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# **Commuting trips in the metropolitan area of Barcelona: travel behaviour, socio-environmental impacts and policy assessment**

**Maite Perez-Perez, Nuria Perez-Sans, Gemma Solé**

Barcelona Institute of Regional and Metropolitan Studies (IERMB), Cerdanyola del Vallès, Spain

# OVERVIEW

- 1. Main objectives**
- 2. Methods**
- 3. Results**
- 4. Current and future policies and strategies**

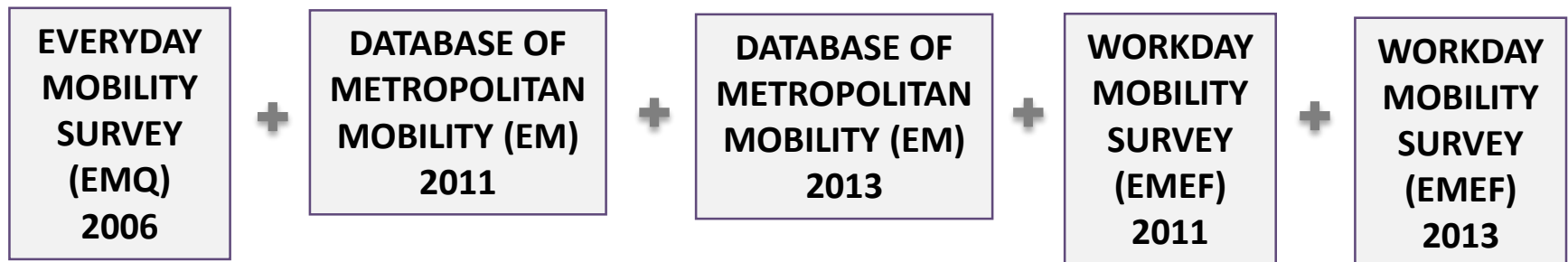
# 1. MAIN OBJECTIVES

- To study the **consequences of commuting trips**, mainly social and environmental impacts **based on the most recent data available.**
- To analyse **public policies implemented** in the metropolitan area of Barcelona.
- To consider **strategies to promote a more sustainable modal share.**

## 2. METHODS

### DATABASE OF METROPOLITAN MOBILITY 2011/2013:

- **Background:**
  - **Database of metropolitan mobility 2011** (inhab. in the 1st metropolitan ring, except Barcelona)
  - **Database of metropolitan mobility 2013** (inhab. in the 2<sup>nd</sup> metropolitan ring)
- **Increase sample:**
  - Fusion work of various surveys to lay more information on the mobility of people living in the Barcelona and the Metropolitan Region of Barcelona (RMB):



## 2. METHODS

### DATABASE OF METROPOLITAN MOBILITY 2011/2013

- **Objectives**
  - This database have been built as a tool to develop recent transportation projects on a metropolitan scale
  - Obtain information at the sub-municipal level
  - The sample survey: about 28,200 individuals
- **Information collected:**
  - Citizens daily trips: trip purpose, mode of transport, duration, time, type of flow
  - Socio-demographical characteristics (age, sex, level of studies, vehicle ownership, place of birth,...)
  - Opinion of citizens regarding metropolitan mobility
  - For each motorized trip of the database, a measure of distance, time, energy consumption and emissions ( $\text{CO}_2$ ,  $\text{NO}_x$ ,  $\text{NO}_2$  and  $\text{PM}_{10}$ )

## **2. METHODS**

### **OTHER SOURCES OF INFORMATION**

#### **DATA**

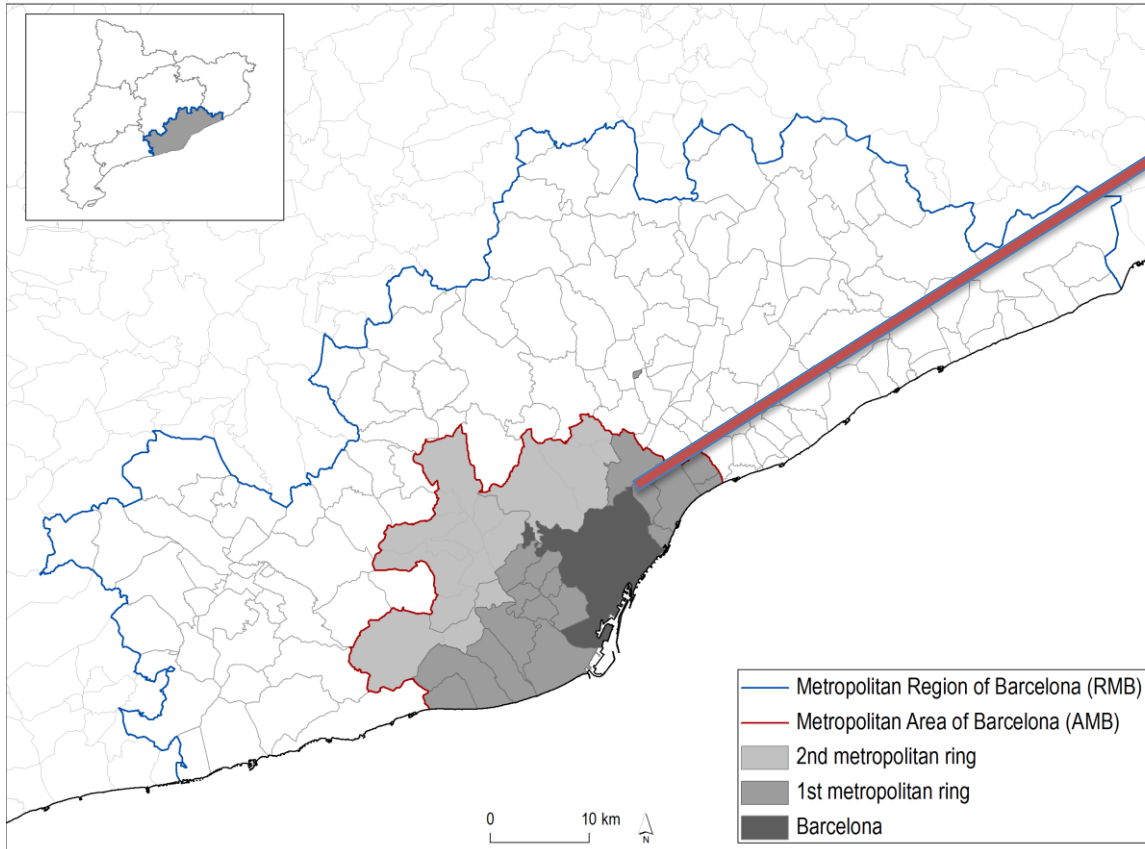
- Population census, census drivers, work-related traffic accident
- Survey on Living Conditions and Habits of the Population 2011 (to link socioeconomic information with workplace location and mode of transport used)
- Land Registry 2015

