Cultural paradigm shifts in socio-technical transitions towards sustainable cities: A case study of the transportation system of São Paulo

Alejandra Ruales Falconí

Master’s programme
Science for Sustainable Development

Master’s Thesis, 30 ECTS credits

Supervisor: Johan Hedrén

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Abstract

Transportation is a key component of the urban realm due to its high fossil fuel consumption, GHG emissions and pollution generation (among other negative externalities) that have been aggravated by an individual motor vehicle-driven society. In order to achieve a balanced urban growth for the future, the transportation paradigm requires a complete shift that will depend upon a change on people’s behaviors and perceptions about mobility. Being the biggest, most populous city of Brazil and the western hemisphere, as well as the financial motor behind the country’s economy, São Paulo currently faces a very serious transportation problem: an extremely high car per capita ratio in conjunction with a deficient public transport network. Furthermore, socioeconomic disparities exert an additional pressure to this dilemma, limiting the access to mobility and deeply embedding the car from a cultural standpoint. Given its prominence, São Paulo is the ideal city to evaluate how specific cultural and socio-spatial niches can steer a cultural paradigm shift that could ultimately trigger a socio-technical transition towards sustainability. In this case study, the role of policies, technology, and infrastructure as policymaking instruments are analyzed in the context of urban spaces in emergent nations, where political and economic structures are strong social determinants. Moreover, this study has shown how these instruments could not only produce a new set of mobility practices (or a new transportation culture) but also the creation of an equitable and thriving urban environment.

Keywords: sustainable transportation, socio-technical transitions, transition management, sociology of circulation, urban development
# Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>BRT</td>
<td>Bus rapid transit</td>
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<tr>
<td>BU</td>
<td>Bilhete Unico</td>
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<tr>
<td>CETESB</td>
<td>Companhia Ambiental do Estado de São Paulo</td>
</tr>
<tr>
<td>CPTM</td>
<td>Companhia Paulista de Trens Metropolitanos</td>
</tr>
<tr>
<td>EMTU</td>
<td>Empresa Metropolitana de Transportes Urbanos</td>
</tr>
<tr>
<td>GHG</td>
<td>Green house gas</td>
</tr>
<tr>
<td>Metrô</td>
<td>Companhia do Metropolitano</td>
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<tr>
<td>MLP</td>
<td>Multi-level Perspective</td>
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<tr>
<td>NGO</td>
<td>non-governmental organization</td>
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<td>NM</td>
<td>non-motorized</td>
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<td>ODS</td>
<td>Origin Destination Survey</td>
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<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
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<tr>
<td>PDE</td>
<td>Plano Diretor Estratégico</td>
</tr>
<tr>
<td>PPI</td>
<td>public private investment</td>
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<tr>
<td>PT</td>
<td>Public Transportation</td>
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<td>PITU</td>
<td>Integrated Urban Transport Plan</td>
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<td>RMSP</td>
<td>Metropolitan region of São Paulo</td>
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<td>SPTrans</td>
<td>São Paulo Transporte</td>
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<tr>
<td>SPUrbanismo</td>
<td>São Paulo Urbanismo</td>
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<tr>
<td>STC</td>
<td>socio-technical configuration</td>
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<tr>
<td>STL</td>
<td>socio-technical landscape</td>
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<td>STM</td>
<td>Secretaria dos Transportes Metropolitanos</td>
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<tr>
<td>STR</td>
<td>socio-technical regime</td>
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<tr>
<td>STT</td>
<td>socio-technical transition</td>
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<td>TT</td>
<td>technological transitions</td>
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<td>TM</td>
<td>Transition Management</td>
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<td>TOD</td>
<td>Transit Oriented Development</td>
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<tr>
<td>VAG</td>
<td>value action gap</td>
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<td>WRI</td>
<td>World Resources Institute</td>
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1. Introduction

Currently, half of the world’s population lives in cities and this number is projected to be 70% by 2050 (IEA, 2013). These large urban spaces hold extremely high population numbers, as well as they are responsible for consuming enormous amounts of energy and resources, which ultimately generate excessive pollution and waste. As Richard Rogers figuratively and accurately writes in his book Cities for a Small Planet, “Cities have become parasites on the landscape – huge organisms draining the world for their sustenance and energy: relentless consumers, relentless polluters” (Rogers & Gumuchdjian, 1998). Indeed, cities have become spaces where the negative externalities caused by their systems, such as excessively high air, water, and noise pollution, or colossal traffic congestion levels, outweigh the positive outcomes that are generated within these compact and dense spaces. Currently, cities are responsible for approximately two thirds of the world’s primary energy demand (Van Timmeren et al., 2012), with transportation and electricity for commercial, residential, and industrial purposes being the top energy consumers within the urban realm (IEA, 2011). As of 2012, the transport sector accounted for almost 27% of the world’s total energy consumption (Tie & Tan, 2013); additionally, it was responsible for producing approximately one fourth of the globe’s energy-related GHG emissions, primarily CO₂ and NOₓ (Geerlings et al., 2012a; Tie & Tan, 2009), with road transport being accountable for approximately 74% of said emissions (et al., 2013a).

In the global south, transportation is responsible for approximately 80% of the local air pollution, and transport-related CO₂ emissions are expected to increase by 57% between 2005 and 2030, mainly by motorization in nations belonging to the aforementioned region (Geerlings et al., 2012a). This rise in energy and emissions has been primarily derived from an exponential increase in individual passenger vehicles throughout the world: of the approximate eight billion daily trips made in cities, 47% are performed via a passenger vehicle (Cervero, 2013). Also, studies show that 25% of the globe’s population which belongs to the lowest income quartile, spends about 14% of their wages on travel; this number increases to 17% in the following quartile, all due to car ownership (Djist, et al., 2013). Hence, an obvious trend is noted: per capita CO₂ emissions have risen with car ownership, which is directly correlated with income growth. Moreover, the use of public transportation (PT) modes such as bus, tram, metro, or urban train are shown to decrease or stabilize as income increases, and these transport modes are considered as inferior goods by social classes with higher incomes (Djist, et al., 2013). In Latin American nations, rising urban populations as well as rapid economic growth are demanding an increase in mobility, which unfortunately in most cases is fulfilled by private motorized modes (Vasconcellos, 2001; Cervero, 2013). Also, car-friendly policies have pushed aside the development of PT along with walking and cycling infrastructures, thus contributing to the establishment of a transportation regime where the car is both seen as a symbol of economic prosperity, as well as a safe, reputable, and highly accessible mobility mode (Cervero, 2013; Hidalgo & Huizenga, 2013; Figueroa et al., 2013; Vigar, 2007; Vasconcellos, 2005a).

In Brazil, one of the up and coming world economies, this car-centered transportation regime has been mostly evidenced in São Paulo, the country’s biggest metropolitan area and one of the world’s top ten megacities with a population of over 21 million people (IBGE, 2014). The city has one of the highest indexes of private cars in the world, with approximately 4.8 million vehicles within its surroundings and 6.5 million within the entire metropolitan region (Cintra, 2013; Departamento Nacional de Trânsito, 2012). Current PT modes include extensive but underserviced bus and rail networks, along with a very small metro system, which altogether
do not provide an adequate coverage to the entire metropolitan region. In addition, these systems are overpriced and have not been prioritized by the government for further improvement for over two decades (Vasconcellos, 2005b; Biderman, 2008) due to car-friendly governmental policies, thus facilitating individual motorized mobility and embedding the car as a culturally accepted means of transport in people’s lives (Geels, 2012). Moreover, walking and biking represent less than one third of the total urban mobility share due to the lack of infrastructure and safety, as well as long distances to be traveled (Vasconcellos, 2005a). Finally, the perspectives and behaviors of the diverse socio-economic groups of the city in regards to their transport system further exacerbate the actual problem of São Paulo, where access to mobility is highly dependent on a person’s economic status (Jones & de Azevedo, 2013; Malatesta, 2007; Vasconcellos, 2005a).

1.1 Aim and research questions

The objective of this study is to highlight social behavior and perceptions as drivers for the fulfillment of regime shifts or socio-technical transitions (STTs) that strive towards sustainable transportation, primarily in the context of developing countries where socio-economic differences dictate the access to mobility as well as where a car-driven culture is predominant. Interactions between industry, policymakers, consumers, and civil society are of utmost importance when analyzing STTs; within this analysis, the perspectives of all stakeholders involved in such process, as well as the ways in which cooperation and support can be achieved between the mentioned social groups, must be explored so that a real change occurs in the transportation regime (Geels, 2012). Therefore, in order to contribute to the understanding of how the city of São Paulo could fulfill a transportation shift towards sustainable mobility, this study aims at the following:

• To analyze the origins of the current car-locked regime1, as well as possible transition pathways towards less car dependency, with substantial efforts for the improvement of PT and non-motorized (NM) mobility along with the promotion of equitable accessibility, through the views of key stakeholders of the transportation regime belonging to governmental and non-governmental institutions.
• To evaluate the process of socio-technical change from a cultural standpoint involving behavior and perception, in order to understand how possible transitions in the current car-locked regime of the city could emerge.

To accomplish the aim of this study, the following research questions have been formulated:

• How do governmental and non-governmental institutions assess the current transportation system of the city?
• How do these institutions envision the transportation transition of the city?
• What do they believe are the main opportunities and obstacles in achieving such transition?
• How are social behaviors and perceptions about transportation regarded in the transition process?

---
1 The car-locked regime is a term derived from the Multi-level Perspective on Technological Transitions theory developed by Frank W. Geels. This term (in brief) explains the social, technological and infrastructural processes and practices that establish the car as the dominant transport technology in a given urban transportation system. A detailed explanation on the origins of this term and what it entails is presented in the Analytical Framework section of this study.
• Are modifications in these aspects considered relevant towards a change in the transportation regime?
• How could a new transportation culture be developed?
• Which strategies can be used to trigger a change in behavior and perception?

1.2 Disposition

Chapter two provides a comprehensive background of São Paulo and the origins of the car-locked regime, in addition to a brief description of the sustainable transportation concept and the importance of perception and behavior in the context of socio-technical regime (STR) shifts. Chapter three describes the methodology used to collect the primary and secondary data of this study. Chapter four presents the theoretical framework, which includes several theories in order to contextualize the diverse concepts addressed in this study.

Chapter five describes in full detail the current state of the transportation network as well as future governmental plans for improving said network along with modifications to the urban landscape. Chapter six provides an in-depth socio-economic, perceptional, and behavioral analysis of mobility and its centrality to the social dynamics of the urban space. Chapter seven presents several perspectives in regards to the envisioning of a transition, which leads to the discussion of diverse pathways for the creation of a new transportation culture in chapter eight. Chapter nine presents a summary of the main opportunities and obstacles towards the fulfillment of a transition. Chapter ten provides a brief analysis of the informant’s views, as well as discusses the varied concepts derived from the results from diverse theoretical perspectives, which lead to a small reflection on technocracy and power dynamics in governmental systems. This section also presents how different cities around the globe have used the discussed concepts as alternate approaches for generating different mobility practices and urban spaces. The last section contains the concluding remarks of this study.

2. Background

Due to the fact that the São Paulo metropolitan region (RMS) is extremely large, encompassing 7,947 km² and 39 municipalities (SEADE, 2014) as depicted in Figure 1, this study will primarily focus on what is called the municipality of São Paulo (commonly known as the city of São Paulo²), which comprises 31 sub-prefectures. The city, which is home to approximately 12 million inhabitants (IBGE, 2014) living in a territory of 1,523 km², is the capital of the state of São Paulo as well as it is the financial, commercial, and corporate engine of Brazil. It is also currently the most populous city in the country as well as in the entire western hemisphere (IBGE, 2014). As any other metropolis in emergent nations, the city faces continuous expansion and a high rural to urban migration, with most of the poorer and industrialized areas growing on the periphery.

² For context purposes, I will refer to the metropolitan region solely as RMS, while São Paulo or “the city” will refer to the municipality of São Paulo. The RMS is included in this study due to the fact that most recent statistical data encompasses the entire metropolitan region; however; inferences derived from this data will be produced for the analysis of the city in itself.
2.1 The origins of the car-locked regime

2.1.1 The city built for cars and social exclusion

São Paulo is a highly dense and compact area, developed on three rivers, Tietê, Pinheiros, and Tamanduatei, of which many portions have been canalized or closed in order to allow for the expansion of urban infrastructure above or around them. The colonial old center where the city was founded is located on top of a hill, creating an uneven geography in many of the streets in downtown as well as today’s expanded center. However, aside from this specific region, the city’s geography is rather flat and São Paulo is well known for its unstable weather with great thermal amplitude due to its subtropical climate (Malatesta, 2012). Historically, São Paulo was developed as a city for pedestrians until the 1950s, with vibrant streets filled with commerce and low NM activity due to a booming coffee industry in the late 19th century. However, ever since those times the car has been seen as a sign of progress, prosperity, and freedom by the locals (Pereira da Silva, 2002), whom are commonly referred to as Paulistanos. Perhaps this is a reason why after the 1950s the city opted for a United States-type of development intervention, which was part of a national infrastructure development plan based on large highways, with less attention given to the already established rail network. Indeed, between the 1950s-1970s, a national industrialization and urban development phenomenon labeled as the exclusionary modernization model (Maricato, 2003) took place. In this developmental model, low-wages and socio-spatial segregation patterns were further accentuated with targeted investments on the hegemonic city, thus generating an early
unequal urbanization arrangement (Ferreira, 2011). Ever since then, the historic center lost its preeminence as a highly valued real estate area, even though up to today all railways converge in this area (Lascano Kezic & Durango-Cohen, 2012).

The present downtown region, developed from the colonial center, used to be the main financial district of São Paulo until the 1970s, when many companies relocated towards peripheral districts located in relatively close proximity (including what is now the bustling financial districts of Avenida Paulista and the Pinheiros riverfront that are part of the current expanded center as seen in Figure 2) thus moving jobs and people mostly belonging to the white collar industry. Hence, the downtown area went through the inner-city shift,

Figure 2. The city of São Paulo (adapted from: Prefeitura de São Paulo, 2015c)
experiencing a relative degradation of the urban space from an infrastructure and social standpoint. However, throughout the 1990s, a somewhat inconspicuous gentrification process occurred due to new governmental projects along with local groups promoting a social, economical, cultural, and touristic recovery of the area. Nowadays the center is again home to many public and financial institutions that concentrate a myriad of jobs, thus many Paulistanos living in the RMSP have to commute every day into downtown. Also, major art and cultural venues, in addition to some of the best universities in the country, are currently located in either downtown or the expanded center, contributing to an even higher influx of people to the area. Nevertheless, there are still many abandoned buildings that are of massive proportions (most of them product of the great Brazilian Modern architecture movement) due to high rental costs; many low-end, informal retail invade downtown streets daily; there is a considerable amount of deteriorated plazas and parks; and a large presence of homeless people that inhabit large and small streets during day and night. Even though walking through downtown during the morning is quite safe, most Paulistanos will think twice before venturing by foot to the area during nighttime.

Furthermore, studies have shown that city residents with the lowest incomes are indeed far more restricted to mobility than those belonging to the middle class and up (Vasconcellos, 2005a; Biderman, 2008; Jones & de Azevedo, 2013), particularly those living farther away from the expanded center and in municipalities of the metropolitan region. Also, the upper middle and high class are completely dependent on cars (and in many cases, helicopters) for mobility, and there is a negative stigma towards PT, walking, and biking. Furthermore, the number of cars in the city is expected to keep rising due the ever-expanding middle class, which currently comprises about 45% of the RMSP (Companhia do Metropolitano, 2012). This social group, with large incomes and “better life expectations” is purchasing cars at high rates (Scalon & Salata, 2012; Yaccoub, 2011). Therefore, now, not only the higher class is taking excessive use of the car but also the middle class, which is a much larger social group.

2.1.2 The transport network dilemma

Throughout the 1970s and 1990s, the concept of mobility adopted by policymakers and city developers was based on a supply and demand model, where infrastructure supply had to be matched with transportation demand for both goods and passengers (Da Silva et al. et al., 2008). This model was fulfilled through an extensive network of road transport developments prioritizing private vehicles over PT, with barely any incentives towards NM modes, and a lack of synergy between land use and transportation planning (Da Silva et al. et al., 2008). Also, as part of a decentralization process during the 1980s, since the city was (and is) the most important financial hub of the country, contributing to more than half of the state’s GDP (Lascano Kezic & Durango-Cohen, 2012), several state level institutions were established and franchised to monitor parts of the transportation network including its infrastructure and operation. These are the following: the passenger rail system, managed by the Companhia Paulista de Trens Metropolitanos (CPTM); the metro system, administered by the Companhia do Metropolitano (Metrô); and the metropolitan bus system, operated by the Empresa Metropolitana de Transportes Urbanos (EMTU). The Secretaria dos Transportes Metropolitanos, or STM, is in charge of overseeing all these institutions. On the municipality level, the bus system is monitored by São Paulo Transporte (SPTrans), a public company administered by the city’s prefecture (although all of its buses are operated privately) leaving the prefecture with the responsibility of road planning and maintenance. This institutional division, along with the characteristics of each network, are depicted in Table 1.
Even though there is evidence that the involvement of the state government has produced a drastic increase in the quality and quantity of PT (Lascano Kezic & Durango-Cohen, 2012), the car has certainly been the major protagonist in the Paulista urban realm for the last 20 years (Pereira da Silva, 2002; Malatesta, 2012). This has occurred due to major investments in the road network both at state and municipal level, as well as the burgeoning car industry of the country. As any other emerging economy, Brazil has benefited heavily from a rapid rise in private motorization, which has been facilitated by a credit boom for consumers as well as financial incentives from the government, such as tax breaks or gas subsidies (Jones & de Azevedo, 2013).

Nowadays, the city has a tremendous transportation dilemma: while an extensive road network of approximately 17,000km of avenues, viaducts, and bridges aims at servicing the approximately five million cars that transit on a daily basis through it (Veja, 2013), 11,000 buses with only 320km of segregated lanes (Serva, 2015), plus a mere 260km of train (which services both freight and passenger transport) and 70km of metro lines, encompass the entire PT network of the city (Rossi, 2014).

