COOPERATIVE SYSTEMS IN URBAN MOBILITY

Cooperative systems are systems by which a vehicle communicates wirelessly with another vehicle (V2V – vehicle-to-vehicle communication) or with roadside infrastructure (V2I – vehicle-to-infrastructure communication or I2V – infrastructure to vehicle communication) with the ultimate aim of achieving benefits for many areas of traffic management and road safety. In an increasingly mobile-centric society, the potential role of nomadic devices in cooperative systems should also be highlighted. This means travellers – independent of vehicles – can make use of cooperative services, for example with real-time information on public transport.

Cooperative systems may support the management of urban transport systems in many ways. A significant potential benefit of cooperative systems for a local authority is the quality and quantity of real-time traffic data gathered from equipped vehicles. Other promised benefits of the technology include: improved management and control of the road network; increased efficiency of public transport systems; reduced emissions; improved traffic safety for all road users; reduced congestion, and better and more efficient response to hazards and incidents. It is generally agreed amongst local authorities that cooperative systems can bring benefits in key policy areas if deployed following local policy objectives.

Many stakeholders from car manufacturers and ITS solution suppliers to the European Commission, are working towards deployment of cooperative systems: with large European research and development projects such as CVIS and SAFESPOT, pilots such as FREILOT and field operational tests (FOTs), as well as explicit mention in the ITS Action Plan (Action Area 4 – "Integration of the vehicle into the transport infrastructure"). Some Member States are also gearing up for cooperative systems, with the notable frontrunner being the Netherlands which has developed a national roadmap for deployment. Despite this push, deployment may be hindered if urban and regional authorities are not more actively engaged in the process.

Local authorities are important in the deployment of cooperative systems

Local authorities have an important role to play in cooperative systems deployment in equipping streets with roadside units (RSUs) and paying the associated costs of installation, operation and maintenance. Cooperative systems will not be able to fully deliver with just V2V communication, and RSUs are essential to the functioning of cooperative V2I and I2V systems for any type of application, be it an application to ease the journey experience of the car driver (eg information about road conditions or parking restrictions) or one to aid the traffic control centre in managing an incident (eg dynamic re-routing). It should be noted that the cooperative roadside units are not the same as the units already in existence for systems such as variable message signs, traffic control or parking guidance (although these could possibly be upgraded to be used by cooperative systems).

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European research and development efforts on cooperative systems to date have tended to focus on developing and testing applications to make car driving more efficient and safe with insufficient consideration of the urban transport policy dimension. Traffic efficiency and road safety are undoubtedly key transport objectives for any local authority but the policy objectives extend to all transport modes and all road users, including public transport users, cyclists and pedestrians. Applications to support sustainable transport – the overriding goal of any urban transport policy – have not been addressed sufficiently so far.

It must be clarified how cooperative systems contribute to urban transport policy objectives, an important prerequisite for any ITS investment.

