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Parking Policy Measures and their Effects on Mobility and the Economy

Subject: Case Study of Lisbon

Parking Policy in Lisbon

1. INTRODUCTION

A diagnosis to the mobility / public urban space, revealed in the 80's the following aspects:

Public transport – Lack of capacity and quality

Transport Individual – "Explosion" of the private car park and an increase on its dependence

Parking –lack and chaos specifically in on-street parking places

The degradation and the traffic congestion on public space resulted from:

- undisciplined parking in a lot of areas of the city
- "deficit" of the parking capacity, in public and private parks
- changes on the use of built garages
- absence of urban planning norms "versus" evolution of private parking
- induced effects on traffic circulation and on the quality of urban life.

2. THE PARKING POLICY IN LISBON

In the 90's the following objectives for a coherent parking politicy were defined:

- to improve the traffic flow circulation and to reinforce, in a balanced way, the urban accessibility.
- to increase the supply of legal parking "versus "illegal parking
- to create management conditions to discipline public spaces
- to control the automobile penetration in the urban centre (paid parking policy)
- To improve the urban environment especially in the central and residential areas.

2.1. Overview

On behalf of this policy and relative to the parking the following actions were defined:

- Public "building" parks – Private concessions (up to 1991 of 20 years – and after that date of 50 years).
- Dissuasion and "mixed"parks – Municipal district or municipal company.
- On-street parking – Creation of a municipal company for administration of "on-street parking" as priority in the 1st city crown.
- Residential Areas – Implementation of residents associations with the objective of the attribution for 99 years of lots in residential areas.
- Expectant lots - (lots awaiting for 2-3 years for the municipality building approval) – private sector.

The creation of EMEL (Municipal Lisbon Parking Enterprise) and the development of a plan to create off-street parking places, is part of this policy. A small variation concerns the support that EMEL gives to the referred residents associations for the construction and administration of residents' parkings, considering the little associative spirit demonstrated (even so 2 or 3 dozens of associations were constituted).

2.2. Parking time limitations

In 1995 it started to be implemented in Lisbon a On-Street Parking policy, with a parking time limitation where:

- Residents have priority to park, without any restrictions or parking fees, in their residential zone. Resident's vehicles are equipped with a residential licence – resident card. The Resident Card has the identification of the zone, the vehicle licence plate and a validity date. These cards are issued by EMEL, and there isn't a limit for the number of vehicles with Resident Card per person. Presently there are in Lisbon 42.000 Resident's cards.
- Outsiders (other than residents of particular parking zone) have to pay for their use of residential places. The parking time limitations are applied between Monday to Friday from 8 a.m. to 22 p.m. and Saturdays from 9 a.m. to 20 p.m.. There are two different kinds of time limitations fees as it can be seen on the next table:

Table 1 – Parking fees zones

Fees zones	A	B
Hourly fraction	Euros	Euros
0h30	0,3	0,275
1h00	0,5	0,425
1h30	0,85	0,675
2h00	1,2	0,8
2h30	1,6	1,25
3h00	2	1,60
3h30	-	2,00
4h00	-	2,45

The maximum parking time, which corresponds to the maximum time for a parking ticket, are 3 hours for A zones and 4 hours in B Zones. After that the vehicle should change parking place, but because it's very difficult to verify the maxim parking time, the users that want to stay more than the maxim time only need to change their tickets.

- There are some free parking places for loading and unloading of goods.

Presently in Lisbon there are 40 parking zones, with 37.000 parking places, where this policy was implemented.

The central area where EMEL acts corresponds to the 40 zones defined on the next picture:

Figure 1 – Parking zones with time limitations

The number of parking places implemented in each year since 1995 was:

	Places with time limitations	Long-term Paid Parks
1995	1.000	1.050
1996	5.800	1.025
1197	7.700	425
1998	7.000	425
1999	6.000	750
2000	6.500	2.125
Total	**37.000**	**5.800**

50% of the revenue of paid parking reverts to the municipality, and the other 50% are invested by EMEL.The total revenue in 2000 was 10.000.000 Euros.

