

Suscity

WP4 - Innovative mobility solutions

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Goals of WP4

- To develop **innovative mobility solutions**.
- Focusing on the promotion of
 - Energy,
 - Environment,
 - and Economically Efficient transport chains.

Full-integrated private and public transport services in efficient infrastructure use and supported on adequate financing mechanisms.

Also includes:

- **Alternative vehicle technology** and possible new energy requirements,
- **Optimization of public transportation services**,
- **Assessment of alternative transportation systems**.

Overview of Tasks

Task 4.1: On road monitoring of vehicle usage and development of innovative vehicle services (50 on-board vehicle monitoring devices)

Task 4.2: Test the implications of ICT feedback mechanisms in transportation

Task 4.3: Based on measured mobility patterns and on-road characterization of specific EV, hypothetical EV geolocated energy requirements will be estimated

Task 4.4: Collect GPS traces from the on-board vehicle monitoring devices (private and public vehicles), taxi fleets (public transport), and personal smartphones (pedestrians) to study the origin and destination of individual trips

Task 4.5: This task focuses on assembling **urban mobility models** to match needs with interactions between public and alternative transportation systems

Task 4.6: The objective of this task is to **identify alternative mobility chains**

Objectives

- ▶ Characterize real world usage driving in the case-study area
- ▶ Driver samples include:
 - ▶ Light-duty vehicles (LDV) for private use, LDV under corporate use (both private and commercial use or a mix)
 - ▶ Conventional and alternative vehicle technologies
- ▶ Final objective: definition and development of innovative services, namely in electric mobility

IDMEC-DTEA tasks	Description	Inputs	Outputs	Start	Ends
T4.1. Vehicle monitoring	On road monitoring of vehicle usage and development of innovative vehicle services	Definition of characterization area in order to proceed with the selection of the monitoring sample.	Task 4.4. Provide GPS traces from the on-board vehicle monitoring devices (private and public vehicles), taxi fleets (public transport). Provide information for WP2 – Information Services and Data Processing Platform.	M1	M24
T4.2. Use-case testing	This task will test the implications of ICT feedback mechanisms in transportation with three pilot applications.	Inputs from WP1 (Urban Analytics) and WP3 (Smart building solutions) on road network and usage, weather conditions, and vehicle, driver and households.	Impacts of rewarding efficient driving; innovative tolling systems; and integrated household/mobility energy efficiency promotion.	M7	M36
T4.3. Study of optimal planning of charging infrastructures for Electric Vehicles (EVs)	Based on measured mobility patterns and on-road characterization of specific EV, hypothetical EV geo-located energy requirements will be estimated.	Information from Task 4.1.	Provide possible usage patterns to WP5 – Smart Grid based services.	M18	M36

T4.1. Vehicle monitoring

- Vehicle monitoring performed using a data logger installed on-board:
 - LDV newer than 2002 and up to 3.5 ton
- Installation of devices underway
- On going contacts with companies for fleet commercial vehicles
- Waiting on private users residential monitoring (WP3 and JFPN) to advance with private vehicle monitoring

#	Vehicle	Type	Installed in
Conventional			
1	Skoda Octavia	Private	27-11-2015
2	VW Golf	Private	09-10-2015
3	Citroen Berlingo	Commercial/JFO	22-07-2015
4	Citroen Berlingo	Commercial/JFO	22-08-2015
5	Fiat Ducato	Commercial/JFO	22-09-2015
6	Nissan CabStar	Commercial/JFO	22-10-215
7	VW Polo	Private	Waiting reply
8	Dacia Logan Pick-Up	Commercial/CML	28-01-2016
9	Dacia Logan Pick-Up	Commercial/CML	28-01-2016
10	Citroën Berlingo	Commercial/CML	28-01-2016
11	Renault Clio-C 1.2	Commercial/CML	28-01-2016
12	Peugeot 207	Commercial/CML	28-01-2016
13	Toyota Dyna SD (KDY231)	Commercial/CML	28-01-2016
14	Mitsubishi L 200	Commercial/CML	28-01-2016
15	Mitsubishi L 200	Commercial/CML	28-01-2016
Electric			
1	Renault Kangoo	Commercial/JFPN	20/11
2	Renault Kangoo	Commercial/JFPN	20/12
3	BMW i3	Private	Waiting reply
4	Peugeot iOn	Commercial/CML	28-01-2016
5	Peugeot iOn	Commercial/CML	28-01-2016

