SOCIAL IMPACT EVALUATION OF THE LILAC LINE PROJECT:

A STUDY ON THE CASE OF SÃO PAULO SUBWAY SYSTEM

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Social Impact Evaluation of the Lilac Line Project: A study on the case of São Paulo Subway System

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Abstract

The work utilizes propensity score matching and difference-in-differences statistical techniques to develop an evaluation study on the social impacts attributed to the construction and operation of the Lilac Line (Line 5) of the subway system in the city of São Paulo over the 1997-2007 period. The study considers the Origin Destination Survey published by METRO in 1997 and 2007, as well as the Urban Mobility Survey 2012 as the primary data sources. Results show that statistically significant results were found regarding a decrease of 18.6% in the number of owned cars (-0.186, SE: 0.0892) and an increase of the number of generated trips (8,221, SE: 3,807).

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Table of Contents

Table Index

Figure Index

Introduction

São Paulo's urban development has been one of intense discussions over the past years. Among the challenges the city currently faces is the mobility issue with an increasing demand over adequate and accessible public transportation. In spite of an existing rail network, the lack of integration between train, bus and subway lines, as well as the still limited length of the latter contributes to the maintenance of a high rate of car ownership. The insufficient public transportation combined with an increasing number of private cars are responsible for heavy traffic congestion, long commuting times reaching 67 minutes in 2007 (in comparison to 59 minutes in 1997) and harmful levels of air pollution. Also, socioeconomic inequalities are translated into São Paulo's spatial segregation, where low-income people face obstacles to access work and educational opportunities, while facing increasing fares, crowded public transportation and long journeys from the peripheral zones of São Paulo Metropolitan Region to the city center.

The excessive reliance upon motorized road transportation poses a challenge for planners and is aggravated by the lack of resources for infrastructure and public transportation investments. The increasing demand for an adequate and accessible public transportation grid had also been the objective of several protests, which showed the urgent need for substantial investments in this sector. In June 2013, São Paulo was at the center of intense social protests, where local populations demonstrated against the approval of an increase in the metro and bus fares, while also claiming for government measures towards many other issues like education, health and transparency. The protests in São Paulo and nationwide gathered millions of people and contributed to bring the urban infrastructure topic to the center of the city's debates.

São Paulo, therefore, faces a turning point in its growth process characterized by the need for substantial structural changes that conciliate economic development and social inclusiveness. This challenge highlights the difficulties facing emerging economies to develop, maintain and expand modern and costly public infrastructure.

It is in this context that the assessment of the impacts of the existing infrastructure of the São Paulo metro system is to be undertaken. The present study aims at presenting a statistical model that utilizes quantitative methods to measure social impacts associated with the construction of subway lines. More specifically, this work focuses on the social impact evaluation of the Lilac Line (Line 5) in São Paulo, considering the data available in the Origin Destination Surveys from 1997 and 2007, as well as the 2012 Urban Mobility Survey as the main references.

In order to do so, first, the study will set the ground by analyzing the main features of the city's profile, commuting patterns and trends in infrastructure development. Next, the case of the Lilac Line, as well as a brief explanation about social impact evaluation will be discussed. Following this, two methods (propensity score matching and difference-in-differences) will be analyzed and, finally, the work will address the regression results and final conclusions.

Background Information

São Paulo is the capital city of the state of São Paulo, one of the most populated and dense cities in Latin America. According to the 2010 Census (IBGE), São Paulo has a population of over 11.25 million inhabitants living in a total area of 1,521.110 km^2, thus having a demographic density of nearly 7,400 people per km^2. The average GDP per capita (current prices, 2012) is R$43,890 (around USD 21,567) and the city's GDP amounts for R$ 499.37 billion (around USD 240 billion). Together with 39 surrounding municipalities, the São Paulo Metropolitan Region (hereinafter referred to as SPMR) is Brazil's main economic and financial center, with about 10% of the national population (around 20 million people) and responsible for 20% of the Brazilian GDP.

During the first decades of the 20th century, São Paulo experienced a booming economic activity through the expansion of coffee exports and a substantial increase in local economic activities and trade, which led to a fast paced urban development. The need for rapid and mass transportation, combined with the widespread nationalist ideals (STEFANI, 2007) led public authorities to invest in rapid-transit transportation systems development in urban areas of the country. In April 24, 1968, the São Paulo Metropolitan Company (*Companhia do Metropolitano de São Paulo*, METRO) a state-run company, was established. Eight months later, the construction of the North-South line began. The first Brazilian subway system was inaugurated in September 1974 and consisted of a 6.4km length operational line between the districts of Jabaquara and Vila Mariana.

Today, the São Paulo subway system is the city's main rapid-transit system and the largest in Brazil. In 2013, the metro had a total length of 74.3 km, 65.3 km of which were operated by METRO and 9 km by Via Quatro, a consortium of private-sector companies that won the bid for a private-public partnership for the operation of Line 4 – Yellow of the subway. The current system counts with 5 lines and 64 stations (6 operated by Via Quatro) and an annual ridership of 1.11 billion passengers. (METRO)

Although São Paulo made progress in expanding its transportation system during the past decades, its infrastructure seems not to keep up with the growing urbanization trends of the city. For comparison purposes, the subway system in New York City, opened in 1904 and operated by The Metropolitan Transportation Authority (MTA), currently comprises 24 lines, totaling 468 stations distributed through 373km, totaling an annual ridership of 1.75 billion passengers (MTA,2014). Likewise, Tokyo counts with 13 lines, 179 stations, 320 km and a ridership of 3.217 billion (Tokyo Metro), and Shanghai, with 11 lines, 267 stations, 410 km covered and an annual ridership of 3.410 billion passengers (Shanghai Metro).

The reality of the São Paulo subway system is still far from the highly developed and expanding rapid-transit systems in the previously mentioned urban centers. However, even with a comparatively small scale, the São Paulo subway system plays an important role in mobility and access to a diverse set of venues and services by the population. Although limited to the municipal borders, the subway system is connected with the lines of the Metropolitan Trains Company (CPTM), and other urban transportation systems that are crucial for the commuting processes between the city and other municipalities in the metropolitan area.

Commuting Patterns

According to the 2012 Urban Mobility Survey, 12.91% of the total trips (generated and attracted trips) on subway in the SPMR are made by populations living in the city's metropolitan area. Figure 1 and 2 show that in some metropolitan zones the demand for subway reaches over 10 thousand daily trips.

The 2007 Origin Destination survey, a study implemented by Metro in 460 different zones in the SPMR, points out that, considering the total supply of public transportation, the city of São Paulo receives a daily inflow of 1.08 million commuters from other SPMR municipalities. In contrast, almost 8 million daily trips are produced within the capital's borders, that is, from one zone in the city to another (Figure 1 and 2)[1]. The zones that receive the greatest number of commuters are Sé (106 thousand daily trips), Parque Dom Pedro (81 thousand daily trips) and São Bernardo do Campo, SPMR (175 thousand trips). Also, among the zones that generate the greatest number of trips are São Bernardo do Campo (183 thousand daily trips), Santo André (141 thousand trips) and Pimentas (138.5 thousand trips).

Figures 3 and 4 below show the daily inbound and outbound movements of commuters in public transportation in the SPMR. If we consider the trips generated and attracted during morning rush hour (6:30-8:30am) (Figure 5 and 6), São Bernardo, Granja Julieta, Santo André and República, respectively, are the zones that receive the greatest number

1 Total trips considering public transportation: subway, train, bus, shuttle bus, school bus and vans.

of commuters. Likewise, Cidade Tiradentes, Alto da Boa Vista, Carapicuíba and Cocaia are the zones from where the highest number of commuters depart.

It is noticeable that public transportation is massively utilized by the population living in the suburban zones of São Paulo, as shown from the movements during rush hour. According to the images, we see a high concentration of outbound movements from these areas to the city's central zones, as well as to a few zones in the metropolitan area. Considering that during this period a great share of commuting trajectories are made due to employment or school reasons, we can arguably see the importance of public transportation for the zones located in the peripheral area of São Paulo.

Figure 1
Metro: Daily Generated Trips (SP, 2007)

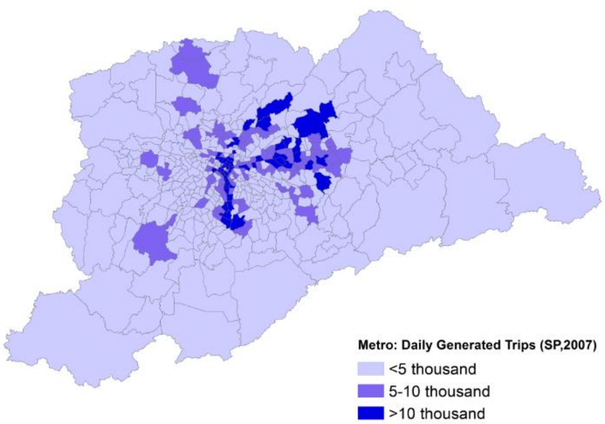
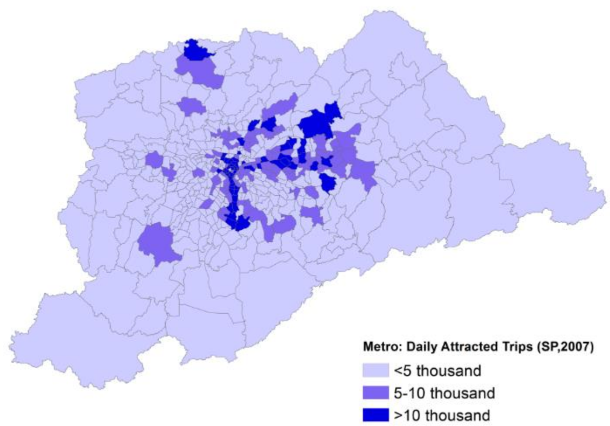


Figure 2
Metro: Daily Attracted Trips (SP, 2007)



As previously explained, even with the relatively small length of the subway system in comparison to the public transportation grid as a whole, it is evident that the system is responsible for a considerable share of the daily inbound and outbound commutes (Figure 5 and 6). Its use, as shown in the images, comprises mostly the populations living in the central and eastern districts of São Paulo. In addition, there is a high utilization of the subway system by commuters from other municipalities such as Guarulhos, Osasco, Ferraz de Vaconcelos, Francisco Morato, Diadema, Franco da Rocha and Itapecerica da Serra. (See Annex for references). The majority of the metro trips attracted and generated per day are concentrated in the central and east areas of the city.

Figure 3
Public Transport, Daily Generated Trips (SP, 2007)

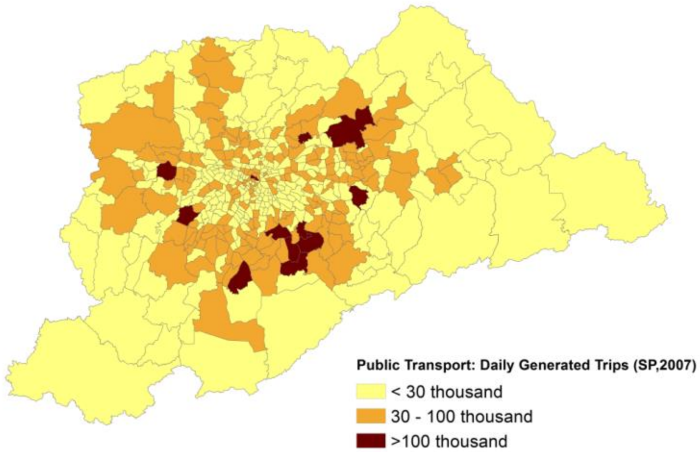


Figure 4
Public Transport, Daily Attracted Trips (SP, 2007)

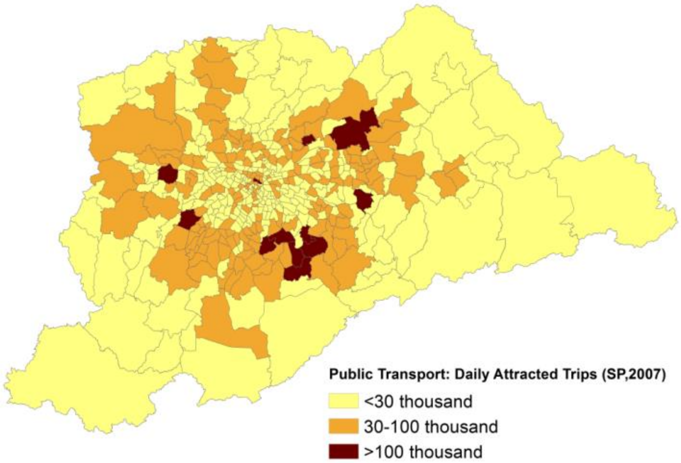


Figure 5
Public Transport, Rush Hour, Generated Trips (SP, 2007)