3. LOCAL SITUATION AND CONTEXT

To understand and evaluate the changes in mobility caused by this parking policy its necessary, in the first place, to understand the base conditions in which these changes occurred, specially the ones which affect the transport system.

The private and public transport network system in Lisbon can be seen on the following pictures:

Figure 2 – Road Network

Figure 3 – The freight public transport network

To understand the actual traffic problems it's also necessary an in depht analysis of other mobility variables like for instance, the distribution of population and work in the city of Lisbon.

The geographic distribution of population and work in the Metropolitan Area of Lisbon (AML) and it's evolution in the last decade is one of the factors which influences mostly the mobility in the region. Between 1980 and 1990 the total Lisbon Metropolitan Area (AML) population grew only 2%, but this growth corresponded to a change in the population that moved from the city centre to the neighbourhoods.

While in Lisbon there was a decrease of 18,2% of the population, in the municipalities on the North side of the River (outside the municipality of Lisbon) the growth was 13,1% and on the South municipalities it was 9,8%. The city centre became mainly a Work centre.

This distribution of population and work creates enormous daily traffic flows between the neighbourhood municipalities and the city centre. On the next pictures it can be seen the distribution of work offer in the city and the daily traffic flows in 1997:

Figure 4 – Distribution of Work in Lisbon and Flows Entrance in Lisbon

The increase of private transport flows in the city is due to the great increase on motorization rates in the last decades and the increase of purchasing power which turns inevitable the use of the automobile.

4. EFFECTS ON MODAL SPLIT

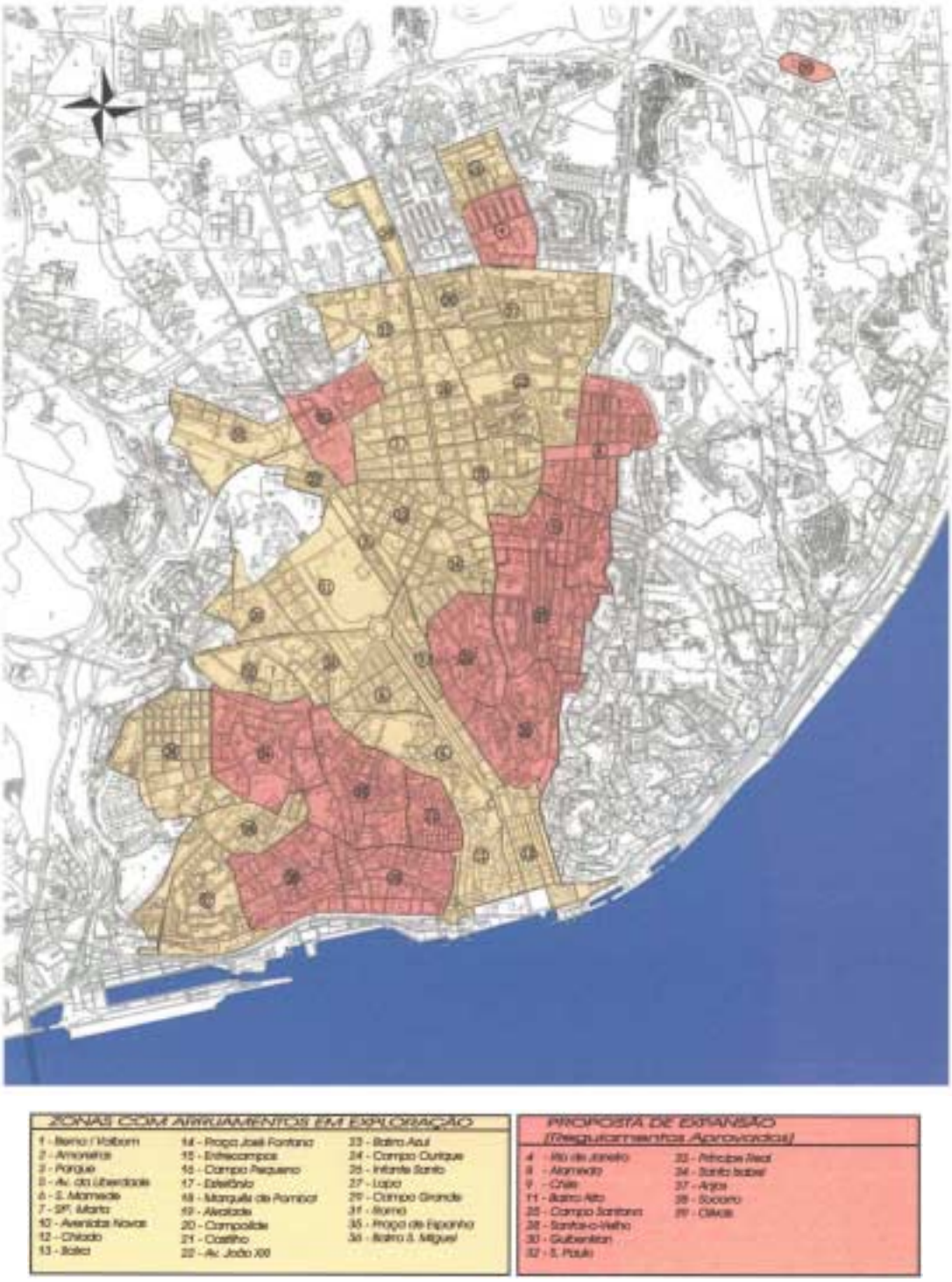
The results presented here are based on the study *"The Influence of the parking limitations on modal split in Lisbon"*, carried out in 1997.

