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INTEGRATION OF INFORMATION SYSTEMS IN TEN-T

Features of information systems (telematics) applied on Trans-European Network for Transport (TEN-T) are presented, especially on roads part of the network. A need to deploy telematic solution on Polish part of TEN-T for transport improvement and for network integration is pointed.

INTEGRACJA SYSTEMÓW INFORMACYJNYCH W TEN-T

Przedstawiono charakterystykę rozwiązań informacyjnych (telematycznych) wprowadzanych na trans-europejskiej sieci transportowej TEN-T, w szczególności jej części drogowej. Wskazano potrzeby, jakie pod tym względem występują w polskiej części tej sieci z punktu widzenia procesu integracji sieci.

1. INTRODUCTION

An increase of inter-operability of various transport networks and systems integral stands as integral element of globalisation and convergence processes. That inter-operability in great part means co-operation in information sharing and exchange. Even integration processes, esp. European integration, calling for connection of transport systems of separate countries into common, comprehensive pan-European transport structure, create needs and possibilities for transport-dedicated intelligent systems development. Therefore efficient inclusion of Polish transport infrastructure into UE system based on TEN-T (*Trans-European Network for Transport*) requires to take into account networks information compatibility problems. It is problem of substantial meaning, because in Polish transport infrastructure a deep shortcomings in not only equipping, but even conceptual and planning areas of informatic support have to be reduced as soon as possible. This means a condition for real and effective inclusion of Polish transport infrastructure into TEN-T and full utilising our geographical position as an economic growth factor.

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2. TRANS-EUROPEAN NETWORK FOR TRANSPORT

The idea of trans-European network TEN was formulated at the end of 1980. European Community Treaty, presuming creation and development of the trans-European networks, which had to be an important element of common market and reinforcement of European economic and social cohesion, gave formal base for the network. It needs to establish activity directions, priorities and projects conceiving common needs in the area of three mutually dependent sectors: transport, energy and telecommunications. On the conference of 1991 (Prague) and 1994 (Crete) have been defined Pan-European Corridors (PAN), the main goal of which was connection of Central and Eastern Europe Countries, but all before, main economic centres of UE countries and other, being not a members of Community. The completion of PAN was done in 1997 (Helsinki). Other developing activities was as follows:

1993 – decision on developing Trans-European Transport Network (Maastricht);
1994 – establishing of 14 main transport projects (Essen List);
1996 – defining of TEN-T development until 2010;
2001 – White Book on TEN-T development;
2003 – basic revision of 1996 decisions and identifying TEN-T projects of high priority hawing to be realised until 2020;
2004 – restructurisation of the financing of TEN-T.

UE enlargement processes caused distinction of the part of network called TINA (*Transport and Infrastructure Needs Assessment*). The aim was to facilitate for the new UE members to integrate their transport systems with those of former UE. TINA network is spanned over PAN, but have been completed according the proposals of participating countries and conditions of operational integrity of TEN-T. In accessing countries TINA have prioritetary character [4].

It is worth to stress, that for getting the best transport development's effects, EU stimulates development of all the modes of the transport, along with multimodal solutions, by financing or co-financing their modernisation.

2.1. TEN-T STRUCTURE AND IT'S POLISH PART

Trans-European transport network comprises infrastructures (roads, railways, water roads, ports, airports, navigation aids, inter-modal freight terminals and pipelines) along with services systems necessary for the operation on those infrastructures.

The backbone of TEN-T has the name of transport corridors (TC), which are defined as communication lanes necessary for maintaining and reinforcement European economy development. There are distinguished roads corridors and railway corridors. In each of type of corridors there are established 6 of such a corridor. As it was mentioned, the UE enlargement process caused attention concentration on fragments of corridors lying in UE accessing countries. It found exact expression in the development program called TINA [9].

Through the Polish territory four of each type of land transport (having important European meaning) is passing. Those are road corridors

- Berlin - Poznan - Warsaw – Minsk (II TC);
- Berlin - Wrocław - Katowice - Cracow – Lviv, with branch Wroclaw – Dresden (III TC);
- Gdańsk - Torun - Katowice – Zilina (VI TC);
- Warsaw – Kaunas (V TC),

and railways corridors

- Berlin - Poznan - Warsaw – Minsk (II TC);
- Gdańsk - Warsaw - Katowice – Zilina (VI TC);
- Berlin - Wroclaw - Katowice - Cracow – Lviv, with branch Wroclaw – Dresden (III TC);
- Warsaw – Kaunas (V TC).