Cities looking for tools to achieve efficient movement of people and goods

The efficient movement of people and goods is crucial for economic vitality and quality of life in cities. For many cities, experience has shown that private cars are not the most efficient mode in terms of moving a high number of people smoothly through dense urban areas and therefore measures are being taken to encourage modal shift. In many large European cities, the majority of trips are undertaken by public transport, bicycle or on foot (see figure 1).
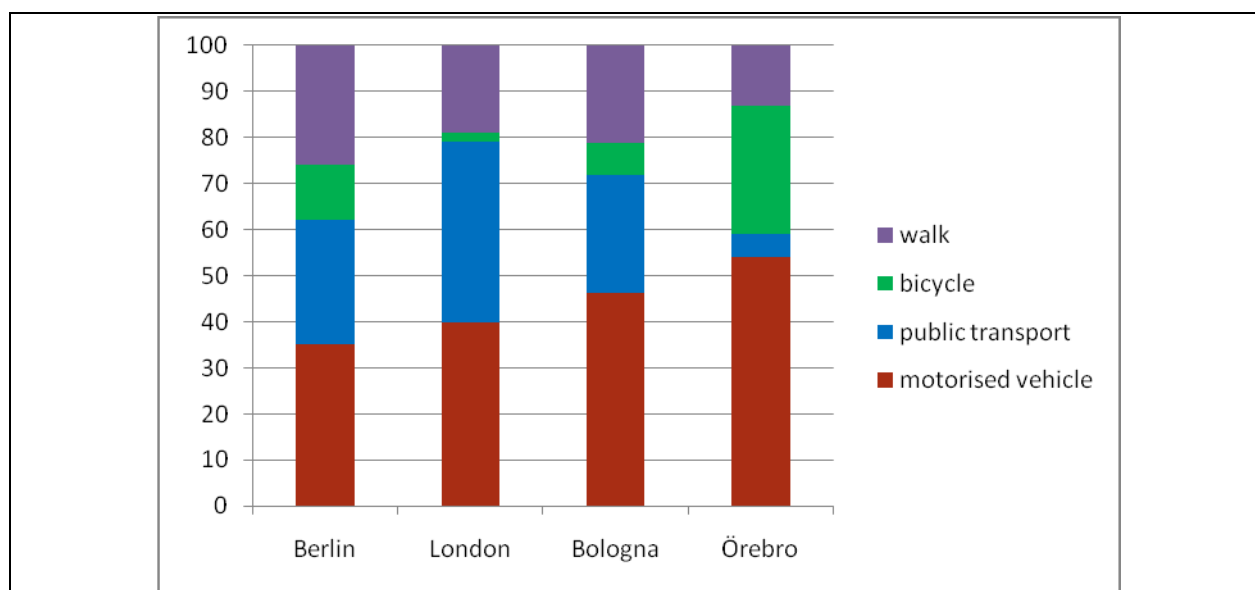
Figure 1
'Motorised vehicle' includes two-wheeled vehicles which is high for example in Bologna (10.6%). Mode share split shows split of total trips. The sources and dates are:
Berlin: Senate Department for Transport and Urban Development, 2006.
London: London Travel Report, TfL, 2007.
Bologna: Urban Mobility Department of Bologna, 2006.
Örebro: Örebro kommun, 2004.
Additionally, modal split statistics for commuting trips in a number of European cities can be found in: Perception Survey on Quality of Life in European Cities. Analytical Report. Conducted by The Gallup Organisation, Hungary upon the request of Directorate General for Regional Policy. 2009.
http://ec.europa.eu/public_opinion/flash/fl_277_en.pdf *(p65)*

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Cities are looking for tools that can assist them in achieving their transport policy goals which include reducing private car dependency while maintaining an accessible city for all.

Next to the aim of efficient movement, other urban transport policy goals include:

- improving the safety of all road users ;
- reducing local transport emissions (air pollutants, noise);
- reducing the transport impact on climate change;
- ensuring a smooth functioning of freight operations in the city;
- good accessibility for all;
- implementation of sustainable cost-effective measures.

Concerns and barriers for local authorities towards deployment

For local authorities to engage in cooperative systems deployment, the business case must be spelled out and must be part of the existing policy framework. Cooperative systems promise benefits, but these are to be proven since the technology is under development, and the results of large-scale field operational tests are some years away. Demonstrations of the benefits of cooperative systems are expected by cities to answer their concerns with regard to deployment decisions.

Furthermore, other means to tackle the same objectives can offer very good results. In some cases, alternative measures could be very successful and more cost-effective, such as route guidance/diversion, parking regulations or other measures to promote modal shift from cars and reduce the environmental impact of transport while also perhaps providing increased health benefits (by promoting cycling and walking). It should be explored how they could be usefully supported by cooperative systems in the future.

