Evaluating the impact of ITS in urban areas

*Issue 5 — November 2011*

# CONDUITS goes on

Welcome to the fifth CONDUITS newsletter, which is also the first newsletter of the CONDUITS follow up activity. CONDUITS was a European project running from May 2009 until June 2011. However, the work of CONDUITS is being taken forward by some committed partners thanks to the sponsorship of the Austrian company Kapsch. The partners will be developing further the main output of the CONDUITS project, which was a set of Key Peformance Indicators for urban ITS and traffic management. In this newsletter, you will read about the development process (a KPIs prediction module), the main case study for this development process (pollution reduction gained through public transport priority in Brussels) and the main results from the KPI application process within the original CONDUITS project. As coordinator of this follow up activity, Polis has great expectations from this initiative and will do its utmost to promote the prediction tool developed widely among local authorities, the European institutions and the ITS industry generally. Alongside Polis and Kapsch, the partners are Technion, Imperial College London, Technical University of Munich and ISIS.

### A word from the European Commission

I am delighted to support the further development of the CONDUITS (Coordination Of Network Descriptors for Urban Intelligent Transport Systems) FP7 project. Developing tools to help quantify the impacts of ITS in urban areas is an important activity as the low level of knowledge on ITS impacts and benefits in relation to urban transport policy is often cited as one of the barriers to ITS deployment in cities. It is also very pleasing for me, as the former CONDUITS Project Officer, to see the results of a European project be taken up and developed further. I look forward to learning more about the new activities and wish the CONDUITS development partners every success.

Patrick Mercier-Handisyde
Head of the Urban Mobility Sector, DG Research & Innovation
European Commission

# CONDUITS achievements

The CONDUITS project was successfully concluded in June 2011 by achieving its primary objective, which was the definition of a new performance evaluation framework for urban traffic management and ITS. Key Performance Indicators (KPIs) were developed for four strategic themes of urban traffic management (traffic efficiency; traffic safety; pollution reduction; and social inclusion), with each theme consisting of individual subthemes (e.g. mobility, reliability, operational efficiency and system condition as part of traffic efficiency). Operative definitions of the KPIs, along with detailed guidance on their use, were provided in a comprehensive reference document (D3.5). The KPIs were subsequently validated with the help of a number of case studies in four European cities (Paris, Rome, Tel Aviv and Munich), each assessing a different aspect of urban traffic management applications.

Two case studies were examined in the city of Paris: the implementation of systems granting priority to buses at signalised junctions on three bus lines (26, 91 and 96), and the construction of a new tram line (T3) on the “Boulevard des Maréchaux Sud” corridor. For both case studies, a before- and after-analysis was carried out in order to quantify the impacts of the two schemes in terms of mobility and traffic accidents. Using the appropriate KPIs fed by data from the city, it was found that the bus priority scheme resulted in clearly better public transport mobility for the three bus lines (lower travel times) and in marginally lower private transport mobility on the corresponding road stretches, thus indicating an improved overall mobility on the affected network parts.

Similar results were obtained for the tram scheme, with improved overall mobility being recorded. As concerns the accidents assessment, it appeared that the bus priority measures were accompanied by a clear reduction in the casualty rate of deaths and slight injuries, but by a marginal increase in the rate of serious injuries, mainly involving pedestrians and cycles. The overall accidents rate, however, appeared to remain constant. A similar trend was observed in the casualty rates of the tram scheme.

A different approach was adopted in the case study of the city of Rome, where a large-scale performance evaluation of the various techniques and ITS technologies that have been implemented within the framework of the Mobility Control Centre was conducted. Using travel times between representative zones throughout the city of Rome, defined as the area lying inside the “Grande Raccordo Anulare” (GRA) orbital motorway, as well as congestion occurrence and duration data, a general performance assessment was carried out in terms of mobility and reliability. The underlying conclusion of the former was that, as expected, private transport mobility was better than public transport mobility, with index values ranging at similar levels to the Paris case study. In the case

of the latter, the city of Rome was found to have a very high reliability index, with very few congestion occurrences as a whole. This, however, may be attributed to the fact that the potentially unreliable and congested peak hours were compensated by the long uncongested off-peak (night time) hours, highlighting the need for a time-based reliability performance evaluation of the transport network.

