This article summarizes the main conclusions of the study “The impact of Metro’s Line 4 on poverty in the São Paulo Metropolitan Region (SPMR)”\(^3\). In the last decade there was a significant increase in the number of poor in the SPMR, and that accounts for the biggest poverty growth rate in the entire country. The profile of this metropolitan poverty is characterized by unemployment, income decline and its location in the most peripheral areas of the capital where the lack of urban services and public transport supply are dominant. The result is the low mobility of this population, who are “imprisoned” in areas which are the farthest from job centers and are condemned to a social and spatial exclusion, which keeps them away from the benefits and opportunities brought about by job opportunities, services and economical and cultural facilities available in the SPMR.

In this context, Line 4 may be of strategic importance in promoting the social and urban inclusion of such groups. The wide network integration created by this new metrorail line will serve a very large catchment area where 79% of the metropolitan poverty is located. This will increase accessibility of the low-income workers to the most dynamic labor markets in the city, with cheaper and shorter trips. In the surrounding areas of Line 4 there are approximately 1.2 million jobs (30% of which are low skilled jobs), as well as the most crucial health, education and recreation facilities of the city. In the first phase, it is estimated that about twenty-four percent (24%) of Line 4 future users will be passengers living below the poverty line (US$2 income per person per day), a proportion that far surpasses their present participation in other Metro lines (13%) or city buses (19%). If the proposed network integration is achieved, the participation of the poor in Line 4’s ridership will tend to increase in a way similar to what happened with other recent metrorail investments in the periphery. Finally, the impact of Line 4 will enhance the economic and social dynamics of its catchment areas, and will stimulate the development of larger suburban regions. This, in turn, will help in reducing the inequality gaps between the different areas in the city, improving the “habitat” for the poor and contributing to the alleviation of poverty by addressing the mobility factor which, according to recent surveys, is one of the main causes for such poverty.

1. INVESTMENTS IN PUBLIC TRANSPORT AS A STRATEGY FOR SOCIAL INCLUSION

In recent years, most infrastructure related loans financed by the World Bank require a very detailed evaluation of the impact of the proposed project on poverty alleviation. This

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\(^{3}\) Study by Marcia Barone, of the São Paulo Metro Planning Department, to provide the elements for analysis of the urban impact of Line 4 on poverty. The authors are thankful to João C. Scatena of the São Paulo Metro for his support.
evaluation is designed to show the impacts of the project on the low-income population segments who are potential users of the infrastructure systems financed by the Bank. The basic philosophy behind this requirement is to ensure that the low-income population will be better rather than worse off with the implementation of the infrastructure financed by the Bank. In the case of the São Paulo Metro Line 4, Metro and Bank staff prepared an evaluation which is summarized below, highlighting a number of actions which must be taken to ensure that in the long-run, low-income users will be the main beneficiaries of the system.

Brazilian urban planners have recently come to a consensus on the problems facing urban centers of Brazil, and agreed that public transport is an essential factor to shape the living conditions of the city’s inhabitants. In today’s economy, this view is particularly true for the poorer segments of society, especially when we consider that in the last decade Brazilian poverty increased mainly in the urban areas and their living conditions have deteriorated. This is an important point to consider when adopting strategies or action plans that may be truly effective in combating urban poverty.

Results from the recently published 2000 Census reinforce these claims, and show that the social indicators traditionally used to measure Brazilian poverty (rate of mortality, sanitation improvements, illiteracy) reveal considerable improvement. However, poverty and social inequality rates (both in absolute and relative terms) measured by household per capita income, remained basically the same or got worse. Such inelastic behavior of those rates in relation to the traditional indicators suggest that, nowadays, poverty in the SPMR has a different profile from before and is now determined by other factors. In searching for these new determining factors of urban poverty, it was found in recent surveys, that deficiencies in public transport have a strong bearing on poverty (see section 3 below). Investing in public transportation in order to decrease the social deficit in these areas is now presented as one of the most effective strategies of social inclusion for the low-income population.