One problem many cities perceive with cooperative systems up till now is that most suggested applications concentrate on the private car (and to a lesser extent on freight transport), but without enough consideration for public transport and non-motorised modes. It should also be highlighted that some promised benefits (improved network management, reduced emissions, improved efficiency of public transport systems, etc.) will be very difficult to deliver on oversaturated urban networks.

Next to this, the investment costs could make it difficult for local authorities to make the step towards implementing cooperative systems. At this stage, the financial implications remain unclear and this slows down the discussion process.

Other concerns or barriers for local authorities include:

- **Legacy and integration issues**

  It is unclear how cooperative systems can be integrated with legacy systems and investments already made. How can the transition from legacy systems to cooperative systems be done smoothly? What are the implications from a technical and financial perspective?

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- **Uncertainty of market penetration rates**

  Benefits will only be felt provided enough vehicles are equipped and RSUs are installed. A local authority may choose not to invest in RSUs if they cannot reap the benefits of the investment because not enough vehicles are equipped with the requisite technology.

- **Legal and liability issues**

  The legal competences of local authorities in road and network management are part of a well-defined legal framework. It is clear which responsibilities the road authority has over which part of the network, and for which failures in the system they are accountable. Local authorities need a clear picture of how cooperative systems will affect their liability structure. If something does go wrong, who is to blame? The prospect of cooperative systems delegating the responsibility of the driver to the system does not sit comfortably with public authorities.

- **Standardisation**

  Local authorities need clear standards for cooperative systems to ensure that any investment taken is future-proof. Standards are being developed, but still have some way to go before industry-wide standards are in place.

- **Complex stakeholder interaction**

  One of the challenges with deploying cooperative systems is that of multi-stakeholder cooperation. Many stakeholders (local authorities, national and regional road authorities, car manufacturers, travellers, road operators, telecommunications companies, fleet operators etc) need to work together in order to get cooperative systems off the ground, and these stakeholders may often have conflicting aims and objectives with regards to deployment. Local authorities need to be assured that other stakeholders contribute their share in deployment if they are expected to invest in cooperative infrastructure.

- **User acceptance**

  Since many stakeholders need to be involved in the deployment of cooperative systems, the issue of user acceptance must be better understood. This also relates to data privacy: cooperative systems require the transfer of location data that can be considered as personal data, and this is both a security issue, as well as a user acceptance issue. Clear rules and procedures to handle these issues need to be in place for local authorities to deploy cooperative systems on a large scale.

- **Data management**

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There are obvious benefits from floating vehicle data, but the added benefits will create additional challenges for the management of extensive real-time data for network management and traffic and travel information.

Conclusions

For an accelerated deployment of cooperative systems, local authorities have an important role to play in particular with regards to installing and maintaining roadside infrastructure integral to the functioning of cooperative systems technology.

More local authorities will be interested in deploying cooperative systems if they offer significant benefits in achieving existing policy goals. Overall, this means the efficient and collective movement of people and goods – independent of the transport mode.

For this reason, their views and policy goals must be better taken into account. In order to accelerate deployment, local policy objectives must be integrated into deployment plans, to provide rationale for local authorities in deploying the technology.

There are many legal and technical issues that still need to be solved. From a local authority perspective, especially the technical and financial implications of moving from current systems to cooperative systems need to be clarified.

Recommendations for an accelerated deployment of cooperative systems

- Develop applications of relevance to local authority policy objectives; particularly with regards to public transport, and non-motorised road users.

- Ensure proper evaluation of benefits, especially at urban level.

- Develop deployment scenarios for local authorities showing (amongst other things) how to move in a cost-effective way from existing systems to cooperative systems.

- Strengthen the role of cities in all development and testing activities, including large scale and complex field operational tests (FOTs) to make sure local policy objectives are taken into account both in the applications developed and in the evaluation. Do not underestimate the relevance of direct involvement of local authorities in testing for dissemination of benefits of cooperative systems to other cities in Europe.

- Develop good business models for local authorities.

Polis is a network of European cities and regions from across Europe, which promotes, supports and advocates innovation in transport.

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