line 4, which is in reality just a western extension of Line 1 (connecting Ipanema/General Osório to Barra - see map below). This design has led to inefficiencies and long wait times between trains.

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Originally Line 4, which was first bid for in 1998, would run from Barra da Tijuca to Botafogo via Gavea and Jardim Botanico. Due to lack of funding the project remained shelved until 2004, when the municipality of Rio de Janeiro decided to pay for its construction (and would then sell it operation and maintenance to a private company). The city likely decided to pay for the project because by this time Rio had already been chosen to host the 2007 Pan American Games. Despite renewed interest, the line's construction never got underway, and the project was again abandoned.

In 2010, after winning the bid to host the 2016 Olympic Games (announcement was made October 2, 2009), the city again returned to the Metro Line 4 project. This time the city modified the projected route to connect Barra da Tijuca to Ipanema via São Conrado and Leblon, instead of running through Gavea and Jardim Botanico.

Figure 17. Map of the Metro Rio Line 4
"Localization of Stations on Line 4 of the Metro Rio, New lines will connect Ipanema to Barra da Tijuca and there will be 6 stations."
From Metro Rio website.

As of March 2016, the new line is slated to open for operation by July 2016, just in time for the Olympic Games. So far, none of the six new stations have opened, and there is skepticism over whether or not it will be finished in time given all of the delays up until now. As of March 2016, there are still 150m to be dug and 3 kilometers of track to be laid (G1 8 March 2016).

Despite the slow expansion and poor network/coverage of the Metro, it remains one of the better modes of public transportation. The quality of subway cars and accessibility outperforms other modes offered in the city. However, this comes at a price. On April 2, 2016, the metro raised its price, bringing a single ticket to R\$ 4.10, making it the second highest transport fare in the city. Even still, it is prone to delays and extreme overcrowding, especially during peak times.

Train

In 1998 the train system in Rio de Janeiro was privatized, with new management going to SuperVia. SuperVia won a 25-year concession, but in 2010, after only 12 years, Governor Sergio Cabral granted a new 25-year concession to the company (SuperVia "Historia").

The Rio de Janeiro train system is made up of five different lines, running through 12 municipalities. It has over 270 kilometers of track and 98 stations, passing through almost all the cities in the Baixada Fluminense (except Seropédica and Itaguaí). Four train stations are integrated with the Metro system and the Bonsucesso stop is connected to the Complexo de Alemão cable car. The current fleet is made up of 160

trains, and 95% of all trips are made on trains with air-conditioning. SuperVia has said that all trains will have air-conditioning by July 2016 (O Dia 26 February 2016).

In 2009, the state government purchased 30 new trains, and in 2012, the government secured the purchase of an additional 70 trains. The final 10 trains of the 2012 purchase are in the testing phase now and will be in operation by the Olympics. This will allow for the removal of the last old, steel trains. This purchase helped modernize the fleet, bringing the average train age from 35 to 16 years old. There are an additional 12 trains that will be delivered in the next 18 months (Ibid).

Despite recent investments, overall quality of the train system remains poor. Considering the number of municipalities served by the rail system and the length of its track, the train system could be an excellent way to reach the city center from the periphery if it were not for the poor quality of service. There are not enough trains circulating, which lead to overcrowding. The trains that are circulating are uncomfortable, slow, prone to delays, and often break down due to poor maintenance.

SuperVia had stated the goal of carrying 1 million passengers per working day by 2015. Yet, in 2014 the average was only 620,000 passengers (SuperVia website). Nevertheless, it should be noted that in the last year that the operation of the train system was in the hands of the state (1998), the average number of passengers per day was only 176,132 (MacDowell 2011).

Since SuperVia started managing the system, there was a groundswell of demand. Even still, growth could have been much higher given the extent of the railway lines, the population density of the affected cities, and the large amount of commuting that the residents of these cities undertake. For comparison, the

metropolitan train of São Paulo, which has six lines totaling 260 km and 98 stations distributed over 22 cities, carried an average of 2.8 million riders per working day in 2014 (CPTM 2015).

The primary deterrent to taking the train for most citizens is the low quality of the offered service: long wait times between trains, old, low-quality cars, frequent delays, lack of air-conditioning and overcrowding, among other complaints (MacDowell 2011). When people are faced with the choice of taking a private car (if they have one) or low-quality public transport, it is less likely they opt to travel by public transport. Thus, SuperVia not hitting their own goal in ridership is partly due to their own actions, or lack there of.

Of the more than 500,000 passengers per day, most are members of "classe c" (from IBOPE 2010 on SuperVia website). According to a 2010 study, only 2% of train passengers are from the highest earning class, "classe A." 34% of users are from "classe B," and 59% of users are from "classe C." The ridership could explain the lack of investment when compared to the Metro. Despite carrying more people and having a much greater reach, the train system has not seen the amount of investment as the Metro system. In Rio, there is a clear priority to expand public transportation in the areas of the city where people already have plentiful transportation options and give priority to individual transport.

