



## Connected Cities Meeting

### Mobility problems in Mountain Cities – the case of Covilhã, Portugal

The city of Covilhã is a small town in the hillside of the highest mountain in continental Portugal. The city uptown and historical centre rises at an altitude of 680m, the downtown at an altitude of 550m and the new part of the city is at an altitude of 450m. The climate is characterised by cold winters (around 0°C) and very hot summers (around 40°C). The city extends itself along the hillside and has three natural barriers, two creeks and the difference in altitude between the uptown and the downtown. The gradient between the downtown and the uptown is around 17%, and between the new city and the uptown around 11%. It has around 35 000 inhabitants. The two creeks impose a larger distance to access city uptown centre.

The major land uses are a mix of residential, commercial and services. The uptown includes the historical centre, residential old houses, churches and services like banks, insurance companies, medical services, local shops, city hall, government offices, police and fire brigade, university main buildings and day care centres. The downtown has the train station, local shops, prison, elementary and secondary school, some financial services, day care centres and municipal offices. The new city has as main land uses new residential developments, shopping centres, regional bus terminal, sport complex, hospital and health centre and the future medical school. Almost all old textile industries in the city area were converted into teaching facilities by the local university or are installed in the 2 suburban industrial parks. The city historical centre population is mainly composed by elder people or university students. In the downtown the population is mainly composed by mid class families and in the new city, attracted by 3 mid size and large commercial areas, the population is composed mainly by students with private car and young couples.

In terms of mobility the city is characterised by an historical centre with very narrow streets, and urban streets with around 3m wide lanes. A great amount of them are one-way only, or only have a dimension for a one-way lane. Most of the inhabitants of the historical centre don't have a legal parking space near by. Most of the parking in the uptown is paid, and there are 4 off-street parks. The underground park is privately owned and the parking revenues of on-street parking are taken to help paying it (in the next 40 years).

The public transport company is private and has around 14 buses. Two of them are midi buses, 2 new regular buses and 10 regular buses with more than 12 years. The average frequency of the buses is 1 Bus/hour, and commercial speed is around 15km/h. Most of

the buses are not acclimatized and often drips in rainy days. There is no space for bus lanes in most of the city area. Most of the passengers are students and elderly persons. Average fuel consumption by the older buses is of 50 l/100km. There are only 3 places for ticket acquisition, and 2 Bus terminals in the city limits. The average distance between bus stops is around 300m and the information provided is limited to the bus timetable. The bus modal share in the city area is about 15% of all trips to school and to work, and the present revenues don't allow enough profits to encourage the operator to invest in/provide a better service.

Most of the old city does not provide sidewalks, and the pavements are in granite stone that with rain are very slippery. The walking between the areas close to the old city centre with similar altitudes is longer due to the creeks, and very longer or very difficult from the downtown due to the big grade existing between them.

We would like to get information about similar situations in other mountain cities in European countries and what has been done to reduce their mobility problems. The interventions can be in the urban design (streets, road intersections, sidewalks, on and off street parking, etc.); in alternative transportation systems or on mobility policies that promotes sustainable transport modes and detracts the use of private cars. We would also like to know the technical/financial feasibility/conditions for such interventions and what political circumstances are needed to implement them.

The overall objective of the city is to improve its citizen's quality of life. More specifically, it is intended to promote the old city area (specially the historical centre) to keep and attract more residents and local shops. The city seek also the improving of the air quality and the decrease of transport noise, to reduce visual impact from illegal parking and promote walking, specifically by improving the citizen's access between the uptown areas and from the downtown, without the use of private cars.

Some tasks that can be discussed are:

- How to improve the walking in the old city area (uptown and downtown)?
- What new transport systems can be implemented in such conditions?
- How can public transport (more ecological ones) be improved and yet be self sustained?
- How can private car use be reduced with citizen's acceptance and parking operator's accordance?
- Are park&ride schemes feasible in such kind of cities? How can they be implemented?

As results the city would like to:

- Reduce illegal parking;
- Improve public transport usage and self sustainability;
- Reduce traffic congestions on peak hours;
- Promote walking and possibly the use of bikes;
- Reduce private car modal share in urban trips, and reduce air pollution;
- Promote residential use in historical centre, and economic feasibility of surrounding local shops.

