Multimodal accessibility and commuting to campus: the case of the University of Lisbon

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

CITIES FOR US

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LISBON, Portugal
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U LISBOA | UNIVERSIDADE DE LISBOA   IGOT Instituto de Geografia e Ordenamento do Território UNIVERSIDADE DE LISBOA   CEG   Técnico LISBOA   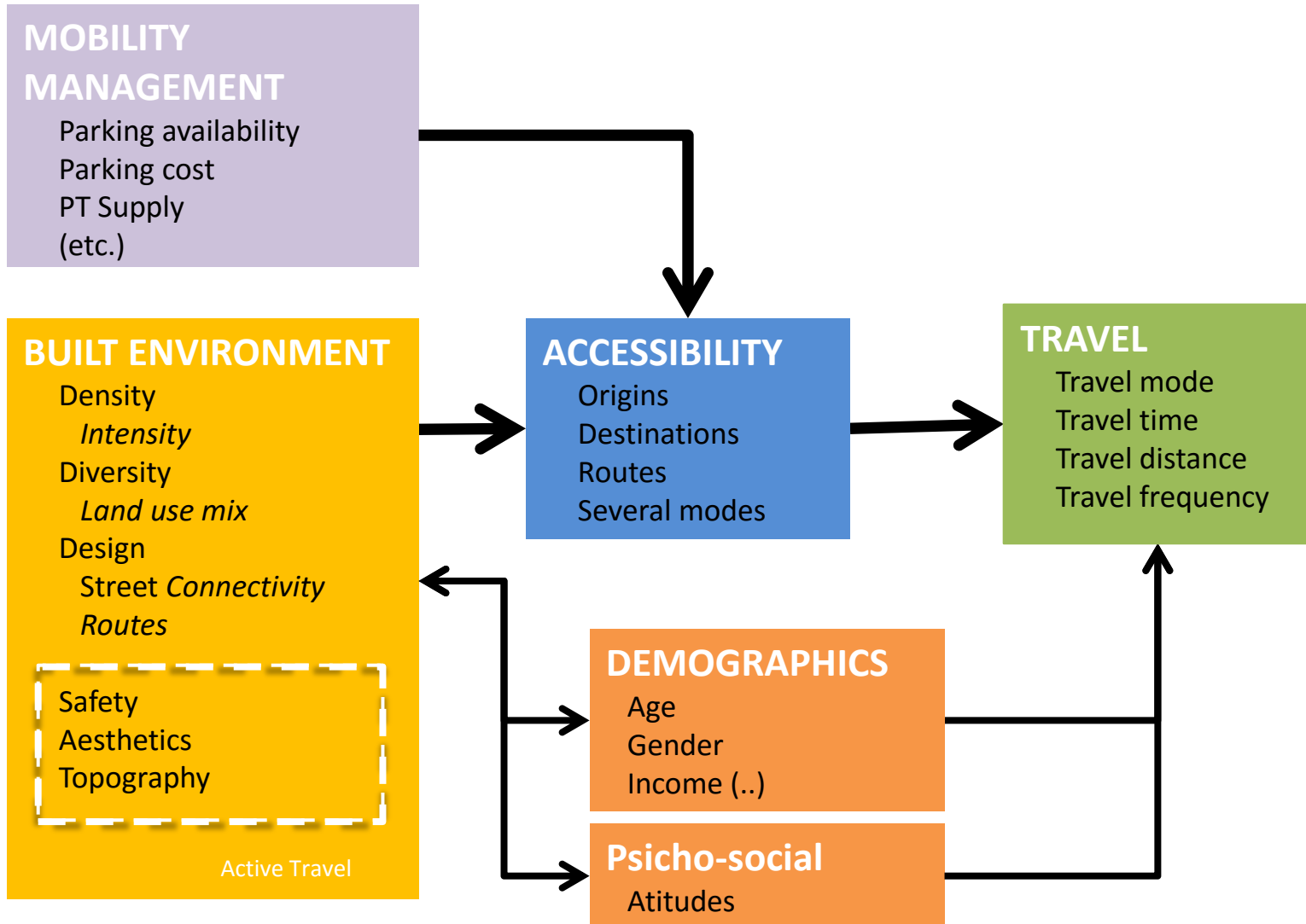FCT Fundação para a Ciência e a Tecnologia MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR   Caixa Geral de Depósitos
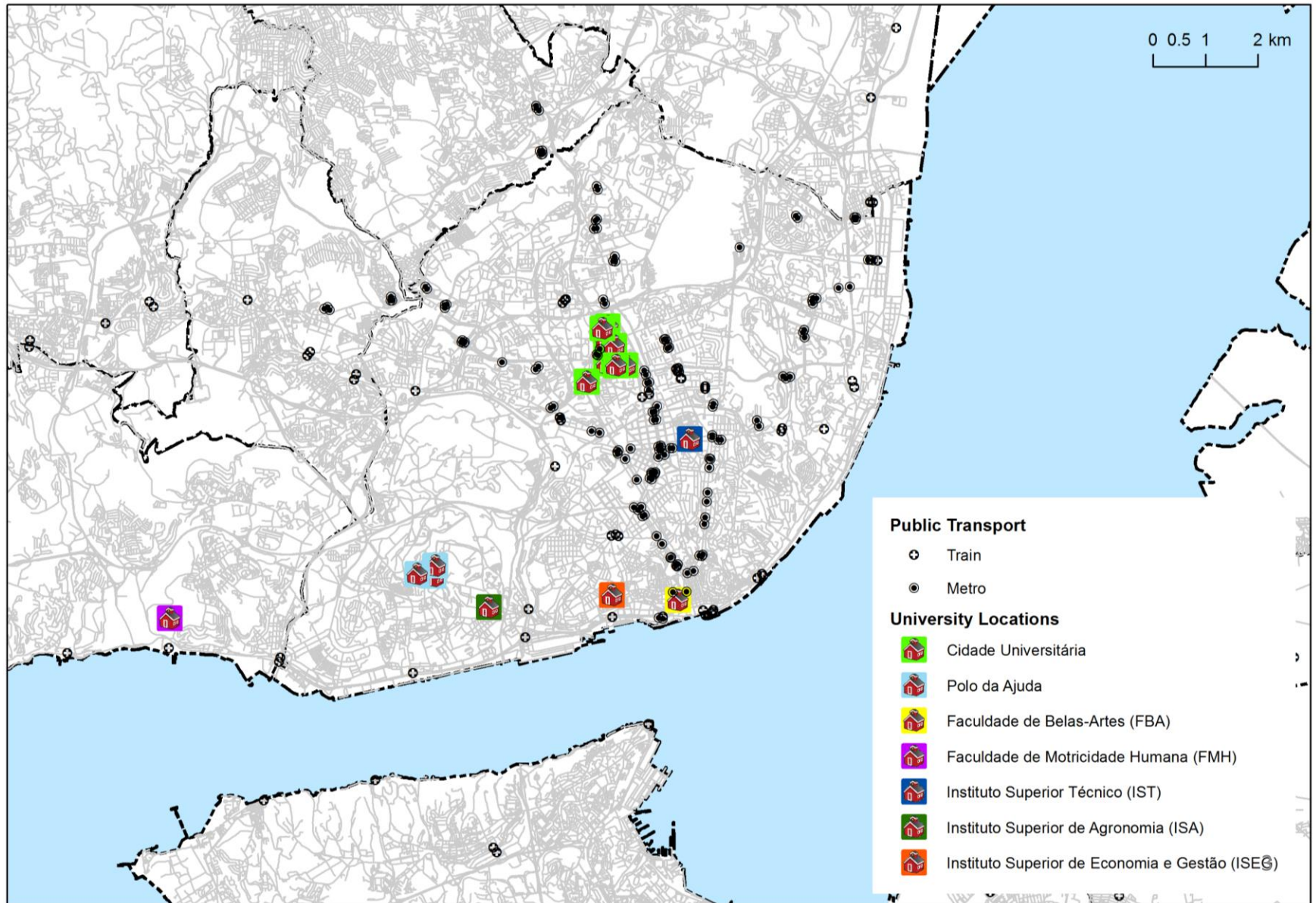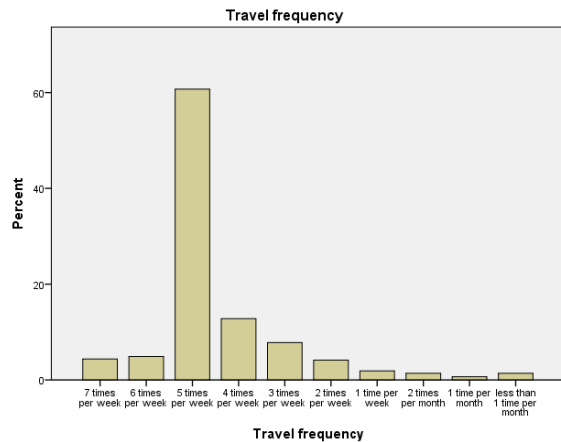
Built Environment and Travel

