



TIDE

Transport
Innovation
Deployment
for Europe

D 5.4 Research recommendations on urban transport innovation

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1 Introduction

1.1 About TIDE

The mission of the TIDE project (Transport Innovation Deployment in Europe, 2012-2015) is to enhance the broad transfer and take-up of innovative urban transport and mobility concepts throughout Europe, making a visible contribution to establish them as mainstream measures. The TIDE consortium¹ has identified fifteen new and feasible solutions to address key challenges of urban transport as energy efficiency, decarbonisation, demographic change, safety, access for all, and new economic/financial conditions. These have been categorised in five thematic clusters:

1. New pricing measures
2. Non-motorised transport
3. Advanced traffic management for traveller information systems
4. Electric mobility
5. Public transport organization

1.2 About the thematic clusters

Thematic cluster 1: New pricing measures

- Road user charging in urban areas
- Parking charge policies

The construction, maintenance and operation of an urban transport system can be a financial challenge for European cities. At the same time the existing pricing structures for different modes do not reflect the actual societal costs to individual users. This leads to unsustainable and inefficient use of existing services and infrastructure. There is an enormous potential for successful implementations of sustainable urban transport systems using new pricing mechanisms. Different innovative tax regimes, pay per use schemes, and pay for availability schemes throughout Europe can be considered to help transition cities towards more sustainable and efficient use of transportation systems.

¹ The TIDE consortium consists of POLIS (coordinator), Rupperecht Consult (technical coordinator), EURO CITIES, WSP Sweden; University of Southampton (TRG), Fraunhofer Institute, University of Gdansk; Wuppertal Institute, Reading Borough Council; City of Rotterdam, Donostia San-Sebastián Municipality; Centre of Budapest Transport and Milan City Council.



Thematic cluster 2: Non-motorised transport

- Bicycle parking schemes
- Creating people friendly streets and public spaces
- Fast cycling lanes

Currently, cycling is experiencing a new boom in many cities. Measures to enhance the walkability of the cities are also getting more and more on the agenda. According to the World Health Organisation, 30-50% of car trips in Europe are done over shorter distances that could be covered on foot or by bicycle. Shifting at least parts of these trips to walking and cycling does not only offer a big potential for reducing congestion and air pollution in European cities, but also for providing additional health benefits through more physical exercise.

Thematic cluster 3: Advanced traffic management for traveller information systems

- Open access server for applications-based traveller information
- User friendly human machine interface (HMI) for traveller information (incl. elderly/ disabled)
- Advanced priority systems for public transport

On-line data on network and service conditions is collected from various sources and used to manage the network through a mixture of control and information provision. With the rapid demographic change happening in Europe, it is necessary to use a variety of approaches to provide information to different user groups in the most appropriate way. There are a number of innovative applications of traffic management to support traveller information across Europe. Training and guidance in this field will help many more cities in Europe to take up such innovative transport applications.

Thematic cluster 4: Electric mobility

- Clean city logistics
- Financing schemes for charging stations
- Inductive charging for public transport

The transport sector accounts for a major contribution to greenhouse gas emissions. In urban areas additional effects are increased level of noise emissions and particulate matter. The reduction and eventual phase out of conventionally-fuelled vehicles is a high priority on the political agenda. Many pilot projects have been initiated and field tests have successfully demonstrated the technology concept and laid the basis for larger scale implementation. The next step is to remove barriers like the perceived risk of implementation, financial uncertainties, or missing information on relevant technologies and stakeholders.



Thematic cluster 5: Public transport organization

- Creation of public transport management bodies for metropolitan areas
- Contracting of services focused on improvement of passenger satisfaction and efficiency
- Market research as optimization tool in public transport

A lot of different types of activities have been initiated with the aim to shift people from individual motorisation towards collective forms of transport. The potential of some of these activities lies in the improved organisation and more efficient utilisation of available resources. The organisation of public transport differs from country to country, e.g. scope of market structure, liberalisation or contracting. It is important that each scheme provides a framework for implementation of innovative concepts, thus improving public transport attractiveness and competitiveness.

1.3 About this document

This document is a compilation of research recommendations connected to the five thematic clusters. It outlines research topics, actions and formats that need to be addressed in future research programmes on the European level. Current research gaps on urban transport innovation are identified, targeting the European Commission in particular, but also other stakeholders (e.g. technology platforms such as ERTRAC and ERRAC, large research organisations, industry) that are active in transport and mobility research on the European level.

