**NODES Report Summary**

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**Final Report Summary - NODES (New tOols for Design and OpEration of Urban Transport InterchangeS)**

Executive Summary:
Cities need efficient transport systems to support their economy and the welfare of their inhabitants. Around 85% of the EU’s GDP is generated in cities. Urban areas face today the major challenge of making transport sustainable from the environmental (CO2, air pollution, noise), competitiveness (congestion) and social (demographic change, inclusion, health) point of view.

To be more efficient transport systems require a greater integration at urban level (city and its hinterland):
- between the various urban transport modes and their various networks, as well as between urban, regional and long distance networks, in order to improve the functioning of the city in a global economy;
- between urban transport networks and land use, in order to influence the development of cities in a way favoring over time a greater use of environmental friendly modes and especially public transport.

In that regard, an innovative design and operation of urban transport interchanges can play an essential role, thanks to a holistic approach of their various functions as urban transport networks nodes and through an appropriate integration of transport services and activities in and around the station. This represents the driving mission of the NODES project.

NODES has produced a Toolbox on five topics which cover the key functions of interchanges:
1. Strategies for integrated land use planning with urban passenger infrastructure planning  
2. Innovative approaches relating to the design of new or upgraded efficient transport interchanges  
3. Intermodal operations and information provision  
4. Management and business models: the interchange as business case for the local economy and in itself  
5. Energy efficient and environmental friendly interchanges

This Toolbox aims to support European cities in the design and operation of new or upgraded interchanges, as a way to provide greater support, services and satisfaction to the travelers and users, as well as to interchange operators, and those societal and economic actors depending on the efficiency of interchange operations.

On the basis of the State of the art and the analysis of User needs and requirements, Performance Criteria and Indicators and later Key Performance Indicators were identified in order to measure the performance of an interchange.

These indicators were used to build an online Benchmark tool, which allows practitioners to assess and benchmark their interchange. This key result consists in the first part of the NODES Toolbox and is built as an entry point towards the NODES tools.

Indeed, on the basis of the performance evaluation received in the Benchmark tool, practitioners are pointed towards a list of
tools which will allow them to improve their interchange. 83 tools in total are listed in the Toolbox, they are of different nature (method, software, technique, model, law/regulation, material, etc.) and are based on the most advanced practices in the urban transport sector. Each tool is described in a standard manner and is classified according to the type of interchange they apply to, what objective they follow, and what type of change the interchange is undergoing. They are also classified according to whom they are directed towards: a public authority, an infrastructure manager, an operator. It is also possible to access this second part of the Toolbox directly, without going through the Benchmark entry point.

These tools were tested and validated in nine cities distributed around Europe, sites that are all engaged in substantial development or upgrading activities. They were then evaluated following a strict evaluation framework. This testing and evaluation phase provided a feedback loop for these tools’ improvement.

This work was also supported by dissemination and communication activities, which aimed at establishing the NODES Toolbox as a reference in Europe and helped its transfer to a greater number of cities.

Project Context and Objectives:
Cities need efficient transport systems to support their economy and the welfare of their inhabitants. Around 85% of the EU’s GDP is generated in cities. Urban areas face today the major challenge of making transport sustainable from the environmental (CO2, air pollution, noise), competitiveness (congestion) and social (demographic change, inclusion, health) point of view. Addressing these challenges is also essential for the success of the EU’s overall strategy to combat climate change, achieve the 20-20-20 objective and promote cohesion.

To be more efficient transport systems require a greater integration at urban level (city and its hinterland):
• between the various urban transport modes and their various networks, as well as between urban, regional and long distance networks, in order to improve the functioning of the city in a global economy;
• between urban transport networks and land use, in order to influence the development of cities in a way favoring over time a greater use of environmental friendly modes and especially public transport.

In that regard, an innovative design and operation of urban transport interchanges can play an essential role, thanks to a holistic approach of their various functions as urban transport networks nodes and through an appropriate integration of transport services and activities in and around the station. This represents the driving mission of the NODES project.

The overall objective of NODES is to build a Toolbox to support European cities in the design and operation of new or upgraded interchanges, as a way to provide greater support, services and satisfaction to the travelers and users, as well as to interchange operators, and those societal and economic actors depending on the efficiency of interchange operations.

