c o n d u i t s

Evaluating the impact of ITS in urban areas

Issue 7 – March 2013

Mainstreaming CONDUITS_DST in traffic management decision making in Brussels

Brussels was a partner in the FP7 CONDUITS project which saw the definition of a KPI framework for assessing the performance of traffic management measures and ITS applications against the range of transport policy objectives.

Brussels was heavily involved in the first phase of CONDUITS-DST (the project) as a case study for the pollution KPI prediction tool (CONDUITS_DST) which was built by Technion with support from TUM and CUL More information on the findings of this case study, particularly the sensitivity analysis can be found on page 3.

Brussels will continue to play an active role in next phase of CONDUITS-DST which will see the extension of the prediction tool to traffic efficiency and road safety.

Why, you may ask.

Well, **Brussels believes there is a strong need for tools to aid decision making on ITS applications and traffic management**. 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.

The Brussels Capital Region has now decided systematically to use the CONDUITS approach in making decisions on new ITS traffic management deployments and the selection of modelling scenarios. It already uses VISSIM microscopic simulation software for modelling traffic flows. It is currently installing, in its Brussels Strategy Department and Mobility Centre array, two additional software programs: VISUM (for traffic analysis and forecasts); and also OPTIMA (for accurately predicting road congestion).

A later step will be to introduce a CONDUITS_DST integrated tool (comprising the KPIs of pollution reduction, traffic reliability and possibly road safety) into all three programmes in an integrated manner, rather than separately in each case. All will then work together in a closely coordinated way.

The first applications that Brussels is considering are:

- VISSIM: to use CONDUITS_DST for individual modelling scenarios to allow the final decision maker to take a decision in the light of the predicted effects on traffic, pollution, safety (and, later. land use).
- VISUM: whenever a major street is being redesigned, the effect on cyclists will be investigated. If this is likely to be negative, the scenario will be rejected.
- OPTIMA: when the region has to decide on the planning of alternative routes, following eg tunnel closures, road works or major incidents, the system will indicate the best alternative in the light of the relevant CONDUITS KPIs. If, for example, the region is experiencing a pollution peak, the pollution KPI will be the main factor taken into account. The initial phase will cover routine planned tunnel closures.

The need for decision support tools is gaining ground in Europe at all levels of government. CONDUITS_DST is a very useful tool for Brussels. What is more, it is free of charge! Cities and regions are encouraged to try it!

Why is Polis supporting CONDUITS?

Polis is promoting the use of the CONDUITS tools because it firmly believes that a more structured and harmonised approach to predicting and assessing the impacts of ITS is of utmost importance.

For transport authorities, ITS is a tool to support policy objectives. ITS is key to enabling measures such as bus priority at traffic lights or real-time travel information to be implemented. What is lacking is a clear understanding of the impact of such measures across the transport policy spectrum. Transport policy has multiple goals: efficiency, environment, safety, inclusion. Flexible and scalable tools are therefore needed to assess ITS impacts in a neutral way in terms of performance as well as secondary impacts.

The process of developing the CONDUITS KPIs and subsequent CONDUITS_DST has been driven by cities. The tools themselves have therefore been designed to be easily used by, and integrated into the working processes of local authorities. The ease-of-use and usefulness of the tools have been proven by the various case studies conducted for the KPIs (Paris, Rome, Tel Aviv, Munich and Ingolstadt) and for CONDUITS_DST (Brussels).

The tools themselves are free of charge!

If you wish to know more about the CONDUITS tools, email shoadley@polisnetwork or join the CONDUITS City Pool meeting in Dublin on 4 June 2013.

CONDUITS_DST: A predictive impact assessment tool for urban traffic management and ITS

In the original EC-funded CONDUITS project, which was concluded in 2011, the CONDUITS performance evaluation framework for urban traffic management and ITS was developed, consisting of a set of Key Performance Indicators (KPIs) covering the strategic themes of traffic efficiency, pollution, safety, social inclusion, and land use. Through application in case studies of four European cities, it was concluded that the CONDUITS KPIs are simple and flexible, and only require already available data collected from real-life measurements or models. This makes them a very useful asset, allowing decision-makers to both evaluate the performance of already deployed solutions, and predict the impacts of future ones.