2. POVERTY\textsuperscript{4} IN THE SPMR

At present, the SPMR is the region of the country where poverty is increasing at the fastest pace. Its poverty rate increased from 20% in 1990 to 39% in 1999, with more than 6.4 million people living in poverty. Since then, a considerable part of the Brazilian urban poverty is located mainly in the most peripheral areas of the SPMR, as well as in different points of its central region. Recent data concerning the explosive increase of unemployment in the city of São Paulo between 2000 and 2002, and the decline in the household income of the poorest in the same period, suggest that the tendency for poverty to increase still persists and is worsening in the last few years. Additionally, the profile of this urban poverty is changing, being created today by unemployment, spatial exclusion and lack of

\textsuperscript{4} The poverty line adopted in this study is the one defined by Sonia Rocha, of the Applied Economic Research Institute/IPEA, for the SPMR, which is R$152.51 monthly/capita (in values of september/1997,) or approximately US$2 to 3 day/capita.
mobility and access to dynamic city centers. This leads to a vicious circle of “lack of services and opportunities” which is difficult to break.

**Poverty in Brazil today is urban**

In the most recent decades, Brazil has shown some improvement in its global social indicators – illiteracy rates, infant mortality, basic education and health. However, its social inequality indicators remain at the same level. It is this very inequality which explains the ongoing absolute poverty in the entire country, which still has about one third of its population living under the poverty line – 54.4 millions corresponding to 34.95% of the population of the country in 1999, according to the analysis by IPEA, taken from data collected by the Brazilian Institute of Geography and Statistics/IBGE. Information obtained from the National Research Home Survey/PNAD, from the same institute, also reveals the tendencies of the latter part of the 1990s to encompass different regional trajectories: on one hand, sustained reduction of absolute poverty in rural zones and in the northeast region of the country; and on the other, deterioration of these rates in the cities and metropolitan regions. Brazil now has a new poverty profile, located predominantly in urban areas - if we consider that 78% of the poor in Brazil live in cities and urban centers.

<table>
<thead>
<tr>
<th>Absolute number of poor (x 1,000)</th>
<th>Location of poor Brazilian population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan Areas*</td>
<td>32.12%</td>
</tr>
<tr>
<td>Urban Areas</td>
<td>45.95%</td>
</tr>
<tr>
<td>Rural Areas</td>
<td>21.93%</td>
</tr>
<tr>
<td><strong>Total Brazil</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Source: based on data from PNAD, reviewed by IPEA
Poverty line definition based in Pesquisa de Orçamento Familiar/POF from IBGE

Poverty has increased in the urban regions, and especially in big cities, due to the changes in productive systems and employment markets determined by the new trends of economic restructuring. The result of these economic changes was a loss of jobs for workers, especially those with low qualifications (up to 4 years of education). Between the second semester of 1994 (when the “Real” Economic Plan was launched) and May 1999, according to IBGE, 1.3 million jobs suitable for this category of low-skilled worker were eliminated. At the same time, there was a decline in the average income of these poor workers, who represent one fourth of the available labor in the metropolitan areas. In 1999, this decline was about 11%. Data from the same source, prepared by IPEA, revealed that the total amount of poor in the population of the Brazilian metropolitan regions jumped from 31% in 1995 to 33% in 1997 and 37% in 1999. The increasing level of unemployment
in the last five years, mainly in these metropolitan areas, allows us to conclude that such proportion continues to grow.

**SPMR’s poverty shows the highest growth in the country**

The “metropolization of poverty” is most obvious in the SPMR, which revealed the highest growth rate of poor of all Brazilian metropolitan regions. According to the IPEA analysis, the rate of poverty in metropolitan São Paulo grew from 20% in 1990 to 32% in 1997, and 39% in 1999. According to these data, at that time about 1/3 of the total amount of poor located in the six metropolitan regions of the country (17.4 million) was concentrated in the SPMR (6.4 million). IPEA’s analysis still shows that from 1995 to 1997 the absolute increase of poor in the SPMR (954,000) was practically identical to the increase verified in the same period in the Northeast region all together (984,000). However, while this data represented an increase of 4.4% in the poverty of the northeast, in the SPMR such increase represented 22.5% of its total poor population.

Analysis of the issue clearly reveals the connection between the metropolitan poverty growth and the acceleration of the unemployment in the region. According to the Employment/Unemployment Research/PED from SEADE Foundation5, after the Economic Plan of 1994 and until 1999, the unemployment rate in the metropolitan regions experienced a significant increase. And as of the year 2000, there has been an explosive increase of such rate, reaching 20.4% of the economically active metropolitan population in April 2002 (about 1.4 million people) while in Brazil as a whole, this rate is about 15%. This trend suggests a considerable increase in the poverty rate of the SPMR for these last few years, and probably the number of poor in the metropolis by 2002 will be much more than 6 million. An indication of this poverty acceleration is the growth in the number of families living in slums of the SPMR which, according to the Life Conditions Research Survey from FSEADE between 1994 and 1998, grew about 47% (from 6.2% of the families living in slums in 1994 to 9.1%, and from 4.6% to 5% for families living in the slum tenement-houses).

