MOBILITY PLANS ON A LOCAL SCALE: METHODOLOGY, RESULTS AND APPLICATION FIELD

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ABSTRACT

During the last decade Mobility Plans have been developed in many cities of the world. These studies evaluate the configuration of the current mobility status and develop some interventions in order to solve particular problems at a city scale, sometimes making use of legal instruments such as regulation. A Mobility Plan on a local scale intends to analyze and solve problems of a neighborhood (parish) that many times are not visible at a city scale. These kinds of studies are specially oriented to pedestrians, residents parking and the livable communities' concept.

This article defines a comprehensive methodology of analysis to this kind of studies and applies it to a neighborhood in the city of Lisbon (borough of Graça). The problems identified and the solutions proposed in this article focus on the pedestrian circulation and their conflict with the car flow and the parked cars, the lack of resident parking (especially off-street parking), the insufficiency of public equipments for residents and the deficient land use mixture to promote a better livable borough.

Some of the conclusions point to the importance of developing these kind of integrated analysis, not only for implementation and project development, but also as a powerful decision making tool that will grant an understanding and easy acceptance of local citizens.

KEYWORDS: Mobility Plans, Parking, Traffic, Pedestrians, Land Use, Traffic Calming

1 .INTRODUCTION

During the last decade Mobility Plans have been developed in many cities of the world. These studies evaluate the configuration of the current mobility status and develop some interventions in order to solve particular problems at a city scale, sometimes making use of legal instruments such as regulation. A Mobility Plan on a local scale intends to analyze and solve problems of a neighborhood (parish) that sometimes are not visible at a city scale. These kinds of studies are specially oriented to pedestrians, residents parking and the livable communities' concept.

The mobility plan of Lisbon was developed recently and stresses the need to make neighborhood mobility plans as an essential instrument to manage mobility at a local scale. This article presents the used methodology of analysis in order to develop a Mobility Plan on a Local Scale, and tries to establish a framework for this kind of studies. The methodology of the analysis was emphasized by the development of a group of indicators of monitorization. These indicators asses the main mobility issues at a local scale, such as the pedestrian comfort. Therefore these indicators are, not only used, to determine the actual state of the neighborhood mobility, but also as an instrument to evaluate the results and impacts of the intervention proposals.

This methodology was applied to a case study, the borough of Graça, located in one of the hills of the Lisbon city center that has a particular livability due to its historic inheritance, a unique landscape over the city and the river Tagus, and an organic urban design. After the

analysis and diagnosis of some the mobility problems of the study area, some of the developed intervention proposals for the study area are presented, and its results and impact are measured. In the end of this article are presented some conclusion about the results of this analysis for the study area, the application fields of this kind of instruments and its importance as a decision making tool.

2 .ANALISYS METHODOLOGY

The analysis methodology for the development of Mobility Plans on a Local Scale was structured in four different phases presented in Table 1: data collection, analysis, state of the art and intervention proposals.

The data collection phase contains three basic elements that must be present in every study: the assessment of the study area and field work, which should have a site visit and photographic report, a collection of studies and reports that analyze the mobility of the study area or that has some valuable information of the main mobility variables (i.e. demographic data), and the acquirement of mapped data in Geographical Information Systems (GIS) or Cad drawings for the statistical and administrative land units, buildings, roads, etc.

This first phase has an important role in the entire process due to need of quality inputs for all the other phases of the methodology, although the outputs of this fist step are only raw data (see Table 1).