Following on from the original CONDUITS project, the extension of the CONDUITS methodology to a novel decision support tool began in 2012 under the Kapsch-sponsored CONDUITS-DST project, with a long-term vision of being able to provide robust and versatile assistance for strategic and operational decision-making. With an ever growing need for making the "correct" and most efficient investments, amplified by the current economic climate, the development of a strategic decision support tool, using the CONDUITS KPIs in a predictive manner by drawing upon the outputs of microsimulation modelling, was deemed invaluable. It is this motivation that gave birth to CONDUITS_DST software, in which the KPIs are implemented and coupled with the well-established and widely-used PTV VISSIM microsimulation package.

Microsimulation is often used to compare different alternatives in a short- to medium-term analysis, and is typically structured around the strategic themes that are of concern, namely: pollution, traffic efficiency, and safety. It is according to this concept that the development of CONDUITS_DST has been divided into three stages, each covering the development of the pollution, traffic efficiency and safety KPI calculation modules, respectively. The first year of the project featured the completion of the first stage, which resulted in an operational version of CONDUITS_DST implementing the pollution KPI. The tool was also validated using a real-world case study from the city of Brussels, and the results were presented at the 19th ITS World Congress in Vienna in October 2012 and the Annual Polis Conference in Perugia in November 2012.

A few months into the second year of the CONDUITS-DST project, work is in progress with respect to the second development stage, which will culminate in the release of Version 2 of CONDUITS_DST. Specifically, the tool is currently being extended to include a module enabling the calculation of the two CONDUITS KPIs for traffic efficiency, namely mobility and reliability, and with the main bulk of the development work now having been completed; the module is presently undergoing beta testing. In addition, Version 2 features a brand new user interface, introducing a range of new functions, such as a user-friendly map display and a more customised KPI calculation process, allowing for the user's preferences and priorities to be better reflected through the more comprehensive setting and calibration of relevant parameters.

It is planned to conduct a case study later this year in order to validate the new module, and also to start with the next stage of the project, which will explore the feasibility of the integration of the safety KPIs in CONDUITS_DST. Initial results will be presented at the CONDUITS City Pool meeting in June 2013 in Dublin.

A word from Kapsch

It's nothing new that mobility of people and goods is the key to economic and social development; mobility integrates states, regions and local communities. But we have to face many challenges such as congested roads, negative environmental impacts, lack of financial resources, lack of road safety, etc. Today's and future ITS solutions could contribute significantly to improving the efficiency of mobility and quality of life.

Political leaders and decision makers recognise more and more the important of ITS addressing the above mentioned challenges. At the ITS World Congress held in Vienna last year, the International Road Federation launched the "IRF Vienna Manifesto on ITS – Smart Transport Policies for Sustainable Mobility". The Manifesto advocates six key policy recommendations for political leaders:

⇒ Incorporate ITS in Existing Transport policies
⇒ Enhance ITS Partnership and Collaboration
⇒ Encourage Sustainable Mobility Behaviour
⇒ Plan for ITS Deployment
⇒ Promote ITS Harmonisation and Standardisation
⇒ Stimulate ITS Education

As a next step the IRF will follow up with a deep analysis and exploration of Key Performance Indicators for ITS. KPIs as a basis for decision support tools contribute to better-informed investments in both, urban and interurban traffic management solutions, and in knowing the expected benefits and impacts of ITS solutions.

This development shows that not only public authorities and associations like POLIS representing cities and regions are interested in KPIs and tools helping, prior to the deployment of ITS, decision making but also foundations representing the private industry sector like IRF realize the necessity of these factors for a sustainable deployment of ITS.

Josef Czako,
Vice President International Business Development
Kapsch TrafficCom

Update on Brussels case study - the CONDUITS_DST sensitivity analysis

A basic aim of the CONDUITS_DST activities was to verify the usability of the decision-support-tool tool by evaluating the performance of an implemented ITS application. The basis was a case study of public transport priority along the bus line 49 in the city of Brussels. The results showed that this ITS application, which overall achieves its goal of reducing time losses for public transport vehicles, had an increase of 6% - 7% of emissions as a short term side-effect. These results evoked new research questions. Can mid-term and long-term changes of route choice or even modal choice counterbalance this increase of emissions? And how can CONDUITS_DST support authorities in investigating this question.

Prediction models can deliver an approximation of such changes in travelling behaviour. However these calculations are costly and cannot be conducted before the implementation of the ITS application. In order to develop a methodology that public authorities can apply with available means, a scenario approach in form of a sensitivity analysis was chosen.

