Cerema

Centre For Studies and Expertise on Risks, Environment, Mobility, and Urban and Country Planning

Lund – BRT seminar

From BRT to BHLS
(Buses with a high level of service)

Main findings in Europe

François Rambaud – CEREMA – 30th of September 2015

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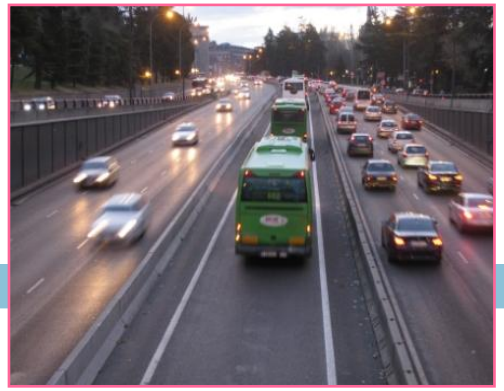
Centre For Studies and Expertise on Risks, Environment, Mobility, and Urban and Country Planning

Cerema : born in January 2014, as a merging of 11 territorial and national agencies, one of which was CERTU

- **Technical centre** of the French Ministry of Ecology, sustainable Development and Spatial Planning
- **Capitalizes, develops and disseminates knowledge and methodologies** on a wide variety of public policies
- **For** the state, the local authorities, institutes and companies which are involved in public service activities

Scope

- Introduction : why we have chosen the acronym “BHLS”
- Key lessons from the COST action (European project 2007-2011)
  - A wide spectrum of solutions
  - Key results (regularity, modal shift, frequency, commercial speed)
  - Some remarkable views from the state of the art
- Trends in Europe
  - No BHLS market for “tram” cities” ?
  - France : less tram, more BHLS projects
  - New BHLS projects on motorways (like in Netherlands, in USA, …)



How we saw, from Europe, the “BRT” market

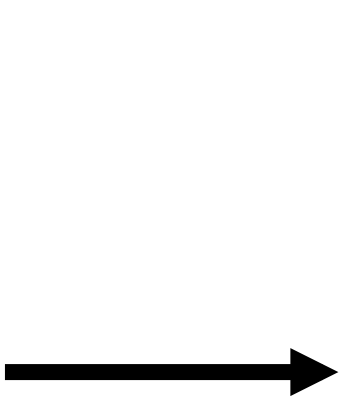
Ottawa (Canada)

Transmilenio in Bogota (Colombia)

- BRT offer high capacity systems, high speed, offering also very long trips
- BRT are able to compete with “Metro systems”
- A wide space is often consumed, like « highways for buses »
- Urban “cuts” are often provided or maintained
- Difficulties to achieve “regularity” objectives, in case of some at grade crossing

Several reasons :

We have not the same ”urban” history, the same urban densities, the same opportunities, the same level of working cost (for developing countries…)



QBC : Quality Bus Corridor

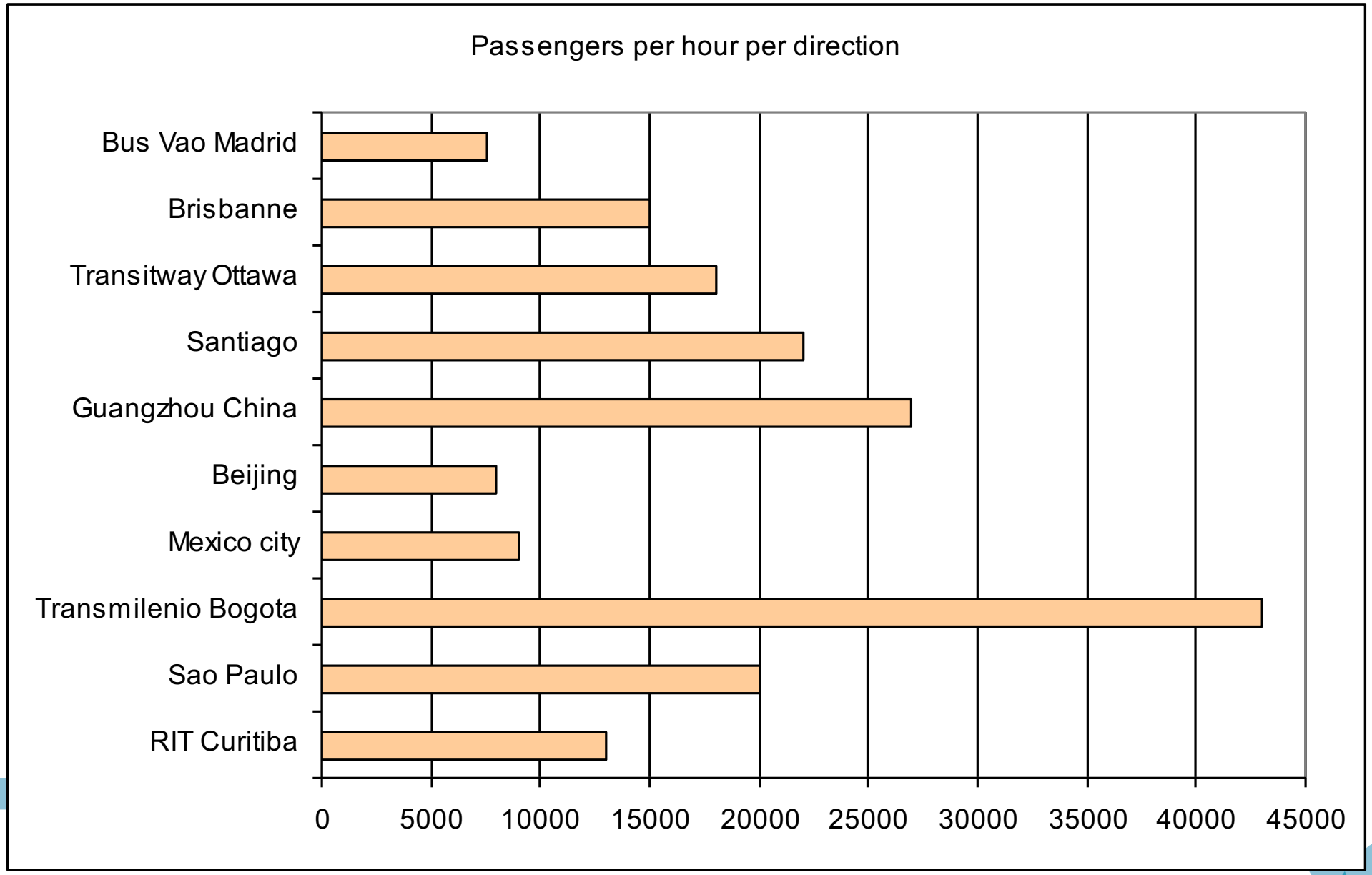
HOV :

MetroBus : developped in Germany (Hamburg, Berlin, Munich)

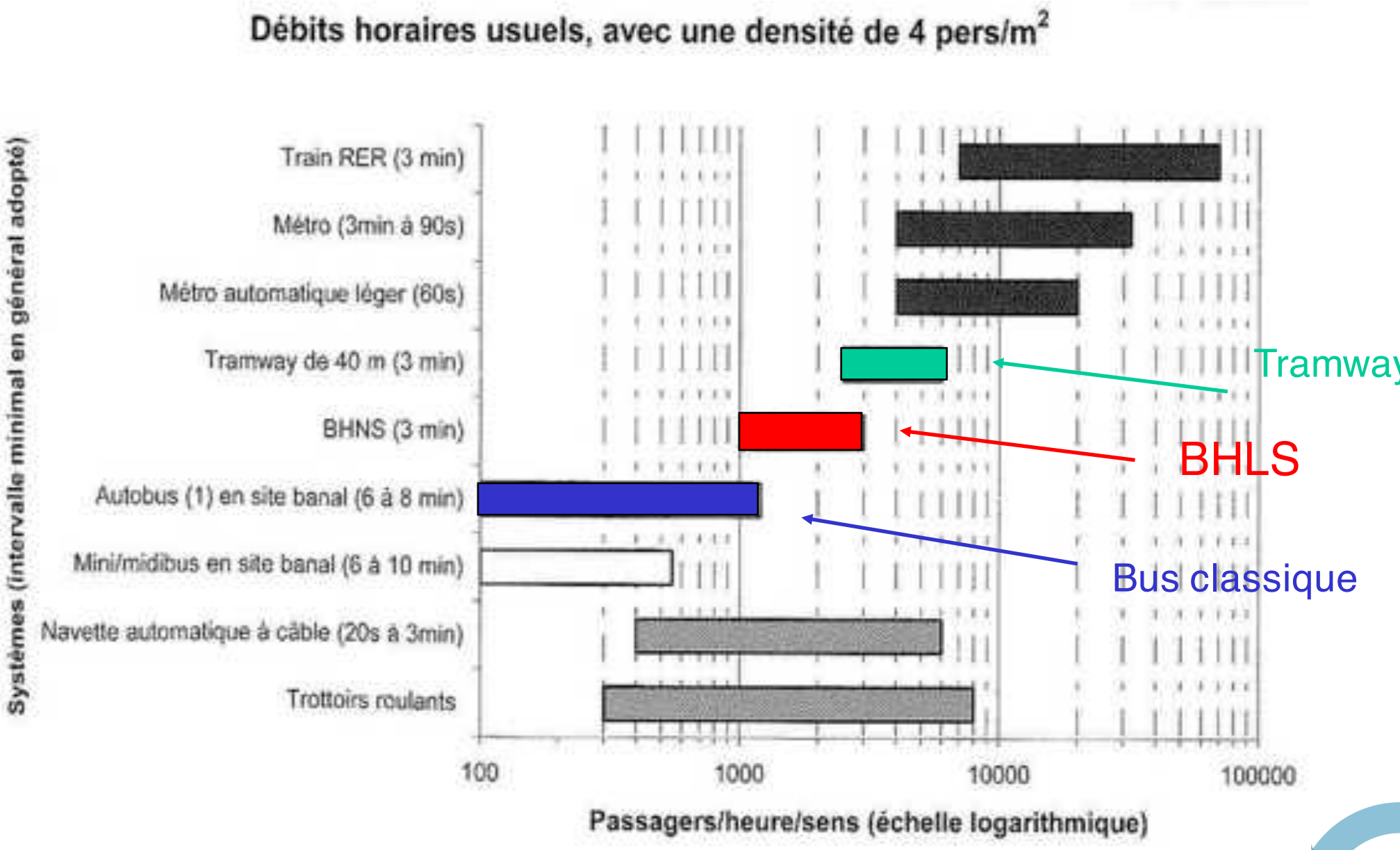
- ✓ We totally agreed with the BRT method : a concept, not a product
- ✓ We disagreed with the word « **Rapid** »
- ✓ « Regularity » or “to have trust on services” appeared to be the fundamental objective
- ✓ Other acronyms were observed in EU: Ireland, UK, Germany, Netherlands…
- ✓ We adopt “BHNS” in 2005

We often adopt also the words: **BHLS = to make the bus like the tram !**

The famous capacitive BRT « corridors »
(they are not line capacities…)