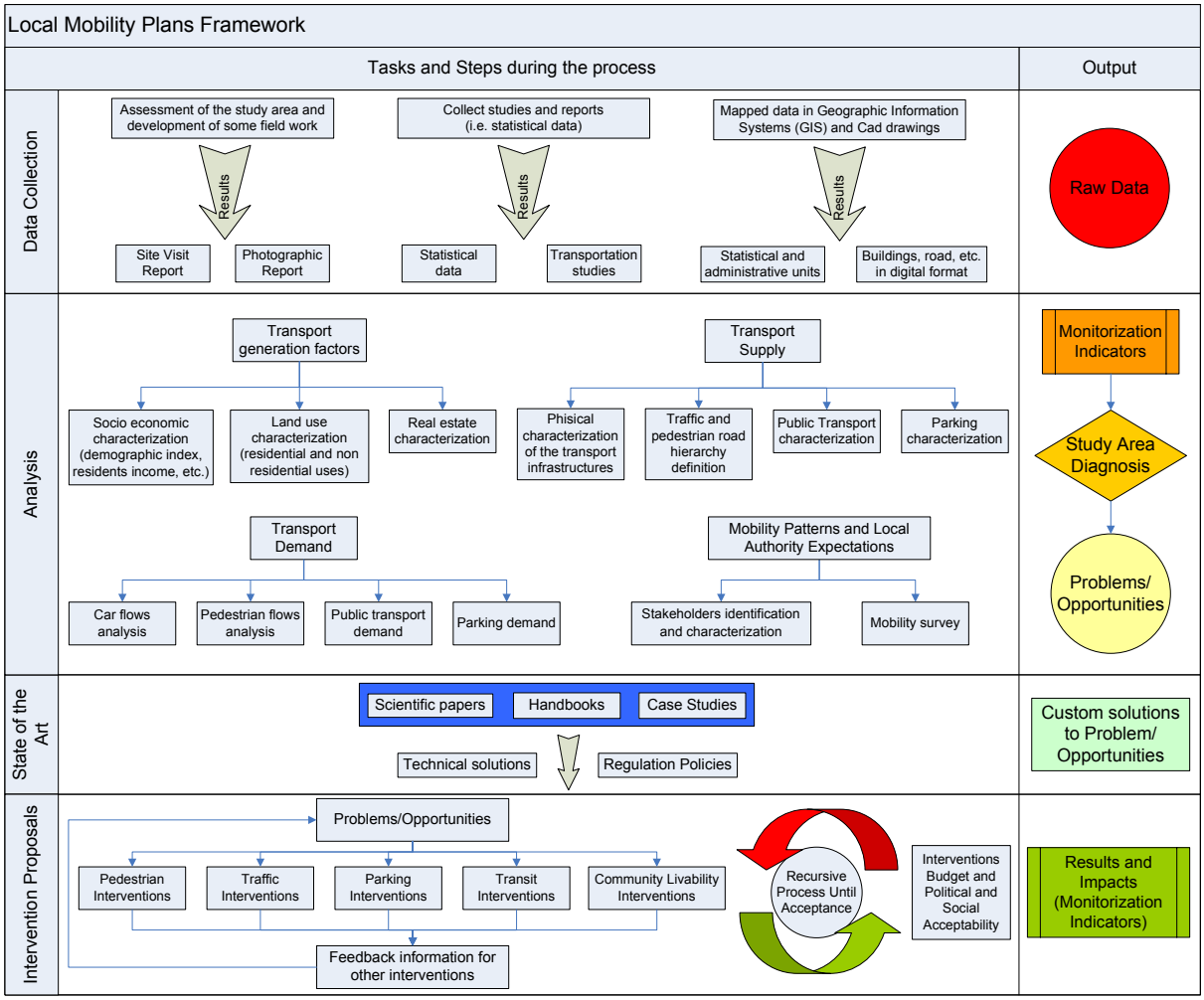


Table 1 – Local Mobility Plans Framework.

The analysis phase is structured in four essential points in a mobility study with some intervention effects (see Table 1):

1. The analysis of transport generation factors that focus in the main socio-economic variables such as the demographic and the income structure of the study area, the land use characteristics (residential and non residential land uses), and the real estate composition (prices, building conservation, etc.).

2. The existing transport supply of the study area and relationship with the surrounding area and all the city, that should focus in the infrastructure characterization, the traffic/pedestrian network hierarchy definition, the existing public transports liability and accessibility, and the parking characterization in capacity (on-street parking and off-street parking) and its (physical?) organization (existence of short/medium/long term illegal parking).

3. The existing transport demand in all the transport modes (individual transport, walking, public transports), the existent conflicts between modes, and the adequacy of the transports supply with the demand and its sustainability.

4. The mobility patterns that should be estimated by making a mobility survey to the different stakeholders of the study area (after its identification and characterization), and the local authorities mobility expectations (a stakeholder with greater political influence) for the short/medium/long term, which should be differentiated.

After a comprehensive analysis of the study area mobility, some monitorization or state indicators need to be used in order to spatialize the main mobility variables (these indicators will be presented latter in this article), once this step is performed, it is possible to develop a study area diagnosis with the resulting identification of the major mobility problems and opportunities, as well as the key fields of intervention for the study area (i.e. parking capacity and organization).

The third phase of this methodology is a state of the art analysis based in scientific papers, handbooks and city case-studies presented at the internet, which should be focused in the detected problems and opportunities of the study area (see Table 1).

The last methodological phase is perhaps the most complex because it deals with interventions in the study area that should have the stakeholders and political acceptance. This is an iterative process of proposals and acceptances that should also contain a feedback analysis of the impact of some interventions in other study area mobility variables (see Table 1).

The final results of this phase should also be analyzed against the monitorization indicators in order to find out the real results and impacts of the proposed interventions, what should be made during the process to ease up the stakeholder's acceptance.

The developed framework for this kind of studies must also be seen as a dynamic process that has an initial development (Local Mobility Plan), but should always be monitorized in order to find out new mobility expectations or problems in a very dynamic society that we nowadays live.

