School-Related Traffic Congestion Easement Plan

Prepared for the
Mayor's Office of Mobility
City of Lisbon, Portugal

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Executive Summary

The Mayor’s Office of Mobility of Lisbon, Portugal, estimates that school drop-offs during the peak morning period account for 30% of the city’s traffic congestion. Recent legislation enabling parents to exercise explicit school choice has the potential to further exacerbate congestion problems. To address this issue, the city is seeking to develop policies that incentivize parents to use alternative and sustainable forms of transportation to school, while expanding and improving existing programs.

The purpose of this report is to identify strategies to reduce school-related traffic congestion in Lisbon. To accomplish this, the report evaluates current transport choices for parents in Lisbon and assesses the effectiveness of a number of existing measures that aim to address the problem. We used a mixed-methods research design that incorporated both quantitative and qualitative approaches. Our research instruments included a standardized survey administered to a sample of parents with children enrolled in elementary and middle schools across the city, interviews with various stakeholders involved in the city’s transportation and education sectors, observational data from the field, and a literature review of case studies from other cities that have the potential to be implemented in Lisbon.

Data analysis from our research reveals several important insights into school-related travel patterns. For example, 64% of parents recorded using a car as the main form of transport to and from school, whereas public transportation was the least likely mode of transport for parents and their children. Factors such as convenience and safety contributed greatly to a parent's decision to drive, whereas concerns related to environmental responsibility did not play a big role in a parent's decision. One of the most striking findings from our data is that 75% of parents who participated in the survey indicated that they were not aware of the existing municipal programs that promote sustainable transport to and from school.

While those patterns were similar across our sample of schools, we found that the differences between schools were even greater than the similarities. Our findings from the field indicate that the nature of school transportation in Lisbon varies significantly by school location. This means that the problem of school-related traffic congestion is localized and heavily influenced by factors such as neighborhood type, local topography, and social demographics.

Accordingly, we developed a set of recommendations that will address the common issues across schools, as well as account for the major differences between them. Based on the review of literature and the comprehensive field data analysis in Lisbon, we propose the development of School Travel Plans as the main recommendation for the Mayor’s Office of Mobility. This main recommendation is complemented by several additional policy options that address other key data findings such as the importance of safety, lack of environmental awareness, and the need for improved marketing techniques. The recommendations presented in this report are realistic and based on the capacity and available resources of the Mayor's Office of Mobility.

We hope that the information and policy options presented in this report will enable the Office of Mobility to plan strategically and act effectively to address school-related traffic congestion in Lisbon.
I. Introduction

A. The Problem

1. The Issue at Hand: Urban Congestion and Lisbon’s Response

Lisbon, the capital of Portugal, is a medium-sized city in the southern part of the European continent. It shares many characteristics with other European capitals: old buildings and narrow streets in the historical part of the city, abundance of parks and shared spaces, and developed and accessible public transportation infrastructure. However, the modal split of the city’s residents is very different from other European capitals. Public transit ridership in Lisbon has fallen from 39% of all trips taken in 2001 to 34% of all trips taken in 2011. In the same period, car use increased from 39% to 48% of all trips taken. This modal split is very high when compared to cities like Barcelona, Paris, or Amsterdam, where less than 20% of trips are car-based.

Given the age of Lisbon’s vehicle fleet and the city’s modal splits, the Municipal Department of Energy estimates that transportation use contributes 42% of the city’s carbon dioxide emissions (Lisboa e-nova, n.d.). The combination of high car use with an urban form characterized by narrow streets, an unpredictable grid layout, and a hilly landscape creates traffic, safety, and accessibility issues. As a result, Lisbon has in recent years embarked on several overarching programs to reduce transport-related carbon emissions and make the city greener and a better place for pedestrians and bike users. The city’s Mobility Strategic Vision includes improving infrastructure for walking and bicycling, increasing access to public transport, creating neighborhood connections and interfaces, and developing smart traffic management systems.

The Lisbon Strategic Charter 2010-2024, the 2012 Lisbon Master Plan, and the 2013 City Council Governing Program all have provisions for the development of sustainable mobility in Lisbon. These comprise of the creation of walking neighborhoods and a set of specific actions that empower walking, bicycling, and public transport. Overall, these programs aim to reduce traffic volumes and their negative environmental impacts. Lisbon has already made progress across this area and is well on track to become the European Green Capital of 2017.

2. Recent Legislation and School-Related Congestion

Since the Mayor’s Office of Mobility is actively working to mitigate Lisbon’s growing congestion, it is critical to understand how school-related travel contributes to this problem. It is estimated that nearly 30% of municipal traffic congestion is caused by automobile traffic that occurs during peak school drop-off hours. Recent legislation enabling parents to exercise school choice has the potential to further exacerbate congestion problems, as this would allow parents to choose schools further away from their place of residence.

The Portuguese political context has had a profound effect on the role of transportation to school. Upon the appointment of Nuno Crato, the Minister of Education and Science, the government outlined the freedom of school choice as a priority. Within the listed priorities of the Ministry, giving “schools autonomy, and parents the freedom to choose what they want for their children” is explicitly highlighted (Ministry of Education and Science, n.d.).

The government’s official gazette, the Diário da República, also provides more evidence that supports this priority. In the April 12, 2013 edition, a comprehensive list of admissions criteria into pre-school, basic education, and secondary education were included. Among these is a provision that dictates that
after proximity to residence, schools may prioritize families based on proximity of family members’ “place of professional activity” (Ministry of Education and Science, 2013).

Expanding school choice to the families of Lisbon would theoretically have impacts on class size, total enrollment figures per school, and social justice (Chingos, 2013). Beyond social implications for families and children enrolled in these schools, expanding school choice also has broad implications for traffic management and congestion. If families choose schools farther away from their residences and assigned school districts, congestion, traffic, and miles traveled could increase.

*The School Run*

Around the world, there has been an observed decline in school children taking alternative transportation options to school. In the United States, research studies to support the Safe Routes to School initiative showed that from 1969 to 2001, percentage of school trips done by alternative transportation options had dropped from 41% to 13% (McDonald & Aalborg, 2009). This has paved the way for the phenomenon commonly known as the “school run,” which signifies the shift away from walking or biking to school and the increase in parents driving their children to and from school.

The rise in parents choosing to drive their children to school can be attributed to several factors. Studies conducted in the United States and the United Kingdom have shown that school transportation choice is affected by parents’ concerns about traffic safety, traffic danger, convenience, and the ability to spend more time with their children. The “school run” and school transportation choice also have larger implications for other issues such as pollution and air quality, childhood obesity, developmental impacts, and equity (McDonald & Aalborg, 2009). Land-use patterns have also increased the distance between homes and schools, making walking or biking from home much more difficult (Pedestrian and Bicycle Information Center, n.d.).

Understanding the “school run” is critical to approaching the problem of school-related congestion in Lisbon. Research in this area indicates that there are several factors that affect school transportation choice, and that the challenge of school-related congestion has larger implications for cities. Thus, it is critical to understand the most important factors affecting school choice in Lisbon to inform a proper strategy going forward.

**B. Purpose of the Report**

This study was undertaken to support the efforts of the Mayor’s Office of Mobility in improving the sustainability of Lisbon’s transportation system by shifting routine automobile travel to more environmentally friendly travel modes. The purpose of this report is to identify targeted strategies that reduce school-related traffic congestion in Lisbon. To accomplish this, the report has three goals:

1. **Evaluate the current school transport choices of parents**
   The first goal is to understand why parents drive their children to school. A better understanding of these reasons provides an opportunity to design and develop programs that address parental concerns and offer appropriate travel alternatives. To this end, the study will gather data regarding the actual travel mode of parents, the reasons why parents chose a specific mode, and the factors that may influence parents to choose an alternative travel mode. The findings will be supported by primary and secondary research.