#### **POLICY ASSESMENT AND NEW POLICIES**

- Transport and mobility plans at a different scales
- Monitoring reports

# 3. RESULTS

## HIGHLIGHTS OF DAILY COMMUTING TRIPS



Metropolitan area of Barcelona

3.22 M inhabitants  
335 km<sup>2</sup> (129 km<sup>2</sup> urban surface)  
5,078 Inhab/km

**10.4 million daily trips**  
(residents metropolitan area)



**2.4 million commuting trips (23 %)**

**12.3 million daily trips**  
(origin and destination metropolitan area)

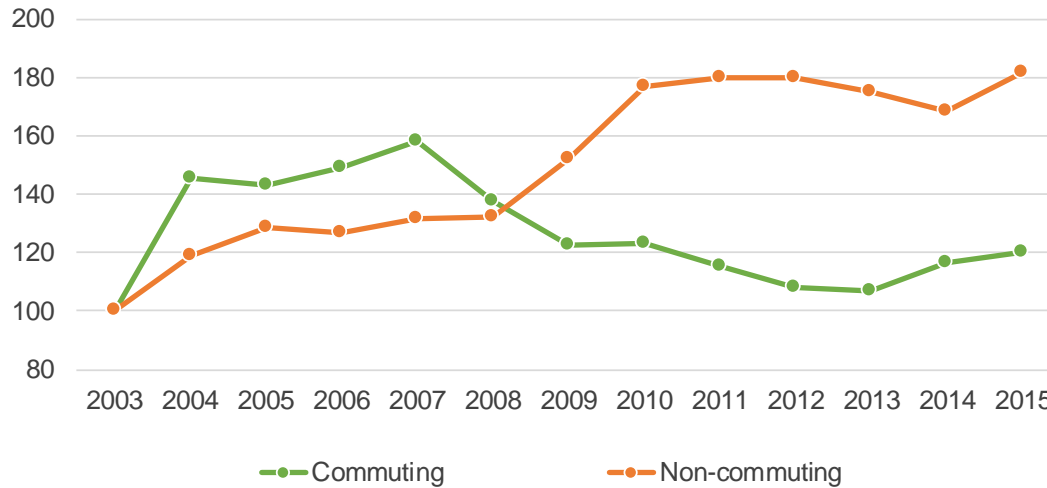


**2.7 million commuting trips**

# 3. RESULTS

## HIGHLIGHTS OF DAILY COMMUTING TRIPS

- **Commuting trips related to the economic cycle**



- **Distance travelled (self-containment rate)**

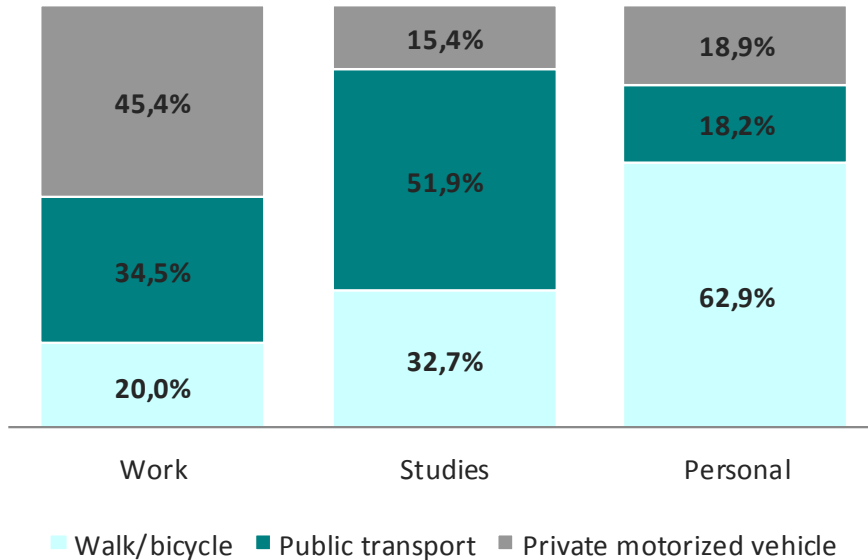




# 3. RESULTS

## HIGHLIGHTS OF DAILY COMMUTING TRIPS

- **Transport modes**



- **Average time by mode (commuting trips)**

**Urban trips**

Public transport: **35** minutes  
Car: **27** minutes

**Intercity trips**

Public transport: **29** minutes  
Car: **15** minutes

- **Car occupancy by purpose**

Work: **1.2** persons/car  
Studies: **2.1** persons/car  
Personal: **1.9** persons/car