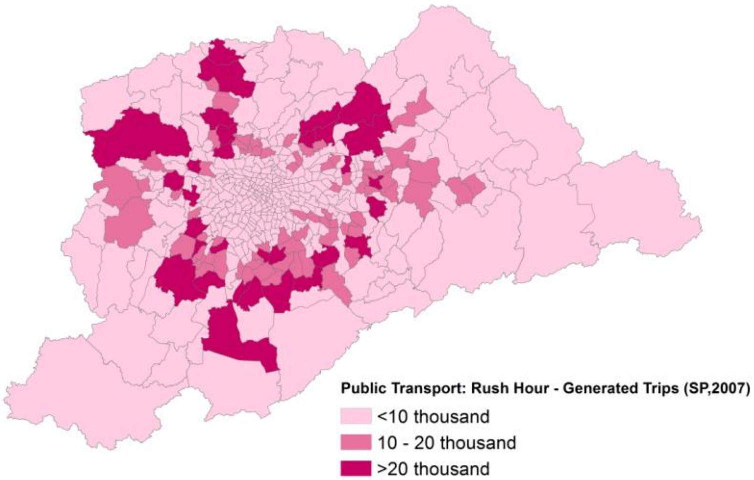
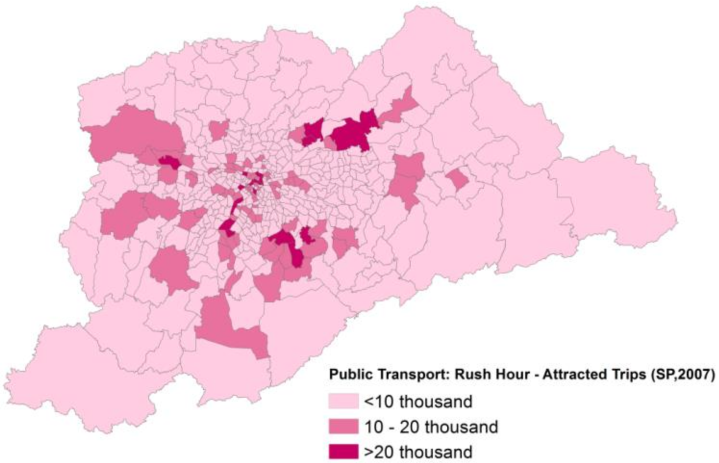


Figure 6
Public Transport, Rush Hour, Attracted Trips (SP, 2007)



Current Trends

In the past years, the State government has been putting efforts into the development of new infrastructure investment schemes that could allow for the growth of the public transportation grid in a faster pace. One of the major changes made by the government consisted of the redesign of regulatory and financing mechanisms that could allow business models to conciliate different stakeholder’s interests on infrastructure projects. One of the initiatives that were targeted by the new legislations consisted of the establishment of Public Private Partnerships (*Parcerias Público Privadas*, PPPs).

In terms of legal tools, the regulation on concessions in force until then used to impose obstacles to the implementation of large projects due to the fact that several of them were not self-sustainable and needed large financing. This type of cooperation agreement was not regulated by any of the preexistent legal arrangements (LACLAU, 2008). The approval of the new “PPP Law” by the Federal government consisted, therefore, in an advance in terms of regulation. The new legislation made it possible for different cooperation arrangements between the public and private sectors to be executed and, in this sense, was more suitable to the type of initiatives aiming at expanding the São Paulo subway system.

As briefly described above, the substantial changes in the financing and legal schemes have the potential of boosting infrastructure development in the city of São Paulo in the following years. The results or impacts of the construction of new subway lines, however, are a field that remains underexplored. The literature review made for this study showed that most of the impact evaluation analysis performed by the academic community has been focusing on the economic impacts of residential property values generated by the subway system as a whole in different locations (see VASCONCELLOS, 2005; MUNOZ-BOWES, 2001; RASKIN, 2010; KING, 2011; and HADDAD et al., 2013). Moreover, according to information provided by staff from METRO, technical studies on the evaluation of social impacts of the lines at the local level are still incipient.

That said, the following section aims at discussing some of the considerations of social impact evaluation and the utilization of quantitative analysis as a tool to measure social impacts.

Considerations about Social Impact Evaluation

The previous sections focused on presenting the main features and key information about the current public transportation grid and, more specifically, the subway system in São Paulo. The information is useful in order to understand who the users are and what types of commuting patterns exist in the SPMR. Although the subway system has been present in the lives of millions of citizens in the past five decades, few are the studies on the role of the subway system in promoting changes in socioeconomic characteristics of the populations directly served with rapid-transit systems.

According to authors such as Cloquell-Ballester et al.(2005), and Vanclay, 2001; social impact evaluations can consider quantifiable or qualitative variables that refer to changes in qualitative indicators such as wellbeing, cultural impacts, values ,and perceptions about the society. The limitations regarding proper specification of all the dimensions involved in a changing process make social impact evaluation always subject to specific contexts and projects implemented.

That said, the concept of social impact in this study is applied only to the broad scope of dimensions whose changes can be quantified in the form of data outputs. These outputs are then organized in variables that are considered to be linked to the general social well-being of residents in a microanalysis. The well-being, in turn, considers socioeconomic aspects of the population analyzed, which will be specified in the following sections.

Limitations

One challenge faced by quantitative analysis applied to social impact is the scarcity of data produced due to budgetary and technical restrictions. Specific information on commuting patterns in such a wide geographic area and/or lack of technical expertise impose challenges to the public authorities and technicians in collecting accurate and sufficient information about users and their displacements.

Another challenge consists of data accessibility to the general public. Until the publication of the present study, only three survey datasets were officially available on the METRO's website. The other datasets utilized in this work were acquired through an official solicitation to the Information Service to the Citizen[2].

The last limitation is methodological. Considering the obstacles in isolating the specific impacts of a certain policy, the conclusions made based on available data have to be analyzed with caution. Considering the design of the study, subsequent survey data can be added in order to make estimates more accurate. The following sections will tackle the proposal of an impact evaluation analysis taking the Lilac Line construction as a case study.

2 Serviço de Informação ao Cidadão, established by Federal Law n. 12.527/2011 and regulated by the State Decree Decree n. 58.052/2012, is a service that aims at providing citizens with information on the management of activities operated by Metro.

Impact Evaluation and the Lilac Line

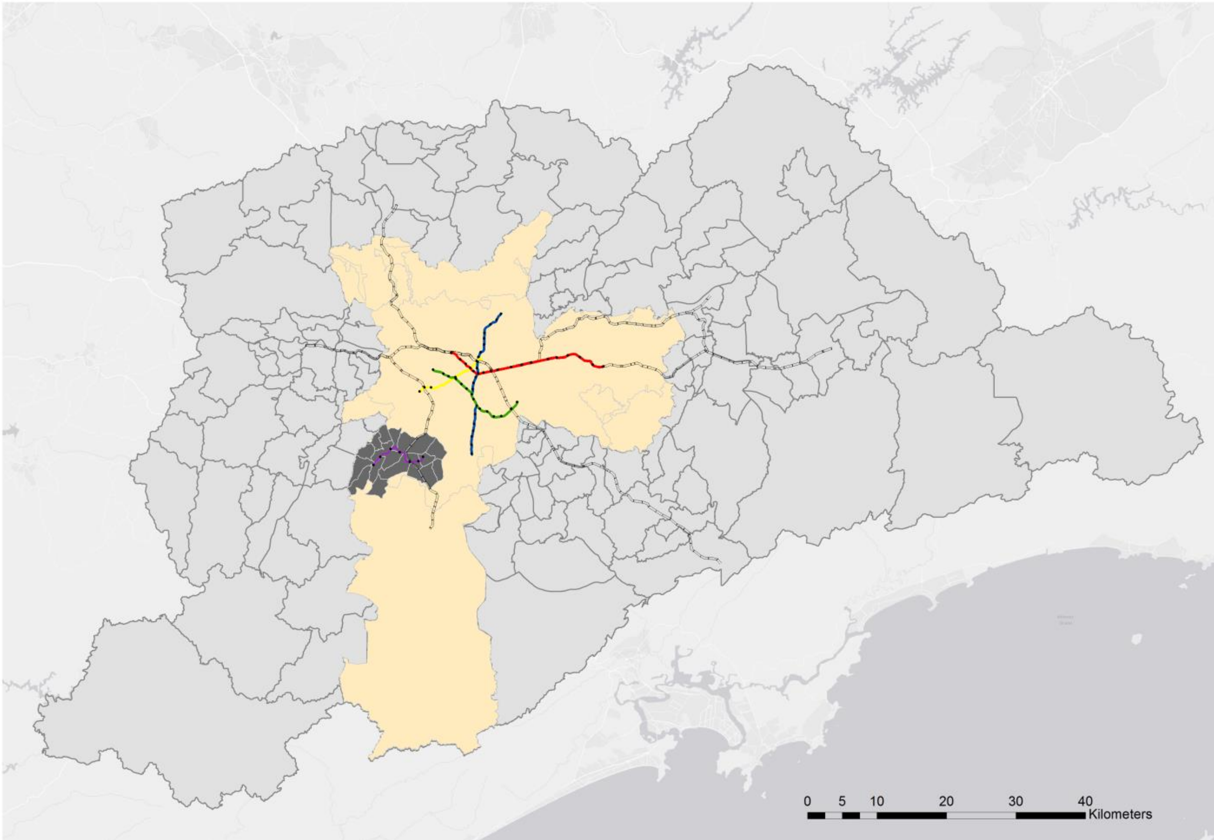
The Line 5 (Lilac) of São Paulo's subway system was inaugurated in 2002 and currently counts with 7 stations (*Capão Redondo, Campo Limpo, Vila das Belezas, Giovanni-Gronchi, Santo Amaro, Largo Treze and Adolfo Pinheiro*). In 2014, the passenger's demand for this line reached almost 80 million trips with an average of 272 thousand trips during weekdays. The line has a length of 9.3 km and stations connected to 5 bus terminals and 1 urban train line (CPTM).

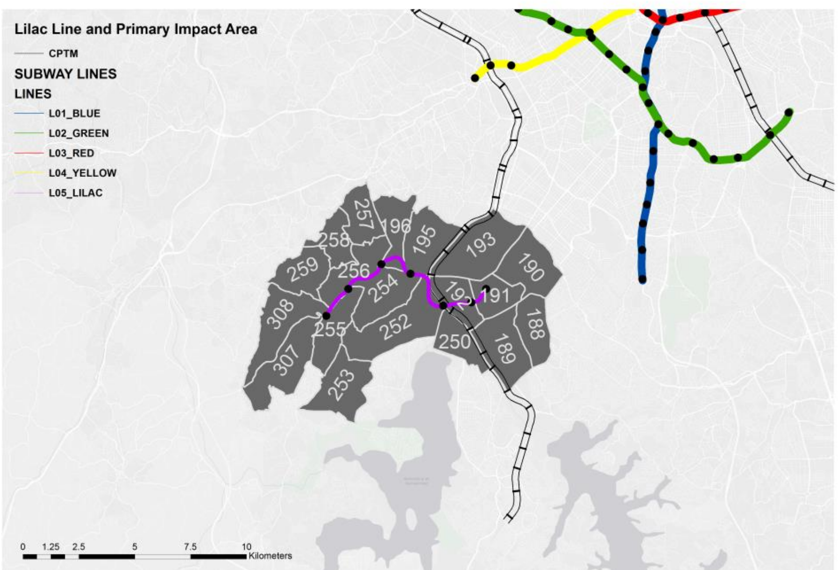
According to data of the OD Surveys from 1997 and 2007, the stations that constitute the Lilac Line are located within a total of 19 zones' borders. As it will be discussed in the following sections, the distance to a Lilac station was the criterion utilized in order to define the subway primary area of impact or, in other words, the area that would be directly affected by the operation of the new subway line.

The Lilac Line study case was addressed in this study due to two main reasons. The first one consists of data availability. Considering that the OD Surveys 1997 and 2007 were the main sources of information, the impact evaluation study had to correspond to the analysis of an infrastructure work that was developed and started to operate between 1997 and 2007.

Another reason consisted of the socioeconomic status of the residents in the area. As already mentioned, São Paulo is characterized by strong inequalities that are translated into spatial segregation. While most of the SPMR revenue and employments are located in the central area of the city, the peripheral zones struggle with poverty and lack of accessibility to services and infrastructure. In 2007, zones located close to Lilac station had an average family income of R$2,922 per month, higher than the average for the metropolitan region, but lower than the zones located close to a subway station (with the exception of the Lilac line), which had an average of R$4,744 per month in the same period. It is noteworthy that from 1997 to 2007, the average commuting time by residents of Lilac zones increased from 63 to 69 minutes, while the SPMR average increased from 61 to 81 minutes (see Annex 3).

