Bus with High Level of Service
TU 603
Start date: 18/04/2007
End date: 21/10/2011
Year: 4

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Bus with High Level of Service

35 BHLS analyzed, 25 visited

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

Duration: 2007 – 2011

www.bhls.eu

The final report is now available, 180 pages with a CD
Scope

- Introduction: the “system” approach …
- A wide spectrum of solutions
- Some views from the state of the art
  - On infrastructure (running ways, stations, bike parks,…)
  - On ITS (always for the passengers, CCTV, protection, priority)
  - On vehicle (design)
- Key results (regularity, modal shift, frequency, commercial speed)
A wide spectrum of BHLS solutions

- A wide spectrum of solution,
- Into different urban context
- Several objectives, different strategies, different effects
# Infrastructure: the most challenging sub-system

# the most expensive

## RoW

| **Internal impacts:** | - Capacity  
- modal shift (from car, other lines) |
|-----------------------|-----------------------------------------|
| **External impacts:** | - Mobility (constraints VP,…)  
- Urbanism, economy, social  
- Pollution / GES  
- City image |
Configuration type « A »

Where it is needed

- Zuidtangent (Amsterdam)
- TVM (Paris)
- Lund, underway for bus et bikes
Priority at all crossing:

- a tool for regularity
- a tool for a better comfort
- a tool for fuel economy
- at last for a better speed

Twente, crossing without traffic lights
Priority at traffic lights, an important tool ... easier with a police man in city centre
Cycle and pedestrian path

Safety barriers for crossing a rapid BHLS (70 Km/h)
Dense areas, where trade offs are inevitable:

- Zone 25 in Hambourg, a commercial street
- Zone 30 in Lorient city centre, shared with bikes

BHLS should have the same priority rule as a tram
Common lanes « tram and BHLS »:

- trade offs with accessible kerb height
- interest to have common priority rules
A manual ramp in SE, D, NL …

Stockholm, on low kerb

Oberhausen, high kerb

Rouen, Optiguide system with high kerb

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

- To fight pavement rutting
- To decrease maintenance costs
- Visual differentiation
Intermodality (Cycling) : a key factor in UK, Sweden, NL
Only a few examples in Europe

- Zuidtangent (Amsterdam); 5 km on emergency lane
- Madrid: 16 km in the middle of the motorway A-6
- Dublin: M7, bus lane in hard shoulder

An emerging market ...
ITS tools for a high comfort and security...

1. - CCTV with cameras inside and outside the vehicle (6 or 8 in total)
2. - Plug and WIFI inside BHLS buses (Fastrack and Cambridge)
3. - Internet screen at station (Fastrack)
Dynamic information, at all stations
A specific bus market for heavy BHLS schemes …

By Irisbus, the Crealis
For the project of Nimes (2012)

By Wright
For Leeds and other cities
The strong economical factor: distance between stops

Spacing between stops, a strong factor for the speed
Always an increase of ridership …

No link between increase and % of dedicated lane…

The ridership increase always on several years…
## Modal shift: different results according to the context

<table>
<thead>
<tr>
<th>Location</th>
<th>Trips coming from the car</th>
<th>Trips coming from biking</th>
<th>From other modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busway (Nantes)</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fastrack (Kent Thameside)</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malahide corridor (Dublin)</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line 11 and 12 (Utrecht)</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus VAO corridor, all lines (Madrid)</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Jokerilinja 550 (Helsinki)</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TVM (Paris)</td>
<td>8.50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 lines &quot;Citybussarna&quot; (Jönköping)</td>
<td>6%</td>
<td>5%</td>
<td>13% new trips</td>
</tr>
<tr>
<td>1% from special T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line 2 and 3 (Twente)</td>
<td>6%</td>
<td>24%</td>
<td>60% from metro</td>
</tr>
<tr>
<td>Trunk network (Stockholm)</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Reliability target (regularity, punctuality)</td>
<td>Threshold achieved</td>
<td>Observation</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------</td>
<td>--------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Nantes (Busway)</td>
<td>90% (i+2min)</td>
<td>98%</td>
<td>High efficiency</td>
</tr>
<tr>
<td>Fastrack (B)</td>
<td>95% (H-1min; H+5min)</td>
<td>97.5%</td>
<td>High efficiency</td>
</tr>
<tr>
<td>Twente (line 2, 3)</td>
<td>80% H-1min; H+5min</td>
<td>95 / 97.6%</td>
<td>Good protection</td>
</tr>
<tr>
<td>Paris (TVM)</td>
<td>90% (i+2min)</td>
<td>95.8%</td>
<td>High load at rush hours</td>
</tr>
<tr>
<td>Grenoble (line 1)</td>
<td>90% (H-1min; H+5min)</td>
<td>95</td>
<td>Good results</td>
</tr>
<tr>
<td>Leeds</td>
<td>95% (H-1min; H+5min)</td>
<td>93%</td>
<td>Low part of RoW</td>
</tr>
<tr>
<td>Almere (network)</td>
<td>80% H-1min; H+3min</td>
<td>91.4%</td>
<td>Calculation with 3 min</td>
</tr>
<tr>
<td>Gothenburg (line 16)</td>
<td>80% H-30s; H+3min</td>
<td>75%</td>
<td>High load at rush hours</td>
</tr>
<tr>
<td>Prague line 213</td>
<td>80% (H-0min; H+2min)</td>
<td>78 - 86%</td>
<td>Low part of RoW</td>
</tr>
</tbody>
</table>