At that time the implementation of this parking system was only beginning and the involving transport system was different, so first we are going to present a brief characterisation of the parking supply at that time and only after we will present a description of the study and its results.

4.1. Parking offer

In 1997, when the study was made, EMEL explored 25 zones with a total of 14.508 parking places. In the next picture are the existing zones and the foreseen zones with the corresponding number of places in each one.

Figure 1 – Time limitation parking zones



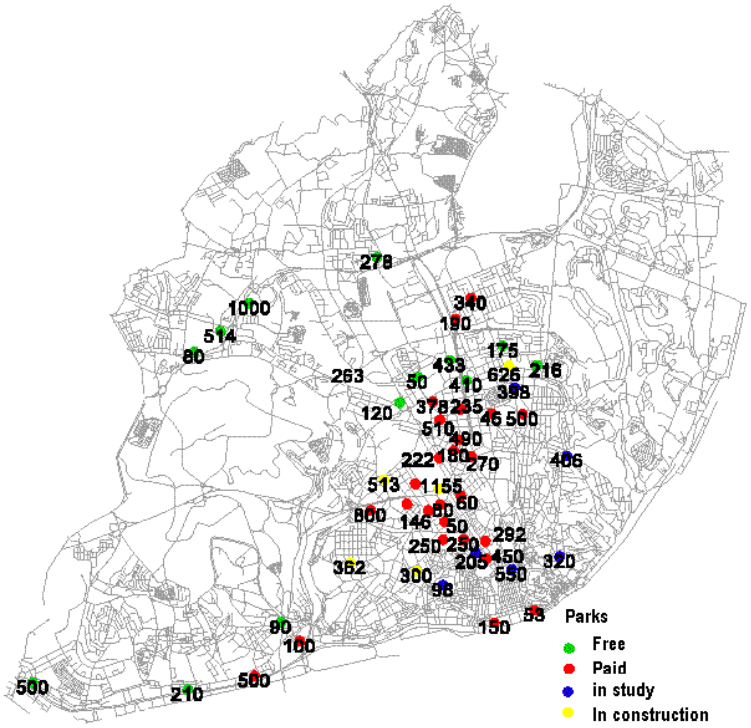
(Yellow – limited time parking zones (1997); Red – Future zones)

Table 1 – Parking zones with time limitations

N.r	Zone	Parking Places	N.	Zone	Parking Places
1	Avenidas Novas I	2150	15	Entrecampos	446
2	Amoreiras	77	16	Campo Pequeno	1036
3	P. Eduardo VII (Nascente)	725	17	Estefânia	452
5	Av. Liberdade (Eixo)	474	18	Marquês de Pombal	422
6	Av. Liberdade (Poente)	638	21	P. Eduardo VII (Poente)	1177
7	Av. Liberdade (Nascente)	466	22	João XXI	1945
8	Alameda	150	23	Bairro Azul	576
9	Arroios	29	24	Campo de Ourique	506
10	Avenidas Novas II	1340	25	Rato	220
11	Chiado Norte	17	26	Estrela-Infante Santo	358
12	Chiado Sul	232	27	Lapa	236
13	Baixa	208	29	Campo Grande	42
14	P. José Fontana	586			