3 .DEVELOPMENT OF THE MONITORIZATION INDICATORS

After the definition of an analysis framework for the study area mobility, where several variables have been measured and quantified, its necessary the use of some monitorization or state indicators to evaluate some critical mobility variables before and after the introduction of the intervention proposals.

These indicators should have a spatial component in order to evaluate the indicators values distribution along the study area. For this spatialization, different land unit can be used, from the smaller administrative or statistical unit available to a new land unit developed in a cell spatial grid.

In this study, the main variables considered as relevant for the mobility characterization and spatial distribution on the study area were five: pedestrian comfort, parking capacity and quality (organization), traffic congestion, transit availability and liability, and community livability (as important element to potenciate the other mobility factors).

The structure and data used for each of these indicators is presented in Table 2, where the community livability indicators is composed for some of the others indicators and aggregated into a single overall appreciation.

Monitorization Indicators					
	Pedestrian Comfort Indicator	Parking Capacity and Quality Indicator	Traffic Congestion Indicator	Transit Avaliability and Liability Indicator	Community Livability Indicator
Input Data	Pedestrian flows (ped./h) Sidewalk widths (m)	On-street parking capacity Off-street parking capacity Illegal parking capacity Number of dwellings	Car flows (car/h) Traffic road hierarchy (4 levels)	Transit modes operating and its capacity Stops/Station location Measure of the average frequency of vehicles	Components: - Equipment Acessibility - Pedestrian Comfort - Traffic Congestion - Parking Capacity and Quality - Building Degradation - Land Use Mixture
Quantification Methodology	Pedestrian level of service concept of the HCM 2000 (A, B, C, D, E and F)	Estimation of the number of legal parking spaces per block and its parking demand Determination of the illegal parking percentage	Comparison between the measured car flows and normal flows for every type of traffic road hierarchy	For each transit mode is estimated the influence area and then quantified the total transit capacity per hour accessible for each block	Construction of a global indicator considering weighted contributions of each component for the global outcome.
Indicator Units	Adimensional after the application of the standardization function (ped./min.m)	Parking spaces/ dwelling % of illegal parking per block	+/- car/h than the predectited for every road	Transit capacity /h avaliable	Adimensional after the application of a linear standardization function that returns values between 0 and 1
Spatialization Method	Sidewalk of every road of the borough (between two road intersections)	Block or similar statistical unit (in Portugal BGRI)	Every road of the borough	Block or similar statistical unit (in Portugal BGRI)	Square cell grid with each cell with the average block dimension

Table 2 – Structure and data used for each monitorization indicator.

These five indicators can spatialize the study area problems and opportunities observed during the analysis and identify a specific location for an urgent intervention, or some problems that should be solved in a medium term. Other indicators considered as relevant can be introduced, but they should always be spatializable.

4 .STUDY AREA CHARACTERIZATION

To develop this methodology, a borough was selected to work as the Case Study. The Case Study selected was a borough located in a hill of Lisbon's city center that has a particular livability, due to its historic inheritance, its location inside the city and its paisagistic value, as well as a particular sense of place between inhabitants and their borough. This borough is called *Graça*, which location inside Lisbon city and its organic urban design can be seen in Figure 1.

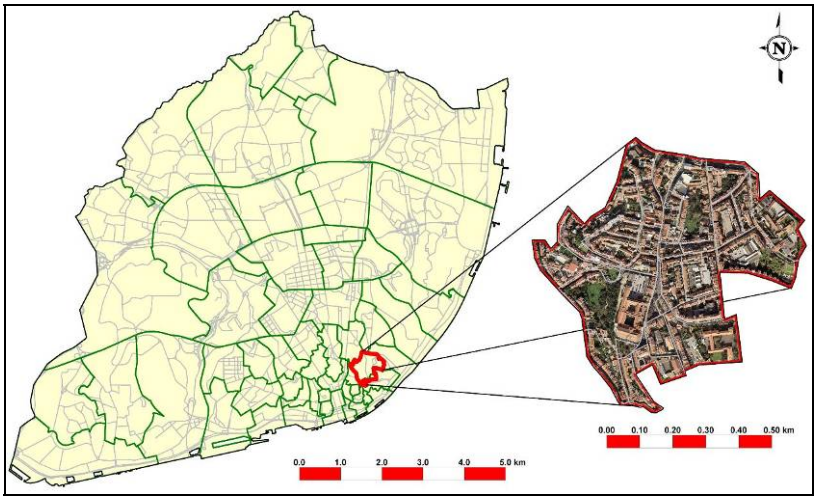


Figure 1 – Location of the borough of *Graça* inside Lisbon.

The *Graça* borough has approximately 40 ha., 7,000 inhabitants and it is a mix of a resident borough and an intense commercial zone. In the next point it will be presented some more features of the study area in order to comprehend its mobility problems and opportunities.