It should be noted that the recommendations are based on the thoughts and perceptions among experts and practitioners involved in this field of research. The results are therefore to be regarded as qualitative in their nature, since the collected data doesn't support a quantitative analysis.



2 Methodology

2.1 General

The needs of practitioners in European cities and regions have been a guiding principle in the project's approach in methodology, content and outreach:

- An on-line survey targeted a wide group of experts to obtain, among other things, details on the topic of future research needs and priorities.
- A two day workshop brought together a number of European experts on the five thematic clusters, as well as some generalists on urban transport innovation.

A review of the final documents was conducted by the five cluster support partners to go over and verify, as well as collect more detailed comments, on specific questions.

2.2 About the survey

The survey was distributed electronically to 97 individuals, of which 22 answered all the questions.

For each thematic cluster, as well as for urban transport and mobility in general, the respondents were presented with a number of topics/issues² and asked to state which ones they would rank as 1st, 2nd and 3rd most important. For the three areas chosen in each thematic cluster they were also asked what, according to their judgement, the current status of research achievements is. This was indicated using the following descriptive scale:

1. Need for more fundamental/theoretical research.
2. Sufficient level of fundamental understanding, but more applied research and technical development necessary.
3. Innovations are ready for market, but implementation processes have to be researched and better understood.
4. Sufficient knowledge about implementation potential, but more demonstrations are necessary for the market to take off.

There were also some questions concerning research on urban transport and mobility in general: what, in the experts' opinion, is the most important role for the European level and what organisational aspects they consider important to be successful on this arena.

² List generated by discussing potentially central issues with Cluster Support Partners.



2.3 About the expert workshop

One of two key purposes with the expert workshop was to address research questions and discuss/gather inputs on future research needs and priorities for the research agenda concerning transport and mobility.

Groups were formed for each of the five thematic clusters and the work was structured around three main questions:

- Which are the knowledge gaps that may hinder deployment?
- What research could fill those gaps?
- What institutional and organizational set-up would give the best conditions for successful research in these areas?

Each cluster was asked to prepare a workshop report summarising their discussions, including if possible a section with general conclusions as well.

The 24 experts who attended the workshop are listed in Annex 1.



3 Research on Urban Transport Innovation

For urban transport and mobility in general, funding of demonstration projects is deemed the most important role for research at the European level, followed by funding of applied research and technical development, as well as networking between researchers and policy makers.

Partnerships (ensuring close cooperation between theory and practice) and a multidisciplinary approach are identified as organisational aspects facilitating successful research on urban transport and mobility. Budget and scale are also perceived to be of importance.

The top research priorities for urban transport and mobility in general are deemed to be policy aspects and behavioural aspects, as well as governance and business models in urban transport.

An overall sentiment seems to be that we need to better understand travellers' priorities and decisions. One respondent expressed that "all money is wasted when behaviour does not change". Especially regarding "soft" transport measures (as opposed to new technology), it is important that we can convey the new options and how individuals can benefit personally from them. Visions building on such knowledge should be at the core when formulating future policies, as well as developing business models and governance structures.

3.1 New pricing measures³

The two measures in this cluster are road user charging in urban areas and parking charge policies. The topics/issues for consideration were:

- Equity aspects
- Acceptability
- Behavioural response
- Effects (traffic, environment, etc.)
- Charging technology
- Institutional and organisational issues
- Integrity issues
- Political science/decision making
- Hybrid schemes: combination of parking and RUC, LEZ and RUC etc.⁴

Highly prioritised in cluster 1 is research regarding behavioural response and acceptability, as well as hybrid schemes and political science/decision making.

³ The topic is currently covered in the STEER project Push&Pull (about parking) and through CIVITAS Collaborative Projects CIVITAS D@NAMO and CIVITAS 2MOVE2. The CIVITAS CAPITAL project is hosting an Advisory Group on the topic of demand management.

⁴ RUC = road user charging, LEZ = low emission zone

The topic of hybrid schemes (e.g. interaction between measures) stands out as being in need of more fundamental/theoretical research (status 1), while the research status regarding political science and decision making is perceived to be a 4, i.e. there is sufficient knowledge about implementation potential, but more demonstrations are necessary. More applied research is needed on behavioural response (status 2) and for acceptability implementation processes have to be researched and better understood (status 3).