As of 2012, the entire Brazilian car fleet consisted of more than 45 million vehicles, where the city’s cars encompass approximately 12% of said fleet (Cintra, 2013; Departamento Nacional de Trânsito, 2012). Moreover, the city’s population grew 8% while the number of cars grew 54% between 2001 and 2012 (Cintra, 2013). Contextualizing this into numbers, it translates to about one car for every two people (Rossi, 2014) or 8 million journeys made by car opposed to 7.4 million on all PT modes per year (Biderman, 2008). Estimates state there are about 500 cars sold each day in the RMSP (Rossi, 2015) and the quantity of those who own a car at home increased from 52% to 62% in the period of 2013 to 2014; furthermore, the use of cars increased from 27% to 38% for those who use all or most days their vehicle, and all of these

<table>
<thead>
<tr>
<th>Table 1. The governmental structure of the PT system and the specifics of each network (adapted from: Lascano Kezic &amp; Durango-Cohen, 2012; ODS Survey 2012; Malatesta, 2012; Hidalgo, 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GOVERNO DE SÃO PAULO</strong></td>
</tr>
<tr>
<td><img src="image" alt="METRÔ" /></td>
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<tr>
<td>• 75km</td>
</tr>
<tr>
<td>• four lines</td>
</tr>
<tr>
<td>• 65 stations</td>
</tr>
<tr>
<td>• 4.6 million passenger/day</td>
</tr>
<tr>
<td>• 896 million passengers/year</td>
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<tr>
<td><strong>CPTM</strong></td>
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<td><img src="image" alt="CPTM" /></td>
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<tr>
<td>• 260km</td>
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<tr>
<td>• six lines</td>
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<tr>
<td>• 92 stations</td>
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<tr>
<td>• 2.9 million passengers/day</td>
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<tr>
<td>• 795 million passengers/year</td>
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<tr>
<td><strong>EMTU</strong></td>
</tr>
<tr>
<td><img src="image" alt="EMTU" /></td>
</tr>
<tr>
<td>• 931 routes</td>
</tr>
<tr>
<td>• 4,500 vehicles</td>
</tr>
<tr>
<td>• five million passengers/day</td>
</tr>
<tr>
<td>• 643 million passengers/year</td>
</tr>
<tr>
<td><strong>Prefeitura de São Paulo</strong></td>
</tr>
<tr>
<td><img src="image" alt="SPTrans" /></td>
</tr>
<tr>
<td>• 974 routes</td>
</tr>
<tr>
<td>• 14,920 vehicles</td>
</tr>
<tr>
<td>• 3,545 total km</td>
</tr>
<tr>
<td>• 320km segregated bus lanes</td>
</tr>
<tr>
<td>• 1,568 million passengers/year</td>
</tr>
</tbody>
</table>

The governmental structure of the PT system and the specifics of each network (adapted from: Lascano Kezic & Durango-Cohen, 2012; ODS Survey 2012; Malatesta, 2012; Hidalgo, 2008)
changes were registered across all socioeconomic levels (Rossi, 2014). Due to the high quantity of cars, traffic, and pollution, authorities decided to implement the Rodizio in 1997, which is a car restriction policy based on plate numbers. Approximately 20% of the city’s cars are not allowed to circulate within the expanded center limits between the rush hours of 7-10am and 5-8pm during weekdays (Biderman, 2008). However, this measure has had little or no impact on reducing present congestion levels due to the overwhelming increase in cars (Lascano Kezic & Durango-Cohen, 2012).

To further exemplify the car-centered transportation problematic, in Manhattan alone there are about 23,000 cars/km² circulating in an area of 87.5km², while in São Paulo’s city area of 1,523km², there are 4,600 cars/km² (Cintra, 2013). Hence, even though São Paulo has five times less cars per total km² than Manhattan, it experiences much higher traffic congestion levels (Cintra, 2013), thus demonstrating the ineffective road network and traffic management system of the city. Also, other mega cities such as London, Berlin, or New York, with far less population numbers, have double or triple the size of the metro and rail line networks (Biderman, 2008) in comparison to São Paulo. Figure 3 depicts the ambivalence in metro networks of several metropolises of the world, where São Paulo ranks last.

![Figure 3. Metro km/inhabitants in diverse world metropolises (adapted from: Malatesta, 2012)](image-url)
In addition to its small scale, São Paulo’s PT network is renowned for having very poor service conditions including extremely crowded trains, metro, and buses, an outdated infrastructure, as well as unorganized itineraries and a relatively high fare (Malatesta, 2007) amounting to R$ 3.50, or about USD$ 1.15 per ride, which has generated large-scale protests from Paulistanos during the last two years.

2.1.3 The negative externalities

Evidently the high numbers of cars, in conjunction with the PT system’s small scale and pertaining malfunctions, produce many negative externalities in the city from an economic, social, and environmental standpoint. Statistics show that about 63% of the population spends about 30 minutes to three hours in traffic (Veja, 2013) for the most common types of trips which are from home to either work, school or university, and back (Malatesta, 2014). The average time between a work to home journey is 42 minutes due to speeds averaging at 19.30km/h on highways. Also, record traffic rates have reached 35% of congestion along 300km of monitored roads (Rossi, 2014) and there are approximately 240,000 hours lost by Paulistanos to traffic with 200 million liters of gasoline consumed (Veja, 2013). In monetary terms, this means daily losses of R$ 11 million (approximately USD$ 3.5million) and yearly financial losses amount to R$ 4.1 billion due to car accidents, pollution, and traffic jams (Veja, 2013). Car accidents are the main transport-related mortalities in the city, followed by motorbikes (Malatesta, 2007). The municipality of São Paulo is also a big contributor of CO₂: as of 2005, it produced 15.74GgCO₂, accounting for approximately 18% of the state’s total 88.84GgCO₂ emissions (Prefeitura de São Paulo, n.d.; The Climate Group, 2012). From the total CO₂ emissions generated in the municipality, almost 12GgCO₂ account towards energy use, from which approximately 95% are consumed by direct use of fossil fuels, while the remaining 5% is for electricity generation (Prefeitura de São Paulo, n.d.) since the state mostly uses biofuels and hydropower to generate electricity (The Climate Group, 2012).

2.2 Sustainable transportation for an equitable and balanced urban space

The car-locked regime has definitely brought a wide-array of negative externalities that compromise the city’s present and future socio-economic and environmental conditions. As written in Freitas Miranda & Rodrigues da Silva et al., a traditional and unsustainable transport system such as the one in São Paulo:

“serves non-drivers poorly; it distributes benefits and costs inequitably; it is financially burdensome to households, governments, and businesses; it is increasingly inefficient due to traffic congestion and dispersed land use; it is a major cause of death and disability; it contradicts environmental and quality of life objectives; and it relies on nonrenewable resources that may become scarce in the future” (2012:141).

The sustainable urban transportation concept could serve as the basis for a new transport model in many nations of the global south (including São Paulo) and its focus is on improving the mobility and accessibility of city dwellers without hampering human health or the environment, while supporting a vibrant economy (Hull, 2008; Da Silva et al. et al., 2008). The OECD and the European Commission Group of Specialists in Transport and Environment define this concept as “transportation that:
• Allows the satisfaction of the basic accessibility and mobility needs of people, companies and society, so that it can be compatible with human health and the equilibrium of the ecosystem, promoting intra and inter-generational equality.
• Has acceptable costs, functions efficiently, offers the possibility to choose transport modes and supports a dynamic economy and regional development.
• Limits emissions and residues according to the earth’s capacity to absorb them, utilizes renewable resources at a rate below or equal to their regeneration, utilizes non-renewable resources at a rate below or equal to the development of renewable substitutes and reduces land use and sound emissions to the minimum level possible’’ (as cited in Freitas Miranda & Rodrigues da Silva et al., 2012:141).

Therefore, the intricate relationship between transport and social inclusion is evident in the concept of sustainable urban transportation, where the displacement of people through time and space is not only achieved via motorized vehicles, but also autonomously through NM modes in order to have a balanced urban development from a socio-economic and environmental perspective (Gudmundsson, 2004). Indeed, the complex nature of the transportation network of São Paulo has not only been detrimental to the environment, but as a matter of fact, most of its repercussions directly affect the residents of the city. Hence, exploring alternatives for the fulfillment of a transition towards sustainable transportation in the city is of utmost relevance.

2.3 Perception and behavior in regime shifts: why are they important?

Undoubtedly, São Paulo (as any other city striving towards sustainable transportation) will have to implement technological innovations, along with transport and land-use policy measures (Hrelja et al., 2013; Banister, 2008) in order to shift away from the current unsustainable car-locked regime, thus creating a sound built environment with lower greenhouse gas (GHG) emissions and equitable mobile accessibility. However, these new technologies, policies, and practices will be inconsequential if no fundamental changes are created in the psyche of the socio-economic groups belonging to the transportation regime of the urban space; in other words, a new transportation culture should emerge for the fulfillment of the transition (Jones & de Azevedo, 2013; Geels, 2012; Stead et al., 2012; Vasconcellos, 2001).

As in many other cities of the global south, cultural differences (primarily based on socio-economic standards) command the various systems of São Paulo (Malatesta, 2014; Jones & de Azevedo, 2013; Vasconcellos, 2005b). In the transportation system of the city, this is mostly evidenced by the disparities in access to mobility, as well as visions as to what are considered acceptable means of transport (Malatesta, 2007; Vasconcellos, 2005a). Furthermore, the ever-increasing middle class, with a predominant car-oriented culture (Arnold & Jalles, 2014; Scalon & Salata, 2012; Yaccoub, 2011), is also contributing to the unsustainable transportation regime of São Paulo. Having this scenario in mind, it is therefore essential to consider the behaviors and perceptions of people when assessing why and how STRs should change, especially in cities and countries where social imbalances are very marked and following unsustainable patterns from social, economical, and environmental standpoints.
3. Methodology

A case study approach was deemed as the ideal methodological approach for carrying out this study because “policy-making and implementation of sustainable mobility initiatives are influenced by site-specific contextual factors” (Hrelja et al., 2013). Hence, the city of São Paulo was chosen as the subject of study where relevant fieldwork research was performed as the base for primary qualitative data collection. Additionally, this study can contribute to the transdisciplinary research field, since it focuses on a context-specific real-world problem, thus involving academic actors and non-academic actors alike in the research process in order to produce a learning experience with a deeper reflection and integration of societal needs (Schauppenlehner-Kloyber & Penker, 2014). Moreover, the knowledge produced from scientists and non-scientist is geared towards the enhancement of the problem-solving capacity of applied science, thus developing new forms of expertise “that are both scientifically sound and societally acceptable” (Gross & Stauffacher, 2014). Thus, transdisciplinarity is considered a key element to the contribution of a new paradigm towards future urban development and sustainability since it provides new ways of dealing with uncertainty and complexity (Schauppenlehner-Kloyber & Penker, 2014). Consequently, the informants that were part of this study were treated as experts that contributed to the context-specific, real-world learning experience with their own particular insights and knowledge.

3.1 Case study approach

Case studies gather extensive information about the particular characteristics of people, social settings, or events in order for the researcher to understand their operation or function (Berg, 2008). Also, they are used as a scientific research strategy to investigate or discover more about a contemporary and complex phenomenon in a real life or natural context, along with a multitude of research methodologies (Johansson, 2003; Yin, 2009). Furthermore, case studies are instrumental when it comes to generating deep insights about a particular research subject or area (Stake, 1995) and empirically based findings generated from the studied case could serve as the basis for discussion of general analytical reference (Hrelja et al., 2013). As described by Flyvberg, case studies can be used as a solid base for establishing general conclusions if the case being analyzed is rich and illustrative (2006); hence, São Paulo as a case study fulfills this requirement due to its trademark complexity of a car-locked regime in an emergent nation. Moreover, evaluating the current state of São Paulo’s transportation system could generate relevant insights for understanding sociotechnical transitions and paradigm shifts towards sustainability that could be applied in other urban spaces of Brazil and Latin America, as well as in other developing economies of the world.

Case studies can serve as the main platform for generating insights and hypothesis that can be further pursued in future studies (Berg, 2008) as they provide detailed information about a specific subject or topic. Nevertheless, the role of the researcher as an impartial observer is essential when analyzing and presenting the results from the case studies since these should not vary in their objectivity (Creswell, 2009). Additionally, the case study findings may rarely be generalized since they focus on one particular event and thus cannot produce statistical generalizations (Hrelja et al., 2013; Berg, 2008). However, the aim of this study is to contribute to the understanding of STTs from a social standpoint in the transportation realm partly based on analytical generalizations (Yin, 2009) by relating the findings of this study to existing research and theories in the field of transitions towards sustainable mobility.
3.2 Primary data

3.2.1 Interviews

The empirical data used in this study was mostly derived from in-depth, semi-standardized interviews performed over a period of approximately three weeks in the city of São Paulo, mainly during the month of March. There was a total of eight interviews with thirteen pre-determined questions that were open-ended in order to allow the informants to elaborate and expand on their answers freely whenever necessary; also, in this manner, I was able to ask additional questions to obtain further information. The purpose of doing this type of interview is to approach the world from the perspective of the interviewee, and thus learn how the informants interpret and relate certain meanings to specific events or situations (Berg, 2008).

Through purposive sampling, I initially selected some of the most important and relevant governmental institutions that are directly related to the planning, management, operation and/or supervision of the transportation network of the city. The selected institutions included the CPTM, SPTrans, Metrô, and the Companhia de Engenharia de Tráfego (CET), which is in charge of the road system of the city. In addition, public companies that are indirectly related to transportation planning, though directly related to urban development, were also selected. These included the Secretaria de Desenvolvimento Urbano (Municipal Secretary of Urban Development) and the Secretaria de Cultura (Municipal Secretary of Culture). Moreover, I wanted to include an institution related to transport-related environmental monitoring, therefore I also contacted the Companhia Ambiental do Estado de São Paulo (CETESB), which oversees the environmental certification of transport-related property developments. Nonetheless, the STM and EMTU, which are institutions also directly related to the management of the transport network, were not considered for this study due to shortfalls in contact information availability.

I contacted all of these institutions via e-mail from Sweden in February 2015 while I was performing the initial planning and coordination procedures of this study. I found the e-mail addresses at some of the institution’s websites or via local contacts provided by two acquaintances of mine that live in São Paulo. From all of the aforementioned public companies and municipal secretaries, only the CET and Metrô did not reply to my initial e-mail contact; therefore, I insisted with two follow-up e-mails that received no response. Since I was in Sweden and did not have any phone numbers from these institutions, I decided to not pursue them any longer, primarily due to time constrains. On the other hand, I did receive a response from the Municipal Secretary of Culture; however, the public official whom I was supposed to interview did not have any availability in his agenda during my stay in São Paulo. Therefore, this institution was also not considered for this study. Even though it would have been very interesting to obtain the viewpoint of all of these public organizations, particularly of the CET and Metrô, those that were ultimately included in this study provided a versatile perspective on many topics. Certainly, besides addressing issues of the entire transport network or land use and urban development, governmental structures and policy executions were also reviewed, which are highly relevant topics when assessing how a sustainable and tangible transportation system can befall.

In addition, through purposive sampling, I selected some of the most prominent non-governmental institutions that are well known in newspapers and social media sites, and which are contributing towards the formulation of present and future public policies related to sustainable mobility at both state and city level. These included Vá de Bike, a local activist
group that encourages first-time or casual bicycle users to employ biking as an urban transportation mode; Instituto Mobilidade Verde, a local non-profit NGO that works with urban mobility and urban development; SampaPê, a local activist group that advocates walking as a NM transport mode; Ciclocidade, a local non-profit NGO that promotes biking as sustainable NM transportation; and Embarq, a global non-profit NGO part of the World Resources Institute (WRI), which strives towards sustainable transportation and urban development. All of these organizations were also contacted via e-mail during February, but as opposed to the governmental institutions, their response rate was considerably higher since all of them replied to my first e-mail communication. However, the organization Vá de Bike was not included in this study, since the prospective informant could not meet me for an interview while I was in the city. Nevertheless, the rest of the organizations whom agreed to take part in this research provided a well-rounded perspective on the main areas of sustainable mobility including walking, biking, urban planning and intervention strategies, as well as equitability and accessibility, besides many other topics that were pertinent to the aim of this study.

In total, there were four public, government-owned institutions interviewed: CPTM, SPTrans, CETESB, and São Paulo Urbanismo (SPUrbanismo), the public company under the Municipal Secretary of Urban Development that is responsible for the urban planning of the city. In addition, three non-governmental institutions, Instituto Mobilidade Verde, Ciclocidade, Embarq, as well as one local activist group, SampaPê, were also interviewed. The group of informants that participated in the interviews had varying positions within their institutions, and additional information on these people, along with each interview details, can be found in Appendix 1.

By including governmental and non-governmental institutions for this study, I not only procured the perspective of important stakeholders directly involved with the development, operation, and maintenance of the transport network from an infrastructural and technological perspective, but I also obtained the political and socio-cultural perspective of stakeholders that are representatives of both the government as well as of diverse social collectives of the city.

### 3.2.2 Observation

Another source of primary data was generated through observation, since I became a resident of São Paulo, as well as a user of the transport network during my four-week stay in the city. Observation is the “systematic description of events, behaviors, and artifacts in the social setting chosen for study” (as cited in Kawulich, 2005: para.2); hence, my personal experience as a temporary resident of São Paulo contributed to the generation of insights and understanding of the local transportation system and the Brazilian society.

### 3.3 Secondary data

The secondary data for describing the case was derived from several sources, primarily from scientific articles with differing topics in the areas of sustainable urban transport and urban planning in the Brazilian context. Also, governmental reports and graduate student theses were used for the inclusion of statistical data that was fundamental in the analysis of the present state of the transportation system, mostly because there is a lack of academic research on the topic during the last three years. As matter of fact, the last official statistical survey of São Paulo’s transportation system, the Origin-Destination Survey (ODS) performed by the Metrô, was performed in 2007. This census-like, mixed method study (including surveys and
interviews) is carried out every ten years for the entire RMSP in which trip and modal shares are evaluated on different criteria ranging from household income, gender, and age, to name a few. Although the Metrô generated a preliminary ODS in 2012, most academic research found to date is focused on the 2007 data; hence, the 2012 preliminary ODS was used as the most recent complementary data for this study. In addition, books and scientific articles with topics including STRs and STTs, transport policymaking, and sustainable cities, were also employed as supporting data of current research and theory.

