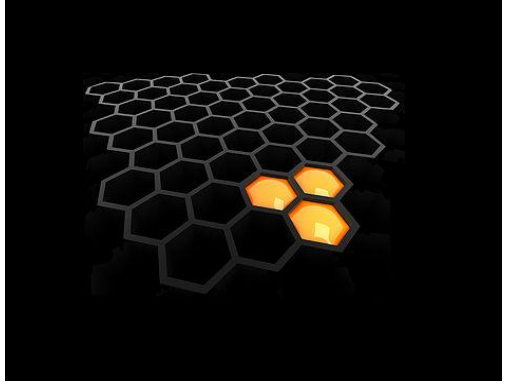


CITIES FOR US

engaging communities and citizens for sustainable development

COMMUTING FLOW PATTERNS IN LMA:
TOWARDS AN EFFECTIVE CONTRIBUTION TO SUSTAINABLE DEVELOPMENT?

Ana Louro
Nuno Marques da Costa

CEG-IGOT-ULisboa

12th International Symposium on Urban Planning and Environment
1th UPE Lusophone Symposium

LISBON, Portugal
May 31 - June 3
2016

The main objectives of this paper:

1) To understand the evolution of commuting flow pattern in LMA, and;
2) Related it with the polycentrism perspective as the preferential spatial model for Sustainable Development in a multi-level scale.

Structure:

Introduction: objectives & methodologies

1. Polycentrism as path to Sustainable Development

2. Evolution of commuting flow patterns in LMA towards SD

2.1 LMA brief characterization
2.2 Main trends of commuting in LMA
2.3. One Fact Stands Out: Distance To Lisbon City Center

3. Demand *vs* Supply of public transport – The case of Bus in LMA

4. Final considerations

INTRODUCTION: OBJECTIVES & METHODOLOGY

SPECIFIC OBJECTIVES:

a) having LMA as case study, to understand the evolution of commuting flow patterns between 1981 – 2011, considering the Origin-Destination matrix, travel time and travel mode;

c) in the context of public transport system in LMA, to briefly analyze the bus system, in order to understand the mismatch between the existent service and their use.

METHODOLOGY:

a) collect and organize statistical data – population and commuting flows (Census, 1981 - 2011); employment (Ministry of Economy, 2003-2013);

b) collect and organize the database of public transport system in LMA (the case of bus, 2015);

c) use of a GIS, to represent spatial evolution of commuting flow patterns and the bus network coverage.

1 POLYCENTRISM AS AS PATH TO SUSTAINABLE DEVELOPMENT

European policy orientations promote **polycentrism** as key concept to territorial cohesion and **sustainable development**.

(Ex. European Spatial Development Perspective, 1999; Territorial Agenda for the European Union 2020 (2007 and 2011; EUROPE 2020)

The objectives of **polycentric development** are clearly defined in the Portuguese spatial planning instruments, namely in PNPOT (2007) and in the Regional Spatial Planning Strategies, reinforcing the Sustainable Development Strategy at national, regional and local levels.

In Portuguese Metropolitan areas:

» Functional Urban Areas have not enlarge from 2001 to 2011 (despite the urban sprawl), but reinforced the relations between the Metropolitan municipalities.

(Costa & Costa, 2013)

1 POLYCENTRISM AS AS PATH TO SUSTAINABLE DEVELOPMENT

» **Complementarity of functions and employment**
» **Existence of an integrated infrastructure and public transport system**

Polycentrism as a factor for Sustainable Development

FUA

- **Principles:** integrated planning and management of infrastructures and services
- **Goal:** contribute for a more sustainable territorial model – strategic perspective; promoting connection through a high quality public transport network

Local – Ex. Sustainable Communities

- **Principles:** self-sufficiency, proximity, governance
- **Goal:** promotion of non-motorized travel modes or public transport modes; easy access to employment, public facilities, sports and leisure, etc.

1 POLICENTRISM AS AS PATH TO SUSTAINABLE DEVELOPMENT

Polycentrism has two complementary aspects:

1st) morphology - distribution of urban areas (number of cities, hierarchy, distribution);

2nd) relations between urban areas - networks of flows and cooperation (generally related to proximity, though networks can also be independent of distance).

(ESPON, 3, 2005).

In this sense, the variables “employment” and “travels” are fundamental to measure polycentrism, allowing the identification of centers and sub-centers.

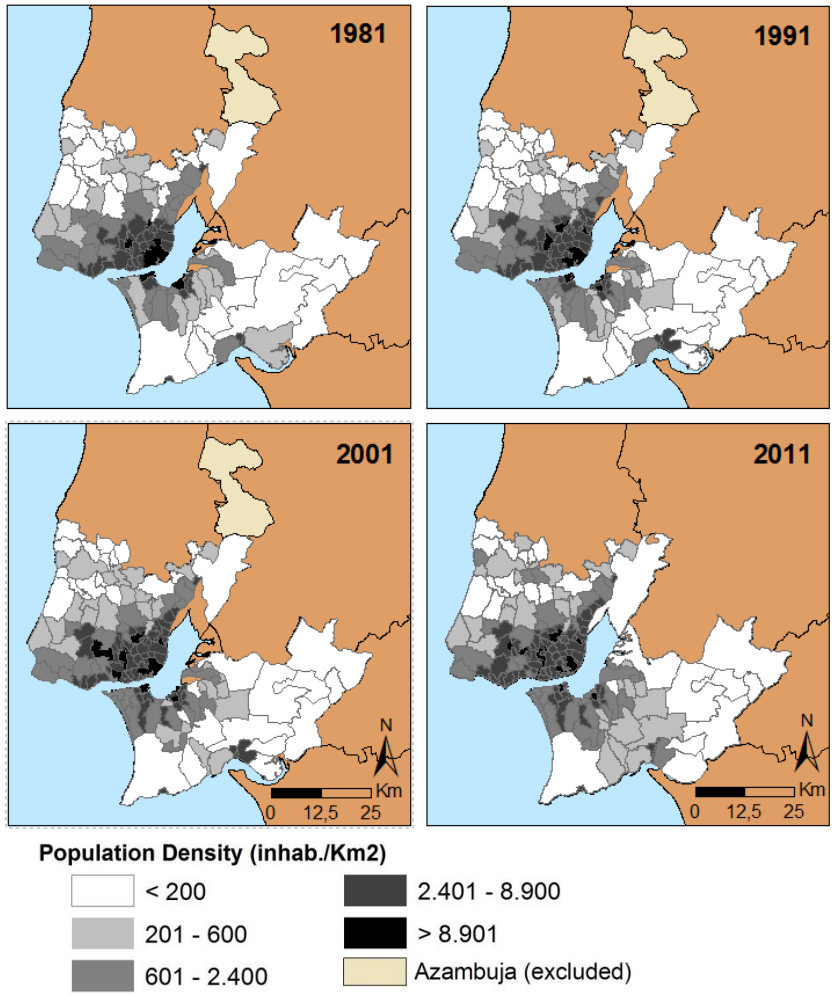
(Giuliano e Small, 1991; McDonald e Prather, 1991)

