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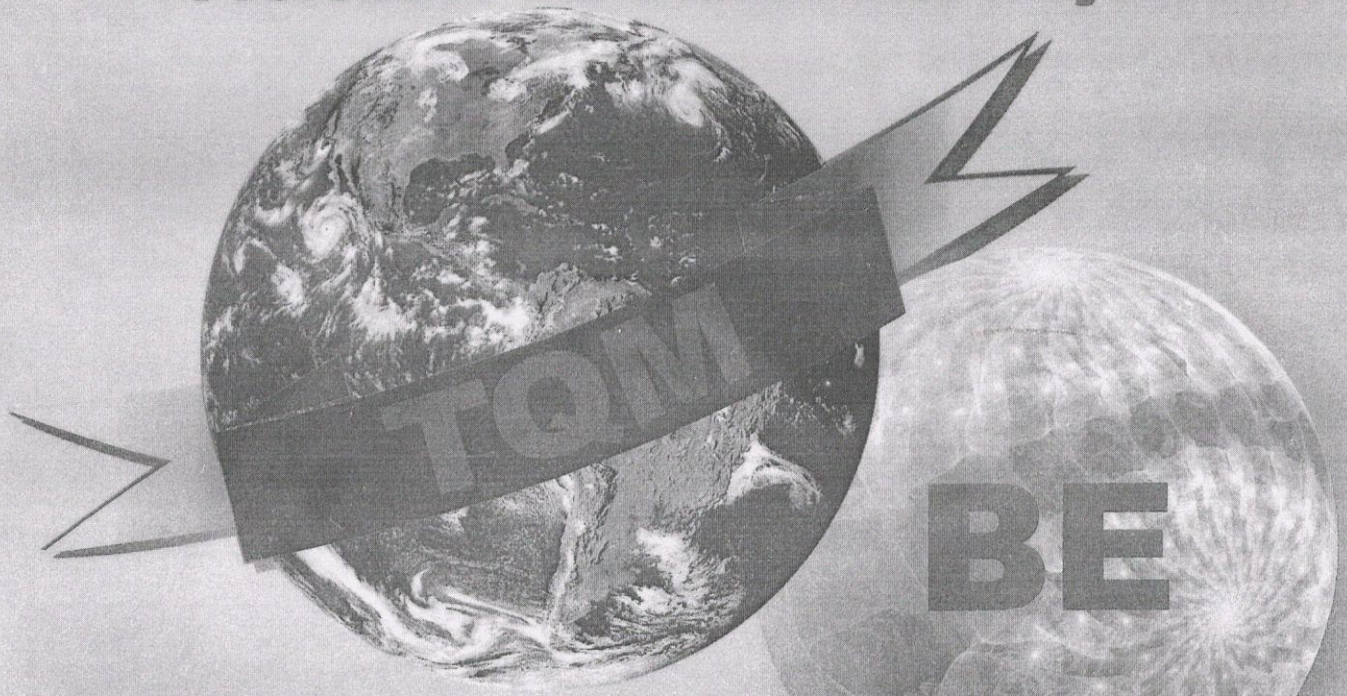

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ADVANCED APPROACH FOR IMPROVED MANAGEMENT OF FREIGHT DISTRIBUTION AND LOGISTIC PROCESSES THROUGH CENTRAL BUSSINES DISTRICT OF BITOLA, FYROMACEDONIA

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Abstract: In the last six years within the Mlcrologistic DIstribution System Analysis – MIDISA in the city of Bitola, FYROMacedonia, an enormous efforts and attention has been paid to the urban goods distribution process which is together with private traffic flows, one of the major sources of energy consumption, noxious gas emissions and noise levels, resulting in the well known negative impacts on life and environmental quality of our city. MIDISA Project aims increasing the sustainability and the efficiency of urban delivery of goods by means of an adaptive and integrated mission management and advanced solutions in order to achieve town and environment compatible goods transport development, reduction of goods transports on our city roads, enhancement of vehicle capacity utilization, and most of all the improvement of city logistics transport process. The overall objective of this paper is to investigate, develop, propose and validate an innovative ITS application (Decision Support System), for improved management of freight distribution and logistic processes in the Central Business District of Bitola.

Key Words: *Urban Logistics, ITS application, Decision Support System.*

1. INTRODUCTION

In the last ten years major efforts have been carried out by the European cities in order to face traffic flow congestion, related energy consumption and noise levels in urban areas.

In particular, limitations to traffic circulation and access restrictions (Restricted Traffic Zone - RTZ) to city centers have become common practice based on specific transport schemes: Park&Ride, public transport accessibility, traffic light co-ordination, innovative transit vehicles and fuels (friendly and safety characteristics, CNG, LPG, hybrid, electrical, etc.) and technological infrastructures as well: access gates, variable message signs, traffic lights, etc.

