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DURANA - USAGE OF INTELLIGENT TRANSPORT SYSTEMS A WAY OF REDUCING ENVIRONMENTAL POLLUTION

Drakuli Lumi
"Aleksander Moisiu" University, Durrës, Albania

Majlinda Sana
"Aleksander Moisiu" University, Durrës, Albania

Osman Metalla
"Aleksander Moisiu" University, Durrës, Albania
o.metalla@gmail.com

Abstract

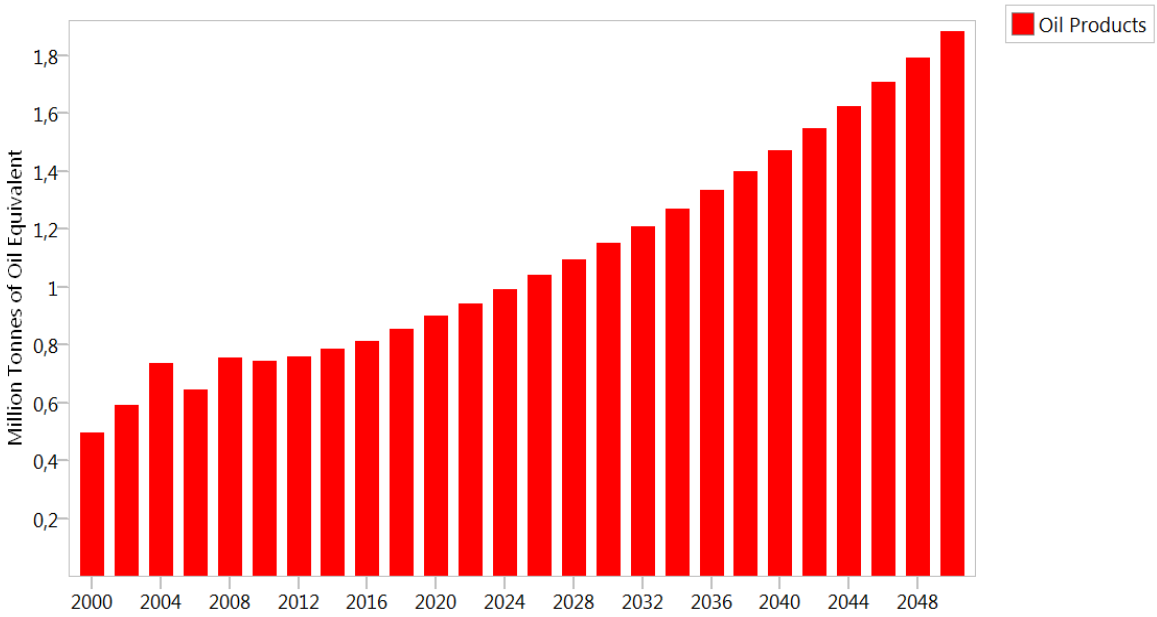
Transport has a great impact on environmental pollution, due to gas emission, which generates 25% of CO2 global emission. In Albania, the number of vehicles has exceeded half million and has a tendency to keep rising. The average age of these vehicles is relatively high and most of them operate in the DURANA region, Albania (this region consists of Tirana and Durrës). The application of Intelligent Transport Systems (ITS) is an impressive opportunity to reduce transporting time, to increase the magnitude of networks, to diminish traffic congestion and to decrease energy consumption. All of the above combined, induce the reduction of gas emission in 10%. The implementation of ITS systems will affect public transport as well, making it more reliable, effective and more appealing, in order to promote its usage. Following the application of ITS, several efficient itineraries can be planned and the chauffeurs will be given instructions on the way of circulating in these itineraries. This would help to diminish fuel consumption and gas emissions.