Project Results:
For this purpose, NODES has identified five topics which together address the key functions of interchanges:
1. Strategies for integrated land use planning with urban passenger infrastructure planning.
2. Innovative approaches relating to the design of new or upgraded efficient transport interchanges.
3. Intermodal operations and information provision.
4. Management and business models: the interchange as business case for the local economy and in itself.
5. Energy efficient and environmental friendly interchanges.

The first step that was completed was to identify and consolidate the available knowledge on those five topics in a comprehensive and structured State of the Art. This was completed within Work Package 2 and led to the Deliverable D2.1 “State of the Art.”

In parallel to this the future user needs and system requirements were identified. This was build on 43 interviews of end users,
local authorities, operators and service providers, as well as further analysis of the results, in particular with the so-called NODES User group.

Performance Criteria and Indicators (PCIs) for the design and operation of interchanges were identified on the basis of the State of the Art analysis and future user needs and system requirements. These PCIs were validated and clustered into a shorter list of Key Performance Indicators (KPIs). In order to do so three steps were followed which consisted in prioritising the indicators (and giving references), pointing out missing indicators and looking at data availability. For this, the NODES partners were consulted (the reference sites) as well as the NODES User group. The KPIs were then included in a Database. This work is described in Deliverable D2.2 “Database Performance Criteria and Indicators”. Final conclusions on the work in Work Package 2 were drawn in D2.3 "Report on State of the Art, Criteria and Indicators".

The NODES Toolbox was developed within Work Package 3. In order to set the framework of this, the first step was to define interchanges (components, objectives, performance measurement, obstacles/success factors of improvements) and propose an interchange typology. These results are summarised in Deliverable D3.1.1 “The NODES Toolbox framework, scenarios and objectives”. In addition, the web-based NODES Toolbox functionalities were defined and a template for each tool was agreed on.

In order to further define the areas in which the tools will be developed, a theme paper was prepared on each of the NODES topics. This formed the basis of the first task-led WP3 deliverables: D3.2.1 D3.3.1 D3.4.1 D3.5.1 and D3.6.1. A draft list of tools was prepared and extensively discussed between experts present inside the consortium, including with the reference sites. Then, this was discussed with the external experts present in the NODES User group. This led to the second set of task-led WP3 deliverables D3.2.2 D3.3.2 D3.4.2 D3.5.2 and D3.6.2. The tools were then worked on individually, fitted into the agreed on template and published online in the NODES Toolbox. In total 83 tools were included.

As an entry point to the Toolbox, a benchmark function was added. This online “Benchmark tool” allows interchange stakeholders to assess, benchmark their interchange and to be pointed towards a selected list of tools inside the NODES Toolbox. Another entry point was established, which is a set of “tick boxes” directly on the Toolbox web page, which allows practitioners to select tools on different criteria such as interchange type or upgrade objective.

The test phase of the tools took place within Work Package 4. The reference sites are distributed around Europe where interchanges are being built or upgraded: Toulouse (France), Reading (UK), Budapest (Hungary), The Netherlands (three sites), Rouen (France), Rome (Italy), Thessaloniki (Greece), Osnabrück (Germany), Birmingham (UK). These sites were selected because together they correspond to different interchange typologies and cover the whole range of topics included in the project. These applications provided a feedback loop, validating the tools as well as their efficiency.

Before launching this test phase, the framework in which the applications will take place was set. This was defined in Deliverable D4.1 “Guidelines for testing”. This includes the timing, planning, and process of the application phase together with the application reporting template. In addition, the final application site was given per site. After contributing to the tools definition, the reference sites selected the tools they will test locally, within the NODES topic(s) they had selected in the Annex I Description of Work. The tool selection was mapped and gaps were identified and after corrective measures were applied, this led to the final tool selection list. This is explained in Deliverable D4.2 “Study Case and application scenario”. Each test site then completed a report on its testing activities (Deliverables D4.3 to D4.11). In these deliverables, in addition to the demonstration context and site description, each tool received a star rating as well as a score out of 25 based on five criteria: tool relevance to interchange, resource cost, ease of use, learning curve and time taken. The WP4 leader then completed an additional report, summarising the testing results per tool.

The evaluation of the tools and of their application took part in Work Package 5. In order to prepare the evaluation phase effectively, an Evaluation plan was put together. This is described inside Deliverable D5.1 “Evaluation Plan”. The NODES tools
were to be evaluated through impact and process evaluation, comparing the measured outputs (physical appearance) and outcomes (measurable or perceived impacts) resulting from the tools’ application.