5 .STUDY AREA ANALISYS METHODOLOGY RESULTS

In this Chapter the analysis results for the selected study area (Graça) will be presented. Due to the space limitations in this article, the problems and opportunities were selected as main points of analysis. These problems and opportunities are aggregated in four main points of the mobility analysis: transport generation factors, transport supply, transport demand and mobility patterns and Local Authorities expectation. In the end of the chapter, a study area global diagnosis is presented, where it is defined the main fields of intervention in the study area (short term intervention). This structure will be presented slightly different from the framework defined before at the flowchart (Table 2). This option resulted from the fact that presenting at a first instance the problems and opportunities of the study area it would allow an easier overview of the main mobility features of the borough.

5.1 . Transport Generation Factors

In the transport generation factors were included three important features in order to understand the resident's characteristics, the land uses and estate's composition and the market in the study area.

The problems and opportunities observed in these features are presented in Table 3, where the population aging and the buildings degradation are the main problems observed in the study area, and the natural social mixture, the high quantity and variety of non residential uses, and the unused large block's commons are the main opportunities.

These social structure characteristics should have some relevance at the options for mobility politics that were to be defined for the study area, because the mobility for children and

elderly people is different from all the rest, and the transports modal split has a high correlation with resident's income distribution.

Transport Generation Factors (Problems/Opportunities)		
Components	Problems	Opportunities
Socio economic characterization	- Population aging (medium term problem) - Residents lost to new residential areas of the city with lower house rentals (short term problem) - High percentage of residents that work or study out of the borough and the surrounding areas (medium term problem)	- Natural social mixture (control of the gentrification) - High percentage of residents between 25 and 35 years, what could guarantee the medium term survival of the borough - High percentage of residents that walk every day to their work or education center (about 30%)
Land use characterization	- High concentration of non residential land uses in the central axis of the neighborhood, what can be a problem for residents located near the limits of the study area, cause a high pedestrians concentration and traffic congestion	- Existence of a great quantity and diversity of non residential land uses in the central axis of the borough, what arises a good community livability - High percentage of non residential land uses with local irradiation, what favors pedestrians in the modal transports distribution
Real estate characterization	- Existence of a significant percentage of degradated buildings - Significant percentage of obsolete dwellings - 14% percentage of non occupied dwellings - Low quantity of dwellings in the estate market (high price speculation)	- Large block's commons that nowadays have a rural use, which can be used for future parking interventions. - Market trend to buildings recuperation and neighborhood renewal

Table 3 – Problems and opportunities observed from the transport generation factors.

5.2 . Transports Supply

In the transport supply characterization were included four important features: the traffic network hierarchy, the physical characterization of the transport infrastructures, the public transport characterization and the parking characterization.

The problems and opportunities observed in these features are presented in Table 4, where the unfavorable pavement conditions, the lack of public spaces, the low transport capacity f public transports, the low parking capacity and the high percentage of illegal parking are the main problems observed in the study area. Listed as the main opportunities are the: the almost exclusive one way road circulation in the study area streets (that grants a sense of neighborhood, avoiding unwanted traffic), the existence of two belvederes, a large quantity of bus routes that cross the study area and liable public transports connection the metropolitan stations.

The transport supply opportunities must be carefully analyzed and used as an important instrument for the intervention proposals.

Transport Supply (Problems/Opportunities)		
Components	Problems	Opportunities
Traffic network hierachy	- It doesn't exit a principal distribuition road crossing the neighborhood, what could reduce the accessibility at the city scale	- It doesn't exit a principal distribuition road crossing the neighborhood, what could reduce traffic congestion in the study area and increase the community livability - The majority of the roads of the study area have only one way circulation, what reinforces the residential vocation of the borough
Physical characterization of the transport infrastructures	- Physical inadequacies of the R. da Graça road to the traffic functions - The sidewalk width of the street are usually lower than the authorized by the municipality, what could cause some pedestrians safety problems - Bad pavement conditions in the greater part of the borough - Lack of horizontal signalization or almost imperceptible - Lack of urban equipment or badly placed - Bad pavement conditions in the sidewalks, mostly caused by the illegally parked vehicles - Unorganized vertical signalization and inadequate in some streets - Lack of public spaces and in bad shape	- The greater part of the roads identified as local in the network hierarchy have favorable physical conditions for this it - Good compatibility of the tram rails with the road pavement - Existence of stairs in the steepest street that allow the elderly to rest - Existence of two belvederes with a beautiful landscape over the city and the river Tagus
Public Transport characterization	- Old bus network design that doesn't connect the study area directly to some new city areas - Peripheral localization of the main bus stops - The start and end points of the main bus routes are almost coincident - Low transport capacity (low capacity transit modes) - The bus routes fleets are quite old and uncomfortable	- Large quantity of bus routes that cross the study area - Existence of some bus routes that link directly the study area to the metropolitan (liable connection)
Parking characterization	- High quantity of illegal parking observed in the study area, what points out the lack of legal parking supply - Low off-street parking capacity in the study area (all for private use), what results in a higher on-street parking demand - The greater part of the off-street parking facilities are in the first floor of buildings and not in underground parking, what largely limitates the parking capacity	- The greatest concentration of off-street parking facilities are not located near the street with higher pedestrian flows (pedestrian-car conflicts reduction)

Table 4 – Problems and opportunities observed from the transport supply.