Boats

In 1998 the boat system, consisting of three routes (Niteroi-Rio, Paquetá-Rio, Ribeira/Ilha do Governador-Rio) was privatized, with the concession going to Barcas

S.A. After the privatization began a process of restoration and modernization of the fleet as well as the stations. One year later, the service that used to have only 3 boats started to operate with 8. In 2004, a new line was opened, running from Charitas to Rio (Praça XV).

In 2006, the system underwent several changes. The boat terminal on Ilha do Governador was changed to Cocotá, a more strategic area located at the center of the island and better integrated with the bus network. Another major change was on the Niteroi-Rio line. The state government purchased the first two catamarans, decreasing travel time because the catamarans do not have to turn around. The following years the fleet continued to be updated and an Operational Control Center Centro was opened. The Operation Center gives real time departure and arrival information, location, speed, and number of passengers onboard.

Today, the boat system in operated by CCR Group, which took over in 2012. Split among the four routes, there are 24 boats (6 large catamarans, 9 smaller catamarans, and 9 traditional boats). 29 million people are transported each year, with an average of 10,000 passengers per hour during peak times (SSA Barcas website).[20]

Although service has improved, many complain that the fare is too high when compared to the service rendered. Today, a single ticket costs R$ 5.60. Lines and wait times can be long during peak times, and it is not uncommon for boats to be delayed. Boats are overcrowded causing people to have to sit on the stairs, which is against safety regulations. On the principal line, which in Niteroi-Praça XV, only two boats have air conditioning. Of the five terminals, 3 have air-conditioning (Charitas- 2004,

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[20] http://www.grupoccr.com.br/barcas/sobre-a-ccr-barcas

Praça XV and Niteroi- 2014, Cocotá and Paquetá- no AC). Additionally, a new line that would connect São Gonçalo to Praça XV, which represents 40% of the passengers that make the trip from Niteroi to Praça XV, has been discussed since 2009 (Palmares 2013). However, it has never gone beyond the planning stages. Again, projects that would serve poorer areas of the city, with the longest commutes to downtown Rio de Janeiro, have been set aside.

Chapter 3: Social Impacts of Urban Mobility

Urban Mobility and Social Exclusion

Now that we have discussed the configuration of the Metropolitan Region of Rio de Janeiro and the modes of transportation used within it, we can look the social impacts of the transportation system discussed in Chapter 2.

Urban mobility is not only "the ability of individuals to move from one place to another within the cities" (Tagore Et al. 1995 in Cardoso 2008). Though it is related to the daily shifts (travel) of the population in urban space – not only its effective occurrence, but also the ease of occurrence of these trips is important (Cardoso 2008). Taking this into account, Gomide (2006) defines urban mobility as the "ease of movement of people and goods in the city, in view of the complexity of economic and social activities it involved." In this sense, the poor, elderly or people with physical limitations are only able to access inferior levels of mobility in relation to the higher income classes and those without physical impediments or disabilities (Vasconcellos 2001). This leads groups of people to be excluded from the activities of society and acts as an obstacle to social development and the rise of urban welfare (SUMMA 2005).

When urban mobility is used as a social inclusion strategy, it should enhance citizens' access to services offered. But, what is true in metropolitan areas is that the poor conditions of urban mobility, particularly with regard to the provision of public transport, has been a factor that intensifies the process of social exclusion (Machado 2010).

Several indicators can be studied to assess the social impacts of the transport system in order to evaluate whether it is exclusionary or if it contributes to social

inclusion. These indicators include: the access to basic services and employment for people who do not own cars, the affordability of tariffs for the lowest income segment of the population - in general, spending on transport should not exceed 20% of the family budget, and the accessibility of the system for people with disabilities (Ibid).

As mentioned in the previous chapter, access to basic services is a real issue faced by the RMRJ due to the high concentration of services in the capital. This makes it more difficult, time consuming and costly for those living far away to take advantage of these services.

The same is true in the case of employment. According to Pereira and Schwanen (2013), the time spent by people in their movements should be of central interest to urban and transport policies since congestion levels have strong impact people's quality of life. In this aspect, the RMRJ has the worst rating in Brazil, with a 50 minute average commute time between home and work (FGV 2014). The number of workers who make long journeys to get to work has increased considerably, and several factors have been listed as contributors to this situation. Factors include population growth, increased motorization rates, and increased congestion levels (Pereira and Schwanen 2013).

Even worse, "the poor and inadequate forms of displacement carried out by an inefficient mobility system would produce effects contrary to income gains made by workers in the current situation of employment generation" (Ribeiro and Ribeiro 2013, p. 9). The concentration of labor supply in the central areas of large urban centers and the growth of the population living in distant suburbs have been the main points of impact in terms of displacement to access of employment and income. This is further

aggravated by the poor quality and even abandonment of the mass transit system, increasing the time spent by residents in their daily commutes, and directly reflected in their perception of urban welfare (Ribeiro and Ribeiro 2013).