Commuting travel could be used to analyze the functional dimension of polycentrism as it reflects the interaction among municipalities or regions. In this case, commuting travel was considered as a functional aspect as it **represents the organization of housing and labor / scholar dimensions.**

(Nunes, Mota & Campos, 2011, 8)

2. EVOLUTION OF COMMUTING FLOW PATTERNS IN LMA (1981-2011)

2.1 LMA brief characterization



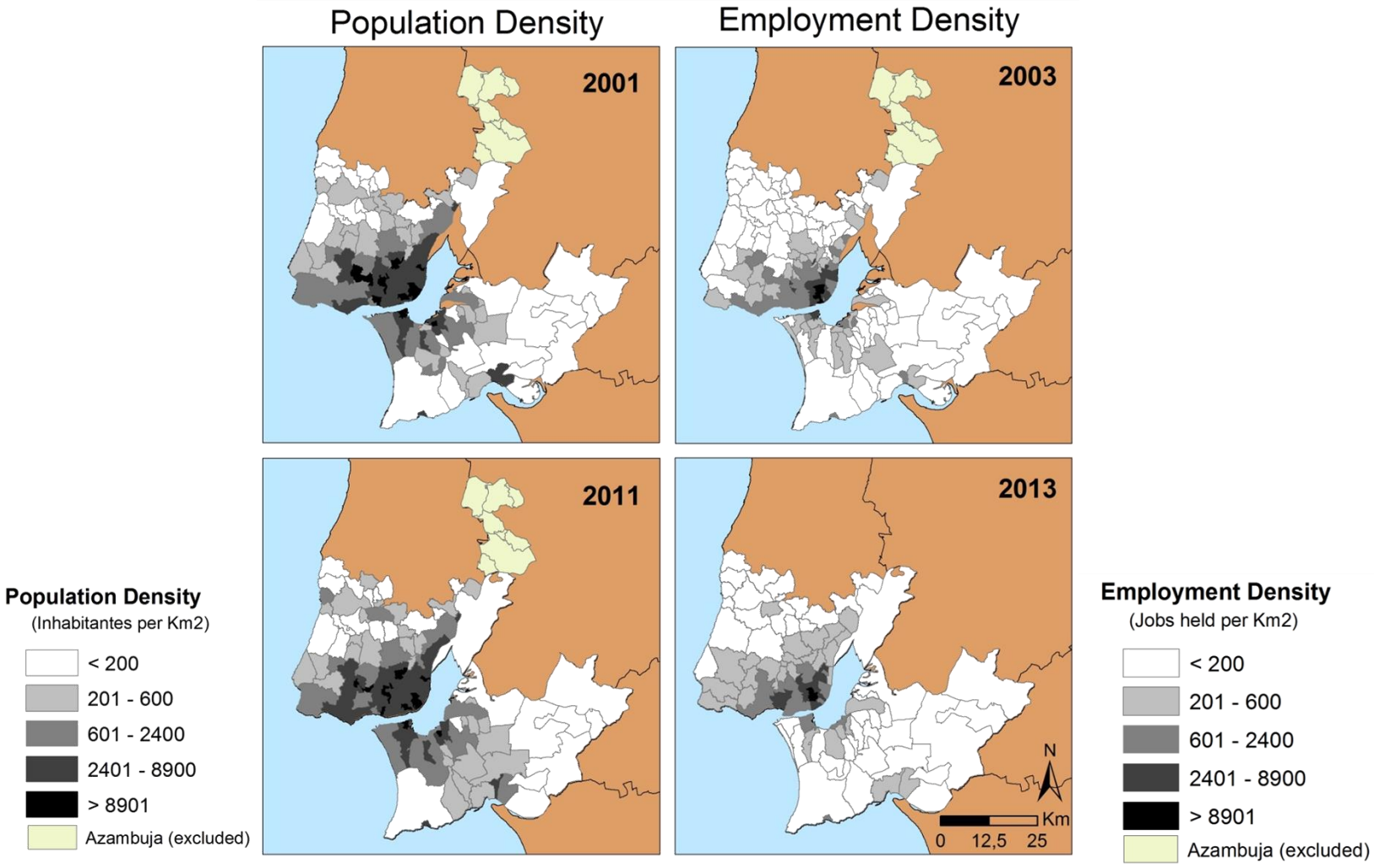
18 municipalities separated by Tagus River

increased population of 13,7% (Census 1981 - 2011)
(from 2.482.276 inhabitants in 1981 to 2.821.699 inhabitants in 2011)