5.3 . Transports Demand

In the transport demand characterization was included a set of four important features: car flows analysis, pedestrian flows analysis, public transport demand estimation and parking demand estimation.

The problems and opportunities observed in these features are presented in Table 5, where the narrow sidewalks (specially in street with high car flows), the systematic illegal parking (specially over the sidewalk) and a high quantity of suppressed parking demand are the main

problems observed in the study area, and the low circulation speed of the cars, existence of high pedestrian flows in some streets, high vehicle occupation rate in the bus routes and low average parking time are the main opportunities.

The transport demand problems and opportunities should be an important guide in order to establish the mobility goals to accomplish and the people's behavior to correct or promote from all the stakeholders of the study area (pull and push transports policy).

Transport Demand (Problems/Opportunities)		
Components	Problems	Opportunities
Car flows analysis	- The car flows in the R. da Graça and Largo da Graça are quite high for their physical infrastructure characteristics - Freight transport that serves the R. da Graça (main commercial area) aggravate severely the car circulation	- The usual circulation speed of the cars in the roads of the study area are quite low, what makes possible a good compatibility with pedestrians
Pedestrian flows analysis	- Narrow sidewalks in the street with higher pedestrians flows (i.e. R. da Graça), what can cause some severe conflicts between cars and pedestrians - Systematic illegal parking over the sidewalks	- Existence high pedestrian flows in some street of the study area, what raise the community livability - Significant number of tourists in the study area - Existence of some residential street in the borough where the traffic flow is very low, easing up the pedestrians and cars coexistence
Public transport demand	- The existent bus-metropolitan connection to is not usually used	- The bus routes that cross the study are present a high schedule liability - High vehicle occupation in most of the bus routes that cross the study area
Parking demand	- Massive occupation of the sidewalks by parked cars, what reduces the sidewalk capacity that is already low - According with the parking demand simulation model developed for this study, the suppressed parking demand in the study area is about 4.000 cars - According with the parking demand simulation model, the total parking supply of the study area is not enough during 6 hours per day	- The average parking time in the study area, not considering the residents, is lower than 2 hours, what could be considered a good parking rotation value

Table 5 – Problems and opportunities observed from the transport demand.

5.4 . Mobility Patterns and Local Authority Expectations

The mobility patterns and Local Authorities expectations were assessed through a mobility survey to the main stakeholders (residents, visitors, workers and shop owners) and an interview with the Local Authority Administration.

The problems and opportunities observed from the mobility survey and Local Authority Administration interview are presented in Table 6, where the main stakeholders consider that the lack of parking capacity and public spaces, pedestrian comfort and security are the main problems observed in the study area. As satisfactory behavior it should be pointed out the conviction form the public transports officials and Local Authority that the municipality and the private initiative will create 3 new off-street parking facilities.

The mobility patterns and Local Authorities expectations problems and opportunities were taken into account in the definition of priority fields of intervention (short term interventions) and when the intervention proposals were developed, as an important instrument to measure the stakeholder's acceptance of the proposals.

Mobility Patterns and Local Authority Expectations (Problems/Opportunities)		
Components	Problems	Opportunities
Mobility survey	- Residents consider the lack parking capacity, public spaces and security as the main problems of the borough - Visitors consider parking, safety and pedestrian comfort as the main problems of the study area. - Workers consider parking as a severe problem of the study area	- Residents, visitors and workers qualify the public transports in the study area as satisfactory
Local Authority Expectations	- The Local Authority Administration consider parking as main the problem of the borough and that has been neglected by the municipality	- The Local Authority Administration expects the creation of 3 new tariffed facilities of off-street parking in the borough (2 from the municipality and 1 from private initiative)

Table 6 – Problems and opportunities observed from the mobility patterns and Local Authorities expectations.

5.5 . Study Area Diagnosis

After a profound analysis of the study area, the monitorization indicators were developed to spatialize the main mobility variables and identify the actual state of borough's mobility (Martinez, 2004; Martinez et al. 2005). In this article an option was made to present solely the global community livability indicator that can show where are the most problematic zones of study area and where the short term interventions are urgent. The results for this indicator are presented in Figure 2, where it can be seen that the central axis and North part of the borough present worse values, due to its pedestrians comfort and traffic congestion problems that must have immediate solution.