MOBILITY MANAGEMENT
Parking availability
Parking cost
PT Supply
(etc.)

BUILT ENVIRONMENT
Density
 Intensity
Diversity
 Land use mix
Design
 Street *Connectivity*
 Routes

Safety
Aesthetics
Topography

Active Travel

ACCESSIBILITY
Origins
Destinations
Routes
Several modes

TRAVEL
Travel mode
Travel time
Travel distance
Travel frequency

DEMOGRAPHICS
Age
Gender
Income (..)

Psicho-social
Atitudes

2

The University of Lisbon Locations – 7 campuses

Scale: 0 0.5 1 2 km

Public Transport
- ⊕ Train
- ⊙ Metro

University Locations
- Cidade Universitária
- Polo da Ajuda
- Faculdade de Belas-Artes (FBA)
- Faculdade de Motricidade Humana (FMH)
- Instituto Superior Técnico (IST)
- Instituto Superior de Agronomia (ISA)
- Instituto Superior de Economia e Gestão (ISEG)

The University of Lisbon Locations – 7 campuses

POLO DA AJUDA

IST

ISEG

Instituto Superior de Agronomia (ISA)

Instituto Superior de Economia e Gestão (ISE4)

The University of Lisbon Travel Survey

Travel frequency

Initial sample: 2037
Georeferenced: 1963

90.6% travel 3 or more times per week
>> Final sample: **1767 individuals**

Employment status
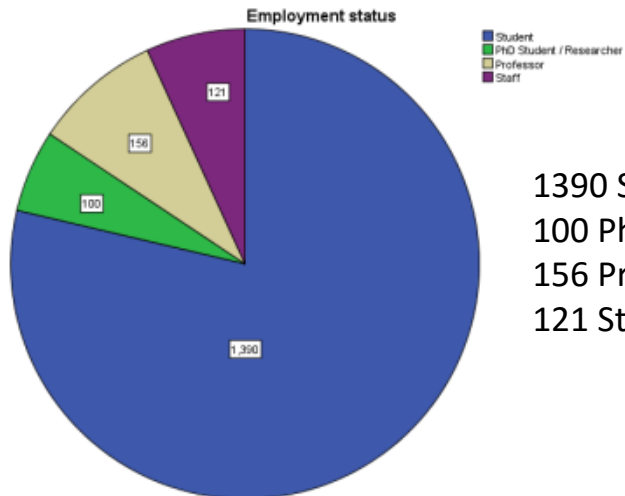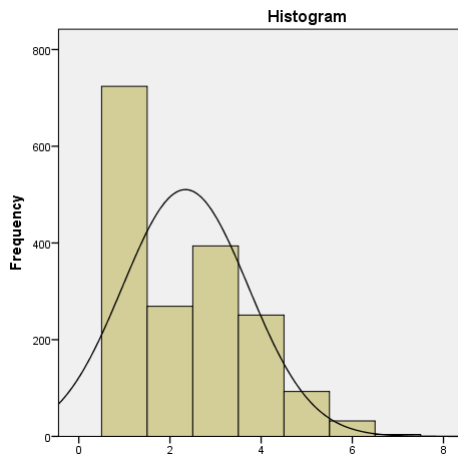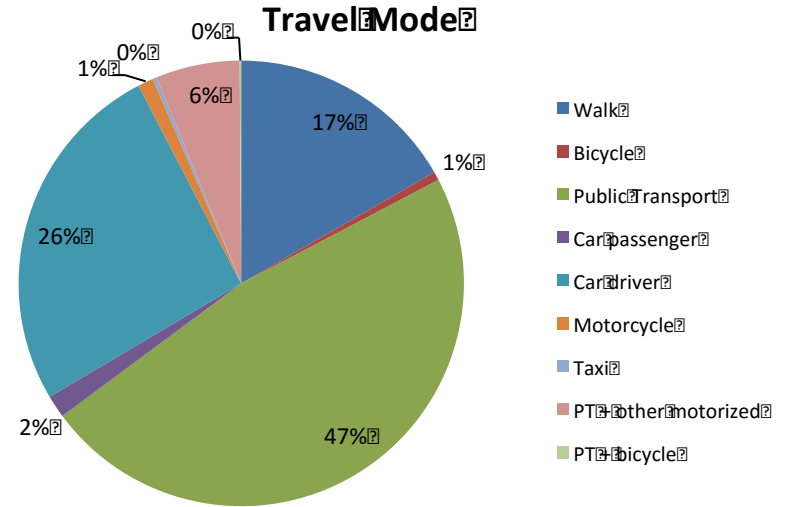
1390 Students
100 PhD / Researchers
156 Professors
121 Staff
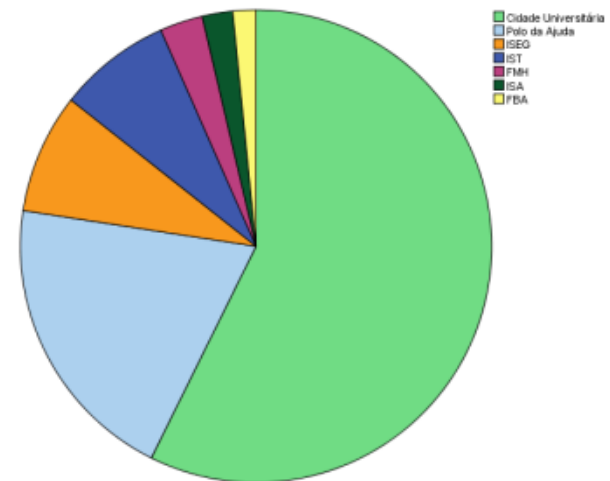
Travel patterns
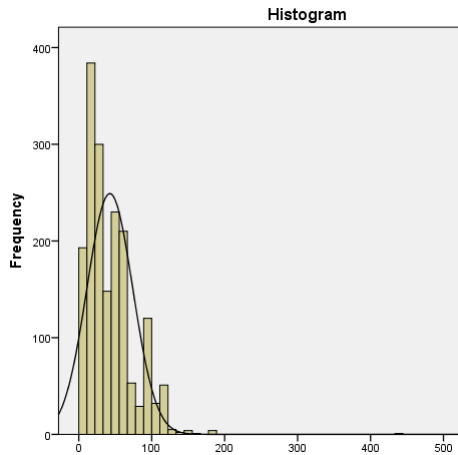
Mean = 42.5 min
StDev = 31.43 min