The main goal of the analysis is to estimate the traffic load reduction required to even out the short-term increase in emissions after the implementation of the priority system. Starting with the "after"-scenario of the original case study, the traffic loads were reduced subsequently in steps of 1%. The simulation and the KPI calculation were undertaken again with the new input data and the new "after"- values were compared with their levels before the implementation of the system. After several iterations a break-even point was estimated, at which "before" and "after" situations had the same KPI level.

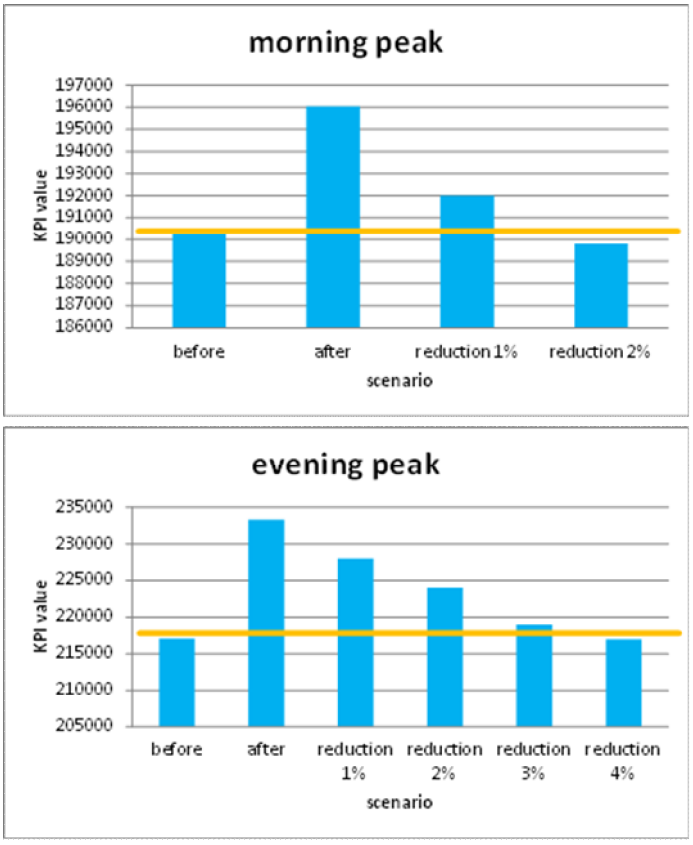

Figure 1 – Results of sensitivity analysis for southern part of Line 49 (source: CONDUITS-DST final deliverable)

The results showed a necessary reduction of traffic load of 2% to 4% for the southern part of line 49 and 8% to 9% for the northern part (figure 1). This relatively large span of different values depends highly on local factors such as the different centrality and saturation level of the two parts as well as differences in demand over the day.

After the calculations, it is up to the local stakeholders to evaluate and to use the results within the decision making processes. The results lead to two key questions: Is the increase in emissions significant enough to justify additional measures for the reduction of car traffic volumes and is the required reduction achievable in the respective area. In general a reduction of 4% can be considered feasible. In cities with network-wide traffic management, such an additional achievement may be difficult, whereas in other cities the potential for traffic load reduction might be significantly higher. In individual cases however the cities can decide to accept the higher emission levels if their overall pollution levels are well under legal thresholds.

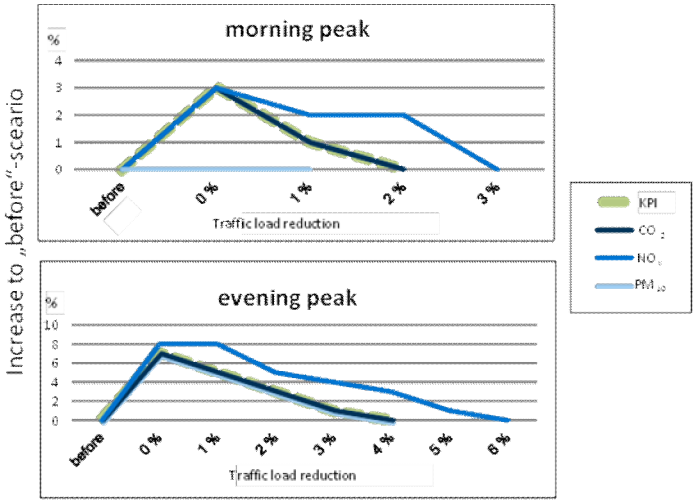

Figure 2 - Decrease of KPI and pollutant values depending on the traffic load reduction (source: Carolina Böhm; "Short-term and long-term impacts of public transport priority at signalised junctions in terms of emission levels"; 2012)

The sensitivity analysis went also one step further, investigating individual break-even points for the single pollutants. The results presented in figure 2 show the relationship of the decrease in values of the KPI and the single pollutants to the corresponding reduction of traffic load.