Keywords: DURANA, Intelligent Transport Systems (ITS), Information and Communication Technology, greenhouse gas

INTRODUCTION

Transport has a key role in the socio-economic development of each country. An efficient transport system empowers trading, making it a mechanism that leans toward economy boost. On the contrary, a non-efficient system restrains the manufacturing capacity and limits economic development. However, on the other hand transport (mainly Road Transport) constitutes one of the major factors that affect the air pollution index (CO_2 , CH_4 , NO , HC, etc.). Studies have shown that 44% of total energy consumption belongs to Transport, 80% of which goes to Road Transport. It is important to emphasize that in the prediction about energy consumption in the next decades, this tendency of advancement is still present (Fig.1).

Figure 1. Final energy demand in the transport sector



In the past few years, there has been a drastic structural change in the pattern of transport solicitation. Particularly, the traditional “single mobility” mode, in which the transport had as an origin and destination a residence, has been replaced by the “multiple mobility” mode, in which the voyage constitutes of various linked transactions. For goods trasport, the passage from a “stock economy” into a “flux economy”, the shifting into a wider sector of manufacturing sites and the rate of expansion of marchandise and logistics have brought to an alteration of the latitude and qualitative trasport demand sector. As a result, there has been an upgrading of blockages with several negative impacts on the environment, life quality and assurance along with high expenses for the comunity.

Referring to the data from United Nations Organization, the actual global scenario is characterized from the following situation:

- World population keeps increasing and in 2013 it reached over 7 milliard residents, 51% of which live in metropolitan zones.
- The Transport sector in total generates over 25% of CO_2 global emissions and especially Road Transport assembles 16% of CO_2 global emissions in global rate;
- The inefficiency of transport networks in general costs about 1 – 2 trillion dollars per year;
- It has been evaluated that leakage from traffic congestions constitute 1% of PBB in developed countries and 2-5% in countries in development.
- Until 2050, the mechanization level will have an extension between 250 and 375%;
- Particularly for Europe, data from the European Commission reveals that actually 75% of the population live in metropolitan zones and cities generate 70% of energy consumption and greenhouse gas emissions (CO_2, CH_4, N_2O).

The data mentioned above highlight the mobility challenges to cope with th expected growth. Increasing the number of infrastructures is not the only way of dealing with this problem. So, a new strategy has to be promoted; “picturing” transport as a wholly integrated system, in which information, management and control operate in synergy.

The Intelligent Transport Systems (ITS) main goal is the optimisation of the management of infrastructure and logistic platforms, rearranging traffic fluxes in order to promote a balance between different ways of transport and ancourage the utilization of other steady means of transport. The Intelligent Transport Systems (ITS), is known for giving the means to “sharper” mobility management, contrastingly from other means. The application of systems utilized until now throughout the world, not only in the urban level but also in the interurban one, makes possible the evaluation of benefits taken from ITS.

Experiences in different countries, such as the USA and Europe, reveal that some of the applications have brought the following results:

- Reduction about 20% of shifting time;
- Increase of network capacity in 5 ÷ 10%;
- Diminution of the number of accidents nearly 10 ÷ 15%;
- Falloff traffic blockages with 15%;
- Decline of gas emissions that cause environmental pollution, about 10%;
- Decrease of energy consumption with 12%.

These benefits have been obtained thank to relatively modest investments and in any case lower than those required for the construction of the new infrastructure. In case of World Economy reversal, the options that ITS offer would face the problems related to transport in an effective way and without doubt, with reasonable costs.

As regards Europe, the Commission has emhasised even in the White Paper of the year 2001 “European Transport Politics until 2010: time to establish” or the one of the year 20011 “Guideline to a unique zone of European Transport – For a competitive and firm Transport Politics ”, the key role of ITS in order to acquire an utterly integrated transport network. This would facilitate the realisation of the chief objective for the European Transport politics: “Guarantee, for very citizen and for goods, the chance for a safe trip, efficient and acceptable for the environment, using each one of the means of transport”.

Particularly, this Paper highlight the predominant role of ITS in the amelioration of the efficiency and environmental impact of the European Transport Nework in a long-term period, by virtue of the best systems of information and traffic management, in multimodal optics for transport of passengers and goods as well.