Moreover, local digital newspapers and magazines, as well as blogs and websites, were also used as primary data sources in order to provide a comprehensive perspective to the study. The newspapers employed are some of the most read and credible sources in the city and the country, belonging to the two biggest media companies of Brazil, Grupo Folha and O Globo, as well as to Ediciones El País, which is one of the biggest editorial companies in Portuguese and Spanish. In addition, most magazine articles were found in the magazine of biggest circulation in the country, called Veja, which publishes articles related to politics, economy, culture, science, and technology. Other newspaper and magazine articles, along with blogs and websites, were found among top query lists provided by the search engine Google Brasil. Keywords used for the search included sustainable urban mobility, transportation strategies and management, transportation and socio-economics, sustainable urban planning, and transport accessibility, among others.

3.4 Conducting interviews

The interviews were carried out face-to-face, where an interview protocol was initially performed in order to obtain a verbal agreement from the informants, granting permission to use all the material derived from the interviews in this study. With such protocol, their anonymity was also agreed in order to avoid any content or confidentially discrepancies (Creswell, 2009). The interview guide (included for reference in Appendix 2) had three main categories of questions: the actual state of the city’s transportation system; the visions about a possible transportation transition in the city; and the transportation culture of Paulistanos. The interviews were performed in English, Portuguese, and Spanish, in order to make the informants at ease with their language of preference, and thus ensure an appropriate as well as full expression of ideas. The interviews were recorded in their entirety for transcription purposes, and these lasted between 45 to 120 minutes, mostly depending on the informants’ time availability. As previously mentioned, interviews are mostly seen as an advantageous primary data source due to the explicit, in-depth information they produce. However, the number of respondents can end up being rather small since the interviewing and observation process is time consuming (Getz, 2007). Hence, even though the total number of interviews in this study is relatively low (eight), the content of each interview provided rich and constructive insights that were used towards a relevant and comprehensive analysis for the fulfillment of the aim of this study.

3.5 Data analysis

The eight interviews were fully transcribed verbatim, where the transcribed text was read carefully and slowly in order to generate subtopics and concepts pertaining to the previously exposed aim and research questions. I manually performed an open coding technique for data analysis, where I established the three categories derived from my interview questionnaire as the basis for generating themes and subthemes. By reading the transcribed text in a very detailed manner, line by line, and word by word, several concepts were produced from each of
the main themes or subthemes that enabled me to develop further questions and answers concerning other issues related to my aim and research questions (Strauss, 1987).

I divided the categories in three major thematic sheets with their pertinent themes and subthemes; under each of these, I grouped the data derived from each informant with small verbatim excerpts or small recaps of the main idea (Berg, 2008). I also developed a separate sheet with the most recurring concepts derived from the thematic sheets; in such manner, I was able to conduct cross-referencing between concepts derived from each informant (Berg, 2008). Finally, I built a separate short-answer sheet categorized by interview, where I wrote brief responses of topics produced exclusively by each informant that did not particularly fit the main themes (also meaning that they were not mentioned or repeated across the interviews), as opposed to the main prevailing themes. These provided entirely new categories and additional insights that were particularly relevant to building up a deeper discussion that was in furtherance supplemented through the diverse secondary sources used in this study.

4. Theoretical framework

This study will be analyzed through four main theoretical frameworks that will help contextualize the aim and research questions previously posed in this paper, as well as provide insights and analytical lenses for the discussion section. It is important to mention that I combined all these frameworks deliberately because I could not find one single theory that could grasp all the concepts and ideas that are exposed in this study. To exemplify this, some theories were solely centered on technological or sociological developments while others briefly touched upon individuals’ behaviors and their roles on transitions towards sustainable transportation systems. Therefore, I believe the four main theories included in this study complement each other in a suitable and coactive manner; additionally, the selected theories were used as theoretical inspirations that helped me develop a unique framework in order to effectively put into perspective the findings of my study.

I will start by defining the sociological approach to transportation, or what is more precisely called the sociology of circulation, which will be the underlying concept of this study throughout since I am primarily evaluating culture, perception, and behavior in the transportation system context as drivers towards sustainability. However, since this theory does not provide insights of the intrinsic relationship between technology and society, I will provide a brief summary of the Multilevel Perspective (MLP) Theory in order to introduce the concepts of STTs and regime shifts from a transportation standpoint, as well as to illustrate how car-locked regimes are developed. Moreover, since the MLP does not explore in-depth the social aspects of regime shifts, I have decided to include the Transition Management (TM) theory, which emphasizes social change as the main driver for fulfilling a STT. Lastly, I briefly touch upon culture theory in order to evaluate the importance of culture, perception, and behavior not only among citizens, but also within institutions that directly or indirectly influence the transport regime.

4.1 The sociology of circulation

The traditional approach for evaluating and improving the transportation system of urban spaces has historically been focused on a technological standpoint, where infrastructure developments are a consequence of technological implementations backed by economic incentives (Vigar, 2007; Vasconcellos, 2001). However, such an approach is quite limited
since it does not include the user (in other words, civil society) in the process; therefore, it is essential to obtain both a social and political perspective when evaluating the development of transportation and its respective outcomes within a given limited land area. The social and political evaluation of transport is termed by Vasconcellos as the “sociology of transport” which defers from simple descriptive social research because it not only accounts the social impacts of transportation, but it also “analyzes travel patterns considering social, political, economic and institutional constraints” (Vasconcellos, 2001:33). Furthermore, as Vasconcellos writes, the sociological approach evaluates transport and traffic-related information “in respect to the relative economic and political assets of social groups and classes, as well as their conflicting (or merging) interests” (Vasconcellos, 2001:33).

The sociological approach of transportation has not been researched extensively since it links areas such as engineering, sociology and political science, which can be difficult to intertwine and assess altogether. Also, Vasconcellos explains that solutions to the negative externalities of transportation, such as traffic or pollution, are often seen as pragmatic actions, which have engineering and infrastructure developments as their main focal elements, while sociology “often sees transport as only a tool, not an end in itself, with little or no effect in shaping people’s values” (Vasconcellos, 2001: 36). Hence, he argues that transportation should be evaluated as the “sociology of circulation”, where the relationships among users’ views and practices, along with the movement of objects and people through time and space, are interlinked. According to Vasconcellos, the central issues for transport and traffic policies in the sociology of circulation concept are encompassed by how access is distributed in time and space, how different social classes and groups use and shape the city, as well as what are the related conditions of equity, comfort, safety, environment, efficiency, and cost (Vasconcellos, 2001). The following table sums up the differences among the technical, social, and sociological approaches to transportation.

**Table 2. Main differences between the three approaches to transportation (adapted from: Vasconcellos, 2001)**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Data used (nature)</th>
<th>Preferred elements for analysis</th>
<th>Preferred focus of evaluation</th>
<th>Preferred elements of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>Quantitative</td>
<td>Vehicles</td>
<td>Individuals</td>
<td>Economic efficiency (cost-benefit analysis)</td>
</tr>
<tr>
<td>Social</td>
<td>Quantitative and Qualitative</td>
<td>People in general</td>
<td>Individuals</td>
<td>Economic efficiency, with social analyses</td>
</tr>
<tr>
<td>Sociological</td>
<td>Quantitative and Qualitative</td>
<td>Political beings and their roles in traffic</td>
<td>Individuals, family, social groups and classes</td>
<td>Economic and social efficiency, equity analysis</td>
</tr>
</tbody>
</table>

This study will therefore have the sociological approach with the sociology of circulation concept as the underlying framework with users, or political beings, as the main elements of analysis; additionally, economic efficiency and social adaptability will be considered as
defining elements for evaluating transportation behaviors and perceptions. The sociology of circulation concept is essential to understand the complexity of transportation systems because they are not just based on infrastructure and technology; indeed, the planning and management of these systems are dependent on an intricate net of objects and people. Elements such as diverse modes of transport and services, regulatory policies, land use patterns, financing agencies and varying aspects of the human behavior (Da Silva et al. et al., 2008) modify and affect how this net operates in its particular urban setting. By placing forth the sociology aspect to transportation, Vasconcellos makes it clear how “structural political and economic conditions maintain social exclusion, poverty and unemployment and confine the decision-making process to selected groups” (as cited in Da Silva et al., et al., 2008:352), which are prevalent scenarios in cities of the developing world, such as the case of São Paulo. Hence, the sociology of circulation concept can provide a better understanding of the convolutedness of transportation systems in cities of emerging economies and disparate social imbalances.

4.2 The multi-level perspective and the socio-technical regime

The complexities of modern mobility can be more easily understood through the MLP, which provides a layered view of the evolution of dynamics between technologies and societal functions. Geels calls these dynamics technological transitions (TT) that “do not only involve changes in technology, but also changes in user practices, regulation, industrial networks, infrastructure, and symbolic meaning or culture” (Geels, 2002:1257); additionally, Geels argues that technology has no power on itself, only fulfilling functions when in relation to social agency (Geels, 2002). Therefore, this relation between society and technology forms a socio-technical configuration or regime (STC or STR); the difference between both denominations is that the latter involves rules, thus creating a set regime. The STR arises from different niches or innovation pockets, to form a complex net of socio-technical configurations that are shaped by a “semi-coherent set of rules carried by distinct societal actors” (Geels, 2002:1260) and which altogether rein any given individual societal system, such as transportation. Ultimately, the conglomerate of distinct STR forms what is called the socio-technical landscape (STL), which entails the spatial and material arrangements of cities (Geels, 2002). These distinct layers and set of configurations are seen in Figure 4.

Changes at the niche level, which Geels denominates the micro level, are bound to occur continuously via distinct niche innovations, which could range from technological or social innovations (Geels, 2012; Shove & Walker, 2010). The meso-level is shaped by the occurrence of these niches and there are many factors that stabilize, or stagnate the said level; this in turn makes the landscape level experience seldom modifications in its configuration due to slow changing external factors (Geels, 2002). The stability of entrenched STRs is produced by the interactions between heterogeneous elements, which are the products of activities derived by social groups that constantly reproduce these interactions (Geels, 2002). In the context of any given transportation system, a diverse number of constituents such as road infrastructures, car regulations, transportation entities, cultural and symbolic meanings of cars, user practices generated by their respective user groups, car manufacturers, among many other heterogeneous elements (Geels, 2002) shape the STR in specific and unique ways. These elements are depicted in Figure 5.

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3 For the purposes of this study, I choose to use the term STR.
In the case of São Paulo, various heterogeneous elements (apart from external landscape pressures or trends) have ultimately made the STR of the transportation system come to a halt; in other words, the STR has come to a technological lock-in fixated on the car. As previously mentioned, the reproduced interactions between the elements create the locked-in STR. These interactions are products of specific practices among the social groups belonging to the elements, and examples of these practices can include: low infrastructure investments for road, urban and spatial planning; a wide array of vested interests that promote the car industry; a diverse number of unsustainable user habits and lifestyles; and/or cultural values that ultimately embed the car from a social perspective (Geels, 2012).

As previously presented, niche innovations could be of a technological or social nature, and as Geels argues, niche breakthroughs can shift the current STC of any STR, for they are the “seeds for change” (Geels, 2002:1261). This shifting is called a STT within the STR, which is a co-evolutionary process that involves many actors and social groups, as well as can take several decades to unfold (Geels, 2002; Vigar 2007). Most niche breakthroughs are facilitated whenever the links between the heterogeneous elements of the STC are confronted with
problems or tensions, thus “loosening-up” the configuration (Geels, 2002). For the purposes of my study, I will focus on certain “cultural and socio-spatial niches that can deviate from normality and challenge the basic assumptions of the automobility regime” (Geels, 2012:475). Examples of these niches include sustainable urban planning strategies (such as transport hubs, Transit Oriented Development [TOD] or compact cities) and intermodal transport practices (such as car and bike sharing schemes or multi-transport nodes), which are directly related to the first, third, fourth and seventh heterogeneous elements of the STC in Figure 5.

4.3 Transition Management Theory

It is well known that the STT concept developed under the MLP mostly focuses on technology and supply innovations, neglecting matters bounded to what is lifestyle and social values (Avelino et al., 2012); therefore I also chose to include the TM theory, which describes transitions as “a transformation process in which society changes in a fundamental way over a generation or more” (Geerlings et al., 2012b:27). Additionally, a sociotechnical change “typically refers to the fact that innovations are shaped by social processes rather than to the ways in which technical systems are implicated in defining and reproducing daily life” (Shove & Walker, 2010:471). According to the TM theory, the fundamental changes might be derived from the modifications in behavior, technology, governance, production and consumption, and perceptions (Geerlings et al., 2012b).

The TM theory is a governance approach which “seeks to transform established practices in critical societal subsystems within which unsustainable practices are deeply embedded” (Avelino et al., 2012:34) not only through technological innovations via policies, but also via
social innovation, thus creating a new culture by means of alternative policies and practices. According to Stead et al., “Shifts in behavior are essential since any transitions to more sustainable patterns and forms of transport will not be assessed on attitudes or policies, but on actions and customs” (2012:355). Indeed, in order to generate the shifts in behavior, the TM theory considers the individual as the core element of the transition, with factors such as public engagement, public acceptability, as well as time and monetary constrains as key areas where substantial modifications could be developed and thus alter individual behavior. This is why the TM theory considers policy instruments and strategies as essential tools for creating such modifications, which could include innovations in information management and technology use, or opinion-shaping activities (Rocci, 2012; Stead et al., 2012) to name a few. As technology is intrinsically involved in any STT, TM theory discusses of a cultural interaction with technological changes through social processes, where policy “is not an exogenous force but part and parcel of the change process it seeks to manage” (Avelino et al., 2012).

4.4 Culture Theory and its role in policymaking

Paradigm shifts can be evaluated as changes in policymaking as well as societal changes, as argued by Geoff Vigar in his book The Politics of Mobility (2002) and Tom Burns in his article The Sustainability Revolution: A Societal Paradigm Shift (2012). The concept of a paradigm was initially developed by Thomas Kuhn to denominate a major shift in an established scientific thought; in other words, a paradigm is a “punctuation point in the history of a field of endeavor” (Vigar, 2002:181). This shift develops incrementally by the accumulation of new knowledge that “does not fit the prevailing world-view” (Vigar, 2002:181); hence, Vigar makes the analogy of policy as knowledge since “the notion of paradigms has extended to encompass issues in the social science realm and the paradigm term has been applied to describe policy explicitly” (2002:181). Also, paradigm shifts can occur in society due to changes in individuals’ world-views or culture (Burns, 2012). Culture is a concept that has many definitions and meanings, but for the context of this study, I will refer to culture as a set of collective values, being these norms or identities, which determine people’s behaviors and perceptions (Hansen, 2011). Moreover, I have used this definition of culture towards the development of the transportation culture concept that was employed for the analysis of the Paulista society.

As described in Burns, a societal paradigm shift “…consists of a cognitive-normative framework – in values, norms, beliefs, and strategies – and typically entails new principles of social organization” (2012:1120) which can assess cognitive issues such as the so-called value-action gap (VAG) where people are aware of the negative externalities of high car usages, yet their behaviors and attitude towards driving remain unchanged (Vigar, 2002). In addition, C.J. Hansen (2011) brings forth the concept of culture of cities in his article The role of policy-making and planning cultures for sustainable transport?, where shared sets of values connected to city living define how a city is developed. Furthermore, as “culture is the production, expression and transmission of meaning, value and identity” (Rose, 2006:139), it can resemble institutions, which can have a culture of their own (Hansen, 2011; Vigar 2002). Consequently, culture “becomes open to interests and political agendas, and therefore it also becomes relevant for policy-making and planning to search for opportunities to strategically identify and bring into play cultural resources” (Hansen, 2011:106) which can be of utmost relevance when assessing how social innovations can contribute to the STT fulfillment. Furthermore, since political institutions can have their own particular world-views or cultures,
if a predominant new worldview (or discourse, as Vigar refers to it) is entrenched⁴ among these entities, a paradigm shift can be established that will contribute to unchain a complete STT.

5. The current state of the transport system

The following section combines the secondary data obtained from the previously mentioned sources (including the ODS surveys, which are solely statistical), with the data generated from the interviews in order to provide a thorough description of the origins of the current-car locked regime. In this section, the informant’s data was used as only factual material; hence, none of their specific viewpoints were included. The combination of both primary and secondary data sources enabled to build a stronger and contemporary problematic to the current transport system as well as enriched it with specific details or examples that were not found in the statistical reports.

5.1 Motorized mobility

As previously mentioned, the last formal ODS survey was performed in 2007, although a preliminary assessment for 2017 was done in 2012. The 2007 ODS survey showed key changes in the transport network of São Paulo since the past ten years, primarily by depicting a 1/3 modal split between motorized and NM modes. Indeed, and interestingly enough, the ODS demonstrated that the share of trips made by car decreased from 1997 levels by about 45% (Bideman, 2008) and a rather equivalent distribution among three main modes of transport was established, these being the car, bus, and walking, as seen in Figure 6. Besides from this, the 2007 ODS showed two important points related to non-motorized mobility: walking continued to be the most popular form of transport in the entire RMSP and there was a growing number of trips made by bicycle, mostly in the RMSP (Malatesta, 2007; 2012).

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⁴ Vigar argues this is possible through discourse structuration and discourse institutionalization, but these concepts will not be further explored due to the scope of this study.
Due to the fact that NM mobility is frequently prevalent in lower income groups (Vasconcellos, 2005a; Jones & de Azevedo, 2013), of which majority lives in the RMSP (Informant 2 & 7) walking and biking is indeed higher in such area as opposed to the city. Also, expected results are shown true when it comes to higher income groups whom mostly live in the downtown and expanded center area, and whom indeed have more access to individual and public motorized mobility (Informant 3 & 4). As seen in Figure 6, car, bus, metro, and train trip shares are in fact higher in the city than in the RMSP5.

With the preliminary 2012 ODS (depicted in Figure 7), more interesting findings came along, primarily on motorized mobility: although there was a reversal in the share of trips made by cars, the total number of trips grew. This can mostly be attributed to the increase in car dependent land use and intercity journeys that are the result of real estate expansion along highways (Lascano Kezic and Durango-Cohen, 2012). On the other hand, there was a 62%, 45% and 13% increase for train, metro, and bus trips respectively, which experts state is primarily due to the implementation of the Bilhete Único (BU) or Unified Ticket, in 2004 (Informant 2; Biderman, 2008). This automated, cost and time efficient smartcard system was the first of its kind in the RMSP, initially allowing four bus rides within two hours for the cost of one, but after 2006, transfers between bus, metro and train were also implemented.