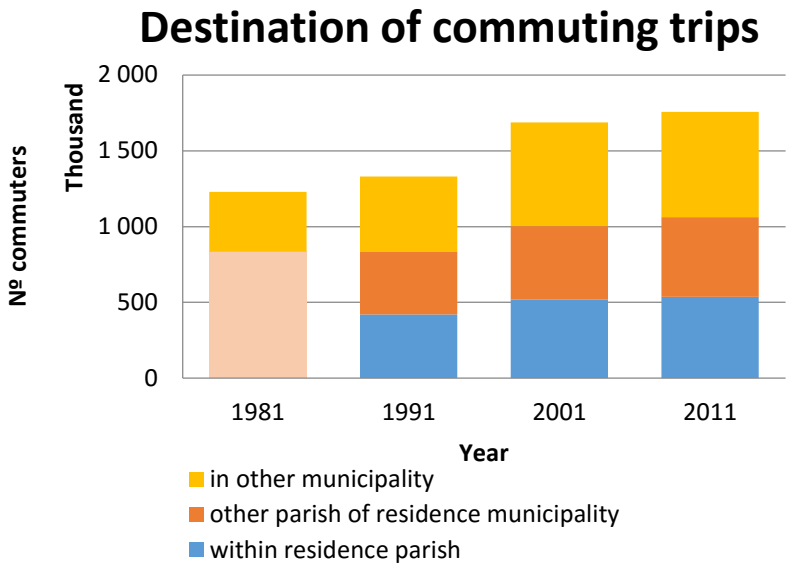
URBAN SPRAWL

2.1 LMA brief characterization

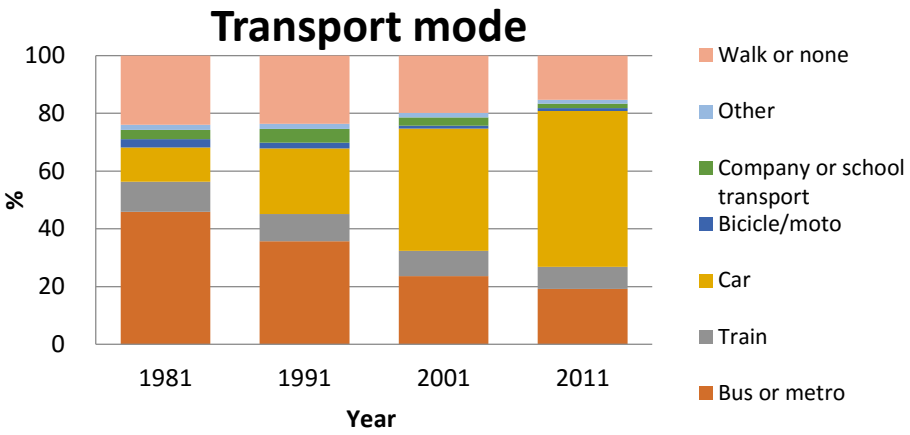
- Influence of geographical dispersion of residential and labor functions

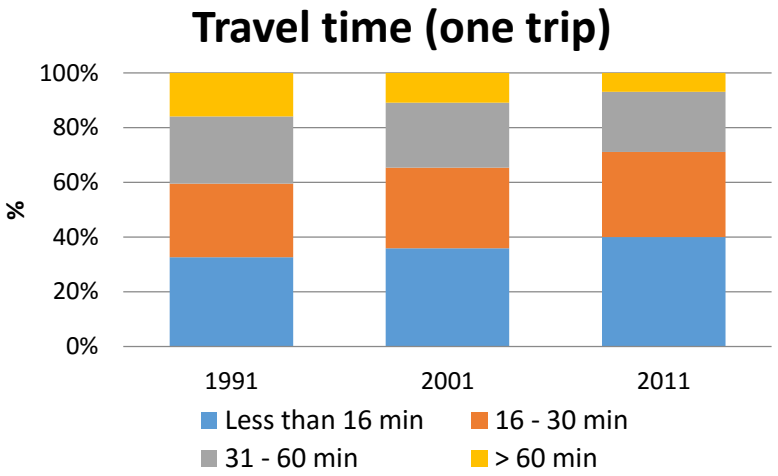


2.2 Main trends of commuting in LMA



No data about "within residence parish" for 1981





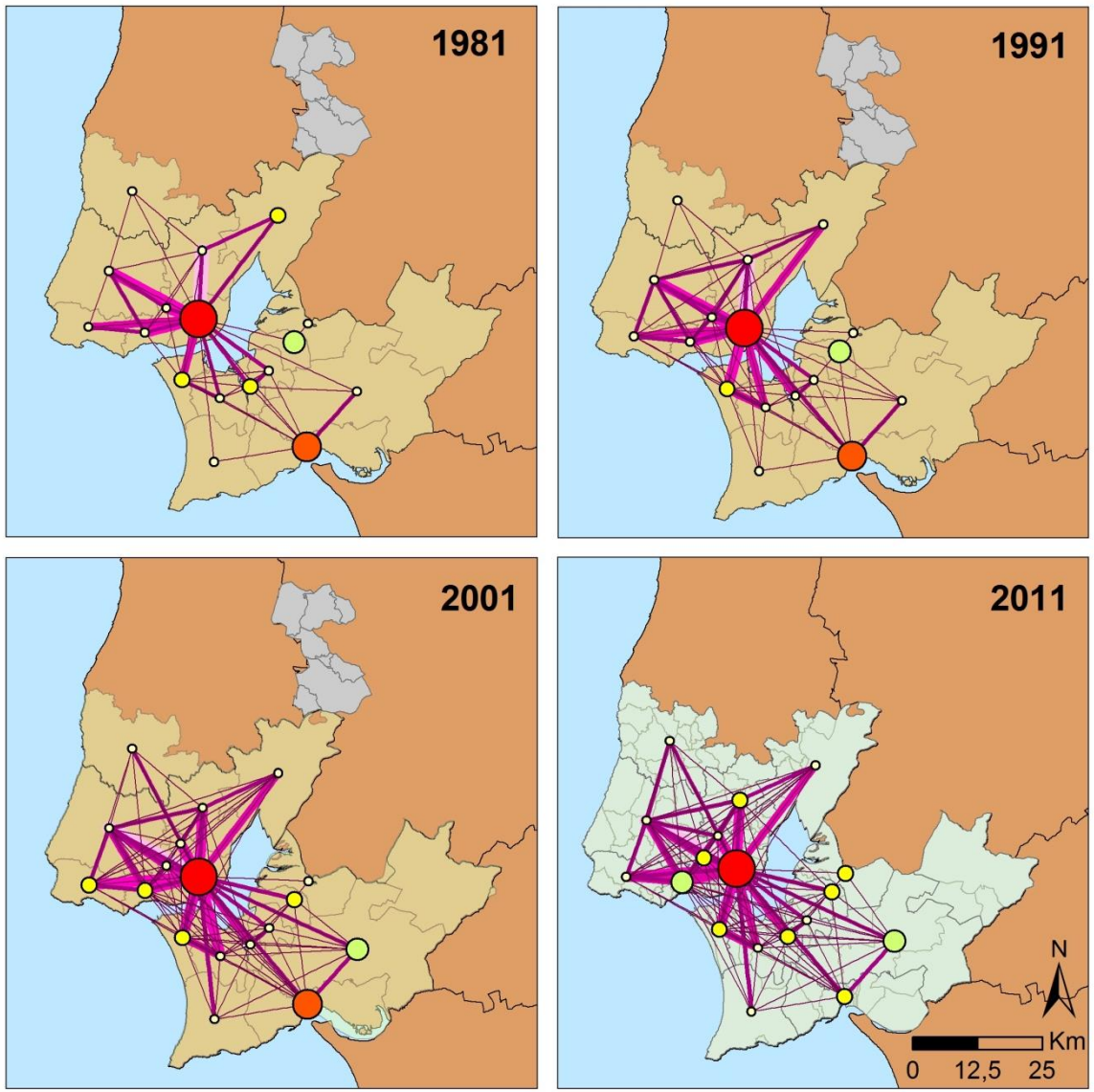
No data about "travel time" for 1981

Duration of travel – LMA (2011)

» Average: 26,37 min
» using individual transport: 22,09 min
» using collective transport: 42,48 min

Commuting travel 1981 – 2011 – Travel modes. Source: Census 1981, 1991, 2001, 2011. National Institute of Statistics

2.2 Main trends of commuting in LMA



Daily commuting
(nº of inter-municipal commuters)

- 250 - 2.500
- 2.501 - 10.000
- 10.001 - 25.000
- 25.001 - 50.000
- More than 50.000
- Azambuja (excluded)

Attractor/Generator Municipality Index
(ratio of inter-municipal flows)

- < 0,49
- 0,50 - 0,89
- 0,90 - 1,10
- 1,11 - 5,00
- >5,01

= 1 - Balanced Inter-municipal Flows
< 1 - Generator of Inter-municipal Flows
> 1 - Attractor of Inter-municipal Flows

- enlargement of urban functional areas
- Intensity increase of inter-municipal relations.