For the discussion of these topics we think that urban planners, local authorities, engineers, architects, public transport operators, new technologies manufactures and

investigators, who have experience in implementing alternative schemes in other cities can bring knowledge about the positive and negatives aspects to take into account.

About the methods for the workshop, in our presentation we will make a brief introduction to the city characteristics and its problems, not only by Powerpoint slides and graphics, but simultaneously presenting city maps with relevant information about mobility using GIS. We don't know if a small text with the information presented will be distributed to the participants before the meeting, but we think that it should be done to allow a better preparation of the invited experts.

We expect afterwards to have a list of possible schemes that can convince local authorities that something can be done, that all they need is to justify it conveniently to their citizens, and audacity to take the chance; and bring new knowledge to the city technicians about urban mobility and the state-of-the-art in other European cities. Presently the local authorities don't see the potential of new schemes and tend to make some mistakes that can influence negatively the future generations. Almost nothing is done and the near future perspectives are not better.



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# Connected Cities Meeting

Covilhã

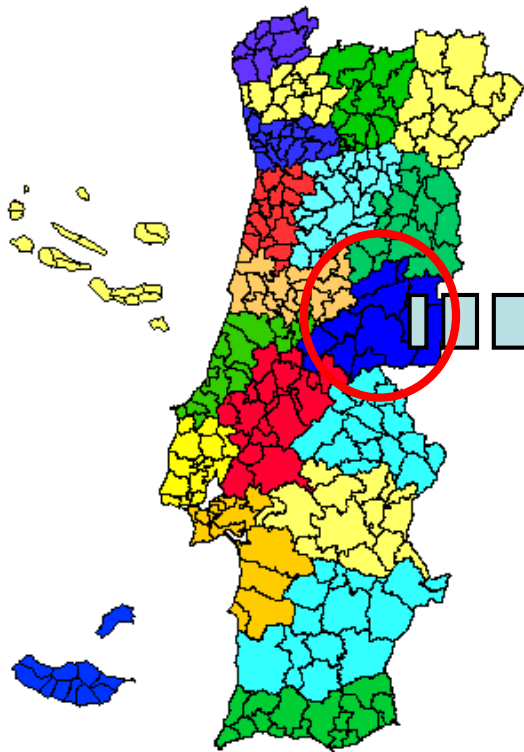
9, 10, 11th October 2006





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# Covilhã's Location



## Mountain City

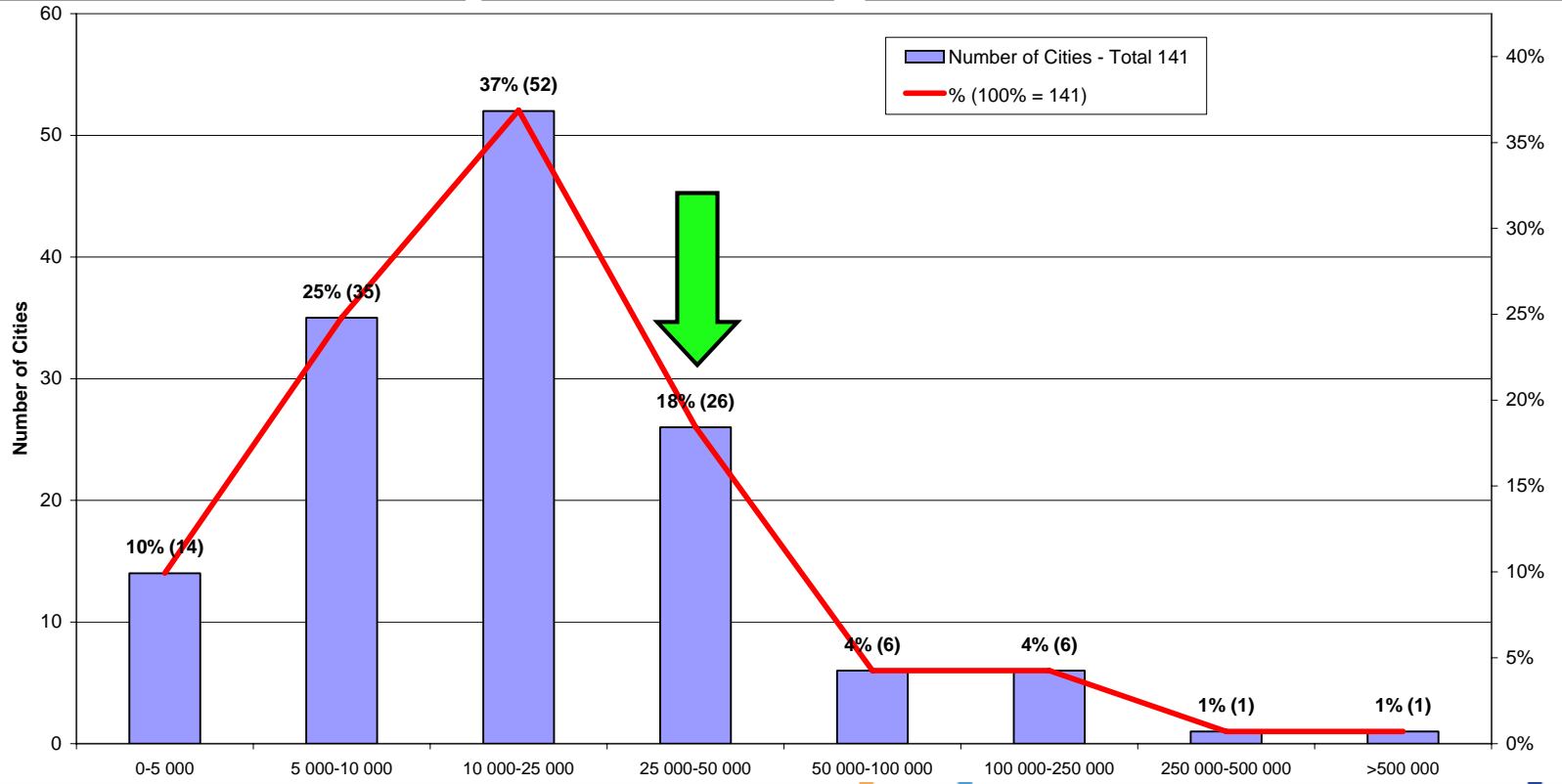




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# National Reality – Portuguese cities





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# Covilhã City Characterization - Indicators

Administrative division - Borough	% of Borough area in city limits	Area km2	Populational Density inhab/km2	Resident Population - Total Inhab.	Nº of Buildings	Buildings density buil/km2	Average Family Dimension
Aldeia do Carvalho	26%	2,52	800	2015	762	302	2,7
Boidobra	51%	8,19	322	2635	802	98	2,9
Canhoso	61%	4,31	400	1722	369	86	2,8
Cantar-Galo	38%	2,21	1124	2484	608	275	2,7
Covilhã (Conceição) - Urban	81%	3,9	1938	7559	1212	311	2,6
Covilhã (Santa Maria) - Urban	100%	1,98	1258	2490	522	264	2,4
Covilhã (São Martinho) - Urban	26%	2,49	1924	4792	905	363	2,6
Covilhã (São Pedro) - Urban	100%	2,66	1031	2742	521	196	2,8
Teixoso	10%	3,73	788	2941	1405	377	2,8
Tortosendo	80%	14,28	378	5392	1655	116	2,8
<b>Covilhã - City totals</b>	-	<b>46,29</b>	<b>751</b>	<b>34772</b>	<b>7856</b>	<b>170</b>	<b>2,7</b>
Portuguese Cities average	-	13,06	2187	28566	5027	385	2,7