**Income grows while poverty and social inequality gap is widening**

What may seems contradictory is that this poverty growth in the SPMR took place while the metropolitan average household income increased as a whole, from R$1,218.00 per month in 1987 to R$1,567.00 per month in 1997 (with an average for the SPMR of R$1,000.00 per month, or 8 minimum salaries for the period). This is mainly a result of the improvement in buying capacity that accompanied the end of inflation with the “Real” Plan. However, this income growth was very unevenly distributed between socio-economic layers and between the different SPMR municipalities. Only the central municipalities of the SPMR, as well as the higher income populations, had positive variations, while the lowest income groups and peripheral municipalities (the same ones which indicated excessive population growth rates in the same decade, according to

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5 Research as a result of an agreement between State System Foundation of Demographic and Economic Analysis/FSEADE and the Inter Union Department of Economic and Social Studies/DIEESE.
Census 2000) showed a decrease in the average household income, with a negative income variation of more than 20.0% for the lowest decile. Recent information from PME/IBGE confirm the increase in the inequality index, showing that in 1998 in the SPMR, 50% of the poorest held 15.6% of total income while 1% of the richest received very close to this percentage (12.1%). For the more recent period, the PED statistics from FSEADE concerning household income indicate a decline in the average income as a whole, implying a worsening of the poverty situation outlined above.

**Figure 1 : Income variation by decile between 1987 and 1997 in the SPMR**

![Average household incomes](image)

**Source:** Convênio SEADE-DIEESE-PED

**Inflator Used IGP**

### 3. POVERTY AND PUBLIC TRANSPORT IN SPMR

The poor in the metropolitan area have very low mobility and restricted use of public transport. Long distances, long trip times, deficiencies in public transport supply in the peripheral areas and lack of an integrated fare system are the main reasons for these restrictions. In addition, the new metropolitan poverty profile, with high rates of unemployment and decreasing incomes, reduces the motivation for displacements and excludes these segments of the population from benefits such as the “vale-transporte”, a federally mandated subsidy which forces employers to pay the difference between 6% of their salaries and the cost of home-to-work trips to its formal employees. But this requires that the poor be formally employed when in reality a lot of them are autonomous or unemployed. Thus, investments that may guarantee better operational and tariff integration

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6 Data for richest decile were too heterogeneous to have a statistical significance and have been excluded from this figure.

7 For the analysis of the relation between poverty and transport, it was adopted as a poverty line limit the household revenue of R$600.00 in values of October 1997, or 5 minimum salaries at that time. This threshold is based on the poverty line of IPEA/Sonia Rocha of R$152.51 household revenue per person, multiplied by the number of average members (4) in a poor household.
between the existing public transport networks can help in increasing the accessibility of the poor to the metropolitan centers of employment. The proposed Line 4 project fits in this category and will certainly tend to increase the level of mobility of the poor population.

_The poor are being pushed away to the fringes of the metropolitan areas_

The 1997 São Paulo Origin-Destination survey allows us to draw a poverty distribution map in the metropolitan region and shows the weight of poor households (up to 5 minimum salaries of monthly household income) in the total number of households located in the various neighborhoods of the SPMR. Data from the latest research confirms the concentration of lower income segments in the fringes of the SPMR.

**Map 1 – Location of households by income range in the metropolitan area**

![Map of São Paulo showing poverty distribution by income range](image)

*Source: 1997 OD survey/CMSP*

In the last decade, the displacement of poor people to remote suburbs, has been accentuated by the unemployment and income decline which has been worse for these groups than others. This traditional pattern of “peripheralization of the poor“ comes as a consequence of the Brazilian process of structuring urban spaces led by an unchecked private real estate attitude. Speculation and an enormous increase in land prices create an intraurban differential of prices so significant that it pushes away the poor population to the outlying fringes of the metropolis, where cheaper land is also synonymous of urban necessities, violence and social exclusion. More recent studies show variations in these pattern of
spatial and social segregation – with the recent ongoing “gentrification” of the extended center, displacement of the middle classes to the periphery and the consequent expulsion of the poor to areas even more distant. Consequently, the population growth rates of the peripheral municipalities exploded in the last years, as shown by the 2000 Census. Finally, in reaction to this process of being confined to the peripheries, part of these poor populations try to bypass the problems of distance and isolation by establishing “poverty islands” in the most central areas of the capital, which allow better access to the traditional employment centers (which includes low-paying unskilled jobs, adequate for the poor workers). The expansion of the slums and slum tenement-houses is due to this movement in the most central areas, creating poverty concentration which account for more than 10 or 20% of the total area population or as high as 35% in the most central areas.