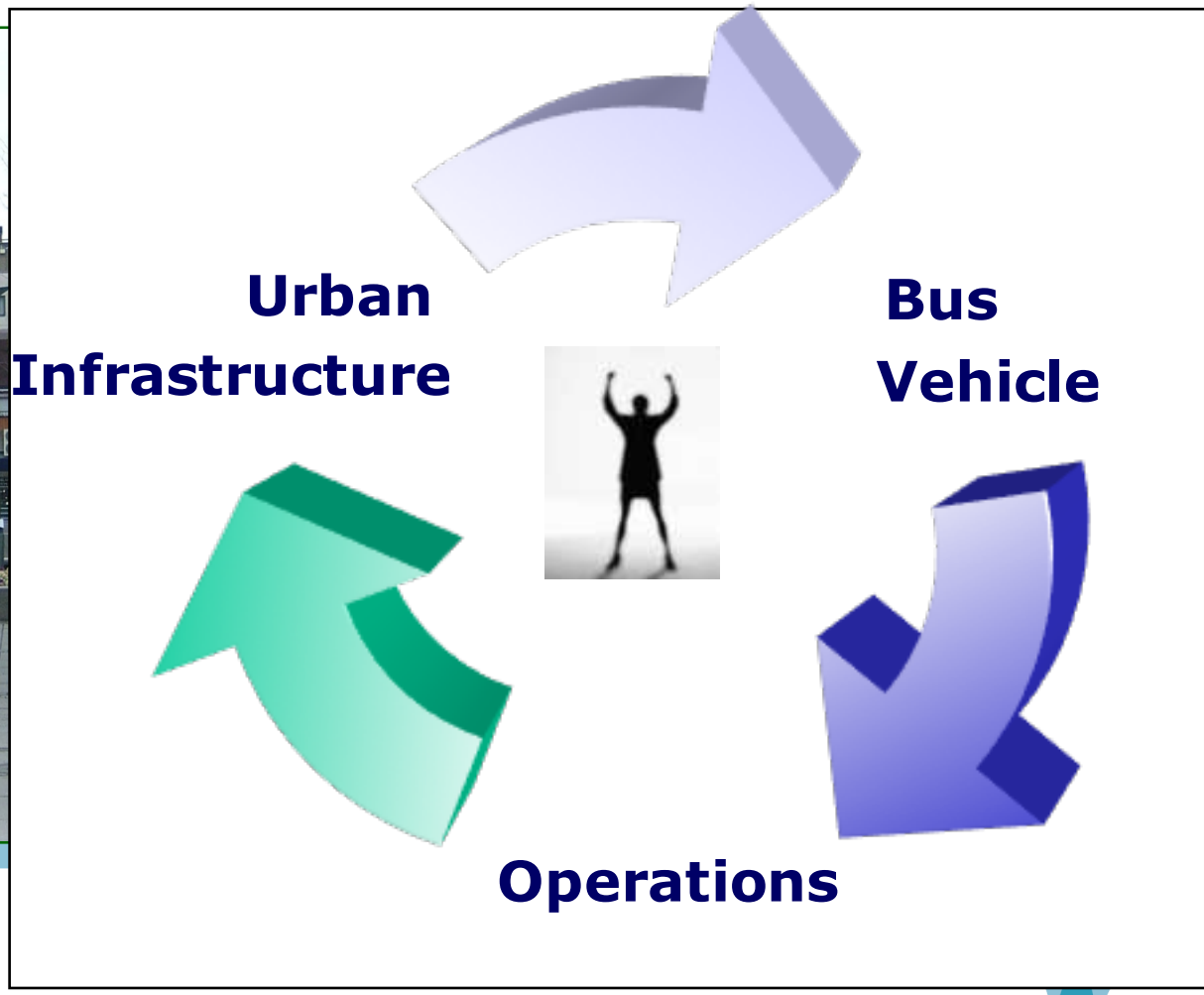
BHLS line capacity objectives: between the common bus and the tramway “modern”



Like the BRT concept : a « system » approach

The whole is greater than the sum of its parts.
(Métaphysique) - Aristote

Jönköping (SE)



Like the BRT concept, infrastructure is the most challenging sub-system, the most expensive

RoW	<u>Internal impacts</u>:	- Capacity - modal shift (from car, other lines)
	<u>External impacts</u>	- Mobility (constraints VP,…) - Urbanism, economy, social - Pollution / GES - City image

A

B

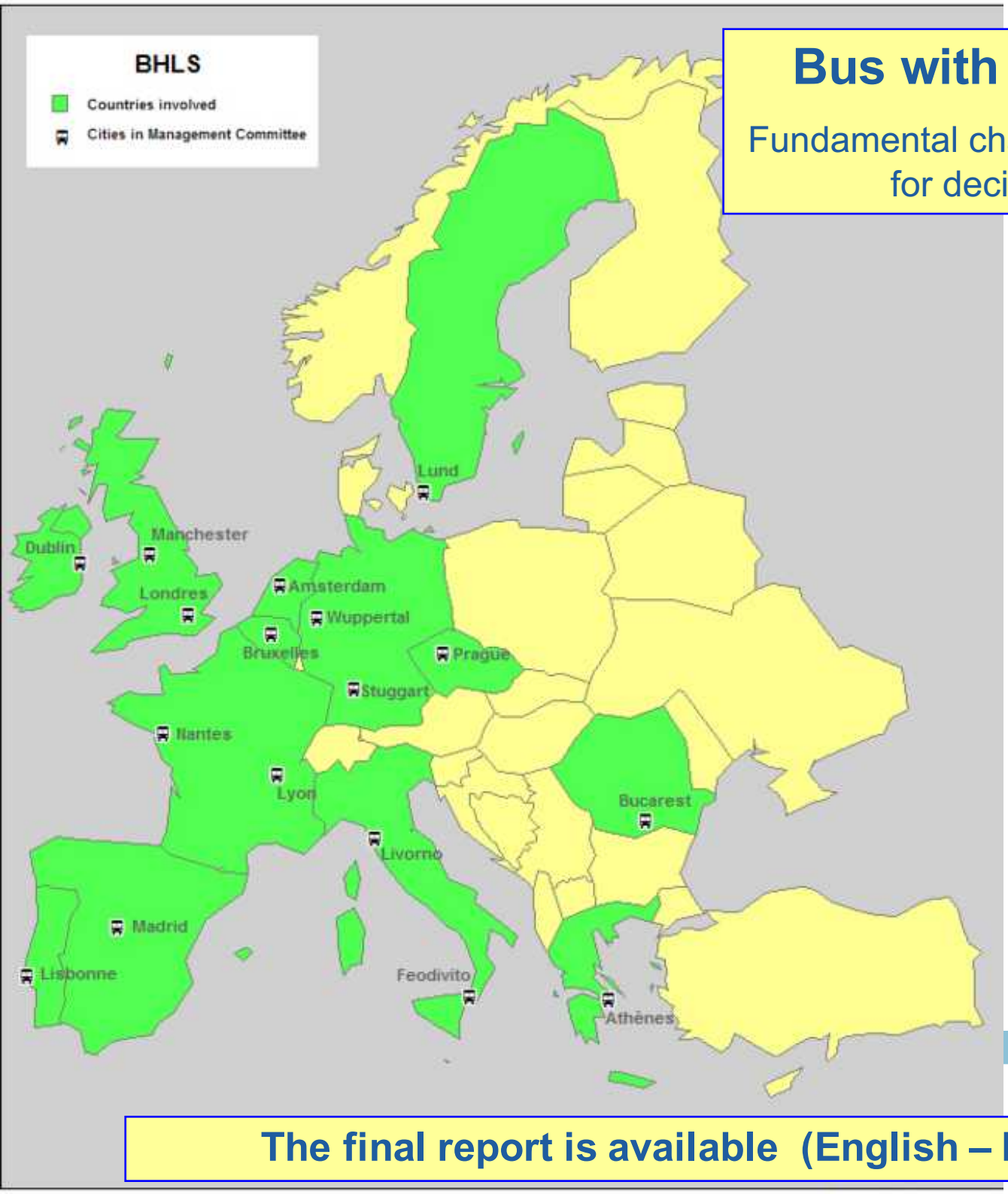
C

For BHLS strategies

The main indicators « High Level of Service »

- Fundamental indicators considered as the most strategic :
  - ✓ **Regularity, availability**
  - ✓ Frequency,
  - ✓ Commercial speed (link with spacing, strategic for suburban projects).
- Additional characteristics :
  - ✓ operating hours,
  - ✓ Comfort , information, …),
  - ✓ ...
- **The safety issue is anyway essential**

A high level of design regarding urban insertion is highly needed…



Bus with High Level of Service

Fundamental characteristics and recommendations for decision-making and research

Duration: 2007 – 2011

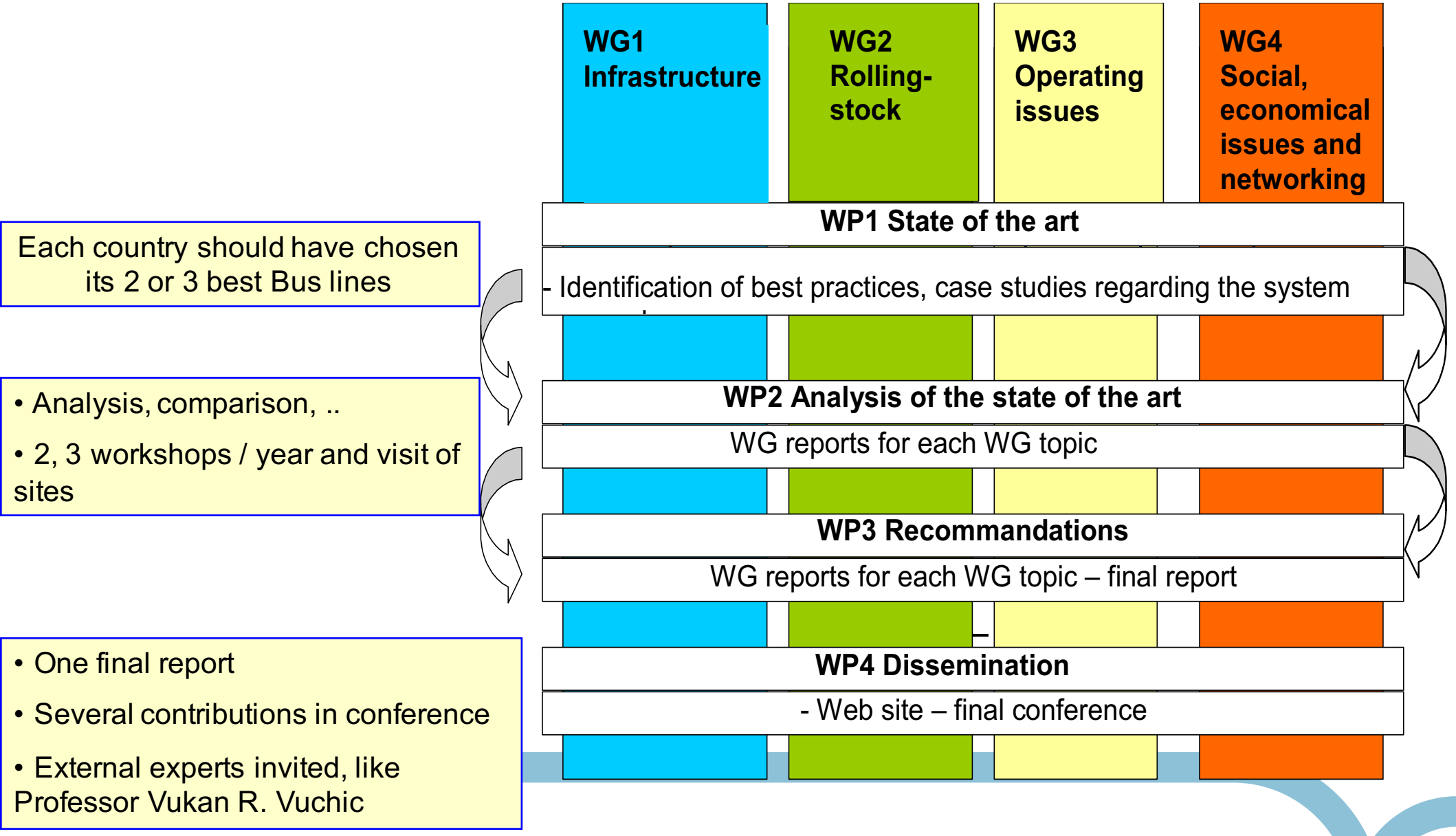
14 EU countries :

Belgium, Czech Republic, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Romania, Spain, Sweden, Switzerland and United Kingdom