# 3. RESULTS

## MAIN FLOWS

- Daly commuting trips

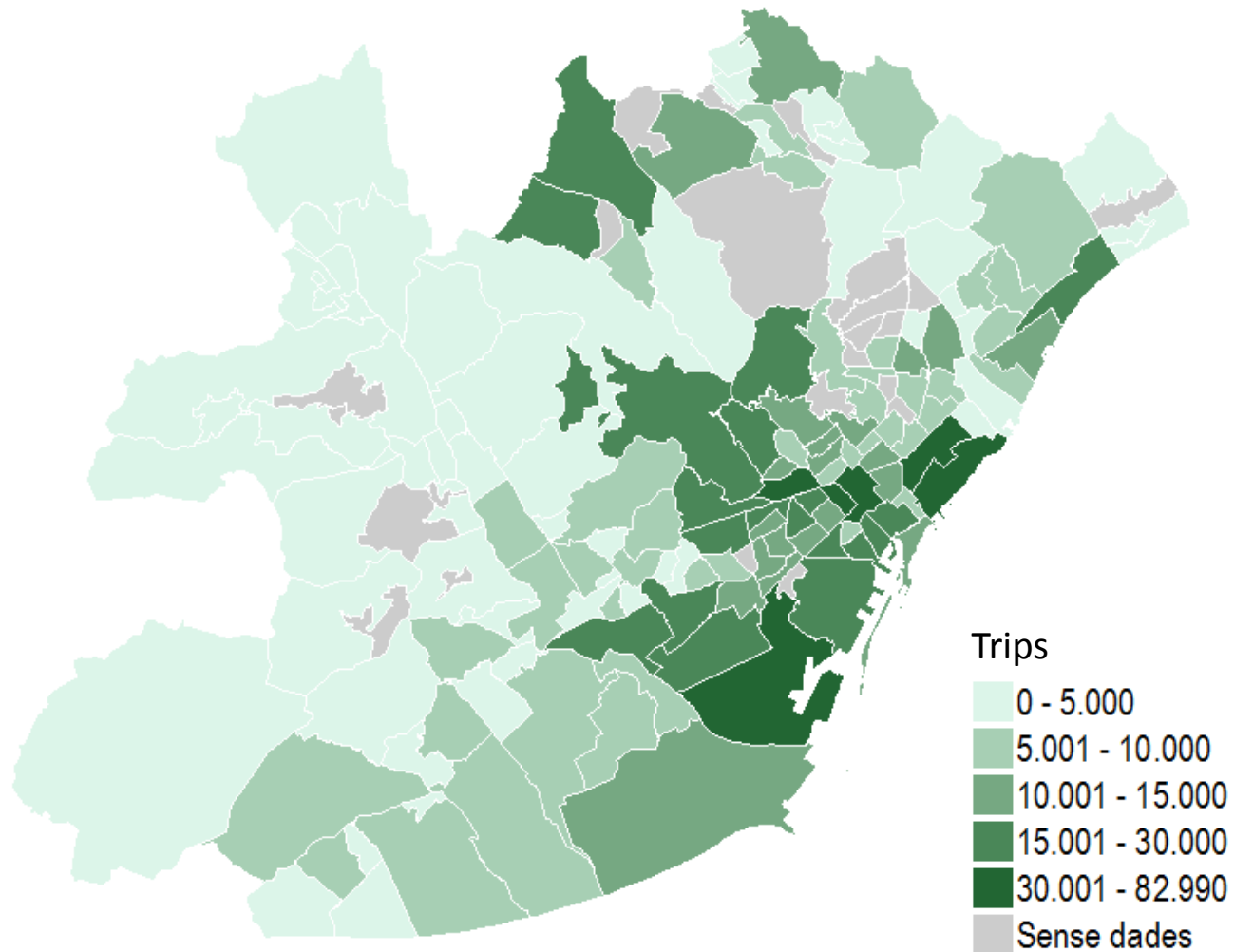
		Walk and bicycle	Public transport	Private motorized vehicle	Total	
Barcelona	Urban	298.641	405.805	305.574	1.010.020	69%
	Intercity	9.843	398.506	440.052	848.401	
Outside Barcelona (rest AMB)	Urban	166.044	30.343	113.602	309.989	31%
	Intercity	12.672	98.668	431.109	542.449	
<b>TOTAL</b>		<b>487.200</b>	<b>933.321</b>	<b>1.290.338</b>	<b>2.710.859</b>	<b>100,0%</b>

		Walk and bicycle	Public transport	Private motorized vehicle	Total
Barcelona	Urban	29,6%	40,2%	30,3%	100%
	Intercity	1,2%	47,0%	51,9%	100%
Outside Barcelona (rest AMB)	Urban	53,6%	9,8%	36,6%	100%
	Intercity	2,3%	18,2%	79,5%	100%
<b>TOTAL</b>		<b>18,0%</b>	<b>34,4%</b>	<b>47,6%</b>	<b>100%</b>

# 3. RESULTS

## MAIN TRIPS (DESTINATION)

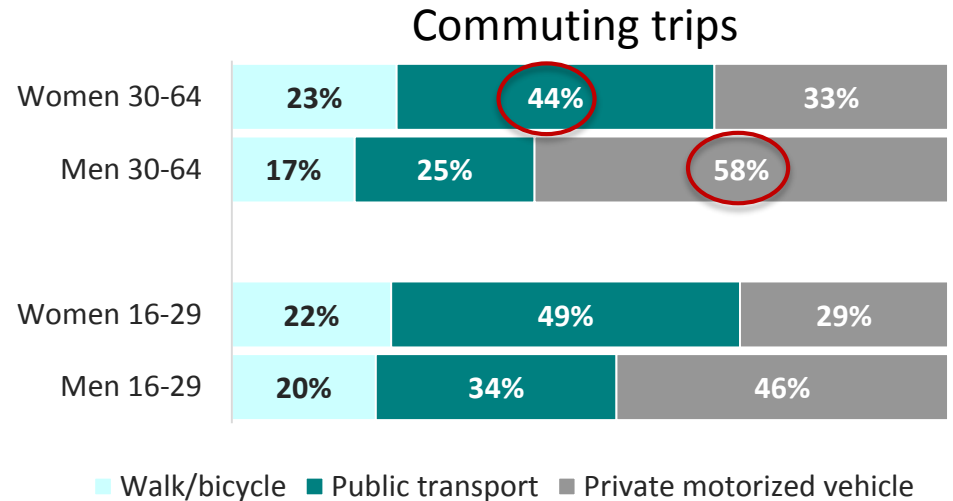
- Daily commuting trips by destination zone