According to Machado (2010), the equity of access and adequate transportation are key to social inclusion and to progress towards sustainability. It is noteworthy that the price of transportation has a significant impact on the low-income population and can be a decisive factor in spatial segregation. Those who cannot afford the fare are trapped in the periphery, unable to take part in the society of the city.

Considering the third indicator listed by Machado, the accessibility of the system for people with disabilities, we turn to a more in depth examination below.

Transportation and Accessibility

2010 census data show that 2,973,367 citizens in the Metropolitan Region of Rio de Janeiro have some kind of disability (visual, auditory, physical/motor, mental/intellectual), representing approximately 24.9% of the residents of this region.[21] Of these, 924,149 people, or 7.7% of the population, have a motor disability or some limited mobility (IBGE 2012). This represents a major challenge for public sector decision makers, as it means that a large number of people need public facilities to be adapted in some way in order for them to have access. Measures to ensure accessibility for people with disabilities are also useful and necessary for the elderly population and people with temporarily reduced mobility. However, despite the significant number of

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[21] This is in line with the national average, which was 23.9% according to the 2010 Census (G1 27 April 2012).

citizens with disabilities, public transportation options available in the RMRJ are far from meeting this demand.

The omission with respect to these citizens is historical. The 1988 Constitution established the requirement that public transportation vehicles must be able to adequately serve people with disabilities. Article 227 is explicit in this sense. It says "the law shall regulate construction standards for public sites, buildings of public use and manufacture of public transport vehicles in order to ensure adequate access for the disabled" (Brazil 1988). Additionally, Article 244 states that the public transport vehicles already in use should be adapted (Ibid).

However, neglect has prevailed. The law mentioned in the Constitution, known as the City Statute, which guarantees accessibility to public transit, was approved only 12 years after the new Constitution, in 2001.[22] Even then, a presidential decree was necessary in order to regulate the law (Brazil 2000). In 2004, Decree No. 5296 was finally introduced, which established that within 10 years the fleet of public transport vehicles and infrastructure services must be fully accessible (Brazil 2004).

Accessibility, as defined in the law and in the subsequent decree, is not restricted to only the necessary changes in public transport vehicles, but also to the public transit infrastructure as a whole, such as passenger terminals, stations, bus stops, and sidewalks. When looking at the current situation, 12 years after the decree and 28

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[22] "Despite the constitutional and legal provisions being truly innovative frameworks and there being timid and isolated experiences of implementing the City Statute's instruments, the effectiveness of its normative premises is a completely different reality. In general, the Statute's instruments and tools are rarely applied by the municipal governments and by the Judiciary" (Junior, Zarate and Emanuelli 2014, p. 14).

years after the new Constitution, it is clear that the government is not giving the necessary priority to the issue.

Accessibility of Each Public Transport Mode

Looking first at the bus system, the most used mode of public transportation, gives a good sense of the situation in the city as a whole – long grace periods to update fleets, underwhelming results and lack of penalization or other consequences. Despite the ample time given, bus companies have still not met the law's requirements regarding accessibility. In the city of Rio de Janeiro, for example, 76% of buses were adapted in 2014. In the same year, both Rio Onibus, the bus union that represents the companies operating the bus system in the city, and the Municipal Transport Secretary do Rio de Janeiro ensured the public that the entire fleet and all necessary equipment would be accessible by 2015 (G1 12 February 2014). In 2015, the union pushed the date back to March 2016, but so far this promise has still not been delivered (Rio Onibus 2015). And yet, there is no signal from the regulatory authorities that they will punish the city bus companies.

The Municipal Transport Secretary, responsible for overseeing that the companies are in compliance with the law, customarily lengthens the time limits for compliance with the law rather than punish companies that even after more than a decade since the legislation, insist on disrespecting rights of persons with disabilities. Decree 5296 and Article 46 clearly state that the supervision and the imposition of fines to collective transport systems, based on Law No. 10,048, is the grantor's responsibility (Brazil 2010).

The syndicate of bus companies operating in Duque de Caxias, Magé and Guapimirim, called Setransduc, and the syndicate that operates in Nova Iguaçu, Belford Roxo, Mesquita, São João de Meriti and Nilopolis, called TransOnibus, do not have any information about the accessibility of vehicles in their fleets.[23] The responsibility for supervision of these companies, when they act only at the municipal level, is the executive power of each of these municipalities.

As for the bus companies that are used on intercity routes, their supervision is the responsibility of the State of Rio de Janeiro Department of Road Transport, or DETRO,[24] which is the state government's organ responsible for monitoring and regulating the provision of this service. DETRO has demonstrated its willingness to act much more so than the municipal inspectors. In 2015, DETRO fined intercity regular fleet buses 1,843 times and removed 700 buses from circulation. Reasons for removing buses included failing to meet accessibility requirements (DETRO 2015b).

However, it should be noted that DETRO is quite limited since the intercity bus fleet is comprised of a total of only 6,506 vehicles. The entire fleet of vehicles in the RMRJ is comprised of 20,032 vehicles (FETRANSPOR 2015). Thus, if the organs responsible for the municipalities in the metropolitan region fail to perform their supervisory role, meeting the accessibility requirements in the whole of the RMRJ is unlikely.