T4.3. Electric mobility

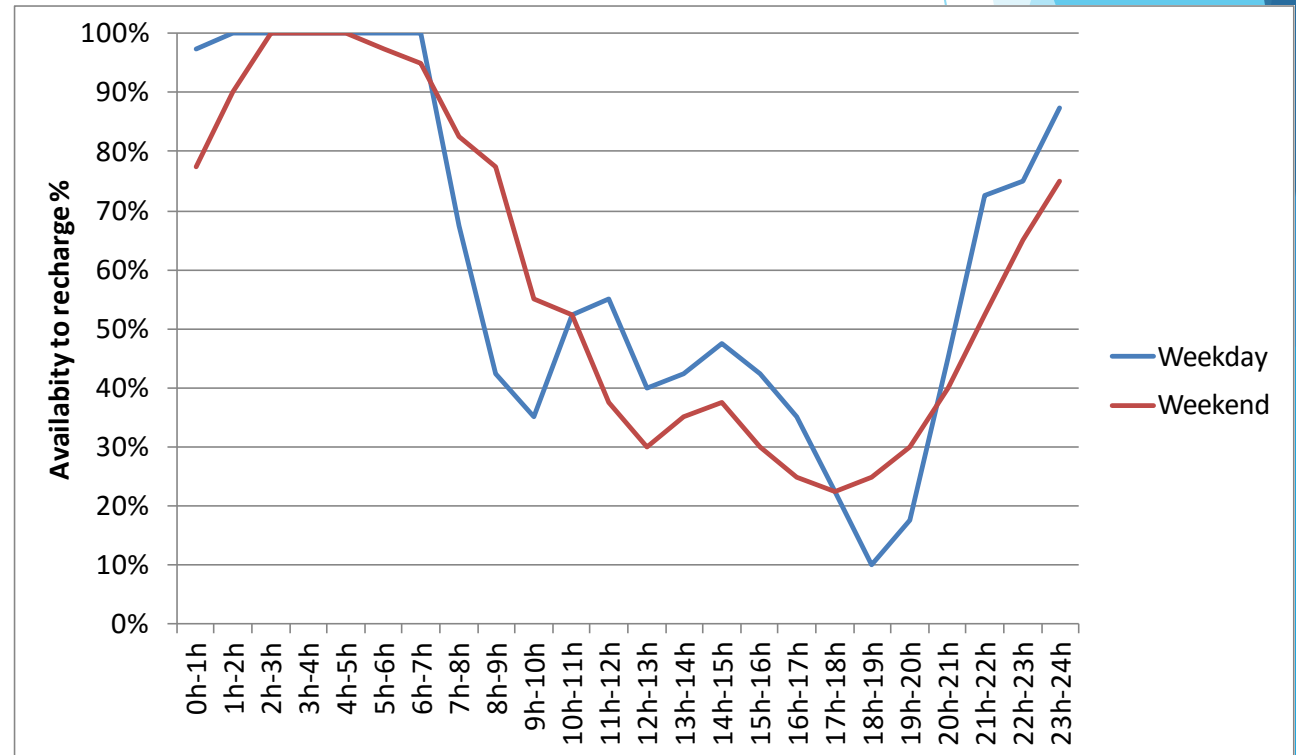
- Development of methodology to estimate impacts if conventional vehicles were replaced by electric vehicle
 - Availability to recharge -> Recharging profile;
 - Energy needs based on real world dynamic profile (kWh);
 - Design scenarios of mobility profiles and energy needs according to different data samples
 - Data samples:
 - Already existing sample of 40 drivers in Lisbon area
 - Private users and commercial fleet vehicles under collection within the Suscity Project
 - Comparison with recharging data from Mobi.e Network in the area