On the next picture are the off-street park suplly in 1997:

Figure 1 – Off-street parking



1.1. "The Influence of parking time limitations on modal split in Lisbon" study

The study, which aimed to analyse the influence of the parking policy on modal split in Lisbon, was based on inquiries made on parking limitation zones. This study had not only the purpose to estimate the changes between Private Transport (PRIV) and Public Transport (PUB) but also to understand the differences of those changes between different zones.

Besides the inquiries, it also made a characterisation of parking demand with the following parameters: parking time and occupation rates. With these values it was possible to expand the inquiry results to the total parking demand.

The reactions to the implementation of this policy were differentiated by the type of zones and by the kind of users or potentials users of the parking. So the inquiries were carried out on four zones with different uses and with a different public transport service. There was also the need to divide the inquiries on different segments of users with the objective of being able to estimate later the global changes on modal split.

Different behaviours, on the different segmentations of demand, resulted apart after the implementation of this policy:

a) Workers in the zone (who are associated with long parking times):

   i) the ones who moved from Private transport (PRIV) to Public Transport (PUB);

   ii) the ones who parked farther (in "free" places);

   iii) the ones who moved from PUB to PRIV (insignificant number)

b) Travellers with leisure or personal trip motives:

   i) the ones who kept the PRIV mode but modified their trips destination:

      (1) rejecting paid parking zones (because it's necessary to pay);

      (2) adopting the paid parking zones (because it's easier to find place);

   iv) the ones who only changed from PUB to PRIV (because it's easier to find a parking place);

   v) the ones who only changed from PRIV to PUB (because the parking is paid)

c) Residents because it's easier to park near their houses they were motivated to change from PUB to PRIV and/or to increment their PRIV trips (for example: going to lunch at home).

To understand and evaluate these different behaviours the inquiries were made to the following different groups:

A- workers - at their jobs

B- people parking – at parking places

C- merchants - in commercial places/stores

D- residents - at their homes

To "catch" the people who changed the destination of their trips, leaving the zone and going to other place (point b) i) 1)), the commerce and services of occasional use in the zone had been inquired, concerning the alterations verified in its total volume of customers.

Definition and characterisation of inquired zones

The land use and the public transport service have great influence in the behaviour of parking demand, in the zones where this parking policy is implemented. So to understand the differente reactions the inquiries were carried out on the following for zones:

Zone A: corresponds to zone 5 of EMEL. This is mainly a commercial and service zone, where the residential function is scarce. This zone has a good, the best of the chosen, public transport service.

Zone B: corresponds to zone 21. It's a mixed zone of residential and services/jobs. The choice of this zone is especially due to the fact of having a bad public transport service.

Zone C: corresponds to zone 1. This zone is also a mixed zone residential and services/jobs, but there's also a strong presence of commercial uses. It's a zone well served by public transport.

Zone D: corresponds to zone 22. It's predominantly a commercial and residential zone. In 1997 this zone was not totally consolidated in terms of parking because there were still areas of parking, inside the zone, with free public access. In terms of accessibility it's well served by public transport.

1.2. Parking parameters Results

In the inquiry zones a characterisation of the parking parameters on paid parking places was made. The results are presented in the following table:

Table 2 – Average parking time and occupation rate

	Zone A		Zone B		Zone C		Zone D	
	Parked vehicles	Vehicle. with ticket	Parked vehicles	Vehicle. with ticket	Parked vehicles	Vehicle. with ticket	Parked vehicles	Vehicle. with ticket
Parking time	2h17	2h26	3h32	2h38	2h18	2h24	3h19	1h49
occupation rate	82,61%		77,42%		91,50%		88,53%	

*Vehicles with ticket – Outsiders, Non residential vehicles

The analysis of parking times was carried out by the comparison of the average parking time of all the parking demand with only the paying vehicles (outsiders).