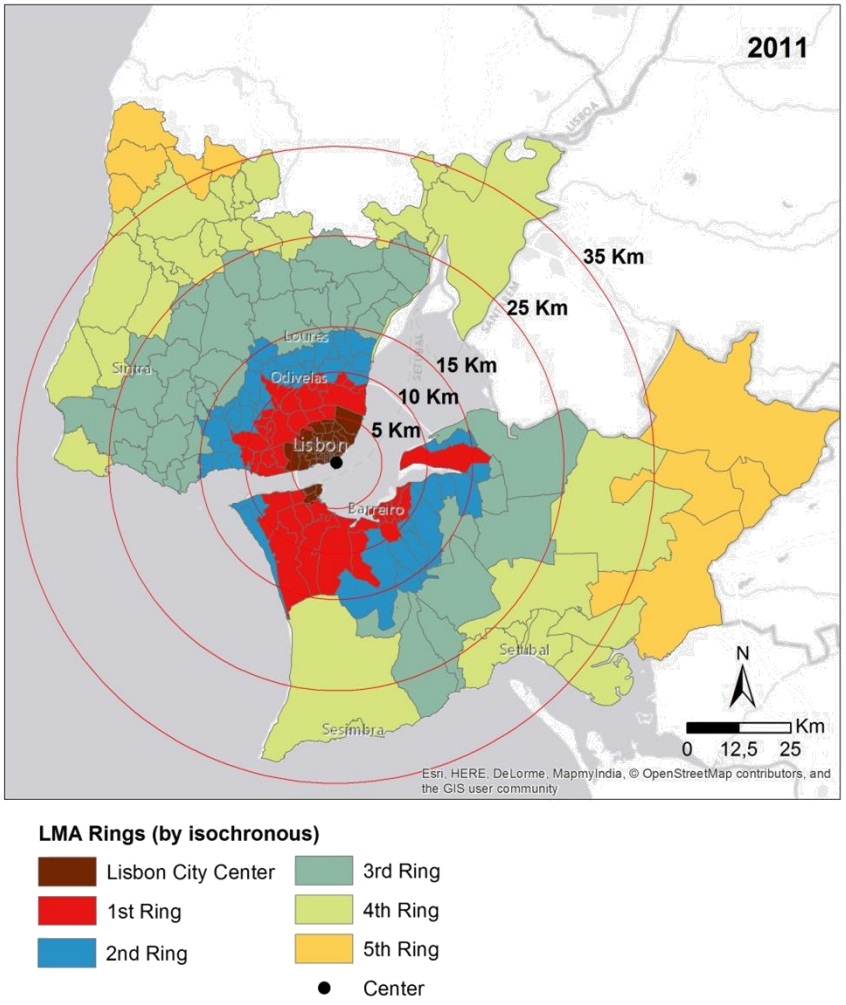
2.3. ONE FACT STANDS OUT: Distance to Lisbon City Center

Role of Lisbon Municipality in LMA

» Portuguese capital
» central position within LMA
» 3,3% of LMA surface;
» 19,4% of resident population
» 21,8% of dwellings

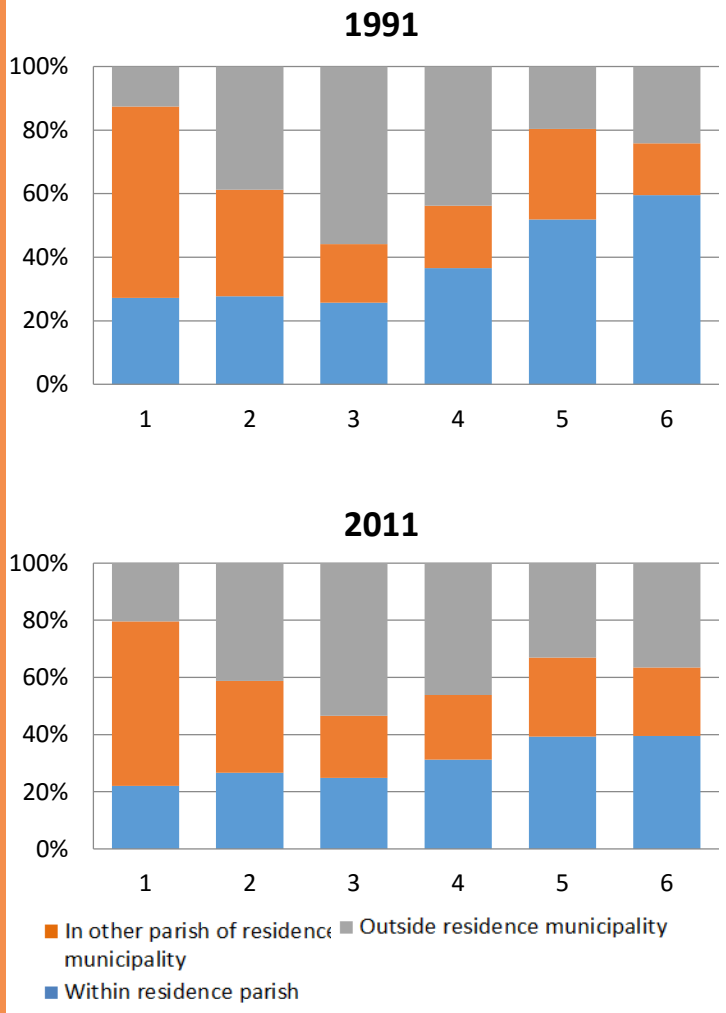
	LMA	Lisbon Municip.
Population density (nº/km)	940	6.448
Dwelling Density (nº/km)	496	3.814
Average population age (years)	41,19	44,44
Average building age (years)	37,19	61,97