T4.3. Electric mobility

- Examples of results
 - Already existing sample of 40 drivers in Lisbon area

Availability to recharge

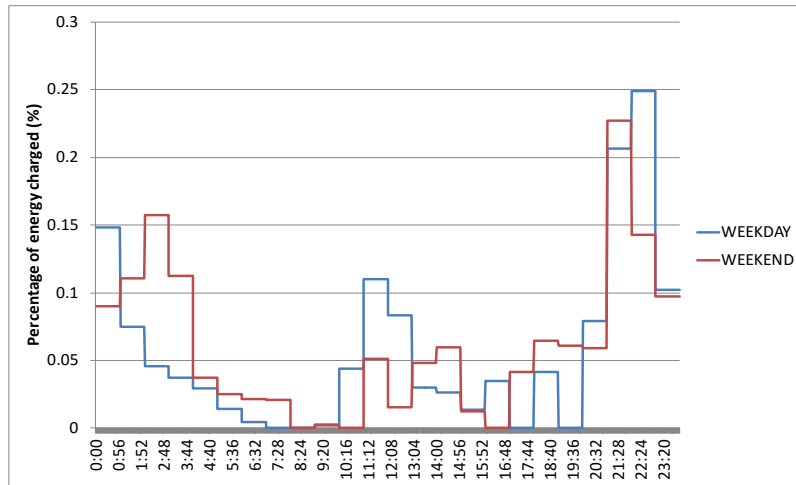
- Almost total between 0 and 7 am
- Over 40% during day time on week days



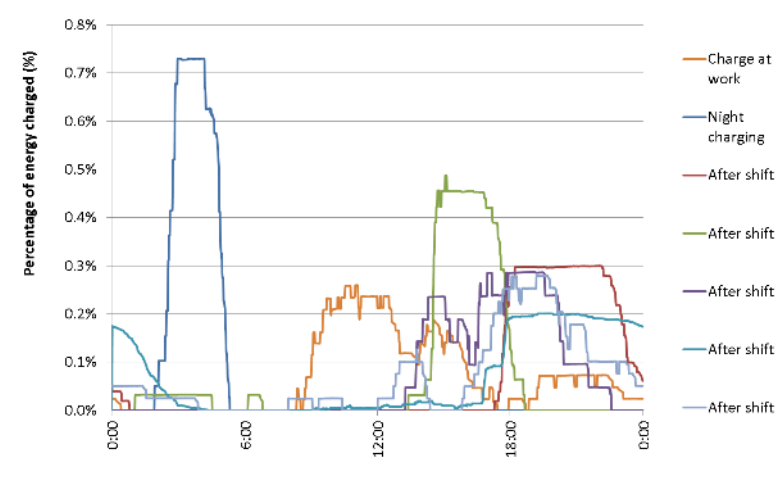
T4.3. Electric mobility

- Examples of results
 - Already existing sample of 40 drivers in Lisbon area

Simulated EV charging data



Real world EV charging data



- Methodology considering full availability to recharge
- Methodology based on vehicle energy use according with vehicle dynamics and vehicle characteristics

Next steps:

T4.1. Vehicle monitoring - enlarge the number of volunteers to enable a more representative sample

T4.2. Use case testing - possible applications of innovative solutions regarding:

- Eco-driving (adjust driving dynamics)
- Pay How You Drive (adjust speed limits)
- Tolling Systems (test of different routes)
- Others

T4.3. Electric mobility - final development of methodology to characterize driver suitability profiles and quantification of impacts



UC-CISUC Suscity project activities

T4.4. Collect GPS traces

Research Objectives

- Developing urban mobility models using opportunistic datasets

Description:

- We will acquire GPS traces from the on-board vehicle monitoring devices, taxi fleets, and personal smartphones and cellular network data to develop trip generation, trip distribution, and mode choice/mode detection models

Important data:

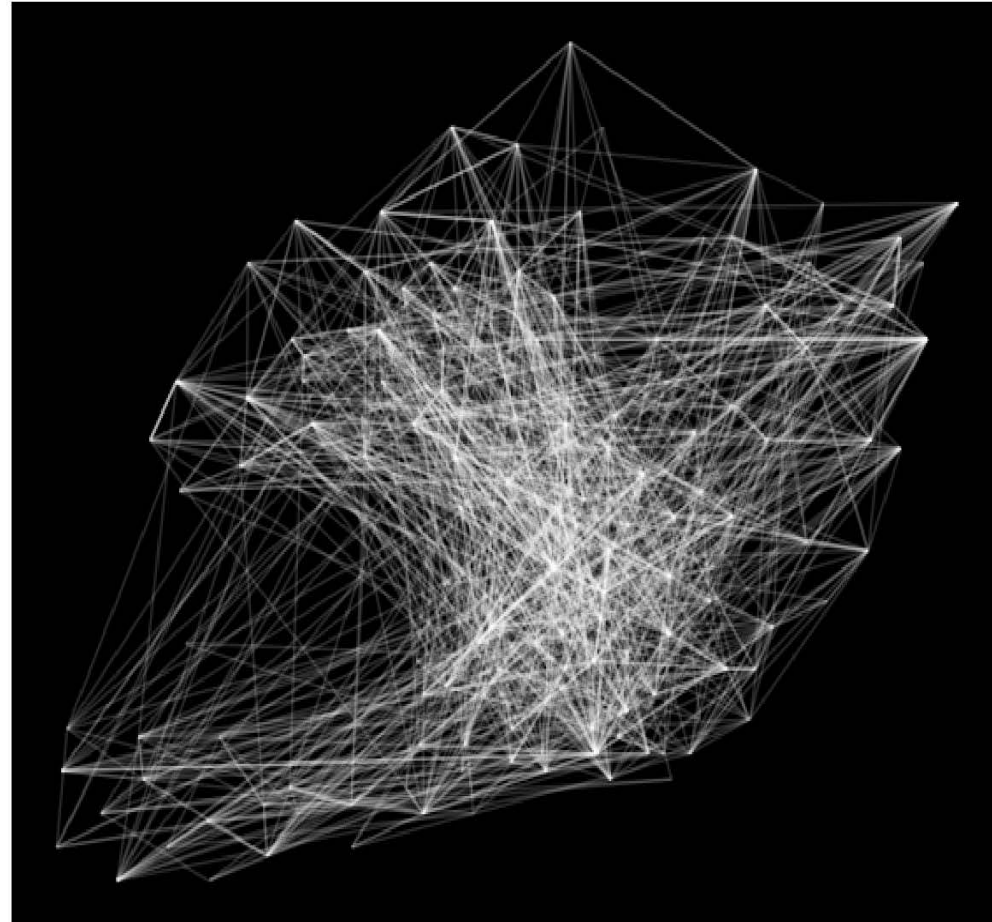
- GPS traces from different sources
- GSM and crowd-sourced data
- Public transport usage; and network information
- Travel surveys (for validating our models)



UC-CISUC Suscity project activities

T4.4. Collect GPS traces

Sample result: Commuting trips based on the home and work locations of sampled mobile phone users





UC-CISUC Suscity project activities

T4.4. Collect GPS traces

Challenges

1. Availability of Volunteers for the mobility surveys
2. Availability of up-to-date datasets from different sources

(GPS traces from personal smartphones, Public transport usage, GSM data, GPS traces from other fleets)