The SETRERJ union of bus companies, which serves Itaboraí, Maricá, São Gonçalo, Tanguá and Niterói, says that their entire fleet complies with the accessibility

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[23] There is no information on either the Setransduc or TransOnibus website.
[24] *Departamento de Transportes Rodoviários do Estado do Rio de Janeiro*

standards defined by federal law (SETRERJ website). However, this information is not consistent with reality. In April 2015, DETRO inspected the Viação Mauá garage in São Gonçalo (operated by SETRERJ) and found 23 buses with irregularities, mainly related to their overall state of repair and the platform lifts for wheelchairs (DETRO 2015; O Globo 24 April 2015). Another issue raised by the inspectors is that even companies that have already adapted to the accessibility requirements have difficulties in operating the equipment. If a bus has a wheelchair accessible door and lift, but the driver has not received training to properly operate it, it is of no good for those people needing it. There is often also a lack of respect from drivers, many of whom will choose not to stop for people in wheelchairs even when the bus is equipped.

Bus companies operating in other cities of the metropolitan region do not provide any information of the accessibility of their fleets.

Turning to rail and water transport, the regulatory agency responsible for the oversight of the boat, metro and train transport systems is AGETRANSP – the State of Rio de Janeiro Regulatory Agency of Publicly Conceded Services for Water, Train, Metro and Road Transport.[25] It was established by the state government in 2005 in the form of special authority and is responsible for defending the rights of users and correcting problems in the provision of services (AGETRANSP website).

AGETRANSP has the authority to fine companies, or consortia of companies, that do not respect the rules regarding accessibility. However, not a single fine has been imposed for infringing these rules, even when the violations are visible in all modes of transport monitored by the agency. The agency has already fined several companies for

[25] *Agência Reguladora dos Serviços Públicos Concedidos de Transportes Aquaviários, Ferroviários e Metroviários e de Rodovias do Estado do Rio de Janeiro*

various compliance problems, but never for accessibility-related issues. This has led to varying degrees of compliance among the three modes of transport it oversees, the train and the boat systems being the worst and the Metro being considerably better.

SuperVia has been responsible for operating the train service in the RMRJ since 1998. SuperVia gives no information or indication of the number of stations that already meet accessibility standards. It only reports that it will invest R$ 376 million so that all 102 stations that they operate are in line with "international standards of accessibility" (SuperVia website). However, these works will only be completed in 2020 (projected), a blatant disregard for the law, with nothing being done to punish it.

Meanwhile, people with disabilities who use the transport system have had to rely on the goodwill of others to be able to assert their right to come and go.

Figure 18. Photo of a Wheelchair User Being Carried Down Stairs
Photo taken at Realengo train station. From Turismo Adaptado Wordpress.

Water transport (ferries that operate between Niteroi and Rio de Janeiro) is the responsibility of CCR Barcas, which took control of Barcas S/A in 2012. Their

concession started in 1998 and has a term of 25 years, extendable for another 25 years. As of today, the company has not fully adapted any of its five stations to meet accessibility standards (CCR website). In May 2015, the deputy director of the ALERJ Commission for Persons with Disabilities, Tania Rodrigues, who is a wheelchair user, said that there are other problems such as lack of staff training, the height of the ticket counter, lack of space specifically for wheelchairs and the absence of lifejackets within easy access of wheelchair users. "They do not provide the infrastructure for wheelchair users to exercise the right to come and go independently." In response, CCR Barcas committed to "developing working groups in order to improve the adaptation of spaces, fully eliminating all types of obstacles" (O Dia 28 May 2015).

However, the deadline for compliance with the accessibility requirements of water transport, unlike the deadlines of other modes of transport, according to Decree 5,296 (2004) and Administrative Order 232 (2008), ended in December 2012 (INMETRO 2008).

As a result of not meeting the deadline, in June 2014 the prosecutor's office[26] filed a Civil Public Action for the Obligation to Comply,[27] which requires the justice to oblige CCR Barcas to comply with the current legislation (MPRJ 2014).

It should be noted that it was necessary to go to extremes, to bring the issue before the justice to be decided. AGETRANSP, the agency specifically created by the state government to monitor these issues, should have acted. Instead, the Prosecutor's Office had to intervene in order for the rights of persons with disabilities or reduced mobility to be respected.

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[26] *Ministerio Publico*
[27] *Ação Civil Pública para Cumprimento da Obrigação de Fazer*

On the other end of the spectrum is the Metro, which far from being perfect has at least made real efforts to improve accessibility throughout the system. MetroRio, the company that has managed and operated the subway lines since 1998, assumed the accessibility commitment in 2007, when its contract was renewed until 2038. MetroRio committed itself to develop and implement an accessibility project in each station (INVEPAR 2011). In February 2010, the former director of institutional relations for MetroRio, Joubert Flores, said that all stations would meet the conditions of accessibility by the end of the year (ALERJ 2010). Five years later, MetroRio claims to be 100% wheelchair accessible buts its users are still finding it difficult to navigate. In December 2015 a woman got stuck in the Carioca station and needed assistance to leave, an occurrence she says has happened to her several times (G1 4 December 2015). Laura Martins, of the website "Cadeira Voadora," writes that the subway is not a great option because in general it is complex and a long way to the boarding area.[28] Furthermore, the gap between the platform and the train, which can be higher or lower depending on the station, makes loading and unloading an adventure. What is more, she says, is that there is not always a suitable location for positioning the wheelchair, which can be a factor that represents accident risk (Martins 2016).