The discussion during the workshop touched upon the following main knowledge gaps/research needs and organisational issues:

- Context dependency: how measures (like pricing, for instance) work in different local and regional contexts and how context dependent the impact of a measure is.
- Better understanding of the behavioural response to parking pricing, as well as getting to know the different components of the parking industry itself and how it works today.
- New technology possibilities make it interesting to evaluate cordon based pricing vs distance-based pricing, the latter of which is lacking in knowledge in the urban context.
- Large scale pilots are preferred when studying behavioural effects, in order to actually see the effects.
- Study the interaction between policy measures, how they work together, in order to understand the effects and formation of policy packages.
- Multidisciplinary research – that combines understanding of ITS (charging technology), traffic engineering (network effects), micro-economic theory (consumer behaviour and welfare), psychology (attitudes), sociology (acceptance) and political science (decision making) – is needed.
- Consider organisational and individual behaviour and how these interact.
- For pilots, there is a need for interested actors, a city or authority, and an interested technology provider.
- Broad co-operation to ensure new knowledge in multidisciplinary manners, but with limited number of partners to achieve more efficient use of funds/resources.



3.2 Non-motorised transport⁵

The three measures in this cluster are bicycle parking schemes, creating people friendly streets and public spaces, and fast cycling lanes. The topics/issues for consideration were:

- Business models/funding sources for cycle parking infrastructure
- ICT⁶ for cycle parking to improve security
- Automated cycle parking systems
- Quantification and data collection for walking
- Features to improve the quality of fast cycle lanes
- Behavioural effects of cycle measures

The behavioural effects of cycle measures, and quantification and data collection for walking, are top priorities for research within cluster 2.

Both of the high priority topics are generally judged to be of status 2, i.e. there is a sufficient level of fundamental understanding, but more applied research and technical development are necessary. Business models/funding sources for cycle parking infrastructure is also picked as a prioritised research topic, although there is no clear opinion as far as status is concerned – it ranges all over the scale.

The discussion during the workshop touched upon the following main knowledge gaps/research needs and organisational issues:

- There is a need for harmonised counting methods for cycling, including (but not limited to) size of measurement area, trip length vs. number of trips, counting all modes used in a trip chain (not just the main one), looking at both time and distance.
- There is limited knowledge as to the real life impact of cycling and walking measures, as opposed to modelling. The lack of information is especially evident with respect to pedestrians.
- Walking has the added challenge that, although most of us walk as part of our daily transport, there are very few groups that advocate for proper walking facilities, as they do for cycling.
- A full study of walking environment around public transport stations and

⁵ The H2020 2014 Mobility for Growth topic 5.3 – ‘tackling urban road congestion’ included a subtopic: Assessing how the role of walking and (safe) cycling in the urban modal split can be increased, for example through awareness raising activities, financial/tax incentives, allocation of infrastructure space, planning approaches/provisions, service concepts, intermodal links, and human-centered environments. The role of partnerships and the active involvement and commitment of public administrations require special attention. Recommendations, tools and guidance material could be developed and tested.”

⁶ Information and communication technology



stops would give information on what passengers (or potential passengers) need.

- Studying design standards across European facilities for bicycles, both moving and at rest, and looking into how to make the entire system safer.
- Finding out why people choose NOT to cycle and/or walk, connecting it to the relationship between non-motorised transport and health, air quality, quality of life, etc.
- Cycling is not perceived as being taken seriously as a mode of transport. As such, and with the exception of the Netherlands, Denmark and to some extent in Germany, it has not been properly counted in such a way that data are comparable over time or across borders.
- Cycling and walking could be included in household surveys, to get a representative sample and to reach both cyclists and non-cyclists.
- A European non-motorised transport expertise centre would provide an arena to gather the research needed.
- The distance between theory and practice needs to be bridged by developing strong communication channels between the institutions and local levels of government, where the actual “field work” takes place.

3.3 Advanced traffic management for traveller information systems⁷

The three measures in this cluster are open access server for applications-based traveller information, user friendly human machine interface (HMI) for traveller information (incl. elderly/ disabled), and advanced priority systems for public transport. The third measure was not taken forward within TIDE, therefore the topics/issues for consideration for the remaining two measures were:

- Standardisation of data format and architecture
- Data coverage (cross boundary issues)
- Role and responsibility of authorities
- Economic/business models
- Feedback mechanism (satisfaction/experience)
- Personalised application development (e.g. elderly)
- Fusion of data from different sources (e.g. guidance to blind person using Wi-Fi hot-spot location data)

In cluster 3, standardisation of data format and architecture stands out as being the most important research topic. Economic/business models, data coverage,

⁷ With regards to ongoing EU research, the OPTICITIES project can be mentioned. www.opticities.com. In current or recent calls for proposals in H2020 the network management angle is not appearing.



and the role and responsibility of authorities are also deemed important.