2. **Assess the effectiveness of existing municipal programs**
   The City of Lisbon has a number of existing measures to promote sustainable transport to school. These include Ação Escolas, Os Verdinhos, Os Alfacinhas, Pedibus, and Bike-to-School programs. In order to
assess the effectiveness of these measures, the study will gauge parental awareness of the programs, their availability and participation rates.

3. Propose an action plan for going forward
The third goal of the report is to design a context-specific action plan that is realistic and based on the capacity and available resources of the Mayor's Office of Mobility. The report will provide a set of recommendations that are informed by the research. Each proposed recommendation will also include a brief implementation strategy.
II. Literature Review

A. Mobility Management Strategies

A literature scan regarding urban mobility management revealed two main approaches to mitigating traffic congestion: supply-oriented measures and demand-oriented strategies (Broaddus, Litman, & Menon, 2009). Supply-oriented measures focus mainly on expanding infrastructure and capacity in order to alleviate congestion. By adding more lanes and highways, supply-side measures essentially aim to "build [their] way out of congestion" (Bruckbauer, 2013). However, due to the high cost of these measures and given the limited physical space of most developed cities, the traditional supply-side solutions have become increasingly difficult to implement in urban areas (Luten et al., 2004). Consequently, demand-oriented strategies that aim to manage the available capacity more efficiently are now being widely used in cities across Europe and the United States (Broaddus, Litman, & Menon, 2009; Ison & Rye, 2008; Luten et al., 2004; National Center for Transit Research, 2003).

Transportation Demand Management (TDM) is a term that describes the various demand-side measures used to influence travel behavior. TDM encourages shifts in travel modes, routes, and departure-times (Luten et al., 2009; Ison & Rye, 2008). In general, TDM measures are applied during peak commute hours in order to alleviate automobile congestion and increase the use of alternative and sustainable modes of transport. TDM measures are broad in scope and can include planning, regulatory, economic, technological, and operational instruments (Broaddus, Litman, & Menon, 2009, p. 18; Smart Growth America, 2013). Table 1 lists some common TDM instruments.

<table>
<thead>
<tr>
<th>Planning</th>
<th>Regulatory</th>
<th>Economic</th>
<th>Technological</th>
<th>Operational</th>
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<tbody>
<tr>
<td>Streetscape design</td>
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<td>Fuel improvement</td>
<td>Travel plans</td>
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<td>Traffic calming/speed limits</td>
<td>Road use pricing</td>
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<tr>
<td>pedestrian infrastructure</td>
<td>Road space allocation</td>
<td>Vehicle ownership pricing</td>
<td>Trip planning information</td>
<td>Marketing / public awareness building</td>
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Table 1. Transport Demand Management (TDM) Instruments

A TDM measure that has been used to promote and facilitate active, safe, and sustainable travel to school is a School Travel Plan (STP). An STP is a "written document that identifies local issues relating to the school journey, sets out a strategy of agreed aims, and identifies a package of measures designed to promote more sustainable travel choices" for parents, students, staff, and visitors of a particular school (Aberdeen City Council, 2012, p.8). STPs identify current issues related to safety, health, and the environment by using surveys and documenting experiences of all users of school transport (Hampshire City Council, 2007). Once these issues are identified, STPs set clear and measurable targets in order to alleviate congestion, help promote healthier lifestyles, and support alternative modes of transport to reduce carbon emissions.

For instance, in Buckinghamshire County, United Kingdom, STPs successfully reduced car use during peak school drop-off periods from 44% in 2002 to 28% in 2007 (Buckinghamshire County Council, 2008, p.9). STP initiatives throughout the country have been promoted jointly by the Department for Transport and the Department of Education since 2003 to tackle a number of trends causing greater car dependency.
in school travel (London Assembly Transport Committee, 2007). A key focus has been on working with schools to develop STPs supported by the appointment of School Travel Advisers, and a range of capital grants for on-site and off-site facilities in and around schools. This resulted in 81% of schools in the United Kingdom having an active STP in place by 2009 (Atkins Limited, 2010, p. 7). Lastly, since STP initiatives take into account the characteristics of the local area and school, strategies could be tailored for a specific context. Because they account for local issues and consider actual practices, they are more likely to reduce car use and change people’s travel behavior to more sustainable modes (Metrolinx et al., 2014, p.7).

B. Case Studies: What Other Cities Are Doing to Combat School-Related Congestion

In order to evaluate congestion-easing programs implemented by the Office of Mobility in Lisbon, we looked at case studies of similar programs that have been implemented in other cities. Likewise, our case study research provided insight into additional programs that are not currently available in Lisbon. There are countless programs that cities have implemented through various TDMs including carpooling, bike sharing, and increased public transport use. This report, however, only provides a handful of case studies that might prove useful to Lisbon’s specific context. These case studies provide a general idea of what can be improved with existing programs, as well as suggestions for new programs that can be implemented in the future.

1. SmartCATZ (Car-Free Active Travel Zone): Telford & Wrekin Council, United Kingdom

The United Kingdom has been one of the most active countries within the European Union in fostering active modes of travel through STPs. One successful example of an STP reducing school traffic congestion is found in Telford and Wrekin Councils. A Car-Free Active Travel Zone was implemented around schools in both councils as a way to encourage students, teachers, and parents to find active ways of travelling into the city center. As part of a marketing campaign, each class of students was given a SmartCATZ pack that contained information sheets and leaflets, as well as stamps, stickers, and record cards. Each time a child and his or her parent walked or cycled from outside the zone, he or she received one point for their travel journey and his or her card was stamped. When he or she reached a certain target set by the school, the student and/or his or her class received a prize.

The program was very effective at reducing car trips to the city center. One primary school experienced a drop in car usage from 40% in May 2003 to 10% in February 2005. Walking and biking increased from 43% to 76% during the same time period. Another school experienced an increase in walking and biking from 51% in 2003 to more than 83% in 2005 (Telford & Wrekin Council, 2009). Thus, the creation of a car-free zone has shown the effectiveness of STPs in reducing parent’s reliance on cars. Forced to find alternative ways of traveling into the city, parents and their children ultimately turned to biking and walking. A car-free travel zone may be an option that Lisbon can implement around schools located in the center of the Old City. The case study also provides an example of a policy that has been implemented effectively with sustained marketing measures (UK Department for Transport, 2003).

2. Safe Routes to School: Alameda and Marin Counties, California, United States

In Alameda and Marin Counties, the Safe Routes to School programs have involved various initiatives that have reduced car-use travel by parents and teachers alike. The Safe Routes to School programs are multi-stakeholder programs involving parents, schools, community leaders, and officials from all levels of
government. The main goal of these programs is to improve the health and safety of children by enabling them to walk or bike to school (National Center for Safe Routes to School, 2015). The comprehensive approach involves state and local officials, along with NGOs and school administrators in designing and facilitating a safe and convenient route for parents and their children to take on their way to school.

The Safe Routes to School program included several initiatives that were coordinated by various stakeholders and have been gradually implemented with the help of effective marketing strategies and administrative support. One of these initiatives is the Bike-to-School Day, which is held six times a year around occasions such as Earth Day and World Bike-to-School Day. During those times, Alameda and Marin Counties experienced a three-fold increase in the usual number of bicyclists riding to school. A second initiative is the Carpool-to-School Day, which, in its initial pilot program in 2013, saw 11,500 participants. Fifteen schools in Alameda County had their entire student population participate in the venture. A third initiative included a “Pollution Solution Golden Sneaker Contest” that saw more than 16,000 students participate in the International Walk and Roll to School Day. The contest encouraged students to walk to school with their parents with the incentive that the winner would receive the county’s “Golden Sneaker” trophy. These programs were implemented with the help of a school task force that convened regularly to discuss safety, community, health, and general environmental issues related to school travel. In a one-year period, the active modal split increased from 33% to 35%, while driving decreased from 55% to 50% (Alameda County Transportation Commission, 2013).