One positive aspect of MetroRio, when compared to other public transport operators, is that it is more transparent in providing information about the accessibility of each station, which can be found on its website.[29]

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[28] The General Osório station, for example, requires three separate small elevators be taken, on top of a long distance, just to reach the tracks, and it is the newest station in the whole system. Other stations have a series of basic wheelchair lifts that run along the stairway handrails.
[29] https://www.metrorio.com.br/Facilidade/Acessibilidade

Although the Metro outperforms other modes of transportation in regards to accessibility, it has one of the most expensive fares and only operates in the capital, where average household incomes are higher. Yet, there is a strong link between poverty and the number of people with disabilities. So those who could benefit most from this more accessible mode do not have it available to them. The neighborhood of Madureira, for example, has more than double the population of people with motor disabilities when compared to Barra da Tijuca (IPP 2013). In addition, throughout the RMRJ over 70% of workers with some sort of physical disability receive only up to two minimum wages. So, as the poorest are much more dependent on public transport modes for their displacement, the precarious accessibility conditions doubly affects the poor with disabilities.

Average Monthly Incomes of People with Disabilities in the RMRJ

6% 3%

18%

73%

■Until 2 minimug wages

■Between 2 and 5 minimum wages

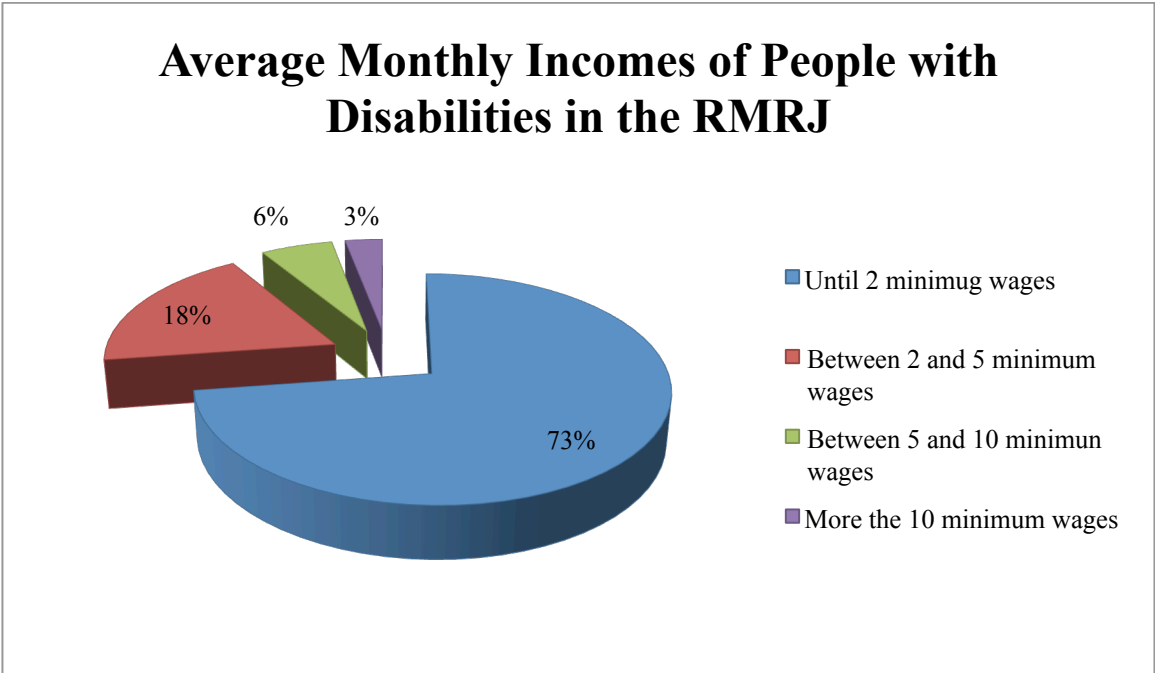■Between 5 and 10 minimun wages

■More the 10 minimum wages

Figure 19. Average Monthly Incomes of People with Disabilities in the RMRJ
Graph my own. (IBGE 2012)

Thus, remembering the indicators listed above that point to whether a transport system is exclusionary or contributes to social inclusion, Rio de Janeiro is failing on all accounts: the access to basic services for people who do not own cars, the affordability of tariffs for the lowest income segment of the population, and the accessibility of the system for people with disabilities. The current system not only favors the rich, offering the best quality and fastest modes only in wealthy areas, it is prohibitively expensive for the poorest residents and is far from adequately serving those with limited mobility or disabilities.