Achievements

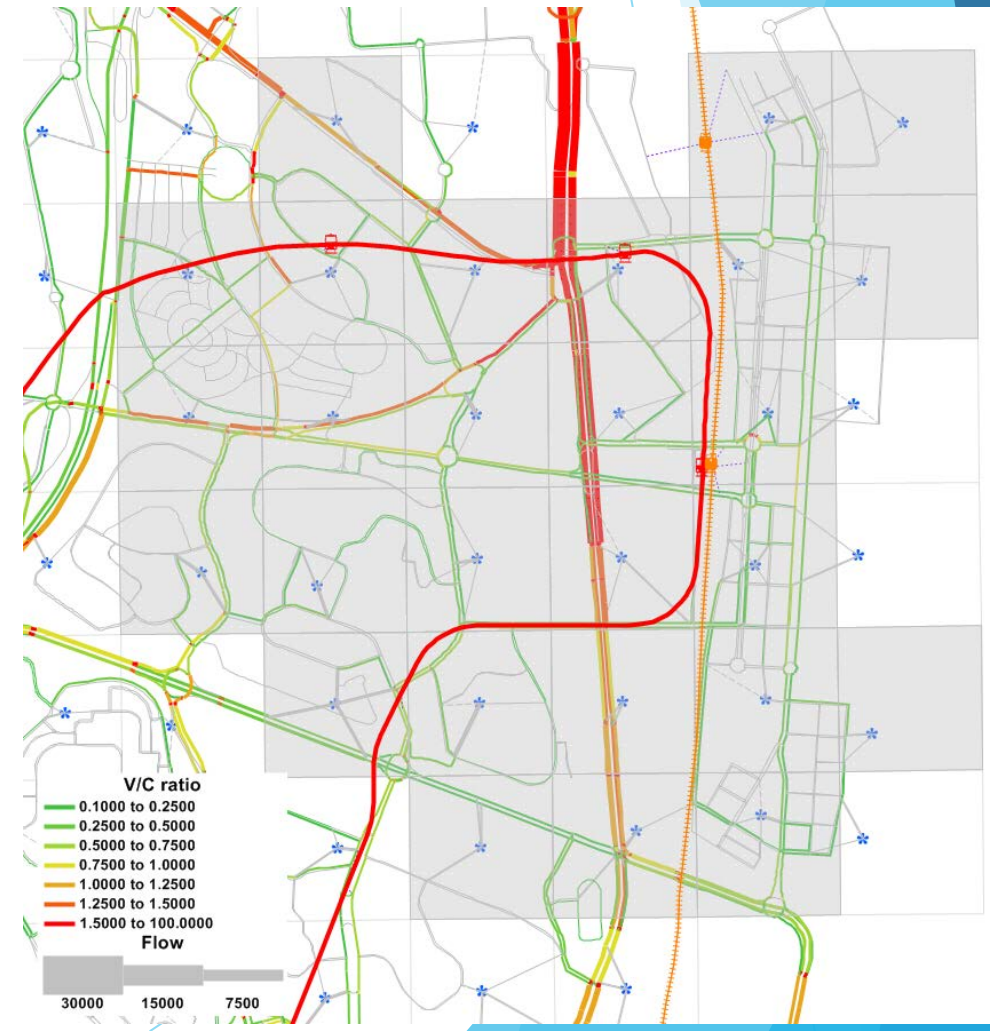
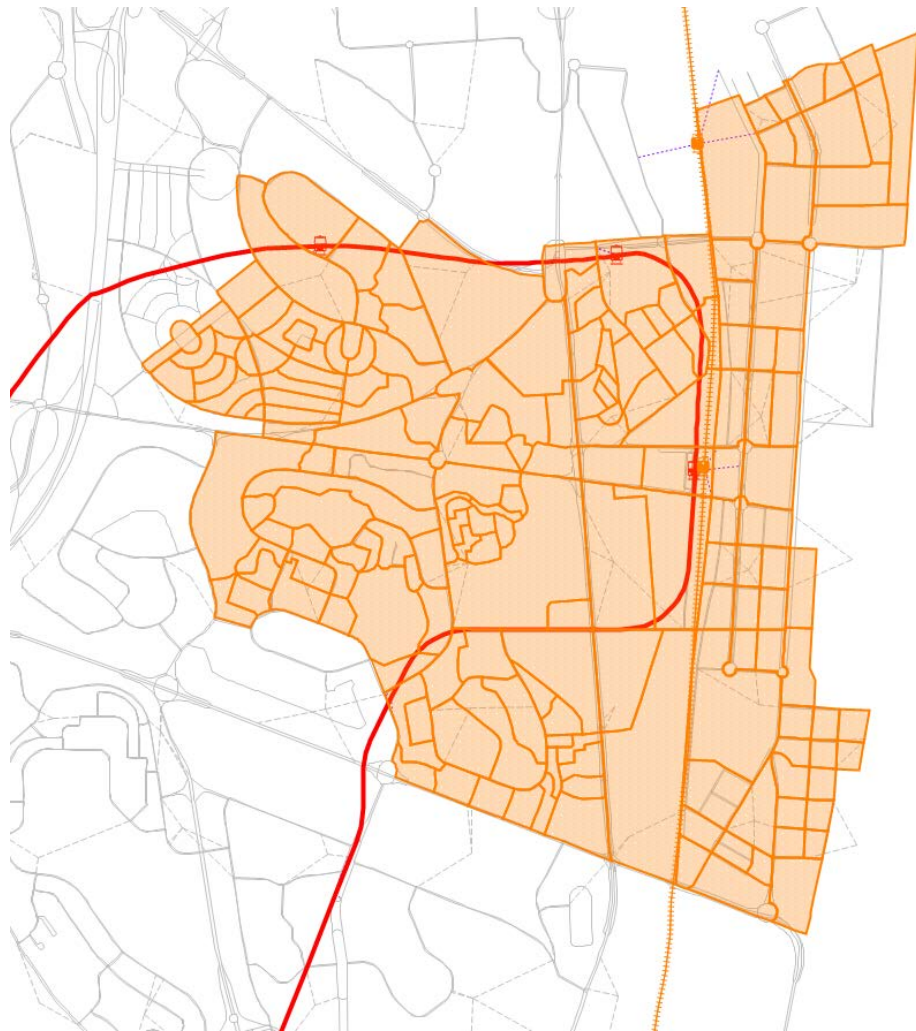
1. Origin-Destination inference (based on previous GSM data)
2. One paper accepted for publication at the IEEE ITS journal. "Inferring Passenger Travel Demand to Improve Urban Mobility in Developing Countries Using Cell Phone Data: A Case Study of Senegal", by Demissie, Merkebe; Phithakkitnukoon, Santi; Sukhvibul, Titipat; Antunes, Francisco; Gomes, Rui; Bento, Carlos"