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5 Due to scope limitations as well as lack of extensive governmental data and academic research regarding taxi and motorcycle use in São Paulo and the RMSP, the individual analysis of these two modes of transport will not be taken into consideration. However, when referring to public and individual motorization, these modes are included in the general context, where taxis are considered as public transportation, while motorcycles as individual transportation.
Nowadays, for the cost of R$ 4.65, the user can have up to three bus rides and board either the metro or train for free within a period of three hours (Prefeitura de São Paulo, 2015a). Also, rail users can pay a single fare independent of the distance traveled or number of connections, and considering the extensive lengths the CPTM trains cover, the user can transverse the entire RMSP for the basic fare of R$ 3.50; also, there are further discounts for students and seniors.

In addition to the BU, the implementation of segregated bus lanes has been of tremendous impact to the bus network, making the individual bus units 68% faster, although they are still far from reaching bus rapid transit (BRT) levels in comparison to other Latin American nations (Rossi, 2014; Biderman, 2008). Average speeds of buses are 16.2km/h and 13.6km/h during the morning and evening rush respectively; on streets without segregated lanes, speeds decrease to 10km/h during the rush hours (Malatesta, 2012). In contrast, metro and train total 35km/h and over 40km/h respectively during the same timeframes (Malatesta, 2012). Also, since taxis are allowed to use segregated lanes (and unfortunately there are many irresponsible private drivers that illegally make use of these spaces as seen in Figure 8), bus traffic flow is much more limited than train and metro (Informant 1). Moreover, the prefecture is dealing with many complaints from different civil society groups whom claim the segregated bus lanes are taking too much space from car lanes, thus producing even more unnecessary traffic (Informant 1 & 3).
The São Paulo metro system is one of the busiest subways in the world (depicted in Figure 9), and it currently has the highest rate of approval by Paulistas among all city modes with over 80%, while the rail system has a 50% rate (Lazcano Kezic & Durango-Cohen, 2012) due to a prevalent history of poor infrastructure and service (Informant 2). Both systems cover extremely large areas, and they face one common problem: the lack of an appropriate line network to suffice the current passenger demand. As an example, for the metro system alone, it is estimated that a 500km network should be ideal for fulfilling the city’s needs (Informant 1), which means an increase of more than 600% of the actual size. In fact, the demand has outgrown the supply, which in the period of 1997 to 2007 was at a 80:28 ratio (Lazcano Kezic & Durango-Cohen, 2012). Apart from this common problem, the two systems face different infrastructural and operational challenges: the distance between metro stations is too big (Informant 3), while the frequency of CPTM trains is too low (Informant 2). Also, although CPTM trains are supported by the EMTU bus system, CPTM trains are the sole mean of transport for many Paulistanos living in the RMSP to get into the city, since most of its municipalities are only serviced by one or two CPTM lines; hence, these trains are constantly super crowded (Informant 2). To exemplify this, the second biggest municipality of the
Figure 9. The São Paulo metro - top left: passengers inside a crowded wagon; top right: passengers en route to embarking on a line; bottom: passengers waiting to get inside a wagon (source: author)
RMSP, Guarulhos (which is home to São Paulo’s only international airport), is not serviced by neither train nor metro (Informant 2). Additionally, the ever-increasing population as well as the incredibly high infrastructure costs (Hidalgo & Huizenga, 2013; Lascano Kezic & Durango-Cohen, 2012), further complicate the whole metro and train scenario. For example, the cost of building one kilometer of metro line is R$ 90-180 million (Cintra, 2013), or the approximate of USD$ 30-60 million. That is a reason why the newest metro line, number 4, is the first Private Public Investment (PPI) in the transportation system of the city and Brazil (Lascano Kezic & Durango-Cohen, 2012), and future metro and train lines are expected to be constructed in the same manner due to lack of state funds (Informant 2). However, there is a general view that the state and the city do have high amounts of funds at disposal, only that they are not prioritized towards transportation (Informant 3, 5 & 8).

5.2 Non-motorized mobility

Walking and biking are the most popular NM modes in the city and in the RMSP, with the highest share of trips being done by foot, as seen in Figure 6. To exemplify this with numbers, there are approximately two million journeys/day performed by foot in downtown alone, or 12 million journeys/day in the entire city (Malatesta, 2007). In addition, walking is the main mobility source for those embarking in other forms of PT (Informant 2). Despite the fact that trips by NM modes are substantially high, their corresponding infrastructure developments are considerably minor in comparison to PT infrastructure. Moreover, neither the prefecture nor the STM have considered walking as an official transport mode, as Informant 4 explains:

“Pedestrians do not have any space in transport; we are not considered a [form off] transport in the city, even when we are the majority of the transport.”

As a matter of fact, each landowner, not the prefecture, is responsible for the implementation and maintenance of the city’s sidewalks; hence, there is a lack of uniformity in the way these are built and preserved, thus contributing to an insecure and alienating urban environment (Informant 3). To exemplify this, pedestrians have been using the recently implemented bike lanes to walk (as pictured in Figure 10), since most sidewalks within downtown and the expanded center are too narrow for the amount of people circulating on them. Moreover, and even more concerning, is that there is minimal information and signalization on streets and bus stops (Informant 4, 7 & 8). Indeed, there is not even essential information such as routes or lines in any of the bus stops in the city (Informant 8), making it very hard for both locals and visitors to travel via this system or locate themselves in the urban space. Other obstacles for pedestrian mobility is the lack of interconnectedness between transport modes, since there are about only seven stations connecting train and metro, and nine connecting train and EMTU buses in the entire PT network, thus making pedestrians walk further distances in order to reach their PT nodes (Malatesta, 2007). Additionally, the poor sidewalks and violent automobile drivers provide a dangerous environment for those who travel by foot: the highest transport mortality casualties in the RMSP are pedestrians, averaging two deaths/day (Informant 4) and these are primarily caused by car accidents (33.5%), followed by motorbikes (32.7%) (Malatesta, 2007).

On the other hand, biking is considered an official transportation mode by the prefecture since 1997 and although bike use in São Paulo is still below the average compared to other Brazilian cities such as Curitiba, Rio de Janeiro or Pelotas, which have better cycling conditions from a terrain and climate standpoint (Jones & de Azevedo, 2013), there has been an exponential increase in cycling. Indeed, the 2007 ODS showed an increase of 200% in bike
Figure 10. Pedestrians using diverse bike lane formats as additional sidewalks – top left: independent bike route; top right: bike lane on sidewalk; bottom: segregated bike lane on street (source: author)
journeys, with the highest share of biking mostly exhibited in the RMSP since the topography is more favorable (less hilly) than in the city; nevertheless, the unpredictable climate has certainly played a negative role towards increasing bike usage among Paulistanos (Malatesta, 2012). Despite this, 33% of families in the RMSP own a bike (Biderman, 2008) and research pinpoints to many reasons as to why biking became a more evident source of transportation. However, the main attribution to its increase is that it is now seen as the best alternative to the worsening traffic congestions, primarily in the upper socio-economic groups of the city (Informant 5; Malatesta, 2012). Even though cycling has drastically increased in the city, currently, there are only about 200km of bike lanes, which can be independent routes, or segregated from the street through concrete or paint divisions (as seen in Figure 10); also, there are about 120km of streets closed to traffic during sundays to create leisure lanes for recreation and health purposes (Malatesta, 2012). Due to the increase in bike trips, the prefecture, in partnership with two national insurance companies, launched two biking rent systems called BikeSampa and CicloSampa (depicted in Figure 11) during the last two years with more than 200 bike points primarily throughout the extended center (Malatesta, 2012). BikeSampa is solely accessible via a smartphone application, while users of Ciclosampa can access the bike with their credit card. Furthermore, metro and train users can also take their bikes on board after 8.30pm, but only during weekends and holidays (Malatesta, 2012). Also, although there are bike racks for storage or parking lots in metro stations, these are not covering the existing demand since there are only 17 storage points in the city with only four points known to be in constant operation; in these, there is evidence of a 80-100% usage (Malatesta, 2012). Hence, the lack of infrastructure for proper bike circulation is still far from adequate standards (Informant 3 & 6). Also, the prefecture has been criticized for

![Figure 11. Ciclosampa station (source: author)](image-url)
implementing most of the bike lanes within the expanded center and not in the RMSP, where most bike journeys actually take place (Informant 6). Moreover, currently all works for bike lane constructions have been halted in the city (except in the area of Avenida Paulista [as seen in Figure 12], which is the most emblematic street of the city) by the State’s Public Ministry on the premise that the bike lanes have not been planned for accordingly and have been placed where there is already several other modes of transportation (Informant 6 & 7; Martin, 2015).

![Figure 12. Bike lane construction in Avenida Paulista (source: author)](image)

5.3 Time, distance, and motives of mobility

The 2007 ODS also allowed to determine the average time spent per mode of transport, as seen in Figure 13. The most common transport modalities, car, bus, and walking, had varying average times: car trips took 37 minutes, bus trips were 68 minutes, and walking was 16 minutes. The fourth and fifth most popular transport modes, train and metro, were the longest in time, averaging 93 and 87 minutes each. On the other hand, bicycle trips averaged 27 minutes. The reasons for these disparate time lengths are evidently based on the length of kilometers traveled by each transport mode; hence, train and metro journeys are indeed the highest in average time (Informant 2). Nevertheless, it was expected that car journeys would take longer considering the traffic congestion levels of the city, but this result could have differed due to the fact that 45% of the car trips made in the expanded center average 15 minutes (Cintra, 2013) since most Paulistanos living in the area use it for very small distances, as short as 2-5km (Informant 3; Informant 4). On the other hand, the average time spent on
Figure 13. Annual trips/mode and minutes/trip in the RMSP (adapted from: 2012 ODS; Malatesta, 2007)

buses does reflect the overall RMSP congestion situation; nevertheless, this time is expected to be lower in the 2017 survey due to the expected increase in segregated bus lanes (Informant 1). Walking trips are obviously shorter in time due to the lower amount of kilometers covered, averaging 2km per trip, and most of the short trips by foot occur in the highly compact built environment of downtown and the expanded center, while longer trips, averaging 5-7km, occur in the RMSP (Malatesta, 2007). The same distance pattern is experienced by bike journeys in the city and RMSP (Malatesta, 2012).

In addition, the 2012 preliminary ODS provided information on the type of transport used per different main activities as seen in Figure 14. Most of the trips are made for work and education (school/university) reasons, encompassing 46% and 32% of the daily trip share; the following highest share was for recreation/pleasure with 13% while health and shopping reasons were last, with 4.4% and 3.7% each. Figure 15 also shows the daily trip distribution by motive and transportation mode, where PT had the highest share in trips made for work and health reasons, while it had the lowest share in trips for shopping and recreation/pleasure. Conversely, individual transport had the highest share in shopping, recreation/pleasure, and health related trips, with the lowest share in trips made for education. Non-motorized transport had the highest share in trips made for education, followed by shopping and recreation/health. Interestingly, non-motorized transport had the lowest share for health-related trips.
Figure 14. Daily trip distribution by motive in the RMSP (adapted from: 2012 ODS)

Figure 15. Transportation mode per motive of trip in the RMSP (adapted from 2012 ODS)
5.4 Planning future alternatives to the transport network

PT was defined as an essential public service under the responsibility of each city’s prefecture in the 1998 Federal Constitution, and only since then the theme of urban mobility has been debated (Da Silva et al., et al., 20008). Also, the state passed a climate change law in 2009 with a target reduction of 20% in CO₂ equivalent emissions by 2020 (The Climate Group, 2012) and more attention was given to cleaner transportation initiatives, as well as diversifying the transportation networks of cities. In order to expand the PT system of the city, the STM created the Integrated Urban Transport Plan (PITU) in 1998, a capital-intensive project with a 2020 deadline for completion of the pertinent planned infrastructure (Hidalgo, 2008). The PITU projects to have 580km of urban bus corridors, 284km of metro lines, a rail line connecting two airports, 265km of regional CPTM rail lines, and 15 distinct terminals connecting the aforementioned modes of transport (Biderman, 2008; Hidalgo, 2008). Furthermore, the federal government has mandated that all cities of +20K inhabitants have to implement their own urban mobility master plan by 2015 if they want access to the federal’s government money for transportation purposes (Informant 8; Rubim & Leitão, 2013). In this new plan, walking is to be included as an official transport mode in São Paulo, and there are talks of sidewalks acquiring a direct management from the prefecture (Informant 4 & 7).

Currently, the prefecture has developed the latest Plano Diretor Estratégico (PDE), which is a planning and urban development master strategy plan that is renewed about every 10-15 years. The PDE has a wide array of policies and regulations for both the RMSP and the city, and its purpose is to give a social function to public property in order to obtain a more equitable and livable urban space (Prefeitura de São Paulo, 2015b). The plan was recently approved as law by the city’s councilman chamber in 2014 after a long participative and inclusive process with over 20K citizens taking part in it (Informant 7), and it has 2029 set as the year to achieve its goals (Pacheco, 2014). Some of its most important strategies are employed to link land use to the PT network, which is something that has not been taken into consideration in past PDEs (Informant 7).

To begin with, there will be a 30% investment allocation directed for PT and NM mobility from the entire urban development fund (Pacheco, 2014). Also, there will be special floor-to-area zones categorized according to their location in relation to the PT network; hence, taller and larger buildings will be allowed to be constructed in zones closer to PT lines (bus, metro and train), while smaller edifications will only be constructed in areas located further away from the PT network (Bedinelli, 2014). These new edifications will also have one car garage built per residential apartment, and buildings with ground-floor commercial establishments will be economically incentivized; therefore, less car use is encouraged as well as more dynamic walkways. This policy has strong fundaments on the new urbanism concept, where a stronger public life is inherently related to bustling streets filled with pedestrians and commerce, thus creating a vivid urban environment through public space (Bonduki, 2014a; Gehl, 1998). This TOD-like strategy will make developers construct along the PT network and thus have for the first time an organized and regulated real estate market subject to public policies (Bonduki, 2014a). Also, this TOD policy will incentivize the government to keep building more PT lines (Informant 7). Furthermore, this land use-transportation policy will create new Economic Hubs (as called by the PDE) throughout the city so that distinct municipalities have higher infrastructure and employment densities, thus making people displace less and obtain better accessibility to work, health, education, and cultural centers (Bonduki, 2014a). Another objective of the PDE is to occupy the vast number of abandoned
buildings in the city center for housing purposes, and thus make use of the diverse mobility modes already in existence in the area (Informant 7).

Other alternative projects currently in development include plans for aquatic transportation in order to take advantage of the rivers around the city (Informant 2). There are also plans for the complete deactivation of the Via Elevada Presidente Costa e Silva (or most commonly known as Minhocão), a 3.5km elevated overpass that runs east-west across downtown and which is the main connection between the city’s western region and downtown (Biderman, 2008). Apart from being presumed one of the many reasons behind the deterioration of downtown (Biderman, 2008), the Minhocão is currently closed to car traffic on evenings (as shown in Figure 16) and weekends for avoiding high noise and smog pollution caused to the people living along it (Boduki, 2014b). Future usage plans for this overpass are still under discussion by city officials (including an elevated park in the same fashion as the High Line of New York City) but the prefecture reiterates they will not proceed with any plan not approved by the majority of the population (Boduki, 2014b).

Following another United States-led initiative, the installation of parklets across downtown and the expanded center has been of significant increase since 2012 (Prefeitura de São Paulo, 2014). Parklets are urban development intervention strategies that consist of extending part of the sidewalk (with benches and vegetation, as depicted in Figure 17) into former parking spaces along the street, thus giving the space back to the public instead of to cars (Informant 3 & 8). The construction of parklets was initially led by local NGOs but after witnessing its success and high reception among Paulistanos, the prefecture decided to convert its installation into formal policy (Informant 8). Nowadays, Paulistanos or private entities such as restaurants or stores, can submit parklet installation requests for their street or neighborhood,

Figure 16. Minhocão closed to traffic during nighttime (source: author)
but ultimately the petitioner is in charge of the maintenance of the parklet once it is built (Informant 8). The city is also developing more technological solutions to make public transportation usage more convenient, as well as ease traffic congestion; examples include mobile applications for charging the BU card as well as metro and bus route maps and information accessed through not only web platforms (as it is currently) but through smartphone devices.

Moreover, for the first time in Brazil, the data generated from public buses’ GPSs was open in order to create an urban mobility laboratory managed by SPTrans called Mobilab (Informant 1). The data used by university students and different information-technology startups is generating technology-centered solutions for an optimized bus network planning and management (Zottis, 2014). The opening of data has enabled SPTrans to become a more transparent institution, since data, codes, and protocols are now open to society, thus enabling a participative process, as well as fomenting innovative solutions for the enhancement and integrity of the transportation network (Informant 1).

6. Transportation: the central element behind the sociology of the urban space

From this section forward, the individual views of the informants were used as the main data source to describe the possible pathways towards an ST transition, as well as to describe the transportation culture of the city. Even though the informants belong to two distinct groups of entities, some representing the public authority and others the public’s voice, it was surprising
to find that their views on the transport system and its pertaining culture were significantly similar. Hence, the continuation of the findings of this study did not exceedingly focus on the degree of data variation between each informant, but rather captured the most prevailing common views among them and highlighted specific examples within these views. Consequently, and following the aim of this study, the main focus was to denote how a ST transition could be fulfilled based on the informants’ views instead of providing a full analysis as to how their views differed. Nevertheless, a small portion of the discussion section was used to analyze how and why certain disambiguation among the informants might have occurred considering their distinct roles as stakeholders within the transport regime.

6.1 Socio-economics, mobility, and accessibility

The 2007 and preliminary 2012 ODS demonstrated the distribution of public and individual transportation trips by income, which is indeed a determinant of the mobility and accessibility levels of the many socio-economic groups of the RMSP and the city. These socio-economic groups are defined according to monthly income per household distribution, as seen in Figure 18, where almost half of the population earns less than R$ 1,200/month, (approximately $USD 405/month) followed by what could be considered the lower-middle class, which encompasses about 30% of the entire population. Those earning above R$ 2,500/month (about $USD 845/month) represent the remaining 20% of the population, therefore it can be implied that 80% of the RMSP is comprised of low and lower-middle class households. Also, for about 20% of the poorest living in the RMSP, the cost of urban transport represents about 8% of the total household expenditures, which is double the average of 4% for the entire population (Gomide, 2008).