TRAVEL TIME

Mean = 2.34
StDev = 1.38

NUMBER OF TRAVEL STEPS

Travel Mode

- Walk
- Bicycle
- Public Transport
- Car passenger
- Car driver
- Motorcycle
- Taxi
- PT + other motorized
- PT + bicycle

17%
1%
0%
0%
1%
6%
26%
2%
47%

66%
37%
18%
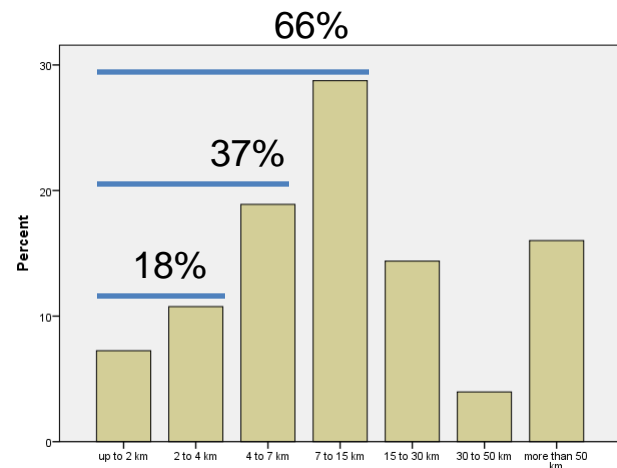
TRAVEL DISTANCE

Travel patterns
Alternative travel mode

Travel Mode * Alternative Travel Mode Crosstabulation

			Alternative Travel Mode								Total
			None	Walk	Bicycle	Public Transport	Car passenger	Car driver	Motorcycle	Taxi	
Travel Mode	Walk	Count	174	0	4	61	29	23	1	1	293
		% within Travel Mode	59.4%	0.0%	1.4%	20.8%	9.9%	7.8%	0.3%	0.3%	100.0%
	Bicycle	Count	3	1	0	4	0	3	0	0	11
		% within Travel Mode	27.3%	9.1%	0.0%	36.4%	0.0%	27.3%	0.0%	0.0%	100.0%
	Public Transport	Count	505	40	10	0	143	129	3	10	840
		% within Travel Mode	60.1%	4.8%	1.2%	0.0%	17.0%	15.4%	0.4%	1.2%	100.0%
	Car passenger	Count	5	0	0	22	0	2	0	0	29
		% within Travel Mode	17.2%	0.0%	0.0%	75.9%	0.0%	6.9%	0.0%	0.0%	100.0%
	Car driver	Count	262	15	7	162	0	0	0	11	457
		% within Travel Mode	57.3%	3.3%	1.5%	35.4%	0.0%	0.0%	0.0%	2.4%	100.0%
	Motorcycle	Count	4	0	1	6	0	9	0	0	20
		% within Travel Mode	20.0%	0.0%	5.0%	30.0%	0.0%	45.0%	0.0%	0.0%	100.0%
	Taxi	Count	2	0	0	1	0	2	0	0	5
		% within Travel Mode	40.0%	0.0%	0.0%	20.0%	0.0%	40.0%	0.0%	0.0%	100.0%
	PT + other motorized	Count	35	0	0	20	18	33	1	1	108
		% within Travel Mode	32.4%	0.0%	0.0%	18.5%	16.7%	30.6%	0.9%	0.9%	100.0%
	PT + bicycle	Count	0	0	0	0	2	0	0	0	2
		% within Travel Mode	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
Total		Count	990	56	22	276	192	201	5	23	1765
		% within Travel Mode	56.1%	3.2%	1.2%	15.6%	10.9%	11.4%	0.3%	1.3%	100.0%

no alternative mode for:

59.4% Walkers
60.1% PT users
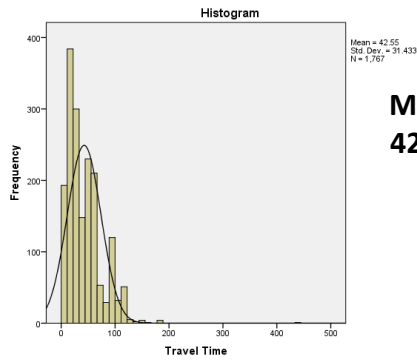**57.3% Car drivers**

PT is alternative mode for:

75.9% car passengers
35.4% Car drivers
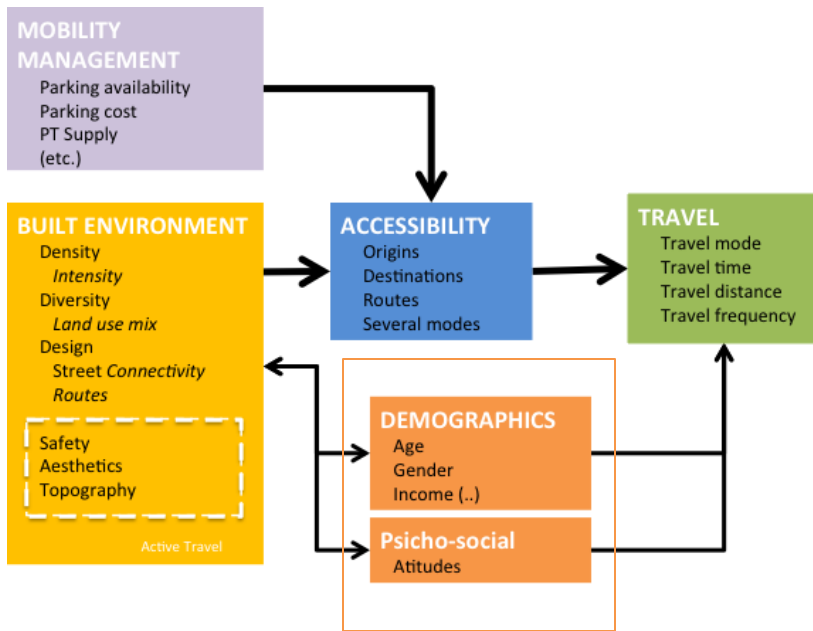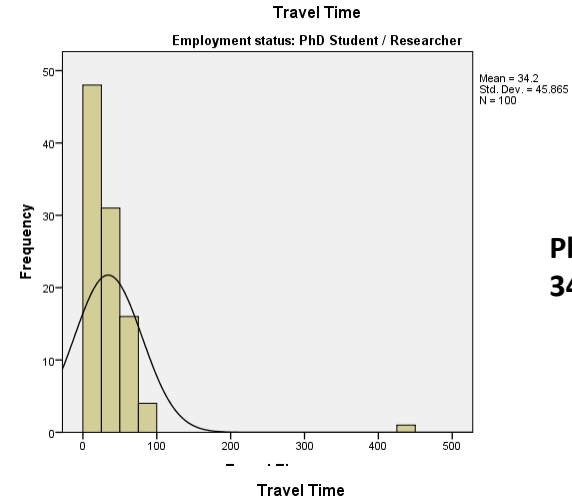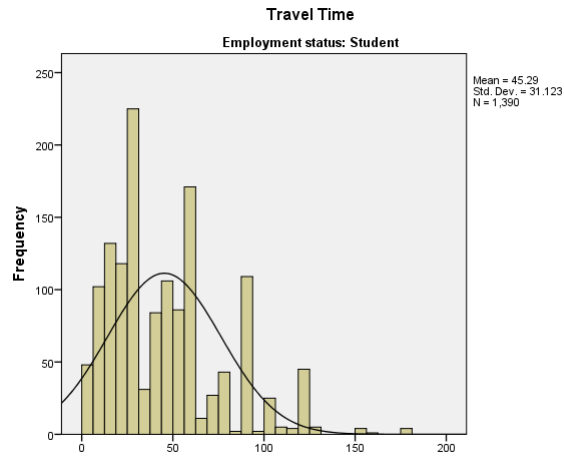
1) What's the impact of the employment status?
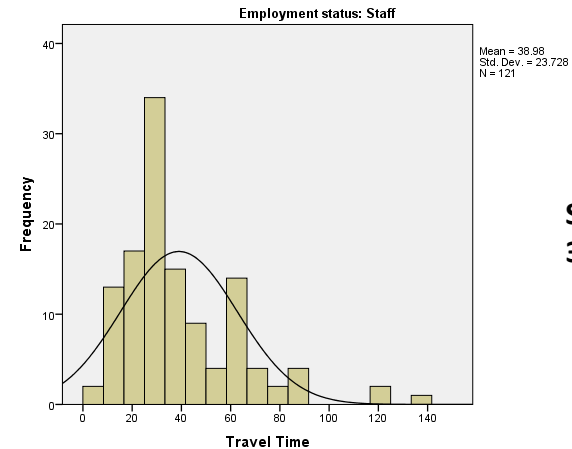
TRAVEL TIME
Employment Status

Mean
42.5 min

Student
45.3 min

PhD / Researcher
34.2 min
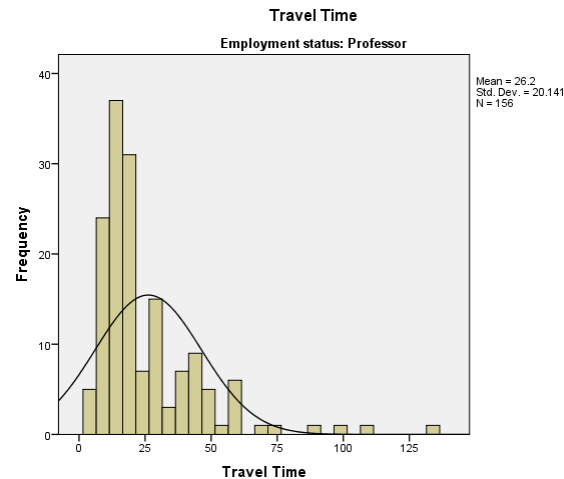
Professor
26.2 min

Staff
38.9 min

Travel Mode
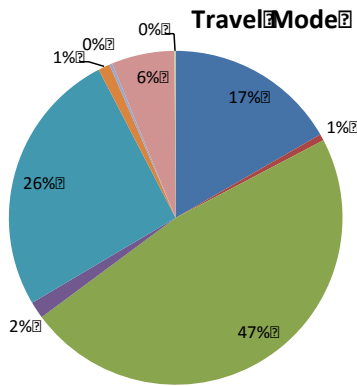
- Walk — 17%
- Bicycle — 1%
- Public Transport — 47%
- Car passenger — 2%
- Car driver — 26%
- Motorcycle — 1%
- Taxi — 0%
- PT + other motorized — 6%
- PT + bicycle — 0%