The reliability performance of the introduction of advanced traffic signalling strategies was evaluated in the Tel Aviv case study. Using congestion occurrence and duration data from the Ha'Shalom Expressway, it was found that the new signal programmes resulted in significantly improved reliability, additionally supported by travellers' perceptions. Nevertheless, it was found through continuous monitoring that the index value had a decreasing tendency, becoming stable within a year following the implementation of the scheme.

A safety performance evaluation was, finally, conducted in a case study in the city of Munich, where the so-called direct safety impact of the installation of speed feedback dynamic message signs for a certain test period was measured through an appropriate KPI. It was found that the introduction of the signs resulted in a reduced speed warnings per vehicle value compared to before, indicating an improvement in safety during the test period. However, the value returned to its previous level after the removal of the signs.

From the case studies, it was concluded that the KPIs are easy to apply and require already available data, thus forming a very useful evaluation tool for assisting decision makers in the field of urban traffic management and ITS.

## Development needs evaluation

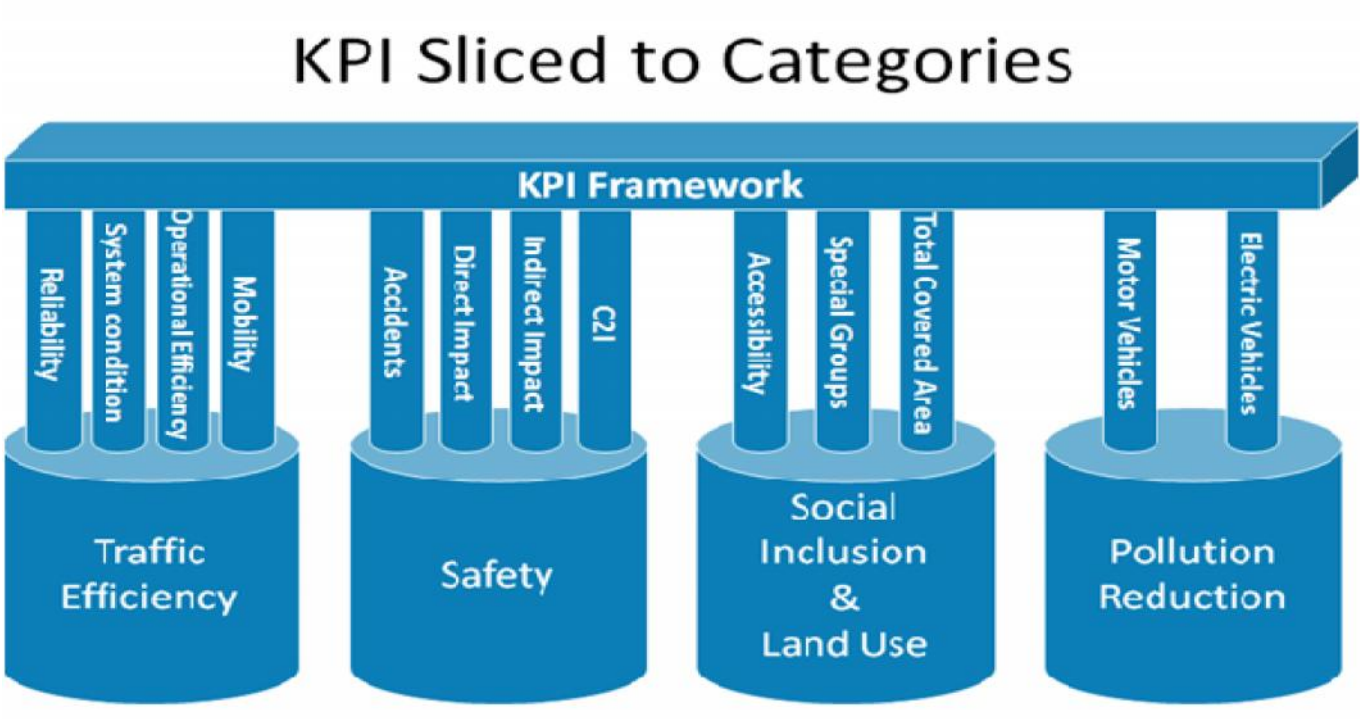
Much has already being said about the benefits of Intelligent Transport Systems (ITS). And it is true; ITS have great potential to make mobility safer, more efficient and cleaner. Nevertheless, the evaluation of these applications is a rather new – but very important – process for the design and development of next generation's ITS solutions.