Figure 18. Household income distribution in the RMSP (adapted from Malatesta, 2007)
The results of the 2007 and 2012 surveys depicted in Figure 19, show something already quite obvious: the lower the income per household, the higher the use of PT and vice versa. Also, when comparing the results, it can be determined that the use of PT decreased from 2007 levels by 1% to 4% in the first three household income groups, while it increased by 1% to 6% in the last two. The income groups that experienced the higher changes in PT were the third income group of R$ 2.5K-5K, where it decreased by 4% while for the last group of R$ +6K, there was a 6% increase. When combining the data of Figure 13 and Figure 19, it can be determined that those that spend the highest amount of time traveling via motorized and non-motorized means are indeed the people belonging to the lower income groups, since they have to spend longer hours in traffic and cover larger distances by motorized and/or NM modes (Malatesta, 2007). The ODS also demonstrated that trips of people belonging to the lower incomes are 60% made on foot, while richer groups can have five times more daily trips on motorized modes (Gomide, 2008).

As previously mentioned, the growing middle class has been purchasing cars mostly as a life quality improvement asset, which brings more comfort, safety and social status (Informant 1 & 4), hence the increase in the car share of the city. However, aside from this reason, Paulistanos have also been buying cars as a mean to escape the long hours on PT (Informant 2, 5, 7 & 8). The current 1/3 modal share distribution among car, bus, and walking in sustainable transportation terms is appropriate; however, according to Informant 1, this share has been established not because the transportation network is good, but because the majority of the population earns less than $USD 845/month, which is rather low, making it harder for people to purchase cars at even higher rates than the currently exhibited ones (Informant 1). As he affirmed:

\*Figure 19. Public vs individual transportation use by monthly household income (adapted from 2012 ODS)\*
“The only reason why we still have a decent share, a decent model split share, is because we are poor.”

On the other hand, even though car trips increased in the RMSP’s daily motorized trips, there was a decrease in individual motorization on higher income groups which could be attributed to the growing traffic jams and parking limitations mostly experienced within the city (Pereira da Silva, 2002). Furthermore, in higher income groups (middle to upper-middle and high class groups), PT increase translates mostly to higher metro use, primarily in downtown and the expanded center, leaving most bus and train transportation to lower income groups living in outer prefectures of the city or in the RMSP (Lascano Kezic & Durango-Cohen, 2012).

Even though daily trips in the RMSP made by car are about 27% of the total, while walking and bus trips are 24% and 33% each, there has been a prevalent unbalanced share of investments skewed towards road infrastructure for cars (Informant 1 & 4). For example, in 2010, almost R$ 2 billion were spent to expand the peripheral roads along the Tietê river, when this money could have been applied towards the construction of approximately 10 kilometers of metro tracks (Cintra, 2013). Also, about 80% of the city’s public space is occupied by cars; thus, most of the high traffic and pollution levels generated are caused by less than a third of the city’s share of motorized trips (Informant 1).

The historical heavy investment on the car market and its pertaining infrastructure has generated a rather poor PT network in a highly dense area, where urban development has been growing along the lengths of highways and avenues, instead of bus corridors, or rail and metro lines. Indeed, as opposed to many metropolises planned in a TOD fashion, primarily led by rail and subway tracks, the Paulista metro and train systems had to grow and accommodate themselves in the already heavily dense built environment of the city (Informant 2 & 3). Because of this, many booming areas in the expanded center, such as the Pinheiros riverfront, have not been serviced by any sort of PT mode up until recent times (Lascano Kezic & Durango-Cohen, 2012). Also, another contradiction exists in the urban landscape of São Paulo: in spite of the fact that the historic center is now one of the most highly accessible areas in the city, primarily via PT and non-motorized mobility, the growth of real estate investment or private companies choosing the area for workplaces has been rather stagnant (Lascano Kezic & Durango-Cohen, 2012). In addition to this, the serious problems related to access to employment opportunities, recreational activities and social facilities based on the income-mobility correlation has made the poorest experience the longest hours and kilometers in travel, as well as has restricted many of them to depend solely on walking in areas where there is no PT (Gomide, 2008). In the words of Informant 1, the current PT network of the city could be summed up to the following:

“Together with the redistribution of income and a bad supply of public transit, and not over-charging for excise taxes in gas, a lot of investment on roads, and then some incentives to buy cars... if you bring all the pieces together, then you get what you are getting.”

Moreover, walking, which is the main mode of transport in the entire RMSP, has been limited and overlooked by poor past and present infrastructure due to almost inexistent policies at the governmental level (Informant 4). Also, the permanent social conflict of the roles played between the users of the road, including selfish, defensive, irresponsible, and disrespectful behavior, as well as the image of the car as the king of the road, promotes an insecure and threatening environment for pedestrians and bikers alike (Informant 4 & 5).
6.2 The perceptions and behaviors of mobility: defining more than the transportation system

All informants agreed that São Paulo is indeed a car-oriented city with many socio-economic imbalances that produce specific notions about the transport system in its distinct social groups. However, according to several informants, the two most prevalent perceptions, which persist amongst all the socio-economic groups, are that PT and NM mobility are denigrating, as well as the car is a symbol of social and economic prosperity (Informant 1, 3, 4, 5 & 6). Indubitably, these two perceptions are obtained and discerned differently, depending on the social status and income of each person. In general terms, it can be said that the majority of upper class groups perceive PT (mostly buses) as well as walking and biking as denigrating, since these modes are primarily employed by lower-income people (Informant 2, 4 & 5). As a matter of fact, walking and biking are mostly considered recreation modes instead of actual transport modes, primarily among upper level classes (Informant 4 & 5). As an informant 4 further explained: “When you don’t have money, you walk”; thus further depicting the income-mobility perspective. These notions, which are essentially a consequence of the ever-present prejudice against the poor and which is a general characteristic of the Brazilian society (Ferreira, 2011), contribute to produce differentiations on the way mobility is perceived (Informant 4). On the other hand, lower-income groups also perceive PT as denigrating, since the traveling conditions in PT do not meet the basic needs and are often detrimental due to long distances traveled in overly crowded buses as well as rail and metro trains, thus causing feelings of contempt and humiliation among these users (Rossi, 2014b; Da Silva et al., 2008).

Accordingly, in regards to the socio-economic status symbol created by the car, the perceptions are similar across the different social groups, varying only in the reason why these groups purchase a car. The car is a representation of having more income across all social classes, since it contributes to the enhancement of the car owner’s social status, which is an important defining component of Brazilian society (Informant 3 & 8); moreover, the level of this status can further be classified by the car model and price. It can also be generalized that higher income groups obtain cars not only out of necessity, but also because they want more comfort through individual motorization, since many areas of the city where these groups live have high accessibility to a wide-array of PT modes (Informant 3 & 4). On other hand, lower income groups purchase cars out of necessity, since many areas where they live are not serviced by PT or they reside in areas that are in great distance from their workplace, making the PT journey a very lengthy one (Informant 2, 4 & 7). In addition, lower income groups also buy cars to achieve a higher class status, since the car, as previously mentioned, is socially-accepted as a symbol of economic success, which can partly be attributed to media campaigns to further increase the car market (Informant 5 & 7). The logic is that, what is sold by the media or portrayed as ideal by higher social classes, is a major influence on people’s perception about transportation.

The perception of the transportation network is also affected by the infrastructure and service provided towards specific transport modes, as previously mentioned. In the case of the PT network, all PT modes have had a very negative track record in their facilities and operation, and thus have alienated people from using their PT system (Informant 2 & 7). This alienation is not only prejudicial towards an increase in PT use, but also towards the use of public space. Since the journeys on PT modes are often long and overcrowded, the Paulistano will switch towards individual transportation as soon as he/her can afford a car (Informant 1, 2, 5, 7 & 8). As people prefer the most convenient, easier, and faster way to mobilize, the car will always have a higher appeal compared to other transportation modes (Urry, 2007). This comfort and
security aspect can be something easily understood in the context of São Paulo, given the extraneous PT conditions. In addition to this, people have to mobilize through a broad range of neighborhoods with diverse infrastructure and social problems, varying in lack of signalization and lightning, or a high presence of homeless people sleeping in the streets (among other problems), and which can be threatening environments to many Paulistanos (Informant 3 & 4). However, the velocity aspect is something that is contradictory and which deepens the car-driven culture of the city: As previously exposed, even though car trips are shorter than other PT modes, primarily due to lower kilometers traveled, Paulistanos will prefer to face long hours stuck in traffic inside their car than use their PT network (Informant 3 & 4). As informant 4 describes:

“People prefer to stay two hours in a car, than spend 30 minutes walking.”

Indeed, the sense of comfort and security brought by the car, is not only shaping the way in which people prefer to mobilize, but also the way they perceive their public space, ultimately affecting their behavior as urban residents. This is evident in people from the upper classes living in the expanded city center, whom are surrounded by multiple PT modes and yet travel mostly or solely by car, because they do want to get involved with and in their local surroundings, which are filled with noise, dirt, disorder, and poverty (Informant 3 & 4). Also, even though car users want no relation with their public space, they believe they are entitled to it entirely and therefore become completely oblivious to the other users of it (Informant 1, 3, & 4). Moreover, even though people realize that they dislike the traffic, they do not feel they are the part of the traffic when they are inside their cars, blaming the congestion on other car and PT users (Informant 1, 3 & 4). As Informant 4 explained: “People don’t see themselves as part of the problem”; hence, even though people realize there is a problem (in this case, traffic) caused by excessive amount of cars, they are not willing to produce a change in their own behavior by opting for other transport mode. This is a characteristic of the VAG embedded in many Paulistanos, whom are aware of the negative externalities produced by cars, but whose behavior remains unchanged. Informant 3 exemplifies this:

“We live in a city of spectacle: it is more important to pretend to be, than actually be. We appear to be better, be anti-communist, environmentalist... but at the moment of truth, we act in a different way.”

Also, as the car is a segregated, finite, individual space, its user is automatically put inside a barrier which forbids him/her from interacting with the outer environment, which in this case translates to streets, pedestrians, animals, vegetation, and many other elements that encompass the urban space (Informant 3). Furthermore, this distancing effect also makes people lose their sense of time and space within their urban environment, and they perceive the city larger and more expanded than what it really is (Informant 3). Hence, Paulistanos inherently assume they have to travel long distances to reach a destination, while the destination is closer than what they really think. For example, a distance of 7km could be either covered in two hours in regular traffic conditions inside a car, which is equivalent to about 20-30 minutes by bike or about one hour and fifteen minutes by bus or by foot (Informant 3). Also, studies in smaller Brazilian cities where people mobilize by NM modes, have shown that the higher number of cars, the lower the perception of a person’s individual territory within his/her urban space; therefore, with more cars on the road, the perception of a more insecure, polluted, noisy, and chaotic space is accentuated (Informant 3).
6.3 The subtle unfolding of a social paradigm shift

The transportation system has had considerable improvements over the past ten years, nevertheless most Paulistanos are not satisfied with the frequency of train, metro and bus units, or the high fare costs (Informant 1 & 2). In June 2013, a R$ 0.20 fare increase generated what could be considered the second most significant manifestation in the country’s history, the famous June Journeys protests (Filho, 2013). What originally started as a local protest in São Paulo against a fare increase by a local activist group advocating for a no-fare policy, became a national manifestation against not only the transport system of many Brazilian cities, but a protest demanding a change of the poor health and education conditions (among other rights), that have been the consequence of many years under a corrupt and broken governmental system (Filho, 2013; Globo, 2013). These protests were further accentuated by the fact that the country was in preparations for the 2014 World Cup, which generated a lot of controversies since people were discontent in the way funds were prioritized (among other claims) and which potentially could have been employed towards the improvement of many public services (Watts, 2014). From the transportation system perspective, these were fundamental in generating the outset of a paradigm shift at a broader sociopolitical scale, making both government and civil society have a slow but significant perception or mindset change towards many public services, including transportation (Informant 1, 3, 4, 6, 7 & 8). This can be evidenced in the fact that segregated bus and bike lanes were implemented as a consequence of the protests (Informant 1 & 6); furthermore, the current prefecture’s administration has been the only one thus far to prioritize sustainable mobility projects within its public policies (Informant 1, 4, 7 & 8). To this point, the actual PDE, as well as alternative projects such as parklets and recreational bike lanes, are positive results of the higher involvement of public administration towards sustainable urban transport and planning. In addition, Paulistanos are increasingly demanding improvements in their transportation system, evidenced through the growth and participation of many local activist groups, mostly composed of young adults from middle and upper-middle classes (Informant 4 & 6). Hence, it seems a new, young, and alternative generation without a car-oriented mindset, which advocates for multiple PT and NM modes is flourishing (Informant 1, 4 & 6). It is believed that this subtle paradigm shift will continue unfolding, for in the words of Informant 6:

“...expanding the old mindset is no longer possible, because it is totally unsustainable, it no longer works, it reached the limit and chaos.”

However, Informant 4 explained:

“...we are living this moment to try to invest in other [alternative] transports but it is too very...mmm, people have a lot of resistance for that, even when they are the minority. They are probably the people that have more public voice or power, so it seems that not everyone is happy for this change because few people are using cars, so it is strange to feel like that. So I think we have the city ready, that we have to change the city, we cannot construct another city that is not made for cars, so we have to think in very smart solutions to make all transportation be on this [new] structure arrangement, and that is what we are trying to live.”

Indeed, even though a momentum is starting to surge among Paulistanos, the dominating view among the informants is that there are still many existing barriers that are put forth by diverse stakeholders or interest groups, including the federal government, the media, and higher-class groups, whom mostly advocate for policies towards continued car expansion (Informants 2, 3,
4, 6, & 7). As an example of this, there was a prominent, high-end neighborhood in the expanded city center where the construction of a metro line was avoided due to a petition from its residents (Setti, 2011). Also, the current Public Ministry's mandate to cancel most future bike lane constructions based on rather preposterous reasons (Informant 7) can also exemplify the power of diverse interest groups. Therefore, since these barriers are mostly produced by high power groups (which are the smaller percentage of the population) it gives the sense that the majority of Paulistanos are discontent with the implemented and proposed changes towards sustainable mobility, such as the case of the bus or bike lanes. Nevertheless, it is evident that the present social mindset conditions are in a prime state for the flourishing of a paradigm shift within civil society and policymakers alike.

7. The envisioning of a transition

Among the informants, the envisioning of a possible transition towards sustainable transportation involved various changes in technology and infrastructure, as well as modifications in policymaking and the role of civil society. Even though each informant had their own specific views as to how certain pathways could lead towards the unfolding of a transition, all of them considered that modifications in social behaviors and perceptions are essential elements for the fulfillment of the transition, given the city’s socio-economic and car-oriented background. This section provides an insight to their common as well as unique views as to how a transition could unfold.

7.1 Diversifying the PT network and promoting NM mobility through infrastructure developments and technological implementations

To begin with, since the PT system is underserviced due to a historic car-dependent urban development, other NM modes are recently coming to scene in the transportation network of the city. Hence, the most prevalent view among all informants towards a future transition is centered on prioritizing and increasing the existing PT network, as well as diversifying it with alternative NM modes. All informants agreed there should be an increase in the number and speed of metro and train lines, as well as segregated and non-segregated bus lines, in conjunction with a substantial improvement in the way these modes are serviced. However, there was not a consensus as to which PT mode to prioritize; some advocated metro and train development, while others were inclined towards a more effective and complete segregated bus system.

Those advocating towards metro and train based their arguments on the fact that these modes carry high amounts of passengers at significantly higher speeds as compared to segregated buses\(^6\) (Informant 2 & 3); also, the metro system can attract more higher-income groups as compared to other PT modes (Informant 2). Those in favor of segregated bus lanes argue these are more affordable and easier to construct, mostly with simple modifications performed on the existing urban infrastructure (Informant 1 & 8). However, as Informant 2 commented, trains are the best option according to the federal government, since despite having a very costly and complicated line construction process, which is partly due to the high amount of land that has to be expropriated, it offers the best travel alternative considering the long

\(^6\) This argument would be invalid if a BRT system was in place since studies have shown these systems can have comparable speeds and carrying capacities as those of subways (Cervero, 2013; Hidalgo & Huizenga, 2013). However, that is not the case of São Paulo, where buses in segregated lanes do not posses neither BRT capacity nor speed (Biderman, 2008).
distances that are covered under a low-cost fare and fast travel time (Informant 5). Moreover, studies show that Paulistanos prefer to travel by train over bus, despite higher fares and even when free bus transfers are offered (Lascano Kezic & Durango-Cohen, 2012).

Also, several informants agreed that if more space is taken away from cars in the form of segregated bus lanes, these would be able to increase the flow and speed of the bus units, and make the bus become a protagonist in the urban space (Informant 1, 3 & 8). This is also relevant towards bike lanes, where this NM mode can symbolically gain more power over the car among public space users through a higher road visibility (Informant 6). Several informants also deemed essential an increase in the pertaining infrastructure for PT and NM modes, such as functional and accessible stations, sidewalks, and bicycle parking lots, among others. Furthermore, these developments should be more functional rather than pleasingly aesthetic (Informant 4), and simple, low-budget solutions should also be explored, such as temporary signalization via cones or painting, which produce enormous effects on the way the public space is distributed and organized (Informant 8). Along with infrastructure developments, technological implementations were also deemed necessary by some of the informants since technology can improve and change the way mobility currently occurs by mostly bringing accountability towards the operation and management of the PT network. As an example, providing justifiable information to users on the reason behind a fare increase can become a straightforward procedure with the open management of smart transport databases (Informant 1 & 8). Furthermore, technology can also facilitate and make more dynamic the experience of the PT network user, by providing information as well as easing transactions once inside the network, such as route applications or electronic payments (Informants 7 & 8).

7.2 Generating modifications in diverse cultures

All informants considered the increase of funds towards PT development a fundamental element in the fulfillment of the transition; in addition to this, the inclusion of sustainable urban development policies to decrease transportation demand or mobility needs, as well increase accessibility, were also discussed (Informant 2, 3, 5, 7 & 8). In other words, the current demand/supply policy would have to be replaced with inclusive policies generated from public participation (Informant 7 & 8). Indeed, some informants firmly believed there should be much higher public involvement in order to generate tangible public policies, thus eliminating the predominant top-down approach (Informant 4, 6). Increased efforts by the government should be taken into consideration to open up a transparent dialogue with Paulistanos, as well as to provide them with abundant information as to why processes and changes occur (Informant 6 & 8). In turn, an informed, educated, and active civil society, which is capable of creating plausible and justifiable demands, would be key in the production of more effective public policies (Informant 2 & 6).