Student
18% Walk
54% PT

PhD / Researcher
16% Walk
41% PT
31% Car driver

Professor
9% Walk
81.4% Car driver

Staff
10% Walk
34% PT
46% Car driver
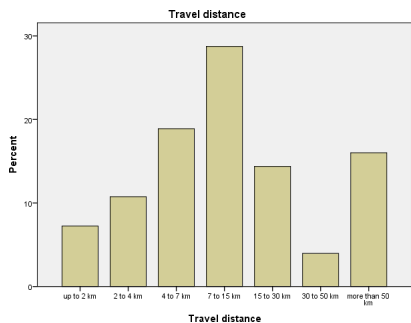
18% up to 4 km
37% up to 7 km
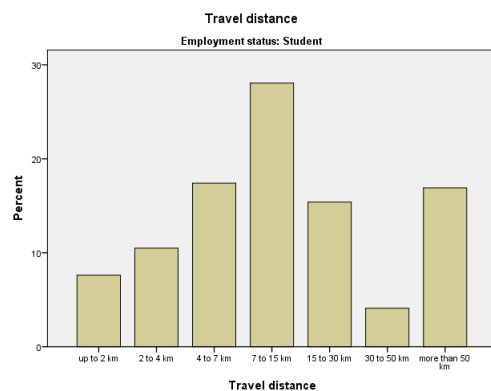
Student
18% up to 4 km
36% up to 7 km
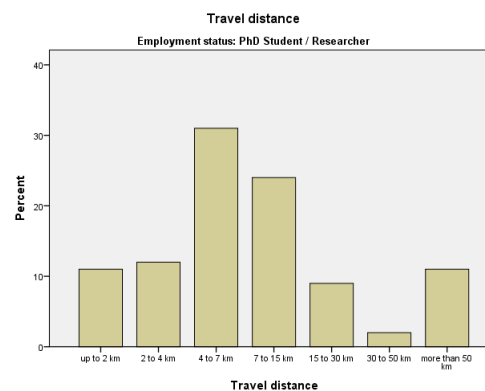
PhD / Researcher
23% up to 4 km
54% up to 7 km
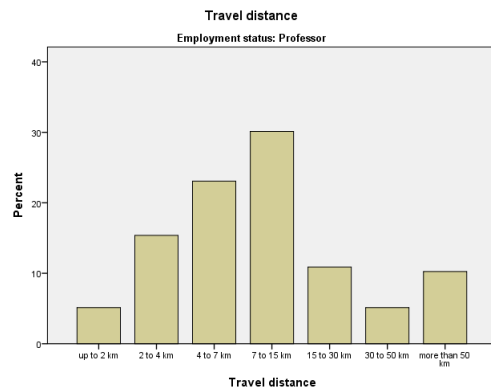
Professor
20% up to 4 km
44% up to 7 km
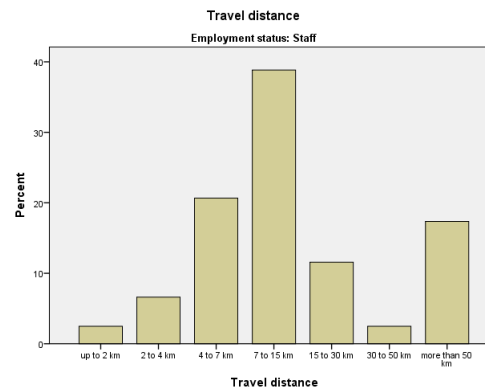
Staff
9% up to 4 km
30% up to 7 km

11
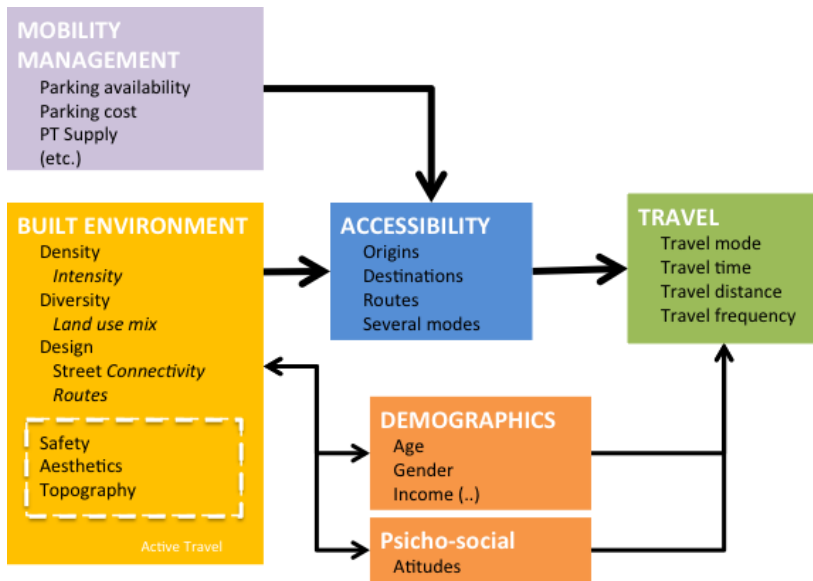
2) What's the impact of the location of the campus?
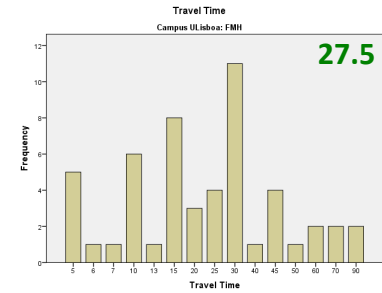
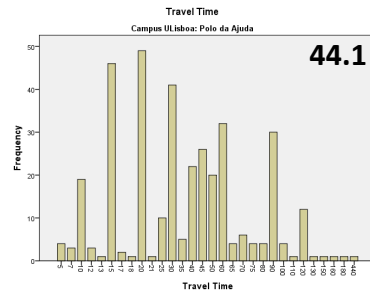# TRAVEL TIME
Campus ULisboa
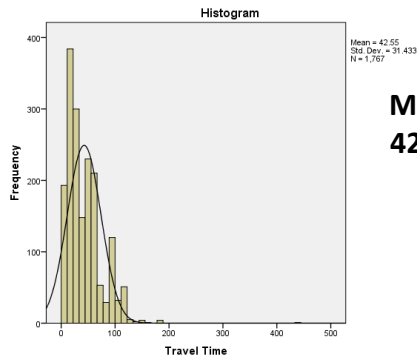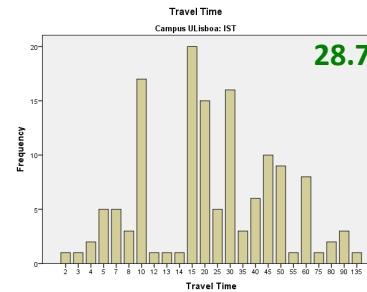
**Mean
42.5 min**

Cidade Universitária

44.7

ISEG

40.6

FMH

27.5

Polo Ajuda
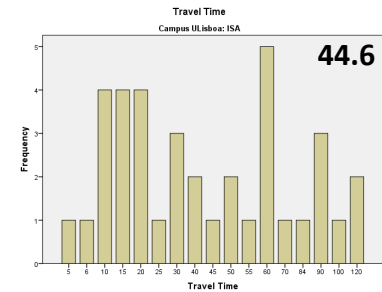

44.1

IST

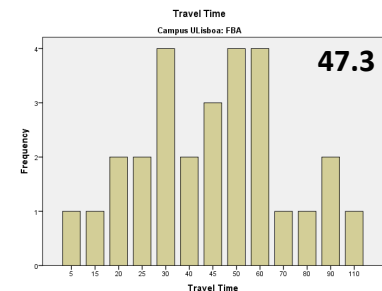

28.7

ISA*

44.6

FBA*

47.3

Smaller Travel Time:
**   IST (Center, Good PT accessibility)**
**   FMH (Periphery, Bad PT accessibility)**

>> Smaller travel distance?
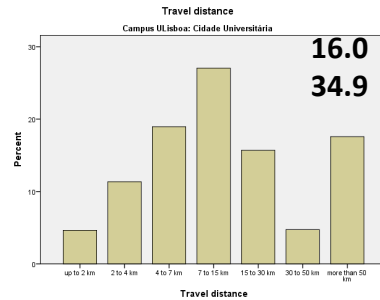**>> Mode change to reduce time?**

