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ANALYSIS OF SUSTAINABLE FREIGHT AND PASSENGER ROAD TRANSPORT DEVELOPMENT USING *ITS*

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The paper presents an analysis of measures to be taken for development of sustainable transport system. Increasing traffic intensity unavoidably requires faster development and modernisation of transport infrastructure, which means not only larger investment but also better transport policy and introduction of more advanced solutions, such as promotion and deployment of ITS – intelligent transport systems and services.

In Lithuania for development of a modern transport system meeting the EU standards and criteria, the key priority is given to development, rehabilitation and modernisation of those transport infrastructure objects that form an integral part of TEN-T. Another as much as significant task is to improve road, railway, water and multimodal transport infrastructure of national and regional significance in order to cope with the growing mobility needs of the society, promote development of business and tourism, and increase competitiveness of the economy. In recent years the ITS deployment policy have been strongly promoted in the national level. Road safety is a further area where substantial improvement is needed, despite significant achievements in the past. Application of ITS is seen as one of the most effective tools in order to improve traffic safety and other areas of transport.

Keywords: sustainable, multimodal, intermodal transport, P&R, ITS

1. Introduction

Multimodality is one of the key elements of efficient transport systems, especially in terms of urban traffic. A sustainable transport system is achieved in case if the priority is given to multimodality. The European Commission draws attention on the following figures: urban transport accounts for 40% of CO_2 emissions of road transport and up to 70% of other pollutants from transport; one in three road fatalities occurs in cities; congestion problems, too, are concentrated in and around cities [1]. Transport policy-makers must find right methods to increase mobility and at the same time to reduce the negative effects of public, private and freight transport (congestion, accidents, noise and pollution). The answer to that is the development of sustainable multimodal public, private and freight transport systems. In passenger transportation we describe multimodal journey the one that involves more than one type of transport (it is recommendable to involve as many modes as it is necessary for seamless transportation). The similar term of intermodality more refers to the ability to seamlessly switch between transport types with limited waiting times and smooth transitions [2]. In freight transport multimodal transport is defined as the carriage of goods by at least two different modes of transport. Intermodality in freight transport refers to movement of goods (in one and the same loading unit (containers/swap bodies) or a vehicle) by successive modes of transport without handling of the goods themselves when changing modes. Intermodal transport is therefore a particular type of multimodal transport [3]. When we talk about sustainable multimodal systems, usually it encompasses both terms. Sustainable multimodality leads to a better productivity and attractiveness of public and freight transport and positively influences people's mobility and strengthens transport role in the economy**.**

Problems such as traffic congestion, global warming and environmental sustainability are forcing to review long-term plans for transport. The main aim must be developing and improving the safety, security and effectiveness of the transportation systems where we can, building on the investments made in past decades. At the same time we must anticipate and be ready for the problems and challenges that are ahead. This is where ITS can play a vital part [4].

2. Sustainable Road Transport

Road vehicles provide much better protection for their drivers and passengers than was the case a decade or even several years ago. Nevertheless there is still much to do in order to improve protection of vulnerable users in the event of accidents. Intelligent Vehicle Safety Systems (IVSS) – or the so-called eSafety systems, are new automotive systems combining mechanical, micro-electric, communication and

information technology and are aimed at significantly reducing the road accidents rate and its consequences. The eSafety initiative established in April 2002 as a public-private partnership of the European Commission and industries having an interest in information-based road safety systems, e.g. car manufacturers, road operators, telecom companies and transport service providers have already shown a huge potential of ITS deployment to increase the traffic safety. These systems use information and communication technologies for vehicle safety. The eSafety initiative has defined a list of the most effective IVSS systems (eSafety systems). The chart below indicates the grouping of these systems by vehicle-based and infrastructure related systems [5]:

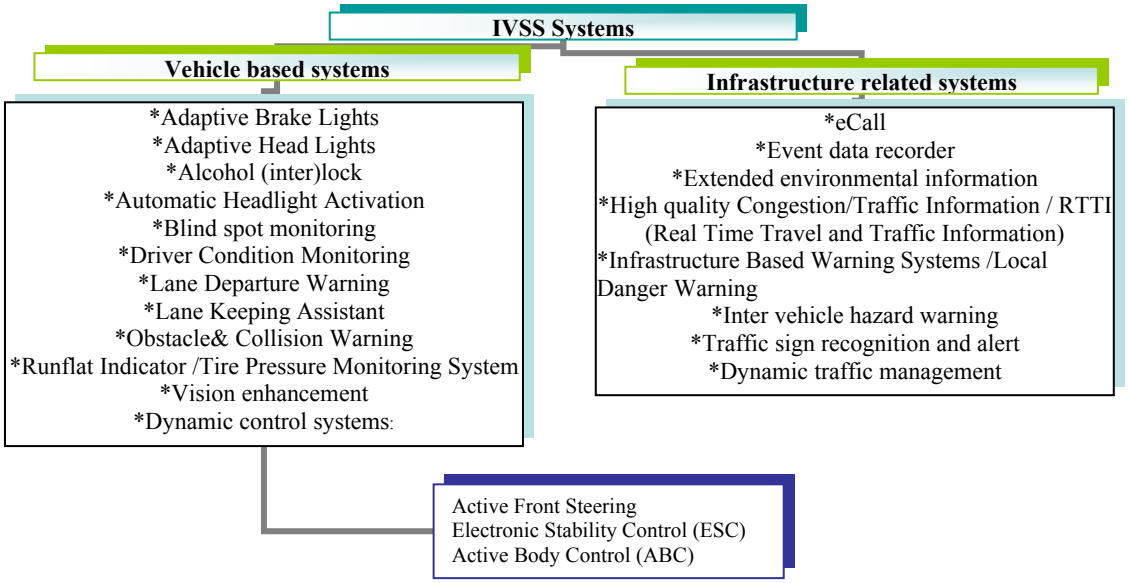

Figure 1. IVSS systems

According to Eurobarometers' survey initiated by the European Commission, overall drivers well perceive a usefulness of IVSS. Given the question on which IVSS they would like to have in their car, the majority would like to have each of the 10 provided at the survey [6]. The share of drivers that would like to have IVSS, even if they think it is not a useful system in their car, ranges from 75% concerning ABS to 52% concerning lane departure warning system. Good results let us hope that this would change the situation in traffic safety and significantly reduce the number of the lethal accidents on the roads. The need of ITS in drivers perception is a huge step towards massive ITS deployment in all areas, be it public, private or freight transport.

To make it most effective, road transport must be seen as a part of an overall transport system, with effective links to other modes [7]. The demand for road transport and mobility continues to grow, and must be met within the constraints of congestion and environmental challenges including greenhouse gases and noise. At the same time, effective and reduced use of energy is needed to contribute to security of supply. Road safety is a further area where substantial improvement is needed, despite significant achievements in the past. Application of ITS is seen as one of the most effective tool to achieve this [8].

Environmentally friendly transport system first of all refers to promotion of eco-transport. In many cases this is seen as effective network of bicycle lanes and use of electro-powered transport vehicles, such as light rail systems, urban trains, trolleybuses, eco-friendly freight transport vehicles, etc. In recent years, new trends of measures to reduce negative impact of environment have been emerged: promotion of bio-fuels, use of information systems to replace a need for transport (concept of "communication instead of transportation"), private-public journey model ("park and ride" concept), and intelligent traffic management systems to eliminate or avoid congestion and improve traffic flow control. Well-developed public transport network and interaction between private and public transport complements measures for efficiency. There are obvious advantages of the public-private concepts such as "park and ride" (P&R), "bike and ride" (B&R) systems, effective deployment of parking lots, night-transport network, car sharing programmes. Dense network of footways and bicycle lanes also play important role in a multimodal system.

2.1. Sustainable freight and passenger road transport system

In the nearest future the EU will face increased demands for personal mobility and freight transport. An internationally competitive, efficient, and cost effective transport system is essential in an expanding EU, and hence continued investment in intermodal links and capacity between road, rail, water and air is critical. With congestion already a problem in many cities and main transport corridors in the EU, even moderate growth predictions represent tremendous challenges.