Several informants also agreed that there must be a change generated within policymakers’ minds in order to have a transition, since most administrations are solely interested in generating more profit or popularity among civil society, and there is almost no continuation of projects between administrations (Informant 3, 4 & 6). Furthermore, the majority of these projects are implemented without ever consulting civil society (Informant 3, 4 & 8). As Informant 4 explained, there must be a transition without political interests behind it, or as in the words of Informant 3:

“We need policymakers who are not concerned with their ego, we need policymakers who are concerned with the city, who are not concerned only for
power, policymakers who want to change the city. We [therefore] need a change in public management.”

Informant 8 further stated: “I think that the beginning [of a transition] starts with the head of the manager, the decision maker”, which will generate a change in the public policy mentality and thus in the way things are conducted both in theory and practice. Indeed, policymakers have to understand that transportation is a very powerful instrument to improve social issues, mostly by allowing people to leave poverty and acquire a stable, enjoyable lifestyle with access to education, health, and work, without having to spend many hours traveling or spending high amounts of money on mobility (Informant 3, 4 & 6). Moreover, more homogenous policies, practices, and schemes at an institutional level should be generated, since even though there is an evident consensus among all transport-related public institutions about a needed change, there are many visions on the way this change can occur (Informant 1, 2 & 7). Indeed, as Informant 1 explained, even within his own institution, there are various different views on which policies to implement or prioritize towards the improvement of the bus transport network.

Another example of this lack of consensus among governmental institutions was the funding schemes for future infrastructure and technological implementations; there are public institutions advocating towards the inclusion of PPI, while others are not too keen on involving the private and public sector for future funding purposes (Informant 2 & 3). However, a congruent view among several informants was the need to centralize the different public sector entities that are involved with transportation and urban planning as an important step towards a transition, since the current slow and tedious bureaucratic process, as well as lack of synergy and communication between institutions (and within departments of those institutions), does not allow for the implementation of effective and applicable policies (Informant 1, 2 & 3). In addition to a change in the actual culture of policymaking, a few informants also mentioned the importance of modifying the culture of private companies, as well as increasing their rather insignificant role and lack of initiatives towards generating sustainable transportation solutions (Informant 1 & 4). An example of this is the unregulated real estate market, which has been causing major unsustainable disruptions to the way in which the city has been planned, and thus the way in which transport has had to develop (Informant 8).

8. Pathways for creating a new transportation culture

8.1 Techniques for building a new mobility experience (perception shaping)

The enhancement of the transportation system through technological and infrastructural developments is most definitely essential in generating a change in the way people perceive, and therefore use, their transport system. Most informants concurred that building a reliable transport network which provides security and trust to users through a regular, highly efficient and smart service, is essential in changing the negative perception Paulistanos have in regards to their system (Informant 1, 2, 6, 7 & 8). Indeed, Paulistanos can be convinced that their system is better by highlighting the advantages of traveling by PT or NM modes in comparison to individual motorization, as Informants 1, 7 & 8 explained. This could be done by having increased bus speeds via segregated lanes, which travel faster than the cars stuck in traffic (Informant 8); another example is to highlight the beneficial aspects of NM mobility, since these are both positive towards health and recreational purposes (Informant 4 & 6).
Also, it is very important to offer distinct mobility alternatives to make transportation not a necessity, but an option (Informant 3) along with an increase of access of information so that people know how to take full advantage of all the services offered by their network (Informant 7). In this way, people are allowed to experience an array of alternative and valuable mobility modes at their own disposal, and this new as well as positive traveling experience could thus provoke a change in behavior (Informant 1 & 4). This is particularly relevant for higher-income groups, since they are not experienced in testing or using alternative modes for displacement (Informant 4, 5 & 7). In regards to the PT network, with an efficient, faster, secure, and accessible service that can displace the aforementioned social groups faster and more conveniently than the car, they will start considering trying out their PT system more often, and over time, convert themselves into regular users of the PT system. In addition, other socio-economic groups can take advantage of these increased benefits. An example of user modification has already been evidenced in the train network, which used to offer a very poor service in the past (people were even allowed to travel on top of wagons due to overcrowding), which provoked users to constantly stone wagons as a sign of retaliation to the deficient traveling conditions (Informant 2). After the CPTM produced major changes on its infrastructure, mostly by providing modern, comfortable wagons and accessible stations, thestoning of trains was completely subdued and now it is the second most valued PT mode in the city.

8.2 Techniques for re-connecting people with their urban space (behavior shaping)

In addition, by developing infrastructure that creates alternate transport modes within the existing built environment, many aspects within the urban space are inherently modified, such as the case of bike lanes. Informant 3 explained that the implementation of a bike lane on a regular street directly reduces the speed limit for cars from an average of 60km/h to 30km/h, therefore the street becomes calmer, less polluted, and allows people to walk more, thus generating a new street dynamic. This can also be said for parklets, which generate a symbolic protest as well as a lot of attention by challenging and overtaking the space given to the ever-privileged car (Informant 3). Moreover, the closing of highways and streets across the city to create the Sunday leisure biking and walking lanes has exposed these two NM modes as plausible and tangible transportation means, since people get a sense of their built environment (and the fact it is not as dispersed as they thought) by displacing through the city via these modes. These types of infrastructure developments or urban intervention strategies, which generate subtle yet significant changes in the built environment, are ways to make people come back out to the streets, become increasingly more aware and connected to their urban space, and experience their own city from a different perspective. This awareness can thus generate a higher appreciation towards what is found outside the homes and cars of Paulistanos, which can ultimately become a cultural and personal experience in which they submerge within their built environment (Informant 4). As informant 3 commented:

“[Policymakers] need to change the city inside out and connect the people with their space and [therefore] their citizenship, because only then the people will realize that the city needs to change. If people are going by car, why would they want to take care of their sidewalk, they have no contact with anyone. They become increasingly distant with their city.”

Therefore, with a new perception and appreciation towards their surrounding built environment, Paulistanos will demand better sidewalks, more parks and plazas, more bike
lanes, more benches, more trees and plants; in other words, the slow connection process can ultimately lead to a complete reinvigoration of the urban space (Informant 3 & 4).

8.3 Developing strategies to create a car-independent society

Even though there was not a clear agreement as to which type of strategies to prioritize, most informants agreed that developing strategies that decrease car use should be prioritized. Some advocated towards car-restriction policies, such as expanding the Rodizio system, increasing parking limits, and implementing congestion charge and no-entry zones, to mention a few (Informant 3 & 6). Others, such as informants 4, 7 & 8 proposed including strategies that are not focused on restricting the car, but actually focusing on increasing PT and NM use, by creating a net of influence among users of these modes towards others via the common “word of mouth” process (Informant 4). This is particularly relevant to increase awareness as well as what is considered as “acceptable” by the majority of the population, thus shifting the attention away from individual motorization. In addition, strategies to modify the existing car-dominated market were mentioned, as in the example of Informant 1:

“I see also changing the culture of companies that are important suppliers of inputs for the transport system and showing them that there is still a market out there with few cars. How do you do that? You do that with negotiations, directing the negotiations; you do that improving the technology itself and coordinating innovation and showing that there is a lot of room for new products that will fulfill this new mobility paradigm.”

Moreover, public and private companies could provide alternative solutions to their employees mobility needs by giving out travel vouchers for bus, metro & train, or approximating them to their workplace with diverse real-state market strategies (Informant 4), since the highest share of trips in the city is done for work purposes.

8.4 Policymakers becoming users to generate users

The transportation system and the urban space must not only be re-experienced by civil society, but by policymakers, so that they can become users of the same system and space, and thus generate fitting policies. As Informant 8 described:

“We have a very big management problem in Brazil. There is a lack of tact, of more personal contact with what you're doing. I think that people [policymakers] should have a more real approximation to what they want to change. It does not consist of simply putting a bus station and expecting people to use it; you have to sell the service, as if putting a brand to it, lure the user, invite him and inform him how his trip will be better in public transport. The person going by car will only leave the car if there is an improvement in public transport.”

By becoming users of the transport system, policymakers not only obtain a realistic perspective of the system, but they can also become exemplars towards civil society and thus incentivize mobility via PT or NM modes. Moreover, a transportation system that treats civil society not as users, but as clients, will experience further increments in user share, according to Informant 8. As stated by several informants, this could be achieved through the implementation of diverse technological services as well as smart strategies to make the transport system a rewarding, smooth, and enjoyable experience, and not an obligation
(Informant 1, 3 & 8). Also, more frequent survey evaluations about the transport system were deemed as essential to learn about customer needs and thus produce pertaining solutions to any needed change in the system (Informant 8). In addition, policymakers and local activists groups or NGO’s should create stronger partnerships, since these institutions represent many civil society demands (Informant 7).

8.5 An all inclusive participatory process with an informed civil society

Bringing civil society together to participate in the policymaking process was a prevalent topic among most informants when they were asked about how a new transportation culture could be provoked. As previously discussed, public opinion and participation are essential when formulating relevant and appropriate policies towards urban planning and transportation development that can have a much higher impact in terms of efficiency, as well as from a monetary and time saving perspective. With education as well as advertising and informational campaigns, communication in relation to the advantages of the PT network and NM modes can generate higher awareness among people (Informant 2 & 4). Moreover, education campaigns that challenge the traditional views of the car as a status symbol or campaigns which can foment ways to become a better citizen and user of the urban space by explaining the dynamics between pedestrians, bikers, car and bus drivers, can be of great advantage for creating an educated, respectful, empathic, and critical society (Informant 6). Moreover, the process of public policy implementation should also be communicated so that people are aware for example as to why a certain project had a high cost, or why a bike lane was constructed on a specific street; in this manner, the process becomes transparent (Informant 1 & 8). Nevertheless this might be something that could be hard to achieve since it generates specific consequences, such as the easier exposure of system flaws, or a highly informed citizen that could demand more rights, which in turn could create animosity from many politicians (Informant 1, 3 & 8). Ultimately, educational campaigns should be implemented in all ranges, from children to adults, to rich and poor, so that the ideas of the centrality of PT and NM transportation, and the importance of sustainable mobility is embedded across all segments of the population (Informant 4, 6). In this sense, the lower income groups (which are already used to traveling via PT) can learn about the enhancements of the system and its consequential benefits, while upper income groups can learn about the advantages of alternative displacement modes. Also, Informant 6 deemed it more important to educate younger generations, where a mindset change is much easier to influence since behavior patterns have not been firmly established, and where the conventional view of transport can be more easily modified.

8.6 The three fundamental pillars for a new set of mobility practices

The previous sections have described how different pathways can generate a new set of mobility practices in civil society, in other words, a new transportation culture. These pathways are mostly based on three fundamental instruments or pillars: policies, technology, and infrastructure, which altogether cannot only serve to build a new transportation culture, but also modify the use of public space and the role of civil society within the urban realm. The main topics that have been addressed in these past sections are summarized in Figure 20.
Figure 20. The three fundamental pillars for generating a new transportation culture7
(source: author)

As previously presented, two critical conditions must be in place in order to build effective pathways or strategies towards a new transportation culture: a very strong commitment and alternative vision from government officials to generate a change in their cities, as well as the inclusion of civil society to build a highly participative policymaking process. Certainly, these two conditions are indispensable if São Paulo ought to fulfill a transition towards sustainable transportation and ultimately an equitable, accessible, and sound urban space.

9. Opportunities and obstacles towards the fulfillment of a transition

The city of São Paulo is evidently experiencing a conscious social movement that is advocating towards a change in the transport system, which in turn is already ousting the needed cultural paradigm shift to fulfill the transportation STT. The catalytic force behind this social mindset change was the 2013 fare protests, which were ultimately accentuated by the World Cup manifestations. These social movements have compelled the government to provide solutions to the detrimental state of the transport system by primarily implementing the segregated bus and bike lanes, which have had tremendous positive impacts on the perceptions and dynamics of not only motorized and NM mobility, but also the public space.

7 Those in bold are considered the most relevant within each pillar
Furthermore, they “opened a window to challenge the status quo” (Informant 1) since it has made civil society think about other means of mobility aside from the car, primarily among high (and therefore, influential) socio-economic groups. As a result, Paulistanos are now more critical towards their transport system and are demanding more changes towards its improvement.

The mindset change has also been enriched by the heavily active participation of insurgent local activist groups, composed mostly of young adults with an alternative perspective on mobility, and whom advocate towards NM modes, an equal access to transportation, adequate and affordable transport services, among other demands. As Informant 7 explained, these groups have been particularly influential due to their high credibility among civil society, for they are not attached to any political party, as well as their substantial will to collaborate with the government. This has also helped the urban mobility concept gain more attention among policymakers, which have to start to realize that it not only improves the quality of life of Paulistanos, but also contributes to the enhancement of a higher sense of citizenship due to the security and wellbeing produced by new dynamics within a sustainable urban space. Indeed, as informant 3 commented:

“Urban mobility has to carry development to people, not the other way around.”

As evidenced by the latest PDE and other sustainable transportation initiatives put forth by the local government (which according to many informants has been the most proactive thus far in the city’s history towards the improvement of the PT and NM network, along with the inclusion of public participation) there is currently a good political momentum in regards to sustainable mobility (Informant 6 & 7). Indeed, the present administration has taken previously ignored issues such as NM mobility or the relevancy and usefulness of a densely compact urban space, and has started incorporating them into new and alternative public policies. Moreover, São Paulo is lagging behind in sustainable transportation initiatives as compared to other Brazilian and Latin American cities (Informant 3 & 8); therefore, this is exercising further pressure on the government to confront the various issues generated by a chronic history of poor PT service and infrastructure, and thus develop creative solutions by combining urban development with transport planning and management.

Despite the aforementioned advantages towards the generation of paradigm shifts among the cultures of civil society and policymakers, there are still many obstacles that could delay or even hamper the unfolding of a transition towards a sustainable transportation system. Two major social obstacles are the deeply embedded socio-economic differences and prejudices of the Brazilian society, and the diverse interest groups that concentrate a lot of power within government, markets, and the media (Informant 4 & 6). This is evidenced in the way past administrations have created a car-dependent system by prioritizing the car industry and its pertaining road infrastructure, putting aside PT and ignoring completely alternative NM modes. Moreover, as Informant 8 commented, the economic models, with their outdated and conservative regulations as well as unscrupulous operational schemes (and from which these interest groups profit) are great challenges towards the transition process. This could be exemplified by the way in which the transport system is operated, where in the case of buses, the main objective is to gain more passengers in smaller (thus cheaper) bus units; therefore, more revenue is produced at the expense of the user (Informant 6). Another example is the complex and inefficient tendering process that will always grant the contract to the higher bidder (which is usually the cheapest contractor due to funds limitations), and in which most
cases translates to a lower quality in infrastructure and faulty services, thus causing added complications to the entire system (Informant 2).

Furthermore, even though policymakers are indeed aware that a change must be generated in the transportation model, the lack of consensus among each governmental institution is another significant barrier in the fulfillment of the transition. The segregation and lack of communication between different federal and municipal institutions produce chaotic public policy measures that translate to inadequate infrastructure planning and logistics (Informant 8). Additionally, these processes are often performed on the basis of mediocre technical studies since they provide faster solutions, and which include no social perspectives into their schemes (Informant 3 & 8). As informant 3 assertively commented: “The greatest evolution of transport will be the people”; hence, these obstacles could be potentially inexistent if a paradigm shift is first fully completed and entrenched within civil society and policymakers alike.

10. Discussion

This section addresses the main findings of this study from a critical and comprehensive perspective by combining diverse topics within governance, science and technology, and behavioral science. Hence, a thorough and relevant discussion section that fully grasps the complexity behind the sociology of circulation concept from a socio-technical standpoint was developed.

10.1 Brief analysis about the informant’s views

As previously mentioned, it was surprising to find the high government involvement in relation to improving the transportation system, which is clearly evident by the fact that a myriad of sustainable mobility and urban planning projects have been established, which are mostly led by the PDE. It was also interesting to notice that the informants belonging to the governmental institutions were not apprehensive of discussing the transport networks’ flaws, the poor services or infrastructures these networks have had to operate under for many years, nor the lack of synergy and cooperation among diverse public institutions. Moreover, they were conscious of the negative externalities brought to Paulistanos by years of detrimental transport conditions and they were critical of the historic trend from both federal and local governments to continue investing in car infrastructure and promoting the car industry through diverse economic incentives, as well as the governmental system as a whole. In addition, they were aware that a more educated user will demand more from his/her transport network; nevertheless, issues such as accountability and transparency were also discussed as fundamental components of a sustainable transport system.

On the other hand, more controversial issues such as the power relation dynamics between diverse interest groups including high social classes, the media, the car industry, and the government, were only brought up by the informants belonging to the non-governmental institutions. Additionally, none of the public sector informants commented on the importance of public officials being users of the PT network or traveling via NM modes, and as a matter of fact, only one mentioned how he commutes everyday to work via PT. Aside from this, both governmental and non-governmental informants had very congruent views on the topics put

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8 These are summarized in Appendix 3.
forth by the research questions of this study, and it was stimulating to see that there was an overall common panoramic view as to how a STT could unfold. It was expected that the non-governmental informants would bring more personal perspectives to their views in regards to the STT as well as the transportation culture of the city; however, they were critical of their own role as non-governmental institutions.

10.2 Brief transition analysis from the Multilevel Perspective

10.2.1 The landscape pressure on the STR and the cultural element

The exclusionary modernization model, with accelerated industrialization and urbanization, has been developed through the premise of “significant economic growth but conditional on the maintenance of poverty” (Ferreira, 2011:75); thus, it has been a major determinant component of the Brazilian STL. Certainly, the sociology of circulation of São Paulo is an extraordinarily complex lattice where the diverse elements of its transportation STC are deeply interwoven and which convolutedness has been further pressured by two enormous external forcings of the STL: the ever-increasing population of the metropolis, and the federal political-economical system. Consequently, the interactions between each of the heterogeneous elements of the STC has produced an unsustainable STR locked in the car, which in turn has created or accentuated a myriad of new or existing problems to Paulistanos as well as their city’s environmental wellbeing. Nevertheless, it could be determined that the cultural and symbolic elements of the STC have contributed the most to the unsustainability of the STR given the context of a developing nation with marked socio-economic differences and where power groups only seek their own profit [see section 6.3]. Indeed, as Ferreira writes, “The elites consolidate intolerance, deepen the ideology of segregation and reverse the diagnosis: it is not the wealthy minority that is out of place in a scenario of widespread poverty. It is poverty that disfigures and threatens the modern city” (2011:79). Indeed, the cultural element, the transportation culture of the city, in many ways dictates how the interwoven pattern of the complex sociology of circulation lattice is threaded. Hence, the STR car lock-in has been mostly a product of diverse socio-economic ideals, status, and interests put forth through years and years of interventions from powerful groups, which are part of the STL, and that have enriched the lock-in through diverse schemes in various elements of the STC. Regulations and policies, road infrastructure and traffic systems, markets and user practices, among other elements, have been configured to create a transportation STR where mobility and accessibility are segregated and limited, where urban development is uncontrolled and unorganized, and where civil society has distanced itself from its own urban space.