# 3. RESULTS

## SOCIAL PROFILES

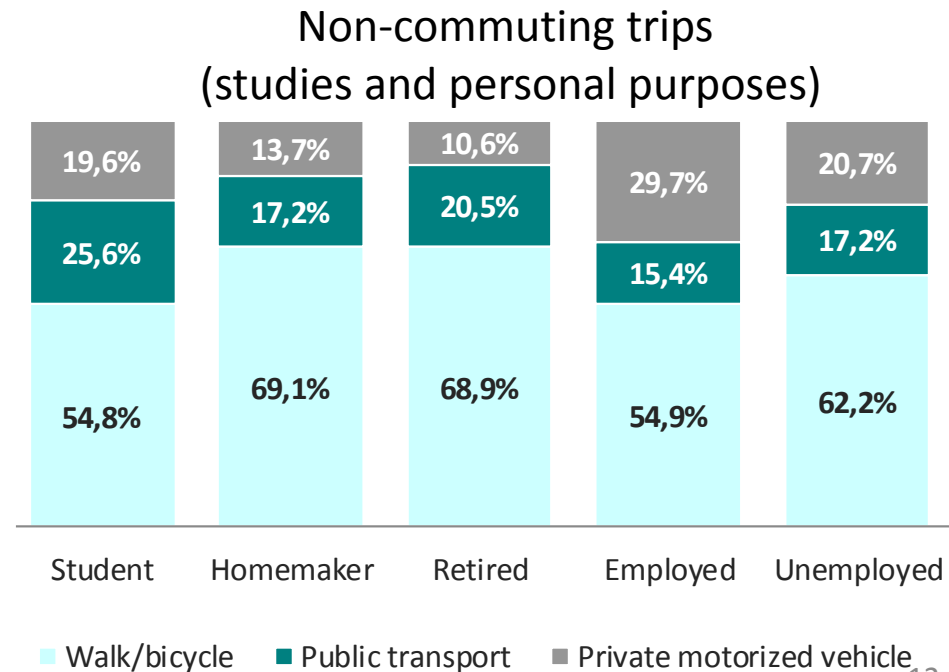
- Travel behaviour by age and gender (commuting trips)



- Travel behavior of non-commuting trips by working status

Mode share of active modes and PT of employed people in non-commuting trips is lower than other groups.

Mode of transport used in work trips influences on personal trips

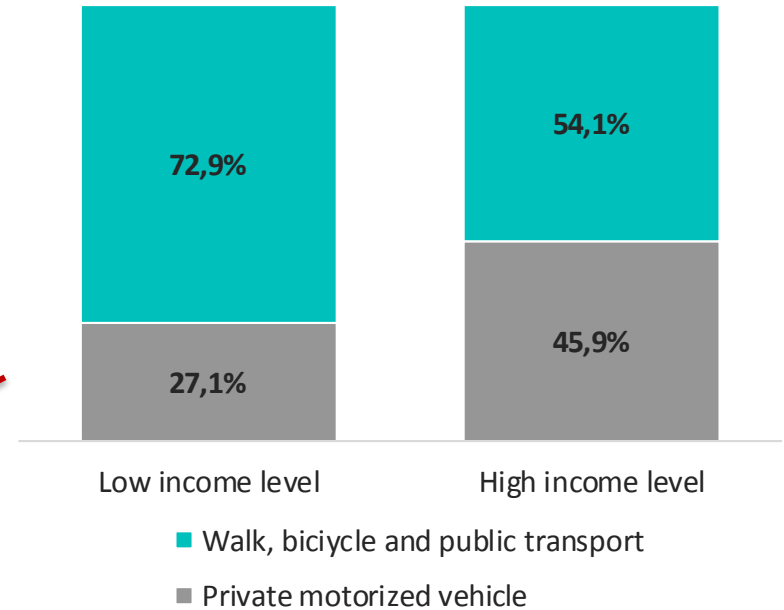


# 3. RESULTS

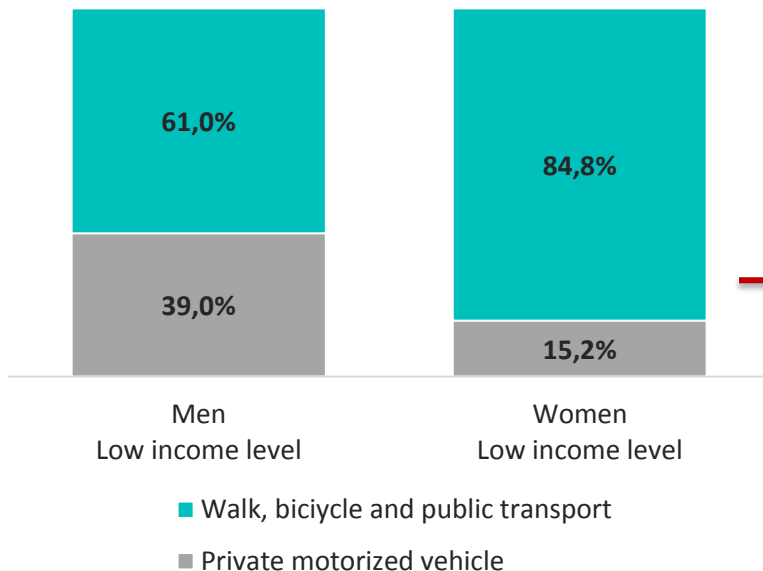
## SOCIAL IMPACTS

- Evidences:** the share of active modes and PT is high between people with less access to car (young people, women, disabled people, low income, minorities among others).