Figure 7
Lilac Line Zones





Zone	Name
307	Adventista
255	Capao Redondo
252	Centro Empresarial
190	Chacara Flora
193	Granja Julieta
253	Jardim Angela
259	Jardim Mitsutani
254	Jardim Sao Luis
257	Jardim Umarizal
195	Jardim Vitoria Regia
189	Jurubatuba
256	Parque Arariba
308	Parque Fernanda
258	Pirajussara
191	Santo Amaro
192	Vila Miranda
188	Vila Sao Pedro
250	Vila Socorro
196	Vila Suzana

Data Description

The case study is based on data from two surveys published by the São Paulo Metropolitan Company (*Companhia do Metropolitano de São Paulo)*: the Origin and Destination Survey (*Pesquisa Origem e Destino*) from 1997 and 2007, and Survey on Urban Mobility (*Pesquisa de Mobilidade Urbana*) from 2012. Additional information was found on official online databases of São Paulo's Municipal Secretariat for Urban Development (SMDU), the Brazilian Institute of Geography and Statistics (IBGE), State System of Data Analysis (SEADE), and São Paulo State Housing Syndicate (SECOVI). Table 1 describes the main features of the dataset, **Annex 1** contains a description of each variable, and **Annex 2** summarizes the means for 1997 and 2007.

Table 1: Data Description

Lilac	19	Adventista, Capão Redondo, Centro Empresarial, Chácara Flora, Granja Julieta, Jardim Ângela, Jardim Mitsutani, Jardim São Luis, Jardim Umarizal, Jardim Vitória Régia, Jurubatuba, Parque Arariba, Parque Fernanda, Pirajussara, Santo Amaro, Vila Miranda, Vila São Pedro, Vila Socorro, and Vila Suzana.
Zones	389	(See Annex 4 and 5 for description)
Years	2	1997 and 2007
Observations	778	
Variables	82	(See Annex 1 for description)

Methodology

The proposed methodology to evaluate the impact of the Lilac Line consists of a "difference-in-differences" model (DID model). The DID model is a well-known statistical technique implemented in order to evaluate the impacts of a specific intervention in a quasi-experiment. Unlike randomized controlled trials (RCTs), the quasi-experiments do not present a controlled design of the treatment and control groups, which might generate bias issues in the estimates of the effects generated by the treatment. Considering this, the DID technique has the advantage of enabling the model to control for changes across the different zones that do not vary over time, for instance, geographic and demographic features (zone fixed effects) and changes that occur over time but do not impact the zones in different ways (year fixed effects). The model, therefore, is a useful tool to examine possible impacts of a treatment without necessarily relying on previously designed control group that mimics a counterfactual situation, as well as to infer associations without specifying all of the possible omitted variables in the model.

Standard DID model (example: employment rate):

$$employmentrate = \beta 0 + \beta 1 * lilac + \beta 2 * y2007 + \beta 3 * lilac\_y2007 + \varepsilon$$

$\beta 0$= Employment rate at non-lilac in 1997

$\beta 1$= Difference between lilac and non-lilac in 1997

$\beta 2$ = Difference between employment rate in non-lilac in 1997 and 2007

$\beta 3$ = Interaction terms between time and zones (lilac/non-lilac)

$\beta 0$+ $\beta 1$= Employment rate at lilac in 1997

$\beta 2$ + $\beta 3$= Difference between lilac in 1997 and 2007

Table 2: DID Model

	Treatment Group (Lilac)	Control Group (non-lilac)	Difference: Treatment-Control
Before (1997)	T_B	C_B	$T_B - C_B$
After (2007)	T_A	C_A	$T_A - C_A$
Difference: After-Before	$T_A - T_B$	$C_A - C_B$	$(T_A - T_B) - (C_A - C_B)$

Table 3: DID Model 2

	Treatment Group (Lilac)	Control Group (non-lilac)	Difference: Control-Treatment
Before (1997)	$\beta 0 + \beta 1$	$\beta 0$	$\beta 1$
After (2007)	$\beta 0 + \beta 1 + \beta 2 + \beta 3$	$\beta 0 + \beta 2$	$\beta 1 + \beta 3$
Difference: After-Before	$\beta 2 + \beta 3$	$\beta 2$	$\boldsymbol{\beta 3}$

Study Design and Setting

In order to implement a DID analysis, some changes had to be made in the datasets available. First, the OD surveys implemented different geographical divisions in data collection. On one hand, the OD Survey 1997, the SPMR was divided into 389 zones. On the other hand, the OD Survey 2007 divided the metropolitan area into 460 zones. The author opted for utilizing the 1997 methodology because the conversion tables available made it possible to aggregate the data from the 460 zones in the 2007 Survey into 389 observation units[3]. Considering that only five O-D surveys were published so far, from which two are currently available online, the final dataset is comprised of data on the SP Metropolitan area divided into 355 zones and in a time frame of two years - 1997 and 2007. The observations that contained value equal to zero for major covariates were dropped in order to reduce bias.

Treatment and Control Groups

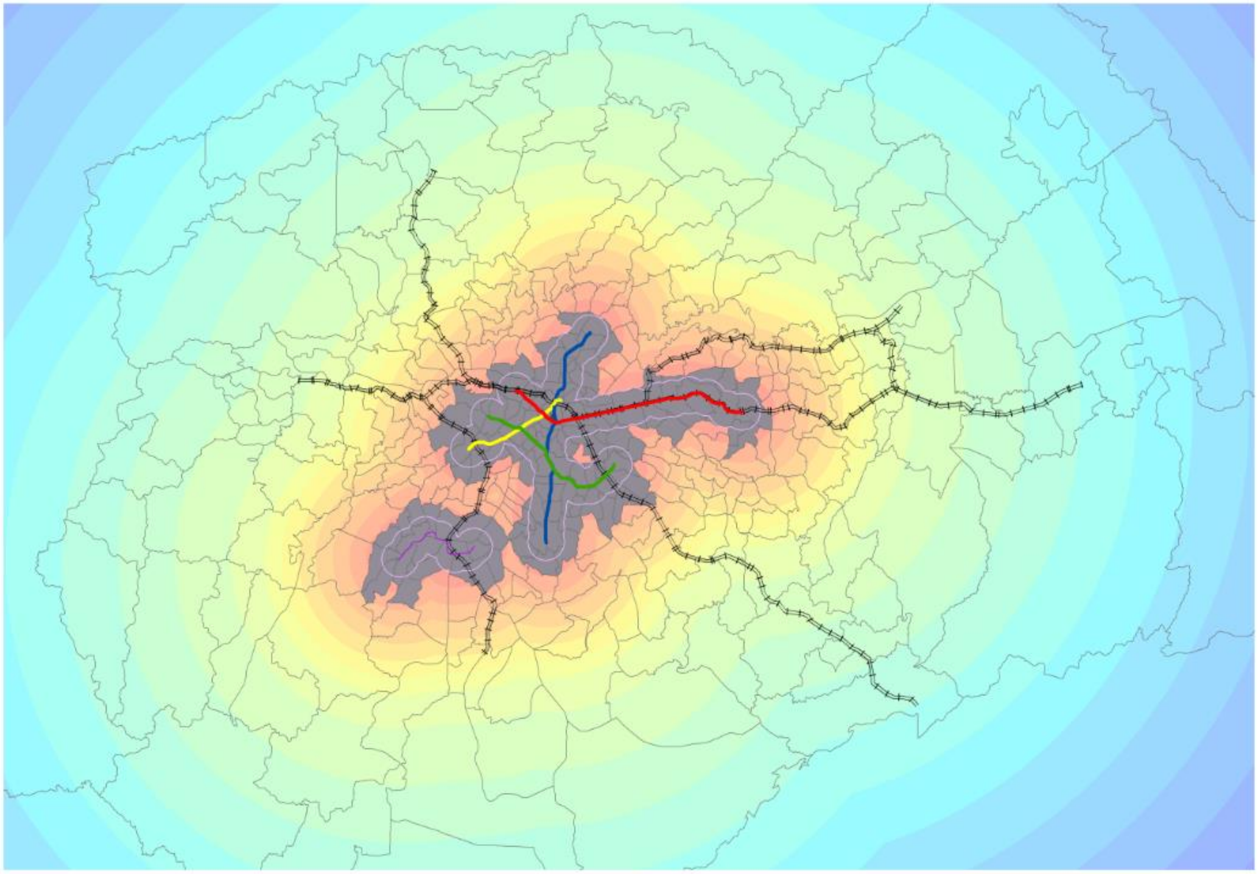
Treatment consists of the Lilac Subway Line operation, started in 2002, and the treatment group is the group of zones within a specific distance from one of the Lilac Line stations. The control group consists of all other zones in the dataset, considering zones where a subway station other than the Lilac Line operates, as well as zones where no subway system operates. The distance chosen was 1,500 meters (about 1 mile) and it was based on previous studies on urban mobility (see RASKIN, 2010), which take into account the

3 It would not be possible to disaggregate the data of the Survey 1997 due to the fact that individual observations were not available, only the aggregated values per zone.

average maximum time a person would be willing to spend walking from her home to the closest subway station instead of opting for other transportation system such as bus, car, or train. The value might not take into consideration the diversity of individual utility curves and the different motivation that influence a person to opt for a specific way of transport over another. However, considering the limitation of the datasets to a zone-level analysis (observations on individuals were not available), the author opted for a distance threshold to determine treatment and control groups. Another important aspect to be considered is that no other infrastructure project effects in the zones located along the Lilac Line were taken into account during the period from 1997 to 2007.

Finally, some of the independent variables utilized in the final dataset were converted into log or per capita rate forms due to a great variation of the values across the different zones. Figure 9 shows the Euclidean Distance tool (GIS) comprised of 1.5 km distance rings having the subway stations as reference. The gray area represents the zones selected as components of the two dummy variables lilac and subway.

Figure 8
Euclidean Distance – Subway and Lilac Areas



Dependent Variable

Several trials were made in order to test for significance of different independent variables associated with socioeconomic impact on the treatment group. The following results correspond to the analysis of impacts of the Lilac Line on the share of the local population comprised of employed people, the share of the local population comprised of students, the average time spent in public transportation, the number of owned cars, and the number of generated trips.

Independent Variable

The independent variables considered are *households* (number of households), *incpcap* (income per capita), *privautomob* (number of private cars), the interaction term *lilac_y2007*, and the dummy variable *subway*. In addition, zone fixed effects and year fixed effects are included in order to control for different features of Zones that do not vary over time (geography for example), and differences that vary over time but impact the zones in the same way (example, macroeconomic events, changes in overall infrastructure, etc).

Considering that the hard railway lines were already existent when Line 5 of the subway was constructed, its effects are not taken into consideration in the calculation of the effects in the treatment group.

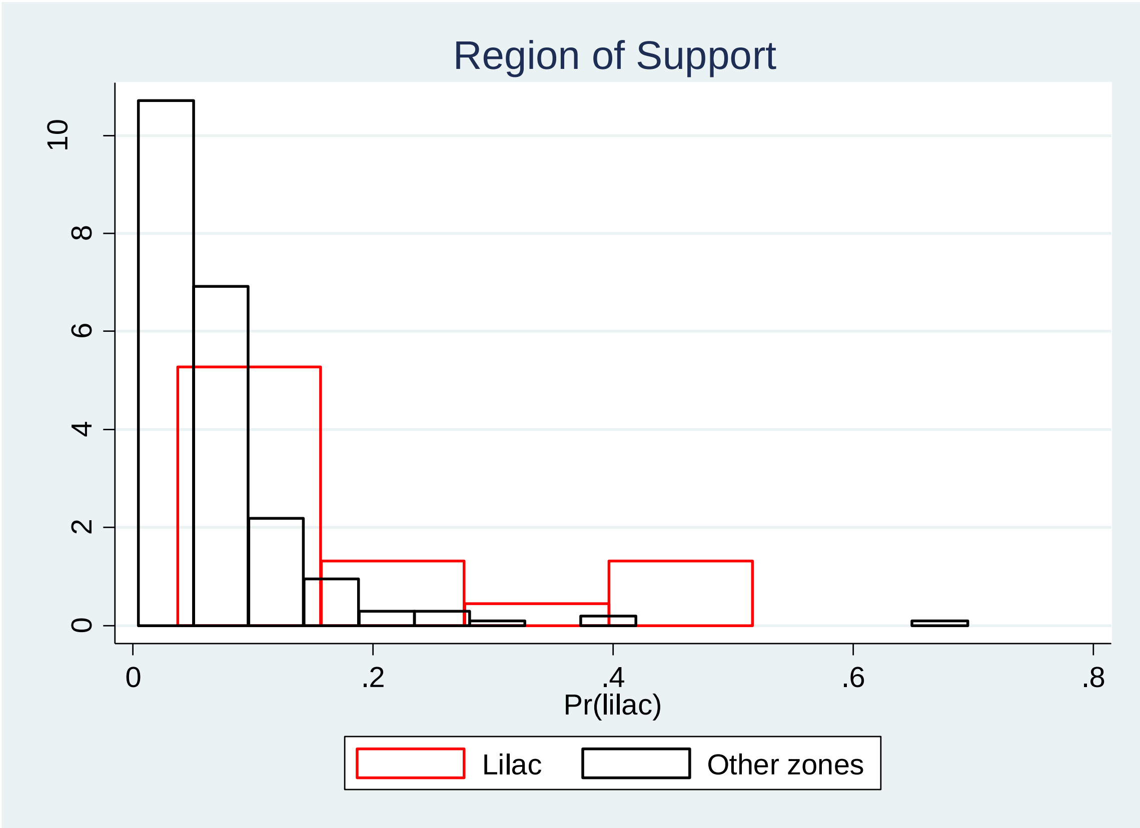
Data Analysis

Propensity Score Matching

A first impact evaluation trial was made through a Stata pre-treatment analysis with the utilization of the propensity score matching technique (Rosenbaum and Rubin, 1983). This method was chosen in order to balance the treatment and control groups and, therefore, to reduce bias in the estimation of treatment effects with observational datasets (nonrandomized trials). The technique, therefore, aims at balancing differences between control and treatment groups based on the calculation of the probability to be treated given observed pre-treatment characteristics *x* listed in Table 4. The control group, in this sense, approximates to a counterfactual, being as similar as possible to the treatment group.

