Smart Transportation

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Abstract- *One of the most important components for proper functioning of cities is the mobility. As the paper focuses on transportation ,the use of Intelligent Transportation Systems is crucial to enable modern smart cities solutions, both in cargo as well as passenger transport. This paper presents various problems of the typical city with regards to transport and mobility. Some problems are already partly tackled, but there are still open issues for research and development of even better approaches. Europe's Smart Specialization Strategy suggests that each region specializes in specific solutions, based on existing competences. The presented solutions are part of the Slovenian smart specialization strategy. However, the most important issue for implementation and for improving the real efficiency of the transportation in the smart city is simply the critical mass/acceptance rate of users/citizens.*

Keywords- on-demand transport, traffic, congestion, cargo, optimization

I. INTRODUCTION

The use of Intelligent Transportation Systems(ITS) solutions to more efficient management of transport networks both for passengers and cargo. With the integration of existing and development of new ITS and other ICT solutions and business models, innovative services that will contribute to smarter cities and communities[2] can be developed. This paper presents some transportation problems of the typical (smart) city and points to their potential solutions. Some of these problems are already partly tackled, but are still open for an additional research and development in order to achieve even better solutions.

Recent technological advances enable fundamental shifts in the processes-for example, autonomous vehicles enable new business models of transport. However this paper restrains from discussing autonomous vehicles and focuses on some other problems.

An important fact or for deciding whether to order public transport in concrete town is primarily the attractiveness of the city and its internal urban structure, ie , the distance between the main transport sources, the objectives, the internal mobility and the number of passengers from and to the city. For these reasons, there are also great differences in the planning of traffic concepts for urban transport for large and small towns.

II. TRANSPORTATIONPROBLEMS

Some of the most recognized urban transportation problems today:

Road congestion:Congestion has become one of the most important aspects of modern life in big cities. The dimension of the problem can be realized by simply considering that one third of all vehicular travel takes place under congested conditions, in which speed averages half the free flow values. Congestion occurs when transport demand exceeds transport supply in a specific section of the transport system. Under such circumstances, each vehicle impairs the mobility of others.The rise in congestion increases the emissions and the energy consumption per passenger-km, making road use increasingly unsustainable. Congestion also has a negative economic impact, as the efficiency and the throughput capacity of a congested transport system reduce substantially.

Parking: Coupled with road congestion, parking is another form of urban congestion, but its effects are different. Parking has a significant imprint on land use, as it consumes large amounts of space. In largely car-dependent cities, this can be very constraining as each economic entity has to provide an amount of parking space proportional to its level of activity. Therefore, parking has become a land use that greatly inflates the demand for space in a largely inefficient way. Land use planning textbooks rarely mention parking congestion and requirements, indicating that the issue has often been neglected and underestimated by urban planners. As in the case of road congestion, cities are often required to provide additional parking space with growing demand in order to ensure economic development.

Pollution and noise: Cities and societies are increasingly concerned with environmental and sustainability issues. Pollution has become a significant problem for many urban areas, as it negatively affects the quality of life and the health of the residents. Although the chronic effects of human exposure to traffic related pollution have not been proven, the acute health effects of short term exposure have been widely

demonstrated . In addition to air pollution, the quality of life in cities is also negatively affected by noise.

Public transport in adequacy: Many public transit systems, or parts of them, are either over or under used. During peak hours, crowdedness creats discomfort for users as the system copes with a temporary surge in demand. Low ridership makes many services financially unsustainable, particularly in suburban areas.

III. SOLUTIONS TO PROBLEMS

Potential solutions to the transport problems are:

- Traffic Management Measures:Temporary and partial relief from road traffic congestion may be gained from the introduction of traffic management schemes, involving he reorganisation of traffic flows and directions without any major structural alterations to the existing street pattern. Among the most widely used devices are the extension of one-way systems, the phasing of traffic-light controls to take account of traffic variation, and restrictions on parking and vehicle loading on major roads.On multi-lane highways that carry heavy volumes of commuter traffic, certain lanes can be allocated to incoming vehicles in the morning and to outgoing traffic in the afternoon, producing a tidal-flow effect.
- Parking Restrictions:It is not possible to provide sufficient space for all who might like to drive and park in the central areas of large towns. Parking thus must be restricted and this is usually done by banning all-day parking by commuters or making it prohibitively expensive. Restrictions are less severe – off-peak, so that shoppers and other short-term visitors who benefit the economy of the centre are not deterred.Separate arrangements must be made for local residents, perhaps through permits or reserved parking.
- Promoting Public Transport: If ETM aims to shift trips away from cars, then attractive alternatives are required. Cycling and walking may be appropriate for the shorter distances, but transferring longer trips requires that a good quality public transport system is in place to ensure that the city can function efficiently.