Income level and mode share.  
Commuting trips



Modal share in commuting trips, in low income population, by sex



Women: 53% without driving license

Men: 26% without driving license

# 3. RESULTS

## SOCIAL IMPACTS

- To consider:

Barcelona has a good level of accessibility in PT

Quality and design of pedestrian areas are in general good

Motorization rate (car, motorbike and van)



↓  
**PT captive population could be smaller** than in smaller urban areas or rural areas



**Pressure on public space produces high car parking prices**



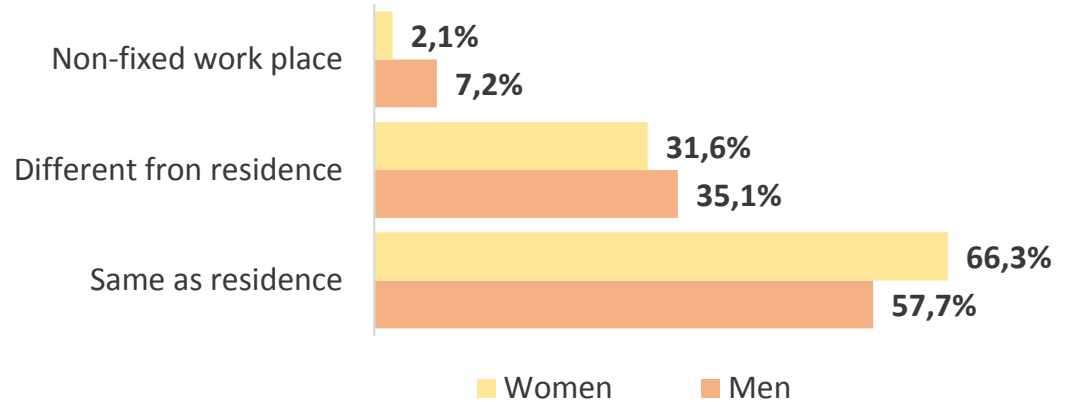
**PT Captive population increases** as a result of cost overrun of owning a car.

# 3. RESULTS

## SOCIAL IMPACTS

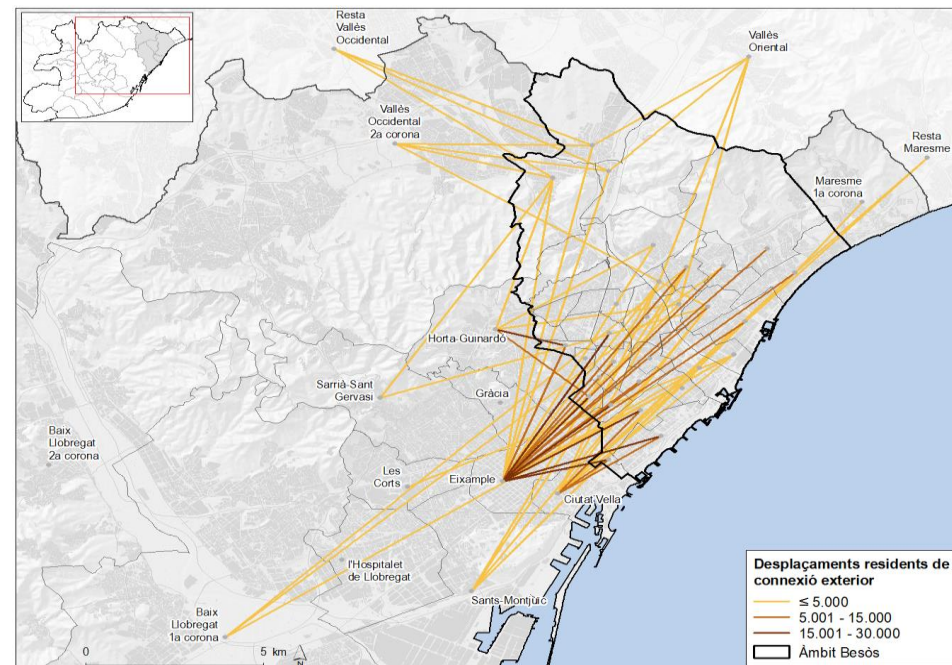
- **Consequences:**
  - **Smaller territorial framework**

Workplace location by gender 2011 (Metropolitan area of Barcelona)



Example “Besòs area”: high density, good accessibility in PT and the highest unemployment rate in metropolitan area.

More connections with Barcelona and other cities with underground network. Less connections with cities without good PT connections.



# 3. RESULTS

## SOCIAL IMPACTS

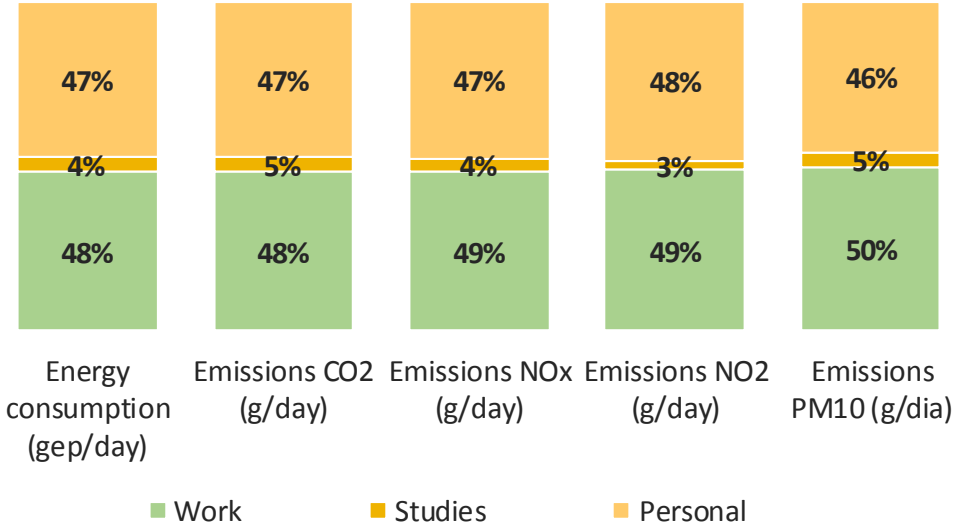
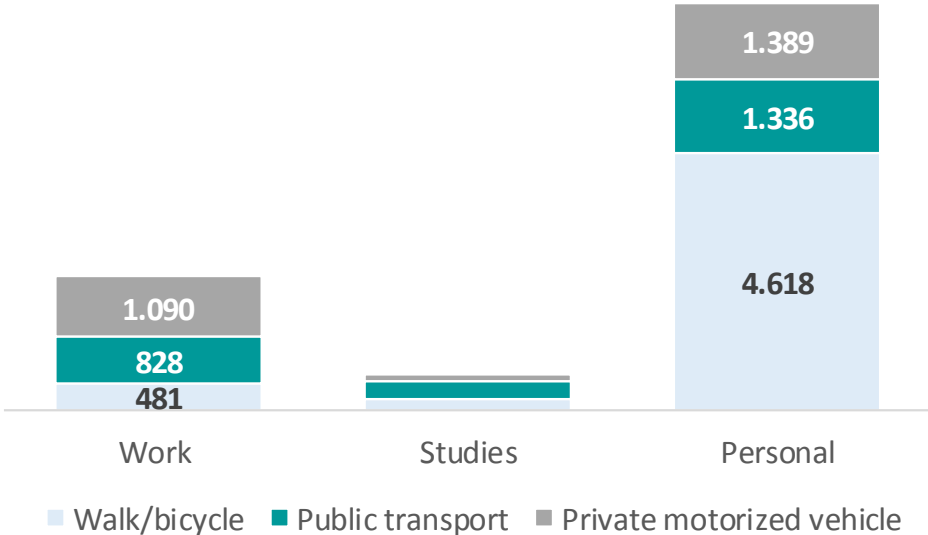
- **Consequences:**
  - **Difficulties in balancing both personal/family and working life to whom cannot access with private car at workplace (Travel time in PT is higher than private transport).**
  - **Increase household expenses when people can only access at workplace with private vehicle.**
  - **To use private transport even if they would prefer to travel with other modes of transport.**