In this study, the *Nearest Neighbor Matching* with a *noreplacement* option was utilized for the match and once tested for balance of treatment and control groups. The match originated a control and treatment group comprised of 19 observations each. Figure 10 shows the distribution of probabilities and assessment of region of support (overlap) between the two cohorts (control and treatment).

Figure 9
Region of Support



Once developed, the treatment and control group could be comparable and further analysis was made based on the distribution of the frequencies.

At this point, the estimation of the average treatment effect on the treated (ATT) was achieved by the use of the “att*” command. The results, however, did not show statistically significant coefficients for ATT (see example in Table 5). The major challenge faced on this phase of the study was the small number of observations (n). The fact that many observations were dropped from the model after the matching created a trade-off between bias and variance of the estimates.

Table 4: Balance Checking

	Mean			t-test		V(T)/
Variable	Treated	Control	%bias	t	p>|t|	V(C)
households	10337	10534	-1.9	-0.07	0.942	0.56
pop1997	40585	41877	-3	-0.12	0.907	0.51
generatedtrips	74354	83766	-14.3	-0.53	0.601	0.21*
attractedtrips	74298	83859	-14.6	-0.53	0.596	0.21*
avincfam	4487.3	4480	0.3	0.01	0.994	0.73
incpcap	1248.4	1223.6	3.4	0.09	0.928	1.03
studpcap1997	0.24254	0.24229	0.7	0.02	0.984	0.67
employedpcap1997	0.42977	0.44439	-24	-0.75	0.459	1.35
timecollec	63.316	60.947	21.7	0.62	0.54	0.78
subway	0	0	.	.	.	.
privautomobpcap1997	0.2632	0.25687	4.9	0.13	0.894	1.22

Table 5: ATT

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
employedpcap2007	Unmatched	0.454788	0.414886	0.039903	0.014795	2.7
	ATT	0.454788	0.464567	-0.00978	0.029355	-0.33

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
studpcap2007	Unmatched	0.1430811	0.1667035	-.02362230	0.0107381	-2.2
	ATT	0.1430811	0.1629775	-.01989630	0.0216684	-0.92

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
timecollec2007	Unmatched	69.105263	72.205240	-.0999770	6.844819	-0.45
	ATT	69.105263	68	1.1052631	5.555442	0.2

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
incpcap2007	Unmatched	909.68421	763.38427	146.29993	133.00967	1.1
	ATT	909.68421	995.84210	-6.1578947	218.15518	-0.39

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
employedpcap2007	Unmatched	0.454788	0.414885	0.039902725	0.014794	2.7
	ATT	0.454788	0.464567	-.00977872	0.029354	-0.33

DID Model with Ranksum

Considering the number of observations and, therefore, the high standard error of the estimates, a second trial was done with a direct comparison of the treatment and control groups by using a Wilcoxon rank-sum test. Ranksum tests the hypothesis that two independent samples (that is, unmatched data) are from populations with the same distribution. The results demonstrate there is a balance between the control and treatment groups, which leads us to assume that the "assignment" of zones to the treatment, in other words, the construction of the Lilac Line, was made in a complex way that could be considered, in this context, as random.

Considering this assumption, new trials were made with a higher number of observations. Table 8 shows the raw results in univariate regressions, while Table 9 presents the results in multivariate analysis. We observe that in both cases, the coefficients of number of school enrollments and number of jobs per capita in the zones close to a Lilac station were not statistically significant, that is, the effects of the Lilac line cannot be assumed to have a significant impact on generating new jobs or increasing school enrollment at the local level. The number of cars per capita showed to be negatively affected by the presence of the Lilac Line, which seconds the intuition of increase in public transportation as a replacement to the use of cars.

The time spent in public transportation and the number of generated trips had their signs flipped with the addition of other covariates. Also, the time spent, that had a significant coefficient in the univariate model, appears not to be significant in the second case. The multivariate model shows that the zones located close to a Lilac station had, on average, a decrease of 18.6% in the number of owned cars from 1997 to 2007. Also, around 8,200 new trips were originated in the districts with Lilac stations (Table 8). It is also interesting to observe that controlling for other covariates (households, cars, and income per capita), the group of zones with subway stations (with the exception of lilac stations) have on average 163 thousand more trips than the rest of the zones. Also, if we consider the zones located close to subway stations (non-Lilac), we find a strong association of zones with a subway station and number of local employments.

Table 6: Naïve Models

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Local jobs (log)	Cars (log)	Local school enrollment (log)	Time: public transport	Generated trips
lilac_y2007	-0.0215	-0.186**	0.0869	-14.35***	5,160
	(0.0572)	(0.0892)	(0.145)	(3.222)	(4,276)
Constant	7.210***	5.560***	8.693***	63.93***	159,774***
	(0.182)	(0.501)	(0.308)	(5.193)	(17,823)
Observations	710	710	709	710	710
R-squared	0.964	0.932	0.911	0.617	0.953
Zone FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Multivariate Models

VARIABLES	(1) Local jobs (log)	(2) Cars (log)	(3) Local school enrollment	(4) Time: public transport	(5) Generated trips
lilac_y2007	0.00334	-0.186**	0.122	-0.896	8,221**
	(0.0442)	(0.0892)	(0.145)	(4.027)	(3,807)
households	2.51e-05***		1.72e-05*		3.720***
	(6.53e-06)		(8.81e-06)		(0.970)
privautomob	1.19e-05*		1.40e-07	-0.00127***	0.0906
	(6.15e-06)		(9.29e-06)	(0.000313)	(1.011)
subway	0.494***	-3.215***	2.613***	-13.91	163,049***
	(0.167)	(0.501)	(0.528)	(22.48)	(10,695)
incpcap	-4.52e-06		6.83e-05	0.0383***	3.303**
	(1.51e-05)		(4.69e-05)	(0.00414)	(1.549)
Constant	6.748***	8.775***	6.028***	39.71*	-3,071*
	(0.105)	(0.0147)	(0.432)	(22.24)	(1,651)
Observations	710	710	709	710	710
R-squared	0.973	0.932	0.914	0.820	0.969
Zone FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Conclusion

The present study focused on the current transformation that São Paulo is experiencing regarding its infrastructure. The need for an adequate and accessible public transportation grid is necessarily connected to the rethinking of strategies that will enable further developments of the city's subway system. That said, it is imperative that the government of São Paulo develop and consolidate proper impact evaluation methodologies in order to assess the progress, as well as to support necessary changes in urban policies.

This work focused on the application of two statistical techniques (propensity score matching and difference-in-differences) in order to evaluate some of the possible social impacts in the case of the Lilac Line construction and operation. The motivation of the author in analyzing the specific impacts of the subway on socioeconomic indicator at the zone level is due to the fact that a significant share of the low-income population currently relies on public transportation in their daily commuting trajectories. Furthermore, the case of São Paulo indicates that these segments of population are in many cases, residents at zones that do not offer proper infrastructure and services.

The results obtained through the regression models do not show statistically significant coefficients of average number of local employments, average number of local school enrollments and average time spent in public transportation, while average number of cars and average generated trips had statistically significant coefficients at 5% level. Considering the socioeconomic context and the background information on commuting patterns of the SPMR, these results might support the idea that the operation of the Lilac

Line alone did not have substantial impacts in creating more jobs or more school enrollments at the zone level, considering the zones close to Lilac stations. In addition, the data observed cannot prove that there was a decrease in time spent in public transportation for residents at the zones analyzed. These results can be explained from different perspectives. Considering methodological factors, the data available was aggregated (not at the individual-level of analysis) and limited to two years of observations. Some possible qualitative considerations are the fact that the impacts of the Lilac Line were not analyzed in conjugation with other major transportation systems such as the bus and the urban train systems. Considering that commuting patterns are made through the utilization of multimodal transports, the inclusion of other modalities can be a good way to analyze overall impacts of the subway system in the time spent in other transportations, for example.

Also, changes in employment and school enrollment at the local level prove to be not significantly impacted by the operation of the Lilac Line. One possible explanation can be that investments on these sectors were not sufficient to increase the supply of labor market and schools at the local level. At the same time, residents might choose to commute to other zones in order to search for jobs and enroll their children in schools due to differences in quality of these specific services in other zones. Therefore, the inauguration of the subway line may not have been enough to improve competitiveness of local employment and education markets when compared to other zones. The same conclusion was also found in the case of the share of population employed or enrolled at schools, which did not seem to be altered after the construction of the subway line.

Finally, the reduction of the number of owned cars and the increase in generated trips might be a good indicator of possible changes in socioeconomic patterns in the following years that could not be measured in a 10 year period (1997-2007). These results point out to the necessity of further analysis on possible impacts that the decrease of reliance on cars and the increase in subway trips might possibly generate at the local level in the future.

Although the models developed in this study were limited in finding positive conclusions regarding socioeconomic changes in the priority zones of impact, they can serve as a good baseline and contribute to studies that are still incipient in the case of São Paulo. In addition, the present work further advances the current discussions on the needs of social impact evaluations that are consistent to the urban projects that the city yearns for in the following years.

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Annex

Annex 1: Variable description

Zone	Zone code
Zone_name	Zone name
Year	Year
Households	Number of households
Families	Number of families
Population	Total Population
Schoolenroll	Number of zone school enrollments
Schoolenrollpcap	Zone school enrollments per capita
Employment	Number of zone employments
Employmentpcap	Zone employment per capita
Privautomob	Number of cars
Privautomobpcap	Cars per capita
Generatedtrips	Number of generated trips
Attractedtrips	Number of attracted trips
Age_a	Age up to 3 years old
Age_b	Age 4-6
Age_c	Age 7-10
Age_d	Age 11-14
Age_e	Age 15-17

Age_f	Age 18-22
Age_g	Age 23-29
Age_h	Age 30-39
Age_i	Age 40-49
Age_j	Age 50-59
Age_k	Age 60 and over
educ1	Illiterate/ Incomplete Primary School I/Complete Primary School I/Incomplete Primary School II
educ2	Complete Primary School II/ Incomplete High school
educ3	Complete High school/Incomplete higher education
educ4	Complete higher education
inc_a	Income up to R$760
inc_b	Income R$760-1520
inc_c	Income R$1520-3040
inc_d	Income R$3040-5700

inc_e	Income R$5700 and above
avincfam	Average Family Income
incpcap	Income per capita
student	Number of zone residents who are students
studentrate	Share of zone population with student status
employed	Number of zone residents who are employed
employedrate	Share of zone population with employed status
timecollec	Time spent in public transportation
Subway	Dummy variable: zones located close to subway station (nonlilac)
lilac	Dummy variable: zones located close to lilac station

Annex 2: Descriptive Analysis

	Year	Households	Families	Pop	School enroll	Employ ment	Priv. automob	Av. Inc. fam	Inc.per cap	student	employed	Time collec	Generated trips	Attracted trips
Adventista	1997	19,334	18,957	77,134	20,370	8,899	10,864	2,762	679	19,023	27,286	69	85,745	83,593
	2007	25,778	28,179	96,116	18,877	16,880	12,093	1,722	505	15,056	42,044	77	120,555	121,072
Capao Redondo	1997	14,062	13,983	54,435	21,909	13,352	9,861	2,609	670	13,283	21,798	57	89,358	88,695
	2007	16,742	16,742	59,681	19,368	13,561	10,092	2,022	567	8,001	28,938	63	90,587	91,565
Centro Empresarial	1997	24,668	26,901	95,542	20,413	26,148	8,687	2,155	607	22,191	38,775	67	137,970	137,469
	2007	32,100	37,958	114,285	25,376	20,759	15,019	1,621	538	20,654	52,395	66	166,072	163,917
Chacara Flora	1997	2,889	3,350	11,248	5,693	13,202	6,755	9,682	2,883	2,617	5,716	79	45,529	46,274
	2007	3,193	3,213	10,280	3,479	27,355	4,464	6,391	1,997	1,496	5,047	78	60,893	61,397
Granja Julieta	1997	7,871	9,421	31,905	14,888	56,726	13,885	7,047	2,081	7,376	12,845	80	137,708	139,223
	2007	8,607	8,607	25,885	33,544	83,382	9,798	4,137	1,376	1,908	12,079	79	179,921	180,918