Among the factors behind parents’ school travel decisions in Alameda and Marin counties are convenience and safety issues. The Safe Routes to School programs offer valuable insight for Lisbon in addressing these two concerns. Bike-to-School Day programs, for instance, have already been implemented in Lisbon, but have not been successful in changing the behavior of school travel. Lisbon can learn from the experience of Alameda and Marin Counties in marketing Bike-to-School Days around specific occasions to highlight the cause. Other programs such as the Golden Sneaker Contest and Carpool-to-School Day may prove useful in illustrating some of the incentives that can encourage active transportation to school in Lisbon.

3. Pedibus System: Lecco, Italy

One of the most successful pedibus programs in Europe can be found in Lecco, Italy. Lecco set up its pedibus system in 2003 to confront the threats of childhood obesity, local traffic jams, and a rise in global greenhouse gasses. The program incorporates paid staff and parent volunteers who pick up and drop off students and walk them safely to and from school. The students themselves were educated about the program and learned about environmental sustainability. Teachers assigned activities that encouraged their participation, such as having to write poems and draw pictures of the pedibus program. In terms of cost, Lecco (pop. 48,000) provides roughly $20,000 USD annually toward organizing and providing staff members for the pedibus. Officials claim that the program helped eliminate more than 100,000 miles of car travel and prevented thousands of tons of greenhouse gases from being emitted.

Although participation drops by 20% on rainy days, the program has been a huge success for the city and has dramatically cut school-related travel emissions (Rosenthal, 2009). The Lecco case study example offers insight into understanding the ways in which a program could be sustained and supported in Lisbon. Stakeholder involvement by both parents and teachers has encouraged continued participation in the program. Creative measures to encourage youth participation such as writing about the pedibus system in classes and garnering the support of the administration in pushing the use of the program have proven to be very successful for the city. Finding long-term support from parent volunteers, however, was noted as an obstacle in the Lecco example.
C. Parents’ Choice Research

School-related traffic congestion is tied strongly with parents’ behavior and how they select their child’s school. Based on a literature review, parents consider several factors as priorities when choosing schools. These include quality of the school, convenience, safety, and their social network. However, how these priorities are ranked is different among different groups of parents, depending on family income, race, parents’ education level, and parental involvement in education (Schneider, Marschall, Teske, & Rock, 1998; Schneider, Marschall, & Teske, 2000).

Academic performance of a school is one of the most important factors for parents. Empirical studies showed a negative correlation between academic performance and school enrollment rate (Armor & Preiser, 1998; Kleitz, Weiher, Tedin, & Matland, 2000). There are also some subcategories to consider such as the class size, student-to-teacher ratio, average education level of the teachers, resource availability of the school, among others. Additionally, households with higher incomes and educational levels are more likely to place a higher value on the academic performance of a school (Rubinowitz & Rosenbaum, 2000, p. 129).

Convenience is another priority for parents in choosing schools for their children. Since most schools do not provide transportation to and from the schools, the distance and transportation accessibility are considered determinants of convenience. Kleitz and colleagues (2000) find that within each racial subgroup, a majority of parents indicate that school location is important. Additionally, those who are most likely to say that location is important are those who are least likely to have the resources necessary to sustain daily transportation to and from a school located far away (Martinez, Thomas, & Kemerer, 1994). The average family income is also correlated with the transportation budget for a family.

Parents also consider safety and security among the top priorities. In fact, Lee and colleagues identify safety as one of the overriding concerns that parents consider when choosing schools for their children (Lee, Croninger, & Smith, 1996). Transportation accidents, violence among students, potential physical punishment, and neighborhood security are all directly related to the safety factor in parents’ choice.

Lastly, social network is another important aspect in parents’ choice. When it comes to choosing schools, parents rely on two types of networks to inform their choices. The first are interpersonal networks where information is gathered from people parents know from their neighborhood and other social groups. The second type of network addresses the extent to which parents rely on publicly available information such as brochures and pamphlets, public meetings, published results of test scores by school, and school and district websites. Social network literature demonstrates that interpersonal networks are efficient means of gathering information (Schneider, Teske, Rock, & Marschall, 1997). Therefore, these networks are important when parents choose a school for their child. “Word of mouth” and “talking to others” are the most common ways parents find out about schools and about school choice options (Boyer, 1992; Wilson, 1992; Witte, 1996).
III. Research Design and Methodology

Overview of Research

The research team used a mixed methods approach that collected qualitative and quantitative data. Our main instruments for data collection included an observational study conducted at nine elementary schools, a mobility survey of parents administered at the selected schools, and interviews with various stakeholders including government agencies and civil society. The data was collected over the span of five working days in Lisbon, March 16-20, 2015. Gathering qualitative data allowed us to gain a contextual understanding of factors that influence parent travel behavior while gathering quantitative data provided school travel characteristics that could be statistically analyzed. Together, these two datasets are used to gain a thorough understanding of the results.

Sample Selection

The sample of our study included nine randomly selected schools in Lisbon. Based on our previous research, we identified three primary characteristics that we believed influenced travel behavior: neighborhood topography, proximity to parent’s workplace, and proximity to a major highway. Based on these assumptions, we stratified Lisbon into three regions that reflected differences in these characteristics (for maps, see Appendix A). One region included schools in the central business district, a second region included schools with challenging topography such as hills, and the third region included suburban areas built around major highways. We randomly selected three schools from each region to use as a sample to collect our observational data in the morning and conduct a mobility survey in the afternoon. Randomizing improved our chances of gathering a representative sample from each region.

However, after a consultation with the Office of Mobility, suggestions were made to change two of the nine randomly selected schools. One of the schools generated by the random sample was Escola Artística de Música do Conservatório Nacional (School for the Musical Arts of the National Conservatory). The school was considered a possible outlier because the primary motivation of parents to choose this school was likely its specialized curriculum, leaving little flexibility on transportation choice. The Office of Mobility also expressed interest in gathering observations from a specific school, Escola Básica Parque das Nações. Thus, we replaced a second randomly selected school located near a major highway with the one chosen by the Office of Mobility. Table 2 shows the final schools selected for the study.

<table>
<thead>
<tr>
<th>Old City (Hills) Observation: March 17</th>
<th>Central Business District Observation: March 18</th>
<th>Near a Highway Observation: March 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escola Básica Castelo</td>
<td>Escola Básica Coruchéus</td>
<td>Escola Básica Arco-Iris</td>
</tr>
<tr>
<td>Escola Básica Lisboa N.º 4</td>
<td>Escola Básica Bairro de São Miguel</td>
<td>Escola Básica Quinta dos Frades</td>
</tr>
<tr>
<td>Escola Básica Saô Jose</td>
<td>Escola Básica de S. João de Deus</td>
<td>Escola Básica do Parque das Nações</td>
</tr>
</tbody>
</table>

Table 2. Sample of schools selected for the field research
Research Instruments

Intercept Survey
The mobility survey was conducted for three consecutive days, March 17-19, from 3:00pm to 5:30pm at all nine schools. Members of the research team intercepted parents in the afternoon after they picked up their children to take the short survey. In total, 49 parents were surveyed across the nine schools. The survey was fully translated into Portuguese and members took precaution to verify that the person surveyed was in fact the parent.

The purpose of the survey was to gather quantitative information on three key areas: commuting patterns, factors that could influence behavior change in transport mode, and knowledge of existing programs. To understand commuting patterns, we asked parents for: commute time, typical mode of transport, and motivation behind mode of transport. If parents primarily drove to school, we provided a list of possible interventions and asked parents to rate the effectiveness of each intervention in changing their behavior. Finally, we asked them about their knowledge of existing programs run by the Mayor’s Office of Mobility. Questions were carefully worded so that parents were not led to a specific answer and truly reflected their opinions.