**Poverty trips standards: low mobility and repressed demand for public transportation.**

Metropolitan poverty means minimal mobility – movement is accomplished primarily by walking and there is restricted use of public transportation. This trip standard refers to segments with a monthly household income up to R$600.00 or 5 sm (sm = minimum wage), corresponding to R$152.51 monthly/capita income. Although these groups represent 24% of the metropolitan population, they are less than 17% of the population being transported, and represent 19% of those using public transportation. This then can be considered as “repressed demand”, which the present transportation system cannot yet satisfy and, in the opinion of social scientists a social debt with these poor populations, which Public Authorities must correct. Comparison of mobility indexes between the richest and poorest reveals an impressive inequality, which is another facet of the social inequality which characterizes poverty in Brazil. The latest OD survey shows a daily mobility index (number of trips/day) of 1.16 and 1.47 for segments with lower income (up to R$250.00 and up to R$600.00 family monthly income). These are significantly lower rates than those for medium and high-income segments (mobility rate of 2.64 for the richest group). If one considers motorized trips only, these mobility differences per income are amplified with the higher income levels having mobility 4 times greater than that of lower income groups.

<table>
<thead>
<tr>
<th>Income level in R$ per month</th>
<th>All trips</th>
<th>Motorized trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 250</td>
<td>1.16</td>
<td>0.49</td>
</tr>
<tr>
<td>250 &lt; x &lt; 600</td>
<td>1.47</td>
<td>0.74</td>
</tr>
<tr>
<td>600 &lt; x &lt; 1000</td>
<td>1.76</td>
<td>0.99</td>
</tr>
<tr>
<td>1000 &lt; x &lt; 1800</td>
<td>2.07</td>
<td>1.35</td>
</tr>
<tr>
<td>1800 &lt; x &lt; 3600</td>
<td>2.34</td>
<td>1.80</td>
</tr>
<tr>
<td>More than 3600</td>
<td>2.64</td>
<td>2.27</td>
</tr>
<tr>
<td>SPMR</td>
<td>1.87</td>
<td>1.23</td>
</tr>
</tbody>
</table>

*Source: 1997 OD survey/CMSP*

Immobility rate per segment confirms this analysis. In fact, the number of people not traveling at all in relation to the total number of family members (which is 30% if we...
consider the whole population), is much higher for these low-income groups - surpassing 56% for the group earning less than R$250.00). These figures also confirm the degree of “imprisonment” this population experiences - confined in their peripheral areas of living.

Analysis of this low mobility profile for the two poorest groups indicates that trips are accomplished primarily by walking (58% and 50% of their trips, respectively for those earning up to R$250.00 and up to R$600.00); or by bus (22% and 28% of their trips); trips to or from work show low percentages for these groups (16% and 36%), if compared to the metropolitan average (41%). This comes as a result of high unemployment rates for these populations and indicates an occupational rate much lower for the poor (12% and 31%, compared with a rate of 55.1% for higher income groups). Travel time spent by the poor on motorized trips are the highest in comparison with travel time for trips by other segments. Finally, the poor families, in spite of their limited mobility, show the highest relative transportation expenditures - 30% and 18% of the household budget respectively for income groups up to R$250.00 and R$600.00, against less than 7% for the richest group.

Table 3: Breakdown of Transport Users by Mode and Socio-Economic layer (R$)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Up to 250</th>
<th>250-600</th>
<th>600-1000</th>
<th>1000-1800</th>
<th>1800-3600</th>
<th>&gt; 3600</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>4 %</td>
<td>15 %</td>
<td>23 %</td>
<td>31 %</td>
<td>20 %</td>
<td>7 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Private (motorized)</td>
<td>2%</td>
<td>5 %</td>
<td>11 %</td>
<td>23 %</td>
<td>32 %</td>
<td>28 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Walking</td>
<td>7 %</td>
<td>20 %</td>
<td>25 %</td>
<td>28 %</td>
<td>15 %</td>
<td>5 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Total population who travels</td>
<td>4 %</td>
<td>13 %</td>
<td>20 %</td>
<td></td>
<td></td>
<td></td>
<td>100 %</td>
</tr>
<tr>
<td>Total of SPMR Population</td>
<td>7 %</td>
<td>17 %</td>
<td>22 %</td>
<td>26 %</td>
<td>19 %</td>
<td>10 %</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Source: 1997 OD survey