# 3. RESULTS

## ENVIRONMENTAL IMPACTS

- Impact of commuting mobility is higher than non commuting mobility, although it accumulates less trips.



# 4. CURRENT AND FUTURE POLICIES AND STRATEGIES

## CURRENT POLICIES IN METROPOLITAN AREA/CATALONIA

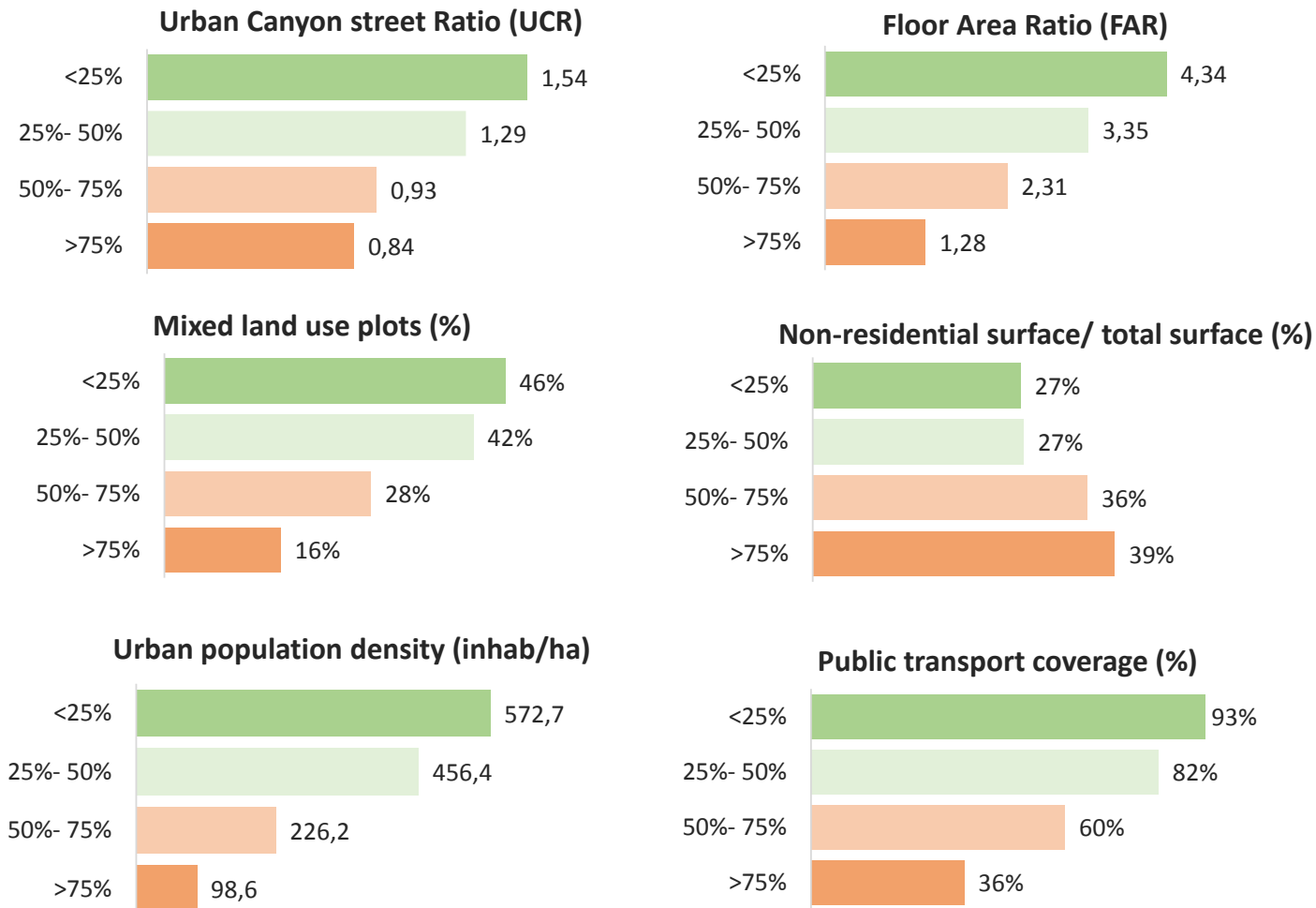
- **Since Catalan mobility law was passed in 2003 (9/2003) most of the policies developed have been mainly related to:**
  - Large mobility centers and industrial estates
  - Insufficient policies in all work centers
  - Excessive planning and insufficient mobility management
  - Incipient policies on environmental taxation in commuting trips
  - Rate-setting of public transport for workers (best practices in Belgium, France or Netherlands)
  - Include the costs of commuting in collective bargaining between company and workers

