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Measure Evaluation Results

GDA 8.1 ITS Deployment

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Executive Summary

Cities, especially large urban agglomerations, are confronted with increasing traffic congestion issues which affect the whole city development. Increase of harmful gases emission and noise pollution, traffic congestions impact negatively the citizens' quality of life. The prognoses which has been identified in the Gdansk's transport strategy report indicates that the share of individual cars will increase by 35% in transport means by 2030 and highlights an overall increase of traffic volume in the city. Therefore, traffic congestion becomes a critical challenge for traffic management, especially during mass events taking place in the city centre.

In order to create an attractive urban environment, the city of Gdansk seeks for a solution that supports efficient traffic management. Gdansk had developed its first ITS system called TRISTAR parallel to MIMOSA's application. The MIMOSA measure 'ITS deployment' gave Gdansk the opportunity to work further on the existing TRISTAR concept. Thus the measure 'Intelligent Traffic Management Systems (ITS)' focused on elaborating a specific strategy to optimize traffic flow during mass events in Gdansk. A feasibility study entitled: "Adaptation of traffic management system TRISTAR" was conducted and the results of the study provided outcomes to elaborate concrete transport management activities during mass events. Furthermore, the results of the measure brought an innovative approach to the whole ITS system in Gdansk. The CIVITAS initiative gave Gdansk a unique opportunity to complete the TRISTAR concept providing more functionality of transport service during mass events. The subcontracted feasibility study is an innovative tailor-made ITS concept addressing all the issues related to traffic management during mass events in Gdansk.

The measure was realized in four phases:

Stage 1: State of the Art (September 2009 – March 2010) The Gdansk MIMOSA team defined the conceptual framework for the measure and identified the stakeholders which are affected or involved.

Stage 2: Revising assumptions (June 2010 – September 2010) The conceptual framework was reviewed and adapted to the current situation.

Stage 3: Subcontractor selection process (October 2010 – May 2011) It has been decided that the feasibility study would be conducted by an external office. The tendering specifications were drafted and the subcontractor was selected in May 2011.

Stage 4: Elaboration of the feasibility study (May 2011- June 2012) The subcontractor conducted the study and delivered the final report - "Gdansk's ITS concept for traffic management during mass events" - to the Gdansk MIMOSA team. The report was distributed to the eight key-stakeholders involved in the measure.

To conduct the study, two strategic locations were identified: PGE Arena (football stadium) and ERGO Arena (sports hall) where most of the mass events have been organized. For these two locations, a concept of comprehensive ITS system supporting transport management was elaborated. An analysis of the transport problems which are encountered during the organization of mass events was made and provided the basis to structure the conceptual work. The ITS system proposed in the feasibility study is based on the implementation of several modules: video surveillance module, alternative routes guidance module, traffic information module and media information module, parking management module, Public Transport vehicles and privileged vehicle priority module. As one of the most effective, the media information Module should be developed in order to assure better communication and help in travel behaviour changing of mass events attendees.

The cost of implementation is estimated to €4.5 million. The costs are mainly due to the acquisition of new equipments: 30% of the total costs are allocated to the alternative routes guidance module. In order to minimize implementation costs, ITS concept could be integrated to the activities of the existing "TRISTAR" control centre.

Currently TRISTAR measures are in implementation process and are planned to be achieved by 2014. Since the measure was a "RTD-only", no impact evaluation was conducted.

Nevertheless, barriers and drivers were identified from the process evaluation. Beyond bureaucratic administration issues, which slowed down the implementation process and were identified as **an overall barrier** in the implementation of the MIMOSA measures in Gdansk, the implementation of the ITS measure did not encounter any specific barriers except for small delays caused by bureaucracy which was a general barrier for all Gdansk measures realized within MIMOSA project.

The main driver observed during the implementation of the measure was the efficient cooperation between the measure leader, the University of Gdansk as subcontractor in charge of the study and the Gdansk's ITS Project Coordinator, who is employed in GIK (Gdansk Investment Company), a city-owned company. The high expertise of the subcontractor in the field of intelligent transport systems and the quality of the work done by the Gdansk's ITS Project Coordinator during the entire process contributed largely to the success of the measure.

To raise the efficiency of the ITS concept, **it is recommended** to establish a cooperation between the existing traffic management units dealing with daily operational activities and emergency and security services. In order to minimize the implementation cost the already existing ITS infrastructure should be used as effectively as possible.