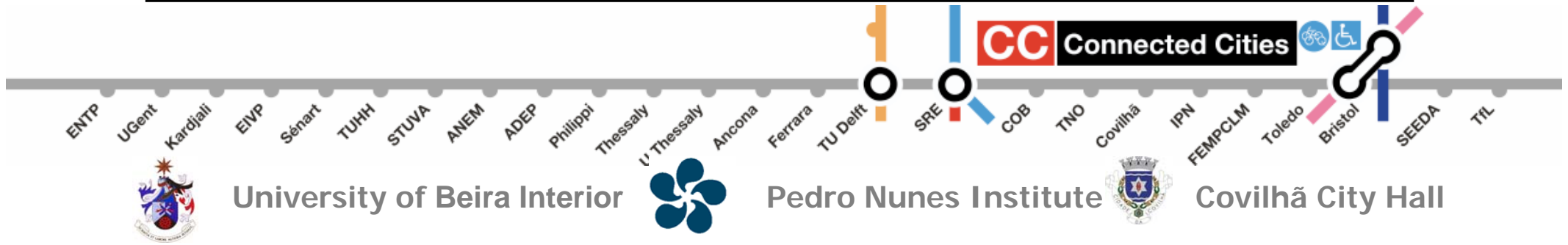


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# Covilhã City Characterization

Administrative divisions & Traffic zoning  
Road network  
Main land uses and traffic generator



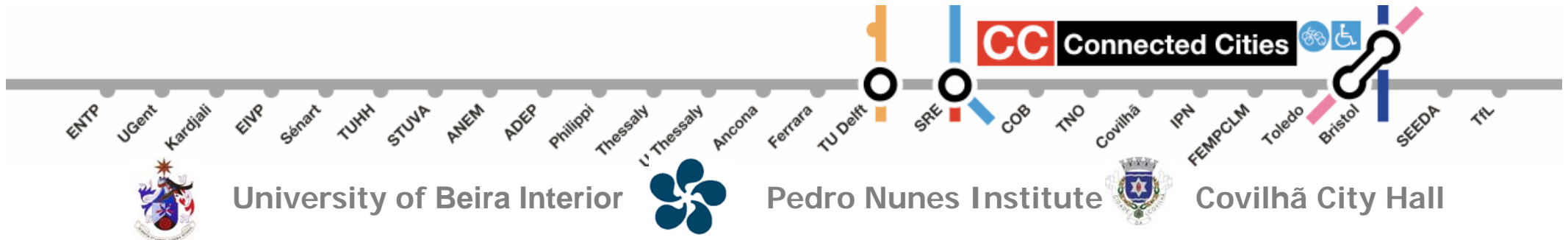


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# Covilhã City Characterization - Age Distribution

Administrative division - Borough	Resident population under 5 years old %	Resident population with age between 5 and 19 years %	Resident population with age between 20 and 24 years %	Resident population with age between 25 and 64 years %	Resident population over 64 years old %
Aldeia do Carvalho	3,0%	16,6%	6,9%	<b>55,2%</b>	<b>18,3%</b>
Boidobra	7,2%	<b>18,9%</b>	8,1%	<b>55,6%</b>	10,2%
Canhoso	6,0%	<b>16,1%</b>	6,6%	<b>58,7%</b>	12,5%
Cantar-Galo	3,7%	<b>16,1%</b>	8,7%	<b>55,6%</b>	<b>15,9%</b>
Covilhã (Conceição)	3,9%	15,0%	8,1%	<b>54,7%</b>	<b>18,3%</b>
Covilhã (Santa Maria)	3,7%	12,5%	6,3%	<b>52,4%</b>	<b>25,1%</b>
Covilhã (São Martinho)	4,0%	14,9%	7,3%	<b>55,3%</b>	<b>18,5%</b>
Covilhã (São Pedro)	3,9%	<b>17,0%</b>	8,3%	<b>55,1%</b>	15,7%
Teixoso	4,4%	<b>17,3%</b>	7,5%	<b>54,9%</b>	15,9%
Tortosendo	4,9%	15,7%	6,6%	<b>55,0%</b>	<b>17,8%</b>
<b>Total</b>	<b>4,4%</b>	<b>15,8%</b>	<b>7,5%</b>	<b>55,1%</b>	<b>17,3%</b>





