


# Travel to school and urban structure in medium and small sized cities. Case Study of Castelo Branco.



Urban Transport 2011, 6-8 June 2011  
Pisa, Italy

# Aims

Study the mobility patterns by school and school grade in medium and small sized cities.

Study, with aggregated data, the relations between land use and mobility patterns

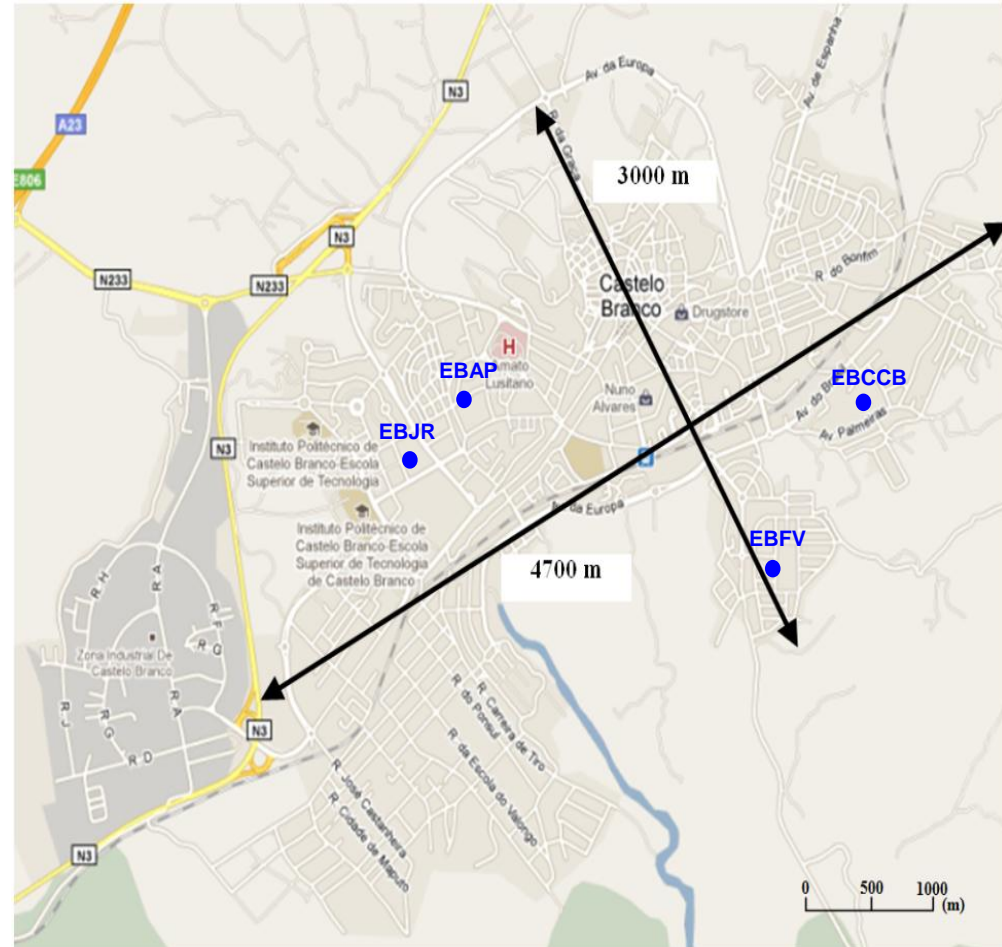
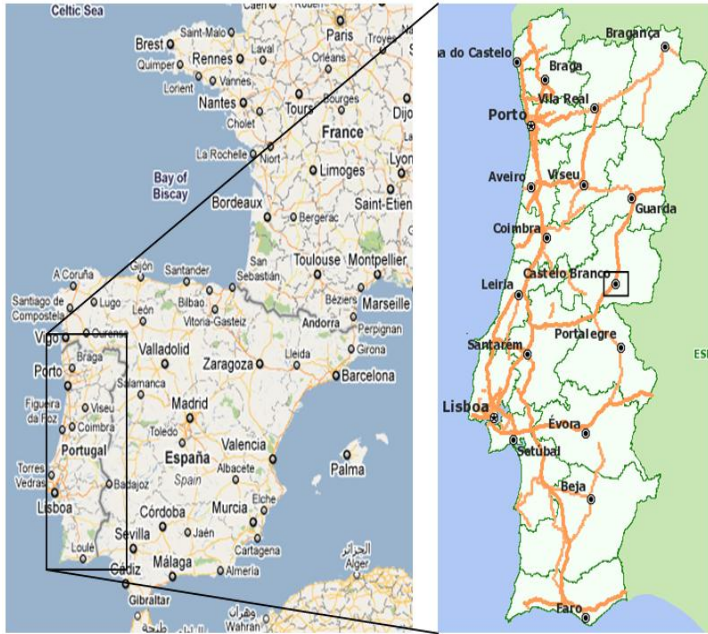
# Means

Projects Ongoing:

Journeys to school in Castelo Branco. Towards Sustainable Mobility.