2.2. TELEMATICS IN TEN-T

Optimisation of the effectiveness of existing infrastructures and their future development becomes a priority action. That's while a feature of modern road construction comprises condition of existence of proper telematic infrastructure for traffic control and provision of information for users. This informatic infrastructure enables also co-operation between European, national and regional levels of traffic management.

Important meaning is given to the combined transport networks, comprising railways and water roads, connected where necessary with starting and/or ending points of motorways. Such a network comprises also installations enabling freight exchange between particular separate networks. Obviously, it has to be supported by proper telematic solutions, playing the crucial role in such a network.

Respecting telematic applications in transport sector, the European Council confirmed[2] that:

1. It is important to introduce compatible telematics systems in the transport sector in order to help create European information infrastructures.
2. It highlights the importance of the introduction of interoperable automatic road traffic information and warning systems in the Member States, the need to define and use compatible specifications in air transport, the need to introduce a European ship reporting system and the importance of the existence of compatible telematics systems in rail transport.
3. It requests the Commission and the Member States to exert their influence on the European railways to this end, jointly to determine the measures to be taken in relation to rail and road transport, to submit recommendations relating to Community policy to promote satellite navigation and to support standardization work launched in the air traffic sector.
4. It invites the Commission to draw up a programme for the measures required at Community level for the implementation of telematics in the transport sector (action programme).

[2] Council Resolution of 24 October 1994 on telematics in the transport sector

Transport telematics acknowledged as a feature of Information Society creation process, have to be developed in the frames of Common Transport Policy. The goals of this development are formulated as:

- providing a background for the development of telematic services and systems to meet both local and community needs;
- keep opening to all technologies;
- encouraging the authorities to incorporate telematics into projects at the transport infrastructure planning stage;
- taking advantage of the trans-European network projects and of the corresponding financial support;
- encouraging involvement by the private sector;
- providing stable conditions for the small and medium-sized businesses using RT services;
- guaranteeing that interworking between infrastructures and services possible in order to provide users with the best possible services.

TELEMATICS IMPEMENTATION'S PROGRAMMES

In the frames of developing activities in transport information systems, a number of particular implementation projects were undertaken. More important are listed below. But it is worth to underline, that for assuring cohesion and effectiveness of implemented solutions earlier was elaborated Frame Intelligent Transport Architecture KAREN [5]. Alike, consolidating role plays activity in telematics standardisation area [13].

The main reason for such a steps putting more order in development of transport telematics was an observation, that number of European countries builds and installs enhanced traffic control and traveller's information systems which do not create an cohesive structure. It was obvious, that there is a necessity to elaborate a method, which will enable or enforce compatibility of systems installed in all the Europe.

For that reason, a short-time program conducted in the frames of TEN-T has been replaced by MIP (*European Commission's Multi-Annual Indicative Programme*), which enabled undertaking of indicative budget formulations. This makes possible planning for longer periods and provision of more comprehensive financing of middle- and long-term projects.

MIP has been directed specifically to areas where traffic congestion was observed (t.ex. international transport corridors, exits to urbanised areas). Three goals are defined:

- optimising the use of road capacity and of passenger and freight traffic flows,
- savings in terms of road safety, due to reduced accidents and reduced impacts of accident,
- Alleviating environmental damage through reducing traffic congestion.

The projects funded in the MIP are designed to address a series of "Priority Actions":

Even some priorities were shown, like:

- implementation of high quality road monitoring for building reliable ITS services,
- establishment of a European network of traffic centres,
- removal of bottlenecks and easing of traffic flows through traffic management and control measures,
- deployment of easy access to high quality traveller information services including exchange with other modes of transport,
- enhancement of safety and efficiency of freight transport through fleet and freight monitoring and management systems,
- development of easy and efficient electronic fee collection systems,
- Promotion of road safety and efficiency through incident and emergency handling.

MIP/TEMPO Programme

To gain full advantages from deployment of intelligent transport systems (ITS) in all the Europe it is necessary to reinforce and co-ordinate the efforts of many interested actors. Therefore European Commission started at 2001 programme TEMPO (*Trans-European Intelligent Transport Systems Project*), with aim to stimulate harmonisation and synchronisation ITS deployment in TERN.