IV. THE ROLE OF INTELLIGENT TRANSPORT SYSTEM

Recent technological developments and ITS have made possible the development and implementation of a wide range of traffic management techniques, methods and policies. The blend of ITS, computing and communications technologies have contributed in improving the safety, efficiency, and convenience of road transport, both for people and for goods. The establishment of ITS is visible today, as roads are equipped with electronic tolling and VMS; passenger vehicles have navigation systems and emergency notification systems; and public transport vehicles have location and communication systems. Transport infrastructure in cities has also improved through systems automatically tracking, monitoring and supporting the better management of road traffic. This wide variety of fields and applications confirms that ITS have gained widespread acceptance within the transport community and by the general public. In fact, many cities already use ITS fairly extensively, while increasingly more plan to do so in the next years.

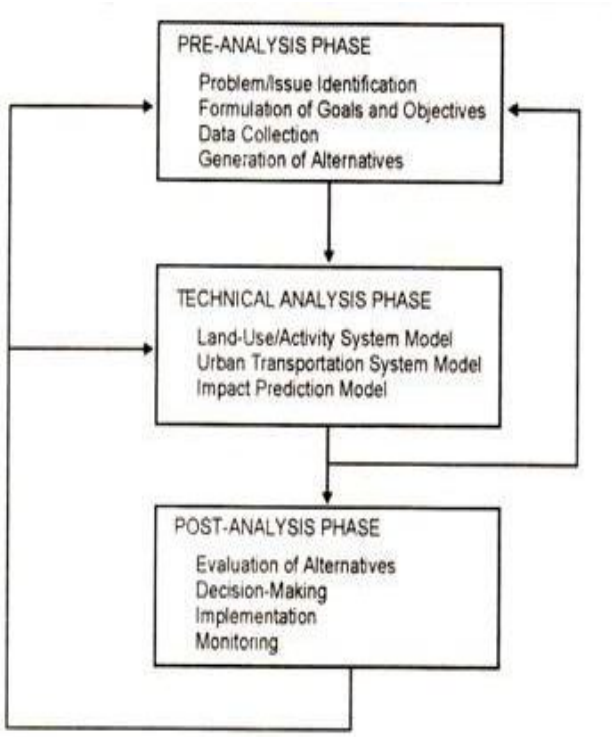

Fig. 1

In terms of congestion management, common example ITS applications include:

- electronic toll collection, that makes it possible for vehicles to drive through toll gates at traffic speed, reducing collection and automating toll collection.
- zones with urban road pricing, that collect a charge form vehicles entering the zone using electronic toll collection and automatic plate recognition.
- variable speed limits, that assist in the management of traffic by reducing the congestion build-up rate.

In terms of road safety and enforcement, ITS have applications such as:

- intelligent speed adaptation that warns or prevents drivers from exceeding the local speed limit.
- automatic road enforcement, that by using cameras and sensors can identify vehicles disobeying rules. Some examples are red light cameras, bus lane cameras and speed cameras.
- emergency vehicle notification systems that can generate emergency calls either manually or automatically using in-vehicle sensors.
- collision avoidance systems that notify drivers about stalled vehicles and traffic incidents on their route.

Finally, in terms of information provision, example ITS applications include, among others:

- the provision of real-time traffic information through various means, such as VMS, mobile phones, radio etc.
- the supply of anticipated travel times, as well as personalised route guidance through satellite navigation systems and mobile phones.

The number of ITS applications is continuously rising with new technological developments providing a wide range of methods and systems for traffic management. However, the orientation of ITS technologies so far has primarily been towards the efficient management of private transport and the smoothening of road traffic, with less focus on public transport. ITS solutions mainly focus on improving road traffic conditions in cities in favour of cars, therefore providing a competitive advantage to private transport in terms of modal choice. As mentioned earlier in this report, the cities' main concern is a modal shift from private transport to more sustainable modes, and in particular public transport, indicating that ITS should provide solutions and contribute to the management of public transport as well. This will balance the quality of service provided by public transport, establishing a more competitive environment.

V. CONCLUSION

High-quality public transport is a prerequisite for achieving sustainable urban mobility. However, traditional public transport solutions do not often take into account demand changes in their long-term time tables. The comprehensive " smart " approach to urban transport planning in small towns presented by the authors offers a possible solution. In achieving high operational productivity, the time table also takes in to account the most important demand requirements. The article presents two basic methods. To determine the required interval, the first described method is derived from the application of a random model to determine the number of trips in the city. The second method was introduced to create an operational concept that achieves high vehicle and staff productivity.

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