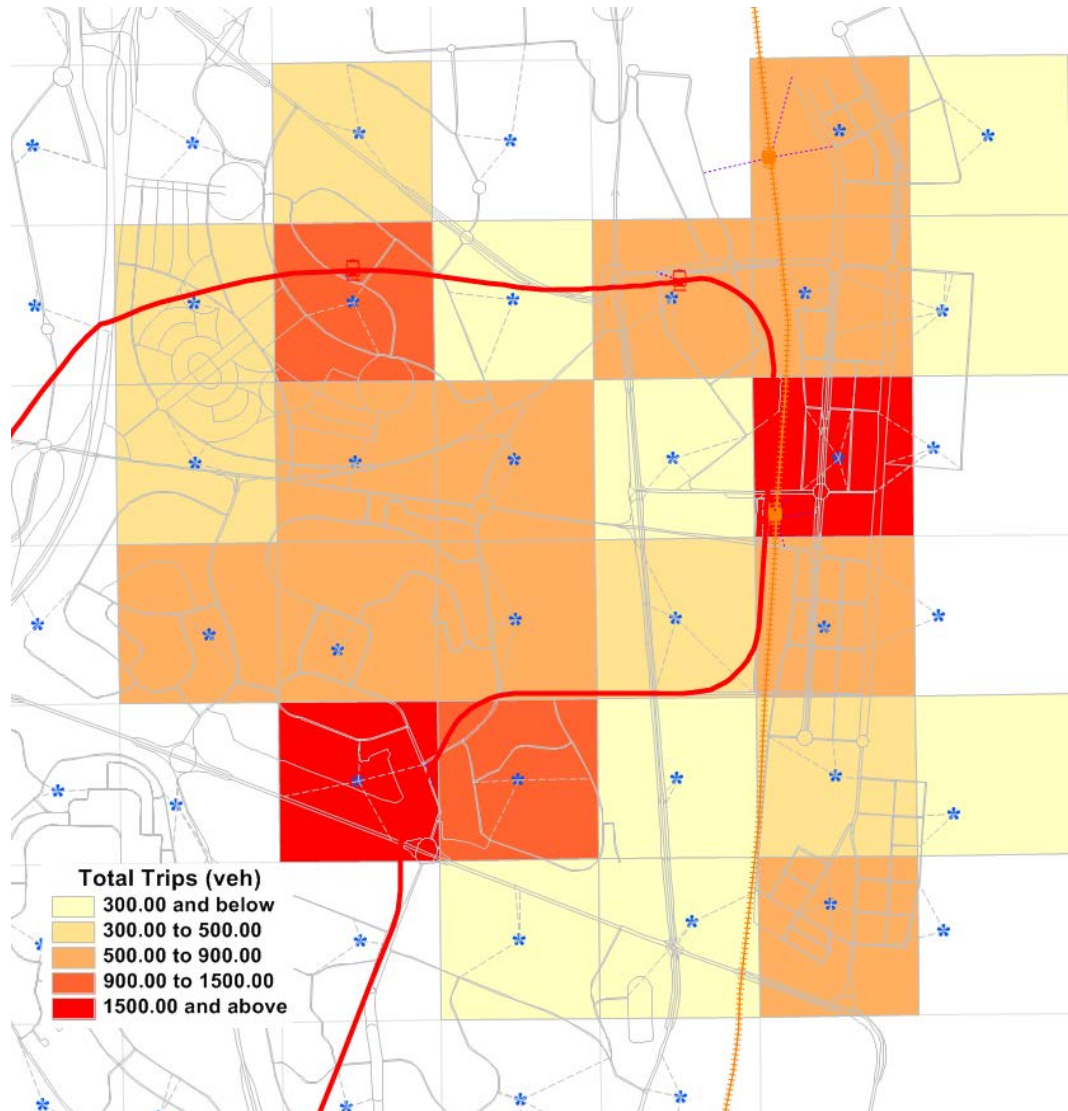
Future actions

1. Acquisition of Smartphones (10) for the mobility survey.
2. Acquiring up-to-date datasets.
3. Development of urban mobility models.

Task 4.5 - Urban mobility models

Passenger Mobility Patterns - Transport Demand (vehicles/road capacity ratio)





Passenger Mobility Patterns Transport Demand Model (trip generation)

		Destination		Total
		Inside	Outside	
Origin	Inside	1 152	6 685	7 837
	Outside	6 661	-	6 661
Total		7 813	6 685	14 498

Task 4.5 - Urban mobility models (Next Steps)

Surveys - Pax

Mode Choice Models



Surveys to volunteers
(based on SCUSSE survey)

Socio-economic data

Location, age, gender, occupation, literacy, income, household structure, car ownership, transit pass ownership, etc.

Mobility patterns

Origin, destination, time, purpose, modes used, level of satisfaction with the current modes used, etc.