As an internationally operating ITS service provider, we develop, integrate, implement, maintain and operate innovative traffic telematics solutions for sustainable mobility. We pursue our objective of creating and ensuring competitive advantages and benefits for our customers and partners without relinquishing our responsibility towards the environment.

We as Kapsch TrafficCom are, therefore, more than happy to have the opportunity to continue the partnership in the CONDUITS project which was originally funded under the Transport Programme of the EU´s FP 7. Together with a highly motivated and qualified team from research institutions from all over Europe and with the excellent support of the POLIS Network, we will continue to work together on the development of a new city & environment & mobility tool which will give us the possibility to evaluate ITS applications in terms of their impact on emissions and air pollution in cities.

Ongoing evaluation and development of ITS and necessary tools will bring us one step ahead to service and satisfy road users as well as convince decision makers of the benefits of ITS.

**Josef A. Czako, Vice-President**
**International Business Development**
**Kapsch TrafficCom AG**



# CONDUITS next steps

## KPIs Calculation Tool Development

The use of standard and aggregated KPIs, like those developed within CONDUITS, is an effective tool for two types of processes:

- **Decision making process prior to the deployment of an ITS project** - Decision makers are mostly interested in knowing what are the expected benefits from the considered ITS measure, prior to its deployment. In other words, better decision making requires reliable predictive KPIs.
- **Ex- antefacto/ex-postfacto analysis of the implementation of an ITS project** – After the initial deployment, decision makers are interested in quantifying the effectiveness of the implementation of an ITS project with respect to its initial goals, based on ex- antefacto and ex-postfacto data. Calculation of the KPIs provides this feature.

The two types of decision making processes were considered when selecting the next step for implementing the KPIs. As effective implementation of KPIs relies on extensive data collection, the benefit of integrating the KPIs with transportation-related modelling software is twofold:

1. The use of transportation-related modelling software is common practice in pre-deployment decision making process, and integration of the KPIs with such a model can yield predictive KPIs.
2. Transportation-related modelling software provides various types of data which can enrich the aspects aggregated into the KPIs without the need for costly deployment.

One of the most common transportation-related modelling software applied for pre-deployment analysis is micro-simulation. This tool shows the likely impacts of ITS measures on mobility patterns. The mobility patterns in the network, along with the physical and energy characteristics of the vehicle fleet, are a fundamental element in the evaluation of traffic- generated emissions. This data can serve as the required input for a predictive pollution reduction KPI.

During the next year the pollution related KPIs will be evaluated by developing a tool which will utilise data retrieved from the VISSIM micro-simulation package and available emissions model. The components of this expected tool and the flow of information between the components are described in Figure 1.

### Brussels and CONDUITS

When presenting new ITS applications to decision makers, it is often difficult to quantify the benefits of these new systems. It may be reasonably easy to explain how these new systems will help to resolve a particular problem; however, it is far more difficult to evaluate the hoped-for gains and even more difficult to compare the effects of the different ITS technologies which may be used to address the same problem.

It is for this reason that the Brussels Capital Region decided to join the European project CONDUITS. The main aim of this project was to establish a coherent set of key performance indicators enabling the impacts of urban ITS applications to be quantified in terms of traffic efficiency, road safety, social inclusion and land use, and pollution reduction.

CONDUITS has finished and the first calculations of these indicators in Paris, Rome, Tel Aviv and Munich were presented during the final project event in Brussels on 22 June.

Thanks to sponsorship from the Austrian company Kapsch, the CONDUITS KPIs are now being developed further. It seems that the most effective way to enable users to apply these indices would be at the preliminary study phase involving modelling software. It has therefore been decided to develop a calculation model for performance indicators based on the VISSIM modelling software because this model is widely used in Europe. This first development will be undertaken for pollution reduction indicators due to the pressing needs in this field.