Integration of land use and transport in medium sized cities.

# City of Castelo Branco



School	Grade and age group		
	1 <sup>st</sup> – 4 <sup>th</sup> (5-10 years old)	5 <sup>th</sup> – 6 <sup>th</sup> (10-11 years old)	7 <sup>th</sup> – 9 <sup>th</sup> (12-14 years old)
EBAP	79	185	207
EBCCR	136	239	273
EBJR	68	219	283
EBFV	80	181	184
<b>Total</b>	<b>359</b>	<b>824</b>	<b>947</b>

**30 000 inhabitants**

**12 000 students of all grades**

**45 schools of all grades**

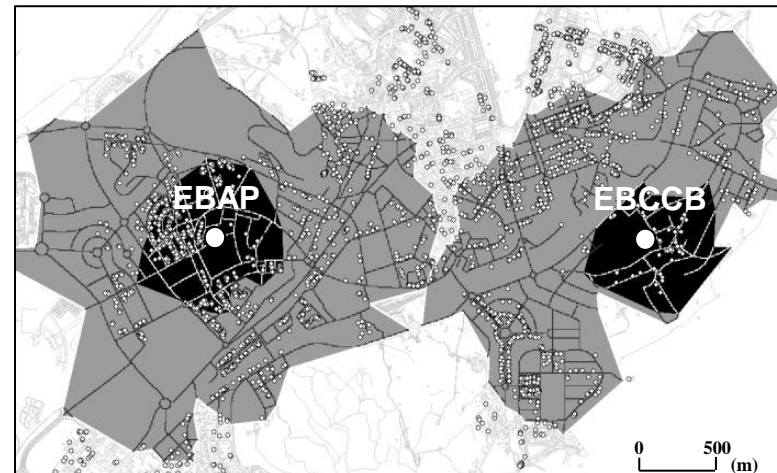
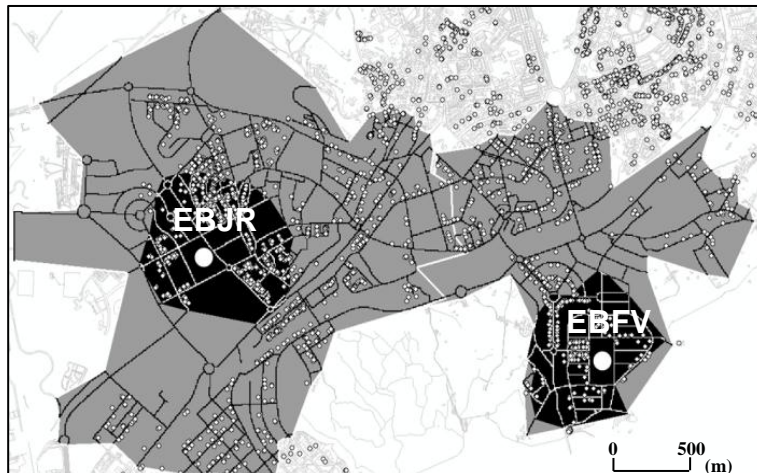
# Methodology

## Characteristics of urban zones where schools are located

	<b>EBAP</b>	<b>EBJR</b>	<b>EBFV</b>	<b>EBCCB</b>
<b>Urban Network Street</b>	Planned	Planned	Planned	Spontaneous
<b>Schools Location</b>	Central Urban Area	Near to City Center	Urban Periphery	Urban Periphery
<b>Typology</b>	Mixed Uses High Density	Mixed Uses High Density	Residential High Density	Particularity Residential Low Density
<b>Community Area</b>	High	High	Low	Low
<b>Employment Places</b>	2500	1500	800	150
<b>Bus Stop (&lt;200 m) Frequencies (8 a.m. – 6 p.m.)</b>	32	58	7	50

Were analyzed 20 indicators of dimension/volume, density/intensity or diversity

School influences zones (500 and 1500 meters from each school)