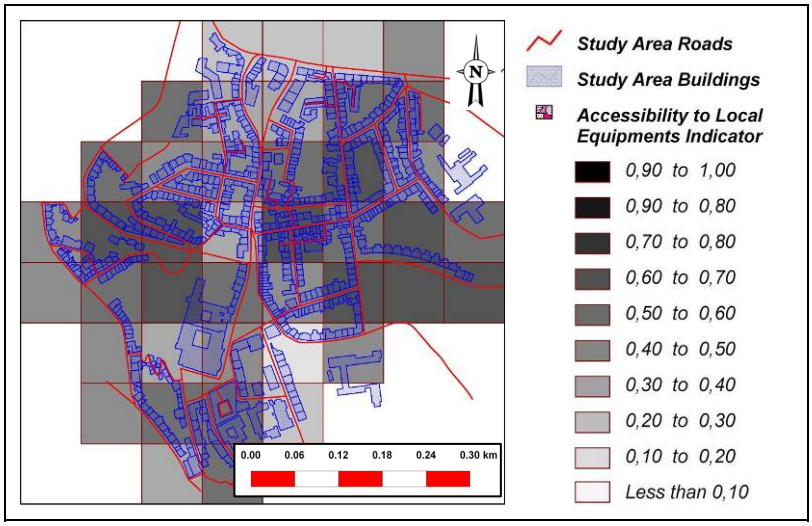


Figure 2 – Community livability indicator (before the interventions proposals).

It was also identified that the main fields of intervention in the study area, based in the analysis results and the monitorization indicators, are the pedestrians comfort and safety, the traffic congestion and its conflicts with pedestrians, the lack of parking capacity and its

physical organization (less illegal parking), and the creation of some public spaces to raise the community livability of the borough.

6 .INTERVENTION PROPOSALS

In this Chapter six intervention proposals will be presented thought to be considered urgent for a good mobility of the borough. These interventions are focused in the fields identified as a priority for the study area. Each intervention proposal has a major goal (i.e. increase parking capacity) but always consider the other mobility variables and interactions. These interventions are presented in Table 7, where all the input (including an estimated budget) and outputs are presented and also an intervention's project overview.

Intervention Proposals (Inputs/Outputs)

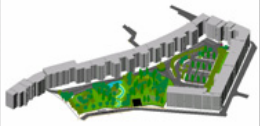
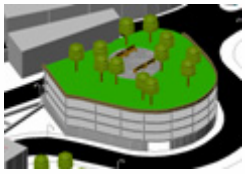
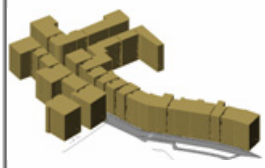
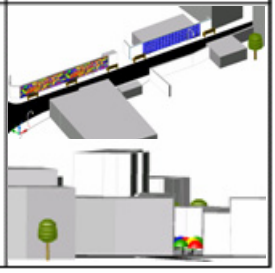
Proposals	Inputs	Outputs	Intervention
On-street Parking Organization (parking spaces marking and tariffying)	- 1589 legal on-street parking spaces (estimated) - 594 illegal on-street parking spaces (estimated) - Untariffed on-street parking - Budget: 20.000 € (estimated)	- 1589 legal on-street parking spaces (marked) - 50% use reduction of illegal on-street parking spaces (estimated) - Tariffed on-street parking (0,50 €/ hour) and free licences for residents (1 per dwelling)	
Block's Commons Requalification for Parking and Public Spaces	- 2 block's commons (15323,23 m2 and 7272,14 m^2) - 180 illegal on-street parking spaces inside the influence area of the blocks (estimated) - Budget: 6.666.175 € (estimation including expropriation)	- 224 new parking spaces inside the blocks (with traffic calming measures to reduce the noise) - 7.000 m^2 of public spaces (gardens and leisures spaces) - Replacement of existing illegal parking inside the influence area	
Construction of a Parking Lot Near the Commercial Area of the Borough	- 1243 m^2 of public land property of no other urban qualification and 20 m of unlevelling (5 parking levels) - Supressed parking demand of 520 parking spaces (estimated) - Budget: 582.800 € (estimation assuming that EMEL municipality company explores it)	- 248 tariffed off-street parking spaces with 10% of them reserved for residents quotas (approximately 60 € per month) - A sightseeing space of 1243 m^2 on the top of the lot. - Reduction of illegal parking inside its influence area	
Creation of a reversible one way road with traffic light control in R. da Graça	- Two way street (one lane per way) and sidewalk average width of 0,80 m in both sides. - Priority intersection HCM 2000 level of service B (intersection average) - Pedestrian HCM 2000 level of service E - Budget: 30.000 € (estimated)	- Reversible one way street controlled by traffic lights - Sidewalk average width of 2 m in both sides of the street - Traffic light controlled intersection HCM 2000 level of service D (intersection average) - Pedestrian HCM 2000 level of service A	
Creation of a pedestrian circuits for tourists	- Existence of touristic spaces in the surrounding areas of the borough (i.e S. Jorge Castle) - Existence of interesting spaces inside the borough that should be visited (i.e Graça Monastery) - Budget: 20.000 € (estimated)	- 2 pedestrian circuits of approximately 40 minutes (14 points of interest) - Line marking in the sidewalk along the circuits (with colour ink) - Introduction of 6 information points along the circuits	
R. Damasceno Monteiro and Travessa do Monte requalification	- Exclusive pedestrian street (T. do Monte) but with residents parking permission - Existence of bars and restaurants (T. do Monte) - Existence of two walls along the road and intense criminality and vandalism (R. Damasceno Monteiro) - Budget: 20.000 € (estimated)	- Pavement replacement for pedestrian exclusive and emergency vehicles (T. do Monte) street (T. do Monte) - Creation of Art Hall in the R. Damasceno Monteiro using the two walls promoting the community livability - Insert this two street in the developed pedestrian circuits	