A local Evaluation plan was defined for each reference site (based on the overall evaluation framework defined in D5.1) to evaluate and validate the effectiveness of the Toolbox by the reference sites. This site-based matrix consists in a selection of KPIs. The drafting of ad-hoc Evaluation forms enabled the collection of local data as well as measuring the Toolbox’s impacts. This was explained in Deliverable D5.2 “Data set for each reference site”, where the data obtained by the “Evaluation Management Team” from the reference site partners was compiled.

Based on the work achieved in WP5, Deliverable D5.3 “Evaluation results and final recommendations as full data set” then compiled the evaluation results and drew final conclusions, including a transferable roadmap. This includes criteria for transferability, lessons learned and final recommendations for successful planning and implementing tools improving urban transport interchanges.

In order to disseminate the results mentioned above, the project the main communication tools were developed. The Dissemination Strategy was prepared together with the NODES corporate identity (Deliverable D6.1 “Dissemination and transfer strategy (including corporate identity”)). The project website was completed in order to provide up to date easy and quick information on the project (www.nodes-interchanges.eu). In addition to this, different social media means were put in place: Twitter, Facebook, Linkedin. A project leaflet was also prepared and distributed widely.

At the end of the project, two communication tools were finalised: a “Catalogue of key-renewal solutions and business case solutions” (D6.5) - which compiles and analyses key renewal solutions in the different topics that were addressed in the project – as well as an “Interchange design and operations toolbox” leaflet (D6.6) which describes and promotes the online NODES Toolbox.

In order to contribute to the objective of the NODES Toolbox becoming the European reference in the field of design and operation of interchanges, different dissemination activities took place including participation in events, publishing a press release and articles. In addition, external interchange experts were consulted on the projects results during five meetings of the NODES User group. The project’s Final Conference brought close to 100 interchange stakeholders together on 22-23 September 2015 in Brussels.

Potential Impact:
The expected impact of the project was to support local government administrations and PT operators in the design and operation of their urban transport interchanges (as a way to provide greater support, services and satisfaction to the travellers and users, as well as to interchange operators, and those societal and economic actors depending on the efficiency of interchange operations). In order to bring this support, the project built a so-called “NODES Toolbox”.

This final result of the project contains two main parts.

First, a “Benchmark tool” which allows practitioners to assess and benchmark their urban transport interchange. This assessment is done thanks to the NODES indicators which were identified and refined during the project. After registering online and answering a set of questions, the practitioner receives an assessment of his interchange based on these indicators, has access to other interchanges’ assessments and is pointed towards a set of tools.

This set of tools consists of the second part of the NODES Toolbox. These tools - based on the most advanced practices in the urban transport sector - help practitioners to improve the performance of their interchange. They address the five topics which were dealt with in the project and are of different nature: method, software, technique, model, law/regulation, material. Each tool is described in a standard manner and is classified according to the type of interchange they apply to, what objective they
follow, and what type of change the interchange is undergoing. They are also classified according to whom they are directed towards: a public authority, an infrastructure manager, an operator. 83 tools in total were included, once they had been tested and evaluated within the framework of the project.

It is possible to access this second part of the Toolbox directly, without going through the Benchmark entry point.

For what concerns the project’s dissemination activities, the key objectives were the following:
• To develop effective communication interfaces and dissemination channels.
• Build-up capacities and skills in the target group of different user categories.
• Reach the attention of all relevant stakeholders and target groups relevant to NODES.
• Enhance awareness among stakeholders and target groups on the chances and opportunities in the design and operation of new or upgraded public transport interchanges.
• Provide easy and perceivable information on how to implement NODES tools and methodologies.
• Enable networking for knowledge transfer on designing and operation of new or upgraded public transport interchanges.
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• Enable networking for knowledge transfer on designing and operation of new or upgraded public transport interchanges.
• Create new co-operations for sustainable planning and implementation of new or upgraded interchanges among stakeholders and target groups on regional, national and European level.

The first step of the dissemination activities was to establish a dissemination and transfer strategy (D6.1) – which identifies the different target groups, the partners’ roles, the project main outcomes and transfer opportunities, explains the role of the user group and provides an overview of the take-up instruments – and to create the project’s corporate identity. The project website was put in place at www.nodes-interchanges.eu - which provides up to date easy and quick information on the project and includes a public area, a secure area for the project’s partners and an access restricted area for the user group – as well as different social media channels (Facebook, Twitter, LinkedIn). In addition, a NODES leaflet was prepared, printed and distributed widely.