ACTUAL CONDITION OF VEHICLES IN ALBANIA

It is well known that in Albania up to the 90’ of the past century, the number of vehivles has been restricted. After the drastic changes of these years, this number increased with an impressive pace. Only during the last 15 years it has multiplied 20 times. Half of the total numer of vehicles is cenralized in the region Tiranë-Durrës (DURANA).

Even thought in the last few years the development of Vehicle Construction Technology and the integration of normatives focusing on Road Safety and Environmental Protection have been a priority of manufacturing countries, used vehicles tend to be prevalent in Albania. The general number of vehicles is shown in the Fig. 2 while in Fig. 3 there is a division according to the regions of the country.

Figure 2. The number of vehicles until 2014

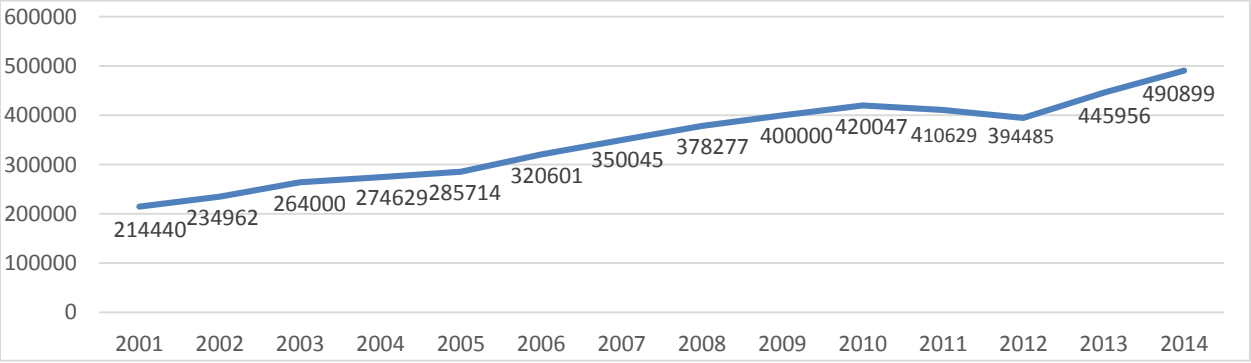
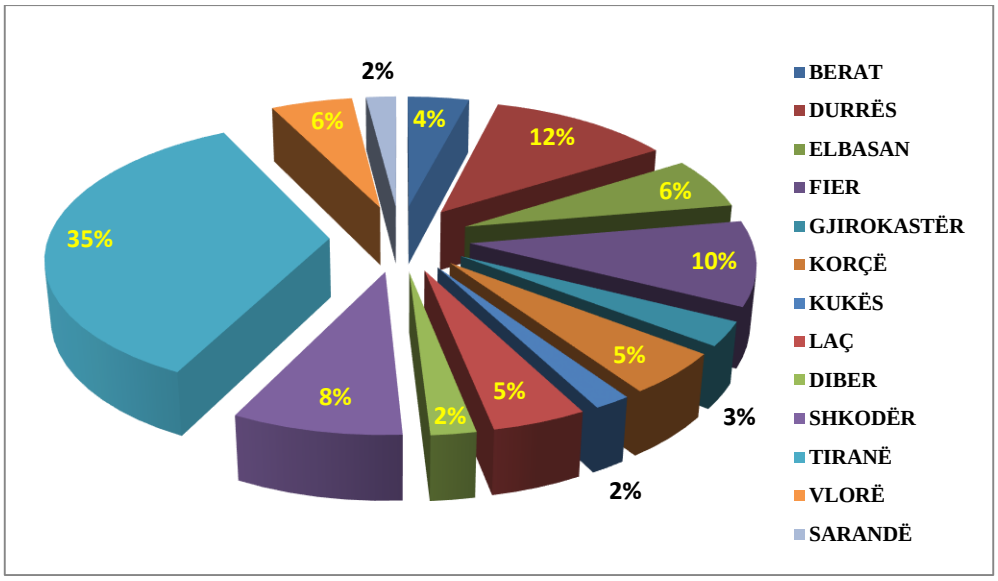


Figure 3. Number of vehicles for each region



In the DURANA region the ratio is as following: 1 vehicle for 8 habitant. In comparison to more developed countries, this correlation isn't still perturbing. However, the tendency is toward its diminuition. Below is given the composition of the vehicles park in Albania, devided according to: Brand (Fig. 4), Vehicle type, (Fig.5), Fuel (Fig.6) and Year of production, (Fig.7).