Due to the high costs (and the mass event EURO 2012 passed by already) the implementation cannot be clearly predicted for the near future, but the application could be implemented if the City found the additional funds for that purpose.

A Introduction

A1 Objectives

The measure objectives are:

- (A) High level / longer term:
 - Reduction of congestion
 - Improvement of quality of life
 - Fuel saving
- (B) Strategic level:
 - Enhancing the use of innovative transport telematics systems for traffic management during mass events
- (C) Measure level:
 - To investigate and plan a use of the integrated traffic management system TRISTAR and control centre which can support organisation of mass events in Gdansk such as Euro 2012 Championship
 - Demonstrate the advantages of an intelligent remote system in a small area
 - To produce a financial implementation plan with estimated benefits in terms of reduction of journey time and fuel saving

A2 Description

The city of Gdansk has over 455.000 inhabitants and accounts for the core of the entire population of the third urban agglomeration in Poland in terms of size. Made up of the functionally linked Gdansk, Gdynia and Sopot (the so called Trojmiasto) and the neighbouring towns and communes, the agglomeration has over one million residents.

The back bone of the city car transport system in this area is the three-lane, dual carriageway connecting the three cities. This road is very congested particularly during peak hours.

Gdansk suffers from having just one central corridor into which all lateral routes converge. This main corridor extends along the coast through Sopot to Gdynia. There is a plan to introduce an integrated management system for this road extending as far as Gdynia. However, the 180 traffic lights in other roads in Gdansk are not covered by this plan, neither are they coordinated in any way, and their phasing cannot be changed remotely to coordinate with each other. There is a developing motorway ring to the south of the tri-city, however connections between this and the central city corridor route inevitably result in highly congested perpendicular or radial routes, none of which currently have any form of intelligent control system.

Because Gdansk already developed its own ITS concept called TRISTAR there was a need for revising the measure description in order not to duplicate research in the same field. During following several meetings with Gdansk's ITS Coordinator it was agreed that the most

desirable solution for a measure with new scope will be an innovative approach of adaptation of the already existing concept of TRISTAR to support the traffic management during mass events in Gdansk.

The new scope of the measure covered, among the others, following issues:

- General characteristics of the traffic management system TRISTAR
- The diagnosis of problems - an analysis of the status quo for public events
 - the place of mass events, identification of necessary actions that can be solved through the use of ITS, traffic analysis within the organization of mass events, critical elements of the road system in the area of organization of mass events
- The conditions to implement element mass events with the use of ITS
- The concept of mass events with the use of ITS in the Gdansk and its integration with currently implemented ITS system TRISTAR
- Evaluation of the outcome of the implementation
- Recommendations for potential implementation steps

Because of the complex scope of the measure a scientific approach to RTD activities was required. Therefore the main part of the RTD work within the measure was subcontracted to Faculty of Civil and Environmental Engineering at the Gdansk University of Technology.

B Measure Implementation

B1 Innovative Aspects

- **Innovative aspect 1** – Use of technology/ITS Integrated traffic management supporting transport service during mass events in Gdansk does not currently exist, neither does any form of central traffic control facility. TRISTAR system which is presently implemented has not provided any service dedicated for traffic management during mass events so far.

B2 Research and Technology Development

Measure 8.1 – GDA ITS Deployment was one of two fully theoretical measures without implementation phase realized in Gdansk during MIMOSA. The main outcome of the measure is a subcontracted report elaborated by the Faculty of Civil and Environmental Engineering at the Gdansk University of Technology, which also developed TRISTAR. The character of the measure required division of RTD activities into two parts. The first part was devoted mainly to pre-RTD activities carried out by the measure leader, mainly revision of measure's assumption and necessary adjustments to current circumstances such as reformulation of measure objectives in order not to duplicate work which is currently implemented within TRISTAR system. This required consulting with ITS experts and engineers, researching already existing scientific studies as well as meetings with stakeholders. The pre-RTD activities took almost 8 months. After this time the measure leader acquired enough knowledge to prepare a general scope of a feasibility study to be subcontracted. Also a research of possible subcontractors was done which resulted in signing a subcontracting agreement between the City Hall of Gdansk and the Faculty of Civil and Environmental Engineering at the Gdansk University of Technology.