Source: Census 2011, INE

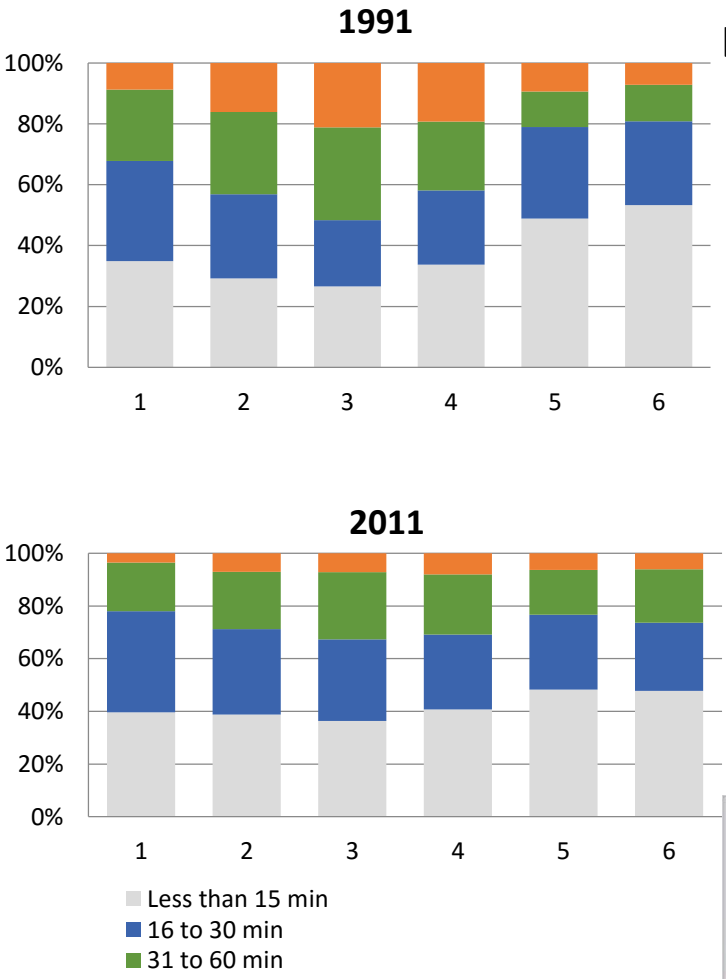


2.3 Distance to Lisbon City Center – Commuting ring patterns

Destination of commuting flows



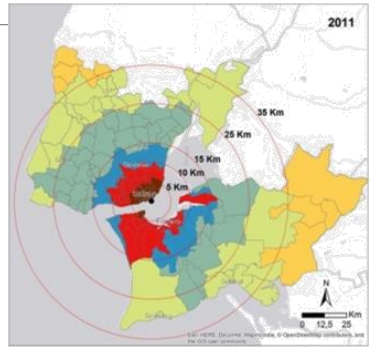
Travel time of commuting flows



Lisbon city center

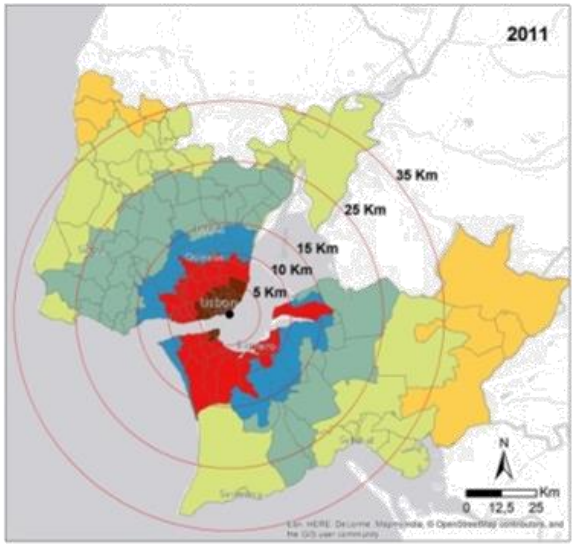
1. Lisbon
2. Ring 1
3. Ring 2
4. Ring 3
5. Ring 4
6. Ring 5

Fringe of LMA

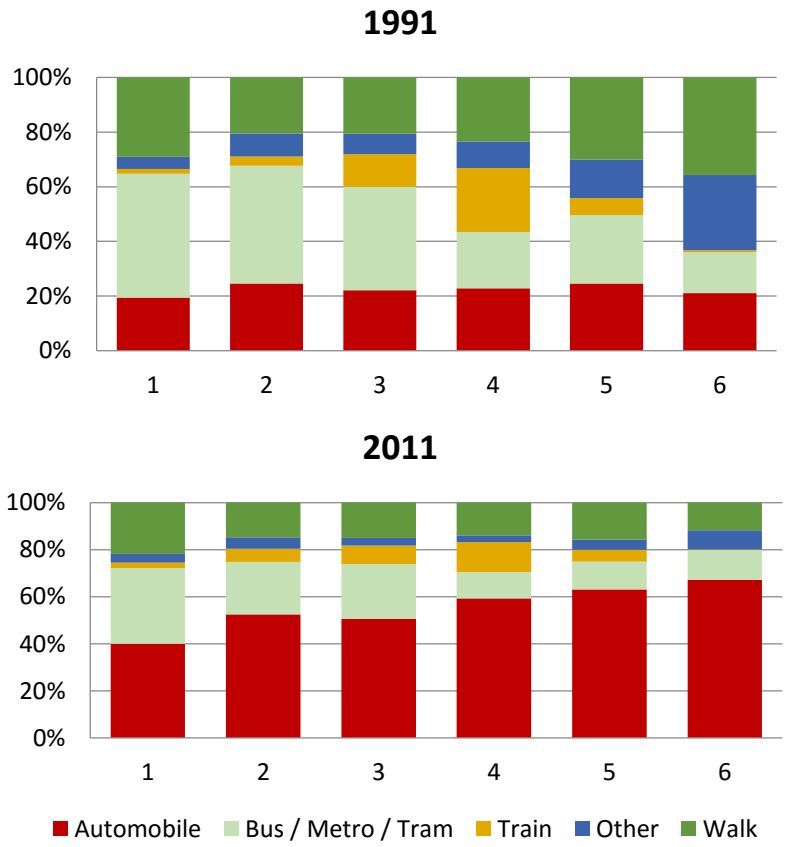


Reorganization/Concentration of the employment location;
& Relative inflexibility of residential location.