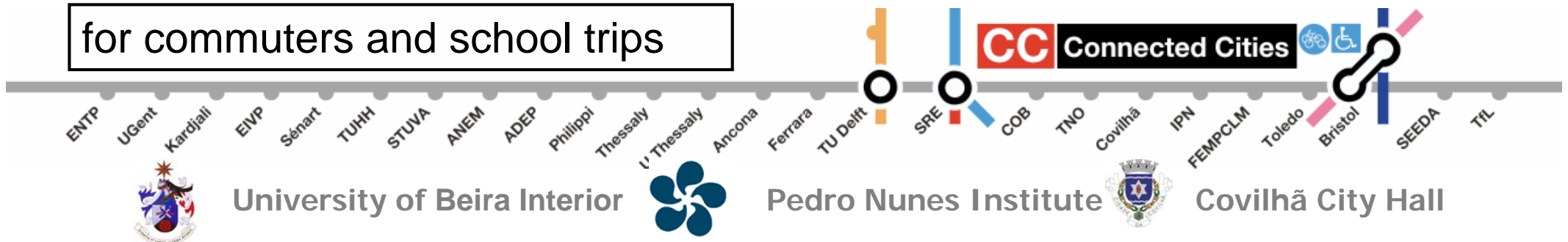
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# Covilhã City Characterization - Modal split

Administrative divison - Borough	Pedestrian	BUS	Train	Private Bus	Private Car	Moto or Bike
Aldeia do Carvalho	15,0%	35,7%	0,1%	4,2%	44,0%	0,9%
Boidobra	16,0%	21,3%	0,0%	1,4%	60,1%	1,2%
Canhoso	15,5%	16,5%	0,0%	1,7%	65,5%	0,9%
Cantar-Galo	14,6%	33,2%	0,0%	4,7%	46,4%	1,2%
Covilhã (Conceição) - Urban	25,7%	13,5%	0,2%	2,2%	57,7%	0,7%
Covilhã (Santa Maria) - Urban	39,7%	11,1%	0,2%	0,9%	47,8%	0,3%
Covilhã (São Martinho) - Urban	30,7%	8,9%	0,0%	2,1%	57,7%	0,6%
Covilhã (São Pedro) - Urban	37,6%	8,0%	0,0%	3,0%	50,9%	0,5%
Teixoso	29,8%	18,4%	0,1%	1,9%	49,1%	0,7%
Tortosendo	31,1%	11,9%	0,1%	2,4%	53,6%	0,9%
<b>Covilhã - City totals</b>	<b>26,7%</b>	<b>15,9%</b>	<b>0,1%</b>	<b>2,4%</b>	<b>54,2%</b>	<b>0,8%</b>

for commuters and school trips





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# Covilhã City Characterization - Average time spent

Administrative division - Borough	Less than 15 min.	Between 16 and 30 min.	Between 31 and 60 min.	More than 61 min.
Aldeia do Carvalho	35,8%	<b>51,1%</b>	11,3%	1,7%
Boidobra	<b>62,2%</b>	30,3%	4,9%	2,6%
Canhoso	<b>68,3%</b>	26,0%	4,2%	1,5%
Cantar-Galo	38,6%	<b>49,7%</b>	9,7%	2,0%
Covilhã (Conceição) - Urban	<b>59,0%</b>	32,5%	6,3%	2,2%
Covilhã (Santa Maria) - Urban	<b>73,2%</b>	22,6%	3,1%	1,1%
Covilhã (São Martinho) - Urban	<b>67,5%</b>	25,9%	4,7%	1,9%
Covilhã (São Pedro) - Urban	<b>73,3%</b>	22,1%	3,4%	1,1%
Teixoso	<b>65,0%</b>	29,0%	4,9%	1,2%
Tortosendo	<b>62,9%</b>	31,0%	4,5%	1,5%
<b>Covilhã - City totals</b>	<b>61,4%</b>	<b>31,3%</b>	<b>5,6%</b>	<b>1,8%</b>

in commuting and school trips



ENTP UGent Kardjali EIVP Sénart TUHH STUVA ANEM ADEP Philippil Thessaly U' Thessaly Ancona Ferrara TU Delft SRE COB TNO Covilhã IPN FEMPCLM Toledo Bristol SEEDA TIL

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# Covilhã City Characterization

## Parking supply in Covilhã





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# Covilhã City Characterization