Observational Data
The observational study was conducted in the morning before school started between 8:30am and 9:30am from March 17-19, 2015. The purpose of the observational study was to understand how Lisbon’s built environment around schools that influenced travel, analyze the level of congestion around the school, observe the modal splits among parents, and find any contextual information that could inform our research. We used an observational data form (see Appendix C), clickers, and site photographs to gather information about the physical environment around the school. The observational data form was modeled after the Irvine Minnesota Inventory Tool and informed by guiding questions from the Center for Problem-Oriented Policing on school-related traffic congestion (Day, Boarnet, Alfonzo, & Forsyth, 2005; La Vigne, 2007). Key school characteristics included in the observational form included road and sidewalk infrastructure conditions, proximity of public transportation stops, and availability of parking. Before the form was used in the field, the team held a training session to ensure that the form would be filled out uniformly. Once in the field, the team counted the number of car trips and other modes of transportation by using clickers, timed how long cars idled, and tracked the level of traffic congestion around the school.

Interviews with Stakeholders
Interviews with members of government and civil society were conducted throughout the five working days in Lisbon. The purpose of the meetings was to acquire more information on the perspective of various stakeholders. With government agencies, the research team met with representatives from the Department of Education and representatives from the planning department. Both departments also provided us with data regarding student enrollment at the schools. From civil society the research team met with Bike-To-School, an organization that focuses on promoting cycling and other forms of transportation in Lisbon.

The interview with the municipal Department of Education was conducted on March 17, 2015, with Ana Guerra Afonso and Gomcalo Banata, and it took place at the Lisbon City Hall. This was the first time that the office of mobility staff met with representatives from the education department, which signaled that no previous coordination or knowledge-sharing existed regarding school-related transport issues. During the interview, we asked how parents chose schools, the policy issues around what determines enrollment, and potential collaboration between the two departments. As the overall coordinator and regulator of 99 schools (from primary to high school), the Department of Education provided significant insights regarding school-related congestion from several perspectives.
The interview with the Bike-to-School parents took place at the Mayor’s Office of Mobility on March 19, 2015. The Bike-To-School program encourages students to travel by bike every Friday on their journey home from school. The program targeted students from 2nd and 3rd cycles of secondary institutions, but all Lisbon schools were invited to participate.

Data Analysis and Data Limitations

All the quantitative data the team gathered was later coded for easier analysis. The data was used to develop descriptive statistics to answer basic questions regarding modes of transport and the motivation behind them. Afterwards, we explored the relationships of school characteristics to transport mode in order to analyze the results in more depth.

During the data collection period, certain events occurred that may have impacted the results of our data. Specifically, there was a day of rain and a separate day where public transportation workers went on strike. The presence of rain and the subway strike may have increased the number of students who were driven to school. For example, the team observed several parents taking their children to school via taxi, which could have been a response to the weather and the strike, instead of a regular travel mode. Therefore, there is a possibility that our modal splits data derived from observational counts may be skewed. Additionally, some schools had multiple entry points, making it difficult for the members of the research team to count all students entering the school. Finally, language barriers arose during the implementation of the surveys that may have impacted our sample.
IV. Data Analysis

A. Intercept Survey Data Analysis

1. Commute Characteristics: Modal Split

Results from the intercept survey verified initial assumptions regarding school-related modal splits. Overall, parents drove their children to school at a very high rate and used public transportation at a very low rate. Across all schools, 65% of parents recorded using a car as the main form of transport to school, 14% of parents chose a weekly combination of walking and driving. Parents that reported a combination of walking and driving described it in two ways: they walked their children to school in the morning and picked them up with a car in the afternoon (or vice versa), or alternated driving and walking depending on the day of the week. Overall, 12% walked exclusively and only 4% of parents recorded using public transportation (see Figure 1). These modal splits are very different from Lisbon’s population where as of 2011, 48% of trips are made by car and 34% are made by public transport. The results suggest that having a child enrolled in school increases the likelihood of an adult choosing to take a car for a school run.

![Modes of Transport](image)

**Figure 1. School transportation modes**

Analyzing modal splits over the three stratified regions yielded some significant variation. Schools near a highway in residential areas had a car rate usage of 73%, compared to 63% for the central business district, and 57% for schools in the hilly areas of the Old City (see Table 3). This suggests that car usage is much higher in certain areas of the city compared to others.
Table 3. Mode of transport stratified by region

2. Commute Characteristics: Travel Times

Across the sample of parents surveyed, the average commute time was 18 minutes. The commute time was defined as the time it takes parents to take children from home to school. This average varied significantly across modes (see Figure 2). Parents who used public transportation endured, on average, the longest commute times at 30 minutes, while parents who drove experienced shorter commutes at 18 minutes. However, parents who walked had even shorter commutes, 11 minutes on average. A limited number of parents described other methods such as motorcycle usage. The striking difference in commute time between public transportation and driving supports the reasoning behind the low public transportation usage rates as a means to get to school. Limited connectivity to all areas extends the commute time and makes public transportation usage undesirable.

Figure 2. Average commute times to school across modes of travel
3. School Choice

Overall, 57% of parents reported that their child did not attend the school nearest to their home, while 43% reported that their child did attend the school closest to their home. These figures seemed alarming, and contradicted data obtained from the Department of Education which showed that across all elementary public schools in Lisbon, only 21% of students attended schools outside of their community. This could also mean that a vast majority of students are attending schools within their districts but not necessarily the one closest to them.

Rates of attendance in the closest schools varied across the three stratified regions. The “Old City” or hilly area had a much higher rate of parents reporting attending the closest school to their homes. Parents in this region attended schools nearest to their home at a rate of 57%, while 31% of parents in the region “Near Highway” reported attending the school closest to their home (see Figure 3). This suggests that living in a community that has infrastructure that induces car driving can lead to a higher rate of school enrollment outside of the region.

![Figure 3. School choice stratified by neighborhood type](image)

Additionally, we asked parents to provide us with reasons why they chose a particular school for their child to attend. Overall, 77% of parents reported that the quality of school highly influenced their decision to enroll their child (see Figure 4). The combination of living in an area that is conducive to driving and the value placed on the quality of education influences driving behavior for parents.

![Figure 4. School choice based on school characteristics](image)
4. Travel Mode Selection

After identifying parents’ chosen mode of travel to school, the survey asked about reasons behind the chosen type of commute. Parents were given the liberty to choose reasons from a list. Overall, nearly 60% of parents selected that their chosen mode “fits [their] agenda” (see Figure 5). This result supports the notion that convenience is the primary motivation for school transport choice.

The second reason parents chose was “the distance is too large to select any other mode” with around 29%. The third most important reason a mode was selected was that it was the safest way to get to school, which was around 27%. This lends to an important notion about the effects of the parents’ perception of safety for children. Finally, the concern for the environment was particularly low at 10%. Given the strategic direction the Office of Mobility is taking around sustainability and alternative forms of transportation, it is important to note that public awareness and concern for environmental responsibility needs to be developed.

![Figure 5. Reasons why parents chose a specific travel mode](image)

5. Factors That Can Influence Changes in Mode Selection

Parents who reported driving to school were presented with an array of public transportation interventions, and were asked to rate the effectiveness of each intervention in changing their behavior. The most popular intervention was an “increase in the frequency of public transportation,” where 36% of parents rated it an effective method to change commuting patterns (see Figure 6). The second most popular choice was “improved connectivity” with 32% of responding parents reporting that it would be effective to change their mode of transport to school. The two least effective methods were improved bicycle infrastructure and less crowded public transportation, each reporting 32% of parents agreeing it would not be an effective intervention to change commuting patterns.
Overall no single intervention will change the majority of parents’ commuting patterns since no single option reported more than 36% rate of effectiveness. The most effective factors were those related with reducing trip and travel times of public transportation. This is not surprising since our results showed that school trips through public transportation usually took the longest. Furthermore, the ineffectiveness of improving bicycle infrastructure potentially signifies a lack of bicycle culture and the need to shift mindsets for bicycling to be considered a viable mode of transportation in Lisbon.