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

For a high BHLS level : a target by over 90 / 95% is needed
First recommendations …

- A strong politician involvement for any BHLS
- A long term vision at network level (Intermodality / hierarchisation)
- Give BHLS buses the same “Tram” priority, with more visible signals
- A better enforcement governance (higher fines, …)

And last but not least:
- To keep operational our “BHLS” Knowledge Network …
Recommendations for a “full or complete” BHLS

Questions? Discussion?

- Belong to the structuring network (same schedule span)
- Right of Way B / A, when needed
- Strong intermodality (train, tramway, bus, biking…)
- Full IT-solutions: dynamic information at all stops,…
- High reliability (up to 95%, 98% 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)

+ 100% within 3 years
+ 60% within 2 years
+ 20% within 2 years
Information resources for BRT, BHLS

- COST Action on BHLS
  - [www.bhls.eu](http://www.bhls.eu)

- Final report available, CD-ROM includes
  - Final report
  - Presentations from the various BHLS sites
  - Data sheets
## Final Report – released November 2011

- **Main report**

- **CD-ROM**
  - Descriptions of 20+ BHLS sites
  - Detailed data for the BHLS sites
  - Presentations
  - Working notes, supporting materials
  - Images, photos
  - Publications, articles, workshop materials
  - Total c 500 MB

- **Negotiating to place in public domain in structured way to facilitate continuity – legacy website**
UNITED KINGDOM

Description
In order to improve sustainable mobility in urban areas throughout Europe, we observe different strategies, such as in Sweden (The trunk network in Stockholm), in England and in Ireland under the name of "Quality Bus Corridor", in France (Bus à Haut Niveau de Service "BHNS"), in Germany (metrobus concept), in the Netherlands (HOV - "Hogerwaardig Openbaar Vervoer"), and a lot of other experiments dealt with "High capacity bus systems". In order to better understand all these trends and to promote a useful way to enhance the bus image, a COST Action has been decided on this topic and is called:

Buses with a high level of service

ORGANISATION

14 EU countries are involved in this COST action that began in October 2007 and should last until 2011.

NEWS

- Final conference of this COST action
  20 August 2011
  will take place in Brussels, the 29th and 30th of November 2011, integrated in the annual POLIS conference.
  The pre-programme

- The workshop in Switzerland
  20 May 2011
  took place in May 2011 in Zurich and Lucerne; the report of this plenary meeting at this link.

- EBSF : videos on the first Use Cases
  25 February 2011
  Madrid (passenger information) and Rouen (mini ramp on guided bus) - February 2011.
  To the presentations.

  Article in the "Built Environment"
State of the art, conceptual approaches and best practices

Urban Infrastructure

Bus Vehicle
French experiences: Nantes, Lorient, Paris

Nantes, the Busway, line 4

At the terminus in the center:

Along the former highway, south entrance of Nantes:
Information resources for BRT, BHLS

- COST Action on BHLS
  - www.bhls.eu

- Final report available, CD-ROM
  - Dario, Juan-Carlos, Walter, Dennis have the report and CD
  - Report is 10MB, mail request to me at etts@indigo.ie
Findings, Recommendations and Research themes
BHLS has been implemented in ...

- Cities of all sizes
  - Major cities, medium-sized cities, small cities
- Cities with different mode configurations
  - Extensive metro/tram, mixed tram/bus, bus dominant
- Different types of routes
  - Urban, radial, peripheral, local, hinterland
- Different regulatory frameworks
  - Public (quasi-) monopoly, city contract, route contract, deregulated
Strong evidence that BHLS ...