2.3 Distance To Lisbon City Center



Travel mode of commuting flows



Lx city center » » » Fringe of LMA

This modal split reflects the individual option of
Trading "space" for "time"

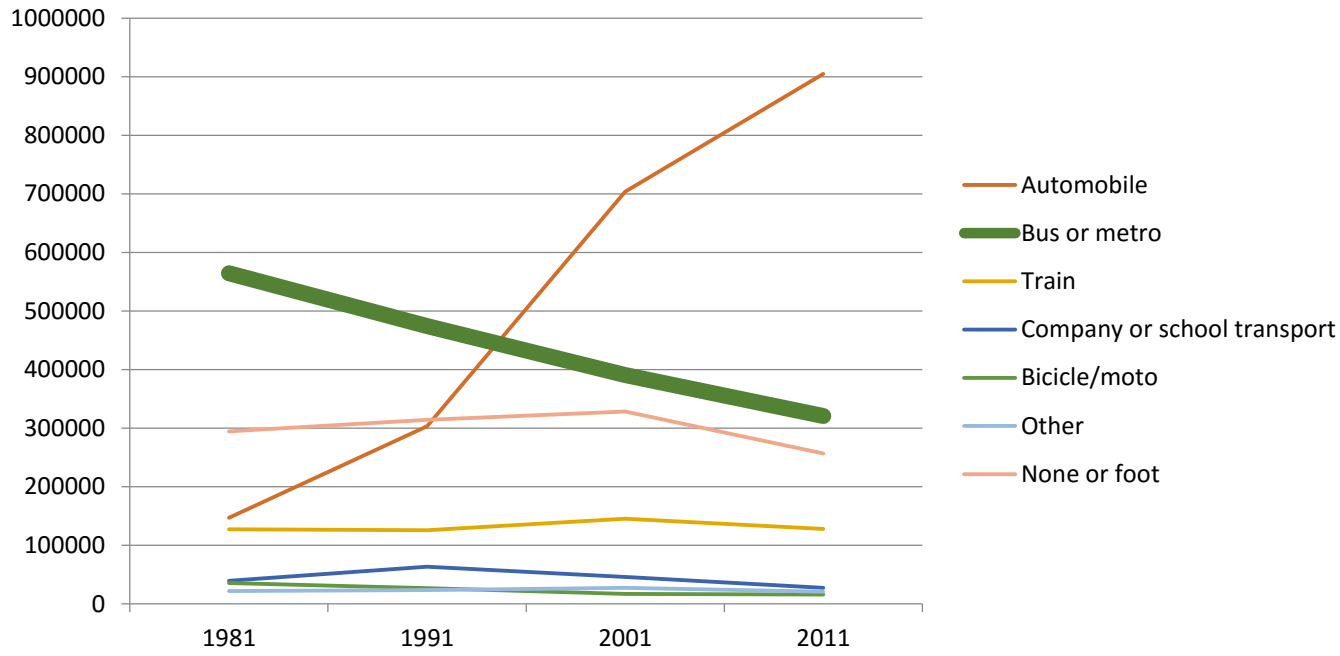
Synthesis

Rings	O/D	Travel time	Travel mode
1st	Majority of inter-parish commuting	Convergence among rings profile between 1991 and 2011 (Specially ring 3) Majority of commuting until 30 minutes Reduction of % of commuting during more than 60 minutes	Modal transfer: loss of Bus and walking specially in the central rings Great increasing of car use, specially the greater the distance to Lisbon
2nd	Considerable inter-municipal commuting (especially ring 3)		
3rd			
4th			
5th	Balanced partition between intra-parish and inter-municipality commuting		
6th			

3. DEMAND *VS* SUPPLY OF TRANSIT SYSTEM
The case of BUS in LMA

3 Demand vs Supply of Transit system
The case of BUS

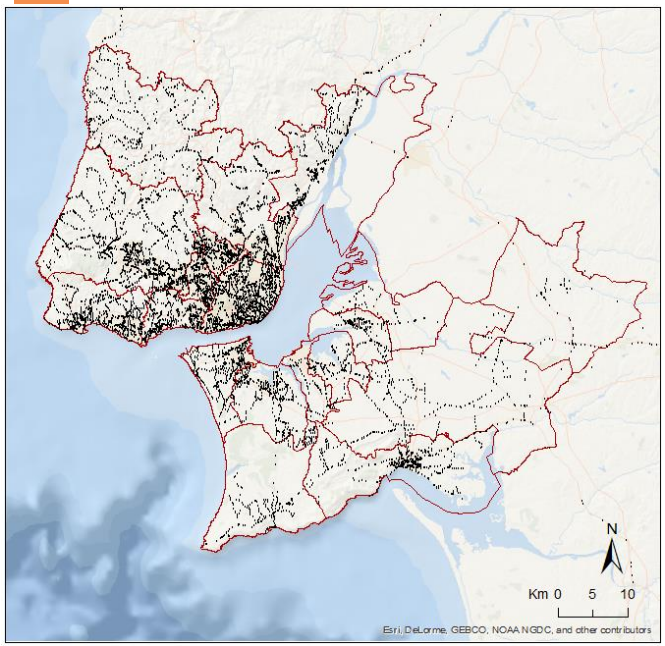
Decreasing of bus users for labor commuting… and increase of car use



… explained by bus system characteristics or personal option?

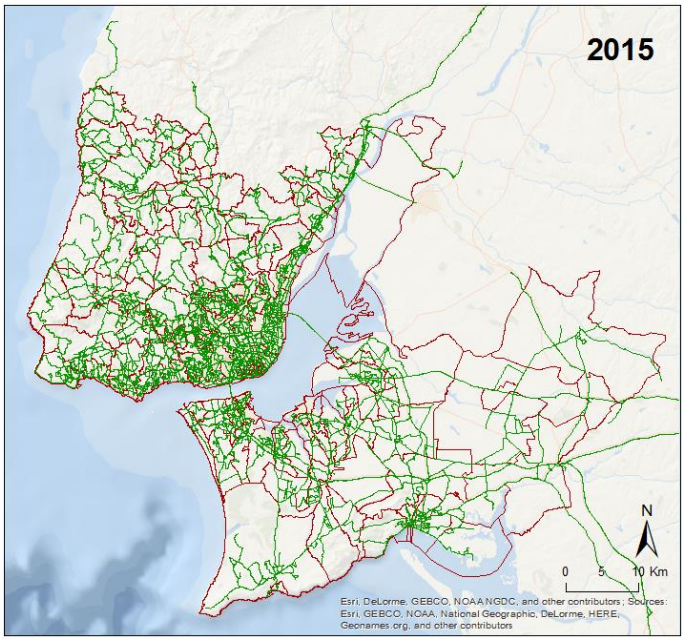
3 Demand vs Supply of Transit system
The case of BUS

BUS stops, 2015



Munic	Stops		
	Nº stops	Stop dens. (stops/km^2)	Stops per 10.000 inhab.
Cascais	992	10,2	48,0
Lisboa	2295	27,0	41,9
Loures	1045	6,2	51,0
Mafra	940	3,2	122,6
Oeiras	897	19,5	52,1
Sintra	2316	7,3	61,3
VF Xira	943	3,0	68,9
Amadora	617	25,9	35,2
Odivelas	540	20,5	37,4
Alcochete	122	1,0	69,4
Almada	666	9,5	38,3
Barreiro	117	3,2	14,9
Moita	219	4,0	33,2
Montijo	449	1,3	87,7
Palmela	548	1,2	87,2
Seixal	669	7,0	42,3
Sesimbra	470	2,4	94,9
Setúbal	713	3,1	58,8
AML	14558	4,8	51,6