* Only students

TRAVEL DISTANCE
Campus ULisboa
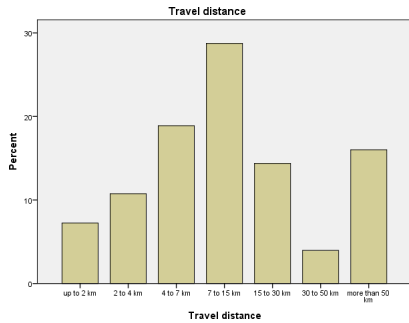
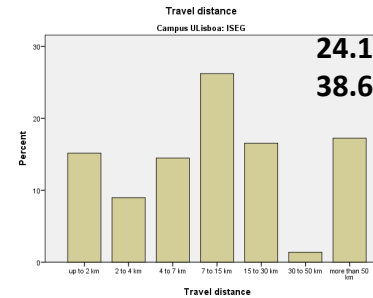18% up to 4 km
37% up to 7 km

Cidade Universitária

16.0
34.9

ISEG

24.1
38.6

FMH

23.1
30.0

Polo Ajuda

11.5
34.6

IST

43.8
65.0

ISA*

16.2
27.0

FBA*

14.3
46.4

Smaller Travel Distance:
   IST (Center, Good PT accessibility)

Reduced number of walking distance residents:
   Polo da Ajuda (Periphery, Bad PT accessibility)

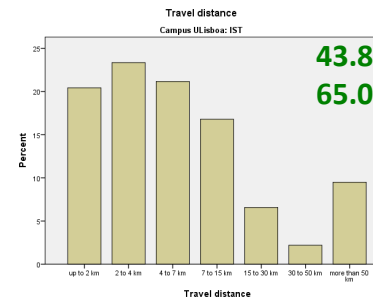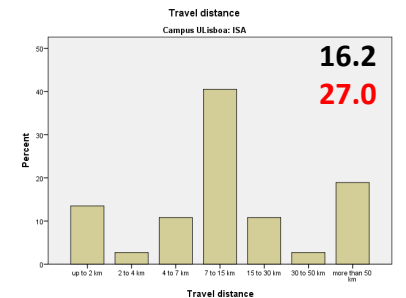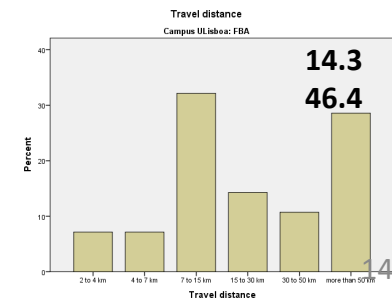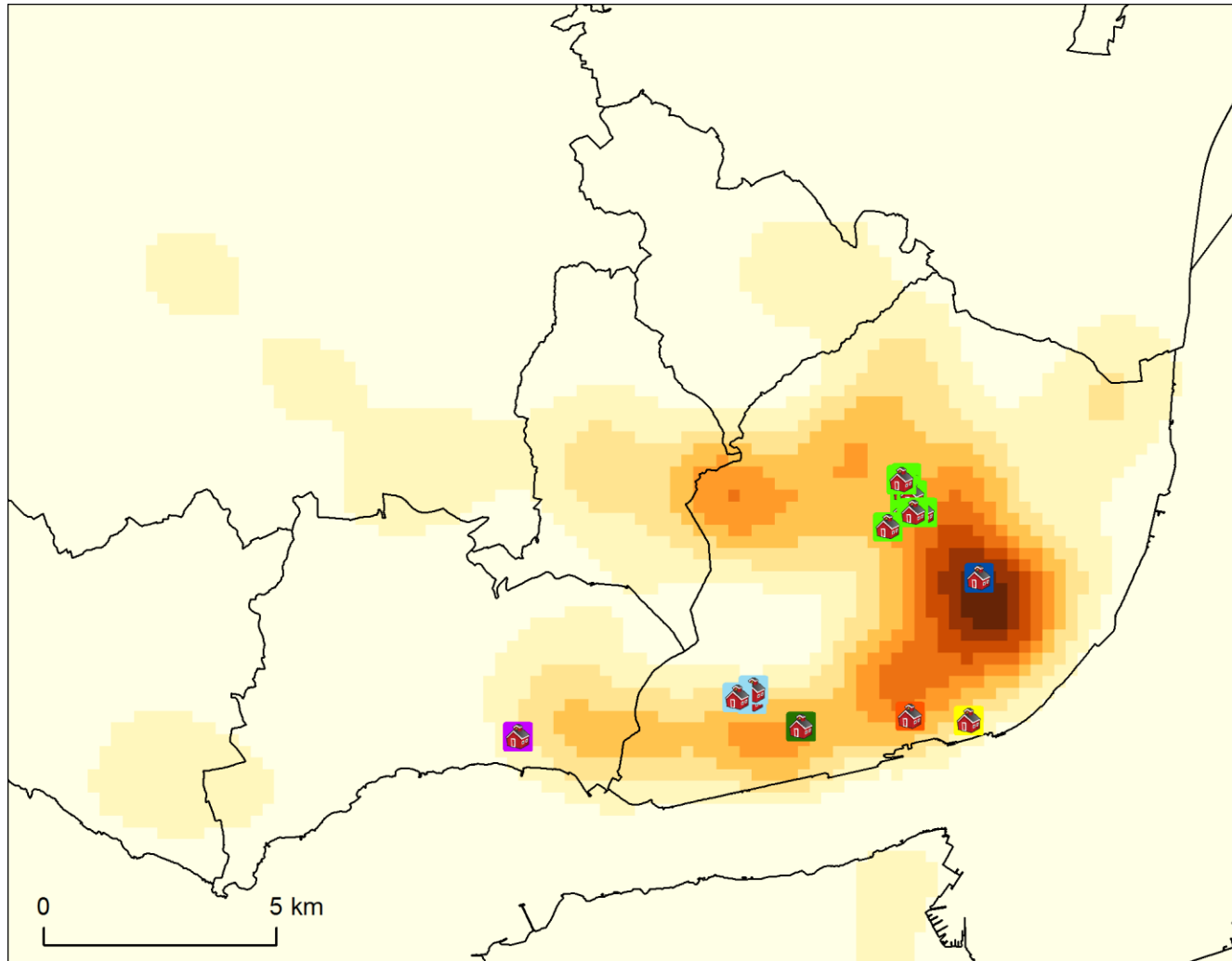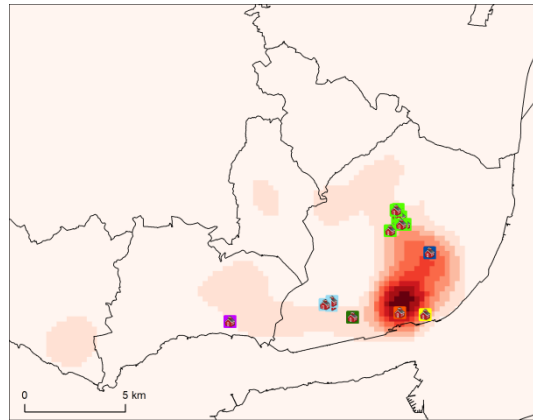**>> Mode change to reduce time?**