Paralympic Games

The upcoming Olympic and Paralympic Games have brought renewed interest in the subject of disability and fresh promises from politicians about making the city, and the country, more accessible. In only a few short months the city will receive 4,350 disabled athletes from 176 countries, but when asked how accessible Rio is on a scale of one to ten, Teresa Costa d'Amaral of the disability advocacy group IBDD[30] says "zero" (Garcia-Navarro 2015).

According to Amaral, Brazil has some of the best legislation in the world on the issue of disability rights, but laws do not mean enforcement. She also point to a pervading attitude of disrespect for disabled persons among the population, an attitude she is hopeful that the Paralympics will help to change (Ibid.) The head of the Brazilian Paralympic Committee, Andrew Parsons, believes the games will help in this regard.

> "I think the Games have to be a catalyst for change but that change is different from the Olympics...When we speak about people with a disability or

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[30] Brazilian Institute for the Rights of the Disabled Person

impairment we're talking about a diversity issue as well because we're trying to change the attitudes towards people with disabilities and who are different. This is something the country needs very much and I think intolerance is everywhere…You see this throughout the world, because people hate what is different, and I think the Paralympics has the potential to change the perception and respect the difference." (Hudson 2015)

Concerning legislation, in 2014 Brazilian President Dilma Rouseff signed into law the Inclusion of People with Disabilities Act, which "eliminates accessibility barriers in transport, housing, services, education, sport and the exercise of citizenship. The new law also states that 2.7 per cent of the gross revenues of the federal lotteries should be invested in sports, up from the current level of 2 per cent" (NPC Brasil 2015).

The law promises great improvements for all of Brazil's nearly 50 million people living with some sort of disability, but even in the host city, major projects have not been completed. Major landmarks in the city are supposed to receive improvements so they are fully accessible, but so far only a forth have been completed (NHK 9 March 2016). One of these projects is making wheelchair accessible routes on Copacabana beach, but so far the work has not even begun.

Conceding that the road to a more accessible city is still far from a reality, Rio Mayor Eduardo Paes says that the Paralympics are "not going to solve our problems, but things are gonna get much better for people with disabilities. We have a long way to go. The Olympics are not like a miracle that are gonna solve all the problems of the city" (Garcia-Navarro 2015).

Chapter 4: Fight for a Better System

Free Fare Movement (MPL)

In recent years, especially since 2003,[31] intense struggles have been waged over public transport issues in cities across Brazil. Protests have broken out because, more than just a technical matter, the current crisis has an eminently political character, and it is only by addressing this can the mobility problem be solved.

Mobility, the ability to come and go in the city, is intrinsically linked to class in Rio de Janeiro, and throughout Brazil. Those who have more money move more and with more ease; those with less money move less and with less ease. At times, the poorest cannot move at all, trapped on the outskirts of cities because they cannot afford the high fare prices. Thus, the public transport fare is a barrier, symbolically represented in the turnstile, which prevents and excludes those who do not have financial resources from moving around the city.

Today, the group at the center of the fight against the unequal and exclusionary transport system in Brazil is the Movimento Passe Livre (MPL), or Free Fare Movement. The Free Fare Movement (MPL) is an autonomous social movement, horizontal in structure and ardently non-partisan. It is independent and fights for a real public transportation, free for the whole population and outside of the private sector.

The MPL emerged in 2005 as an organized expression of earlier urban transport struggles, most notably the "Buzu Revolt" (*Revolta do Buzú)* that took place in Salvador in 2003. University students marched almost daily during August and September in response to what they felt was an abusive increase in the public transport (bus) fare. In

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[31] 2003 was the year of the historic "Buzu Revolt" in Salvador.

response to the protests the city repealed the fare increase, creating, for the first time, the precedent of fare reduction. Following the success in Salvador, student led demonstrations against fare increases spread to other cities such as Teresina, Natal, Vitória, Aracaju and Porto Velho, all of which also succeeded (MPL-SP 2013). Despite these groups' successes, they lacked legitimated people or groups able to mediate with the government. Thus, the MPL was formed as a political expression wholly devoted to fare reductions and eliminations.

The MPL argues the following:

"In the process in which the population is always the object instead of the subject, the transport system is organized in a top-down manner according to the imperatives of the circulation of money. In this way, the population is excluded from the organization of its own daily experience. This organization is principally based on the transport system, which restricts the mobility to come and go from work and places turnstiles throughout the city. When turnstiles are reinforced, the transport system's contradictions become even more evident, which arouses resistance. It is amidst this concrete experience in the fight against urban exclusion that the Free Fare Movement was forged. " (MPL- SP 2013)[32]

The MPL makes the transport fare issue an affirmation of the right to the city. Free and unrestricted movement is an essential component of this right, "a city only exists for those who move around it."[33]

According the movement's website, 35% of the population living in big cities does not have enough money to pay for the bus regularly (from IPEA 2013 on MPL