Scenarios choice

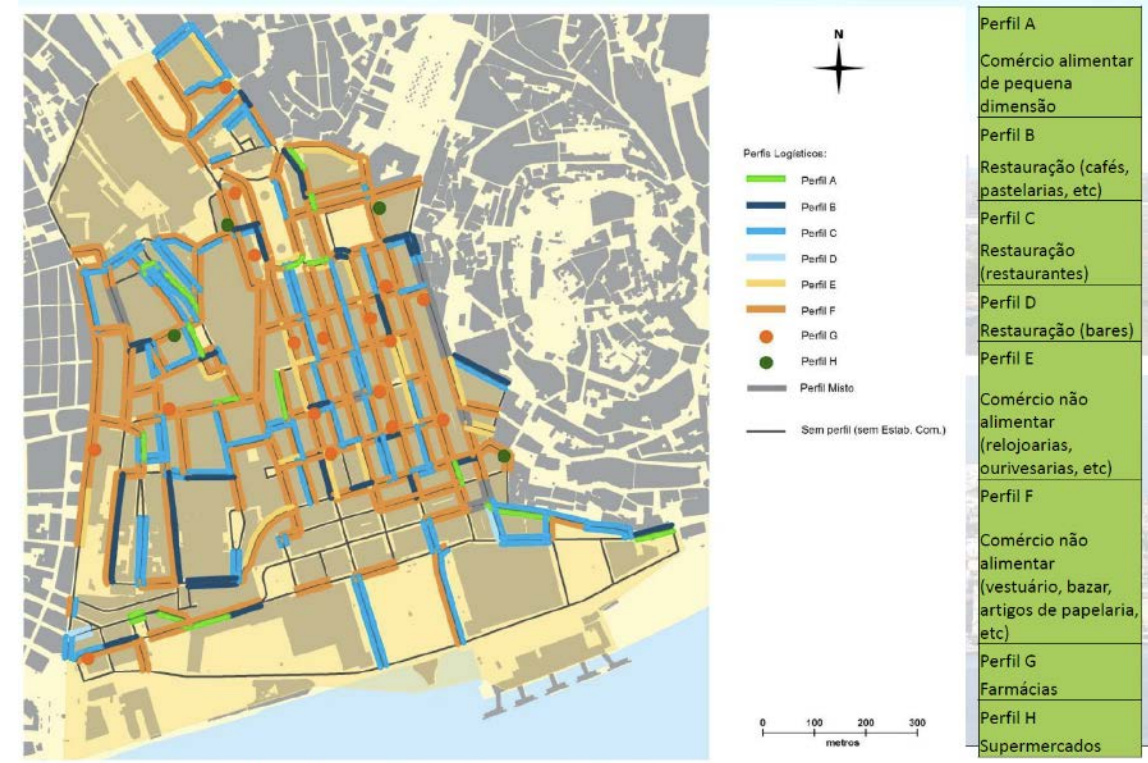
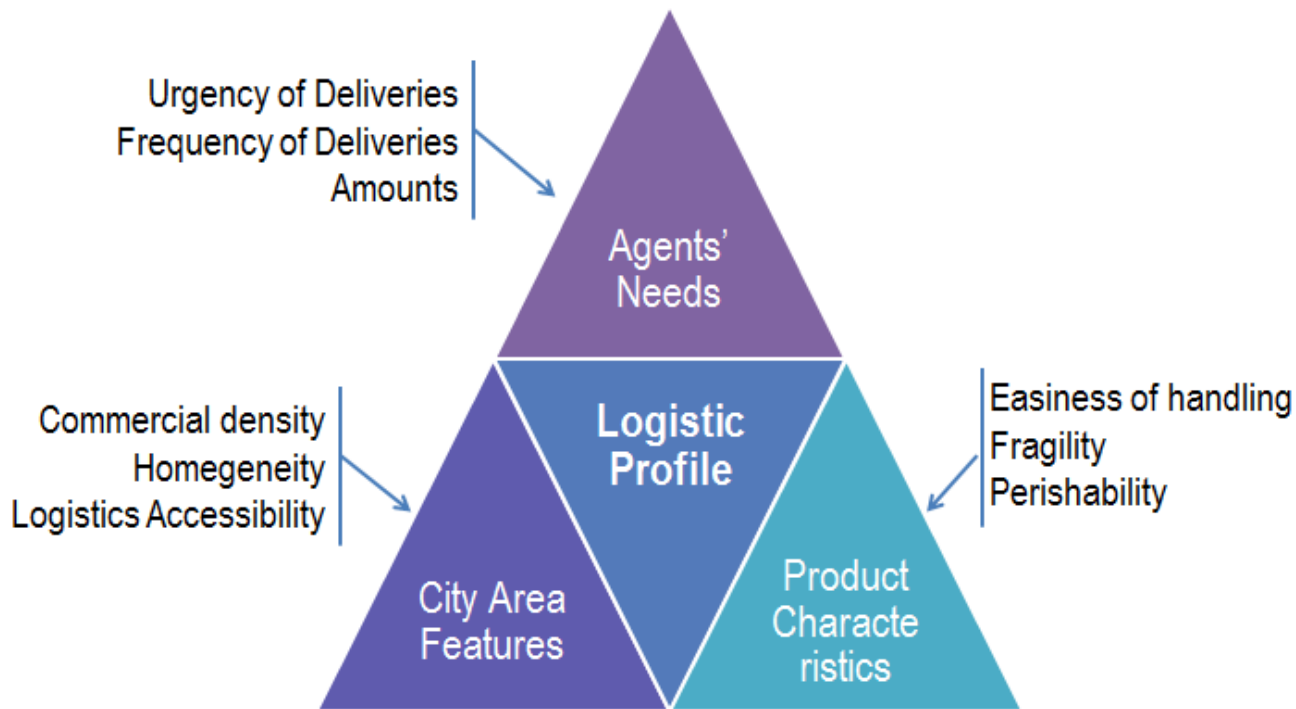
Choice between different mobility scenarios (combination of modes, cost and time)

Attitudes and behaviour

Preferences regarding different travel attributes (comfort, frequency, etc.)

Task 4.5 - Urban mobility models (Next Steps)

Surveys to companies (based on Straightsol survey)



WP4 - General Schedule

WP4 - Innovative mobility solutions		Partners involved	Year 1												Year 2												Year 3											
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Task 4.1	Vehicle monitoring	IST ID, iTds, IDMEC IST, MIT, Ucoimbra, Uminho, ADENE	Active																																			
Task 4.2	Use-case testing		Active																																			
Task 4.3	Study of optimal planning of charging infrastructures for EV		Active																																			
Task 4.4	User needs		Active																																			
Task 4.5	Urban mobility models		Active																																			
Task 4.6	Designing sustainable mobility solutions		Active																																			