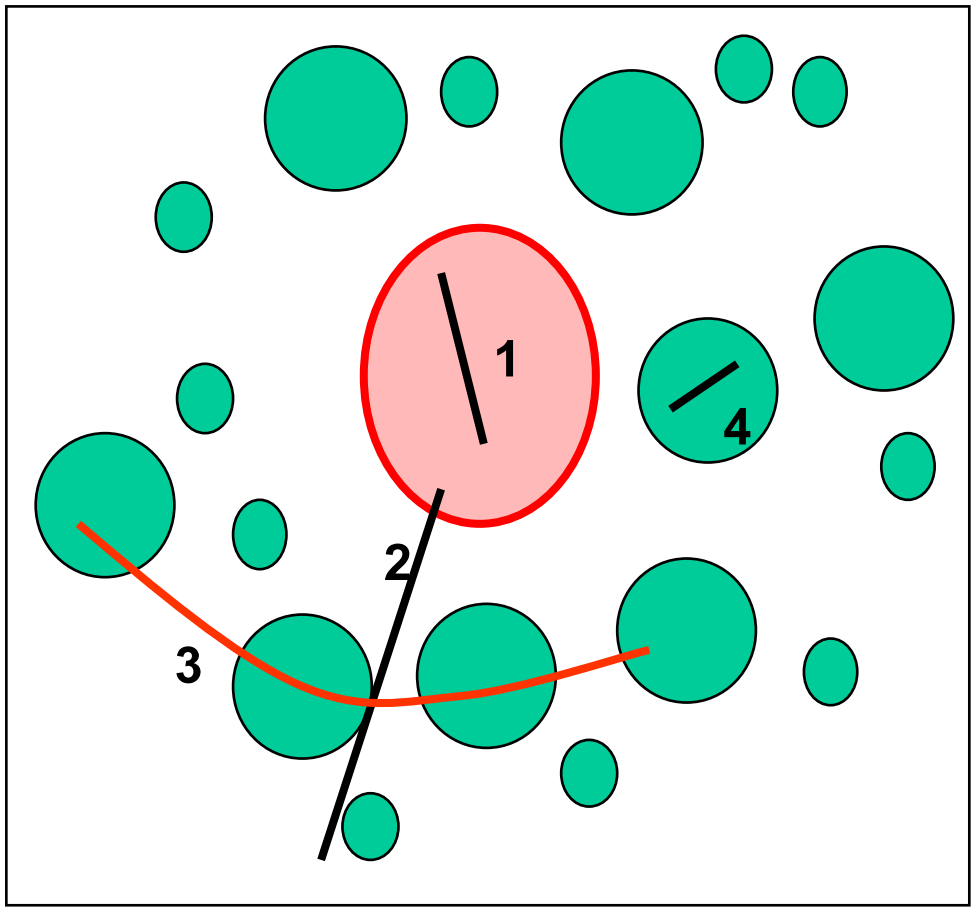
35 BHLS analyzed, 25 visited

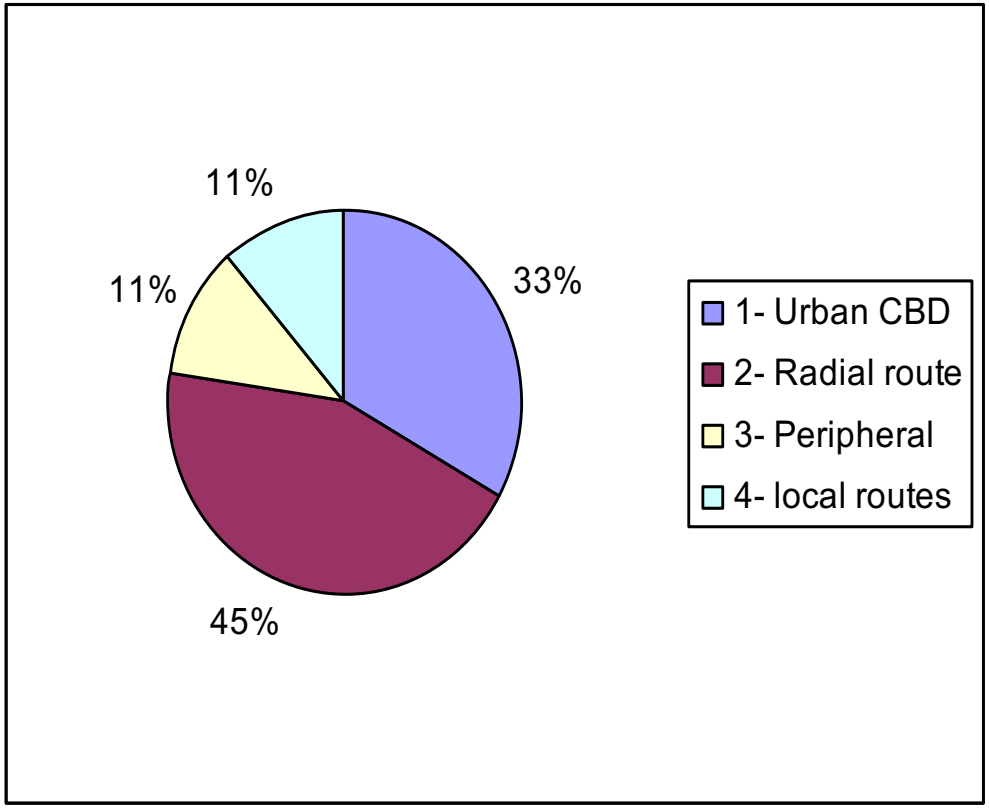
The final report is available (English – French) , 180 pages

Organisation of the COST action (2007 – 2011)



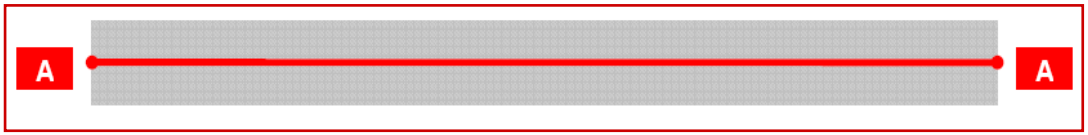
A wide spectrum of BHLS solutions were observed



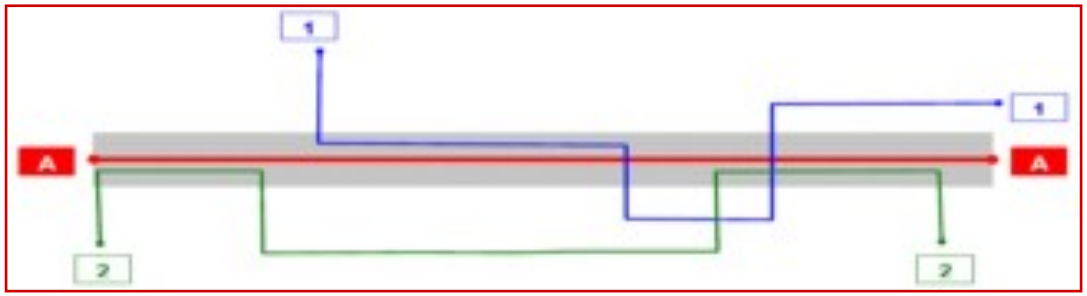


- **A wide spectrum of solution,**
- **Into different urban context**
- **Several objectives, different strategies, different effects**