Table 7 – Intervention proposals characterization.

During the development of these proposals the monitorization indicators were always used as an instrument to measure the results, impacts and also the stakeholder's acceptance. These proposals are a final result of an iterative process of proposals and stakeholderd's acceptance as it was presented in the framework for this kind of studies.

6.1 . Results and Impacts of the Proposed Interventions

After the development of the intervention proposals, it were made a set of analysis on results and impacts (expected), using the different monitorization indicators, a qualitative overview of the intervention results and impacts over other mobility variables, and also a qualitative analysis of the opinion of the different stakeholders. This analysis is presented in Table 8, where it can be seen that the results and impacts of the interventions are mostly positive for all mobility variables, resulting of an integrated analysis process.

Intervention Proposals Results and Impacts						
	Pedestrian Comfort	Traffic Congestion	Parking Capacity and Quality	Transit Avaliability and Liability	Community Livability	Stakeholders acceptance
On-street Parking Organization	++ Estimated 25% reduction of conflicts between pedestrians and parked cars	+ Reduction of illegal parking or non organized parking that leaves more road width for car circulation	-/++ Conservation of the study area parking capacity (tariffed) largely incresing the parking organization, decresing this way the conflicts of parking with other mobility features.	+ Possible increase in transit demand due to the parking tariff and increase of transit liability (less traffic congestion)	+ Increase of the community livability due to the parking organization promoted and an expected increase of pedestrians.	Parking tariff (residents, workers and Local Authorities) / Shop owners and visitants
Block's Commons Requalification for Parking and Public Spaces	++ Estimated increase of pedestrians in the streets near these new public spaces	- Soft increase of traffic congestion in the streets located near the parking entry points	++ 15% increase of the study area parking capacity specially dedicated for resident. This parking capacity increase will allow a total substitution of the illegal parking inside the influence area of the blocks.	+ Increase of transit liability due to the illegal parking reduction that sometimes obstruct the buses circulation, and pedestrians accessibility to bus stops	++ Increase of the community livability due to the parking organization promoted, the expected increase of pedestrians and the creation of new local public spaces	Owners of some small and obsolete industries in these commons (some of them illegal) / All the other stakeholders
Construction of a Parking Lot Near the Commercial Area of the Borough	++ Estimated increase of pedestrians in the streets near the new sightseeing in the top of the parking lot	- Soft increase of traffic congestion in the streets located near the parking entry points	++ 15% increase of the study area parking capacity specially dedicated for visitors and for some residents through tariffed licences (total capacity increase for the study area of 30%)	+ Increase of transit liability due to the illegal parking reduction that sometimes obstruct the buses circulation, and pedestrians accessibility to bus stops	++ Increase of the community livability due to the parking organization promoted, the expected increase of pedestrians and the creation of new local public spaces	Perhaps the Municipality because it will be built in public land property / All the other stakeholders, specially from the shops owners and the visitors
Creation of a reversible one way road with traffic light control in R. da Graça	++ Estimated increase of pedestrians and safety in this street (main commercial zone of the study area)	- Soft increase of traffic congestion due to the traffic light control, specially to cars that cross the borough		+ Increase of transit liability due to the easier circulation and priority in this street, and pedestrians accessibility to bus stops	++ Increase of the community livability due to the expected increase of pedestrians and safety	Usual car drivers (from the study area or that cross the study area) and from the local authorities / Usual pedestrians and public transport users.
Creation of a pedestrian circuits for tourists	++ Estimated increase of tourist pedestrians in the streets along the circuits		- Loss of some on-street parking spaces in conflict areas along the circuits (less than 2%)		+ Increase of the community livability due to the increase of pedestrians along the circuits	Car owners residents near the parking spaces suppresion / All the other stakeholders, specially from the shops owners
R. Damasceno Monteiro and Travessa do Monte requalification	++ Estimated increase of pedestrians in these streets without car conflicts		- Loss of some on-street parking spaces in these streets (10 parking spaces)		++ Increase of the community livability due to the increase of pedestrians in these streets and their requalification	Car owners residents near the parking spaces suppresion / All the other stakeholders, specially from the shops owners