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[32] *Num processo em que a população é sempre objeto em vez de sujeito, o transporte é ordenado de cima, segundo os imperativos da circulação do valor. Dessa forma, a população é excluída da organização de sua própria experiência cotidiana da metrópole, organização essa que se realiza principalmente pelo sistema de transporte, o qual restringe a mobilidade ao ir e vir do trabalho e coloca catracas em todos os caminhos da cidade. E, no momento que se fortalecem as catracas, as contradições do sistema tornam-se mais evidentes, suscitando processos de resistência. É em meio a essa experiência concreta da luta contra a exclusão urbana que se forjou o Movimento Passe Livre.*

[33] This is a principal slogan of the MPL.

website). Many people are excluded from education and public services because they cannot afford to take the bus or metro to and from these places. This is only exacerbated with every fare increase. Every time the fares increase, exclusion increases. Thus, instead of fighting strictly against fare increases, the MPL fights against the very existence of the tariff. They believe transport needs to be seen as an essential right, not a commodity (MPL-SP "Carta de Princípios").

In early June 2013, when São Paulo's municipal and state governments announced a hike in the public transportation fares from R$ 3.00 to R$ 3.20, the MPL was ready to respond. As they had done many times before, the MPL organized a street protest in front of the city hall. The first march in São Paulo mobilized a couple thousand protesters and was focused on public transportation. The crowd marched to the chant of "if the fare doesn't go down, the city will stop."[34] By the sixth "grande ato," or march organized by the MPL, on June 20, many cities, including Rio, had indeed stopped. Millions had taken to the streets of Brazil to publicize their revulsion at current conditions. Many cities initially joined the protests as their own act of defiance against rising fare prices (in Rio the bus was set to increase from R$ 2.75 to R$ 3.00) and in solidarity with the São Paulo protesters who faced egregious police violence. This was the trigger that drew people to the streets, to directly intervene in the city's politics, and exposed the depletion of the Brazilian everyday lifestyle in the urban context.

By mid June, protests anger had mushroomed far beyond "20 cents." "Transportation, infrastructure, health, education, housing, women-gay-indigenous-

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[34] The chant rhymes in Portuguese. *Se a tarifa nao baixar, a cidade vai parar!*

black-citizen rights, corruption, political reform (parties, elections, congress), justice, security, environment, specific legislation, energy (nuclear, hydro, oil), and violence" had all become areas of grievance (Holston 2013). However, the initial protests' main agenda was the reduction of the fare increases. On June 17, 2013, São Paulo and Rio de Janeiro governors announced that the fare increases would be halted. This marked a major victory for the MPL, not only having their demands met, but proving that mass demonstrations could affect policy.

> "If taking back the urban space appears as a goal of the protests against the fare increase, it has also performed a role as a method in the practice of occupying the streets and directly determining their flows and uses. The city is used as a weapon for its own recovery: knowing that only blocking a crossroad compromises the whole movement in the city, the population launches the metropolis chaotic transportation system against itself, a system that prioritizes individual transport and leaves people at the edge of collapsing. In this process, people collectively assume the reins of their everyday life. Therefore, the true popular management happens in the people's direct action over their own life - and not behind closed doors, in municipal councils cleverly instituted by the municipalities or any other institutional chicanery." (MPL-SP 2013, p. 16)

Although 2013 appeared to be a moment of hope and change, citizens demanding a "qualitatively different kind of urban society," little has actually changed in the lives and commutes of V, A, R and D (from the beginning of the paper) (Harvey 2008). Since 2013, the public transport fares have continued to increase. Although branches of the Free Fare Movement organize protests whenever the increases occur, none have been anywhere near the size or have had the impact of the June 2013 protests. Today, the basic fare prices are as follows (there are many different "combo prices," example: Train+municipal bus is 6.50 or Train+Metro is 6.60, and other exceptions, example: boat paid with "Bilhete Unico" is 4.10)

Bus: 3.80

Metro: 4.10

Train: 3.70

Boat (Rio-Niteroi): 5.60

Policy Recommendations

The transportation issues discussed throughout this paper cannot be solved independently. According to Campos (2013), the integration of urban land use, transportation, mobility, affordability and sustainability is the key to improving quality of life in cities. Thus, it is necessary to combine efforts and rethink the patterns of occupation and use of urban land.

After the large, nation-wide protests of 2013, the federal government created the Mobility Pact. The Pact provided for the allocation of funds for 6 new urban mobility projects in the cities of Nova Iguaçu, Duque de Caxias and São Gonçalo. To date, none of these works have been realized, or even moved beyond the planning phase (Brazil 2013). The same year, the government promised R$ 2.57 billion for the construction of metro Line 3 between Niteroi and São Gonçalo. This project has long been a part of the political discourse, a frequently promised improvement, but construction has never actually started. The current governor Rio de Janeiro, Luiz Fernando Pezão (PMDB), ensured the start of the works by 2015 during his 2014 election campaign. Now, he has already changed his position, advocating the construction of a BRT corridor instead of a metro line (Moura 2015).