The most significant case occurred on Zone D where the difference between these two values is very significant. This is evidence that this zone has on the one hand one strong component of residents with long periods of permanence, but simultaneously that the paying vehicles are mainly associated with very short parking time (medical purchases, consultations, shopping, etc….).

In the opposite side in zones A and C the parking time is very low and practically there are no differences between the two times of permanence. The average parking time for payable vehicles within these zones are however quite superior to the one of Zone D, evidencing that on these zones the payable demand is associated to work motives.

Finally the Zone B presents a difference between the two times of permanence, certainly due to the great presence of residents vehicles, but simultaneously to the parking time of the payable vehicles, whose trips correspond specially to work and services motives.

The occupation rates are quite high (always above 75%) with emphasis for Zone C with more than 90%, which corresponds in practical terms to the full occupation of the supply during the whole day. This is more relevant if we have in account that this is the zone with larger offer of parking places, 2150 places, among all the already existing in Lisbon. This situation shows the high pressure in the parking demand.

1.3. Modal Split – transfers between private and public transport

The transfers in modal split are going to be analysed for the different users segments:

1.3.1. Workers

The introduction of this policy forced a rearrangement in the modal split of house-to-work trips for a significant number of workers.

The comparison with the previous situation can be seen in the Table 3, in which the values of workers modal split before and after the introduction of this parking policy are.

Table 3 – Workers modal split

Transport Mode	Zone A		Zone B		Zone C		Zone D		Average	
	Before	After	Before	After	Before	After	Before	After	Before	After
Private Transport	57,4%	43,2%	80,0%	68,0%	67,2%	54,2%	66,9%	62,3%	67,9%	56,9%
Private and Public	9,5%	16,9%	1,3%	3,3%	5,3%	6,9%	2,6%	4,0%	4,7%	7,8%
Public Transport	33,1%	39,9%	18,7%	28,7%	27,5%	38,9%	30,5%	33,8%	27,4%	35,3%

Even on this new scenario, with paid parking, most of the house-to-work trips for these areas are accomplished in Private Transport (56.9%). However it can be seen a tendency for growth for the trips by Public Transport.

In Zone A the house-to-work trips, after the implementation of this parking policy, present a credit for Public Transport of 57% against 43% in Private Transport. In this area it is quite significant the weight of the trips with combined modes (Private Transport + Public Transport) representing now 17% of the total trips when before it represented just 10%. This is due to the fact that this area is well served by public transport. There are direct connections to the Metro (with dissuasion parks - P&R), the bus service is good and it's near to the station of South and Southeast (3% of the workers referred that they arrive to this zone by foot after using the boat station).

Zone B is the one with the larger unbalance in favour of Private Transport. This situation isn't strange because this is the area with worst public transport service.

In the next table the transfers for the different transport modes in all the studied zones are presented.

Table 4 - Variations in the workers modal split

Modal Split	Zone A	Zone B	Zone C	Zone D	Average
PRIV	-14,2%	-12,0%	-13,0%	-4,7%	-11,0%
PRIV + PUB	7,4%	2,0%	1,5%	1,3%	3,1%
PUB	6,8%	10,0%	11,5%	3,3%	7,9%

A decrease in the trips made by Private Transport occurred in all the zones. Zone D was the one with the smallest decrease with only 5% less. The remaining areas had breaks around 13%.

In general the transfers were directly from Private Transport to "pure" Public Transport (trips made integrally by Public Transport). Only in Zone A, where it was observed the largest transfers, there was a balance among the combined trips (Private Transport + Public Transport) and "pure" Public Transport.

On average there was a loss of 11% on the Private Transport trips and an increment of 8% in the trips made only by Public Transport. This new modal split resulted not only totality from the transfer from private transport to public transport, but there was also a little transfer from private transport to public transport because now there are places available.

Table 5 - Transfers between modes

Transfers	Zone A	Zone B	Zone C	Zone D	Average %
PRIV → PUB or PRIV+PUB	15,5%	13,3%	13,0%	6,0%	12,0%
PUB or PRIV+PUB → PRIV	1,4%	1,3%	0,0%	1,3%	1,0%

As it can be seen on this table the transfer from Public Transport to Private Transport is in average 1% and never above to 1,4%.