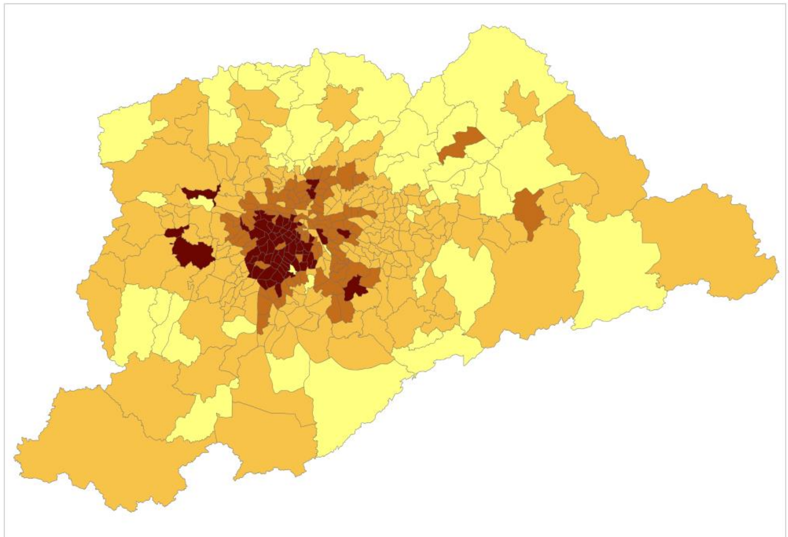
Jardim Angela	1997	21,392	21,537	86,229	19,212	14,938	8,490	1,826	456	20,943	28,870	70	88,385	87,091
	2007	21,958	26,379	80,659	26,591	14,017	9,807	1,563	511	12,238	31,564	70	131,967	131,091
Jardim Mitsutani	1997	12,183	12,226	46,998	14,690	14,027	8,633	2,143	558	8,783	18,151	60	68,690	66,909
	2007	18,159	20,056	66,881	22,038	10,243	7,942	1,738	521	10,883	29,466	69	103,932	104,334
Jardim Sao Luis	1997	17,897	21,571	68,976	18,570	21,827	15,429	2,885	902	16,355	34,211	51	88,811	87,861
	2007	20,009	20,421	71,461	20,447	26,042	6,488	1,611	460	6,079	29,932	65	119,933	119,969
Jardim Umarizal	1997	9,229	9,244	38,443	10,630	13,068	6,572	2,758	663	10,254	15,210	66	58,804	59,838
	2007	13,292	13,522	48,389	9,374	7,914	8,624	2,058	575	8,594	21,135	53	69,202	70,194
Jardim Vitoria Regia	1997	4,573	4,809	16,066	1,554	10,164	6,674	9,693	2,901	4,994	8,289	82	35,170	34,977
	2007	6,274	6,328	19,759	1,353	9,200	8,333	5,496	1,760	3,364	11,321	66	36,710	36,671
Jurubatuba	1997	3,670	3,806	15,829	5,103	29,106	4,911	4,595	1,105	4,677	5,907	57	55,367	56,026
	2007	4,978	4,978	15,905	5,766	41,872	4,520	3,350	1,048	2,277	7,377	72	83,285	83,842
Parque Arariba	1997	10,851	12,039	43,642	13,324	11,335	6,372	2,281	629	12,459	17,341	49	75,355	75,658
	2007	15,832	16,403	57,432	9,882	10,881	7,825	1,775	507	9,503	21,591	64	80,863	80,660

Parque Fernanda	1997	17,458	18,612	69,442	14,888	9,724	6,639	1,924	516	14,965	28,428	72	71,437	72,995
	2007	30,179	30,821	112,606	16,762	18,120	9,426	1,258	344	23,175	41,228	78	137,176	136,922
Pirajussara	1997	8,621	8,982	33,572	9,725	10,159	3,357	2,369	634	9,633	12,282	57	52,719	51,709
	2007	10,623	10,814	38,796	27,027	11,213	7,162	2,032	566	8,139	15,352	53	80,151	80,207
Santo Amaro	1997	3,189	3,628	11,010	21,500	34,978	5,257	8,306	2,737	2,094	5,785	62	132,504	133,396
	2007	3,072	3,126	9,074	26,409	37,920	3,227	3,922	1,351	779	4,483	69	136,169	135,867
Vila Miranda	1997	2,245	2,283	8,826	6,127	22,578	2,496	5,431	1,405	2,038	3,387	72	51,637	52,362
	2007	2,183	2,239	6,855	8,999	30,155	2,208	3,156	1,031	786	3,564	81	66,154	66,951
Vila Sao Pedro	1997	8,374	8,187	32,933	5,863	14,857	14,917	7,137	1,774	7,940	16,924	43	54,977	54,546
	2007	11,863	11,975	39,124	6,397	22,951	15,560	4,587	1,404	4,450	21,231	73	84,034	83,630
Vila Socorro	1997	2,446	2,523	8,950	6,024	26,528	2,271	3,318	935	1,757	4,588	59	52,820	53,401
	2007	2,558	2,558	8,091	6,273	28,551	1,839	2,897	916	751	3,129	79	59,333	58,453
Vila Suzana	1997	5,443	4,980	19,929	2,600	8,616	6,799	6,337	1,584	4,688	9,663	51	29,740	29,636
	2007	7,663	7,872	25,125	4,355	10,091	8,096	4,173	1,307	3,749	12,492	58	48,795	48,737

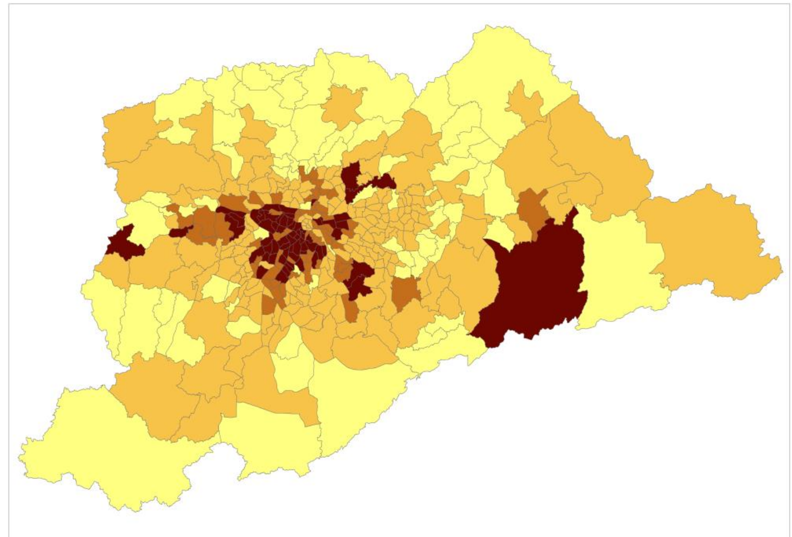
Lilac	1997	196,395	207,039	771,109	233,083	360,232	148,869	4,487	1,248	186,070	315,456	63	1,412,726	1,411,659
	2007	255,063	272,191	906,404	292,317	441,107	152,523	2,922	910	141,882	394,368	69	1,855,732	1,856,397
Subway	1997	850,966	933,680	3,037,286	1,088,923	2,470,513	801,569	4,744	1,517	640,393	1,354,555	63	8,625,056	8,667,508
	2007	925,161	946,301	2,844,566	1,075,269	3,066,032	735,094	5,018	1,750	373,839	1,347,923	101	9,299,833	9,313,807
SPMR	1997	4,256,674	4,552,931	16,771,140	4,969,675	6,863,367	3,088,976	3,531	1,038	4,013,916	6,580,621	61	31,237,121	31,235,834
	2007	5,500,813	5,715,051	19,512,252	5,199,908	8,884,338	3,597,453	3,320	1,072	3,132,206	8,058,968	81	37,780,430	37,781,014

Annex 3: São Paulo Profile (maps)

Average Household Income (R$/month), 1997



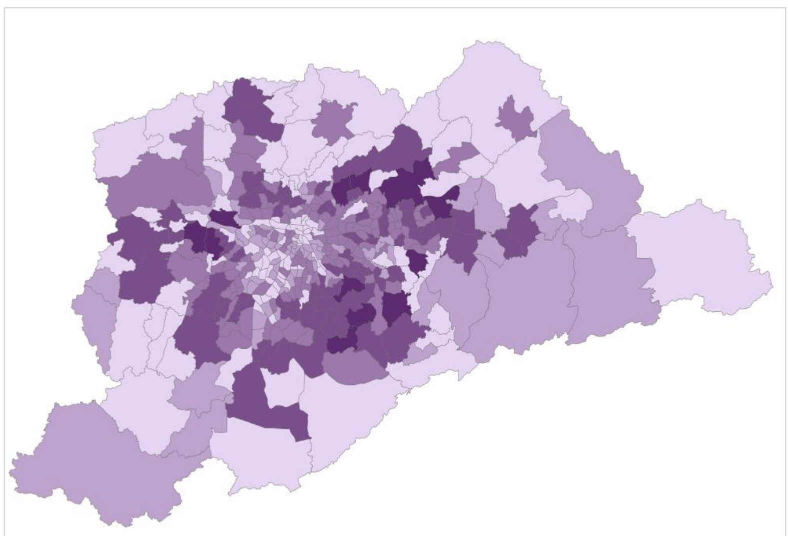
Average Household Income (R$/month), 2007



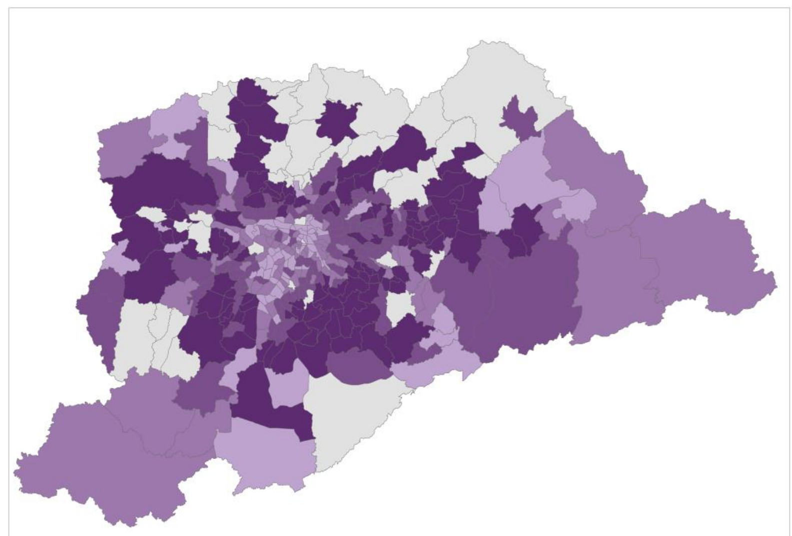
Av Family Income (R$)