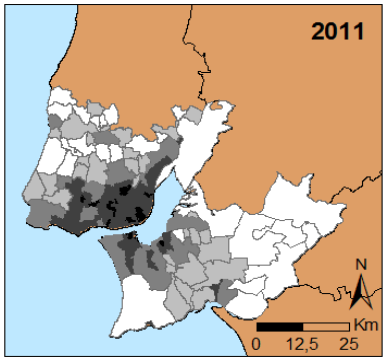
BUS lines, 2015

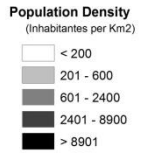


Source: IMT, 2015, Own treatment

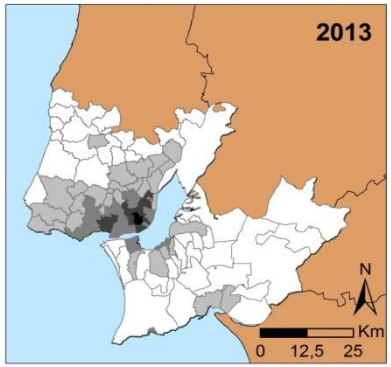
3 Demand vs Supply of Transit system
The case of BUS

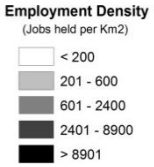
Population density



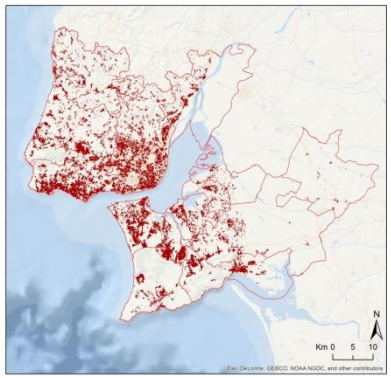


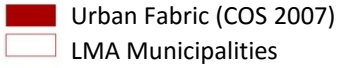
Employment density



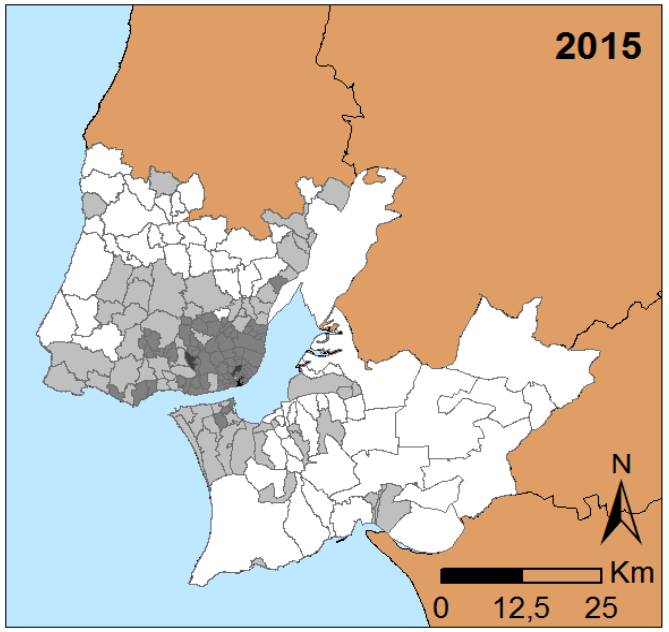


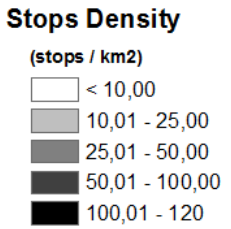
Class 1.1 Urban Fabric (COS 2007)





Bus stops density

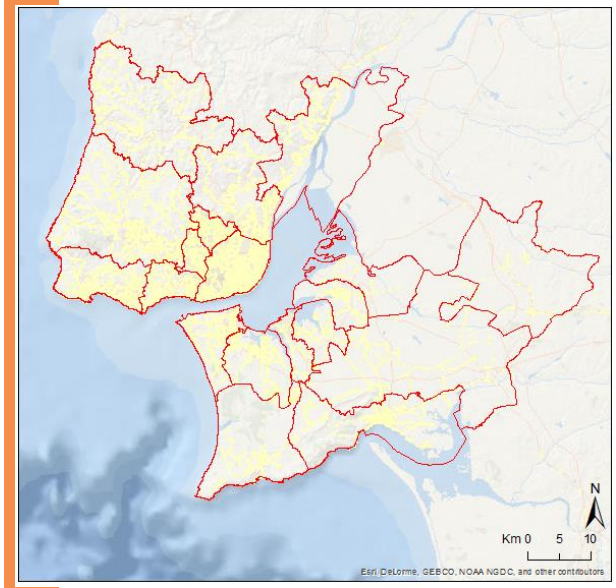




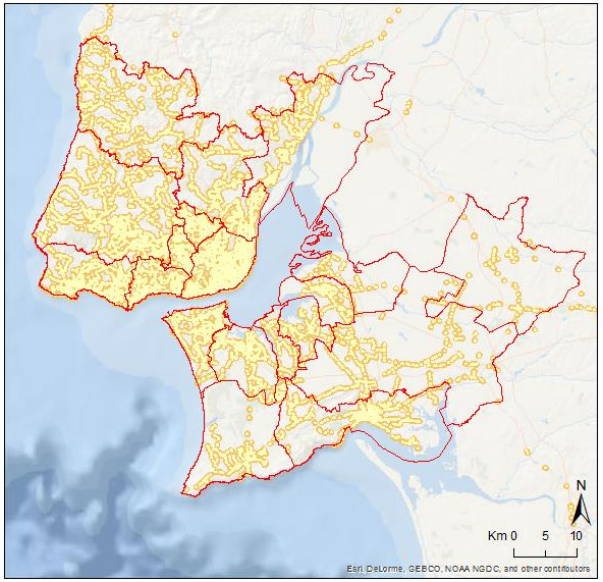
3 Demand vs Supply of Transit system
The case of BUS