Then, the dissemination activities began which can be summarised as follows:

• The setting up and management of a NODES User Group by UITP, Polis and EPF. In addition to the expertise present inside the consortium, it was extended to these “cities, operators and end-users which are involved in the interchange design and operations and are interested in helping to shape the outcomes of the project” (Annex I, page 29 of 40). These experts who are not part of the consortium “will ensure the long term impact of the project, anchor a broader group of cities to the project, and establish the tools and methodologies as a reference” (Annex I, page 30 of 40). They were consulted on a regular basis on the project results, in particular through regular meetings (five in total, the fourth one being merged with the Final Conference).

• As part of the project corporate communications, NODES main objectives and activities have been presented in different media at European and national level, including partners’ own channels, like for example:
  o UITP website, newsletters ("UITP Direct", thematic newsletters) and publications ("Public Transport International", “UITP PT trends 2015”, etc.);
  o Polis website and newsletter “Info Polis”;
  o Tisséo article (08/03/2014 Accessibilité et handicaps mentaux, psychiques ou cognitifs: quels besoins? Technicités n. 265, 2014.
  o CRTM article (19/10/2012 El CRTM participa en el proyecto europeo Nodes, Boletín de Noticias, Autobuses & Autocares)
  o International Railway Journal: “Station Designers get a new toolbox”, September 2015
  o TRIP: “NODES project allows users to rate and improve their interchange”, September 2015.
o NODES article on DG Research & Innovation website (still to be published).

• Two press releases were published during the project (at the beginning of the project and on the Final Conference day), leading to article in different media such as Nexobus, 4-traders, Masstransitmag, Eltis, International Railway Journal, ITS international, Buss Magasinet, fer press.

• Four project newsletters were prepared by Polis. They compile the NODES news published on the website.

• To explain the project more in detail and/or to reach beyond the partners’ direct contacts, regular presentations on the project were given at events:
o By UITP (presentations and/or session moderation, and leaflets distribution):
- 19-21/11/2014, Intermodality Conference, CEREMA, Strasbourg
- 24/03/2015, European Mobility Week, Brussels
- 08/06/2015, UITP World Congress, Milan
- 08/10/2015, Civitas Forum, Ljubljana
- 22/10/2015, Next station conference, Marrakech
- 4-5 November 2015, UITP Taxi Seminar, Mumbai
- 16/11/2015, Viajeo Singapore City Showcase, Singapore
- UITP also updated its different related Committees and Commissions on the NODES progress on a 6-monthly basis (eg. Bus committee, Metro committee, Light Rail committee, Organising authorities committee, etc.).
o By Polis:
- 20-24/03/2013, Club Ferrovial Conference
- 25/06/2015, WOCOMOCO conference, Innsbruck (Germany)
- 19/02/2015, CityHub Final conference, Lille (France)
- Support to submission of the NODES abstract for the TRA2016 conference.
o By CRTM:
o By Centro:
- 08/06/2015, UITP World Congress, Milan
o By Thepta:
- 30/03/2015, European Transport Conference ETC 2015, Frankfurt

• UITP also produced dissemination material for several key public transport events:
o APTA EXPO 2014 (13-15/10/2014, Houston, USA)
o Smart City Expo World Congress (18-20/11/2014, Barcelona)
o UITP World Congress (8-10/06/2015, Milan)
o Sustainable Mobility 2015 exhibition and Revolve magazine (16/9-30/10/2015, Brussels)

• Two take-up instruments were produced:
o A NODES Toolbox leaflet - which promotes the Toolbox and explains how it works - has been created in electronic and printed format.
o A Catalogue of key-renewal solutions and business case solutions has also been created in electronic and printed format, highlighting existing good practices and tools for interchanges from and beyond the NODES project.

• Four transfer events were organized on specific topics, tools and methodologies to transfer the NODES Toolbox to cities outside the project:
The project’s Final Conference was organised in Brussels on 22-23 September 2015. The NODES results were presented and discussed with close to 100 stakeholders.

List of Websites:
www.nodes-interchanges.eu
Project coordinator: Caroline Hoogendoorn, UITP, tel 00 32 2 788 0111; caroline.hoogendoorn@uitp.org

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<th>Documents and Publications</th>
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