In the EU, road transport is a clearly dominating means of transport both in terms of passenger and freight transportation. In freight transportation road transport accounted for the single largest share (44 %) in 2005, sea transport was not far behind with a share of 39 % [9]. The road transport share in the EU accounted for about 84 % of passenger transport performed in 2004 when passenger cars, powered two-wheelers (P2W) and buses and coaches were taken together. Road infrastructure is one of the key factors determining efficiency of transport operations and having vital significance for the Lithuania's socio-economic development as well. In Lithuania over 50% of all cargoes and nearly 98% of all passengers are carried by road. Lithuania has a very similar market share of road and rail companies in terms of cargo transportation. However, quite inadequate situation is seen in the modal split of passenger traffic: road transport takes almost 98 percent of all market. The reason is that the railway infrastructure for carrying passengers, experiences only an initial phase of modernisation; network of railway lines is not dense enough. Also it should be mentioned that the level of motorization booms. Reflecting the European policies, efforts today are taken to balance passengers' traffic modal split, between road and rail. A number of newly-registered cars are growing substantially: since 1990 the road vehicle fleet has grown 2.1 times, while traffic loading has increased by 119% on average. All this calls for a faster implementation of ITS.

2.2. Sustainable urban public transport

In the field of urban passenger transport, there is an increasing demand from European citizens for individual mobility, but at the same time society as a whole must reduce the environmental impact of road transport and increase its efficiency. The EU strives for a clean, energy-efficient, safe and intelligent road transport system. Despite efforts to promote the popularity of other transport modes, notably in congested areas, the car remains the personal means of transport par excellence, allowing people to get from A to B when and how they want; a growing independence that has meant concomitantly a dramatic increase in the number of passenger cars [10].

There are no any efficient urban transport network without public transport. Otherwise, all the cities would have faced with unavoidable and invincible congestion phenomena. Nevertheless, public transport succeeds to attract users only if a set of urban public transport characteristics tilt the balance of advantages compare with personal cars. Prof. J. Sussman accentuates these factors (variables) [11]:

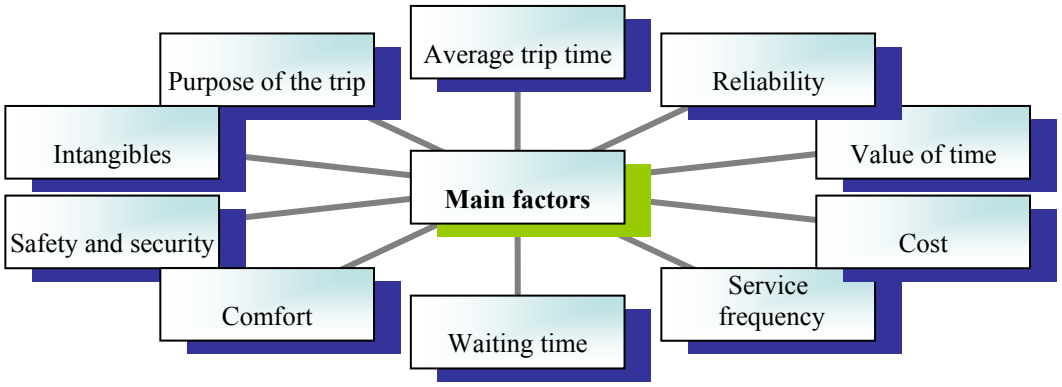

Figure 2. Main factors influencing the choice of urban transport type

The aim of decision-makers is to draw attention to those factors that are considered as the main obstacle in passenger's mind when it comes to choosing a transport mode to perform one or another journey. The ITS therefore should be deployed firstly to remove these obstacles as, for instance, the deployment of real-time traffic information systems turns waiting time factor into positive, because a passenger might quite easily plan a multimodal trip (provided that frequency of service is perceived as

good enough). The transport links should be developed rationally enough for ITS to give a strong effect. The scheme below illustrates a streamlined model of transport links.