The Brussels Capital Region has volunteered to take part in a real modelling-based study. The pollution reduction impacts calculation module developed by project partners will be used to directly calculate the key performance indicators on the basis of ex-ante and ex-post results coming out of the VISSIM model. It will be based on a real case study focusing on public transport priority. As soon as the module is validated, it will be tested in other cities.

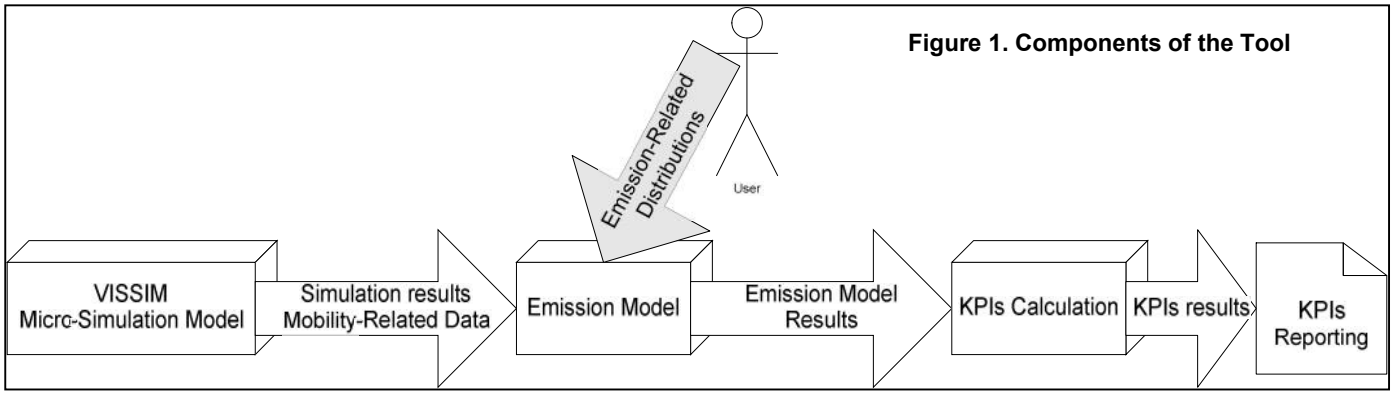



**Figure 1. Components of the Tool**

The first step of implementation is a part of a greater plan, which considers basing the KPIs data sources on real-life transportation data bases as well as transportation modelling packages as described in Figure 2.

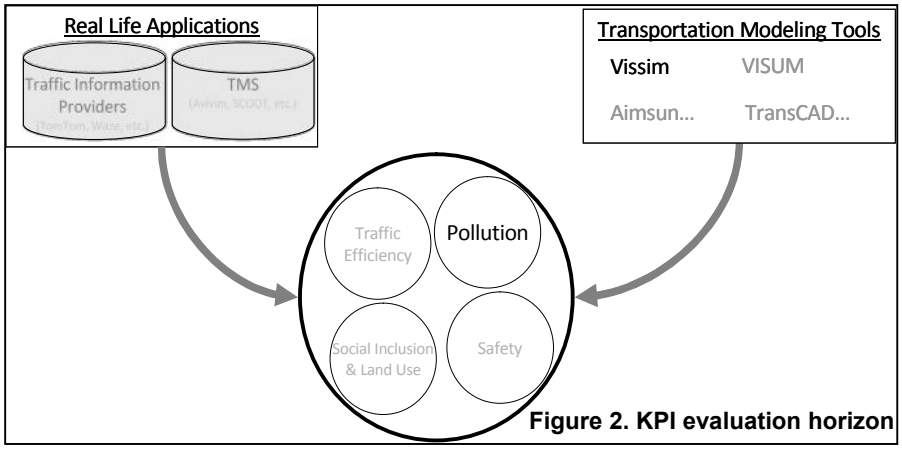


**Figure 2. KPI evaluation horizon**

The development of the tool is financed courtesy of KAPSCH which along with POLIS is to form the project management. The development of the tool will be conducted by the development team. The user group, composed of Brussels, which will supply the case study, and two other cities are to serve as the reference group. ISIS will play an advisory role. The main role of the user group is to affirm the ability for other cities to use the tool by itself. The relationship between the development team and the user group are described further in figure 4.