Among these, the topic connected to finance is judged to be in need of more demonstrations in order for the market to take off (status 4), while the other two are over all status 3 topics (innovations are ready for market, but implementation processes have to be researched and better understood). The perception of the research status on standardisation is divided.

The discussion during the workshop touched upon the following main knowledge gaps/research needs and organisational issues:

- Knowledge about the economic benefits of open data needs to be spread wider, so that public authorities are prepared to make necessary investments and to make private companies willing to share data.
- Different user surveys could be used to identify acceptability for giving away information from personal devices in return for e.g. more accurate journey time information.
- EU/national standards or data format is necessary to facilitate data collection from different sensors, as well as cross boundary information. However, privacy issues concerning personal data need to be thoroughly addressed.
- The data storage facilities needed for releasing a vast amount of data in an open data server can be a difficult issue to solve. Maybe there could be a two-tier data release mechanism, with filtered data in the open data server and the raw data available from the source.
- The emergence of autonomous vehicles capable of providing data in great detail is an opportunity as well as a challenge. There is ongoing work to bring out standard protocols for data sharing, but more research is needed in this field.
- Broad cooperation is needed, with e.g. universities and research organisations bringing out innovative and efficient systems of data collection and dissemination, while public authorities and consultancies address the practical aspects of field implementation of such systems.
- As the technologies are continuously evolving, continuous research is needed to adapt the measures based on the developments. Any changes made should be adopted at the EU/national level rather than confined within local areas.



3.4 Electric mobility⁸

The three measures in this cluster are clean city logistics, financing schemes for charging stations, and inductive charging for public transport. The topics/issues for consideration were:

- Business models for (public) charging infrastructure
- Interoperability of charging infrastructure
- Policy options for incentives/funding of charging infrastructure
- Standardisation of charging technology
- Standardisation of communication systems
- Demand orientated build-up of charging infrastructure

Practically all of the topics in cluster 4 have been deemed more or less a priority for research.

There is a slight differentiation regarding the research status of different topics. Interoperability, policy options and standardisation of charging technology/communication systems, are basically perceived as being ready for market but implementation processes have to be researched and better understood (status 3). Charging your vehicle means parking your vehicle. For demand orientated build-up of charging infrastructure, the parking conditions (location of parking spots, electrical connection, parking duration etc.) have to be known. This would reduce investment risks for cities and stakeholders and would eventually support for the market to take off (status 4). More fundamental/theoretical research is needed when it comes to business models (status 1).

The discussion during the workshop touched upon the following main knowledge gaps/research needs and organisational issues:

- The type of customers and the settlement structure determines the requirements for and organisation of electric vehicle (EV) charging infrastructure. In rural and suburban areas people can charge an EV at home, whereas in urban areas people are dependent on public charging infrastructure.
- There is a need for information on the effective margins of EV-infrastructure operators, in order to conduct serious evaluations and benchmarking of charging infrastructure.

⁸ The ongoing ZeEUS (electric bus) and FREVUE (electric freight) projects can be mentioned, as well as the recently started ELIPTIC project. With regards to procurement, the H2020-2015 Mobility for Growth 5.4 topic with regards to capacity building specifically about procurement, bankability, financing and business models comes into view. Also within the framework of the Connecting Europe Facility, the innovation topic allows for investment in electromobility infrastructure.



- Charging solutions (including experienced barriers and success factors) across Europe should be evaluated and benchmarked to find best practice.
- Information on the parking situation in general and the availability of EV infrastructure in particular in European cities is necessary to have. There are no reliable statistics regarding the parking of cars during the night. The overnight parking situation is a key precondition for the development of business models for public charging infrastructure.
- Developing more detailed market scenarios in 5 and 10 years' time regarding general societal and technological trends/changes and the share of electrified vehicles on the market.

3.5 Public transport organisation⁹

The three measures in this cluster are creation of public transport management bodies for metropolitan areas, contracting of services focused on improvement of passenger satisfaction and efficiency, and market research as optimisation tool in public transport. The topics/issues for consideration were:

- Legal background for metropolitan transport authorities
- Settlement schemes for metropolitan transport authorities
- Regular customer satisfaction surveys
- Automated collection of passenger feedback
- Including incentives into operator remuneration schemes

The top priorities for research in cluster 5 were deemed to be settlement schemes for metropolitan transport authorities and automated collection of passenger feedback. Another topic mentioned was including incentives into operator remuneration schemes.