## Present parking situation

- Most of parking spaces are not well defined
- There are five major parking lots in the city core
  - 2 Private off-street parks in uptown centre
  - 2 Public converted off-street parks in uptown centre
  - 1 Private off-street park in downtown
- On-street parking is paid in uptown centre
- On-street parking is free in the rest of the city
- On-street parking in downtown near the new off-street park will be paid in the future
- Parking fares increase with parking duration



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# Covilhã City Characterization

## Parking reality:

- Illegal parking in many urban areas
- On-street revenues in the uptown are taken for the next 40 years to pay underground park
- Off-street underground park in city's uptown is private and has an concession of 40 years
- Parking fares policies of off-street parks are out of the local authorities control
- Off-street private park tariffs around 0,20€/0,25h
- Off-street public park tariffs around 0,15€/0,25h
- On-street parking limited to 4h and tariffs increase with time from 0,25€/0,5h to 3€/4h



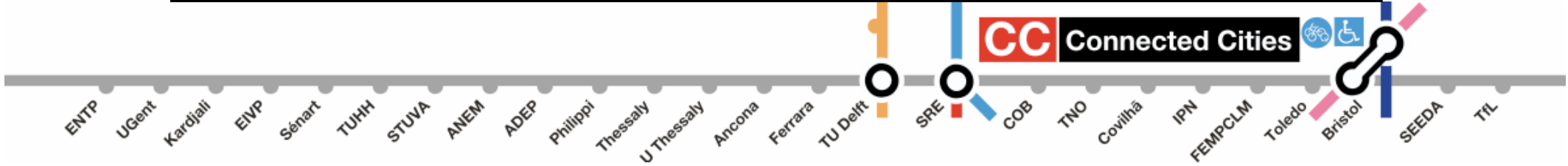


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# Covilhã City Characterization

Public Transport System  
System spatial coverage  
Bus routes



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# Covilhã City Characterization - Public Transport System

Bus Routes	Average Frequency (TC/h) (weekday)		Average Headaway (min.) (weekday)		Average Commercial speed (km/h)		
	Peak	Off-Peak	Peak	Off-Peak	Min.	Av.	Max.
1	0,9	0,6	70	96	4,1	13,6	34,6
1A	Only at night				not analised		
2	2,3	1,9	26	32	6,5	10,7	22,2
3	1,4	0,9	42	69	8,1	12,9	29,5
4	0,8	0,5	74	120	5,0	12,7	19,9
5	0,9	0,8	70	80	6,5	14,0	17,8
6	1,7	0,9	35	69	4,1	15,5	34,6
6A	only two trips per day				8,1	16,5	34,6
10	1,7	1,1	35	53	2,7	21,3	50,9
<b>Average</b>	<b>1,4</b>	<b>0,9</b>	<b>50</b>	<b>74</b>	<b>5,6</b>	<b>14,7</b>	<b>30,5</b>

Note: Peak 8:00-9:30 and 17:30-19:30; Off-peak 9:30-17:30

## Performance Indicators



- ENTP
- UGent
- Kardjali
- EIVP
- Sénart
- TUHH
- STUVA
- ANEM
- ADEP
- Philippi
- Thessaly
- U Thessaly
- Ancona
- Ferrara
- TU Delft
- SRE
- COB
- TNO
- Covilhã
- IPN
- FEMPCLM
- Toledo
- Bristol
- SEEDA
- TIL



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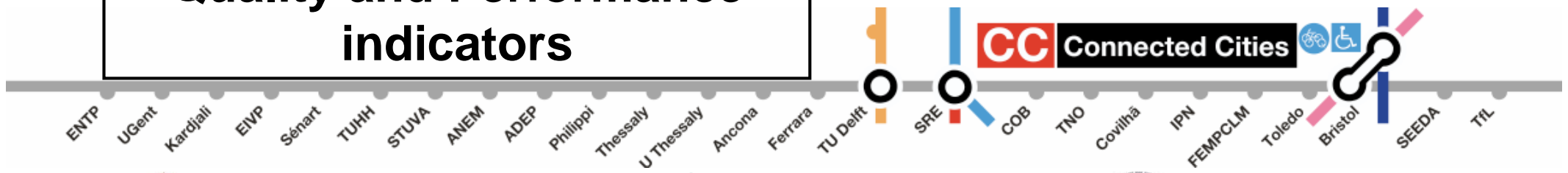
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# Covilhã City Characterization - Public Transport System