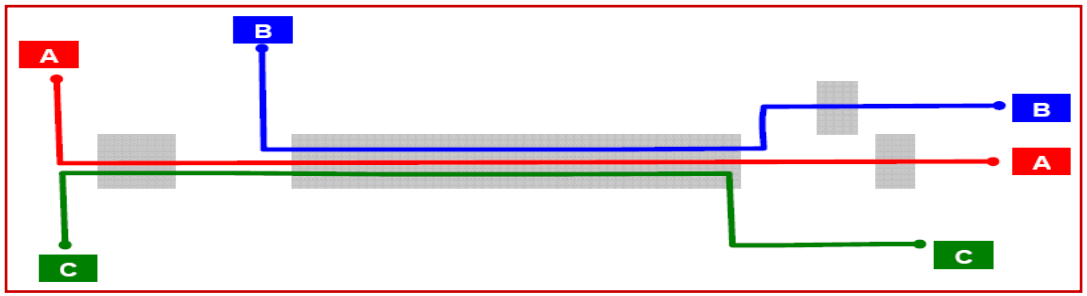
Various implementations were observed



Busway - Nantes

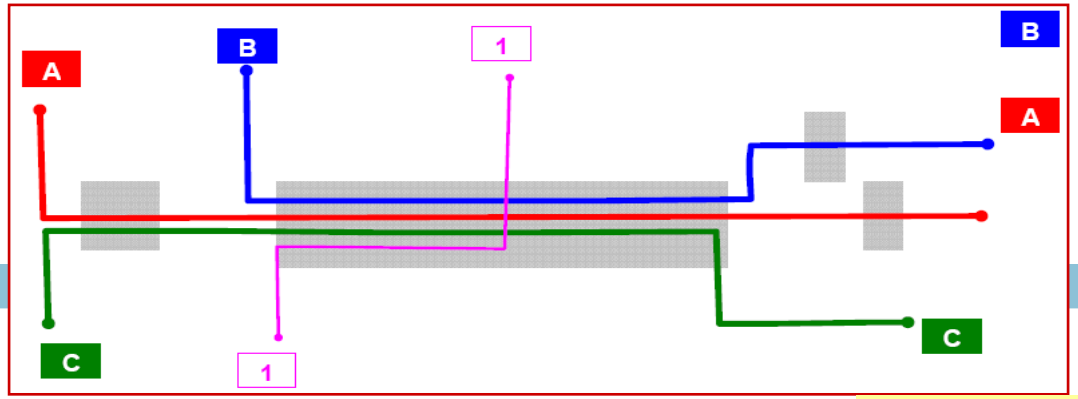


TVM - Paris



TEOR – Rouen

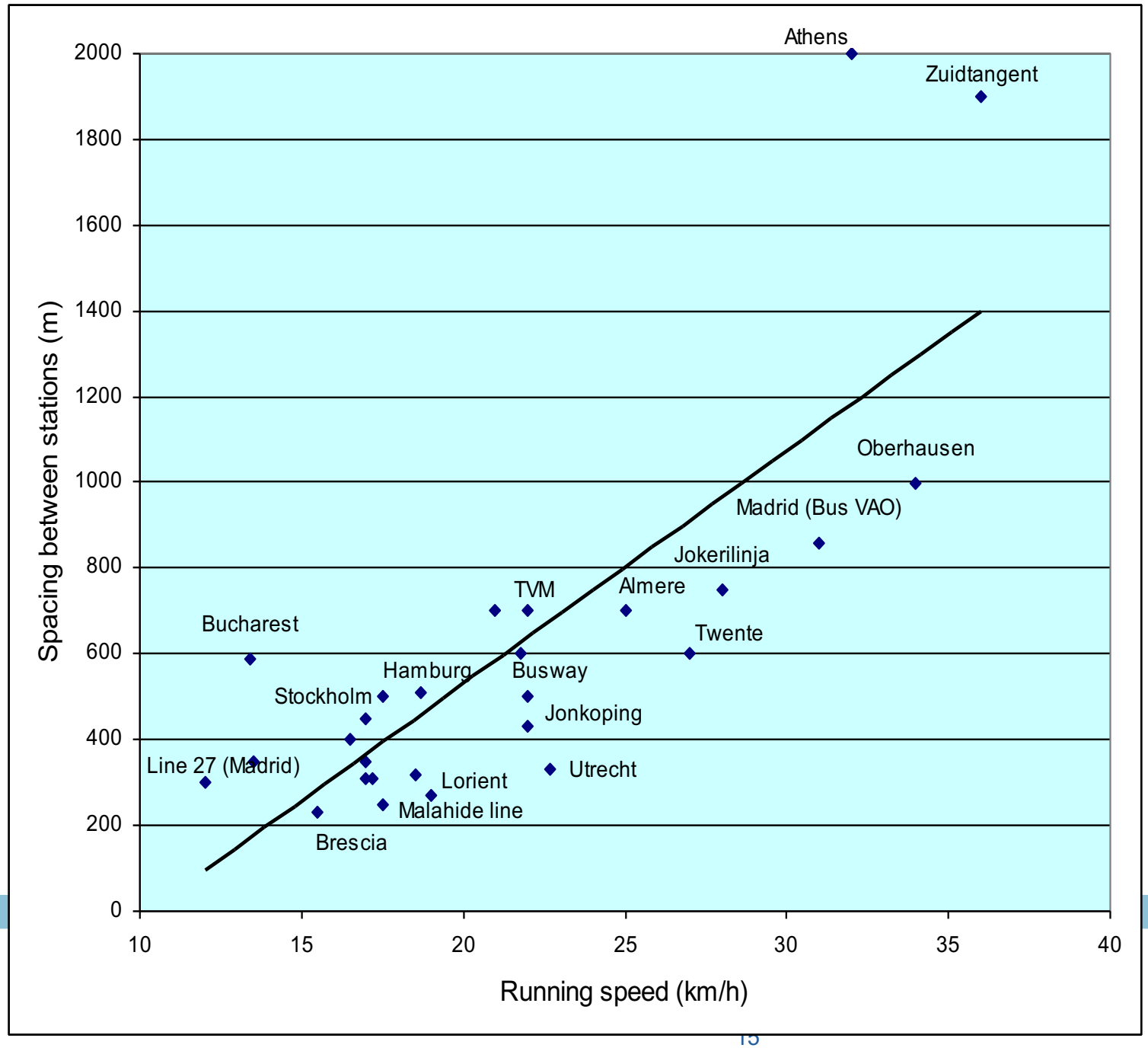
Jönköping



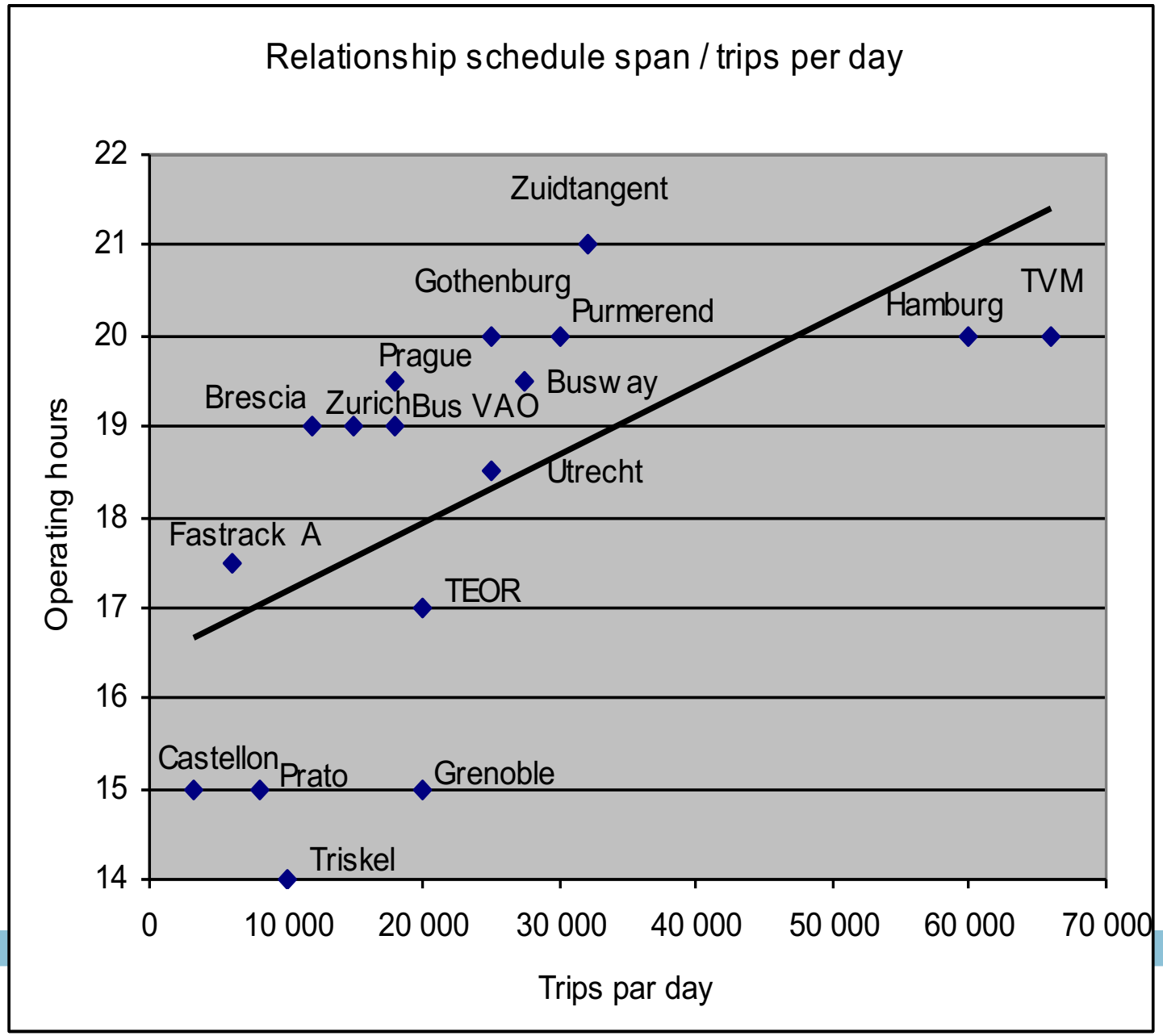
Zuidtengent - Amsterdam

However, no express services …

Spacing between stops : a strong factor for the speed

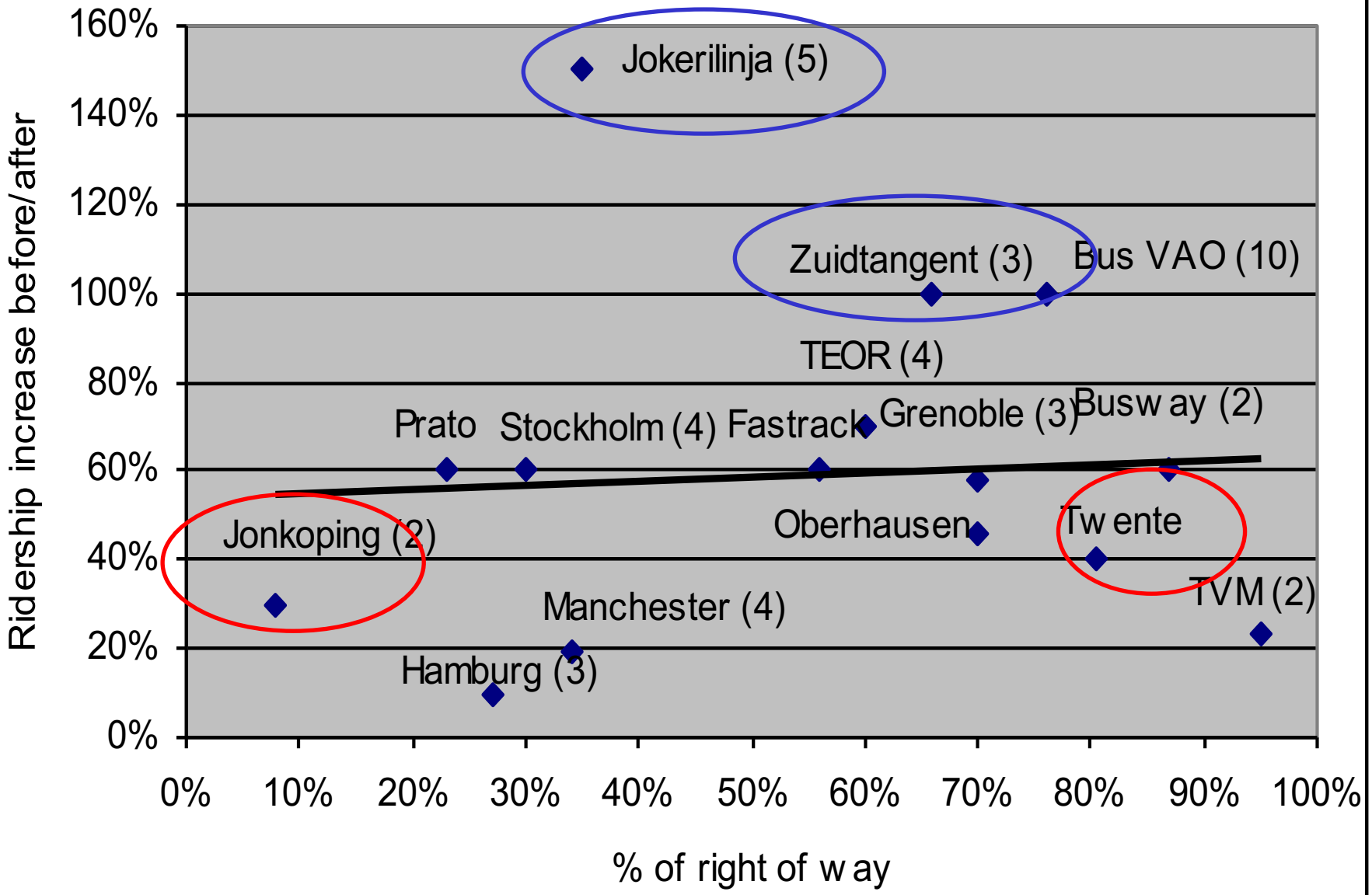


Operating hours : one of the important factors for a capacitive BHLS



Always an increase of ridership has been observed …

But, no link between ridership increase and % of dedicated lane…

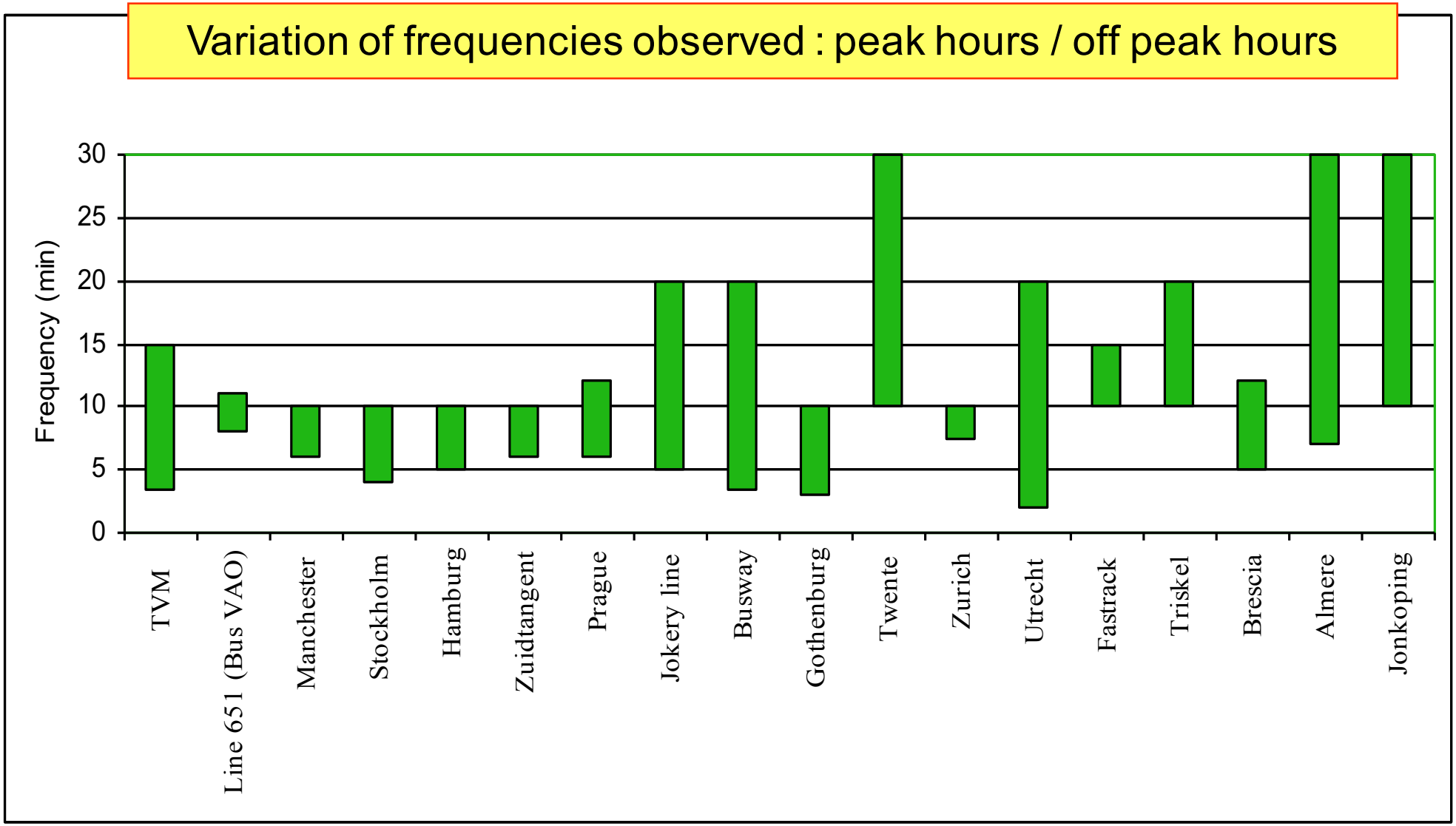


The ridership increase always on several years…

Modal shift: very different results according to the mobility context

	Trips coming from the car	Trips coming from biking	From other modes
Busway (Nantes)	30%		
Fastrack (Kent Thameside)	19%		
Malahide corridor (Dublin)	17%		
Line 11 and 12 (Utrecht)	15%		
Bus VAO corridor , all lines (Madrid)	15%		
The Jokerilinja 550 (Helsinky)	12%		
TVM (Paris)	8,50%		
3 lines "Citybussarna" (Jönköping)	6%	5%	13% new trips 1% from special T
Line 2 and 3 (Twente)	6%	24%	
Trunk network (Stockholm)	5%		60% from metro

Variation of frequencies observed : peak hours / off peak hours



- The various frequencies are mostly linked with the demand
- Then, the need of a high level of regularity/ availability can be understood

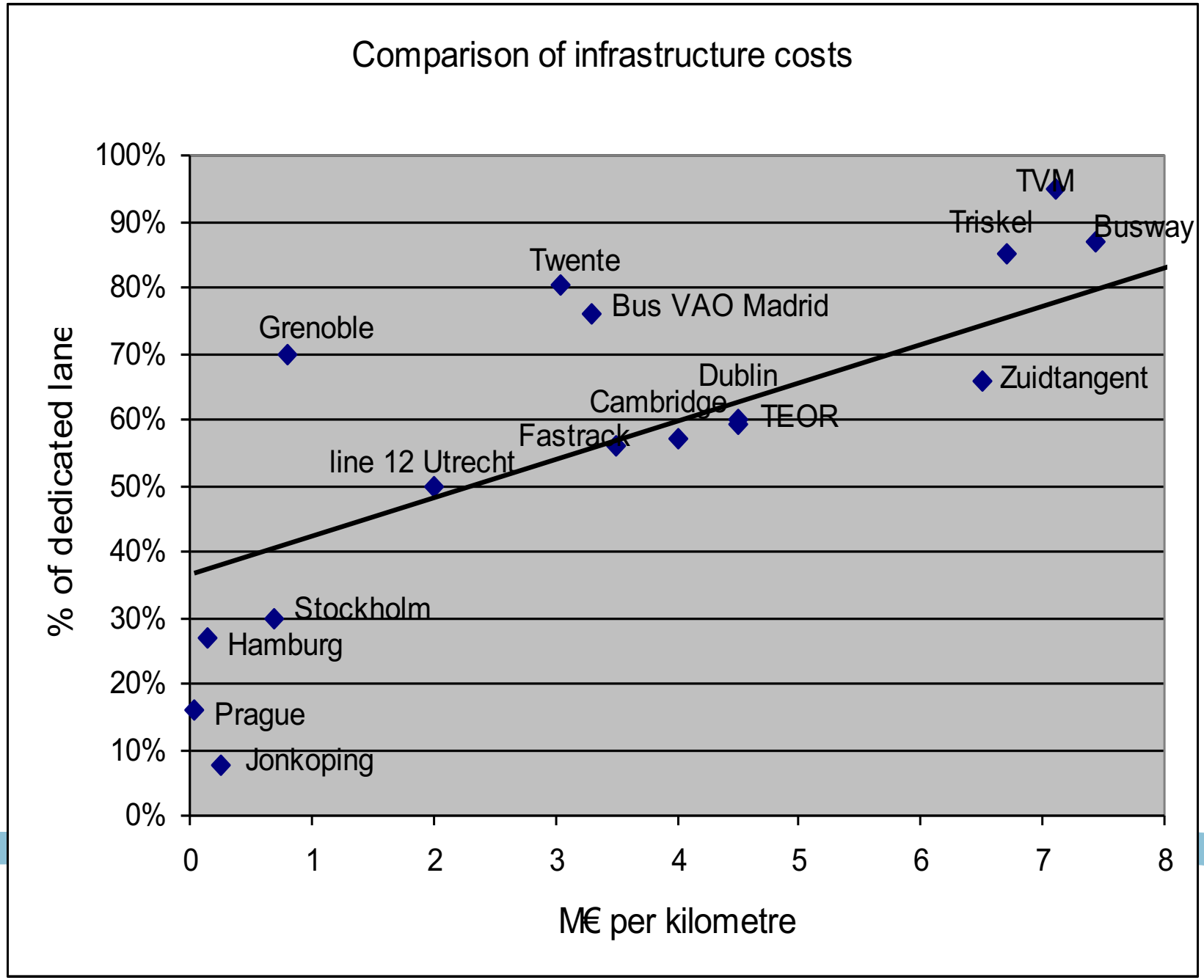
Regularity / punctuality : some results achieved, according to the EU standard - EN 13 816

	Reliability target (regularity, punctuality)	Threshold achieved	**Observation**
Nantes (Busway)	**90% (i+2min)**	**98%**	High efficiency