This exclusion from the transport system is one of the symptoms of the overall exclusion of the poor and reflects their weak involvement in the social, cultural and economic life of the SPMR. Geographical exclusion is worsening, and together with unsatisfactory public transport supply for the peripheral municipalities, imposes lengthy trip times and uncomfortable and unsafe levels of service. The fragility of present integrated systems and the lack of a tariff policy, allowing inclusion of these poorer segments in the effective demand for public transportation, are amongst the factors which significantly reduce the choices of employment, the use of urban public services and the possibility of taking advantage of the opportunities of metropolitan life. In addition, lack of formal employment makes it impossible for the poor to use a series of subsidies and social protection measures, including the “vale-transporte”.
The negative impacts of this low mobility in the quality of life of those who are squeezed out of the central areas is noted in a study by the Secretaria Estadual de Transportes Metropolitanos (State Metropolitan Transport Secretary), about life conditions in the outskirts of the metropolitan area. This survey highlights the primary role played by public transportation in the lives of these poor populations, and includes statements that illustrate how the shortage of a safe, fast and affordable transportation system drastically prevents a good quality of life for the poor. For example, since the inhabitants of the suburbs have no proper public transportation system they miss employment opportunities or are fired because of delays due to transportation problems; they cannot follow through with their education; people die because of difficulties faced in getting to hospitals and they are unable to participate in general sporting or leisure activities, like going to a soccer match, to dance reunions, to the fast food restaurants, etc. In other words, they are denied almost everything that constitutes the richness of life in an urban center because their mobility is severely constrained.

4 – THE IMPACT OF LINE 4 ON METROPOLITAN POVERTY

Building Line 4 will produce benefits which will help combat metropolitan poverty, because it will effectively make accessible job and service areas which today are almost completely inaccessible to the poor. Additionally, it will guarantee them faster and more reliable traveling conditions, thereby saving time and money. Finally, by improving the economic and urban dynamics of its catchment areas, and democratizing the Metro network for the population of the periphery, it will bring improvements to the “habitat” of these populations – a necessary element for combating urban poverty. We explain why this will happen.

79% of metropolitan poverty reside inside the Line 4 catchment area

Line 4 catchment area, which can easily be traced by drawing its trip origin/destination zones, has a much wider metropolitan scope than any other existing Metro line, because of its strategic role in integrating the subway network with the suburban rail network, as well as with the municipal and inter-municipal bus system. The number of poor living inside this over-arching service area, which involves all metropolitan quadrants and certain portions of its suburbs, amounts to more than 3.150 million persons – that is 79% of the overall metropolitan poverty lies in this area. The majority of this group is located in districts located the longest distance from the capital, or in peripheral municipalities located west, southwest and east of the metropolitan region. But even in the surrounding area of Line 4, composed by central city zones with an employment and services profile, there are more than 22,000 households (50,000 individuals) living below the poverty line. These people would also benefit from the new line.

The table below highlights the weight of poor households in the municipalities which compose the regional catchment basin of Line 4, directly integrated with this line in the west, southwest and south metropolitan vectors.

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8 Survey on “the Conscience of the Metropolitan Region” of UTM/Secretary of Metropolitan Transport/STM-1999
Table 4 – Poor households in Line 4 regional catchment basin

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>Poor Households up to R$250,00*</th>
<th>NA</th>
<th>%</th>
<th>Poor Households from R$250 to R$600,00</th>
<th>NA</th>
<th>%</th>
<th>Poor Households Total</th>
<th>NA</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taboão da Serra</td>
<td>4.336</td>
<td>9.0</td>
<td></td>
<td>8.767</td>
<td>18.2</td>
<td></td>
<td>13.103</td>
<td>27.1</td>
<td></td>
</tr>
<tr>
<td>Embu</td>
<td>3.298</td>
<td>6.5</td>
<td></td>
<td>12.429</td>
<td>24.6</td>
<td></td>
<td>15.727</td>
<td>31.2</td>
<td></td>
</tr>
<tr>
<td>Cotia</td>
<td>2.377</td>
<td>7.6</td>
<td></td>
<td>6.223</td>
<td>19.9</td>
<td></td>
<td>8.599</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>Embu Guaçu</td>
<td>1.463</td>
<td>12.6</td>
<td></td>
<td>3.647</td>
<td>31.3</td>
<td></td>
<td>5.110</td>
<td>43.9</td>
<td></td>
</tr>
<tr>
<td>Itapecerica da Serra</td>
<td>3.065</td>
<td>10.2</td>
<td></td>
<td>7.941</td>
<td>26.4</td>
<td></td>
<td>11.006</td>
<td>36.5</td>
<td></td>
</tr>
<tr>
<td>Juquitiba</td>
<td>1.570</td>
<td>30.0</td>
<td></td>
<td>1.194</td>
<td>22.8</td>
<td></td>
<td>2.764</td>
<td>52.8</td>
<td></td>
</tr>
<tr>
<td>São Lourenço</td>
<td>530</td>
<td>21.4</td>
<td></td>
<td>531</td>
<td>21.4</td>
<td></td>
<td>1.061</td>
<td>42.8</td>
<td></td>
</tr>
<tr>
<td>Vargem Grande Paulista</td>
<td>444</td>
<td>6.1</td>
<td></td>
<td>1.502</td>
<td>20.7</td>
<td></td>
<td>1.946</td>
<td>26.8</td>
<td></td>
</tr>
</tbody>
</table>