The choice of the BRT could be a good alternative. A study carried out by a technical team found that a BRT would be able to meet the demand by people who need

to travel between these cities. Preliminary studies indicate that the demand of Line 3 would be approximately 229,000 passengers per day (Moura 2015; Palmares 2013). This demand could be met by a BRT system. The expected number of daily passengers on the Transoeste BRT is roughly equivalent to the demand of the proposed metro Line 3. The Transoeste BRT is expected to transport 230,000 passengers per day (with a capacity to serve 10,000-30,000 passengers per hour and per direction, depending on the amount of available vehicles) (Castro 2013; Rio de Janeiro 2014).

In the case of the Mobility Pact, there was a failure of implementation; none of the plans moved beyond the discussion phase. This is primarily due to two factors, lack of funds and lack of political will. The city is without the necessary funds and struggling to meet previous commitments such as finishing the Metro Line 4 and BRT lines before the Olympics. There is also little political will since bigger political and economic crisis has muffled the public outcries.

Likely, the problems faced by the residents of the periphery who work in the capital and need to make long daily commutes have no solution in the short term. "Increasing the traditional infrastructure won't be of much help. It is the role of the governments to make predictions and study the dynamics in which we're living and find alternatives," argues economist Persio Davison, advisor at the organization "Wheels of Peace,"[35] in Brasília (Davison in Maciel 2014).

One of these possible long-term alternatives is to develop incentives for the creation of secondary employment centers outside the capital that are served by the public transportation system. According to Renata Florentino, from the Observatory of

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[35] *Rodas da Paz*

the Metropolises, the debate over mobility must not disregard the subject of planning. The discussion must include moving jobs closer to where the people are and encouraging the construction of affordable homes in the big centers, where most job openings are located (Maciel 2014). Additionally, the government should also work towards making public service offerings more widely available outside of the capital. These measures would open opportunities and minimize the number of long displacements for those living far from the capital.

In the short term, the government should hold the operators of the public transport modes accountable to quality and service standards. Additionally, the government should create educational campaigns to discourage car use, instead highlighting the positive impacts of taking public transportation or non-motorized modes of transport. However, this will likely be difficult due to concerns over quality and safety, especially since the collapse of part of the new bicycle path from Leblon to São Conrado. Citizens worry that the projects, such as the Metro Line 4, are not safe due to their hasty completion and lack of oversight (Bacelar 2016).

Lack of planning and implementation of the urban mobility system affects unequally the various groups of people, according to their social conditions and their dwelling places, leading to an increase in the average time lost in traffic. This time could be used to carry out other activities, such as leisure, time with the family or gaining additional education. Thus, public transport needs to be seen by policy makers as an essential service, an indispensable basic right that people can move freely to conduct their activities, leaving implicit the need to create conditions so that the space city is easily accessed by all.

Conclusion

The personal vehicle is deeply entrenched in Brazilian society and culture as both a "solution" to individual mobility needs and as a status symbol. This cultural trait is very harmful and acts as an obstacle to any intervention attempt in the urban mobility system. The growth of average household incomes during the 2000s and the government incentives provided for purchasing a car led to a flood of new vehicles (cars and motorcycles) on the city's street and intensified the problem of urban mobility (Maciel 2014). "The investment in individual motor vehicles totals eight to ten times as much as in collective ones. Over the course of the years, this was reflected in the design of the cities, which favors car drivers. This is unsustainable in the medium and long run" (Florentino in Ribeiro 2013).

These ineffective public policies, and lack of planning, have worsened the mobility in Rio de Janeiro, as seen by indicators such as home-work commute times. These commutes have become an increasingly stressful activity due to the constant increase in their average time and the corresponding loss of time that could be used for other activities.

Another cause, besides the increase in personal motorization rates, is the poor integration between the municipal and state governments. Despite the Mayor of Rio, Eduardo Paes, and Governor, Luiz Fernando Pezão, both coming from the PMDB party, they have not been able to jointly develop policies to address the urban mobility issue in the RMRJ. Similarly, there is a lack of coordination among the municipal leaders.

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Since RMRJ mobility affects many municipalities, it is impossible to treat each in isolation. This lack of integration hinders the development of infrastructure projects.

Another factor contributing to poor urban mobility is urban sprawl and disorderly land use, which has necessitated the movement of increasingly greater distances in order to go to work and take advantage of health services and education and leisure opportunities. Jobs, schools, and hospitals are all much more readily available in areas with the highest purchasing power.

The result is an urban mobility system that restricts people's Constitutionally guaranteed Right to the City. Instead of opening the city to all inhabitants, the urban mobility system functions as a contributing factor to social exclusion and spatial segregation of the lower classes. The upper classes have vastly greater access to the city, which is confirmed by the quality and quantity of public transport modes available to affluent neighborhoods and the lack of quality options in the poorest areas. Thus, urban mobility's main function, to allow all citizens to access the city in a democratic manner, is far from being reached in the Metropolitan Region of Rio de Janeiro.

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