- Buffer 500 m
- Buffer 1500 m
- Students' home

# Results – Indicators of the urban structure

	Within 500 meters from school				Within 1500 meters from school			
	EBAP	EBJR	EBFV	EBCCB	EBAP	EBJR	EBFV	EBCCB
Land Use (ha)	41,17	45,92	35,96	33,10	297,86	322,63	163,67	209,11
Resident Population (hab.)	<b>6705</b>	<b>6759</b>	3459	750	24444	23310	15384	18471
Dwellings	<b>2235</b>	<b>2253</b>	1153	250	8148	7770	5128	6157
Streets length (km)	7,6	7,7	7,5	4,3	44,7	44,3	26,2	33,6
Compactness Rate	0,80	0,91	0,69	0,79	0,50	0,49	0,53	0,30
Land Cover (%)	12,78	14,41	16,18	12,10	13,02	11,22	18,06	18,38
Motorized Vehicles Area (%)	19,79	25,34	20,11	9,59	18,30	17,25	25,26	19,90
Pedestrian Area (%)	<b>11,05</b>	<b>11,14</b>	6,38	2,67	9,19	7,90	5,91	6,07
Green and Recreation Areas (%)	<b>7,04</b>	<b>3,39</b>	1,12	0,00	9,23	8,50	0,84	1,26
Community Services Area (%)	<b>33,44</b>	<b>18,32</b>	0,61	7,21	<b>11,22</b>	<b>11,03</b>	1,66	1,30
Building Area / Land Use (m <sup>2</sup> /m <sup>2</sup> )	<b>0,70</b>	<b>0,86</b>	0,54	0,20	0,48	0,51	0,53	0,51
Building Area / Land Cover (m <sup>2</sup> /m <sup>2</sup> )	<b>5,49</b>	<b>5,97</b>	3,34	1,67	3,70	4,57	2,95	2,76
Commerce and Services Building Area /Building Area (%)	<b>4,87</b>	<b>5,34</b>	2,75	2,35	<b>48,77</b>	<b>40,51</b>	10,21	8,06
Vehicle Area / Streets Length (m <sup>2</sup> /m)	10,65	15,11	9,61	7,40	12,19	12,56	15,81	12,37
Pedestrian Area / Streets Length (m <sup>2</sup> /m)	<b>5,95</b>	<b>6,64</b>	3,05	2,06	<b>6,12</b>	<b>5,75</b>	3,70	3,77
Population Density (hab/ha)	<b>163</b>	<b>147</b>	96	23	82	72	94	88
Density Dwellings (dwellings/inh)	<b>54</b>	<b>49</b>	32	8	27	24	31	29
Attractiveness Capacity (%)	30,5	33,2	<b>37,6</b>	<b>40,0</b>	35,3	34,4	36,3	35,4
Students Density (Students/inh)	9	14	11	3	3	4	<b>5</b>	<b>6</b>
Urban Streets Density (meter/inh)	185,8	167,7	209,2	129,6	150,1	137,3	159,8	160,9

Significant differences within the buffer of 500 meters from each school.

Similar characteristics within the buffer of 1500 meters from each school resulting from the overlap of the influence areas for the 4 schools.

# Indicators of mobility

## Mobility patterns of journeys to/from school

	<b>EBAP</b> (Central Urban Area)	<b>EBJR</b> (Near to City Center)	<b>EBFV</b> (Urban Periphery)	<b>EBCCB</b> (Urban Periphery)	<b>GLOBAL</b>
Number of Students	471	570	445	648	2134
Geocoded Students	441	554	415	629	2039
Number of students in 500 meters buffer	124	207	154	42	527
Number of students in 1500 meters buffer	462	387	385	378	1613
Distance per student in 500 buffer	337	359	<b>263</b>	<b>229</b>	316
Distance per student in 1500 buffer	728	628	630	<b>985</b>	755
Distance per student home to school (meters)	<b>1186</b>	<b>1046</b>	2298	1477	1464
Journey time/ student (minutes)	7,9	8,6	<b>6,4</b>	9,8	7,2
Additional Journeys times of parents /student (min.)	<b>1,8</b>	4,8	<b>2,9</b>	4,1	8,2
Additional distance of parents / student (min.)	<b>890</b>	2423	1458	2061	4100
Journeys in adults company (%)	26	31	33	<b>45</b>	35
Journeys in adults company by walking (%)	15	14	<b>28</b>	11	16
Walking to school (% of trips)	48	<b>54</b>	<b>62</b>	35	49
Driving to school (% of trips)	47	<b>39</b>	<b>33</b>	59	45
Global Co <sub>2</sub> Emissions (gr/student/day)	219	410	349	451	368
Additional Co <sub>2</sub> Emissions of parents (gr/student/day)	<b>125</b>	<b>339</b>	204	289	248
Co <sub>2</sub> Emissions of student's journeys (gr/student/day)	<b>94</b>	<b>70</b>	145	163	119

# Final Notes

- 1) The influence of the urban structure for scholar mobility patterns is not clear in small sized cities;
- 2) Similar sized schools with the same number and aged students may present similar scholar mobility patterns even if located in distinct urban structure;
- 3) Economic, social and psychological factors related with individual characteristics (age and environmental perception by parents and students) may explain the mobility patterns in travel to school in a small sized cities;
- 4) Hereafter, it will be analyzed the mobility patterns, according with disaggregate data trough logistic regression models.