<1500
1500-3000
3000-5000
>5000

Population, 1997



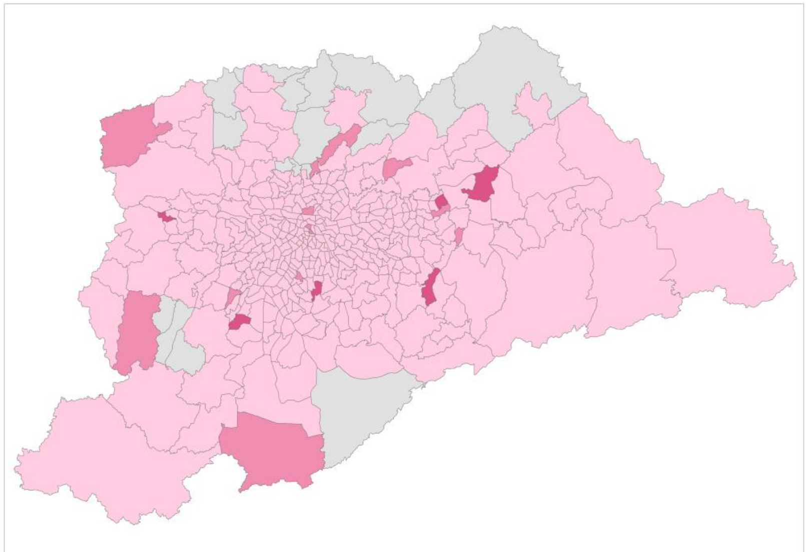
Population, 2007



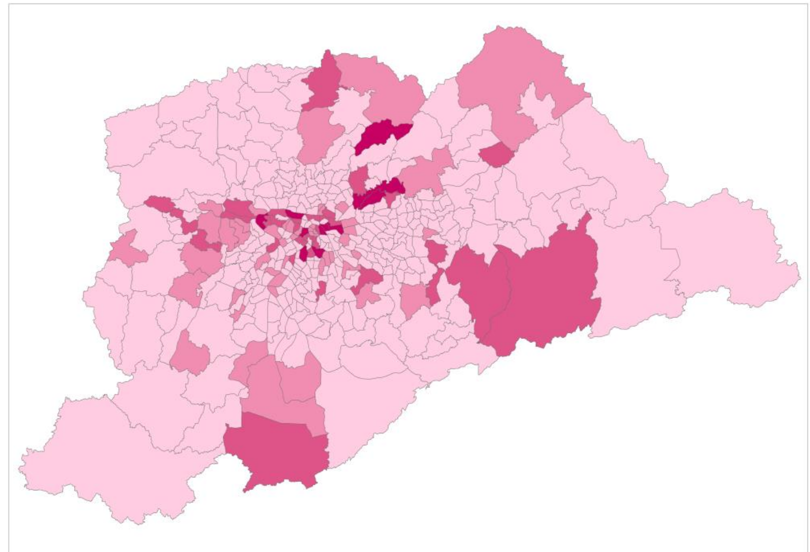
Population (thousand)

<15
15-30
30-60
60-150
>150

Time Private Vehicle, 1997



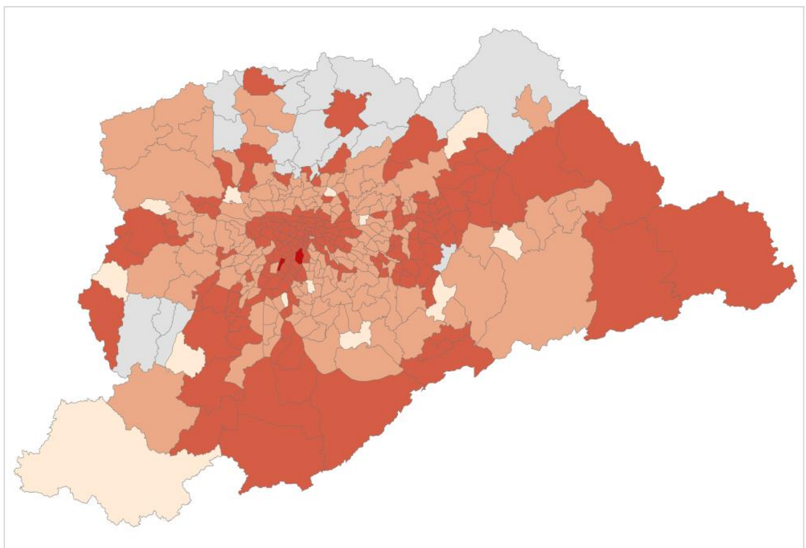
Time Private Vehicle, 2007



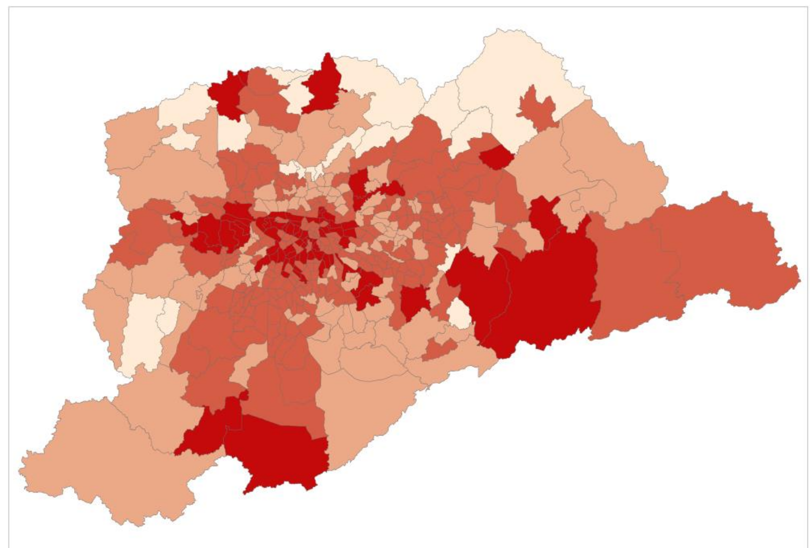
Time private vehicle

<45
45 – 60
60 – 90
>90

Time Collective Transport, 1997



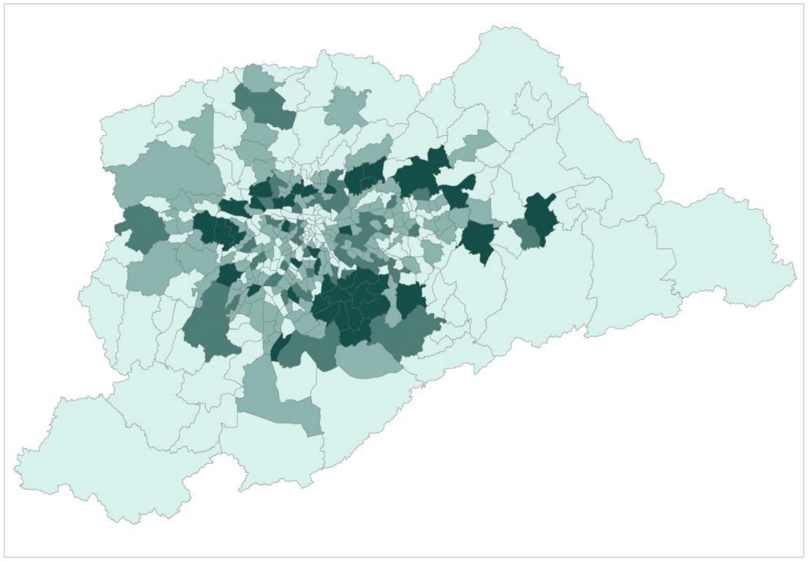
Time Collective Transport, 2007



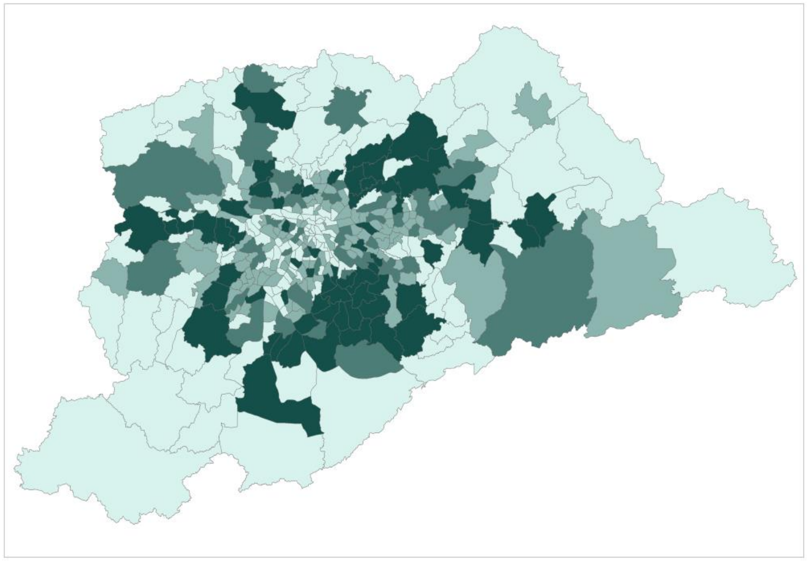
Time collective transp. (min)