**Poor Households total:** 17.083 9,1 42.234 22,6 59.316 31,8

*In R$ oct//97

Source: O/D survey/CMSP

In the first phase - 2005 – poor passengers will be little more than 210,000 or 24% of Line 4 daily demand. This weight of the poor on total line demand should be considered as meaningful, for its present participation in any other metropolitan transportation mode is always lesser than this (for the metro, poor represent 13% of demand; for public transportation in general, 19%). In fact, this line will be significantly used by users from poor municipalities located at the periphery and connected to the metropolitan area center by suburban railway lines serving overwhelmingly low-income people, or by bus feeder lines.

Examination on trip origin zones for Line 4 confirms the weight of peripheral passengers in the projected demand, as there is a significant participation of trips coming from the distant municipalities located in the same metropolitan quadrant of the line – west with almost 13% (Osasco, Carapicuíba, Barueri, Itapevi); southwest with almost 6% (Taboão, Embu), and south. But, even though Line 4 is located in the southwestern quadrant of the SPRM, trip origins are far from being restricted to this area: as an example, 20% of the trips on this line will be originated in the peripheral districts of the eastern part of the metropolitan region, thanks to the good connection between the suburban rail (CPTM) network and Line 4. With the exception of Osasco and part of Barueri, all these are areas with the highest poverty indexes in the SPMR.
It is reasonable to assume that once the impact of Line 4 is consolidated in the metropolitan general accessibility matrix, and given the easier accessibility to labor markets, that mobility rates for these poor segments of the population will also increase. A recent example of investment in the eastern zone of the capital, where significant portions of SPMR’s poor population reside, allows this conclusion. In fact, since the introduction of 6 kilometers of new rail line with metrorail characteristics and level-of-service, there was an increase of about 100,000 users per day in suburban rail demand in that area. This comes after little more than six months in use, doubling the ridership of CPTM’s (São Paulo Metropolitan Train Company) E line. In fact, this line is a surface metro and its impact on the poor population has been outstanding, allowing us to draw a parallel with Line 4 which has a much greater interconnectivity potential.

1.280 million jobs in its catchment area, being 30% low skilled jobs

Most of the tertiary sector jobs of the metropolitan area are located in the Line 4 catchment area, amounting to 1,280 million jobs. In its surrounding areas, in a radius of 2 km of the central station, there are approximately 933,000 jobs, around the historical center and the expanded center (Av.Paulista and Av Faria Lima). These are jobs available in offices, commerce and service shops in the region, as well as employment in the areas of personal and domestic service offered by the middle and upper classes who reside in the area. These jobs require low and medium-level qualifications, suitable for low-income segments. Also, the most important health, higher education and leisure centers in the SPMR (hospitals,
universities, concert halls, museums, theatres) are located in the more central part of this area. From a real estate perspective, this is probably the most dynamic area in the metropolitan region, consolidating 10% of the residential real estate new developments for the middle and upper middle classes in the last decade, together with 18% of the commercial and service real estate new developments in the metropolitan area - rates which tend to be translated into new tertiary sector jobs with a wide range of qualifications.

In its regional catchment area, there are approximately more 350,000 jobs located in the most dynamic and new job area of the SPMR in the southern part of the Pinheiros River Avenue. These are served by the new stations of CPTM’s Line 7, interconnected to Line 4 at Pinheiros station. Although these are jobs linked to the new global economy, requiring medium and high qualification workers, they bring as byproducts an immense variety of services jobs with qualifications typical of low-income segments of the population.