The specificity of the measure required subcontracting all the conceptual work. The RTD activities carried out within the measure led to creation of theoretical feasibility study.

The Faculty of Civil and Environmental Engineering at the Gdansk University of Technology carried out all the scientific part of RTD activities within the measure as subcontractor. The outcome was a feasibility study **entitled: “Adaptation of traffic management system “TRISTAR” to support the transport service during mass events in the City of Gdansk”** which constituted a missing innovative functionality of already existing TRISTAR concept. The feasibility study comprises the following subjects:

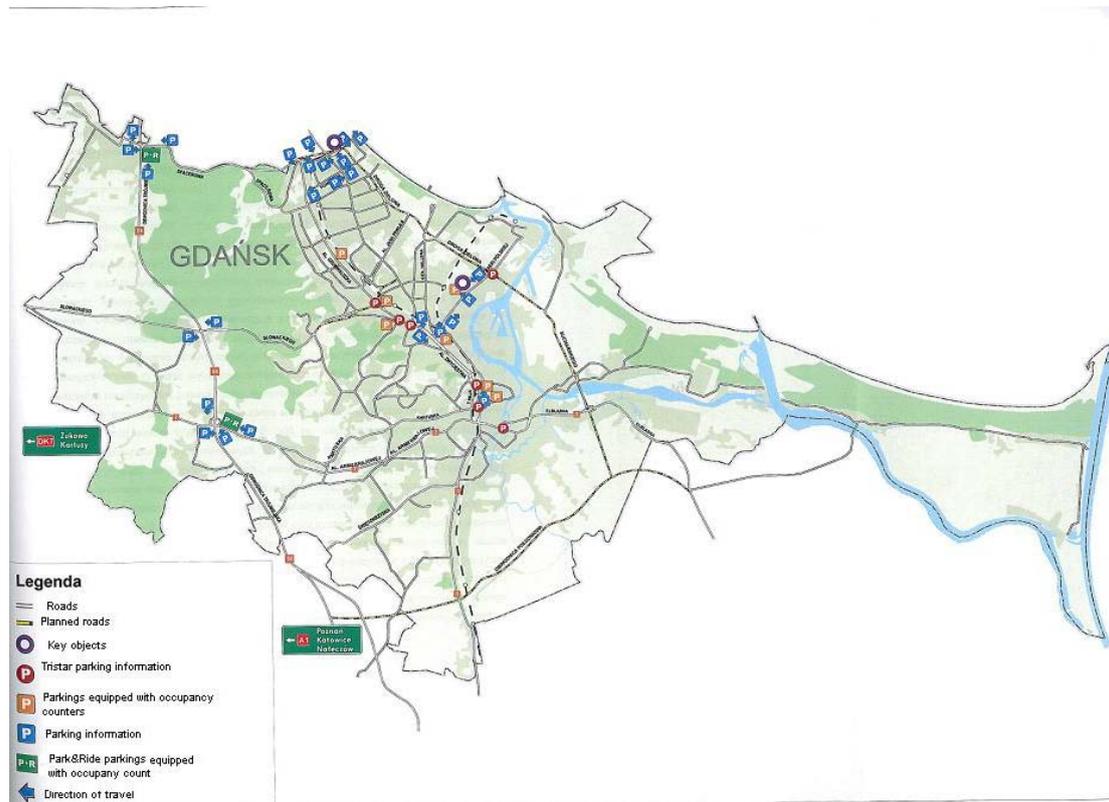
- 1) General characteristics of the traffic management system TRISTAR
- 2) The diagnosis of problems - an analysis of the status quo for public events (the place of mass events, identification of necessary actions that can be solved through the use of ITS, traffic analysis within the organization of mass events, critical elements of the road system in the area of organization of mass events).
- 3) The conditions to implement element mass events with the use of ITS:
 - a. Support for events in the system architecture TRISTAR

- b. Traffic Management Centre
 - c. The existing infrastructure and transmission of information (communications)
 - d. Procedures
- 4) The concept of mass events with the use of ITS in the Gdansk
- a. Analysis of appropriate management practices during mass events - examples
 - b. The choice of method - the concept
 - c. Locating the TRISTAR system architecture – hardware and functional compatibility,
 - d. Management Strategies - Methodology operation
 - e. The structure of hardware
 - f. Implementation plan – financing and implementation steps
- 5) Evaluation of the outcome of the implementation
- a. Identification and selection of performance indicators
 - b. Complementary Measurements
 - c. Analysis using the program to simulate the traffic in the street network (the Saturn) to estimate the effects of the operation of the proposed solutions
 - d. Approximate cost analysis
- 6) Recommendations