<45
45 – 60
60 – 90
>90

Private Automobiles, 1997



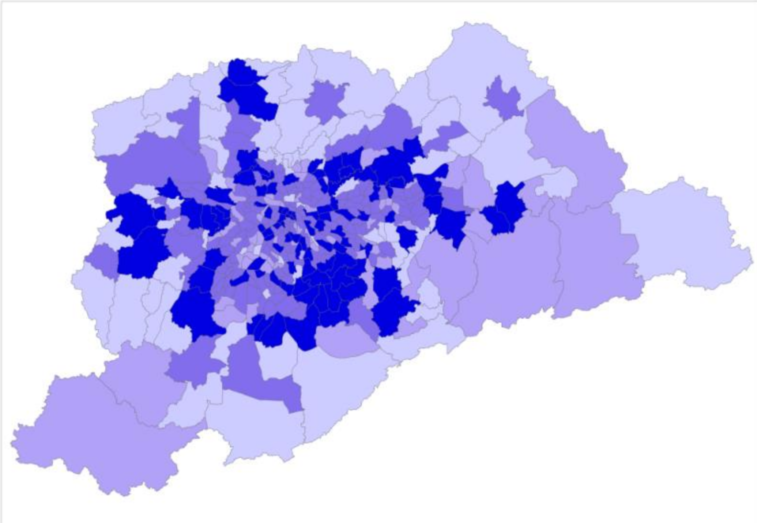
Private Automobiles, 2007



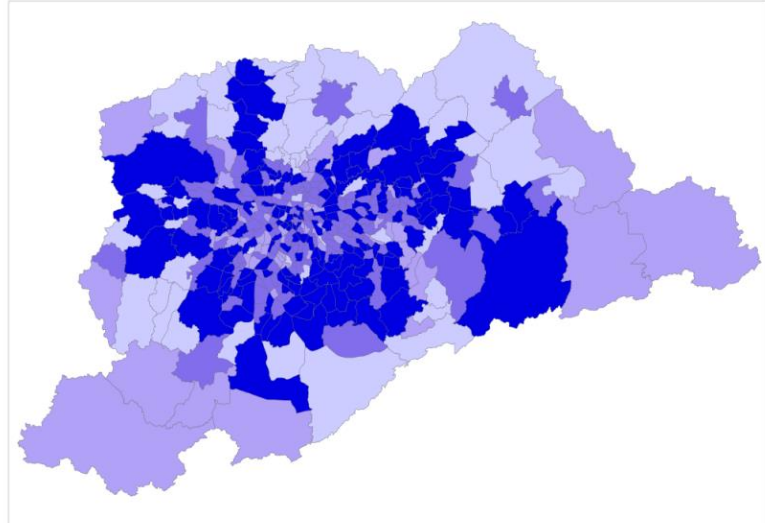
Private Automobiles

<5,000
5,000-10,000
10,000-15,000
>15,000

Generated Trips, 1997



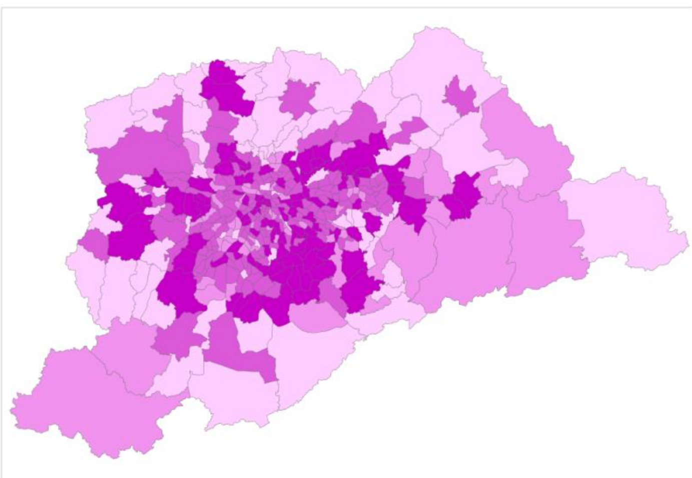
Generated Trips, 2007



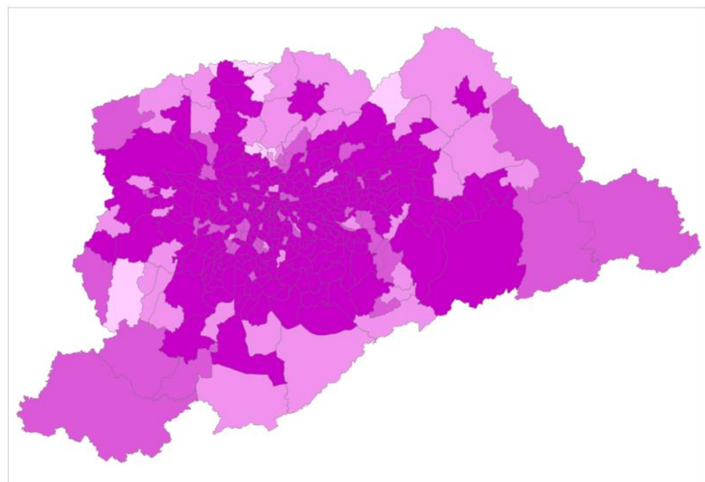
Generated Trips

<20,000
20,000-50,000
50,000-100,000
>100,000

Attracted Trips, 1997



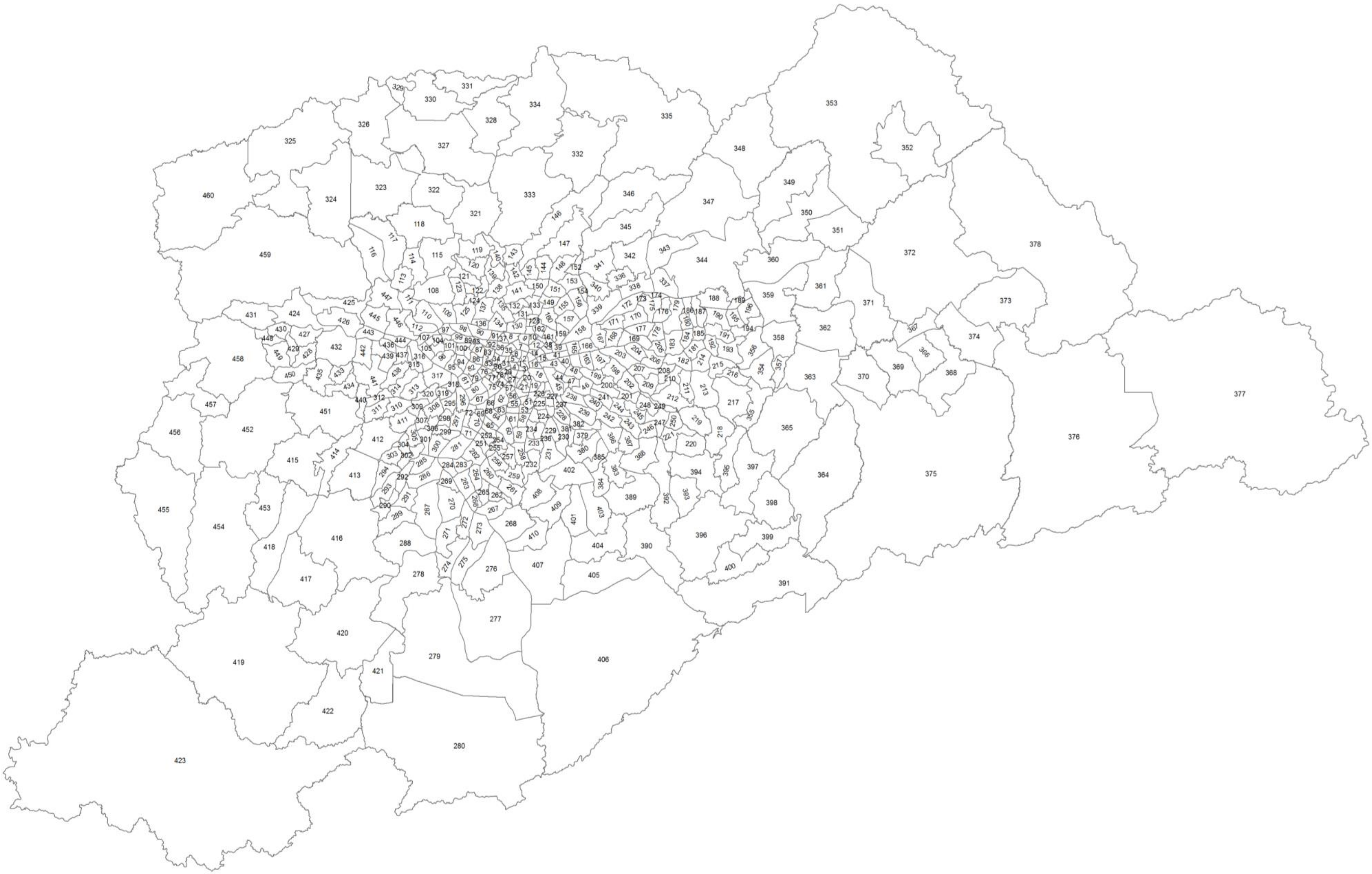
Attracted Trips 2007



Attracted Trips

<20,000
20,000-50,000
50,000-100,000
>100,000

Annex 4: Zoning



Annex 5: Zone Description (OD 2007)

Zone OD 2007	Zone OD 1997	Zone Name	Municipality
1	1	Sé	São Paulo
2	2	Parque Dom Pedro	São Paulo
3	3	Praça João Mendes	São Paulo
4	4	Ladeira da Memória	São Paulo
5	5	República	São Paulo
6	6	Santa Efigênia	São Paulo
7	7	Luz	São Paulo
8	19	Bom Retiro I	São Paulo
9	19	Bom Retiro II	São Paulo
10	20	Canindé I	São Paulo
11	20	Canindé II	São Paulo
12	21	Pari	São Paulo
13	22	Bresser I	São Paulo
14	22	Bresser II	São Paulo
15	22	Bresser III	São Paulo
16	8	Brás I	São Paulo
17	8	Brás II	São Paulo
18	9	Independência	São Paulo
19	10	Cambuci	São Paulo
20	11	Glicério	São Paulo
21	12	Aclimação I	São Paulo
22	12	Aclimação II	São Paulo
23	13	Liberdade I	São Paulo
24	13	Liberdade II	São Paulo
25	14	Bexiga I	São Paulo
26	14	Bexiga II	São Paulo
27	15	Bela Vista	São Paulo
28	16	Masp I	São Paulo
29	16	Masp II	São Paulo
30	17	Consolação I	São Paulo
31	17	Consolação II	São Paulo
32	17	Consolação III	São Paulo
33	36	Pacaembu I	São Paulo
34	36	Pacaembu II	São Paulo
35	18	Santa Cecília	São Paulo
36	38	Higienópolis	São Paulo
37	40	Barra Funda	São Paulo
38	23	Belenzinho I	São Paulo
39	23	Belenzinho II	São Paulo
40	24	Quarta Parada I	São Paulo
41	24	Quarta Parada II	São Paulo
42	24	Quarta Parada III	São Paulo
43	25	Moóca	São Paulo
44	26	Alto da Moóca	São Paulo
45	27	Parque da Moóca	São Paulo
46	55	Regente Feijó	São Paulo
47	53	Água Rasa I	São Paulo
48	53	Água Rasa II	São Paulo
49	30	Vila Mariana I	São Paulo
50	30	Vila Mariana II	São Paulo
51	30	Vila Mariana III	São Paulo
52	30	Vila Mariana IV	São Paulo
53	62	Santa Cruz	São Paulo
54	64	Vila Clementino	São Paulo
55	31	Lins de Vasconcelos I	São Paulo
56	31	Lins de Vasconcelos II	São Paulo
57	32	Paraíso	São Paulo
58	63	Bosque da Saúde	São Paulo
59	109	Miguel Estéfano	São Paulo
60	111	Planalto Paulista	São Paulo
61	65	Mirandópolis	São Paulo
62	66	Parque Ibirapuera I	São Paulo
63	66	Parque Ibirapuera II	São Paulo
64	116	Moema	São Paulo
65	117	Bandeirantes	São Paulo
66	67	Vila Nova Conceição	São Paulo
67	69	Chácara Itaim	São Paulo
68	121	Vila Olimpia I	São Paulo
69	121	Vila Olimpia II	São Paulo

70	123	Brooklin	São Paulo
71	124	Vila Cordeiro	São Paulo
72	122	Berrini	São Paulo
73	33	Pamplona I	São Paulo
74	33	Pamplona II	São Paulo
75	68	Jardins	São Paulo
76	35	Clínicas	São Paulo
77	34	Trianon I	São Paulo
78	34	Trianon II	São Paulo
79	71	Jardim Paulistano	São Paulo
80	70	Jardim Europa	São Paulo
81	72	Pinheiros	São Paulo
82	73	Vila Madalena	São Paulo
83	37	Cardoso de Almeida I	São Paulo
84	37	Cardoso de Almeida II	São Paulo
85	37	Cardoso de Almeida III	São Paulo
86	74	Perdizes I	São Paulo
87	74	Perdizes II	São Paulo
88	76	Pompéia I	São Paulo
89	76	Pompéia II	São Paulo
90	41	Água Branca I	São Paulo
91	41	Água Branca II	São Paulo
92	39	Sumaré I	São Paulo
93	39	Sumaré II	São Paulo
94	75	Vila Beatriz	São Paulo
95	130	Alto de Pinheiros I	São Paulo
96	130	Alto de Pinheiros II	São Paulo
97	79	Santa Marina I	São Paulo
98	79	Santa Marina II	São Paulo
99	77	Lapa	São Paulo
100	78	Vila Ipojuca I	São Paulo
101	78	Vila Ipojuca II	São Paulo
102	78	Vila Ipojuca III	São Paulo
103	132	Vila Hamburguesa I	São Paulo
104	132	Vila Hamburguesa II	São Paulo
105	133	Vila Leopoldina I	São Paulo
106	133	Vila Leopoldina II	São Paulo
107	133	Vila Leopoldina III	São Paulo
108	140	Vila Zatt	São Paulo
109	139	Pirituba	São Paulo
110	137	São Domingos	São Paulo
111	138	Jardim Mutinga	São Paulo
112	136	Jaguara	São Paulo
113	208	Jaraguá I	São Paulo
114	208	Jaraguá II	São Paulo
115	209	Parada de Taipas	São Paulo
116	270	Parque Morro Doce	São Paulo
117	271	Anhanguera	São Paulo
118	272	Perus	São Paulo
119	211	Vista Alegre	São Paulo
120	210	Jardim Damasceno	São Paulo
121	145	Vila Terezinha	São Paulo
122	144	Brasilândia	São Paulo
123	143	Vila Morro Grande	São Paulo
124	142	Itaberaba	São Paulo
125	141	Freguesia do Ó	São Paulo
126	44	Carandiru I	São Paulo
127	44	Carandiru II	São Paulo
128	45	Tietê I	São Paulo
129	45	Tietê II	São Paulo
130	43	Parque Anhembi	São Paulo
131	83	Santana	São Paulo
132	84	Santa Terezinha	São Paulo
133	85	Jardim São Paulo	São Paulo
134	42	Casa Verde	São Paulo
135	82	Parque Peruche	São Paulo
136	80	Limão	São Paulo
137	81	Casa Verde Alta	São Paulo
138	146	Cachoeirinha	São Paulo
139	147	Jardim Peri	São Paulo
140	212	Reserva da Cantareira	São Paulo
141	148	Mandaqui	São Paulo
142	149	Horto Florestal	São Paulo
143	213	ETA Guaraú	São Paulo

		Pq Palmas do	
144	152	Tremembé	São Paulo
145	151	Tremembé	São Paulo
146	214	Cantareira	São Paulo
147	215	Jardim das Pedras	São Paulo
148	155	Jardim Guapira	São Paulo
149	86	Parada Inglesa	São Paulo
150	150	Tucuruvi	São Paulo
151	153	Vila Gustavo	São Paulo
152	156	Cohab Jova Real	São Paulo
153	154	Jaçanã	São Paulo
154	89	Parque Edu Chaves	São Paulo
155	87	Vila Medeiros	São Paulo
156	88	Jardim Brasil	São Paulo
157	49	Jardim Japão	São Paulo
158	50	Parque Novo Mundo	São Paulo
159	48	Vila Maria	São Paulo
160	47	Vila Isolina Mazzei	São Paulo
161	46	Vila Guilherme I	São Paulo
162	46	Vila Guilherme II	São Paulo
163	52	Tatuapé I	São Paulo
164	52	Tatuapé II	São Paulo
165	51	Pq São Jorge I	São Paulo
166	51	Pq São Jorge II	São Paulo
167	91	Penha	São Paulo
168	93	Tiquatira	São Paulo
169	164	Vila Esperança	São Paulo
170	160	Rui Barbosa	São Paulo
171	92	Cangaíba	São Paulo
172	159	Eng.Goulart	São Paulo
173	159	USP Leste I	São Paulo
174	161	USP Leste II	São Paulo
175	161	Ermelino Matarazzo	São Paulo
176	218	Parque Buturussu	São Paulo
177	162	Ponte Rasa	São Paulo
178	163	Águia de Haia	São Paulo
179	219	Limoeiro	São Paulo