- For all the studied zones a significant transfer from Private Transport to Public Transport or Private Transport + Public Transport was verified. The percentile values vary between a maximum of 16% in Zone A and a minimum of 6% in Zone D, with intermediate values of 13% in Zones B and C.

- In Zone A occurred the highest transfer to public Transport, this can be explained by the good public transport service and on the other side by the lack of parking places.

- In Zone D the transfer between private and public transport only represents 6% of the total trips, which is the lowest value. This fact can be explained because near the limits

of this area, and even inside, there was free parking places (without fees). So many workers besides changing to public transport only changed their parking place (parked farther).

1.3.2. People parking

The main objective of this inquiry was the characterisation of the demand in Private Transport and through that the understanding of transfers between Public Transport and Private Transport and eventually the increments of trips generated in Private Transport.

Private Transport transfers to Public Transport cannot be observed through this inquiry, however most of this transfer occurred in the workers' segment already studied.

From these inquiries the following conclusions were taken:

Trip motives

From the results presented on the following table it can be verified that the work trip is the most significant motif of parked vehicles.

Table 6 – trip motives – parking users

Motives	Zone A	Zone B	Zone C	Zone D	Average
Work	35,9%	36,3%	42,7%	24,5%	34,9%
In service	36,9%	24,5%	27,2%	23,1%	27,9%
Personal	11,1%	13,9%	11,0%	13,0%	12,2%
Shopping	7,8%	8,4%	5,3%	24,5%	11,5%
Leisure	3,7%	13,9%	5,3%	7,9%	7,7%
Health Motives	4,1%	3,0%	7,3%	5,1%	4,9%
Return to home	0,5%	0,0%	1,2%	1,9%	0,9%

In Zone A the parking demand for service motives is the highest. It has also confirmed the great component of shopping trips in Zone D.

Trip Frequency to the Zone

After the introduction of paid parking policy the trip frequency, by Private Transport, to a studied zone changed. Some people go there often because now they can find a parking place but some seldom go ther because now they have to pay.

The number of people that answered they seldom to the zones is practically equal to the number of answers “go often time”, so in average they are compensated. These results confirm the information collected on shopping, who say that the customers' frequency is equal after the installation of fee parking.

Table 7 – changes on the trip frequency

	Zone A	Zone B	Zone C	Zone D	Average
Equal	66,4%	73,0%	72,0%	78,7%	72,5%
More	17,5%	10,5%	14,6%	13,0%	13,9%
Less frequency	16,1%	16,5%	13,0%	8,3%	13,5%

The zone which won more trips was Zone D. The number of people that answer they go there more frequently were 13% while the ones that answer in opposite terms were only 8%, so there was 5% more vehicles parking.

Fidelity of parking demand

An important element to understand the acceptance of paid parking in public streets is the analysis to the people's answer when they were asked about what they would do if the prices of the fees increase.

In this study they were questioned about their behaviour if an increase of 25% and 100% occurred. Three groups of potentials kinds of parking users were considered:

- Captive: those that answer they would always come by private car, even after an increase of 100%.
- Undecided: the ones that now come by automobile, but that will leave it if the price increases 100%.
- Transferable for Public Transport: the ones that sometimes come by Private Transport or that will change to public transport if the price increases.

The results obtained are shwon in the following table:

Table 8 – Fidelity of parking demand

	Zone A	Zone B	Zone C	Zone D	Average
Captive	26,3%	28,3%	24,0%	32,9%	27,8%
Undecided	27,6%	30,4%	27,6%	27,3%	28,2%
Transferable to PublicTransport	46,1%	41,4%	48,4%	39,8%	43,9%

This demonstrates that for a wide portion of parking demand, the actual modal choice can still change.