Table 8 – Expected results and impacts of the proposed interventions.

The results and impacts can also assessed using the monitorization indicators, mainly using the community livability indicator and its variation from the original configuration. The results

are presented in Figure 3, where it can be easily seen that, after the interventions the same indicator used previously at Figure 2 presents now more homogeneous values and also higher values, especially in the East part of the study area where the values are near to the indicator's maximum value.

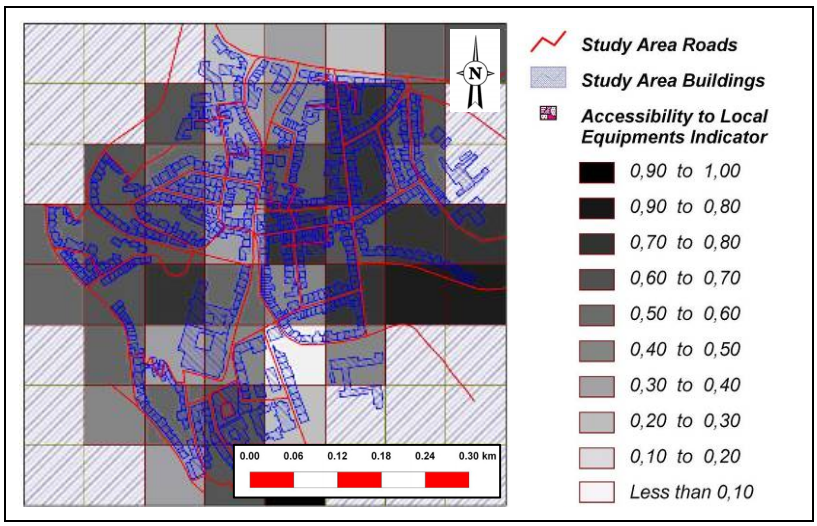


Figure 3 - Community livability indicator (after the interventions proposals).

7 .CONCLUSION AND APLICATION FIELD

After the development of a framework analysis for Local Mobility Plans and the its implementation in a case study, it can be concluded that these kind of studies mean an important breakthrough for the understanding and improvement of local mobility, being an important instrument to raise neighborhood life quality and even at larger scales through the coordination and integration of several Local Mobility Plans, raising mobility standards for all the city.

This kind of studies should also allow (coordinated with other instruments and policies - i.e. land use regulation) for the increase of the city's center attractiveness for residential use, what could solve some social and mobility problems at the metropolitan scale.

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BIBLIOGRAPHY

Golias J., Yannis G., Harvatis M. (2002) Off-Street Parking Choice sensitivity. Transportation Planning and Technology, vol.25, pp.333-348.

HighWay Capacity Manual – 2000. Transportation research Board. National Academy of Sciences, 2000.

Litman T. (2003) Economic value of Walkability, Transportation Research Record, 2731, Paper no.03-2731, pp.3-10.

Making London a Walkable City [internet] The Walking Plan for London. Available: http://www.transportforlondon.gov.uk/streets/downloads/pdf/walking-plan-2004.pdf [consulted 22 of May 2004].

Martinez, L. Miguel, José M. Viegas, Elisabete A. Silva (2005), "Livable Communities" Indicator development and its aplication in a borough of the Lisbon City. AESOP 05 –

Viena: The Dream of a Greater Europe, July 13-17. Abstracts: page 117. Paper: 9 pages

Martinez, L. (2004) Plano de Mobilidade da Graça (A Mobility Plan for Graça). Major Degree Dissertation, Adviser: Prof. José Viegas, Co-Adviser: Dr. Elisabete Silva. Pages. (DECIVIL). IST-UTL.Lisbon, Portugal.

Robertson K. (2001) Parking and Pedestrians: Balancing two key Elements in DownTown Development, Transportation Quarterly, vol.55,No2, pp.29-42.

Viegas, José M. (2004) The current Mobility Situation in large Urban Agglomerations. Automóvel Clube de Portugal Symposium on "Mobility for All", 18 – 19 Setembro. Lisbon. IST.