180	220	Vila Jacuí	São Paulo
181	226	Parada XV	São Paulo
182	227	Itaquera	São Paulo
183	223	Vila Campanela	São Paulo
184	224	Rio Verde	São Paulo
185	225	Saudade	São Paulo
186	221	São Miguel Paulista	São Paulo
187	222	Cidade Nitro-Operária	São Paulo
188	279	Jardim Helena	São Paulo
189	280	Jardim Romano	São Paulo
190	281	Vila Curuçá	São Paulo
191	284	Jardim Robru	São Paulo
192	286	Lageado	São Paulo
193	287	Fabrica Bandeirantes	São Paulo
194	285	Fazenda Itaim	São Paulo
195	282	Itaim Paulista	São Paulo
196	283	Jardim das Oliveiras	São Paulo
197	95	Vila California	São Paulo
198	96	Vila Carrão	São Paulo
199	54	Jardim Anália Franco	São Paulo
200	97	Vila Formosa	São Paulo
201	171	Sapopemba	São Paulo
202	169	Aricanduva	São Paulo
203	94	Vila Matilde	São Paulo
204	166	Vila Guilhermina	São Paulo
205	165	Cidade A.E.Carvalho	São Paulo
206	167	Artur Alvim	São Paulo
207	168	Cidade Lider	São Paulo
208	228	Santa Marcelina	São Paulo
209	170	Parque Savoy	São Paulo
210	229	Vila Carmosina	São Paulo
211	230	Fazenda Caguaçú	São Paulo
212	231	Parque do Carmo	São Paulo
213	292	Gleba do Pessêgo	São Paulo
214	289	José Bonifácio	São Paulo
215	290	Guaianazes	São Paulo
216	291	Juscelino Kubitschek	São Paulo

217	293	Cidade Tiradentes	São Paulo
218	295	Terceira Divisão	São Paulo
219	294	Iguatemi	São Paulo
220	296	Parque São Rafael	São Paulo
221	236	Rodolfo Pirani	São Paulo
222	58	Ipiranga I	São Paulo
223	58	Ipiranga II	São Paulo
224	59	Nazaré I	São Paulo
225	59	Nazaré II	São Paulo
226	29	Vila Monumento	São Paulo
227	28	Vila Independência	São Paulo
228	101	Vila Carioca	São Paulo
229	103	Moinho Velho	São Paulo
230	104	São João Clímaco	São Paulo
231	106	Sacomã	São Paulo
232	108	Parque do Estado	São Paulo
233	107	Vila Moraes	São Paulo
234	61	Jardim da Saúde I	São Paulo
235	61	Jardim da Saúde II	São Paulo
236	60	Jardim Previdência	São Paulo
237	57	Quinta Parada	São Paulo
238	56	Orfanato	São Paulo
239	100	Vila Zelina	São Paulo
240	99	Linhas Corrente	São Paulo
241	98	Vila Ema	São Paulo
242	175	Parque São Lucas	São Paulo
243	176	Parque Sta Madalena	São Paulo
244	173	Jardim Colorado	São Paulo
245	174	Teotêonio Vilela	São Paulo
246	235	Fazenda da Juta	São Paulo
247	233	São Mateus	São Paulo
248	172	Cidade IV Centenário	São Paulo
249	232	Rio Claro	São Paulo
250	234	Cidade Satélite	São Paulo
251	120	Joaquim Nabuco	São Paulo
252	119	Vieira de Moraes	São Paulo
253	118	Campo Belo	São Paulo
254	112	Congonhas	São Paulo
255	114	Jardim Aeroporto	São Paulo
256	115	Vila Santa Catarina	São Paulo
257	113	Jabaquara	São Paulo
258	110	Cidade Vargas	São Paulo
259	182	Jardim Bom Clima	São Paulo
260	185	Cupecê	São Paulo
261	183	Jardim Miriam	São Paulo
262	184	Vila Missionária	São Paulo
263	189	Jurubatuba	São Paulo
264	188	Vila São Pedro	São Paulo
265	186	Campo Grande	São Paulo
266	187	Vila Sabará	São Paulo
267	245	Mar Paulista	São Paulo
268	244	Pedreira	São Paulo
269	250	Vila Socorro	São Paulo
270	248	Parque Interlagos	São Paulo
271	249	Jardim Represa	São Paulo
272	247	Rio Bonito	São Paulo
273	246	SESC Interlagos	São Paulo
274	303	Jardim Presidente	São Paulo
275	302	Grajaú	São Paulo
276	301	Cocaia	São Paulo
277	347	Bororé	São Paulo
278	349	Jaceguava	São Paulo
279	348	Parelheiros	São Paulo
280	382	Marsilac	São Paulo
281	193	Granja Julieta	São Paulo
282	190	Chácara Flora	São Paulo
283	191	Santo Amaro	São Paulo
284	192	Vila Miranda	São Paulo
285	254	Jardim São Luis	São Paulo
286	252	Centro Empresarial	São Paulo
287	251	Guarapiranga	São Paulo
288	304	Jardim Capela	São Paulo
289	305	Riviera	São Paulo
290	306	M' Boi Mirim	São Paulo

291	253	Jardim Angela	São Paulo
292	255	Capão Redondo	São Paulo
293	307	Adventista	São Paulo
294	308	Parque Fernanda	São Paulo
295	127	Morumbi	São Paulo
296	126	Joquei Clube	São Paulo
297	125	Fazenda Morumbi	São Paulo
298	128	Real Parque	São Paulo
299	194	Paraisópolis	São Paulo
300	195	Jardim Vitória Régia	São Paulo
301	196	Vila Suzana	São Paulo
302	256	Parque Arariba	São Paulo
303	259	Jardim Mitsutani	São Paulo
304	258	Pirajussara	São Paulo
305	257	Jardim Umarizal	São Paulo
306	197	Portal do Morumbi	São Paulo
307	198	Vila Sonia I	São Paulo
308	198	Vila Sonia II	São Paulo
309	200	Jardim Maria do Carmo	São Paulo
310	262	Jardim Cambará	São Paulo
311	263	Jardim João XXIII	São Paulo
312	264	Raposo Tavares	São Paulo
313	201	Rio Pequeno	São Paulo
314	202	Jardim Adalgiza	São Paulo
315	135	Parque Continental	São Paulo
316	134	Jaguaré	São Paulo
317	131	Cidade Universitária	São Paulo
318	129	Jardim Caxingui I	São Paulo
319	129	Jardim Caxingui II	São Paulo
320	199	Jardim Bonfiglioli	São Paulo
321	273	Melhoramentos	Caieiras
322	324	Caieiras	Caieiras
323	323	Santa Inês	Caieiras
324	322	Cajamar	Cajamar
325	358	Anhanguera	Cajamar
326	359	Cristais	Franco da Rocha
327	325	Franco da Rocha	Franco da Rocha
328	363	Juqueri	Franco da Rocha
329	360	Sete Voltas	Francisco Morato
330	361	Francisco Morato	Francisco Morato
331	362	Cascatas	Francisco Morato
332	326	Mairiporã	Mairiporã
333	274	Paiva Castro	Mairiporã
334	364	Colinas	Mairiporã
335	365	Pirucaia	Mairiporã
336	158	Guarulhos	Guarulhos
337	90	Rod.Presidente Dutra I	Guarulhos
338	90	Rod.Presidente Dutra II	Guarulhos
339	90	Rod.Presidente Dutra III	Guarulhos
340	157	Vila Galvão I	Guarulhos
341	157	Vila Galvão II	Guarulhos
342	217	Jardim América	Guarulhos
343	277	Cumbica	Guarulhos
344	278	Pimentas	Guarulhos
345	216	Picanço	Guarulhos
346	275	Morro dos Macacos	Guarulhos
347	276	Estr.de Nazaré Paulista	Guarulhos
348	366	Vasconcelândia	Guarulhos
349	327	Arujazinho	Arujá
350	328	Arujá	Arujá
351	330	Fazenda Velha	Arujá
352	368	Santa Isabel	Santa Isabel
353	367	Jaguari	Santa Isabel

354	336	Ferraz de Vasconcelos	Ferraz de Vasconcelos
355	340	Paiol Velho	Ferraz de Vasconcelos
356	288	Santos Dumont	Ferraz de Vasconcelos
357	337	Jardim São José	Poá
358	334	Poá	Poá
359	331	Itaquaquecetuba	Itaquaquecetuba
360	329	Bonsucesso	Itaquaquecetuba
361	332	Pinheirinho	Itaquaquecetuba
362	335	Miguel Badra	Suzano
363	338	Suzano	Suzano
364	341	Ouro Fino I	Suzano
365	341	Ouro Fino II	Suzano
366	372	Mogi das Cruzes I	Mogi das Cruzes
367	372	Mogi das Cruzes II	Mogi das Cruzes
368	375	Mogi das Cruzes III	Mogi das Cruzes
369	371	Brás Cubas	Mogi das Cruzes
370	339	Jundiapeba	Mogi das Cruzes
371	333	Jd. Graziella	Mogi das Cruzes
372	369	Itapeti	Mogi das Cruzes
373	374	Sabaúna	Mogi das Cruzes
374	373	César de Souza	Mogi das Cruzes
375	375	Reservatório de Jundiaí	Mogi das Cruzes
376	376	Biritiba Mirim	Biritiba-Mirim
377	377	Salesópolis	Salosópolis
378	370	Guararema	Guararema
379	105	Boa Vista	São Caetano do Sul
380	178	Vila Gerti	São Caetano do Sul
381	102	São Caetano do Sul I	São Caetano do Sul
382	102	São Caetano do Sul II	São Caetano do Sul
383	179	Santo André I	Santo André
384	179	Santo André II	Santo André
385	177	Utinga I	Santo André
386	177	Utinga II	Santo André
387	177	Utinga III	Santo André
388	237	Parque das Nações	Santo André
389	239	Jardim do Estádio	Santo André
390	298	Parque do Pedroso	Santo André
391	380	Paranapiacaba	Santo André
392	238	Capuava	Mauá
393	297	Mauá I	Mauá
394	297	Mauá II	Mauá
395	342	Vista Alegre	Mauá
396	345	Ribeirão Pires	Ribeirão Pires
397	343	Jardim Santa Luzia	Ribeirão Pires
398	344	Ouro Fino Paulista	Ribeirão Pires
399	378	Parque Sete Pontes	Rio Grande da Serra
400	379	Rio Grande da Serra	Rio Grande da Serra
401	241	Planalto	São Bernardo do Campo
402	180	Rudge Ramos	São Bernardo do Campo
403	240	São Bernardo do Campo	São Bernardo do Campo
404	299	Demarchi	São Bernardo do Campo

405	346	Riacho Grande I	São Bernardo do Campo
406	381	Caminho do Mar	São Bernardo do Campo
407	300	Reservatório Billings	São Bernardo do Campo
408	181	Diadema	Diadema
409	242	Piraporinha	Diadema
410	243	Eldorado	Diadema
411	260	Taboão	Taboão da Serra
412	261	Parque Pinheiros	Taboão da Serra
413	309	Santo Eduardo	Embu
414	310	Embu	Embu
415	311	Ressaca	Embu
416	351	Itapecerica da Serra	Itapecerica da Serra
417	352	Jardim Petrópolis	Itapecerica da Serra
418	353	Embu-Mirim	Itapecerica da Serra
419	384	São Lourenço da Serra	São Lourenço da Serra
420	350	Embu-Guaçu	Embu-Guaçu
421	383	Cipó I	Embu-Guaçu
422	383	Cipó II	Embu-Guaçu
423	385	Juquitiba	Juquitiba
424	319	Barueri	Barueri
425	269	Aphaville	Barueri
426	268	Tamboré	Barueri
427	317	Quitaúna	Barueri
428	315	Jardim Silveira I	Barueri
429	315	Jardim Silveira II	Barueri
430	315	Jardim Silveira III	Barueri
431	320	Jardim Belval	Barueri
432	267	Carapicuiba I	Carapicuiba

433	267	Carapicuiba II	Carapicuiba
434	313	Aldeia da Carapicuiba I	Carapicuiba
435	313	Aldeia da Carapicuiba II	Carapicuiba
436	204	Osasco I	Osasco
437	204	Osasco II	Osasco
438	203	Santo Antonio I	Osasco
439	203	Santo Antonio II	Osasco
440	265	Jardim das Flores	Osasco
441	266	Jardim Veloso I	Osasco
442	266	Jardim Veloso II	Osasco
443	205	Jardim Piratininga I	Osasco
444	205	Jardim Piratininga II	Osasco
445	206	Mutinga I	Osasco
446	206	Mutinga II	Osasco
447	207	Três Montanhas	Osasco
448	318	Ribeirão Itaqui	Jandira
449	316	Jandira	Jandira
450	314	Ribeirão das Pombas	Jandira
451	312	Granja Viana	Cotia
452	355	Cotia	Cotia
453	354	Capueira	Cotia
454	386	Caucaia	Cotia
455	387	Caucaia do Alto	Cotia
456	388	Vargem Grande Paulista	Vargem Grande Paulista
457	389	Quatro Encruzilhadas	Itapevi
458	356	Itapeví	Itapevi
459	321	Santana de Parnaíba	Santana de Parnaíba
460	357	Pirapora do Bom Jesus	Pirapora do Bom Jesus