# 4. CURRENT AND FUTURE POLICIES AND STRATEGIES

## STRATEGIES: STRUCTURAL APPROACH (URBAN PLANNING AND SOCIAL INCLUSION POLICIES)

- Share of private transport in commuting trips according to spatial characteristics of the destination (sub-municipal level analysis in metropolitan area)

Mode share of private transport



# 4. CURRENT AND FUTURE POLICIES AND STRATEGIES

## STRATEGIES: STRUCTURAL APPROACH (URBAN PLANNING AND SOCIAL INCLUSION POLICIES)

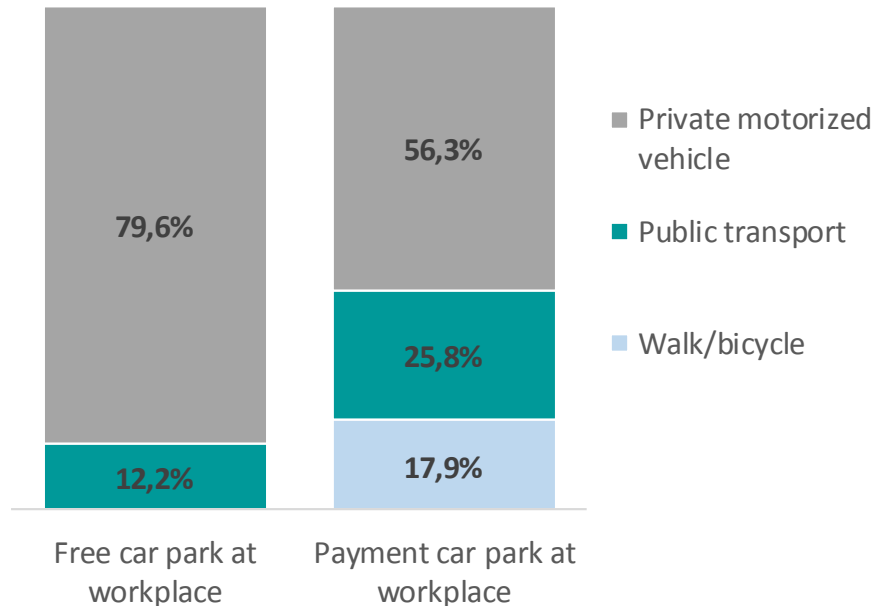
- The **inclusion of sustainable mobility in urban planning** is a mid-term and long-term **strategy to promote more sustainable mobility behavior** in commuting trips.
- **Urban planning has to adequate to sustainable mobility criteria** in:
  - New development localization
  - Densities
  - Diversity land uses (at a different scales)
  - Type of edifications
  - Scale and morphology of streets
  - General and local transport systems
  - Car parking standards and localization
- **But the persistent economical crisis and the high increase prices of rental housing in Barcelona can produce a new period of residential migrations in the metropolitan area of Barcelona.** Intercity mobility flows could be grown.
- **It is important to implement housing and social inclusion policies that help contain property speculation and urban segregation processes.**

# 4. CURRENT AND FUTURE POLICIES AND STRATEGIES

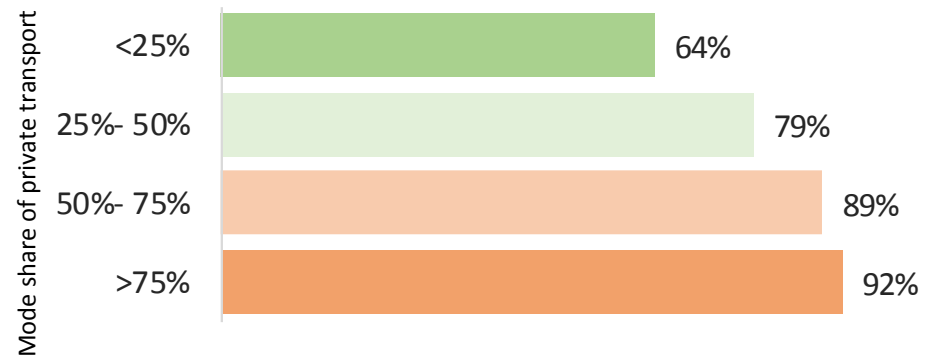
## STRATEGIES: DINAMIC APPROACH

- Recent changes in travel behaviour on commuting trips are mainly consequence of economical crisis.
- There aren't still enough mobility management policies that could change travel behaviour in commuting trips.