**Figure 6. Factors that can influence selection of travel modes**

6. Knowledge of Office of Mobility Projects

Finally, parents were asked if they were aware of any of the Office of Mobility’s school transportation programs. In one of the most striking responses we found in the survey, 75% of parents said they were not aware of any of the programs (see Figure 7).

**Figure 7. Parental knowledge of existing municipal school travel programs**
Further stratifying the data into the specific research districts revealed that parents in the business district had the most knowledge of the Office of Mobility’s programs at 37%. In the hilly area of Old City, none of the parents surveyed had knowledge of the Office of Mobility programs (see Figure 8). While variation existed among the stratified regions, it was clear that little knowledge existed about the Office of Mobility programs. This signifies that more effort needs to be dedicated to improving the visibility of the city’s initiatives.

![Knowledge of Office of Mobility Initiatives](image)

**Figure 8. Parental knowledge of existing school travel initiatives by type of neighborhood**

### B. Findings from Observational Data

Although the sample size (N=9) of the observational study is small, the data gathered from the schools nonetheless reveals important insights. For instance, in terms of bicycle infrastructure, only two out of nine schools had bicycle lanes, and only one school had a bicycle rack on its premises. This might help explain why the team counted a total of only three students biking to school. Increased investment in bicycle infrastructure is an important step toward encouraging a change in travel behavior. Additionally, only half of the schools visited had appropriate road signage to indicate to drivers that they were entering a school zone, and only one school had a speed limit sign posted in its vicinity.

In terms of the actual modal split, the team observed more children being walked to school in the Old City (hilly area) of Lisbon, whereas schools in the central business district and those near the highway had more car drop-offs. This data informed the similar trends within the intercept survey. Lastly, the team observed many cars idling, blocking traffic, and parking on the sidewalks during the drop-off periods. The range of idle time across all schools was between 1m40s and 10m.

### C. Findings from Stakeholder Interviews

#### 1. Interview with the Department of Education

Listed below are several insights gained from the meeting with the Department of Education.

School choice indirectly contributes to school-related traffic congestion. Although parents choose schools based on several factors, the most important factor is school quality. Since not all schools are of the same quality, certain schools in each *agrupamento* become more attractive to parents due to the higher academic performance of their students, quality of teachers, and better management. Parents choose these schools...
even if they are not the closest school to their home, which can contribute to traffic congestion. When parents chose schools far away from their residences, they were less likely to walk or take public transportation due to inconvenience. The enrollment rates of certain popular schools are always at full capacity, while other schools in the same agrupamento have empty classrooms. In this sense, information about the quality of schools makes them popular and can further exacerbate the traffic flow.

The Department of Education has implemented several travel-related programs including a pedibus program, Bike-to-School Day, and a school bus program called Os Alfacinhas. While parents are free to sign up for the Os Alfacinhas bus service, the limited budget for the program prevents the Department of Education from expanding it to all schools. The scale of the school bus program is unlikely to increase. Currently, Os Alfacinhas has routes only within specific agrupamentos. For the parents who do not live in the agrupamento where their child attends school, the school bus program is unlikely to be helpful.

When selecting future school sites, the Department of Education suggested that transportation accessibility should be a priority. They recommended a 'hub-centric' approach to planning. If new school sites include public transportation accessibility and better connections between neighborhoods and specific areas of the city, then parents would be more motivated to choose public transportation. In terms of the potential adjustments of current schools, the officials posited that raising the quality of all schools would help create a more even distribution of students within an agrupamento.

2. Interview with the Bike-To-School Advocate

The program advocate listed three reasons for why he chose to participate in the Bike-to-School program:

First, it contributes to his children's physical health and character building. Rather than sending children to school in cars where they become passive commuters, he believes that biking to school is more engaging and part of the overall educational experience for his children. Therefore, it might be beneficial to design awareness-building strategies and targeted marketing campaigns that incorporate these sentiments.

Second, the distance between his home and school is conducive for biking to school for two reasons. First, he specifically purchased his home near a good quality school. Further, the topography of his neighborhood is flat and even. For this reason, the Office of Mobility can focus the majority of its initial sustainability efforts precisely in the neighborhoods where parents are more likely to adopt an alternative mode because they already live in areas with favorable conditions for walking or cycling.

Third, the parent stated that biking to school is considered “cool.” He stated he advertises Biking-to-School Programs to the teachers and children, but not to their parents, once a year. He always learns that students think that riding bikes, four-wheel bikes in particular, is cooler than driving a car or walking. This insight can be useful when designing sustainability programs that aim to engage the youth and encourage their participation in transportation to school.
V. Recommendations

Based on the review of literature and the comprehensive field data analysis in Lisbon, we propose the development of School Travel Plans as the main recommendation for the Mayor’s Office of Mobility. The implementation of a School Travel Plan Initiative is complemented by other policy options that will support the city's efforts in addressing the challenge of sustainable transportation to school in Lisbon. By presenting options, we hope to enable the Office of Mobility to select those measures that are most realistic and convenient at any given time. Some of these strategies can be implemented in the short-term, while others will require significant time, coordination and planning to execute.

1. Promote the development of School Travel Plans throughout Lisbon

Our findings from the field indicate that the nature of school transportation in Lisbon varies significantly by school. This means that the problem of school-related traffic congestion is localized and heavily influenced by factors such as neighborhood type, local topography, and social demographics of each particular school. Therefore, the most effective strategy to address the problem in Lisbon will need to be sensitive to the local context and the unique needs and opportunities of every school. School Travel Plans are key to achieving this goal.

An STP is a "written document that identifies local issues relating to the school journey, sets out a strategy of agreed aims, and identifies a package of measures designed to promote more sustainable travel choices" for parents, students, staff, and visitors of a particular school (Aberdeen City Council, 2012, p. 8). Therefore, each STP is tailored to the surrounding environment, travel patterns, and safety concerns of an individual school. Through a combination of educational, training, and publicity measures, STPs in the United Kingdom have reduced the average number of car trips made to schools by 23% (Newson, Cairns, & Davis, 2010). At their most basic level, STPs encourage children and their parents to begin a conversation about what is the most appropriate and sustainable mode of travel for each trip they make.

Figure 9. Flow of information and relationships within a School Travel Plan
Although each STP is unique and representative of local circumstances, there are nonetheless common features that each document should include. At a minimum, an STP should:

- Describe current travel patterns based on a recent survey,
- Describe the findings of a site audit,
- Identify problems of the journey to school,
- Identify concerns of parents, students, and staff have regarding the journey to school,
- Develop initiatives to address the problems and concerns identified,
- Set clear and measurable targets (Aberdeen City Council, 2012).

Implementation Process

The Mayor's Office of Mobility should work with the Department of Education to develop a joint strategic approach to promote the development of STPs in all 99 public schools in Lisbon. STPs are most useful and effective if they are created jointly by a diverse set of stakeholders (Newson, Cairns, & Davis, 2010). This provides a more accurate assessment of needs and opportunities at each school, generates the necessary buy-in from all stakeholders, and allows for a more efficient use of available resources. The implementation process described below is modeled after the School Travel Planning Toolkit from the Canadian Active and Safe Routes to School program.

Stakeholder groups at two different levels should be created to ensure proper coordination, division of responsibilities, and implementation of the travel plans at every school in Lisbon.