10.2.2 The autopoietic system

Indeed, the car has emerged as the most coveted and popular technological fix in the transportation STR since it provides a different dynamic to the process of mobility. As opposed to PT modes, the car and its correlated infrastructure is an autopoietic system, as described by John Urry, “capable of expanding and dominating other systems by continuously transforming the environment within which other [modes] operate” (Urry, 2007:110). On the other hand, PT modes such as rail and metro trains, or buses, are linear systems displacing people from defined points, and Urry calls them as hierarchical, linear systems which are not expansive or adaptive towards a person’s mobile needs (2007). Moreover, as previously explained, the car lock-in goes beyond the technological fix: it is also enforced by a combination of locked-in institutional processes that are very hard to reverse due to the
cultural practices that establish the STR (Geels, 2012; Urry, 2007). These cultural practices have become embedded due to the fact that the mobility experience provided by the car is highly individualized, flexible, practical, and secure [see section 6.2], generating high emotional attachment (Spaargaren 2011; Urry, 2007). Moreover, since the car provides an individualized mobility experience, the user becomes an isolated object from the urban environment “concerned only with steering himself to his destination, and in looking about sees only what he needs to see for that purpose” (as cited in Carmona, 2010:202) hence causing additional troubling dynamics between users of the urban space as well as the loss of connection to the city [see section 6.2].

10.2.3 Seeds of change: Cultural and socio-spatial change niches

The configuration of the established car-oriented STR, according to Geels, can be altered by diverse tensions or problems among the different STC elements; hence, niche breakthroughs are facilitated by the weakening of links between these elements (2002). Moreover, cultural and socio-spatial changes, considered small, alternative niches within the STR, can provide the seeds for radical change in the STR configuration since they are “supported by urban actors and social movements that are willing to deviate from mainstream trends” (Geels, 2002). Certainly, this has been evidenced through the growing social groups with alternative views not only of the transportation system, but also of other public service sectors and who have become increasingly weary of the negative externalities produced by the car-locked regime along with the socio-economic imbalances that are products of higher external forces of the STL [see section 6.3]. Hence, the cultural and socio-spatial change niche has been slowly but steadily growing within the Paulista society, ultimately provoking major changes towards the re-configuration of the STR as evidenced by the June Journey and World Cup protests, which lead to the implementation of segregated bus and cycle lanes. This process is illustrated in Figure 21.

![Figure 21. The generation of the subtle cultural paradigm shift in São Paulo (source: author)](image-url)
Furthermore, ever since those two critical manifestations, the concept of mobility and accessibility has been included in public transportation policies and subsequent future development plans [see section 5.4], thus opening doors for the generation of cultural paradigm shifts in policymakers and society alike.

10.3 Transforming established practices through policy packages

New cultural practices are fundamental for the development of a new transportation culture, and these could be generated through diverse governmental policymaking instruments that have to reach all socio-economic groups and which have to be derived from a highly participative process, where civil society and policymakers alike reinforce each other (Geerlings et al., 2012b; Pel, 2012; Stead et al., 2012; Bannister, 2008; Vigar 2002). Evidently, these policymaking instruments have to be supported by infrastructure developments to sustain the complex transport network and its respective modes, as well as diverse technological implementations to enhance the mobility experience [see section 7.1]. The latter is specifically relevant to build a unique and rewarding travel experience within the PT network [see section 8.1], and thus contribute to the formation of recurring clients, not users, within the network.

Additionally, this section includes examples of other cities from around the world that have implemented several of the discussed policymaking instruments in order to create different and attractive transportation practices, as well as stimulating and welcoming urban spaces. Nevertheless, it is important to mention that these cities have not been included as comparison points for São Paulo, since most of them belong to the global north\(^9\) where mobility and accessibility are not as limited by socio-economic imbalances\(^10\) as it is in nations of the global south (Cervero, 2013; Figueroa et al., 2013; Dimitriou, 2011; Setty Pendakur, 2011; Vasconcellos, 2001). Moreover, these cities have had a comprehensive urban development process combining transport and spatial planning strategies, along with the support of significantly high economic investments, which are all the result of the strong commitment of local governments to re-structure their transportation network, land use patterns, as well as achieve their emissions reduction goals (Hickman & Banister, 2014; Beatley, 2012; Soholt, 2009; Hull, 2008; Kidokoro et al., 2008). As previously exposed throughout this study, this is currently not the case of São Paulo; nonetheless, these cities can exemplify into real-world contexts the feasibility and applicability of policy packages that combine technology, infrastructure and unconventional strategies to generate new mobility and lifestyle practices.

\(^9\) I have included Curitiba (a Brazilian city) since it is a world-renowned city for sustainable urban development and transportation planning (Freitas Miranda & Rodrigues da Silva, 2012). Unlike many other cities in the global south, Curitiba’s urban planning roots date back from the mid-1800s due to the city’s high index of European colonists. These colonists and their “pre-urbanism” plans, built the railroad station right next to the main square, thus establishing an early urban grid pattern around the public transport core (Macedo, 2013). Subsequent urban developments were put forth in order to address tremendous population growths through physical planning (thus limiting and controlling the urban sprawl), as well as setting Curitiba as a model city (nationally and internationally) via marketing (Macedo, 2013). Also, Curitiba is distinguished from other cities in Brazil and the global south for the historical political will of its government to establish successful and continuous planning initiatives across different administrations (Freitas Miranda & Rodrigues da Silva, 2012).

\(^10\) However, there are many cases of cities of the global north (particularly in countries such as the U.S., the U.K., and France) where transportation affects (and is affected by) economic and social structures. Indeed, mobility problems and patterns among the poorer social segments of advanced economies have been a topic of research in many studies including, but not limited to: Hine, 2009; Glaeser et al., 2008; Sanchez, 2008; Taylor et al., 2008; Grieco & Raje, 2004; Grieco, 2003; and Orfeuil, 2003.
10.3.1 Policy packages for socio-spatial changes

It is evident that urban development and transportation planning (considered niche innovations by Geels) are two areas that have to be fully synchronized in order to create sustainable spaces where less mobility demand and higher accessibility to multimodal transport means are entrenched (Hidalgo & Huizenga, 2013; Bannister, 2008; Gomide, 2008; Hull, 2008; Vigar, 2007). This can be achieved through diverse land-use policy and urban intervention measures [see section 8.2] to reduce travel distance, increase the quantity and interconnectedness of diverse PT and NM entry modes, and submerge the individual in a highly compact, balanced, and welcoming urban space, which in turn provides a higher sense of belonging and citizenship (Bannister, 2008; Gehl, 1998; Rogers & Gumuchdjian, 1998).

Cities that have successfully combined land use and transportation planning strategies in order to create attractive and efficient urban spaces are Portland and Stuttgart. These cities are known for having a central polycentric region with multimodal transportation nodes converging in the city center, where both radial and circumferential travel is successfully provisioned to their residents (Jessen, 2008; Seltzer, 2008). In such way, PT ridership is exponentially increased, as most journeys can be covered via multiple travel modes (Seltzer, 2008). Another city renowned for a similar mixed-use, high-density development is Curitiba (the 8th largest city in Brazil), which has grown along BRT corridors (Macedo, 2013), thus prioritizing mass transit and stimulating urban development through PT. In addition, cities that have used alternative urban intervention measures to modify their public space settings and increase the presence of people in these spaces are New York City and Melbourne. Both cities have transformed their streets and squares into more people-friendly areas with simple “pedestrianisation” techniques such as coloring the asphalt in attractive tones and installing chairs, tables and umbrellas in former car-transited streets, as well as including heavy green planters for additional comfort and coziness (Søholt, 2009). In such way, people are invited to spend more time out in their local surroundings, besides experiencing their city from a different angle. These simple techniques have provoked drastic changes in the dynamics of the streets in New York City and Melbourne, and their success has inspired other cities to implement similar measures (Søholt, 2009).

10.3.2 Policy packages for a new generation of individual mobility experiences

Since the car has re-defined the concept of mobility, making it a highly individualized and emotional experience, it is important to provide relevant practices that impact individual motivation, or rational considerations, in order to fully generate a change in behavior (Dijst et al., 2013). Moreover, as Urry explains, it is unlikely that the transportation systems of the future will return to their original collective-focused structures (2007). Also, since people tend to overestimate the advantages of their own behavior (in this case, car use), they systematically underestimate the disadvantages of this behavior; in addition, people tend to overestimate the negative aspects of alternative behavioral options, such as public transport modes, and downplay its positive aspects (Dijst et al., 2013). This cognitive dissonance as described by Dijst et al. contributes to the VAG, thus leaving behavior unchanged and creating a behavioral paradox [see section 6.2]. Indeed, although there is an increase in public awareness, people still refrain from changing behavior towards more sustainable mobility (Rocci, 2012). This could be due to the strong links between individual motivations, which according to Dijst et al., are based on three main lines of behavioral research in regards to any transport modality: the weighing of costs and benefits, the moral and normative concerns, and the affect produced by the travel experience (2013). Hence, the logic is that policies that take
into consideration these individual motivations by making PT and NM modes more attractive from a cost and benefit standpoint, can therefore also alter the moral and normative notions around these modes, producing more affect and ultimately creating a new kind of individual mobility experience that is car-independent.

A city that has done an extraordinary work in generating an attractive travel experience, primarily from a cost and benefit standpoint, is London. To begin with, the city’s transport authority, *Transport for London* (TfL), is a single, functional body responsible for the planning, operation and management of all transport modes and road networks of the city, thus facilitating the execution and logistics behind its well-planned transport system (Ween, 2012). Some of TfL’s main objectives are to enhance the quality of life of Londoners through transport besides providing them with multiple travel modes opportunities, as well as improving safety and security in the city (Ween, 2012). Since the city’s transport and road network is very complex but highly interconnected, the city created the Oyster card system, which lowers fares and simplifies access through a standard paying format for services across the entire network (Barney, 2009). Thus, the clients of the Oyster system can benefit from reduced fares with ticketless access to the system, as well as a convenient and swift travel process that can be easily planned for or adjusted via multiple travel mode combinations at no additional cost.

Another city that has modified its transportation service approach by providing a more appealing and engaging travel experience has been Paris. Apart from increasing multimodal travel points throughout the city in addition to offering a wide range of mobility alternatives (including carpooling) to its residents, an online platform for real-time, door-to-door journey planning was also launched by the municipality (Laurian, 2012; Goldman & Gorham, 2006). This platform not only delivers real-time information on traffic or availability of all travel modes, but also provides information on cultural events, entertainment and other services such as car and bike sharing (Goldman & Gorham, 2006). Moreover, the city’s integrated smart travel cards are marketed with distinct branding strategies and packages that contain special benefits targeted at specific demographic groups including youth, adults, seniors, and tourists (Goldman & Gorham, 2006).

Moreover, and evidently, the role of technology is critical when developing new mobility experiences that are highly engaging as well as practical. Also, technological implementations can reduce the need to travel, thus diminishing the time-space barriers of mobility (Hidalgo & Huizenga, 2013; Geels, 2012; Bannister, 2008). Examples can include intelligent transportation systems to increase efficiency in traffic management, or telecommunication technologies such as web-conferencing or diverse online platforms to decrease people’s need for displacing across distant urban points.

Cities that are heavily using technology in order to effectively plan, monitor and service their transport network, besides providing an improved and engaging travel experience, are Hangzhou and Helsinki. The Chinese city is developing a platform system based on the analysis of user requirements for basic transport information collection and exchange, thus real-time transport information can be provided to network users to ease the planning of their journeys (Xu et al., 2013). Also, valuable data is continuously gathered for future enhancements of said network (Xu et al., 2013). On the other hand, Helsinki is developing a digital interface for on-demand, multimodal service provision to all users of the PT network. The concept of “mobility on demand” will use diverse mechanisms to deliver real-time information on traffic flow and fluidity, as well as different and highly affordable mobility
services and options based on individual user preferences through an interactive mobile device application (Heikkilä, 2014). The premise of this new concept is to increase accessibility based on personal travel preferences, as well as to make car ownership meaningless in a city where multiple transport services are offered (Greenfield, 2014).

10.3.3 Policy packages for generating public acceptability

Policies that strive towards modifications in moral and normative concerns are of utmost relevancy in the Paulista society given the socio-economic and socio-cultural imbalances that dictate the access to mobility as well as how it is perceived [see section 6.1 and section 6.2]. Certainly, social factors are important since “people may choose certain transport modes because they expect other people will see them as ‘normal’ or ‘desirable’. For example, a private car gives more status than the use of the bus, and some types of cars are more representative for some groups than others” (Djist et al., 2013:25). Therefore, policy packages that challenge the status quo and establish new moral and normative concerns about “acceptable” forms of transportation can have a higher impact in modifying behavior [see section 8.4]. This could be achieved by diverse policy strategies to spread information via diverse channels such as education, communication and marketing (Stead et al., 2013).

To begin with, “To have influence on behavior, information must be tailored and individualized. People need to be personally affected and to be aware of the personal benefits. It is worthwhile to encourage people to act voluntarily because if people decide to change their behavior by themselves and, thus, want to achieve a personal goal, there is better chance to act and to modify behavior” (Rocci, 2012:248). As previously explained, the individual advantages offered by PT and NM modes have to be highlighted so that people learn about new mobility practices and thus experience a different way of displacing in their own urban space. These new modal practices, as argued by Rocci, are generally obtained through education and the transmission of information provided by policymakers [see section 8.5], which in turn can also be transmitted among civil society through peers via information exchange mechanisms such as advising, sharing common interests on social networks, and recruitment, to name a few (2012). Moreover, as Bannister writes, “Public acceptability of sustainable mobility seems to be high provided that social norms can be changed and the policy measures are presented as a package that can effectively be implemented. The process needs to build up trust and respect between the different actors over time, so communication and active involvement are essential. It also seems that legitimacy must be based on a participatory and inclusive approach that involves ‘selling’ the message of sustainable mobility to individuals, groups and localities through explaining the need for changes in behavior and convincing them of the importance of their contribution” (2008:78).

Copenhagen has been a city that has developed various communication channels to particularly increase bike ridership among its residents. To begin with, a wide range of campaigns to create a positive vision of the city as well as to promote it as a leading “Eco-Metropolis” have been launched by the municipality (Gössling, 2013). Moreover, it has created multiple citywide campaigns that are focused on highlighting individual and communal benefits derived from cycling based on rational, affective and positive arguments or messages in order to build the “biking spirit” of Copenhageners (Gössling, 2013). Slogans or headlines such as “Cycling is good” or “The cargo bike is the SUV of the Copenhageners” (as cited in Gössling, 2013:201) have been promoted to establish biking as a cultural norm or as a mass phenomenon that offers a pleasurable and rewarding experience.
Additionally, a city that has witnessed the growth of a peer exchange system is Freiburg. The residents of the Rieseßfeld neighborhood (a former waste site of the city) created “Kiosk”, which started as a hub for collecting and sharing creative ideas from fellow neighbors in order to foment a new vision of the area as a livable, walkable, green, and safe community among various demographic groups in Freiburg (Medearis & Daseking, 2012; Eberlein, 2011). Kiosk is now a well-established organization that is managed by volunteers; it acts as an information center, it is responsible for the local community newspaper, and it organizes distinct activities such as farmer or flea markets (Medearis & Daseking, 2012). Moreover, its popularity and high reception among its residents has allowed Kiosk representatives to cooperate with local government officials and obtain political representation at the municipal level, besides promoting exchange with various other small social collectives of the city (Medearis & Daseking, 2012).

10.3.4 Applying these policy packages in the Paulista context

The findings of this study (presented across sections five through nine) have allowed for the elaboration and compilation of the aforementioned policy packages as possible pathways or drivers towards the generation of a new transportation culture that could ultimately unfold a complete transition towards sustainable transportation and urban development. As previously presented, São Paulo is indeed experiencing a subtle social paradigm shift in regards to transportation. This has been evidenced by the growing efforts put forth by the prefecture (primarily via the PDE) where transport and spatial planning strategies are seemingly integrated for the first time in the city’s urban development policies. Additionally, simple measures as those taken in New York City or Melbourne have been mimicked in São Paulo (such as asphalt coloring for bike lanes or parklets) in order to modify the dynamics of the urban space. Moreover, with the creation of the BU (similar to the Oyster card in London), the city’s PT network has seen a dramatic increase in user ridership, which has demonstrated to public officials how important it is to create and maintain an optimized transport service where clients are offered convenient travel alternatives at a relatively affordable cost.

However, as presented throughout this study, there are still many more strategies and efforts to be enacted by the city’s government in order to create the much needed new transportation culture. Indubitably, significant efforts in regards to the PT network, such as providing a rewarding travel experience in conjunction with the betterment of the network’s operation, must take place in order to decrease car usage. This will certainly require large investments for technology and infrastructure developments; however, as presented, São Paulo does have the economic possibilities for such measures, if only the focus of current investments (mostly centered on car-related infrastructures) were driven towards the improvement of the PT network and NM alternatives. In addition, the prefecture must strive to generate public acceptability policies, which as discussed, are extremely important to normalize PT or NM mobility across all of the Paulista socio-economic groups. Certainly, if public acceptability policies were given the importance they deserve within public policymaking, many other processes towards the transition for sustainable transportation would be facilitated, since the Paulista society would have a congruent view on mobility, accessibility and equality.

Evidently, the implementation of these policy packages and their successful continuation are solely dependent on the will of local public officials to commit to generating diverse modifications not only in the city’s transport network or built environment, but most importantly, in its civil society. As previously discussed in section nine, the troubling governmental system and its broken structure (both at a prefecture and federal level) could be
one of the biggest obstacles towards the transition in São Paulo. Indeed, as previously argued, there must also be a change in the culture of policymakers, which can be the single most significant (and complex) component towards the unfolding of a complete transition not only at a transportation level, but across many other public domain systems. The essential yet vexed role of government is further discussed in section 10.5 of this study.