Fastrack (B)	**95% (H-1min;H+5min)**	**97,5%**	High efficiency
Twente (line 2, 3)	**80% H-1min;H+5min**	**95 / 97,6%**	Good protection
Paris (TVM)	**90% (i+2min)**	**95,8%**	High load at rush hours
Grenoble (line 1)	**90% (H-1min;H+5min)**	**95**	Good results
Leeds	**95% (H-1min;H+5min)**	**93%**	Low part of RoW
Almere (network)	**80% H-1min;H+3min**	**91,4%**	Calculation with 3 min
Gothenburg (line 16)	**80% H-30s; H+3min**	**75%**	High load at rush hours
Prague line 213	**80% (H-0min; H+2min)**	**78 - 86 %**	Low part of RoW

Legend: where i=interval (regularity objective) and H = scheduled time (punctuality objective)

For a high BHLS level : a target by over 90 / 95% is possible !

The infrastructure investment costs observed



Zuidtangent (Amsterdam)

Grade separated crossing

where it is needed

TVM (Paris)

Lund, underway for bus et bikes

Almere: priority, that control the speed below 40 Km/h

Priority at all crossing :

- *a tool for regularity*
- *a tool for a better comfort*
- *a tool for fuel economy*

Twente, crossing without traffic lights

Dense areas : trade offs are inevitable

- *Zone 25 in Hamburg, a commercial street*

- *Zone 30 in Lorient city centre, shared with bikes*

.. An interest to have the same priority rules as the tram has …

Hambourg

Lorient

Oberhausen

Very few common lanes « tram and BHLS » were observed :

- *trade offs with accessible kerb hight*
- *an interest to have common priority rules*

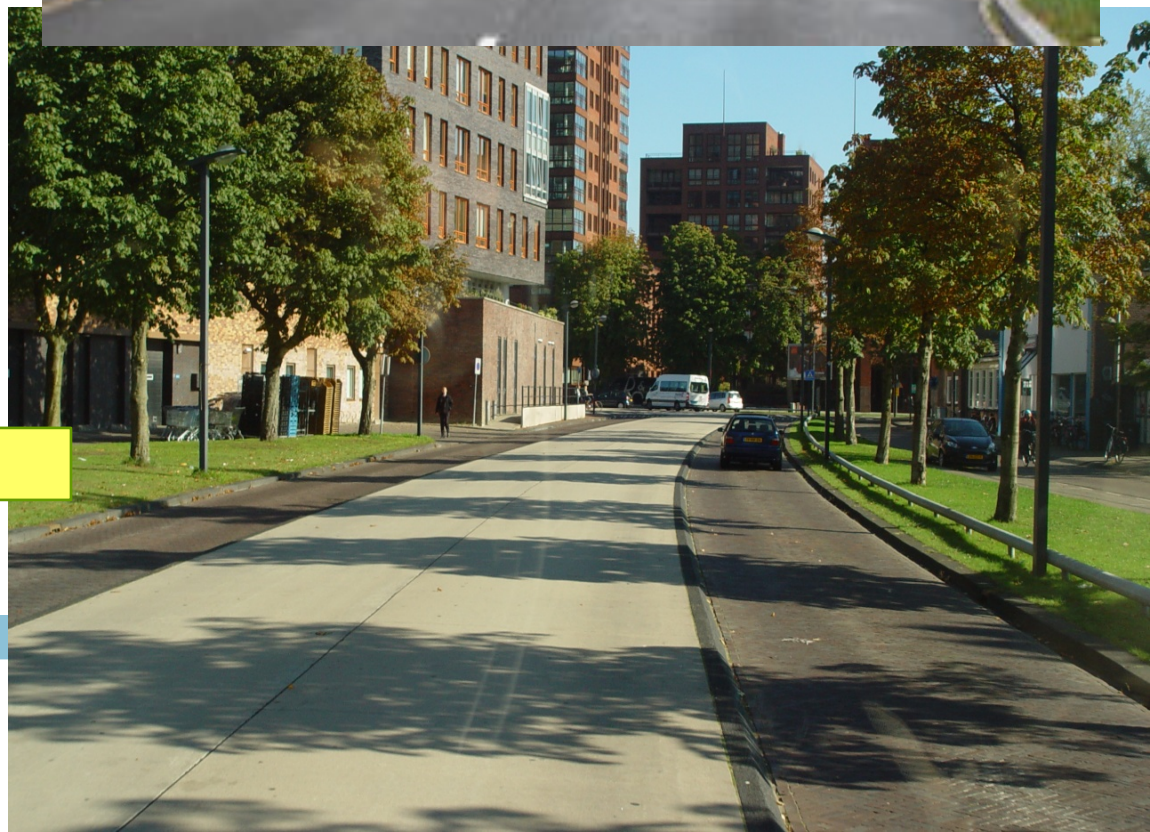
Gothenburg

Important use of concrete, in Germany, Sweden, Uk, CH, NL :

- *To fight pavement rutting*
- *To decrease maintenance costs*

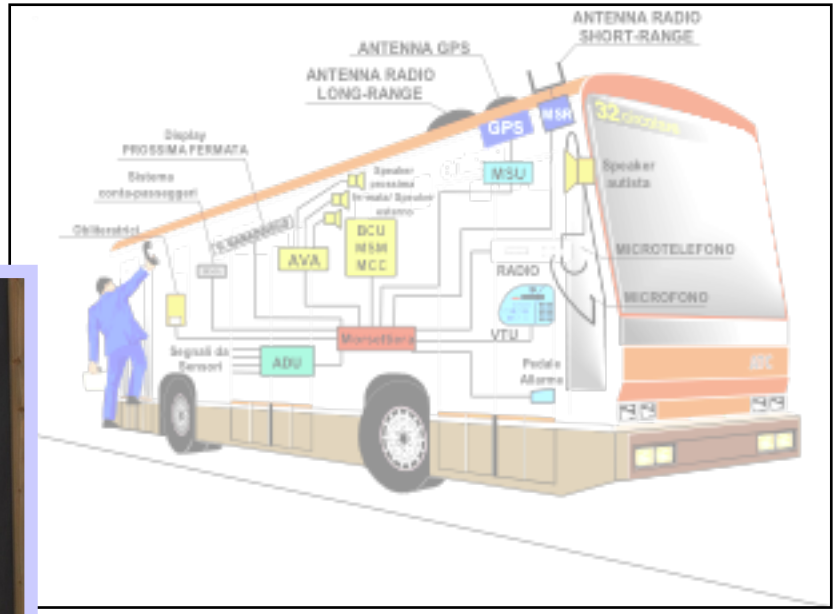
Almere

Twente



ITS : the first need is an AVM system...