Municipal Stakeholders Group

The first step in the STP implementation process is to form the Municipal Stakeholders Group. The primary goals of this group are to promote travel planning as a concept for all schools and to provide guidance to schools on creating their own STP. Figure 10 offers suggested stakeholders that can contribute significantly to the goals of the municipal group.
The Mayor’s Office of Mobility is the principal member of this group because it can provide transportation issue expertise, as well as relevant data. Specifically, the role of the Office of Mobility is to:

- Form and co-chair the Municipal Stakeholders Group with the Department of Education. This will involve setting the overall citywide goals of the STP initiative, attending the group meetings at least four times per year, developing the agenda and objectives for each meeting, and contributing staff time for necessary follow-up.
- Participate in relevant aspects of data collection. Our team developed a comprehensive electronic survey that can be distributed to each school (see Appendix B). The survey captures the current travel patterns at each school, as well as the major travel concerns identified by parents. Additionally, our team created an Observational Form that can serve as a tool for the site audit at each school (see Appendix C). The Office of Mobility can share the data gathered from these instruments to support each school developing an STP.
- Provide relevant historical data such as crash statistics, injury data, and any relevant neighborhood and city maps that can be used during the site audit.
- Ensure engineering improvements recommended in STPs. This is an opportunity for the Office of Mobility to build awareness for and incorporate aspects from the Ação Escolas project.

School Stakeholders Group

Once the Municipal Stakeholders group has been established and the citywide STP goals have been determined, individual schools should form their own School Stakeholders Group. The groups operate on the ground-level and serve as champions of the STP initiative. Critical stakeholders for the School-level STP group are listed in Figure 1.

Main responsibilities of the School Stakeholders Group are to develop, implement and regularly update their own STP. Specifically, the role of each school group is to:

- Lead the STP process at their school. This includes setting up the meeting schedule for the group, determining the overall goals for the project, developing a timeline and an action plan, and sharing key information with the school community throughout the process.
- Conduct the school travel surveys. Each school can distribute the electronic survey developed by our team to capture baseline data regarding school travel.
- Tabulate data from the school travel surveys. With the help of the Municipal Stakeholder Group, the data from these surveys can be analyzed in detail. The analysis will help inform the creation of the STP.
- Based on the findings of the school travel surveys, implement a participatory process that engages all stakeholders on the content of the STP.
- Create the STP document.
- Implement the tasks identified in the action plan of the STP.
- Revisit the plan periodically. This includes updating the plan and reprioritizing issues as the circumstances of school-related travel change.
Timeline

The objective is to have all 99 public schools in Lisbon implement STPs within 5 years. We believe this is a reasonable goal as a similar timeline was set up to implement STPs throughout the United Kingdom (U.K. Department for Transport, 2003). The 10 schools from the first year of the initiative can serve as a pilot project. The pilot can target schools with the highest rate of car use. Due to the limited capacity of the Office of Mobility, the rest of the schools can be rolled out over the following four years. Below is a proposed timeline and action plan for implementation.

<table>
<thead>
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<th>Year</th>
<th>Start Date</th>
<th>End Date</th>
<th>Number of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(July 2015 – July 2016)</td>
<td>10 schools</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(July 2016 – July 2017)</td>
<td>16 schools</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>(July 2017 – July 2018)</td>
<td>26 schools</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>(July 2018 – July 2019)</td>
<td>26 schools</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>(July 2019 – July 2020)</td>
<td>21 schools</td>
<td></td>
</tr>
</tbody>
</table>

Action Plan for the Office of Mobility

June 2015: Schedule a meeting with the Department of Education to discuss the STP initiative. Propose potential members for the Municipal Stakeholders Group. In the following two weeks, reach out to potential members and schedule an initial group meeting for July.

July 2015: Convene the initial Municipal Stakeholders Group meeting. Determine the role and level of commitment from each group member. Discuss potential citywide goals for the initiative and the required resources. Create group by-laws. Set up a timeline for future meetings.

Sept./Oct. 2015: Select the first 10 pilot schools. Reach out to school administrators and set up an initial meeting to discuss the initiative and the role of each school in creating its own STP.

January 2016: Support schools as they conduct school travel surveys and site audits.

April 2016: Select the next 16 schools to participate in the initiative. Support the first 10 schools with data analysis. Over the next two months, help implement engineering improvements recommended in the STPs.

2. Implement a Comprehensive School Transportation Survey

In the effort to understand and address school-related congestion in Lisbon, our team developed a household survey to assess the travel choices of parents and guardians (see Appendix B). We recommend the distribution of this electronic survey to all public schools by the end of June 2015. We believe that implementing this survey is an integral part of an informed and targeted strategy to reduce car travel to schools. The comprehensive survey will allow the Office of Mobility to gather data regarding the actual travel mode of parents, the reasons why parents chose a specific mode, and the factors that may influence parents to choose an alternative travel mode. A better understanding of these reasons will enable the Office to design and develop programs that address specific parental concerns and offer appropriate travel alternatives.

Since the survey already exists in an electronic form, there are minimal costs associated with its distribution as well as the data/response collection. The survey still needs to be translated from English into Portuguese. The Office of Mobility should coordinate the survey implementation with the municipal
Department of Education, as they can provide the contact information for each school *agrupamento*. The *agrupamento* officials can then distribute the survey directly to the parents and guardians.

3. Address Safety Concerns of Parents

The survey data that we collected in Lisbon suggests that safety is the third highest reason for driving children to school instead of taking alternative forms of transportation. Other research also cited the dangers of traffic and pedestrian safety as contributing to school transportation choice. For example, in the United States, the Safe Routes to School Partnership fully incorporated security in its implementation (Pedestrian and Bicycle Information Center, n.d.). Because traffic dangers and pedestrian safety were cited as the second most influential reason for driving children to school, making alternative modes not only available but also safe for children was a major consideration for the program. The STP initiative should therefore take into consideration that understanding security implications and incorporating safety measures are key to success.

The following are examples of strategies to enhance basic safety and security:

- **Maintain pedestrian walkways.** During construction or renovation along roads, demarcate and maintain temporary walkways for pedestrians. The pedestrian pathway should not be severed or interrupted, especially in school zones. In the Saõ Jose area of Lisbon, we noticed several sidewalks around the school were completely blocked to pedestrians, forcing them to walk on the road itself.

  *Figures 12 and 13. Sidewalks blocked to pedestrians in a school zone in Sao Jose*

- **Implement additional traffic calming measures and strengthen the enforcement of all traffic safety-related measures in all school zones.** Devices such as speed bumps, neckdowns, rough paving, and traffic diverters have been used to slow down traffic and make streets more pedestrian friendly (Southworth, 2005). The Office of Mobility has already implemented these types of measures in certain areas through its *Ação Escolas* project, but not all schools have been included. During our observational data collection, we saw many vehicles driving at high speeds on the roads immediately bordering the schools.

- **Strengthen the enforcement of all traffic safety-related measures, particularly in school zones.**
4. Engage Students in Implementing Sustainability Initiatives

Lisbon has already started to target young people in its sustainable mobility programming. For instance, the city’s Bike-to-School events and its pedibus program focus on school-age youth. However, these programs frame young people as consumers of these policies instead of participants in the decision-making process. Thus, we recommend engaging Lisbon’s youth in the design and implementation of any initiatives related to school transportation.

Many institutions around the world, including the United Nations, have heralded the value of young people in decision-making and the need to include their views on global issues. Adding a youth participation dimension to policy improves development outcomes, the overall wellbeing of the youth, and puts democratic principles into practice (United Nations, 2004). Because the problem of school-related congestion directly involves the youth of Lisbon, encouraging participation not only provides young people with a voice on policies directly affecting them, but also allows for a more inclusive approach.

Recognition of young people’s role in a community can serve as a basis for their participation in sustainability initiatives. In a study of youth involvement in environmental programs in Italy, researchers asserted the value of young people’s voices in addressing environmental issues (Brondi, Sarrica & Nencini, 2012). Their survey findings not only showed that young people in the Chiampo Valley region of Italy were aware of the environmental degradation and air pollution issues facing their community, but that they had several compelling suggestions for how to approach the problems. Another successful environmental campaign that put youth at the forefront of their strategy was the Magic Eyes campaign in Thailand (Sopchokkhai, 1990). The campaign initially focused on teaching children not to litter, but later expanded to issues of water pollution and deforestation. The strategy was a mass media campaign featuring a children’s mascot named Magic Eyes. Videos, jingles, and activities were used with the objective of developing environmental awareness.