10.4 The power of technological interventions

The car-locked regime of São Paulo has been established through diverse interactions within the regime’s heterogeneous elements that have ultimately generated a technological determinism on an object that disrupts the balance of the urban space and which brings above all, repercussions on its socio-environmental systems. Since technological determinism will always be of a contrasting and conflicting nature due to the extremely diverse notions as to what are considered ideal or good technologies (Winner, 1986), this study has centered on evaluating transition strategies that are not emphatic on technological solutions, but rather focus on issues of lifestyles and values (Stead et al., 2013). However, it is important to mention that technology is a very powerful determinant of many STRs and as Winner himself denotes, technocracy has allowed technology to become the ends, not the means (1977). Indeed, “technological innovations are similar to legislative acts or political foundings that establish a framework for public order that will endure over many generations” (1986:29). Moreover, he argues that, “The issues that divide or unite people in society are settled not only in the institutions and practices of politics proper, but also, and less obviously, in tangible arrangements of steel and concrete, wires and semiconductors, nuts and bolts” (1986:29).

Indubitably, this was clearly evidenced, for example, by the implementation of segregated bike lanes on the streets of São Paulo, which brought a set of new different dynamics to the urban spaces where they were built in. Having this in mind, the STT process should not promote technological fixes as solutions or instruments of governance towards fulfilling transitions (which ultimately become lock-ins for the regimes due to the diverse social practices that enrich said technological determinisms), but rather as interventions that can positively alter behavior and perceptions, thus generating a new set of sustainable practices that do not revolve around any given specific technology. Furthermore, since material arrangements can configure users (Shove & Walker, 2010), diverse elements of the STR can be modified by cultural and socio-spatial niches, such as urban planning or intermodal transport planning (Geels, 2012), that could (and should, as a matter of fact) become instruments of governance instead of solely implementing technocratic solutions for the intricately complex urban web of objects and people. The learnings from this interplay process between technology and innovation in cultural and socio-spatial niches from the Paulista perspective are illustrated in Figure 22.
The specific innovations or transformations in cultural or socio-spatial niches are indeed a product of strategic and alternative regime actors that challenge the conventional structures of regimes or systems. These niche innovations should use technology not as the means to achieving the STT, but as a positive intervention tool to alter perception and behavior, thus avoiding technological determinism. Moreover, these niches should provoke the creation of socially-inclusive packages that can ultimately generate a new transportation culture in the Paulista realm. Certainly, if changes in perception among civil society are generated, modifications in behavior will consequently arise, thus engendering a new cultural paradigm in regards to mobility and accessibility.

10.5 A reflection on power dynamics

The federal political-economical system of Brazil is a major external force driving the many processes within diverse STRs of the country’s STL, therefore I deemed it important to provide a small critical reflection about the complexity of governmental systems and their respective policymakers, as well as the role of power from a socio-technical standpoint. Moreover, I wanted to provide an additional view regarding the current global economic models and why these could be the biggest barriers for any transition towards sustainability. Nevertheless, since the power dynamics between various stakeholders of the Brazilian STL is an exceptionally complex subject to grasp in detail, this section merely serves as a brief insight to the influence these power struggles have on defining policymaking and ultimately on social structures.

To begin with, it was evident that even though there is a higher notion of the importance of urban mobility among the policymakers of São Paulo, there are still diverse visions as to what
is sustainable mobility and how the city could bridge the gap between transportation, accessibility, equitability, and spatial planning [see section 7.1 and 7.2]. Indeed, these different sectoral translations of sustainability (Pel, 2012), which revolve around professional/and or departmental cultures and their respective organizational issues (Hull, 2008), prevent the adequate mobility policy integration between the different entities directly and indirectly related to transport, as well contribute to deepen institutional barriers. As Hull writes, “City-level integration of transport modes (walking, cycling, bus, rail, car, air) is undermined by disintegrated implementation, insufficient funds and a variety of champions with limited competence and persuasive power. The strategic sustainability issues on spatial ordering and accessibility to facilities and jobs in a city-region and the infrastructure funding to support this fall through the ‘cracks’” (2008:101) of a “fragmented society”, as added by Pel (2012:61). Moreover, the values of these champions, “or the range of professionals working on transport policy formulation and delivery therefore are crucial to understanding the implementation inertia on sustainable transport solutions” (Hull, 2008:101). Hence, due to these contrasts among policymakers, an unilaterally defined sustainable mobility supersystem will unlikely come about (Pel, 2012).

In addition, according to Geels, policymakers are constrained by two big dependencies. One is the pressure imposed by civil society, which can make policymakers follow rather than lead public opinion (2012:480). As Geels explains, if policymakers introduce tough policies, they risk electoral defeat or can face increments in public protests (2012:480). Also, policymakers are dependent on industries for a wide array of economical reasons including jobs, taxes, and overall economic growth (Geels, 2012). Moreover, Geels argues that car mobility has been facilitated since it is a culturally accepted technology, embedded in people’s lives (2012:480). Indeed, that is a reason why technological determinism is such a great threat towards sustainability, but what is not included in Geel’s analysis is the reason behind this determinism. Certainly, technological lock-ins are a product of an economy of scale that allows the dominance of specific technologies through the support of economic models that deal with individual wants or desires (Annema et al., 2013; Dijst et al., 2013), which bring about many negative social and environmental consequences. As explained in Dijst et al., “In economics, only the wants that are accompanied by sufficient purchasing power determine which transport service will be supplied, not the needs of the consumer” (2013:36).

Moreover, as argued by Vigar, there is a technical elite that imposes its own notions and perspectives above the political process, thus becoming the dominant policy community and excluding any group or individual that does not share the same views (2002). Hence, socio-technical relations that are driven by any given technocratic system “tend to congeal around a particular configuration of actors, practices and storylines” (2002:170). Furthermore, as explained by Annema et al., “it is clear that the current dominant transport technology also has many advantages related to economies of scale. So it seems obvious that industries and people profiting from these advantages are reluctant advocates for a fast and radical change” (2013:174). Therefore, sustainable mobility measures are indeed politically controversial, and diverse power relations are played in the pursuit of mobility management policies (Hrelja et al., 2013). Hence, a critical and thorough view must be applied when evaluating this power interplay, since as Hrelja et al. explains, “the [analysis] of particular power dynamics is critical to understanding why and how sustainable transitions are complex to manage and difficult to implement” (2013:196).

Undeniably, all these power dynamics and struggles, as well as institutional differentiations have been clearly evidenced in the transportation regime of São Paulo, which is tremendously
influenced by the federal government and its specific economic interests. For many years, a dominant policy community driven by a car-centered economy of scale, has created the current unsustainable STR. Moreover, even though new seeds of change are been engendered, the supporters of the dominant transport technology are indeed reluctant to allow room for alternative policy communities to arise. Vigar argues that new ideas developed by alternate communities have to be congruent between the ideologies and values of the dominant policy community, so that a paradigm shift in policy could be fulfilled (2002:170). Indeed, as Stead et al., explain, “Policy integration should not be considered as an end in itself but as a way of achieving political outcomes that simultaneously fulfill the goals of more than one sector or tier of government” (2012:354). Finally, in order for policy integration to gain wider interest in politicians and civil society alike, there should be a “sense of need and openness to change” (Stead et al., 2012:354), which is a process that could be driven by information, education, and training, as previously discussed. Certainly, as Ferreira writes, the possibility of change towards more sustainable and balanced urban spaces require a radical alteration of “the balance of force governing the priorities of structural public policies” (2011:84), which could “only be possible if there was a change in individual behavior that could contaminate, so to speak, society at large” (2011:84). Indeed, the current socio-technical and economic models in which cities and societies are built need to be urgently questioned.

11. Conclusion

As elaborated in the introduction of this study, the diverse systems that constitute the urban realm are indeed major consumers of resources and indisputably transportation is a paramount system responsible for a wide array of negative externalities from a social, environmental and economic perspective. Indeed, the car-centered transportation regime of São Paulo has created multiple imbalances that directly impact the Paulista society along with their pertaining natural and built environment. In addition, the cultural differences created by influential, prejudiced socio-economic classes have generated diverse notions of mobility, and the powerful interest groups have further exacerbated the car-locked regime of the city by providing an unsustainable transportation network lacking equitable accessibility.

The transition towards sustainable transportation means generating a paradigm shift primarily in the culture of policymakers (and thus in turn civil society), whom need to understand and accept the central role sustainable mobility has towards the formation of a balanced, lively, and equitable urban space. The complex dynamics between political beings, or civil society, and the objects that surround them have to be modified through diverse tools and strategies put forth by policymakers. These can be an assorted mix of policy packages containing infrastructure and technological implementations, smart and comprehensive urban strategy interventions, as well as rich information channels that promote public acceptability and new mobility practices which altogether will ultimately modify the perception and behavior of Paulistanos towards their transport system and their urban space as a whole. Moreover, the formulation of these policies has to involve the perspectives, needs, and demands from civil society in order to have a tangible, participative policymaking process.

Despite (or due to) the political and economical structures of the country, the city of São Paulo is indeed traversing a social momentum where a small group of regime actors have been able to foment a change in the cultural and socio-spatial niches of the STR. With significant manifestations and diverse urban intervention strategies, policymakers have been forced to react and implement distinct measures in the infrastructure of the city as well as
create future urban development plans combining transportation and spatial planning. Although São Paulo is far from achieving a cultural paradigm shift due to deeply embedded governmental sectoral visions and structures, product of the power struggles among national and local influential interest groups, the centrality of the transportation concept is now finally debated among the political beings of the Paulista urban space, which leaves a positive outlook for future niche developments and a possible transition towards an equitable transportation regime and consequentially, a sustainable urban system. Although there are multiple pathways for the generation of STT towards sustainable urban spaces, this study has provided an insightful perspective as to how cultural paradigm shifts can contribute towards said transitions. Indeed, the learning of the case supports the vital role of strategic and alternative regime actors as fundamental constituents towards the fostering of cultural and socio-spatial niche innovations that could engender a cultural paradigm shift in the political beings of cities, thus ultimately paving a way for a transition towards sustainability.
Acknowledgements

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Last but not least, I would like to thank Stiftelsen ÅForsk for the travel grant provided to fulfill this study. I finally want to thank Linköping University for conceding me a full scholarship during my entire master’s program, which has definitely been the most rewarding academic experience of my life thus far.
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## Appendix 1

### Interviews: Specifics

<table>
<thead>
<tr>
<th>Date and length</th>
<th>Institution</th>
<th>Category</th>
<th>Remarks</th>
<th>Informant</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-03-15 48 minutes</td>
<td>Secretaria dos Transportes Metropolitanos (SP Trans)</td>
<td>Public company/ owned by the prefecture</td>
<td>The informant works in a high-level position in the Executive Office, overseeing all the processes of the company. The informant also has more than 15 years of experience in academic research, and is currently a professor of public administration and economics.</td>
<td>1</td>
</tr>
<tr>
<td>13-03-15 49 minutes</td>
<td>Companhia Paulista de Trens Metropolitanos (CPTM)</td>
<td>Public company/ owned by the state</td>
<td>There were two informants working as geographical engineers for the planning department of transport; one of them had more than ten years working in the company. The other informant worked as an administration and management analyst.</td>
<td>2</td>
</tr>
<tr>
<td>16-03-15 125 minutes</td>
<td>Instituto Mobilidade Verde</td>
<td>Local NGO</td>
<td>The informant is the founder and director of this NGO, with professional experience in low carbon transport and strategic environmental assessment plans in Europe and Brazil. The informant is currently involved with many projects in conjunction with the prefecture towards the implementation of parklets and other sustainable transport and urban interventions.</td>
<td>3</td>
</tr>
<tr>
<td>18-03-15 72 minutes</td>
<td>Sampa a Pé</td>
<td>Local activist group</td>
<td>The informant is one of the founders of this activist group that promotes walking as a means to obtain a sustainable and lively city through cultural and historical walks among diverse groups of people. The informant is currently a contributor of the upcoming 2015 mobility master plan.</td>
<td>4</td>
</tr>
<tr>
<td>18-03-15 32 minutes</td>
<td>Companhia Ambiental do Estado de São Paulo (CETESB)</td>
<td>Public company/ owned by the state</td>
<td>The informant works as a biologist in the environmental licensing department, assessing the impacts of metro lines from an environmental and land use perspective.</td>
<td>5</td>
</tr>
<tr>
<td>20-03-15 56 minutes</td>
<td>Ciclocidade</td>
<td>Local NGO</td>
<td>The informant is part of the board of the directors of the organization, with professional experience in European NGO’s. The organization has contributed with studies towards the implementation of cycle lanes across the city, as well as was a key participant of the latest PDE.</td>
<td>6</td>
</tr>
<tr>
<td>25-03-15 56 minutes</td>
<td>SP Urbanismo</td>
<td>Public company/ owned by the prefecture</td>
<td>There were two informants in this interview, both of them working as architects for two distinct departments of the company. One works for the applied research division, while the other works with urban design and small-scale projects. Both were involved with the planning of the latest PDE.</td>
<td>7</td>
</tr>
<tr>
<td>02-04-15 72 minutes</td>
<td>Embarq</td>
<td>Global NGO</td>
<td>The informant works in the coordination department for transport projects in various Brazilian cities. The informant has a graduate degree from Europe, as well as experience working in the public sector. Embarq is a global NGO that performs analytical and social reports as well as provides advisory projects for an increased sustainable urban mobility across Brazil.</td>
<td>8</td>
</tr>
</tbody>
</table>
Appendix 2

Interview guide

Before the interview, perform the following:

• Provide a short introduction of myself and my study
• Ask for permission to record the interview
• Ask for an oral permission for disclosing all the information derived from the interview in my thesis, except disclosing the informant’s name

1. General

• Ask what institution the person works for and what is their function
• Ask what is the persons’ role and main tasks at their institution

2. The current transportation state

• Can you please give an overview of the current state of São Paulo’s transportation system?
• What are the main causes of the current state? Is it because of complications in the present infrastructure, technology, policies and/or social behaviors about transportation?

3. Visions about the transportation transition

• Does your organization believe there should be a transition in the transportation regime?
• If so, how do you envision it?
• What do you think are the main opportunities in achieving one?
• What do you think are the main obstacles or external factors that can hinder a path towards sustainable mobility?
• What type of instruments and strategies do you believe will be most efficient in fulfilling the transition?

4. Transportation culture

• What do you think is the transport behavior of São Paulo’s residents and how do they perceive their transportation system? In other words, what is the transportation culture of the city?
• How do you think socio-economic statuses shape this culture?
• Do you consider social behavior and perceptions relevant for fulfilling the transportation transition?
• Do you believe there should be modifications made in the transportation culture of the city?
• If so, how do you think a new transportation culture could be developed?
• Has your institution already created any strategies to tackle this issue? What was the outcome?
Appendix 3

Main findings of the study (in no specific order)

Policymakers/government

- The government is aware of the consequences brought by exposing too much information or having an informed civil society, however the need to have a transparent political process was evident.
- The actual prefecture has been the most proactive thus far in generating projects and policies that strive towards sustainable urban development and transportation.
- Moving forward, there must always be a socially inclusive policymaking process.
- The lack of communication and information between the different public entities in charge of the implementation and operation of PT has been key towards contributing to the actual chaos in the transport system.
- It is of utmost importance for policymakers to become users of the system in order to have tangible and effective set of policies being implemented.
- There is a lack of consensus among policymakers as to how things have to change.
- São Paulo is a rich city that has sufficient funds to substantially improve the transportation network.
- Policymakers have to stop striving for their own interests.

Civil society/transportation culture

- The 2013 protests were the main catalyst to generate a spark towards social perception and behavior change regarding not only transportation, but also other public services.
- There is a changing mindset primarily among young generations belonging to middle/ middle-high income groups in regards to mobility.
- Lower income groups are tired of their PT network, while higher income groups are tired of the car. This is evident on the higher share of individual motorized trips in lower income groups and vice versa.
- Lower income groups are purchasing cars as a means to escape the detrimental transport conditions.
- The currently exhibited “sustainable” share of transport modalities is only held in place due to poverty, otherwise car usage could be exponentially higher.
- PT and NM are seen as denigrating forms of transportation.
- The car is seen as a status symbol.
- Higher income groups use car to travel small distances within the city, despite having multiple PT modes available.
- As soon as people can afford a car, they purchase one.
- There is a big VAG mostly due to the general social perceptions of “I am not the problem, others are” as well as pretending to be, rather to be authentic.
- Socio-economic classes and social prejudices affect the way in which people view their transport system as well as their own built environment.
**Infrastructure/technology**

- The implementation of segregated bus and bike lanes has contributed to behavioral and perceptual modifications.
- The car industry could be the biggest threat towards the development of PT and NM modes.
- Mobility is not the main problem of the downtown or expanded center area, housing is. For the RMSP, both mobility and housing are big problems.
- Cars are distancing users from their own urban space.
- There is a big lack of information and signalization on the city’s streets and PT stops.
- There must be more economic investments on PT and NM modes and thus diversify the transportation network.
- There must be higher emphasis put on the available (and currently abandoned) infrastructure of the downtown area that could potentially house significant amount of people and thus take advantage of the highly dense built environment of said area.
- Technology can provide a better experience to the PT network user, as well as decrease the need for mobility.

**Policies/strategies**

- There has been a historical unequal land use planning that has always displaced the poor towards the peripheries.
- Even though walking is the main mode of transport, it has been inadvertent to the policymaking process.
- Policies that promote a secure, comfortable, affordable and rewarding travel experience via PT and/or NM are essential to modify behavior.
- The different social groups of the city must be addressed accordingly with personalized strategies: lower income groups already use the PT network and NM modes extensively, while upper income groups do not.
- The focus of transport policies should not be on eliminating cars, but providing many alternatives to said transport medium.
- It is essential to highlight the advantages of PT over cars: higher speeds and shorter travel times could be the best reasons.
- Transportation must be deemed as a central element of the urban life in the policymaking process.
- There must be less federal incentives on cars as well as less media efforts to promote said device.
- Policies that make civil society become more involved with their public space are indispensable.
- Land use and transportation planning strategies must be combined in order to decrease mobility and increase accessibility.