No equal efforts and attention have been paid to the urban goods distribution process which is, together with private traffic flows, one of the major sources of energy consumption, noxious gas emissions and noise levels in urban areas, resulting in the well known negative impacts on life and environmental quality of our cities.

From the system and technological point of view, several projects have been initiated in many European cities, for the introduction and development of systems for urban logistics and logistic platforms oriented towards the distribution of goods at urban,

regional, or urban-regional levels: Cost 321, SURFF, IDIOMA, FREIA, ARTEMIS, MOSCA, LEAN, e-DRUL, BESTUFS, THEMIS, etc.

Such projects have often covered the introductory phases and the exploration of organizational and technological solutions for the development of logistic platforms. The level of development differs. The adoption of technological solutions and telematics infrastructures often has an experimental and step-wise character, through the realization of pilot or exploratory projects on the different technologies and/or on the different organizational solutions that they imply.

2. STATE-OF-THE-PRACTICE IN URBAN FREIGHT TELEMATICS AND TECHNOLOGIES

Important areas in urban transport developments are:

- information and communication technology (ICT);
- engine technology;
- mechanization and automation.

ICT developments open advanced opportunities for routing and scheduling of vehicles that help streamline logistical optimization. Further more ITC can help to enhance traffic safety and to increase infrastructure capacity. The development of telematics technologies within the last decade has had a primary role in contributing to the development of logistic platforms. Today the technological supply in this sector includes several technologies, methodologies, and tools, such as:

- communication technologies and fixed networks, primarily the strong development connected to the expansion of internet;
- mobile platforms (on-board terminals, palmtops and PDAs, code-reading peripherals, etc.) and wireless communication networks (GSM, packet networks, e.g., Mobitex, evolution of mobile phones – GPRS, and in future 3G – UMTS);
- models and software tools for distribution management and planning (route planners, distribution planners, demand-supply managers, etc.) ;
- tools and services for message exchange and rationalization of information flows among the different logistics actors;
- tools and systems for the integration of the logistics system with the available information on traffic and mobility (TIC, mobility service centers, etc.).

3. MIDISA PROJECT

MIDISA (**MI**cro logistic **DI**stribution **S**ystem **A**nalysis) Project, started in May 2006 [1], [2] and spanning to the end of 2012. In the first four years was coordinated and financed by the academic staff at the Department of Traffic and Transport Engineering-Technical Faculty of Bitola, and in the last two years the Municipality of Bitola was included also. The overall objective of MIDISA Project is the optimization of logistics flows in the city, improving the efficiency of last mile deliveries, lower emissions, noise and congestion within the city and higher quality, stock availability and value added services.

Namely, it is planed MIDISA measures and solutions to be demonstrated, tested and validated, at different levels in Macedonian sites with different area characteristics, local policies and transport network infrastructures.

3.1 MIDISA Project and the City of Bitola

Large part of Bitola's inner city traffic problems are attributable to goods transports, just like in many Macedonian cities. In the town centre of Bitola this situation is most of all the result of the high business concentration. In addition to this, the historic old town is characterized by a system of narrow, widening lanes and streets. These not only serve as transport routes for delivery traffic, but are simultaneously also filled with shoppers, tourists and residents. The range of mobility interests converges in an extremely constricted space. According to the new territorial distribution, study area, known as Central Business District of Bitola - CBDB has 32.4644 ha surface [3]. The land assignment is a complex mix of a large number of activities. Traffic network is quite specific and formed as a result of the inherited town structure in the central part. It is characterized with non-regular, winding form and geometric profile which is not dimensioned for the modern necessities in the town. The old centre has an area of 1.0 km^2 and more than 4.000 vans and lorries drive into the area every day. General results from the tterrain survey are described below, [4]:

- limited access of delivery and pick-up vehicles because of the illegally parked TAXI vehicles;
- limited access of delivery and pick-up vehicles because of the inappropriate road geometry;
- manually handled loading and unloading operations;
- deficiency of loading ramps;
- conflicts between delivery vehicles;
- conflicts among delivery vehicles and other traffic consumers; est.

The number of lorries and delivery vans has steadily increased in number leading to increasing traffic congestion. Only 15% of these vehicles are loaded more than 60% and more than half of them less than 20%. So, it is obvious that better capacity utilization will reduce the number of vehicles and lower the visual intrusion from street traffic.

4. MIDISA ACTION MEASURES

To date we have proposed several action measures, some of which are already implemented.

4.1 MIDISA Certification

One of proposed MIDISA action measures is the implementation of obligatory certification scheme– with the goal of reducing the number and/or size of the lorries and delivery vans that drive in the Bitola Inner City. We propose, three types of City Goods Certificates:

- The Green Certificate – that will be valid for two year period. In order to be eligible for the green certificate, 60% of the vehicle's cargo carrying capacity must be utilized. Additionally, the vehicle's engine must not be older than 8 years.
- The Yellow Certificate – that will be valid for 6 months. This certificate will serves as an option for those vehicles that cannot meet the Green Certificate's restrictions.
- The Red Certificate will be valid for one day. This certificate is meant as a service for those deliveries that only occasionally come into the innermost parts of Bitola Centre. The Red Certificate may be bought at petrol stations.