The authors indicated PGE Arena (football stadium) and ERGO Arena (sports hall) as the two spots with the biggest number of mass events such as EURO 2012 Championship, volleyball tournaments or pop concerts. For these two locations the concept of comprehensive ITS system supporting transport management was created. The authors made a diagnosis of transport problems which are encountered during the organization of mass events, which constituted a basis for a further steps in their conceptual work. The proposed ITS system consists of 4 combined modules:

- **video surveillance module** allowing the observation of intersections and automatic recording of road accidents as well as control of PT stops occupancy which helps the Public Transport Management in adjustment of frequency of PT vehicles courses,
- **alternative routes guidance module, traffic information module and media information module** which allow informing (through the internet, electronic message boards and satellite navigation) mass events attendees and other road users about adverse road condition, traffic jams, closed roads as well as proposed detours and the most convenient transport solutions,
- **PT vehicles and privileged vehicle priority module** allowing fast and safe getting around the city of PT vehicles and emergency services.
- **parking management module** which gathers and processes data on occupied parking space, informs and direct drivers to free parking spaces and Park and Ride parking supported by the bus service.

The module directly limits the number of cars on the road and simultaneously affects the reduction of greenhouse gas emissions. The scheme showing the car parks and parking information point system is presented below.

FIGURE B2.1: Location of car parks and parking information points

Source: Kazimierz Jamroz, Jacek Oskarbski, Izabela Oskarbska, Karol Romanowski: 'Adaptation of traffic management system "TRISTAR" to support the transport service during mass events in the City of Gdansk', Gdansk (2012, annex) 2012

The cost of implementation indicated by the authors is 4.5 million Euro. This relatively high cost arises from the need to purchase necessary equipment (alternative routes guidance module cost constitutes 30% of total implementation cost). The system could be managed from already existing "TRISTAR" control centre.

B3 Situation before CIVITAS

Gdansk is one of the largest Polish transport nodes of international significance. The city lies at the centre of sea routes across the Baltic Sea and the land section of the 6th Trans-European Transport Corridor North-South, linking Northern Europe to Central, Eastern, and South-Eastern parts of the continent.

The predictions contained in Gdansk's transport strategy show that the number of means of transport in Gdansk will increase (35% more cars) as well as the traffic in general. Therefore the main aim of local transportation policy is to constantly create conditions for efficient, environment friendly and safe transport. It is also very important to increase the quality of travelling within the city and outside the city. The transportation policy of Gdansk is being made under sustainable development priority (eco-development). At this date, the city is actively developing this Transport/mobility Plan that consists of large infrastructure projects that enable the city's future liveability. The Plan covers:

- Tramway renewal and extinction;
- Replacement of old trams and buses (buses already replaced);
- Improvement of safety and security on roads and in means of PT
- Better traffic management to solve traffic jams and congestion in the city centre.

It should be noted that there was not any ITS system planned in the Plan.

Gdansk suffers from increasing motorisation and heavy congestion during rush hours. The number of households with one or two cars grows rapidly. This trend is reflected in Gdansk's modal split. The problem of congestion grows rapidly during mass events organized in Gdansk. Gdansk experienced serious traffic problems during EURO 2012, especially when main roads were closed in order to provide a passage for the authorities. This caused hours of traffic jams because the car drivers were neither informed about bypasses nor about change of traffic.

TABLE B2.1: Modal Split in Gdansk in 2009

| Modal Split in Gdansk in 2009 | |
|-------------------------------|-------|
| Car | 41,6% |
| Bus | 19,1% |
| Pedestrians | 16,1% |
| Tram | 16,0% |
| Fast Commuter Train | 5,7% |
| Bicycle | 1,5% |

Source: Internal data of the City Hall of Gdansk delivered by Faculty of Analysis and Socio-economic Research.