Implementation of this recommendation can come from the School Stakeholders Group. As part of the Stakeholders Group, students can form their own leadership structure in each school to address the challenge of sustainable transport options. Students can be guided by a point of contact in their schools or Agrupamentos to ensure that their ideas and views are incorporated at all levels of decision-making. The Municipal Stakeholders Group can be responsible for working with the School Stakeholders Group to implement citywide activities for each school year. of the school year.

The following are sample activities that help include a youth perspective in sustainable transportation:

- “Know Your Public Transportation” Field Trips. Separate trips can be created for each mode: buses, trams, and the subway.
- “How Do You Get to School” Drawing Contest. Schools can host competitions and award prizes to the best drawings in different class categories.
- “Map My Class” Activities. Together with students, teachers can help students map their homes and transportation to school to generate discussion on travel patterns and their effects on the environment.
- Safe School Sidewalks Activities. Schools can host weekend events to do minor sidewalk improvements and raise awareness for pedestrian safety.
- Family Transportation Open House Night. Schools can host annual open house events with discussions and activities focused solely on a family’s transportation patterns to school.
- Zero Car Week. Schools can organize a one week challenge for families to sign up for no car use, with incentives and prizes for participants.
5. Market Existing Programs

In our conversations with parents and interviews with various stakeholders throughout our study, we found that 75% of parents simply did not know of existing programs in Lisbon that address the issue of sustainable transportation to school. In order to revitalize programs such as Bike-to-School and the pedibus, we recommend creating a marketing campaign to bring attention to the programs and change the mindset of parents around sustainability and reduced car use.

We suggest choosing six pilot schools located in the Old City that have the combination of public transportation accessibility, as well as high car usage. City officials and organizers of the pedibus project should meet with school administrators from the pilot schools to develop a marketing strategy. For example, newsletters, annual reports, letters for students to share with their parents, and information bulletins could be extremely effective in educating parents of the programs already in existence. Advising sessions with parents can also be used to inform parents about travel policies and the aims of the city in reducing car travel to schools.

One example in building awareness for school safety and traffic congestion around schools can be illustrated by the Hampshire STP program in the United Kingdom. In order to bring attention of local authorities to traffic danger, one school decided to hold a street festival outside the school. The road was closed at the end of the day when parents began picking up their children, creating significant congestion. Members of the media and NGOs that were invited to take part in the event generated media coverage about the issue of congestion in the city’s newspaper. This example shows how effective marketing could be utilized to promote existing programs in Lisbon (Hampshire City Council, 2015).

Another way of marketing the existing programs is through communication campaigns launched around events such as the European Sustainable Mobility Week. These comprehensive communication campaigns should be coordinated with city officials, the police department, and teachers, and focus on safe cycling courses and workshops on biking and walking. Additionally, promotional videos can be posted online and shared through a social media campaign. Safety accessories such as fluorescent jackets, brochures, and bracelets are also options to help market the programs. Businesses can be involved in the marketing campaigns through sponsored events that can increase pedestrian traffic along safer routes to school. Overall, the marketing of the programs should clearly define the safety and health benefits of sustainability for students, parents, and teachers.

Overall, we believe that implementing STPs throughout the city, engaging students in sustainability initiatives, and marketing existing programs to expand their use and visibility will have significant effects in reducing overall congestion related to school travel. In order to become a truly sustainable, livable, and economically prosperous city in the decades to come, Lisbon must ensure that it stays ahead of the game in implementing progressive and realistic congestion mitigation initiatives. Schools are only one part of the larger issue of transportation in Lisbon. However, we believe that our recommendations are a significant step towards changing travel behavior and shifting the mindsets of city residents towards more sustainable transport alternatives.


Appendix A

Maps of Sample Schools Selected for Field Research

Map of three stratified regions of Lisbon: Historical, Central Business District, and Peripheral zones.
Map of nine sample schools selected for field research.
City of Lisbon School Transportation Survey

This survey is part of a research effort by the Mayor’s Office of Mobility and students from Columbia University. The purpose of the survey is to understand the mobility patterns of students and parents during school hours. You are being asked to take part in this survey because your responses will help us understand these patterns and help us design better policies. Your participation is entirely voluntary. Though we encourage you to complete the entire survey, you can skip any questions you do not wish to answer. Additionally, we will not keep a record of your name, nor will we publish your name in our final report. We will carefully protect the information you share with us.

If you have any questions, please contact the Mayor’s Office of Mobility, City of Lisbon

1. What school does your child attend?
   (If you have children that attend secondary school at another location, please only list your child that attends primary or nursery school)
   
2. How many children do you have in each of the following:
   Pre-School/Nursery School
   
   Ciclo 1
   
   Ciclo 2
   
   Ciclo 3
   
   Secondary
3. Do you have children in other schools? If yes, which schools?

4. On a scale of 1 to 4 (1 being the most important) rank the reasons why you chose this school:

<table>
<thead>
<tr>
<th>Reason</th>
<th>1st Choice</th>
<th>2nd Choice</th>
<th>3rd Choice</th>
<th>4th Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity to my residence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to my place of employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. What is the main mode of transport your child uses to travel TO school?

<table>
<thead>
<tr>
<th>Day</th>
<th>Walk</th>
<th>Cycle</th>
<th>Car</th>
<th>Public Transportation (Bus, Subway, Tram, Train, Boat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td></td>
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<td>Wednesday</td>
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<td></td>
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<td>Thursday</td>
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</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. What is the main mode of transport your child uses to travel FROM school?
7. What are the main reasons he/she travels this way to school? (select all that apply)

- It is good for my child's health
- The distance is too far to use any other mode
- The distance is too short to use any other mode
- My child cannot get there any other way
- It is the cheapest
- My child enjoys it
- It is good for the environment
- It fits in with my work schedule
- It is the safest way to get my child to school
- Other: ___________

8. How long does the total journey (by all modes) to school usually take your child?

9. The journey to school is:

- only to take your child to school.
- part of a combined journey (i.e. on the way to work).
- part of a car pooling arrangement.
- Other: ___________

10. If you drive your child to school, how many children are usually in the car?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>More than 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. How easy/difficult would it be for your child to travel to his/her school by:
<table>
<thead>
<tr>
<th></th>
<th>Very Difficult</th>
<th>Somewhat Difficult</th>
<th>Neither Easy nor Difficult</th>
<th>Easy</th>
<th>Very Easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car driven by a family member</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car driven by someone outside the household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tram</td>
<td></td>
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<tr>
<td>Subway</td>
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<tr>
<td>Walking</td>
<td></td>
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<td></td>
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<tr>
<td>Bicycle</td>
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<tr>
<td>Boat</td>
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</tr>
<tr>
<td>Train</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. If you had no constraints, would you prefer your child to travel by:

<table>
<thead>
<tr>
<th></th>
<th>No Preference</th>
<th>Weak Preference</th>
<th>Neutral</th>
<th>Some Preference</th>
<th>Strong Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car driven by family member</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car driven by someone outside the household</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bus</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tram</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subway</td>
<td></td>
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</tr>
<tr>
<td>Walking</td>
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<tr>
<td>Bicycle</td>
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<tr>
<td>Boat</td>
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<td></td>
</tr>
<tr>
<td>Train</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

13. To what extent do you agree with the following statements about you child’s journey to school?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>There is dangerous traffic on the way to school</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>There is dangerous traffic in the area outside of the school</strong></td>
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</tr>
<tr>
<td><strong>I believe riding a bike to school is safe</strong></td>
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</tr>
</tbody>
</table>