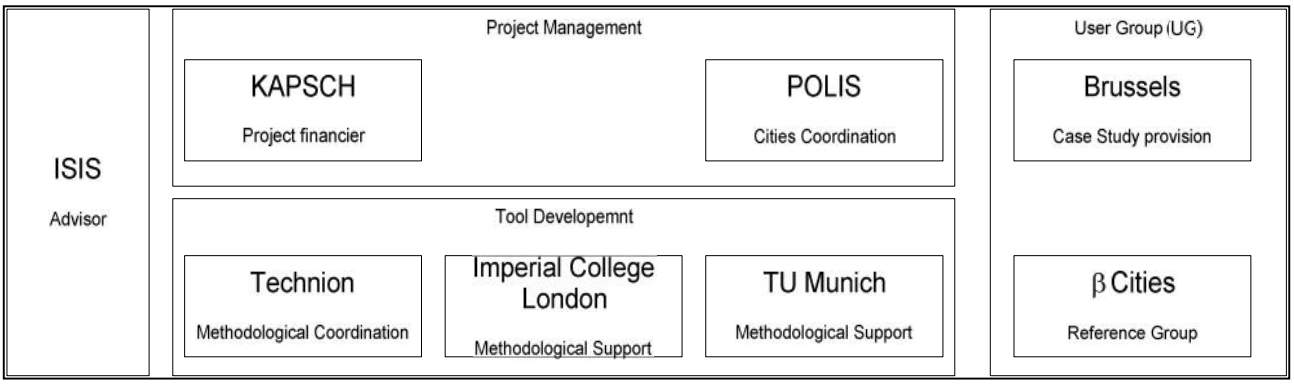


**Figure 3. Organisational Structure**

The tool will be developed based on a specific case-study of the city of Brussels. The inclusion of the reference cities in the user-group ensures the applicability of the model in other areas. After the development process is completed, the reference cities will be invited to apply the model as a b-testing-team to verify its applicability.

By adopting the CONDUITS developed pollution KPIs, the tool will allow cities to impartially evaluate the contribution of ITS to the quality of life in their cities as well as to benchmark their own performance. With the contribution of the reference group, cities will be able to do so by using the tool independently.

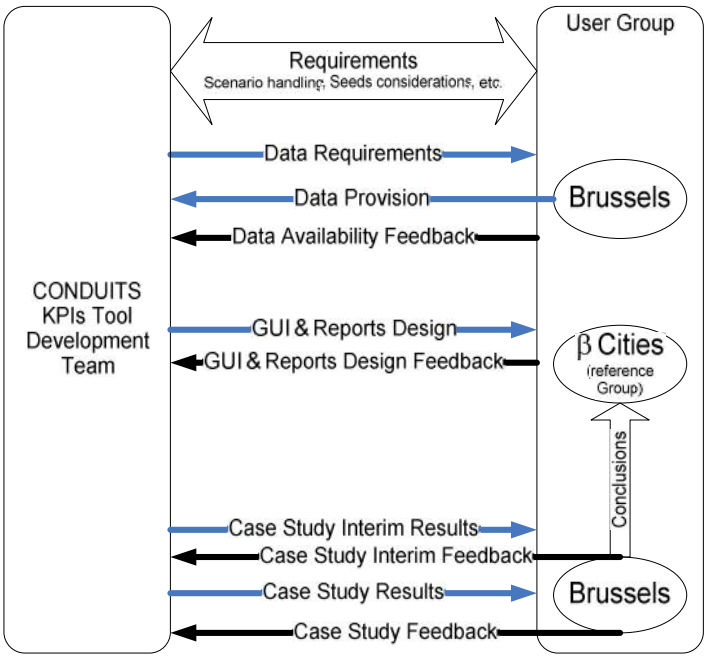


**Figure 4. Development Team-User Group relationship**

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