The problem of traffic congestion increases especially during mass events when sports fans or viewers approach the city centre. The development of Gdansk's road system does not provide any solutions to the problem of constantly increasing group of car drivers. Therefore within CIVITAS measure 8.1 GDA – ITS Deployment, Gdansk seeks for a highly innovative ITS solution that could help managing the private and public traffic, especially during mass events. The authors of the subcontracted report took advantage of the unique chance given by CIVITAS and proposed the following steps in the implementation plan:

- Creation of information platform which would coordinate the work of transport management services and emergency services.
- Equipment emergency service vehicles in devices assigning priority on traffic lights.
- As one of the most effective, the Media Information Module should be developed in order to assure better communication and help in travel behaviour changing of mass events attendees.
- The intersections indicated in the subcontracted report should be included in the traffic lights steering system.
- As a last step the authors proposed the implementation of an alternative routes guidance module.

B4 Actual Implementation of the Measure

The measure was implemented in the following stages:

Stage 1: State of the Art (*September 2009 – March 2010*) – During the first stage the measure leader became acquainted with the assumptions of the measure and the theme of ITS. During this stage the measure leader was mainly focused on:

- Studying measure description,
- Current situations of ITS in Gdansk,
- The list of stakeholders.
- The list of the institutions possibly interested in the report results.
- The list of possible issues to be dealt with in the report.
- Look for possible subcontractors with a scientific background.

During the first stage the measure leader held several meetings with stakeholders to understand better the measure assumptions.

Stage 2: Revising measure's assumption (*June 2010 – September 2010*) – During the second stage the measure leader was mainly focused on:

- Revising the measure description and adjusting it to current situation.

Stage 3: Subcontractor selection process (*October 2010 – May 2011*) – During the second stage the measure leader was mainly focused on:

- Creating the final specification for the subcontracted report. Negotiations with the possible subcontractors leading to obtaining the best report terms.
- Signing a contract with the subcontractor in May 2011.

Stage 4: Creation of a subcontracted feasibility study (*May 2011- June 2012*) – During the third stage the measure realization was mainly focused on:

- Conducting research and elaborating the feasibility study by the subcontractor.
- Verification of the report delivered by the subcontractor.
- Delivery of the feasibility study to stakeholders dealing with mobility management, ITS systems and crisis management.

B5 Inter-Relationships with Other Measures

The measure is related to other measures as follows:

- Measure 8.1 is not directly related to any other measure being implemented in Gdańsk. However the assumptions of the measure are indirectly convergent with 4.1 (reduction of the number of cars on the road). Thanks to park and ride systems and media information module the proposed ITS system would help in reducing number of cars on the roads.

C Impact Evaluation Findings

The study was completed successfully and will be used in the future. The city of Gdansk believes it will be helpful for improving transport in the future.

It is important to highlight that police and emergency services expressed a great need of creating ITS system supporting their work during mass events. Due to the high costs (and the mass event EURO 2012 passed by already) the implementation cannot be clearly predicted for the near future, but the application could be implemented if the City found the additional funds for that purpose. What's highly important the measure stays in line with Gdansk's policy towards development of the intelligent traffic management system. Currently the first Gdansk ITS system "Tristar" (providing the basic ITS functionalities) is in the implementation phase therefore it is difficult to foresee what result it will bring and which additional functionalities (like traffic management during mass events) will be implemented in the future. Over last years the City of Gdansk invested significant financial resources into creation of sports stadium and events halls (PGE Arena (football stadium) and ERGO Arena (sports hall) - two spots with the biggest number of mass events such as EURO 2012 Championship, volleyball tournaments, boxing events or pop concerts) therefore it seems to be inevitable to implement a ITS system for traffic management during mass events. If Gdansk decides on further development of ITS the feasibility study created under CIVITAS MIMOSA may consist a basis for a further development of Gdansk's ITS system.

D Process Evaluation Findings

D1 Deviations from the Original Plan

The deviations from the original plan comprised:

Deviation 1 Change of measure level objectives – Because Gdansk developed its own ITS concept called TRISTAR parallel to MIMOSA application, there was a need for revising the measure description in order not to duplicate research in the same field. The measure leader carried out several meetings with Gdansk's ITS Coordinator leading to creation of a new innovative scope of the measure. It was agreed that the most desirable solution would be adaptation of the already existing concept of TRISTAR to support the traffic management during mass events in Gdansk. The CIVITAS initiative gave a unique chance to enrich the TRISTAR application in a new functionality.