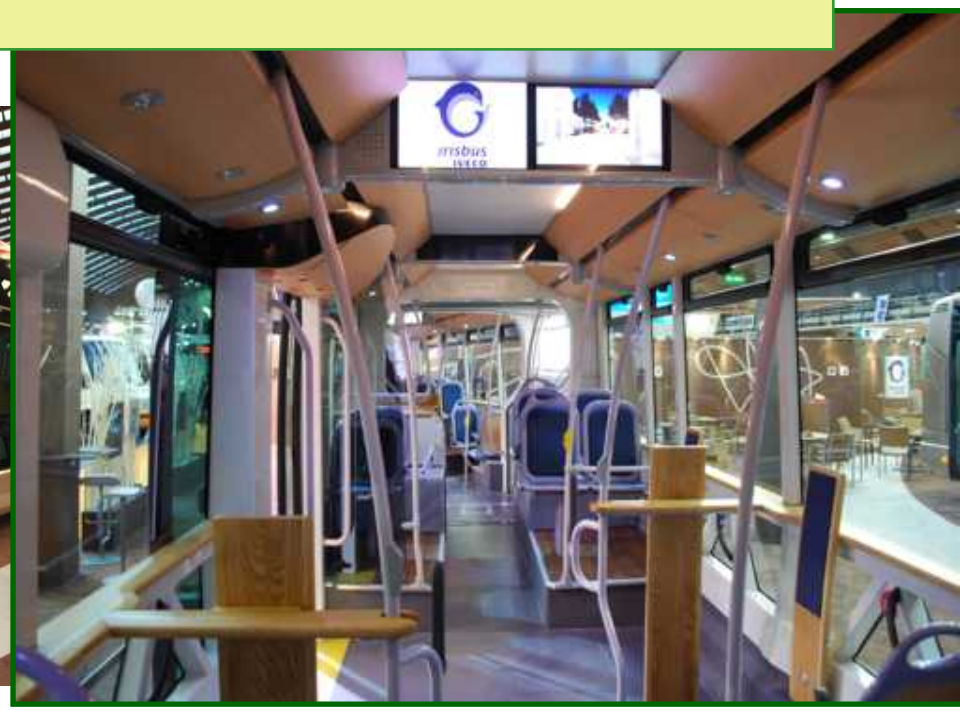
With a full dynamic passenger information at each station



A specific bus market for some BHLS schemes …

By Irisbus, the Crealis

Chosen by Nimes (2012)



By Wright

Chosen by Leeds

Intermodality (Cycling) : a key factor in UK, Sweden, NL

In conclusion,
our main recommendations for a "complete, attractive" BHLS

- **Belong to the structuring network** (same schedule span)
- **Strong intermodality (train, tramway, bus, biking…)**
- **Full IT-solutions : dynamic information at all stops,…**
- **High reliability** (around 95% trips having a bus on time)
- **Mostly off bus ticketing** (no ticket selling by the driver)
- **A specific brand/image** (related to the service quality)

Current trends in Europe

- No BHLS market for “tram” cities ?
- France : less tram projects, more BHLS projects
- A new BHLS market on motorways in France (like in Netherlands, USA, …)

Comparison Vienna / Curitiba

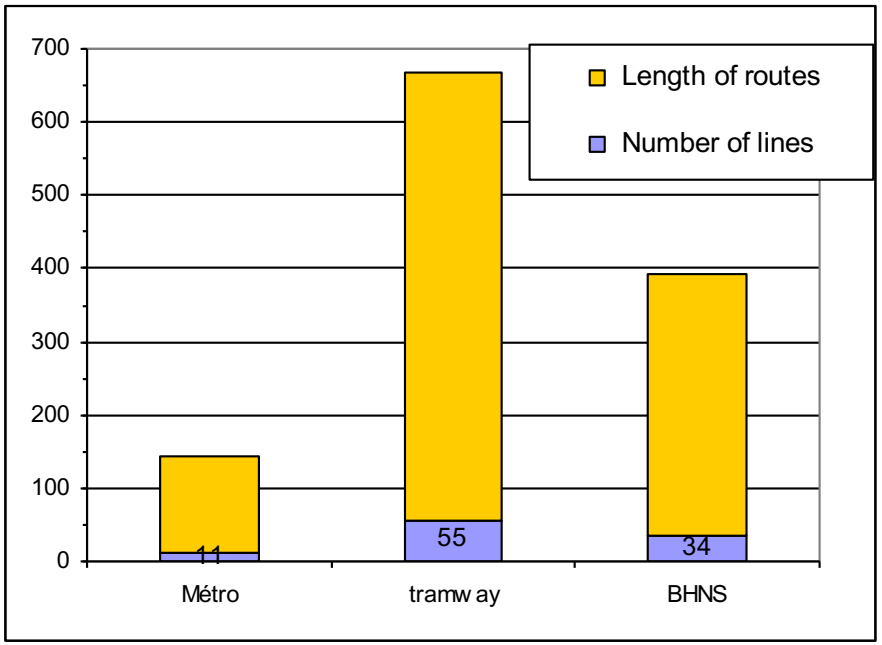
(by Thomas Macoun - Vienna)

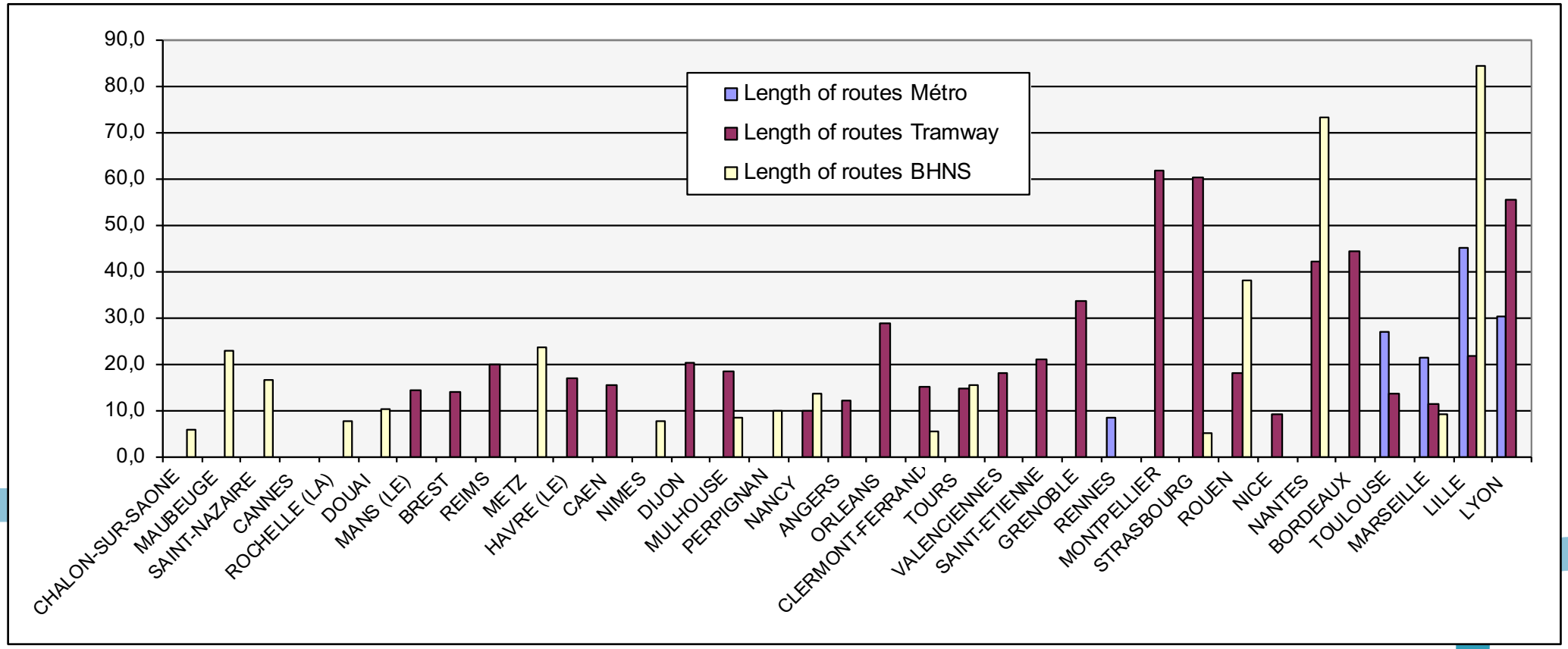
	Vienna	Curitiba
Population [people]	1,766,746 (2014)	1,776,761 (2012)
Area [km^2]	415 [km^2]	432 [km^2]
Population density [inh./km^2]	4257 [inh./km^2]	4113 [inh./km^2]
Green Area [km2]	188 km^2 (45%)	114km^2 (26%)
Modal Share [%]	Car: 27%; Motor bike 0%; PT: 39%; Bike: 6%; Foot: 28%	Car: 23%; Motor bike 5%; PT: 45%; Bike: 5%; Foot: 21%
Private cars[cars/1000 inh.]	386	690

- Same urban characteristics, virtuous and similar modal share,
- Curitiba less dense in city centre, that explain a higher motorization rate (higher as in Europe : 536)
- Vienna (Austria) : city without BRT
  - Introduction of the electric tram in 1897
  - Today, 29 tram lines, 225km ; one of the most important pole of Tram construction
- Curitiba (Brazil) : city without tramway
  - Introduction of the electric tram in 1911
  - Deterioration of PT (Tram replaced with the bus, last line in 1952), then very rapid development with BRT since the 70ties.