There is an obvious dependency between the KPI and the CO2 values –a result of the large volume produced per vehicle-kilometre. Furthermore NOx shows a much higher break-even point than the KPI – most likely due to its specific production mechanism.

These phenomena demonstrate the necessity and the possibility of weighting, provided by the CONDUITS KPI framework. For the purposes of this study the KPI calculation considered an equal weight for all elements. Local policy however might have different goals, for example resulting from exceeding legal limits for one specific pollutant. An individual weight can be inserted in the calculation, changing the dependency of the KPI. The process of estimating those weights however is policy driven and has to be adjusted for each application area individually.

A general conclusion after the completion of the case study with CONDUITS_DST is that including predictive KPIs for different fields of policy in the decision making process can change the way ITS are deployed. The transparent evaluation of side-effects will allow stakeholders to decide on applying additional measures along with the core application. Furthermore the decisions will be taken upon a wider scope of considerations and argumentations that can lead to a wider acceptance of ITS among politicians and society.

CONDUITS at international events

International seminar on ITS for public transport priority

On 19 November, TUM-Asia and the LTA-Academy organised a one-day seminar on "ITS for Public Transport Priority" in Singapore with the support of the German Federal Ministry for Education and Research. The event, in which experts from Germany and countries of Southeast Asia met, aimed to foster mutual learning and cooperation. Within a presentation of prioritisation technologies at signalised junctions, simulation and evaluation Dr. Antonios Tsakarestos from TUM presented the KPI evaluation framework of CONDUITS and the results of the related case studies for the cities of Paris and Brussels. Transparent decision support and comprehensible evaluation towards stakeholders was recognised by the participants as a clear necessity in all countries - though ITS applications for public transport prioritization are not largely spread among Asian countries. However new Bus Rapid Transit projects may increase the demand for ITS in the coming years.

ITS World Congress 2012

CONDUITS was present in Vienna in the form of a technical paper during a technical session (presented by Niv Eden of Technion) and a lunch session hosted on the Kapsch stand.

The lunch session saw the participation of CONDUITS-DST partners (Polis, Brussels, Kapsch, Technion) as well as representatives of the cities of Berne and Zurich, to debate the contribution of ITS to urban mobility. All cities on the panel viewed ITS as an enabler of measures to address growing congestion. Berne for instance is considering road pricing to bring down traffic peaks.

The discussion showed the importance of KPIs to convey clear and concise messages about the performance and impact of ITS, whether it be to decision makers or the general public. KPIs are used by London, Stockholm and some Italian cities to report annually on the road pricing or access restriction schemes. The simple way of communicating the drop in congestion is effective in sustaining public support for these measures.

CONDUITS City Pool

More than 40 cities from Europe and beyond, with an interest in ITS impact assessment and decision support, make up the CONDUITS City Pool. The City Pool has met periodically since the start of the CONDUITS FP7 project (January 2009) to share knowledge and express views on ITS deployment and evaluation. The pool remains open to any local authority with an interest in the topic.

The next CONDUITS City Pool meeting will take place on 4 July 2013 in Dublin, alongside the ITS Europe Congress. The two-hour meeting will focus on providing an update on the Brussels case study (see article on p.3) and an overview of the extended CONDUITS_DST and its new interface.

For more information, contact shoadley@polisnetwork.eu

CONDUITS events in 2013

- CONDUITS City Pool meeting, 4 June 2013, Dublin (alongside ITS Europe Congress)

  Further information: shoadley@polisnetwork.eu

- CONDUITS_DST presentation, ITS Europe Congress, 5 June 2013, 14.00-15.30

  Further information: www.itsineurope.com

- CONDUITS_DST presentation, Belgian Roads Congress, Liege, 11-13 September 2013

  Further information: www.congresdelaroute.be

- CONDUITS_DST at the 2013 Annual Polis Conference, 1st week of December 2013

  Further information: shoadley@polisnetwork.eu

For more information about CONDUITS activities:
shoadley@polisnetwork.eu or www.polisnetwork.eu/eu-projects