4.2 MIDISA Route Guidance

To reduce the negative effects that heavy freight traffic causes to the quality of life of our citizens, we propose to set up corridors for heavy freight vehicles and restricting their access to residential areas. This action measure has already been implemented, [5], [6].

Two components of this action measure are heavy traffic regulations on routes and the required signing, (Figure 1, 2).

Figure 1. Proposed route for guidance of heavy vehicle weighting more than 7.5t

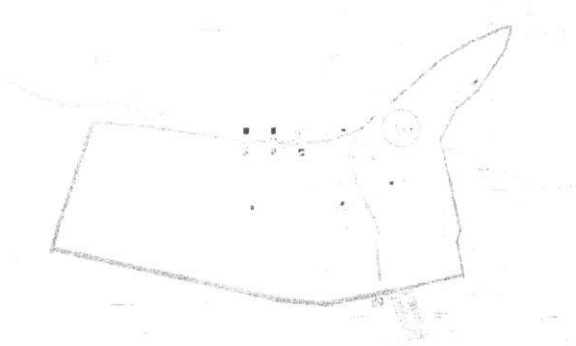

Figure 2. Proposed corridor for guidance of heavy vehicle weighting from 1.5 to 3.5t

4.3 MIDISA ITS Platform

Main aspect of the MIDISA ITS measure is the realization of an innovative and advanced goods distribution IT platform with the following capabilities:

- decision support system of logistic resources enabling integrated, demand responsive goods distribution services;
- integration of different actors of the city logistic chain through a multi-service, web-based platform supporting on-line collaboration among logistic parties and Local Logistic Agency;

Supporting the operation of the Local Logistic Agency will be a central task of MIDISA ITS measure. It is planed Local Logistic Agency to acts as virtual enterprise ensuring the work of different logistics operators in a multi-organization context.

Despite the physical location of the operators and the goods terminals, as well as shop keepers requests, it will manage the entire goods distribution service chain (from service planning, monitoring and control) as unique entity.

Specifically, the MIDISA ITS platform will allow logistic operators to manage the following operations:

- Trip planning and management for goods pick-up and distribution;
- Management of available vehicle capacities;
- Management of the economic costs related to the goods distribution;
- Management of communication and exchange of on-line and real-time information with the different actors within the distribution system;
- Management of communication with the vehicles for routine operations of goods pick-up and delivery;
- Interaction with e-Commerce/e-Business network services, in order to ensure:
  - the communication of information to the customers (planned time of goods delivery),
  - the communication with the goods pick-up points (notification of collection time, changes or errors in the service, etc.).

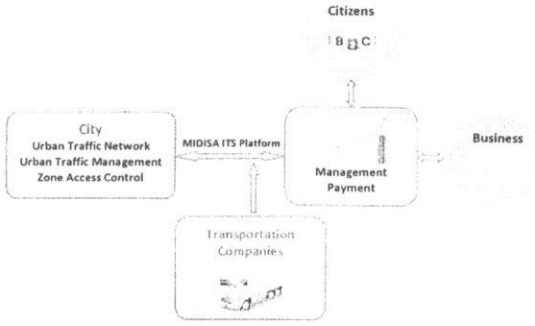

Figure 3. MIDISA ITS Context

The implementation of the MIDISA ITS architecture involves a number of advanced IST applications and enabling technologies, including:

- web-enabled information services for the customers (B2C segment),
- information exchange, resource sharing for e-logistics operators (B2B segment);
- delivery notification and information through mobile phones and SMS;
- goods dispatcher software for trip planning and resource (vehicle capacity) optimization;
- in-vehicle display units and hand-held devices (new generation mobile phones based on WAP and GPRS) to support vehicle drivers and goods delivery operators tasks;
- GPS-based or GSM/GPRS-based vehicle location systems;
- long-range, wireless communication channels (GSM, GPRS) to support interactions and information exchange among the logistics planning/management platform and vehicles/goods delivery operators.

5. CONCLUSION

The main reason for this efforts is that facing the urban logistic process implies aiming at the study and implementation of a number of measures – regulatory, organizational, operational and technological – to improve City Logistics operations and reduce the negative impacts of freight traffic in the inner historical centre of Bitola, addressing on different, inter-related city management aspects: institutional, city regulatory and mobility policies, political, social and citizens consensus, city operational and business processes, as well as infrastructural/technological service organization.

The solution of the above issues are the basic conditions to create a coordinated development and management of the operational processes of the city logistic arena in the context of a current, partnership-driven approach, for designing and realizing an advanced freight distribution platforms and for demonstrating and evaluating new urban logistic IT systems and schemes integrated with e-Commerce services.

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