Bus Fleet	18 standard buses	2 mini buses	
Average fleet age	14 years (2 new)	4 years	
Fuel Consumption	51l/100km	19l/100km	
Average bus Capacity	82 (38 seated + 44 standing)	21 (16 seated + 5 standing)	
Km traveled by year	463 000		
Number of drivers	26 but only 16 work per day		
Passengers			
Tickiting	On board ticket	10 pre-paid ticket	Social Pass
Fares	1,10 €	4,60 €	21,40 €
Average distance between stops	300m		
Operation time (weekly)	from 7h00m to 23h00m		
Ticket sale places	3 in city limits		
Bus terminals	2 in city limits		

## Quality and Performance indicators



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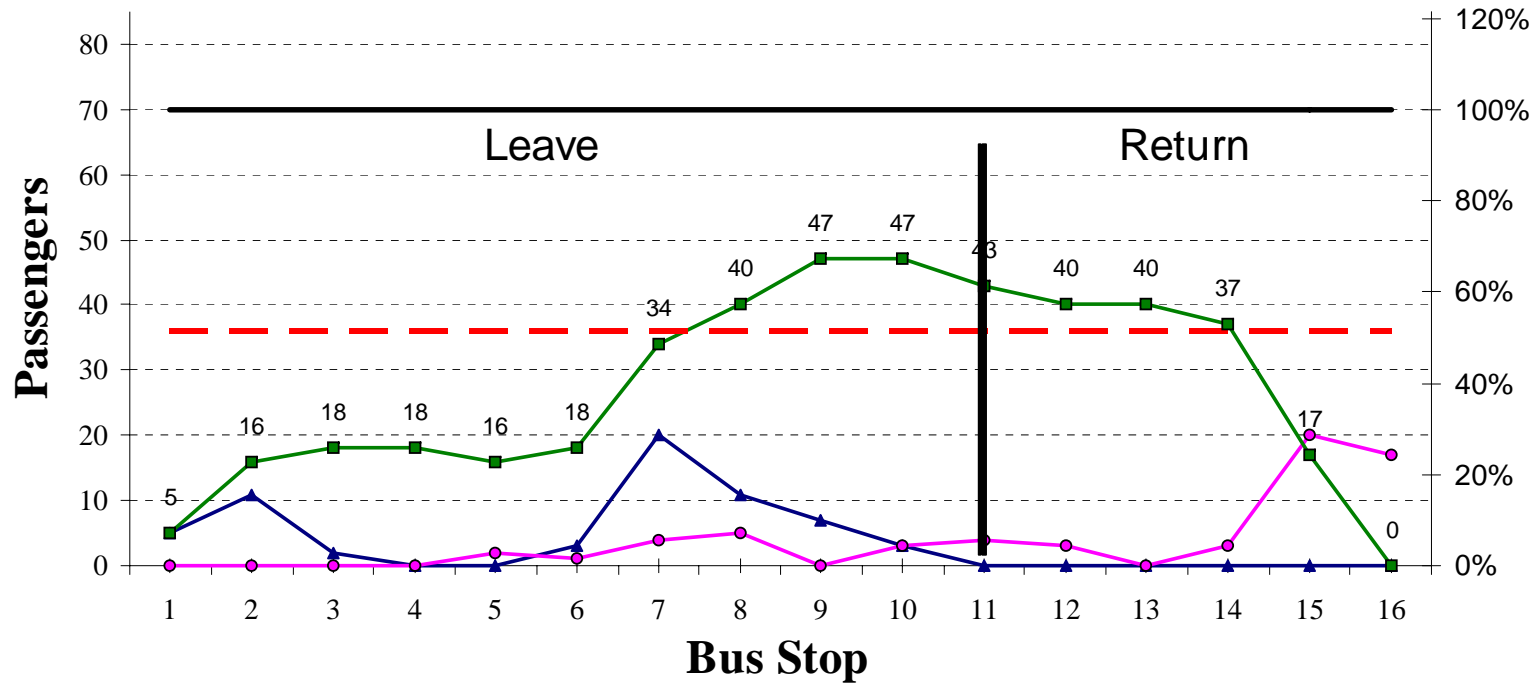
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# Covilhã City Characterization - Public Transport System