LMA Bus coverage …

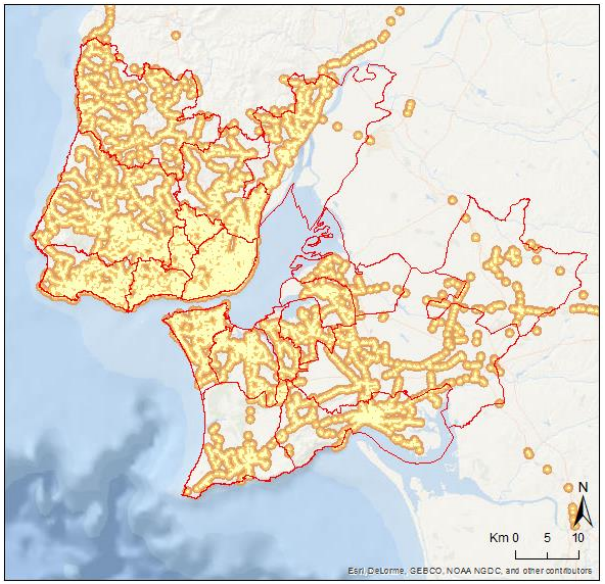
250m from a bus stop



500m from from a bus stop



800m from a bus stop



3 Demand vs Supply of Transit system
The case of BUS

Municipalities	Covered Area (%)			Covered Population (%)			Class: 1.1 Urban Fabric (%)		
	Distance to a bus stop			Distance to a bus stop			Distance to a bus stop		
	250 m (+/-4 min)	500 m (+/-8 min)	800 m (+/-12 min)	250 m (+/-4 min)	500 m (+/-8 min)	800 m (+/-12 min)	250 m (+/-4 min)	500 m (+/-8 min)	800 m (+/-12 min)
Cascais	93,1	98,4	99,8	95,7	99,8	100,0	98,0	99,3	99,8
Lisboa	99,5	100,0	100,0	99,3	100,0	100,0	97,5	98,0	100,0
Loures	88,0	94,3	97,9	84,8	93,0	99,0	90,2	94,0	96,7
Mafra	86,2	94,7	97,8	79,5	93,2	96,6	86,1	92,0	95,8
Oeiras	96,6	99,9	100,0	96,3	100,0	100,0	99,0	100,0	100,0
Sintra	90,8	96,7	98,6	96,0	99,5	100,0	89,3	97,8	99,1
Vila Franca de Xira	93,9	97,7	99,2	81,8	88,7	91,1	75,5	80,7	97,6
Amadora	99,5	100,0	100,0	98,8	100,0	100,0	99,7	100,0	100,0
Odivelas	95,9	99,2	100,0	97,5	99,9	100,0	93,9	99,7	100,0
Alcochete	85,9	87,9	88,2	73,7	96,3	99,4	81,5	91,2	97,0
Almada	85,9	96,6	99,5	89,1	98,5	99,9	97,8	99,4	100,0
Barreiro	72,3	88,4	92,5	60,1	84,3	95,4	88,8	99,8	100,0
Moita	92,6	98,5	100,0	83,1	97,0	100,0	68,9	89,8	99,4
Montijo	70,4	80,3	86,2	89,5	96,8	98,7	82,3	91,0	96,1
Palmela	75,4	85,1	90,0	73,9	89,3	95,3	74,0	85,3	91,7
Seixal	79,3	92,8	96,7	93,4	98,8	99,5	98,2	99,0	99,0
Sesimbra	90,2	94,5	96,8	86,2	95,7	99,6	89,7	97,8	99,0
Setúbal	95,5	98,9	99,5	92,4	97,4	99,2	94,2	95,3	97,3

3 Demand vs Supply of Public Collective Transport
The BUS service case

So… what are the main aspects to consider in the reading **public transport *vs* private transport**?

- Origin-Destination lines and interfaces
- Frequency of service
- Speed (and travel time)
- Cost (ticket cost, time, fuel, etc.)

(future analysis)

4 FINAL CONSIDERATIONS

Recent trends

Housing

Employment

Urban Sprawl

Deconcentrating New commercial and service areas

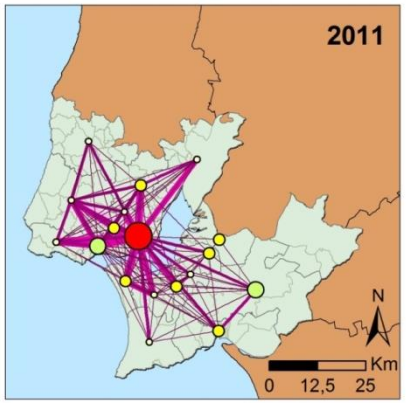
Reinforce polycentrism

How the interaction between housing and employment affects the commuting mobility pattern?

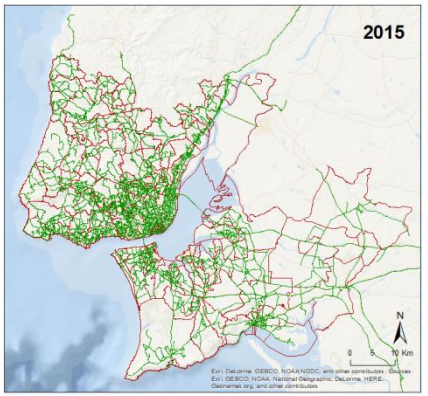
How public transport could supply the needs for commuting?

Commuting pattern

Ring pattern



Public transport network



Axial pattern

4 FINAL CONSIDERATIONS

Today mobility patterns are more complex than in the past:

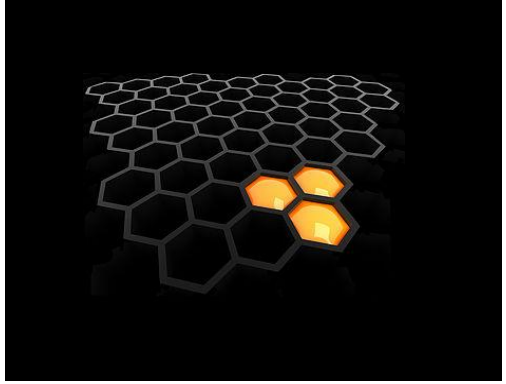
- Much more trips not related to work;
- Different patterns according to age, income and household composition;
- … and that was supported by car use.

»»» As result: increased pressure on road systems, congestion, high energy consumption, increasing of polluting emissions, among others » This puts into question the Sustainable Development principles at economic, environmental and social scopes.

To better decide we need to know and understand mobility needs in order to avoid mismatching of demand and supply.

» Justifying the relevance of regular **mobility surveys**, considering not only commuting but trips for diverse purposes (eg. leisure, sports, shopping, public services, etc.), allowing a multi-scalar reading (from local communities to metropolitan areas / functional urban areas).

And the solution is not only on the transport side (namely by car use). A better coherent urban planning policies will be needed.



COMMUTING FLOW PATTERNS IN LMA:
TOWARDS AN EFFECTIVE CONTRIBUTION TO SUSTAINABLE DEVELOPMENT?

CITIES FOR US

engaging communities and citizens for sustainable development

Thanks for your attention!

Nuno Marques da Costa – nunocosta@campus.ul.pt
Ana Louro – analouro@campus.ul.pt
CEG-IGOT-ULisboa

LISBON, Portugal
May 31 - June 3
2016