Mode share by availability of car park at workplace



Free car park at workplace in destination

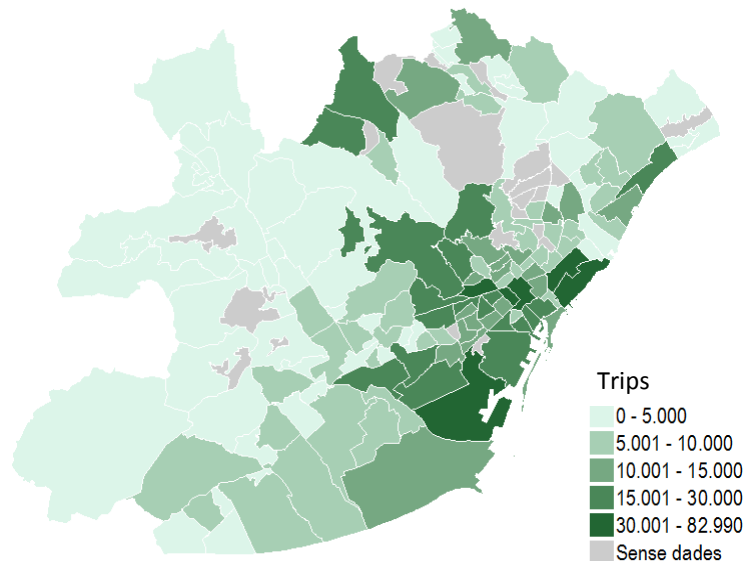


# 4. CURRENT AND FUTURE POLICIES AND STRATEGIES

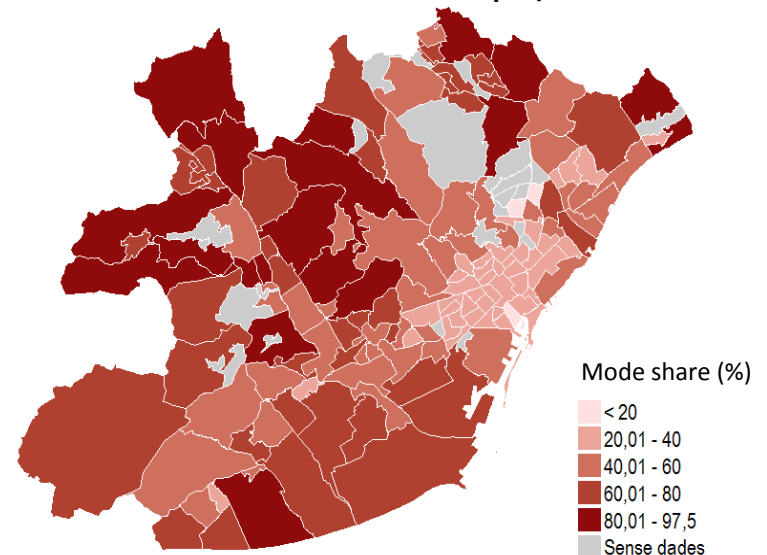
## STRATEGIES: DINAMIC APPROACH

- **Why mobility management can improve travel behaviour in commuting trips?**
  - **Captive population of private transport:** people who prefer to travel in private transport despite having good accessibility in TP.
  - **Highest private flows are placed in the metropolitan centre,** despite mode share is positive.

Number of trips (commuting destination trips)





Mode share of private transport (commuting destination trips)

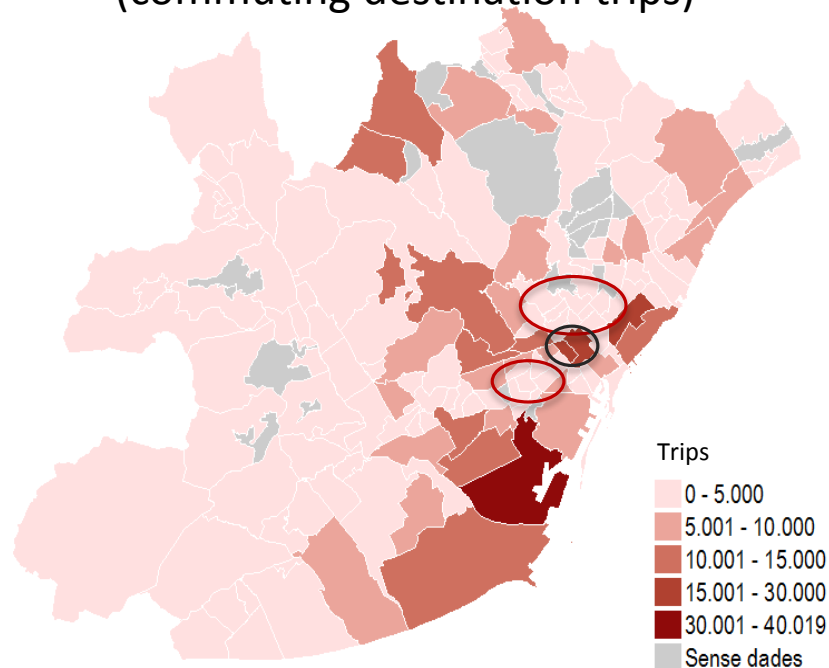


# 4. CURRENT AND FUTURE POLICIES AND STRATEGIES

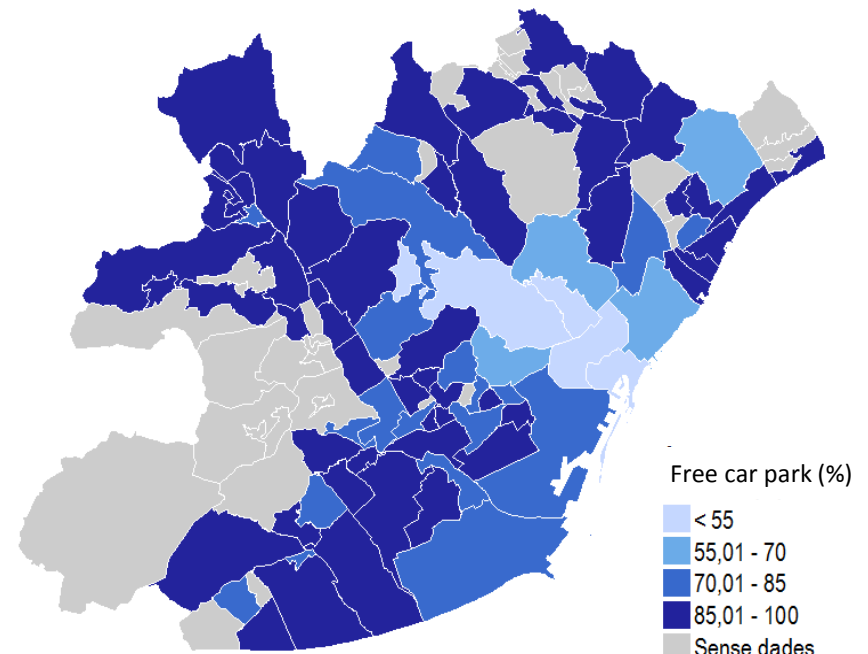
## STRATEGIES: DINAMIC APPROACH

- Residential car park policies (“Area Verda”) in central districts reduces trips in private transport in mainly city center of Barcelona (Eixample District) 
- Free park for motorbikes in central area generates many trips (the share of motorbike within commuting private vehicle trips is 58% in Barcelona). 

Number of private transport trips  
(commuting destination trips)



Free car park (%)



# Commuting trips in the metropolitan area of Barcelona: travel behaviour, socio-environmental impacts and policy assessment

Thank you very much for your attention!

[maite.perez@uab.cat](mailto:maite.perez@uab.cat)

[Nuria.perez.sans@uab.cat](mailto:Nuria.perez.sans@uab.cat)