A crucial goal of TEMPO realised in MIP frames is just getting a coherent process of telematics development, striving to converge national and regional plans of information's technology support for transport and treated as the part of information society building process.

For ensuring a maximum of added value which may be gained from undertaken projects, are foreseen such activities as on cross-border and European level co-ordination technical and operational co-operation, information and experiences exchange on the best practices, validation of the solutions and structural cost-effectiveness as well as consideration of man-machine co-operation aspects. Such a tasks are taken into account in ARTS, CENTRICO, CORVETTE, SERTI, VIKING and STREETWISE projects [9].

For Poland, the most important project is CONNECT (Co-ordination and Stimulation of Innovative ITS Activities in Central and Eastern European Countries), It has been additionally established for building compatibility – mainly on traffic management systems – between transport networks of the former UE and those of accession countries and concerns TC II, III, IV, V, VI and X. In the frames of program have to be prepared requirements on effective cross-border traffic management system, improvement of the security on roads by providing users with proper information and harmonisation of national ITS architectures. The program is realised by Czech Republic, Germany, Hungary, Poland, Slovakia, Slovenia and Austria. The last one co-ordinate the project planned for years 2004 – 2006 and realised by 32 organisations[3].

[3] The main performer ofthe project is Vienna's firm *via donau* (www.via-donau.org)

FP projects

Even in successive FP programs some tens of researches or implementation telematic projects were or are realised [16]. It is worth to mention:

- in IV FP realised
  - Programme TELEMATICS 2C, covering such a thematic areas as information processing, information systems, telecommunications, transport, training and education;
  - Programme TRANSPORT, covering thematic areas of security and transport;
  - Program ESPRIT 4, which includes projects belonging to thematic areas of electronics, microelectronics, information processing, information systems;
- V FP projects classified in thematic areas of: security, transport, development policy, information processing, information systems; innovations, technology transfer; telecommunications, fuels; alternative energy sources; other energetic problems, economic aspects, industrial production, development policy, social aspects.

Especially creative analysis and summary of all the works can be found in [7].

3. INFORMATION PROBLEMS OF POLISH TRANSPORT NETWORK

3.1. POLISH OBLIGATIONS I TRANSPORT BRANCH

In Polish transport branch the main effort is concentrated on the improvement of roads in four TC passing the country. Partially it is result of approving in 1999 the final version of TINA Report, which is seen as the basis of inclusion of Polish transport networks to trans-European networks.

For the road transport, regulations concerning road quality tests, driving licences, vehicle marking and data on public roads are accepted. During 2001–2002 Poland has adopted UE conditions concerning road transport law. What concerns the integration of TEN-T, the most important issue was adoption of the programme of the adjustment of Polish roads network to European standards. The year of 2015 have been declared as a final date of the adjustment. In 2002 Polish government worked-out national plan of the infrastructure development, coherent with TEN-T goals, which foresees expansion and upgrading of the infrastructures belonging to this network.

In the area of railway transport, very important structural changes are to be implemented. Among them, adjustments to the UE requirements are not the last. Legislative regulations in the railway transport area of 2001 just considers many of Community questions

Alike, some structural changes in the air transport area are constructed. Among others, Poland joined the European Common Air Area.

In the marine transport area, the security problems are of highest importance. Underlines that it is necessary to reach the European standards. It was considered in maritime security legislation act adopted in 2002.

3.2. SOME ACIVITIES IN POLAND

For reaching the full advantages of Common Market provision of effective connections between all the European countries by TEN road networks is crucial. One of basic strategic goals is improvement of security in transport, including reduction of the accident's costs. The road transport is most dangerous and generates very high expenses[4]. For improvement of transport, adopted strategy underlines the inter-modal transport systems development.

Real development operation plans takes into account in the first range international and inter-regional linkages belonging to TEN-T: building of A2 (II TC) to 2013, A4 and A18 (III TC), country road no. 8 – via Baltica (I TC), express road S22 (Ia TC) an modernisation of railways lines: E75 – Rail Baltica (I TC), E20 (II TC), E30 (III TC), E65 (VI TC). Those plans was adopted with vision of doubling of traffic until nearest 15 years, what causes necessity of assumption of big reserve and expansion possibility [18], [8]

Infrastructure development will be accompanied by improvements in traffic management and control area, drivers and society education or road security promotions. In the railway transport area will bę also implemented new solutions assuring growth of security level. Maritime transport will be provided with National System of Maritime Transport and telecommunications system for operation of the Maritime Service for Searching and Emergency (SAR). Alike, in air transport will be installed a National Program of the Civil Aviation Protection. On the basis of railway infrastructure and logistic centres will be installed inter-modal transport terminals, supported by finances from Cohesion Found [8].