D2 Barriers and Drivers

D2.1 Barriers

Overall barriers

- **Delay caused by the need of changing measure description** – The fact that Gdansk has already developed an ITS concept caused the measure leader to revise the measure's assumptions and adjust it to the current circumstances. This required additional time devoted to preparatory activities and delayed realization of the entire measure.
- **Bureaucracy** – The second barrier is general for all the measures and is a result of impeding administrative structures, procedures and routines, impeding laws, rules, regulations and their application.

D2.2 Drivers

Overall Drivers

- **Good cooperation with subcontractor and Gdansk's ITS Project Coordinator** – The only driver that should be mentioned is bound up with good cooperation between measure leader, the subcontractor, the Faculty of Civil and Environmental Engineering at the Gdansk University of Technology and Gdansk's ITS Project Coordinator. Gdansk's ITS project Coordinator provided a crucial help during measure's revision process and determining the new measure objectives.
- Also an important issue for the measure implementation was a **wide experience of the subcontractor** in the theme of intelligent transport systems. The fact that the subcontractor has already dealt before with the issue of ITS in Gdansk was a strong driver.

D2.3 Activities

Overall activities

- **Coordination of measure`s realization** – Due to the fact that the core part of the measure was subcontracted, the main activity was coordination of the work carried out by the subcontractor. The main activity of the Gdansk MIMOSA team was preparation of the subcontract and coordination, post processing and dissemination of the work carried out by the subcontractor.

Preparation phase

- **1** – Acquiring knowledge in field of ITS by the measure leader and adjusting measure objectives to current circumstances in Gdansk.
- **2** – Creating the final specification for the subcontracted report followed by negotiations with possible subcontractors to obtain the best report terms.
- **3** – Finalizing the subcontract and signing it by the chosen subcontractor in May 2011.

Implementation phase

- **1** Creating the feasibility study by the subcontractor

Operation phase

- **1** – Revision of the delivered subcontracted feasibility study and distribution of the report to the stakeholders.

D3 Participation

D3.1 Measure Partners

- **Department of Public Utilities of the City Hall of Gdansk** were Gdansk's MIMOSA team responsible for realization of the measure from where the Cities site was situated.
- **The Faculty of Civil and Environmental Engineering at the Gdansk University of Technology** responsible for elaborating a subcontracted report entitled: "Adaptation of traffic management system "TRISTAR" to support the transport service during mass events in the City of Gdansk".

D3.2 Stakeholders

Among the stakeholders of measure 8.1 – GDA ITS Deployment following entities should be mentioned:

- ZKM – Public Transport Provider
- ZTM – Public Transport Management
- BRG – Gdansk's Development Bureau
- ZDiZ – Road and Greeneries Management
- GiK – Gdansk's Investments Company where Gdansk's ITS Project Coordinator is located. The ITS Project Coordinator assessed the solutions proposed in

subcontracted report as innovative and necessary for a proper and effective mobility management in Gdansk. The report is a kind of benefit during TRISTAR implementation.

D4 Recommendations

D4.1 Recommendations: Measure Replication

Need for implementation phase – Measure GDA 8.1 – ITS Deployment was one of two fully theoretical measures without implementation phase realized in Gdansk. The main outcome of the measure is a subcontracted report elaborated by The Faculty of Civil and Environmental Engineering at the Gdansk University of Technology. The implementation phase has not been planned so far. However the possible implementation could happen, if the City acquired necessary financial resources for this purpose. The cost of implementation is relatively high and sums up to 4.5 millions euro. Implementation of such measure requires an engagement of different bodies in the city. The measure, even at its theoretical stage of realization, cannot be handled isolated from current and future mobility management plans. Therefore it is extremely important to ensure that the measures objectives stay in line with the city strategy and that ITS is planned or will be planned in the following years. The crucial issue is that the city realizing such measure provides funding for the implementation phase, which constitutes the core part of the measure's total cost.

D4.2 Recommendations: Process (Related to Barrier-, Driver- and Action Fields)

Use of best practice examples from more advanced cities – Measure leader responsible for realization of ITS measure should communicate with cities that already implemented ITS systems. The best practice examples exchange may have a crucial impact on implementation process and help to avoid barriers encountered by more advanced cities. Also drivers supporting implementation of ITS may be indicated thanks to consultation with experienced cities.

E References

Kazimierz Jamroz, Jacek Oskarbski, Izabela Oskarbska, Karol Romanowski: 'Adaptation of traffic management system "TRISTAR" to support the transport service during mass events in the City of Gdansk ', Gdansk 2012.