Settlement schemes are judged to be of research status 3 (well-known implementation potential but more demonstrations necessary). The topic connected to passenger feedback is put at status 2 (researched and better understanding of implementation processes needed). Regarding operator incentives the status perceptions range all the way from 1 to 4.

The discussion during the workshop touched upon the following main knowledge

⁹ The EPTA project (www.eptaproject.eu) covered this issue. The EBSF2 project will – to a degree – further explore similar issues. (www.ebsf2.eu)



gaps/research needs and organisational issues:

- Holistic strategy that will lay down an integrated approach of public transport in Metropolitan areas. As public transport is above all a technical issue, it should be built taking into consideration other metropolitan plans (e.g. energy, waste and water management) and all different modes of transport. Before being adopted, such strategy should go under public scrutiny to ensure proper access to information and democratic participation.
- Transparency, which will take into account users' satisfaction, availability and reliability of data, and clear and accessible tendering conditions. In that regard, European guidelines would be welcomed. Monitoring, reporting and auditing are key aspects of future public transport developments.
- Use of social media and marketing tools to promote new trends in transport patterns. This should be further developed in order to ensure value for money applications (real-time information, surveys, transit routes) and users' interaction platforms while respecting privacy concerns and accessibility for all social class users.
- Technical issues that need to be researched further are data interoperability and efficiency, rewards in tendering procedures, new innovative public procurement.
- Political governance issues that need to be researched further are tendering transparency, role of ERA in identifying and disseminating good practices, impact of new PSO regulation over regional and local in-house operators.
- Communication issues that need to be researched further are steering open-data and big data in future digital infrastructure (smart cities), smart application for public transport combining all modes of transport.



4 Final comment

The five thematic clusters vary greatly in scope and focus, but on an overall level they mirror the top research priorities for urban transport and mobility in general quite well. The predominant sentiment seems to be that human aspects (e.g. behaviour, acceptance and passenger feed-back) are more critical research topics than the various technologies themselves, although further technical development is also needed in some areas. A better understanding of the human factors should be at the core of another task that is identified as important in virtually all clusters: to develop political decision making processes and business models further, in order to facilitate the implementation of different measures. A higher degree of harmonisation/standardisation would also aid in this endeavour.

There is no evident trend when it comes to maturity of the different thematic clusters. Judgements of the current status of research achievements concerning different topics cover the whole range from status 1 (needing more fundamental/theoretical research) to status 4 (there being sufficient knowledge about implementation potential, but more demonstrations are necessary for the market to take off).



Annex 1 – List of workshop participants

The recommendations and general conclusions are largely based on the discussions and conclusions of a workshop held at the TIDE Expert group meeting in Brussels in February 2015.

The focus of the workshop was to discuss the deployment of innovative measures in urban transport, i.e. how to ‘make it happen’ as well as research priorities and how to foster new knowledge. Discussions covered content as well as aspects relating to process and organisation.

The workshop had plenary sessions combined with break-out sessions where the participants were divided into thematic groups.

	Thematic cluster
Karen Anderton, University of Oxford	1
Greg Archer, Transport and Environment	4
Yannik Bosse, Polis	3
Karin Brundell-Freij, WSP	1
Akos Burghardt, BKK Budapest	5
Andrej Cacilo, Fraunhofer Institute	4
Dr Ernest Czermanski, University of Gdansk	5
Fermi Echarte, City of Donostia/San Sebastian	2
Bonnie Fenton, Rupprecht Consult	2
Michael Forss, WSP	1
Joel Franklin, Royal Institute of Technology	1
Lyndon George, Reading Borough Council	3
Bernard Gyergyay, Rupprecht Consult	2
Michael Haag, Fraunhofer Institute	4
Hanna Hüging, Wuppertal Institute	1 (day 1) 4 (day 2)
Imre Keresu, VUB	5
Ivo Cré, Nicolas Hauw Polis	5
Melanie Leroy, Eurocities	2
Rob McDonald, Reading Borough Council	3
Berthus Postma, Rotterdam City Council	4
Stephanie Priou, UITP	5
Birendra Shrestha, University of Southampton	3
Benedicte Swennen, European Cyclists’ Federation	2
Anthony van de Ven, Brainport Eindhoven	4
Dr Marcin Wolek, University of Gdansk	5