Figure 4. Composition of the park according to Brands

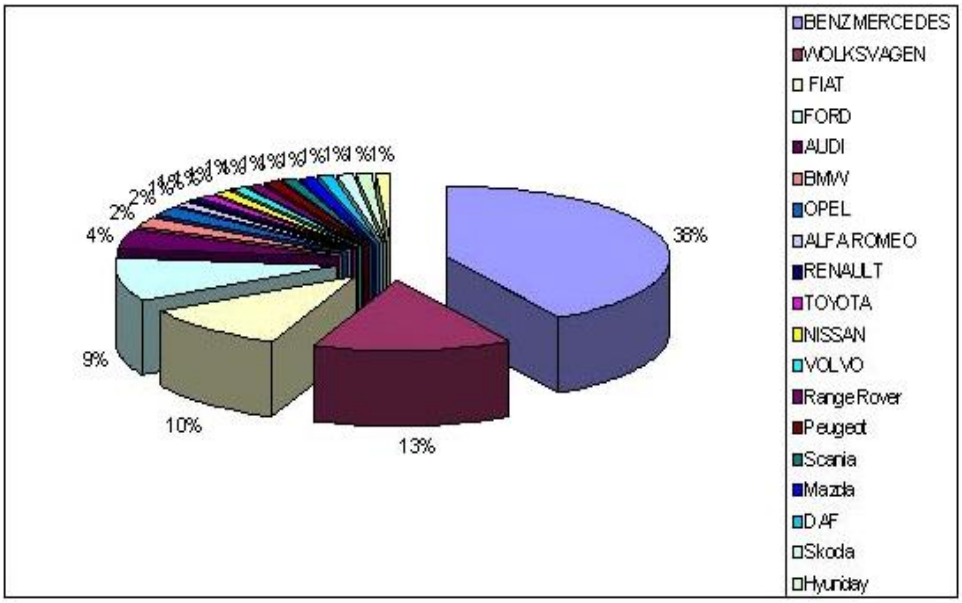


Figure 5. Composition of the park according to Vehicle type

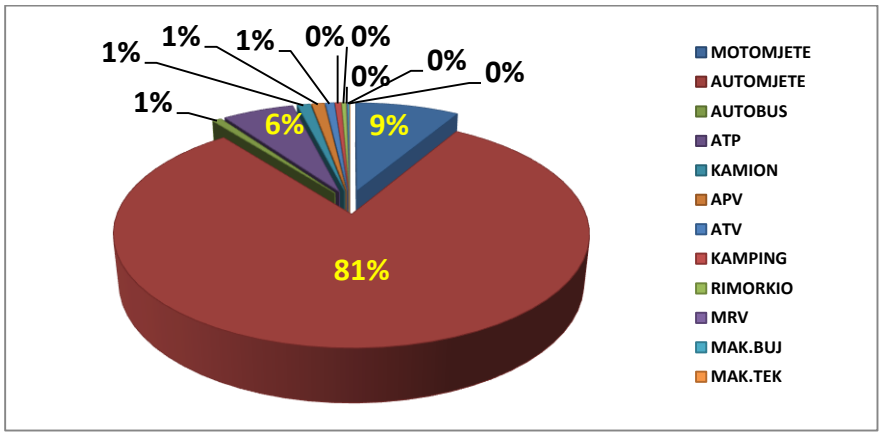


Figure 6. Composition of the park according to Fuel

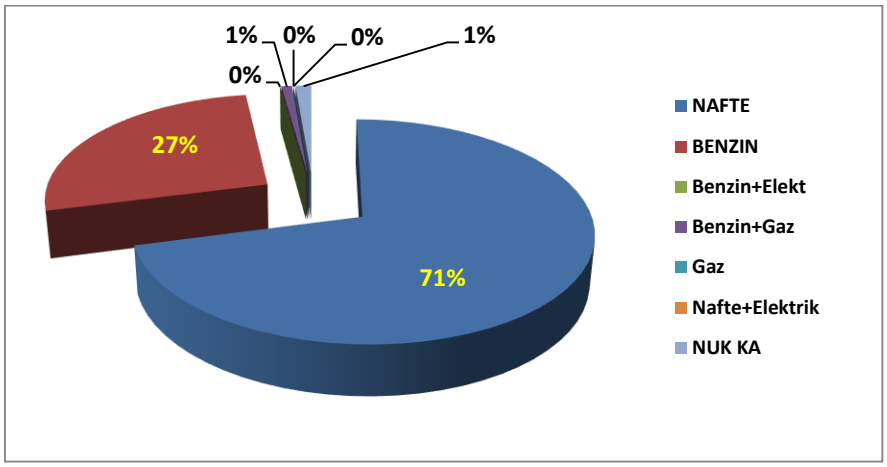
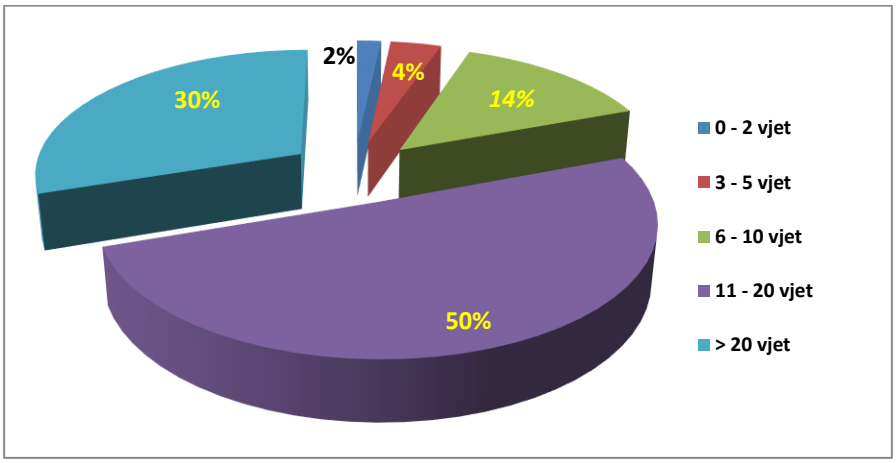


Figure 7. Composition of the park according to Year of production (Age)



Thus, we can spot that in Albania the most common vehicles are cars, which use gas as fuel all of which are quite old and with few or no chance at all of application of catalytic marmite and operating computer systems, that would diminuish environmental pollution. So, the application of ITS would be an excellent way to reduce the gas emission pollution.