BHLS evolution in France
(outside region Île de France)

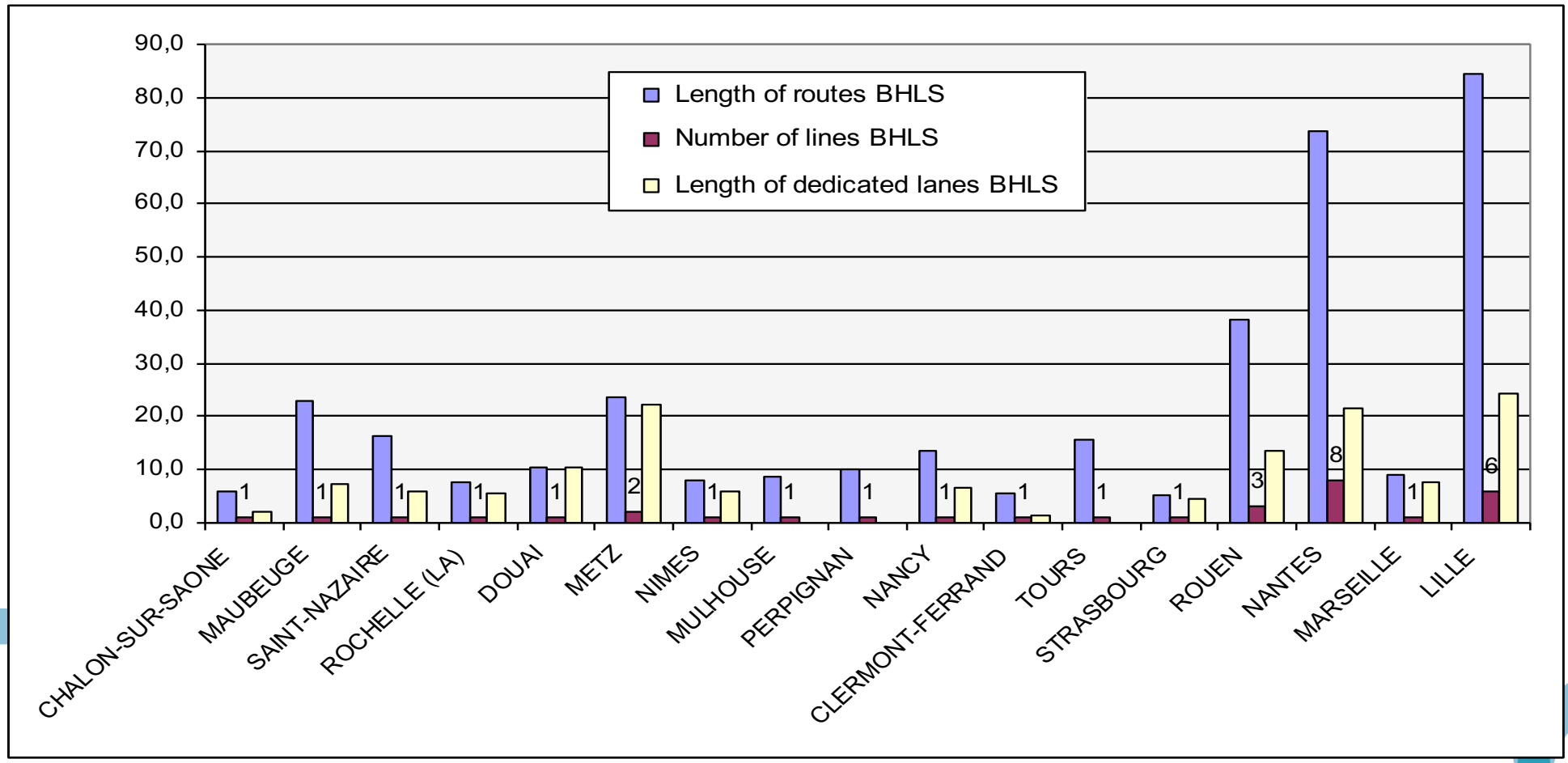
- Much more BHLS observed (due to the crisis?)
- Around 800 km are expected in 2020
- Multi modality in the biggest cities





BHLS evolution in France
(length of routes, lenghth of dedicated lane)

- Evolution to BHLS with lower frequency, lower capacity : Nantes (with the Chronobus lines)
- With lower frequency, less dedicated lane is needed : one way alternative or flexible
- The last biggest into service : Metz with bi-articulated buses : 97% of dedicated lane



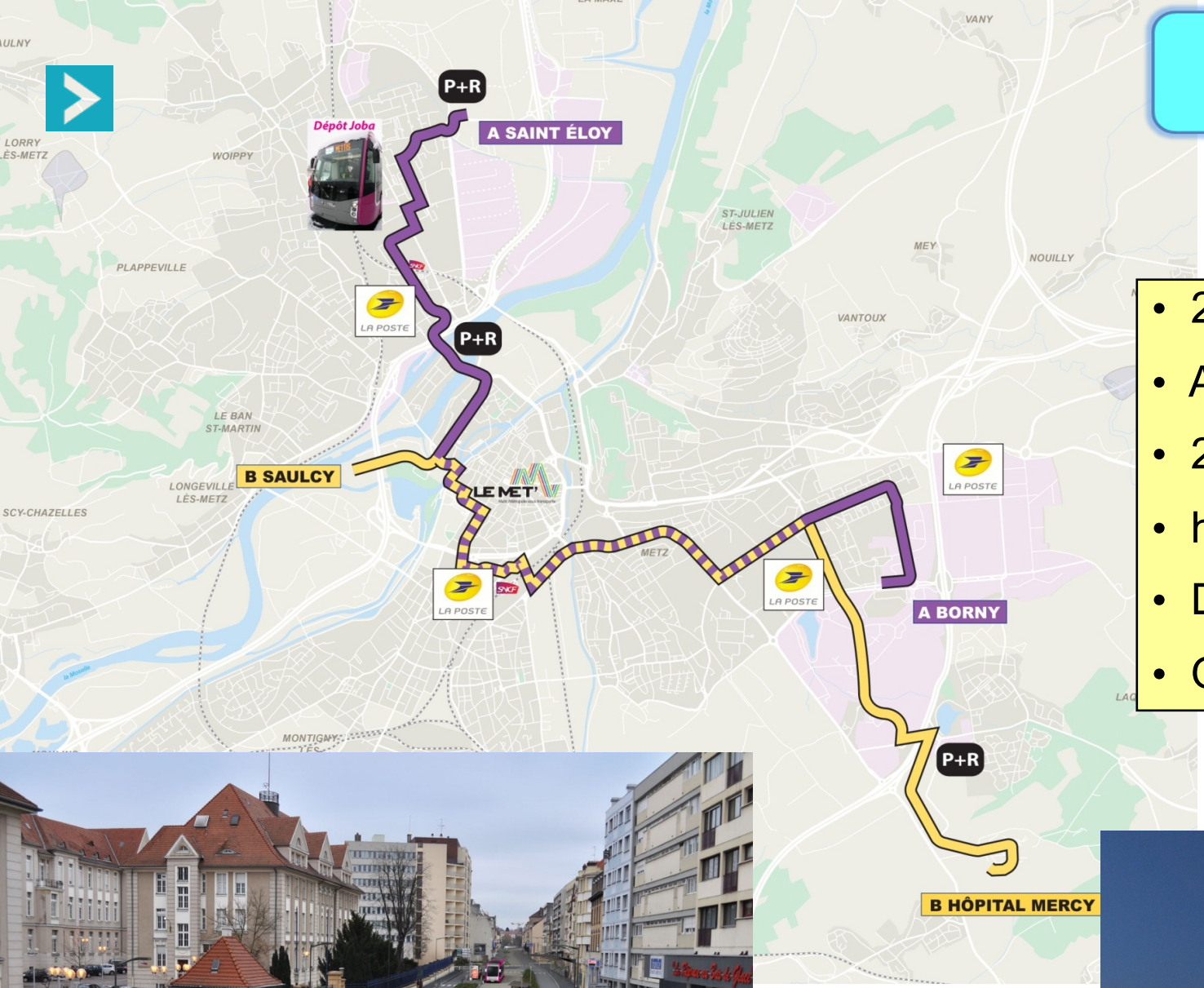
Île de France

Concept « TZen » for a big BHLS program

T Zen 1 : line « Sénart – Corbeil »

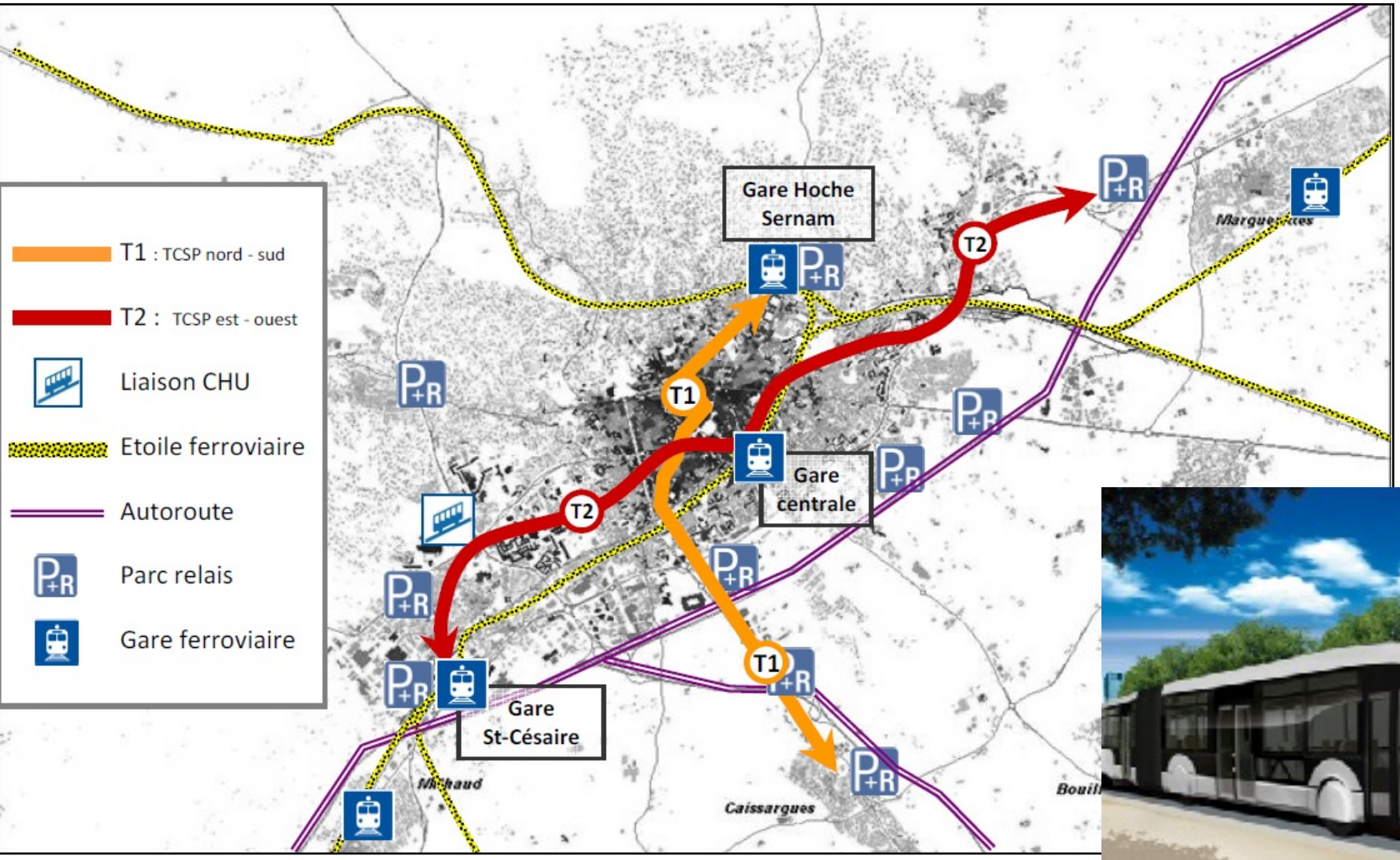
- First line opened in 2011
- Big spacing : 960 m ,
- High commercial speed = 29 km/h
- Low ridership : 6000 passengers / day
- Line implemented before the urban growth

Metz



- 230 000 inhabitants
- A network approach
- 27 bi-articulated buses
- high frequency : 4 à 5 ’
- Dedicated lanes : 93%
- Opened in 2013

Nîmes (250 000 inhabitants) : tram choice replaced by a BHLS



T1 opened in 2012, guided BHLS

extended in 2016: 10 /15000 trips/day - 8 km

T2 in 2020 :