- Can be implemented successfully – we can do it!
- Is not restricted to a narrow range of scenarios
- Is highly adaptable
- Can be implemented at lower investment cost and less urban impact than rail systems
This does not mean that BHLS is the most suitable choice in all circumstances

- BHLS is just one of a number of options
- The point is that there is almost always a good BHLS option
- Let the alternatives analysis and appraisal determine outcome

There can be challenges, and they can be significant

- **Barriers**: These can be the ‘show-stoppers’, may be arbitrary
- **Technical challenges**: These can be serious constraints
- **Design and implementation**: Normal stuff - need planning, expertise, resource and hard work
Potential Barriers

- Difficulties to sell a BHLS project to all stakeholders, including the citizens
  - Ingrained preference for rail-based modes
  - Lack of understanding of what is possible
  - Poor image of bus

- Difficulties to gain the required right of way, or especially priority over cars
  - Need skilled authority to recognise genuine concerns, stand up to blocking tactics, and guide through approval processes

- Organisational and regulatory barriers
  - Strangely enough, not an issue (see Thredbo 11 paper)
Technical Challenges

- Challenges may be:
  - Unique to BHLS
  - Common with tramway and other transit systems
  - Common with ‘normal’ bus projects and operations
  - Intrinsic to any project

- Challenges specific to BHLS include:
  - Designing the required Right of Way, especially core urban area
  - Obtaining required priority at traffic signals
  - Knowledge and skill base
Design and implementation challenges

- Infrastructure
- Bus stations design
- Vehicle design and associated issues
- ITS, in particular AVM
- Marketing and branding
- Hierarchisation
- Urban environment and area around bus stops
Recommendations at EU Level

- Recognise BHLS as a higher-order transit mode
- Develop a framework for defining and rating BHLS
- Continue and develop BHLS knowledge network
- Give ‘tram-level’ priority to BHLS
- Develop efficient RoW enforcement strategies
- Safety issues
- ITS issues
- EU rules on bus sizes
Recommendations at City, Regional level

- Strong political will is essential, at every stage
- Need a long-term vision at city level
- Develop an efficient communication strategy
- Organise visits to other BHLS cities (cities have airports)
- Set up a BHLS management committee
- Develop RoW enforcement capacity
- Be both innovative and willing to compromise in infrastructure and priority levels
- Make sure the first BHLS is a winner!
Research recommendations

1) Evaluation of benefits and impacts
2) Design and optimisation of BHLS
3) Quality and regularity measures
4) Improve/assess system approach quality
5) BHLS market knowledge
6) Financing mechanisms for BHLS
Transportation system impacts: e.g. modal share, total network effectiveness, transport sector energy consumption and emissions.

Societal impacts: e.g. access to jobs, social equity, social exclusion.

Urban impacts and importance for public transport: e.g. land use patterns and urban spatial/economic structure, land values, development, urban economy.

Economic value impacts: e.g. post-implementation socio-economic CBA, structured impacts analysis.
Optimisation of service plans and operations of BHLS.
Organisational methods and structures for BHLS.
To evaluate the efficiency of the available modelling tools, to benchmark the macro, micro analysis.
Research (3) - Measurements

- Enlarge and test several types of indicators and their geographical presentations. Include points of view of authorities, operators and users. Test information on regularity/punctuality towards customers.
- Make benchmarking among operational BHLS systems.
- Develop enhancements, where relevant, to the EU standard on service quality (EN 13816) and to monitor applications and organise feedback.
- Define a set of complementary KPIs. The telediagnostic tools (based on the EBSF IT standardized platform) can provide an important support especially when high frequency has to be guaranteed.
Assess the AVMS management (quality of data, quality of assessment, information on disturbances).

Compare BHLS customer satisfaction indicators

Use of the new information solutions like flash code, social networking like Facebook or Twitter

New needs for PT and BHLS (Wifi, sockets on buses, information on mobile phones, personal and targeted information, emerging technologies)

On fares issues, willingness to pay more for faster or better services; the impact on fraud management.
Research (5) – BHLS Market knowledge

- Role of BHLS within a PT network (planning, organisation, inter-modality, multimodality, etc.).
- Image of BHLS (e.g. why tram is considered so exiting and not bus?).
- Public participation and acceptance.
- Sharing data basis for network comparisons.
Research (6) – financing mechanisms

- Financing mechanisms for BHLS infrastructures and their maintenance.
- Financing mechanisms for transportation services and for customer services.
- Potential for PPP and other forms of private investment.
‘Go Large’ in Hamburg
Acknowledgements