The changes from different transport modes to the private vehicle can be seen on the next table:

Table 9 – Modal split before paid parking system of actual parking demand

Modal Split	Zone A	Zone B	Zone C	Zone D	Average
Private Car	84,8%	85,7%	88,2%	89,4%	87,0%
Public Transport	10,6%	8,4%	8,5%	5,6%	8,3%
By Foot	1,8%	1,7%	2,0%	1,9%	1,9%
Other	0,0%	1,3%	0,0%	0,0%	0,3%
Didn’t came	2,8%	3,0%	1,2%	3,2%	2,5%

Only 2,5% of the actual parking demand started to come to this zones after the implementation of paid parking. It is not possible however to indicate the balance since the losses are not known (persons who changed parked on the zone but now go to another place), but these losses aren’t significant (in merchants opinion).

The changes from Public Transport to Private Transport were greater in Zone A. On the other hand Zone D was the zone with less behaviour alterations.

1.3.3. Residents

The residents are the best benificiaires with this parking policy because they can park freely, without a time limitation and there is more parking places available. So an inquiry was done to residents in the studied zones to understand the effect that this policy had in residents modal choice and in trip generation.

The next table presents the results on the areas analysed, except on Zone A where the residents data was insufficient to bring conclusions.

Table 10 – Changes daily trips in private transport

	Zone B	Zone C	Zone D	Averag
Increase	41%	26%	21%	**22%**
Decrease	59%	74%	79%	**78%**

Through these results it can be verified that for a significant percentage of the residents of there zones this policy resulted in an increase of the mobility in automobile in some cases but an alteration in the mode choice in most of the cases. Although not explicit the way it has changed, it seems that they have been mainly from PRIV to PUB.

1.4. Conclusions

Besides these indicators, the estimated trip transfers in each zone, in absolute values, gives other perception of the effects of the impact of this policy in the modal choices in Lisbon.

The modal transfers that happened in each Zone are:

Table 11 – Changes on modal split

	Zone A		Zone B		Zone C		Zone D		
	Trips	%	Trips	%	Trips	%	Trips	%	
Total daily (8h00-20h00) trips to the zone	23.104		5.693		34.132		35.769		**Averag e**
Changes form PRIV → PUB.	1.963	8,5%	476	8,4%	2.185	6,4%	1.171	3,3%	**5,9%**
Changes PUB → PRIV	488	2,1%	123	2,2%	690	2,0%	583	1,6%	**1,9%**
Trips in PUB before	13665	59,1%	2279	40,0%	14586	42,7%	14828	41,5%	**46,0%**
Trips in PUB After	15140	65,5%	2632	46,2%	16080	47,1%	15416	43,1%	**49,9%**
Balance for Public Transport	**1475**	6,4%	**353**	6,2%	**1494**	4,4%	**588**	1,6%	**4,0%**

- In the group of the four studied Zones there is an increment of 4.000 trips in Public Transport resulting from modal transfers, corresponding to 4% of the 100.000 trips generated in those zones during the study period (8:00h - 20:00h – paid parking limitation). The changes from Private Transport to Public Transport were of the order of 5.900 trips while from Public Transport to Private Transport were 1.900.

- The quantification of the people who changed from PRIV to PUB was only carried out on workers group, because this behaviour isn't significant in trips with other motives. On the other hand the changes from PUB to PRIV was specially characterised through the "people parking" inquiries (work and other trip motives).

- The occupation rates are quite high (always above the 75%), this shows the high pressure in the parking demand.

- Even with paid parking most of the house-to-work trips are made by Private Transport, in average 56.9%. However it can be seen a tendency for growth for the trips in Public Transport. In all the studied zones a significant transfer from PRIV to PUB or PRIV+PUB was observed. This transfer depends directly on the quality of the public transport service.

- The analysis of parking demand fidelity demonstrated that for a wide portion the modal choice could still change. There was a strong percentage of people who said they would change to Public Transport with an increase of the fees.

- The occupation rates on all the zones studied is very high (always above 75%), which corresponds in practical terms to the full occupation of the supply during the whole day. This shows the high pressure in parking demand.

- The residents are the best benificiaires with this parking policy because they can park freely in their residential zone, without a time limitation and with more parking places available. But if the destination of their trips is a time limited zone they have to pay. So this policy resulted in an increase of the mobility in automobile in some cases but in an overall decrease in most of the cases.