Time: 17h00m

## Occupancy



▲ In     
 ● Out     
 ■ On board     
 - - - Seats (36)     
 — Maximum Capacity (70)

Occupancy rate



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# Mobility problems detected

## With public transportation system:

- Low hourly frequency/headway
- Low quality of rolling stock
- One-way circular networks
- Manoeuvre difficulties in certain areas/streets
- Air pollution, noise levels and fuel consumption

## With private car usage:

- Illegal parking in the majority of the urban area
- Manoeuvre difficulties in most streets of the historic centre
- Majority of off-street parking is private and out of local authorities' control
- The number of public parking spaces in non-central areas without use

## With Walking:

- Urban design and mobility for all: (by Ana Virtudes, urban planner)





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# Urban design and mobility for all: (by Ana Virtudes, urban planner)

- 1. Questions of mobility
  - Valuing of the statute of the pedestrian
  - 1/3 of routine trips in the cities are made on foot
  - Understanding the pedestrian as an essential part of urban traffic
  - Life quality of the pedestrian under debate
  - The street as a collective living space for everyone





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# Urban design and mobility for all: (by Ana Virtudes, urban planner)

- 2. Portuguese official documents:
  - Bill of rights of the pedestrian
  - Letter of New Urban Design
  - New Athens Letter
  - Law Statute no 123/97:
    - Technical rules in the removal of architectural barriers in public spaces, collective equipment and the public way
    - Goal to improve access for people with limited mobility





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# Urban design and mobility for all: (by Ana Virtudes, urban planner)

- **3. Obstacles to mobility:**
  - Lack of incentive of pedestrian circulation and use of bicycle
  - Shortage of bicycle paths
  - Scepticism about the bicycle as means of transport, only a leisure hobby
  - Rough relief, cultural rejection
  - Many streets of the villages, towns or cities without walks
  - Bigger number of accidents with pedestrians of whole nations in the UE
  - Pedestrians circulate in the road



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# Urban design and mobility for all: (by Ana Virtudes, urban planner)

- **4. Obstacles to pedestrian circulation:**

- Absence of the walks, insufficient and deficient width of comfort
- Unsuitable placing of the urban furnishings
- Absence or maladjusted placing of stair carpets
- Traffic lights
- Conflicts pedestrian / automobile
- Parking automobile in the walk

- **5. Obstacles to bicycle circulation:**

- Bicycle pathways
- Bicycle circulation conflicts / automobile traffic
- Inter-modular platforms





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# Urban design and mobility for all:

Example of problems with  
mobility in city centres



**Workshop Covilhã**

*Presentation*



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# Desired future scenarios

- Decrease of private car dependence (decrease modal share by half to 25-30%)
- Increase modal share for public transport (double modal share to 30-40%)
- Defining a self-sustainable public transport concession that provides a real alternative to private car
  
- Increase usage of more sustainable transport modes like:
  - Public transports with alternative non pollutant fuels
  - Biking/Cycling
  - and if possible more Walking
  
- Increase residential land use in the city core/historical centre and avoid suburban sprawl (through improvements in citizens urban mobility)
- Increase pedestrian accessibility in the majority of the existing narrow urban streets and old public buildings
  
- Improve parking policies taking into account the ones adopted in the past
- Decrease illegal parking





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## Topics for discussion

- Enhance Public Transport service quality
  - Mini/MidiBus
  - Alternative fuels: Hydrogen Cells vs Electricity
  - Buses with space for bike
  - PT subsidies through traffic restraints (parking restrictions, Road pricing, etc,)
- Self-propelling Bikes
- Elevators and escalators (accessibility to city centre from downtown)
- Park & Ride systems



**Workshop** *Covilhã*

*Presentation*