Out of this 1.28 million jobs which are located within the Line 4 catchment area and will become accessible to new network users, more than 29.5% or 350,000 places are specifically for workers with low qualifications. So, Line 4 will put more low skilled jobs within reach of the low-income populations.

The map below displays the location of jobs in SPMR and shows that Line 4 serves the densest areas in terms of labor market.

**Better travel conditions, shorter trip times and less out-of-pocket cost for poor users.**

Benefits expected from Line 4 will be primarily related to reduction of travel time and savings in out-of-pocket cost of displacements. Examination of these impacts allows us to affirm that these benefits, although extensive to all income levels, will be stronger among poor segments - precisely the population who, according to what has been already shown, bears the highest relative costs and travel times, if compared with the others socio-economic layers.

Line 4 will make more trips affordable to the poor as long as the commitment of promoting tariff integration among the various public transportation modes in the metropolitan area is respected, including the metropolitan buses, suburban train network and the metro network. This way, household transport-related monthly costs will tend to decrease, for they presently constitute an important restriction for mobility of this population. In addition, low-income users are expected to save more time and travel shorter distances, because this line will shorten their itineraries compared to their current bus trips and offer higher commercial speed.
Table 5 – Time and Distance Savings per Income Segment

<table>
<thead>
<tr>
<th>Income Segment *</th>
<th>Pas-kmsaved in the L4 (%)</th>
<th>Average Saving per Trip Of Time in minutes</th>
<th>Of Distance in km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 600</td>
<td>44</td>
<td>13.8</td>
<td>1.2</td>
</tr>
<tr>
<td>600 to 1800</td>
<td>34</td>
<td>12.4</td>
<td>0.4</td>
</tr>
<tr>
<td>1800 to 3600</td>
<td>15</td>
<td>12.4</td>
<td>0.4</td>
</tr>
<tr>
<td>3600 and more</td>
<td>6</td>
<td>9.0</td>
<td>0.29</td>
</tr>
</tbody>
</table>

* in R$ oct/97

Source: O/D survey – CMSP

Impacts of improvement in peripheral housing locations are the most effective in combating poverty.

Impacts on poor metropolitan populations demonstrated up to this point refer to the most direct effects, in the short and medium term, which can be expected from the building of this line. Nevertheless, impacts proven to be the most efficient in combating poverty are those which, in the medium and long term, stimulate an improvement in the “habitat” of these populations. These are impacts requiring an “ex-post” evaluation, emerging from the
spin-offs of these kinds of investments: new metro lines do create an economic and social dynamics in their surrounding and regional catchment basin, creating an enabling environment for investors to locate new business, thereby generating new jobs, diversifying economic activities and income structures in these target areas, attracting the establishment of public services, creating new social and urban environments which stimulate the decrease of spatial inequalities and the equalization of the different urban areas. Thus, it is possible to achieve an improvement in urban life conditions, by decentralizing activities, services and jobs, which indirectly increase the access for poor segments to new opportunities in the city. The possibility of breaking the vicious circle of poverty is created - redeeming for the the poor a quality of life which a metropolitan area as the SPMR can offer.

**Figure 2: trips origins and itineraries on Line 4**

![Map of trips origins and itineraries on Line 4](source)

*Source: Line 4 traffic forecasts based on the 1997 OD survey
(The darker the area, the higher the number of trips on Line 4 originating from it)*

**Ensuring positive impacts for poor populations**

In countries like Brazil, with significant social inequalities and poverty, the achievement of equity by distributing the effects of public policies, including investments in transport, requires specific strategies, otherwise a “naturally” unequal distribution will result. In this case, the achievement of positive social impacts with Line 4, as outlined above, will depend on objective actions which would ensure, on one hand, proper functioning of the committed imodal integration system, and creation of a fare integration system which will stimulate...
and facilitate the access of the poor population to the system. On the other hand, in conjunction with municipal authorities, it will be essential to create institutional instruments for land use control, thereby encouraging high density and social diversity in the surroundings, insofar as housing, economic, consumption and leisure activities are concerned. It will be particularly important to introduce housing and land use policies that could minimize the eventual expulsion of poor residents by the real estate market, thereby achieving equitable distributive impact of the investment through appropriate urban development policies.