14. Please say how effective the following things would be to influence the way your child travels to his/her school:

| **Cheaper fares on public transport** | Very Ineffective | Ineffective | Neither Effective nor Ineffective | Effective | Very Effective |
| **Up to date travel information on public transport routes, times and fares** | | | | | |
| **More frequent/reliable public transport** | | | | | |
| **Less crowded public transport** | | | | | |
| **Improved cycle paths** | | | | | |
| **Improved pedestrian paths** | | | | | |
| **Parking restrictions near the school** | | | | | |
| **Help finding other families with which to walk my child** | | | | | |

15. In general, how much do you like traveling by the following modes of transport?

| **Car** | Strongly Like | Like | Neither Like nor Dislike | Dislike | Strongly Dislike |
| **Bus** | | | | | |
| **Tram** | | | | | |
| **Subway** | | | | | |
16. To what extent do you agree with the following statements about car use?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>People should be allowed to use their cars as much as they like</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I think owning a car is a sign of success</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>It is important to reduce the number of cars on the road</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>You can judge a person by the car they drive</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Car use reduces quality of life in cities due to traffic noise and odor nuisance</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A high level of car use leads to an unhealthy lifestyle</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>People who do not own a car are at a disadvantage</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I would like to travel by car more often than I have recently</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traveling by car is expensive</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

17. To what extent do you agree with the following statements about CYCLING?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not the kind of person who rides a bicycle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general, I would</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
rather cycle than use Public Transport

Cycling provides freedom and flexibility

I feel I should cycle more to keep fit

Cycling can be quickest way to travel around

Cycling is very healthy way to travel around

I tend not to cycle because I am not fit enough

Cycling gives me a way to express myself

Cycling is not safe

I find cycling stressful

<table>
<thead>
<tr>
<th>18. To what extent do you agree with the following statements about WALKING?</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not the kind of person who walks a lot</td>
</tr>
<tr>
<td>In general, I would rather walk than use Public Transport</td>
</tr>
<tr>
<td>Walking provides freedom and flexibility</td>
</tr>
<tr>
<td>I feel I should walk more to keep fit</td>
</tr>
<tr>
<td>Walking can be quickest way to travel around</td>
</tr>
<tr>
<td>Walking is very healthy way to travel around</td>
</tr>
<tr>
<td>I tend not to walk because I am not fit enough</td>
</tr>
<tr>
<td>Walking gives me a way to express myself</td>
</tr>
<tr>
<td>Walking is not safe</td>
</tr>
</tbody>
</table>
19. To what extent do you agree with the following statements about travelling by Public Transport?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not the kind of person to use Public Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general, I would rather go by Public Transport than cycle</td>
<td></td>
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</tr>
<tr>
<td>There are many problems with using Public Transport</td>
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<td></td>
</tr>
<tr>
<td>I think that successful people tend to travel by car rather than by Public Transport</td>
<td></td>
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</tr>
<tr>
<td>Public Transport can be the quickest way to get around</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I find traveling by Public Transport expensive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I find traveling by Public Transport stressful</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

20. To what extent do you agree with the following statements about CONGESTION AND THE ENVIRONMENT?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic congestion is a problem in my local area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is important to build more roads to reduce congestion</td>
<td></td>
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</tr>
<tr>
<td>I feel a moral obligation to help solve my town/city’s traffic problems</td>
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<td></td>
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</tr>
<tr>
<td>Being</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
environmentally responsible is important to me as a person

What I do personally can make a real difference to climate change

New Car technology will be enough to solve the environmental problems caused by car use

I feel a moral obligation to reduce the emission of greenhouse gases

Environmental threats such as global warming have been exaggerated

21. Are you aware of any actions or initiatives being undertaken at your child's current school to encourage cycling or walking to school?

- Yes
- No

22. If yes, please list all the actions or initiatives that you are aware of:

23. In your opinion, what is the best way to improve the "Pedibus" program?

- Increase the number of caravan routes
- Increase the number of adult volunteer "drivers"
- Improve the coordination between schools and parents
- Increase the safety of the program
- Make information more available
- No improvement is needed
- I am not aware of the program
24. In your opinion, what is the best way to improve the "Bike-To-School" program?
- Improve the registration process
- Improve the training sessions
- Improve the coordination between schools and parents
- Improve the safety of the city roads
- Make information more available
- No improvement is needed
- I am not aware of the program
- Other: 

25. In your opinion, what is the best way to improve the "Os Verdinhos" program?
- Increase the number of guards
- Improve the placement of guards
- Make information more available
- No improvement is needed
- I am not aware of the program
- Other: 

26. What is your home address?
(We will keep all information confidential and anonymous)

27. If you are not comfortable providing your full home address, can you provide only your postal code?

28. What is your Gender
- Male
- Female
- Other

29. Are you:
- Employed/Self-employed full time
- Employed/Self-employed part time
- Unemployed/seeking work
- Retired
- Unwaged (houses career)
- Full Time Student at College or University
- Long-term sick/disabled
- Other: [input field]

Submit

100%: You made it.

Never submit passwords through Google Forms.
### OBSERVATIONAL DATA FORM

<table>
<thead>
<tr>
<th>TEAM MEMBERS:</th>
<th>DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHOOL:</td>
<td></td>
</tr>
<tr>
<td>SCHOOL START TIME:</td>
<td>PUBLIC TRANSIT STOPS (WITHIN 0.5 MILE?)</td>
</tr>
</tbody>
</table>

**BUILT ENVIRONMENT FEATURES (FILL IN 1 HOUR BEFORE SCHOOL STARTS)**

**Access Points** (entrance/exit of cars and people)

- How many? ____________

**Pedestrian Signs**

- Traffic signal ____ YES ____ NO  Stop sign ____ YES ____ NO
- Yield sign ____ YES ____ NO  Pedestrian activated signal ____ YES ____ NO
- Pedestrian crossing sign ____ YES ____ NO
- Pedestrian overpass/underpass/bridge ____ YES ____ NO
- School Zone sign ____ YES ____ NO

IF YES TO ABOVE (SCHOOL ZONE), what are they? (i.e. children crossing, etc.) List.

**Crosswalks:**

- ____ YES ____ NO

- How many seconds to cross?

- What kind of demarcation? (i.e. zebra, white/yellow, painted lines, different surface like tiles)

**Traffic Features (FOR MAIN ACCESS POINT/ROAD ONLY):**

- What is the posted speed limit on this segment?
  - NUMBER _______ N/A__________

- Are there measures on this segment that could slow down traffic? Mark all that apply.
  - Speed bump/speed hump/raised crosswalk; or dips (that are intended to slow down traffic)
  - Rumble strips or bumps (includes dots, reflectors, raised concrete strips, etc.)

**Condition of sidewalks:**

- How many sides of the street have sidewalks? ____1 ____ 2
- Is the sidewalk complete on one or both sides? ____YES ____NO

- What is the condition or maintenance of the sidewalk? (biking, width, potholes, uneven pavements)
  - ____under repair ____good ____poor

- Is there a decorative or unique paving that covers most or all of the sidewalk on the segment? (e.g., bricks, tile, etc.)
<table>
<thead>
<tr>
<th>OFFICE OF MOBILITY PROGRAMS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What did you observe? How many signs/stickers/groups, etc.? If none, mark N/A.</td>
<td></td>
</tr>
<tr>
<td>1. Acao Escolas - speed limits</td>
<td></td>
</tr>
<tr>
<td>2. Os Verdhinos - crossing guards</td>
<td></td>
</tr>
<tr>
<td>3. Os Alfacinhas</td>
<td></td>
</tr>
<tr>
<td>4. Pedibus</td>
<td></td>
</tr>
<tr>
<td>5. Bike-to-School</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIMED MEASUREMENT: (START 30 MINS. BEFORE OFFICIAL SCHOOL START TIME)</th>
<th>START TIME</th>
<th>END TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car Drop Offs *VIDEO1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIDEO REVIEW CT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biking *VIDEO1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIDEO REVIEW CT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking *COUNTER1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Congestion**

HOW FAR IS TRAFFIC BACKED UP, IF AT ALL? (i.e. blocks, cars)