

# A EUROPEAN VISION FOR MORE ENVIRONMENTALLY FRIENDLY BUSES

**Maria Vittoria Corazza and Antonio Musso**

“Sapienza”, University of Rome

e-mail: mariavittoria.corazza@uniroma1.it, antonio.musso@uniroma1.it



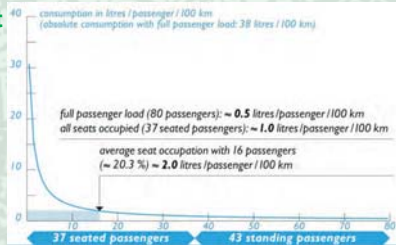
**Umberto Guida and Michele Tozzi**

UITP - International Association of Public Transport  
email: umberto.guida@uitp.org; michele.tozzi@uitp.org

## INTRODUCTION

Public Transport is accredited for being a smart solution to problems such as congestion and poor air quality; **since bus systems move around 50 to 60% of all transit passengers (30 billion per year) in the EU**, buses are in the front line in competing with passengers cars for any travel.

**Buses can be also highly efficient modes with low levels of local emissions, CO<sub>2</sub> and other GHG emissions, even with modest occupancy.**



However, the level of satisfaction for Public Transport may be very low, due to poor performance (regularity, speed, comfort and design), which contribute to the **modest attractiveness of this mode**

*A paradigm shift is then needed.....*

## THE BUS SYSTEM OF THE FUTURE: EBSF, 3iBS and ZeUS

An opportunity to bring about such a radical change is represented by three research projects funded by the European Commission, with the aim to **develop a new generation of buses across Europe**

*Main case studies*

**EBSF (2008-2013)**  
THE reference for Bus System research in Europe

- Definition of EBSF System (Urban, suburban, rural)
- Development and test of innovations
- Open dialogue between urban bus transport stakeholders
- IT Standard Architecture development and test

**Innovative Bus Systems Roadmap**

Areas for further Innovation Research and Priorities

Developed within EBSF/ACT in 2011 (EBSF) - updated in 3iBS and ZeUS projects

Supported by key actors of bus services domain

Contributions and review by more than 100 bus stakeholders

**ROADMAP CHAPTERS**

- Bus system integration in new urban scenarios
- Mobility challenges of an ageing society
- EBSF ICT platform integration and standard adoption
- Sustainable Bus System
- Energy efficiency
- Environmental performances
- Electrification of bus systems
- Innovative vehicle technologies
- Comfort, accessibility, better driving style... Modularity

**3iBS (2012-2015)**  
Stimulate coordinated research on BS innovations

- Capitalise successful concepts & solutions
- Boost best practices through international exchanges
- Move from research to innovation
- accessibility, special events, intermodality, level of service, modularity, energy, IT

**ZeUS (2013-2017)**  
Bringing electrification to the heart of the bus network

- Expand the fully-electric solutions to the core of the bus network
- Facilitate the market uptake of electric buses
- Guidelines on "if, how and when" introduce eBus

For the three projects, the common task is two-pronged:

- to develop and test innovative solutions to **increase the attractiveness of this mode** and
- to **operate more environmentally friendly vehicles**



*Main areas for innovation tested in the projects*

**Comfort and design**

**Capacity**

**Smart driving**

**Energy management**

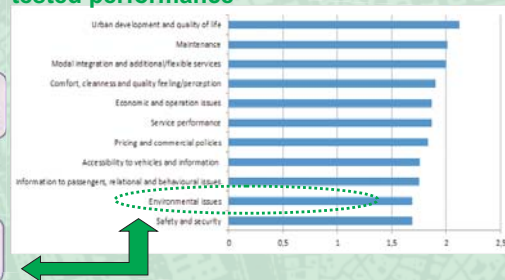
## METHODS AND RESULTS

EBSF, 3iBS and ZeUS are all based on demonstrators and the related performance assessed through **Key Performance Indicators (KPIs)**. The assessment is a before-and-during-the-implementation comparison of results, with KPIs measuring the performance variations at case study and cross-case, also fostered by additional activities, such as **modelling and surveys**.

For EBSF a **Transferability Exercise (TE)** was also performed, i.e the assessment of the tests results to outline the points of strength achieved by the best performance as drivers which can make each innovation worth to be transferred elsewhere in Europe

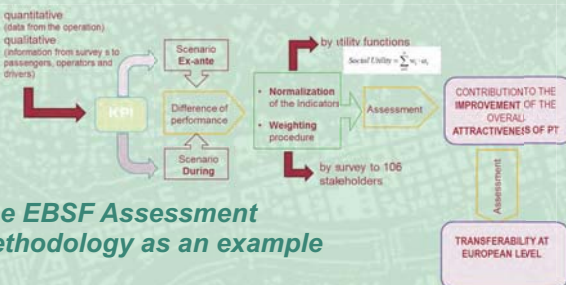
**The most "convincing" tested performance**

**Transferability Exercise performed by 20 European cities**



**Poor relevance of "Environmental issues": a lack of green awareness.....**  
innovative measures can be transferred, if rewarded by reduced fuel consumption, but in any case they do not have to increase operating costs.  
Energy consumption is considered just for its saving potentials.....

*The EBSF Assessment Methodology as an example*



**Surveys on Energy Efficiency** submitted to a panel of European companies

- Smaller companies seem to be more efficient than those with a higher energy balance
- The majority of fleets is doomed to obsolescence within a very short term, 60% being Euro I to III –compliant, and about 70% of companies stated their will to purchase (or have already purchased) either EEV or Euro VI vehicle, but...

- More than 90% of the buses in operation use standard propulsion systems (diesel, biodiesel, gas and biogas) and around 3% of them are hybrids
- More than 60% of the respondents is willing to change in favor of more hybrids and more fully electric with batteries
- 57% of the companies already produce energy from photovoltaic systems, partly to supply their own electric fleets, but not new installations or different systems are planned