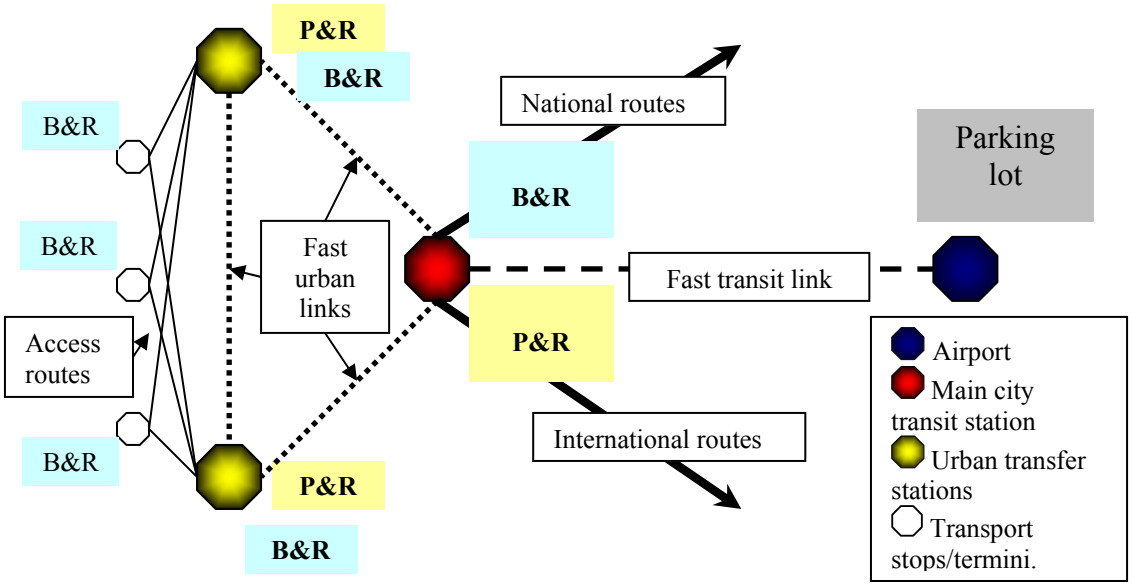

Figure 3. Model of effective urban transport links

In practice, urban transport network has to have fast public transport links in order to eliminate (reduce) congestion in the main transport arteries. Those links connect main urban passenger terminals (stations) with the main city station (main passenger train terminal with multimodal links) which is in turn linked to usually outside the city located airport by fast transit link and as well serves for international and national traffic. In order to effectively control transport flows, city is not possible provide with no-transfer links. The outermost areas of the city, especially not densely populated ones, are usually linked to urban transfer stations (light rail or urban rail station, the bigger ones bus terminals) by bus routes (bicycle lanes is a supplementary option, too). For those residents who have no frequent or convenient public transport links to fast urban links, P&R areas are provided to park their personnel car and to further continue journey by fast urban transport. This system is rather complex mechanism than easy-to-achieve goal. The ITS deployment in public transport has been seen as a necessity to manage more and more complex public transport.

3. Conclusions

Transport flows on main roads and urban streets are constantly growing all over Europe, congestion becoming a threat of traffic safety. Therefore ITS are seen as an effective solution to implement the concept of sustainable mobility.

Traffic management and travel safety does not meet the growing demands of traffic actors, ITS services are not yet efficiently delivered to travellers in Lithuania.

Private and public transport interaction systems, such as “park and ride”, especially at vicinities of the city helps to avoid congested street and promotes the use of public transport. “Bike and ride” option is seen an attractive as the way to access the nearest public transport terminals, where landscape is favourable.

Involvement of urban transport stakeholders must ensure that all of them participate in management of transport systems in a co-operative way. Organisational structure has to ensure that transport managers and operators know passenger’s need and get a feedback constantly to be able timely react.

Implementation of the intelligent transport systems and services greatly affects all the factors influencing urban journey and leads to sustainable functioning of multimodal urban transport systems.

In order to achieve sustainable mobility, effective innovative measures have to be introduced to ensure shifts to more environmentally friendly modes where appropriate, especially on long distance, in urban areas and on congested corridors, but at the same time each transport mode must be optimised.

With the expanded geography of the EU a need for new intra-European corridors will come, as well as a general reinforcement of the existing international freight transport routes. The expected investment in linking the East and the West offers a rare and significant opportunity to create an innovative and efficient infrastructure. It seems that ITS deployment has the biggest rational, especially improving the situation of road traffic safety. Road transport is the key element of the entire transport system. Therefore it is of vital importance to increase effectiveness of this sector and achieve the goals of having road transport as a part of the entire multimodal transport system.

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