INFLUENCE OF THE INTELLIGENT TRANSPORTATION SYSTEMS

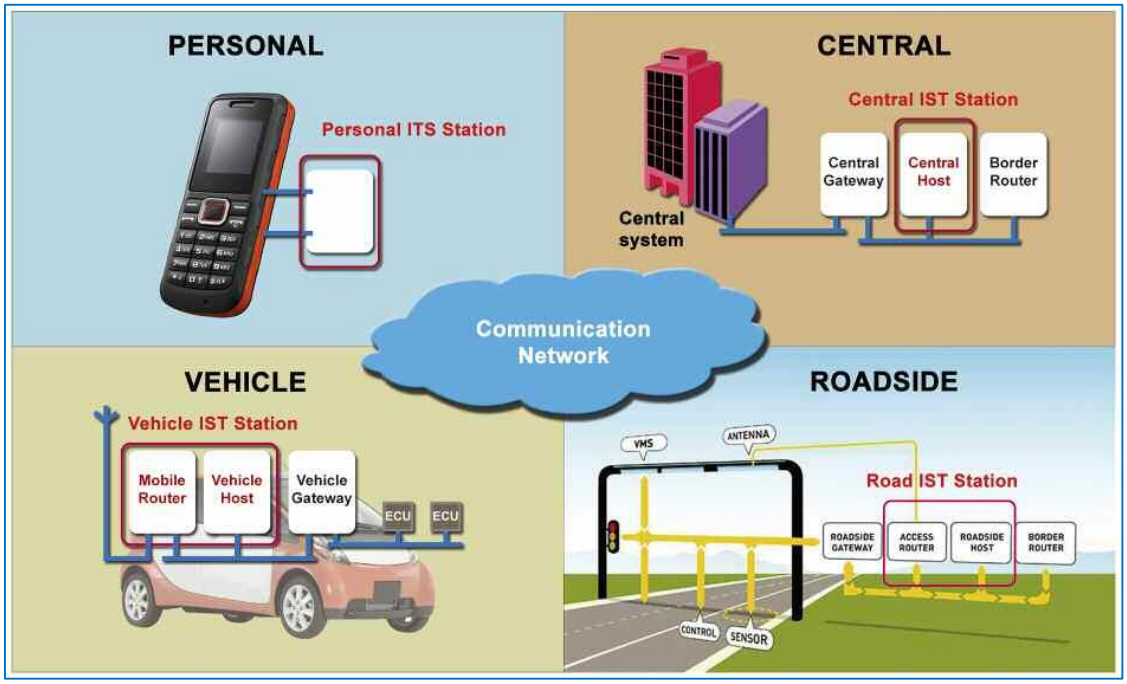
As highlighted, transport devours approximately 44% of total energy consumption in EU. Despite the devlopment of other means of transport, the majority of this energy is absorbed by Road Transport. The same situation is found even in Albania. Road Transport realizes 80% of the total volume, 75% of which is effectuated in the DURANA region.

The environmental impact of using ITS, comes as a consequence of:

- Improvement of the efficacy of goods and passengers transport plus the diminution of the time spent in traffic jams. Without doubt, indirectly this bring profits to the ecosystem, even in the aspect of space usage.
- Maintenance of traffic flows in urban and interurban roads, in the border crossing of the Port of Durrës and in the Customs Control in Tirana, mostly for commercial vehicles. By diminishing the delays caused by traffic jams and road accidents we will lower as well energy loss from over freight and the pollution caused by the “stop-and-go” way of driving.
- ITS will help vehicles operate in a more efficient way. Specific local information related to the road, position and climatic conditions will be guaranteed.
- ITS will influence on planning methodical itineraries and guide drivers through the shifting of this itinerary, in order to lessen fuel consumption and gas emission.
- The implementation of ITS will affect public transport as well, making it more reliable, effective and more appealing, in order to promote its usage. More detailed information on travel timetable and transits will be provided. Furthermore, public transport users will keep in contact with their families or business centers during eventual delays.

Considering the aspiration of Albania to become a member of the European Family, it would be vital to merge with the objective of the EU to create a common framework for the coordination of usage of ITS in Road Transport. In figure 8 is shown a sketch of the architecture of ITS for Road Transport. The following schema is used by the EU countries, so it would be inevitable to be implemented even in Albania.

Figure 8. The ITS scheme for road transport



The architecture provides the acquirement of labors from ITS and consists of five main elements:

- **a.** The infrastructure of service centers;
- **b.** Infrastructure of TIK (Information and Communication Technology) situated on the road (sensors, gantries, communication and processing units);
- **c.** Infrastructure of TIK positioned in vehicles (sensors, communication and processing units);
- **d.** Personal communication equipments (Smart phones etc, located in every vehicle or belonging to pedestrians, cyclists, motorcyclists);
- **e.** Public and Private communication networks (wireless, radio), which facilitate the communication between platform units.