Some detailed information on transport telematics state in Poland can be found in [6] and [17].

3.3. BASIC NEEDS IN TELEMATIC APPLICATIONS

It have been acknowledged that needs to be fulfilled in nearest time, calls for following priority actions:

- As regards driver information, which is based on the RDS-TMC (Radio Data System / Traffic Message Channel), is to guarantee cross-frontier interworking and make it easier to create a European market for such products and services. Both technical harmonisation and political co-ordination are needed for that purpose. The Commission will give particular support to the provision of a common framework ("memoranda of understanding") whereby the parties concerned will undertake to provide the service and apply the standards on the TERN.
- The aim concerning electronic-payment systems is likewise to achieve an adequate level of interworking. This requires not only the development of a convergence strategy for all electronic payment systems but also a solution to the problems concerning the classification of vehicles, non-equipped users, and the legal and institutional aspects. Technical harmonisation will have to take account of the multi-lane environment and the introduction of other telematic services using the same technology, such as reservation and payment systems. The work should be completed by at the latest the year 2000.

[4] In Poland happens annually about 60 000 road incidents, with mortal victims number about 6000, and 55 000 injured. It generates loses on the 2,7% of GNP level annually. Additional joined costs doubles this losses [8].

- Close co-operation between countries and regions will be necessary with regard to the exchange of transport data and information management. The Commission will make it easier for the parties concerned (highway authorities, service providers) to provide a common vector for applying data exchange standards on the TERN.
- The man-machine interface is characterised by two main types of device that alter the driver's task: the display of the information needed to help drivers to take decisions while driving and vehicle-control devices such as self-contained intelligent speed regulators and collision-prevention systems. The Commission advocates the application of codes of good practice to the interface between human beings and the information equipment.
- The architecture of the intelligent transport systems must enable various concepts and technologies to be used and to incorporate factors such as public transport and integral payment.

In completion of this priorities, other recommended actions originated by various individual proposals comprises:

- the supply of information and vehicle guidance before and during the journey;
- improvements to the management, monitoring and regulation of both urban and interurban traffic;
- the large-scale application of high-performance telematics to electronic payment and reservations;
- the development of public transport applications, more particularly for ticketing services, vehicle positioning systems, operational support systems covering bus timetabling or maintenance, real-time customer g (public terminals, electronic guides);
- the introduction on the market of advanced safety and vehicle control systems such as stand-alone speed regulators or the automation of intermittent traffic;
- improving the safety and efficiency of commercial vehicles by monitoring and locating goods consignments electronically and making greater use of electronic recording systems, such as electronic tachometers, smart driving licences and continuous customs clearance.

4. CONCLUSIONS

Basic telematic services including traffic monitoring a system providing information for transport infrastructure users, growth from experimental phase and tends to cover all European transport networks. Various solutions deployed by various organisational entities and technology providers allowed to collect a broad knowledge on system architectures, technologic solutions and operational procedures. At the same project realised in last time concerning mostly hot spots and urbanised areas creates the kind of patchwork of non-compatible systems in various European countries. The shortage in financial resources do not allow to account that in nearest time this patchwork will be replaced by one compatible and cohesive system. Rather it will be competed and integrated step by step.

Observed in Eastern Europe and other developed countries tendency for intensifying transport branch support with information technologies, have not comparable development conditions in Poland. Although it seems, those integration processes will enforce advancement in this area. Among others, a creative issue will be necessity to build an

integrated approach to transport modernisation and deploy modern transport chains for carrying persons and goods.

According adopted strategy is necessary to [18]:

- Support modern technologies;
- Reduce number of accidents an victims;
- Support (by State) "ecologically friendly" technologies;
- Improve mobility conditions through cities;
- Include intermodally airports;
- Modernise technologically seaports in spite of containers reloading and small loads, ferry, ro-ro and short distance navigation as well as ships loading services.

All these activities will imply a broad applying of modern information technologies.

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