5. Conclusions and summary of Line 4 impacts on the poor

Recent surveys and traffic forecasts demonstrate that 22% of future Line 4 users are living below the poverty line. The benefits for them are high, especially through:

- Enhanced accessibility to the main service centers and job opportunities of the SPMR through improved overall connectivity of the urban transport network and increase in the so-called grid effect. In particular, Line 4 will put more low-skilled jobs within reach for the low-income populations. The decrease of the lowest quintile average revenue over the 1987-1997 period is explained, amongst other factors, by the scarcity of unskilled jobs in the area, which strikes predominantly the less educated people. Out of the 1.28 million jobs which are located within Line 4 catchment area, 29.5%, i.e. 350,000 jobs, are for low-skilled workers. This betterment in accessibility derives mainly from two factors:
  - affordability: although the families living with less than 250 R$ per month are traveling much less than the wealthier socio-economic layers, they are dedicating up to 30% of their revenues to transportation. Those living with less than 600 R$ par month are spending 18% of their revenues on transportation. Line 4 will alleviate this financial burden and/or make more trips affordable to the poor by promoting tariff integration between the suburban train network and the metro network. Today, the poor living in the suburban areas pay 2.5 R$ per trip on the intermunicipal buses. There is a strong commitment to keep the future integrated tariff (train + metro) below this figure.
  - shorter travel times: in addition, low income users are expected to save more time and travel distance than the average Line 4 user because Line 4 roughly straight line alignment will shorten their itineraries compared to their current tortuous bus trips and offer much higher commercial speed.

- Positive environmental impacts: being usually more exposed to noise and air pollution than the rest of the population, the poor will be the biggest beneficiaries of the overall environmental improvement brought about by Line 4.

- A social equalizer role: sprawl and spatial growth in the SPMR have increased trip distances, which adversely affects the poor who reside on the outlying fringes of these metropolitan regions. When these trips became too long to be made by non-motorized modes such as walking or bicycling, the poor ended up captive of road-based public transport modes. Road vehicles
such as buses suffer disproportionately from increasing congestion due to their larger size which reduces their maneuverability, and to the need to stop to pick up and drop off passengers. Thanks to relatively high speed and segregated right-of-way, metro Line 4 equalizes accessibility between car drivers and public transport users and does have a substantial positive impact on the quality of life of those who are captive to public transport, notably the poor.

- Direct jobs for the poor: the implementation of Line 4 will generate around 30,000 person-year over four years in the areas of civil engineering, manufacturing and assemblage of rolling stock and electromechanical systems. From this total, approximately 16,000 are related with civil construction activities and will employ mainly low-skilled workers. At the operation stage, one can expect an estimate of 1,500 permanent jobs (train operation and maintenance, fare collection and management), out of which a substantial share will be occupied by low-skilled workers.

- Economic revitalization in the catchment basin of Line 4: the other impact that one can expect from Line 4 is the creation of a more favorable environment for investors to locate new businesses in these areas and launch a process of economic vitalization. To really benefit the poor, this impact will have to be accompanied by some land use regulations which would reserve a number of dwellings for the poor to avoid that the resulting gentrification ends up expelling the low-income households.

- More poor than on any other metro line: Presently, those living below the poverty line approximately represent 19% of public transport users and 13% of metro users. As much as 22% of future Line 4 users are living below the poverty line, and, given that most of them travel on longer distances than average, 24% of the passenger-km on Line 4 will be attributed to poor users. This is slightly higher than the share of bus users who are poor (21%), although the bus network catchment area covers the SPMR more extensively than the metro network, and especially the most remote and poorest municipalities. In addition, the poor will get 28% of the overall time savings, mainly because the poor travel on longer distances. For example, for someone going from Vila Sônia to Luz by bus today, the trip time will be reduced at peak hour from 60 minutes to 20 minutes by metro.

Given that these figures are based on traffic forecasts that assume no change in mobility (no additional trips are generated by the model), these calculations are a lower bound estimate, since the poor are today the likeliest to be restrained in terms of mobility due to the present lack of affordable and reasonably rapid means of transport. Line 4 is expected to trigger part of this repressed demand. Line 4 will help “democratize” the metro network and will increase the participation of the poor in the metro ridership and making this highly regarded public transport system more accessible to the poor and low-middle class than it is today.
• **How to maximize these benefits**: affordable fares and tariff integration

To make all these benefits accessible to the poor, it is essential that fares on the metro system be lower or equal to what buses charge today, especially since the road-based public transport system will be partially restructured to feed the metro. A narrow focus on cost-recovery aiming primarily at assuring the financial sustainability of this new line may harm the poor if the issue is not systemically approached. Fare integration between buses and metros and trains and metros is a prerequisite to succeed in meeting poverty alleviation objectives.