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* Only students

Location of residential place Kernel density

Cidade Universitária
Polo da Ajuda
FBA
FMH
IST
ISA
ISEG

0   5 km
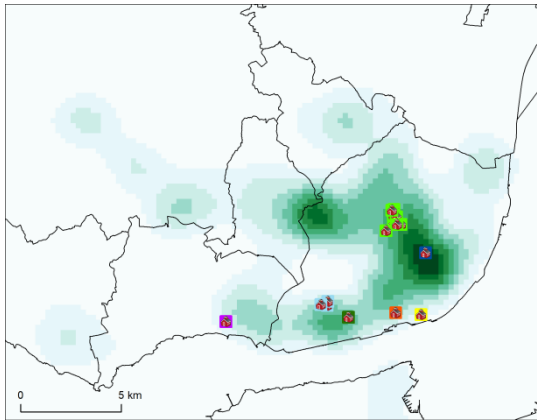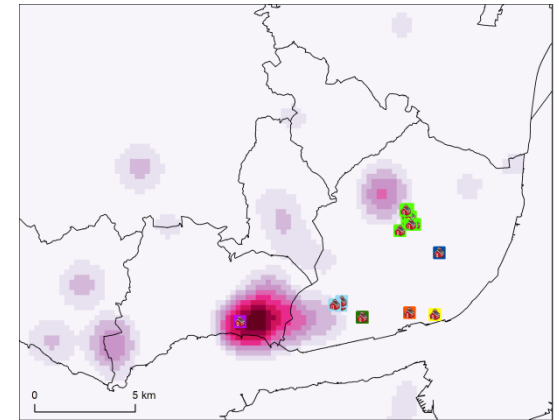
Cidade Universitária — ISEG — FMH — **Polo Ajuda** — IST — ISA* — FBA*
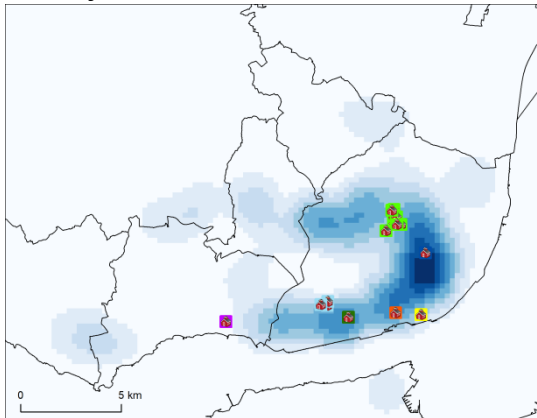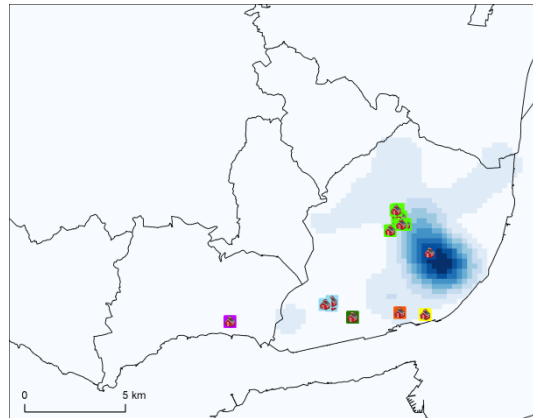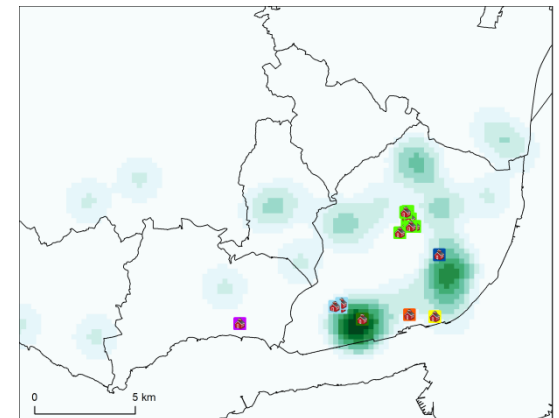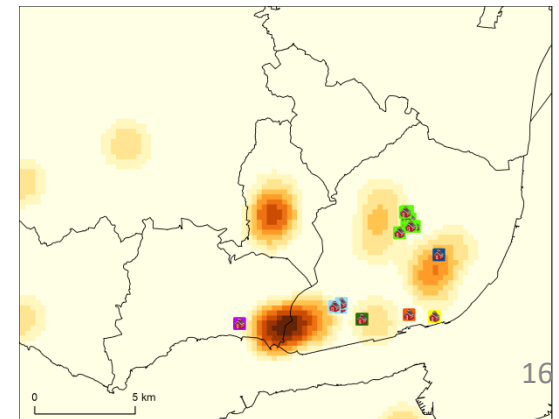
Location of residential place Kernel density

By different campuses

* Only students

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TRAVEL MODE
Campus ULisboa
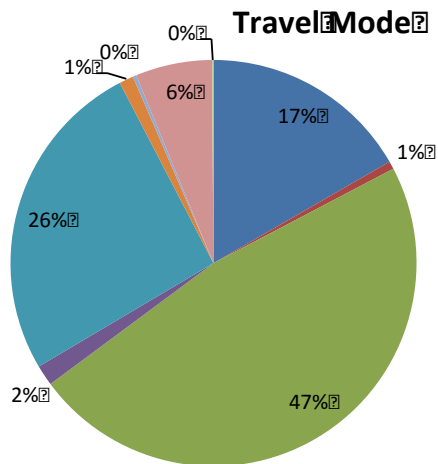
Travel Mode

Legend:
- ■ Walk
- ■ Bicycle
- ■ Public Transport
- ■ Car passenger
- ■ Car driver
- ■ Motorcycle
- ■ Taxi
- ■ PT + other motorized
- ■ PT + bicycle