- The 35 BHLS systems and their owners, who showed it could be done, and could be done extremely well
- More than 50 people in 14 European countries who took part in the COST TU0603 action, and shared info
- The COST program, who made this collaboration happen
  - big thanks to Thierry Gogier at COST program
- CERTU who led this action, especially Francois Rambaud
- The Final report authors and editors
  - Francois Rambaud, Odile Heddebaut, Arno Kerkhof, and me
  - Francois and Arno who generated the first half of this presentation
- The people who use all of the European BHLS systems every day and make them a success
## European BHLS – Key Characteristics

<table>
<thead>
<tr>
<th>City</th>
<th>System Identity</th>
<th>System Length (KM)</th>
<th>Nature of Running Way</th>
<th>Passengers per day</th>
<th>Peak Headway (Minutes)</th>
<th>Dedicated Fleet?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>Zuid-Tangent</td>
<td>41 (33)</td>
<td>Bus-only road, bus lanes</td>
<td>40,000</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>Dublin</td>
<td>Quality Bus Corridor</td>
<td>12 (8.4)</td>
<td>Bus-lanes</td>
<td>34,000</td>
<td>&lt; 1.5&lt;sup&gt;4&lt;/sup&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Gothenburg</td>
<td>TrunkBus</td>
<td>16.5 (7.5)</td>
<td>Bus-lanes</td>
<td>24,000</td>
<td>3.3</td>
<td>Yes</td>
</tr>
<tr>
<td>Hamburg</td>
<td>MetroBus</td>
<td>14.8 (4.0)</td>
<td>Bus-lanes</td>
<td>60,000</td>
<td>3.5</td>
<td>Yes</td>
</tr>
<tr>
<td>Helsinki</td>
<td>Jokeri Line</td>
<td>28 (6)</td>
<td>Bus-lanes (orbital route)</td>
<td>25,000</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>Madrid</td>
<td>Bus-VAO</td>
<td>16.1 (16.1)</td>
<td>Tidal segregated lanes</td>
<td>33,000&lt;sup&gt;5&lt;/sup&gt;</td>
<td>&lt; 1&lt;sup&gt;4&lt;/sup&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Nantes</td>
<td>BusWay</td>
<td>7 (6)</td>
<td>Bus-lanes</td>
<td>24,600</td>
<td>3.3</td>
<td>Yes</td>
</tr>
<tr>
<td>Paris</td>
<td>TVM</td>
<td>20 (19)</td>
<td>Bus-only road (suburban/orbital)</td>
<td>65,800</td>
<td>3.5</td>
<td>Yes</td>
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<tr>
<td>Prato</td>
<td>LAM</td>
<td>42 (15)</td>
<td>Bus-lanes</td>
<td>n/a</td>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>Stockholm</td>
<td>Blue Line</td>
<td>40 (12)</td>
<td>Bus-lanes</td>
<td>36,575&lt;sup&gt;6&lt;/sup&gt;</td>
<td>5</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## European BHLS: Ridership gains

<table>
<thead>
<tr>
<th>City</th>
<th>System Identity</th>
<th>BHLS Ridership Change(^2)</th>
<th>Change in Operating Speed(^4)</th>
<th>Peak-Period Headway Reduction</th>
<th>Network Restructuring in the Corridor?</th>
<th>Major Tariff Restructuring as part of BHLS?</th>
<th>Unique Identity for BHLS Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>Zuid-Tangent</td>
<td>+47%</td>
<td>Significant</td>
<td>Yes</td>
<td>Significant</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Dublin</td>
<td>Quality Bus Corridor</td>
<td>+125%</td>
<td>Major</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Gothenburg</td>
<td>TrunkBus</td>
<td>+73%</td>
<td>Moderate</td>
<td>Yes</td>
<td>Significant</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hamburg</td>
<td>MetroBus</td>
<td>+20%</td>
<td>Minor</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Helsinki</td>
<td>Jokeri Line</td>
<td>+100%</td>
<td>Significant</td>
<td>7 ↔ 5</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Madrid</td>
<td>Bus-VAO</td>
<td>+70-100%</td>
<td>+80-100%</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Nantes</td>
<td>BusWay</td>
<td>+55%</td>
<td>Moderate</td>
<td>Yes</td>
<td>Significant</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Paris</td>
<td>TVM</td>
<td>+134%</td>
<td>Significant</td>
<td>5 ↔ 3.5</td>
<td>Significant</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Prato</td>
<td>LAM</td>
<td>+57%</td>
<td>+5%</td>
<td>15 ↔ 7</td>
<td>Major</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Stockholm</td>
<td>Blue Line</td>
<td>+27%</td>
<td>0</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>