Forecast: 40 / 50000 trips/day - 1 300 / HP - 12 km

Choice in 2014 : tramway, replaced now with a BHLS

Regarding the BHLS trends on motorways

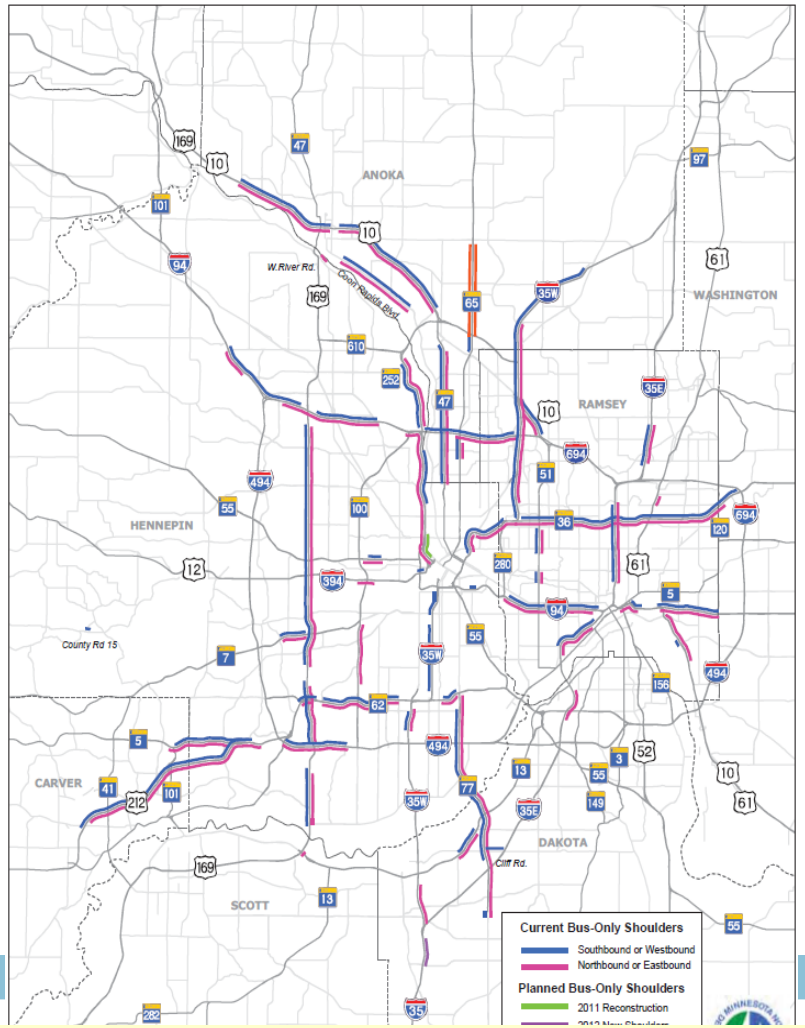
- **Only few examples in Europe**
  - Zuidtangent (Amsterdam); 5 km on emergency lane
  - Madrid : 16km in the middle of the motorway A-6
- **An emerging market …**

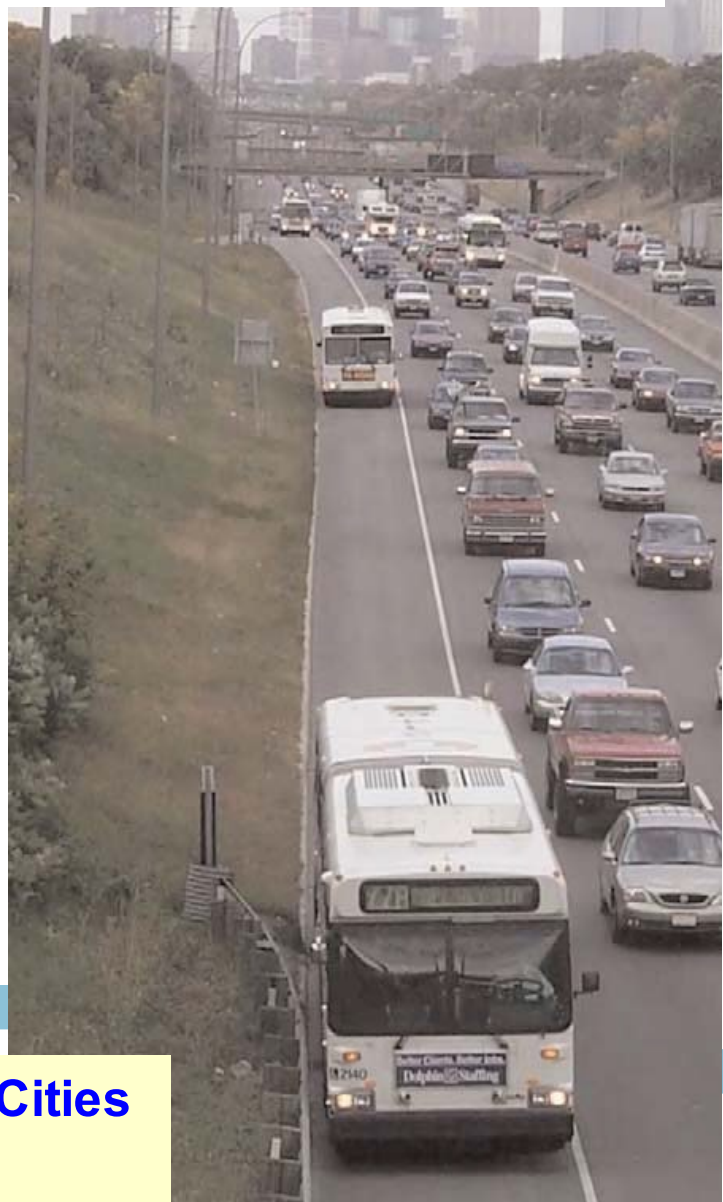
Zuidtangent : buses on shoulder during congestion

Madrid: 200 bus/h

Buses on freeway shoulder - Minneapolis - Saint Paul, Minnesota, USA

In 1991, bus-only-shoulders were tested for freeway express buses. Buses are allowed to use the shoulders only when mainline traffic speed drops below a threshold of 56 kph.





The 480-km. network of Bus Only Shoulders in the Twin Cities (Minnesota Department of Transportation)

Buses on shoulder on highway A48

North entrance of Grenoble,

opened in 2007, extended in 2014

Grenoble

Dedicated lane opened by an operator - 4km

Opened during congestion (2 h 30 per day)

Positive results, **25 / 30 bus /hour**

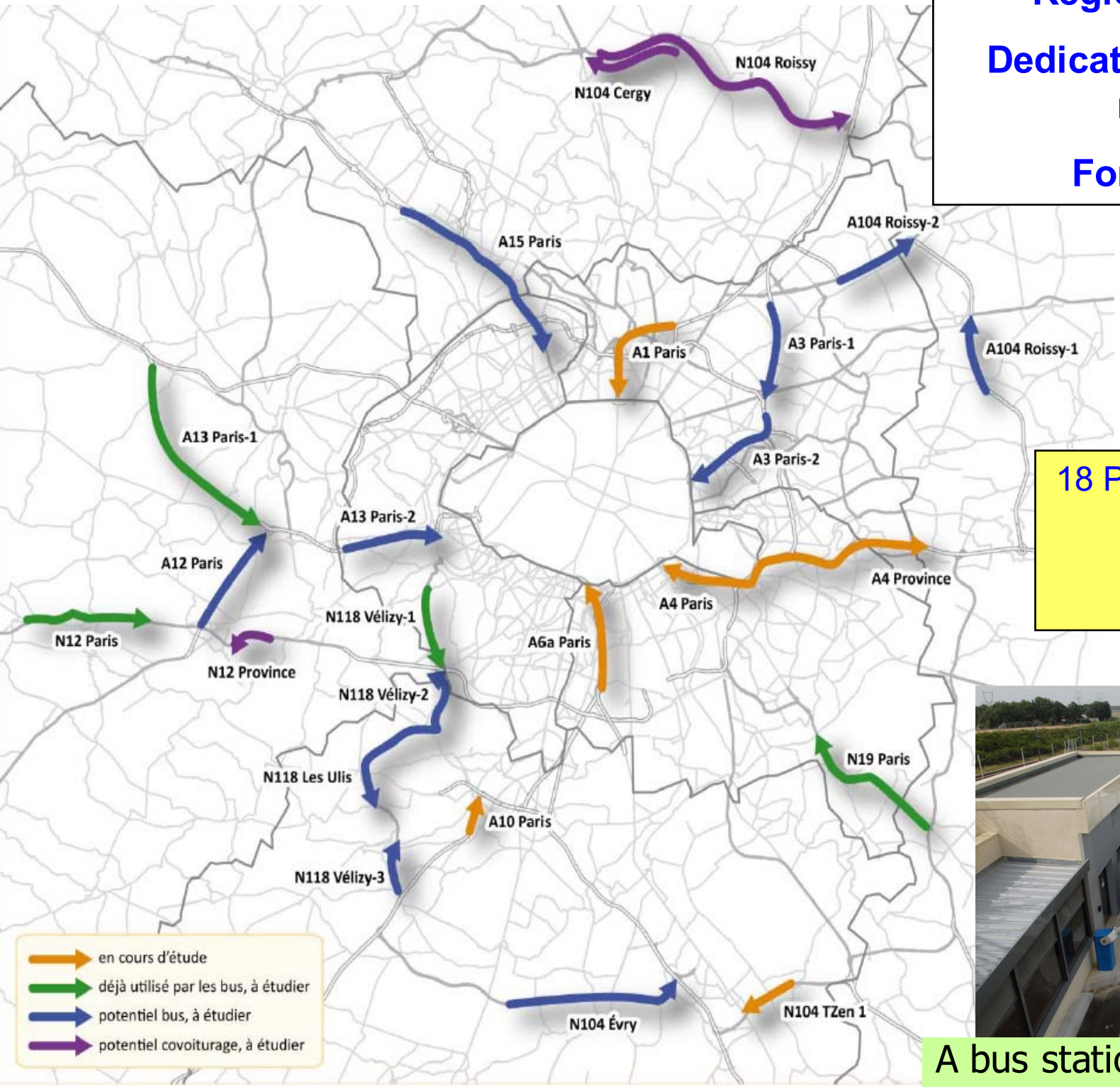
System considered now too rigid

Extend by 4 km upstream – since February 2014

Region Île de France

Dedicated lanes on urban motorways

For buses, taxis



18 Projects in study : 83 Km

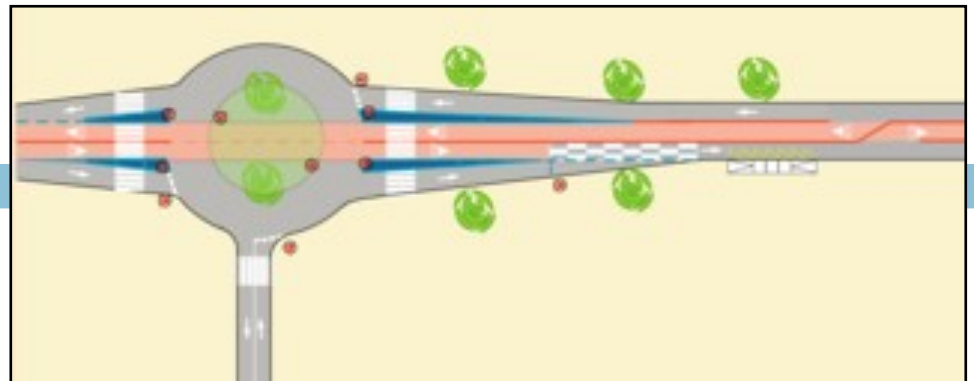
Total : 220 M€

Rate : 2,6 M€ / Km

A bus station for Briss sur forges

Some conclusion words

- “Regularity / punctuality” : not easy to achieve good results
- BRT / BHLS strategies : large benefits are often observed
- Bus system / rail system are anyway complementary, even if the choice can be sometimes so hard
- A long term vision at network level is needed (Intermodality / hierarchisation)
- A strong politician involvement is always requested, all along the project
- Experiences should continue to be exchanged all over the world



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