Main pie percentages: 17%, 1%, 47%, 2%, 26%, 1%, 0%, 0%, 6%
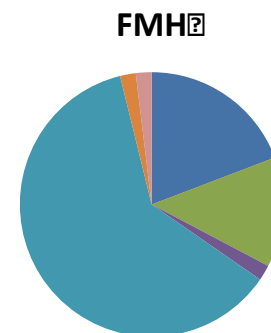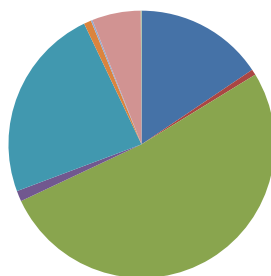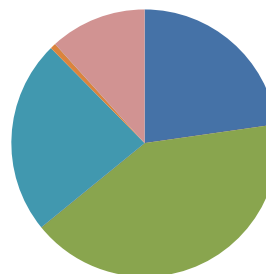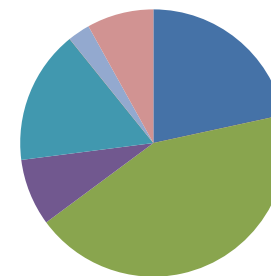
More car drivers:
Polo da Ajuda + FMH

More walkers:
IST + ISEG

More PT users:
FBA

FMH

Cidade Universitária

ISEG

ISA*

Polo da Ajuda

IST

FBA*

* Only students
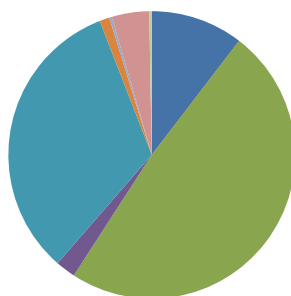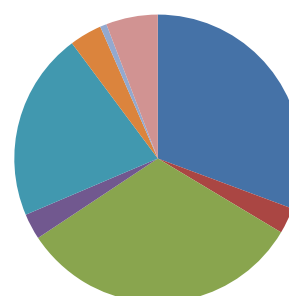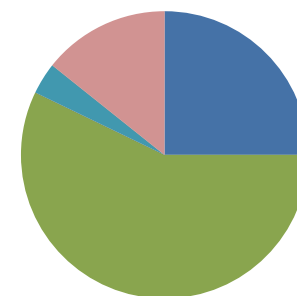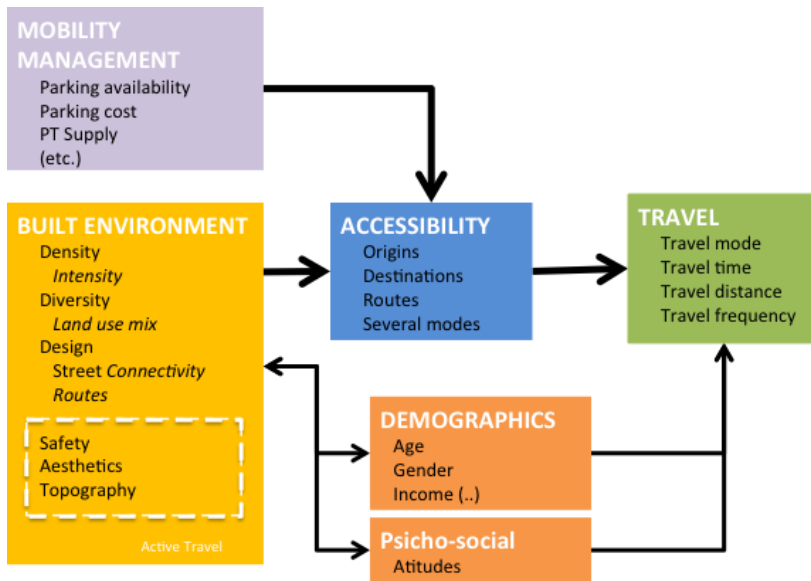
3) What explains the commuting pattern?

Logistic model (No-car commuting = 1)

Independent Variables (30)

BUILT ENVIRONMENT @ HOME (6)

Density:
Number of buildings
Number of dwellings
Number of residents

Diversity:
% Exc. Res. Buildings
Variety of POI types

Design
Pedestrian shed ratio

BUILT ENVIRONMENT @ CAMPUS (6)

Density:
Number of buildings
Number of dwellings

Diversity:
% Exc. Res. Buildings
Variety of POI types

Design
Pedestrian shed ratio
Route Lenght

SOCIO-ECONOMIC (9)
Employment status
Age
Has less than 25 (dummy)
Gender
Young Children (<10) (dummy)
Number of cars
Has a car (dummy)
Drivers license (dummy)
Has PT card (dummy)

ACCESSIBILITY @ HOME (4)
Distance to closest stop
Has PT stop 400|800 (01)
Has PT stop < 800 m (01)
Number of POIs

ACCESSIBILITY @ CAMPUS (4)
Distance to closest stop
Has PT stop < 800 m (01)
Type of closest PT stop
Number of POIs

TRAVEL DISTANCE (1)
Network distance (km)

FCA 500 meters network

FCA example

Logistic model (no-car commuting)

Nagelkerke R^2 = .451
PAC = 81.9% (% accuracy)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Socio-economic								
SE_Status (student= ref)			39.754	3	.000			
SE_Status (researcher)	-.148	.308	.231	1	.631	.862	.471	1.578
SE_Status (professor)	-1.853	.306	36.653	1	.000	.157	.086	.286
SE_Status (staff)	-.236	.278	.723	1	.395	.789	.458	1.361
SE_AgeLess25 (Yes=1)	1.641	.205	63.870	1	.000	5.159	3.450	7.715
SE_NumCars	-.705	.084	70.650	1	.000	.494	.419	.582
SE_Car (Has car = 1)	-2.608	.757	11.882	1	.001	.074	.017	.325
SE_DrivLic (Yes=1)	-3.310	.431	58.909	1	.000	.037	.016	.085
Travel Distance								
TrvDist_Class (up to 2 km = ref)			54.086	6	.000			
TrvDist_Class (2 to 4 km)	-.355	.403	.776	1	.378	.701	.319	1.544
TrvDist_Class (4 to 7 km)	-1.325	.359	13.616	1	.000	.266	.132	.537
TrvDist_Class (7 to 15 km)	-1.551	.348	19.868	1	.000	.212	.107	.419
TrvDist_Class (15 to 30 km)	-1.398	.366	14.586	1	.000	.247	.121	.506
TrvDist_Class (30 to 50 km)	-1.143	.459	6.192	1	.013	.319	.130	.784
TrvDist_Class (more than 50 km)	-.336	.382	.776	1	.378	.714	.338	1.510
House Built Environment HBE_PT stop at less than 800m (Yes =1)	.335	.158	4.485	1	.034	1.399	1.025	1.908
University's Built Environment UL_Percentage Exclusively residential	-.010	.002	18.723	1	.000	.990	.986	.995
UL_Route Lenght FCA (Km)	.012	.003	11.866	1	.001	1.012	1.005	1.018
Constant	8.248	.964	73.136	1	.000	3820.020		

Conclusions

- Major differences found between employment status BUT ALSO between campus location (and associated BE and Accessibility)

- Socio-economic very determinant

- However, BE of destination has important as BE of home

- Transport-Land Use integration must consider both origins and destinations

- Different destinations require different measures

   > **One size does NOT fit all!**