It is vital to emphasize that this architetcture predicts the simultaneous communication of the units that constitute it, such as through ad-hoc mechanisms of a dynamic network and even thanks to conventional mechanisms of access in public Internet. As a conclusion, we will list the application of ITS for three fields that have a considerable impact on environmental pollution:

1- Traffic Incident Management
2- Electronic Payment Systems & Pricing.
3- Commercial Vehicle Operations.

Figure 9. Traffic Incident Management

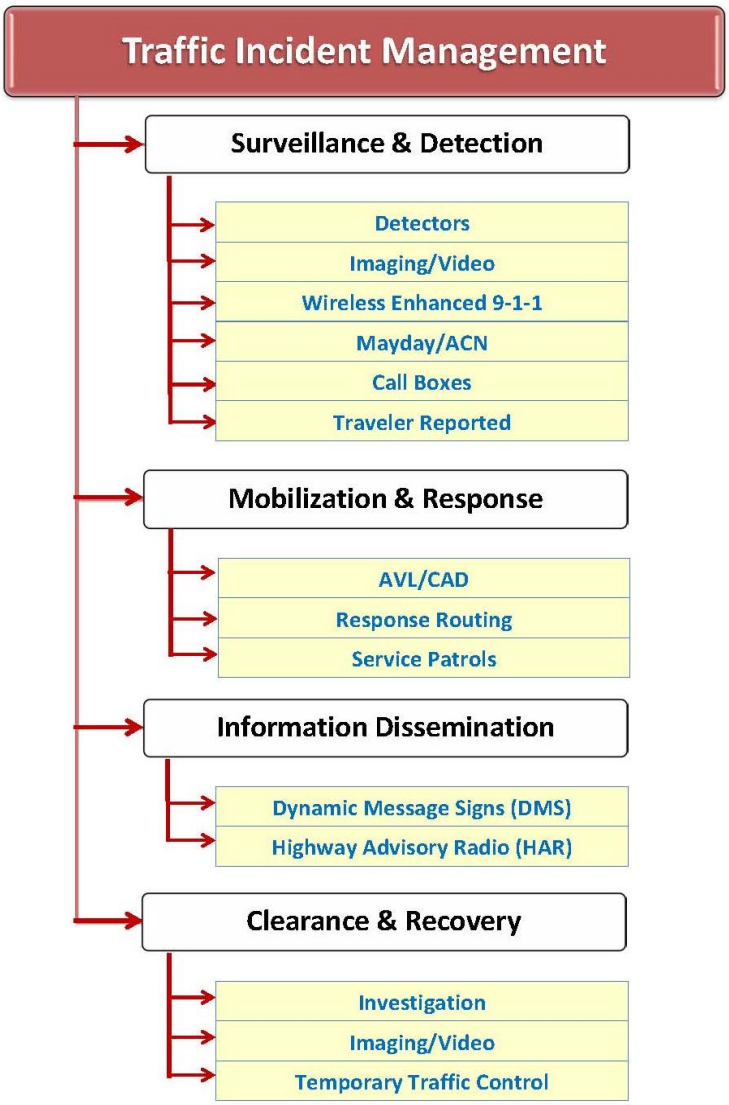


Figure 10. Electronic Payment Systems & Pricing

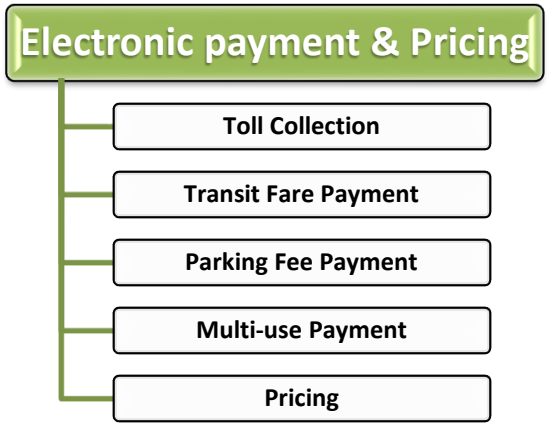
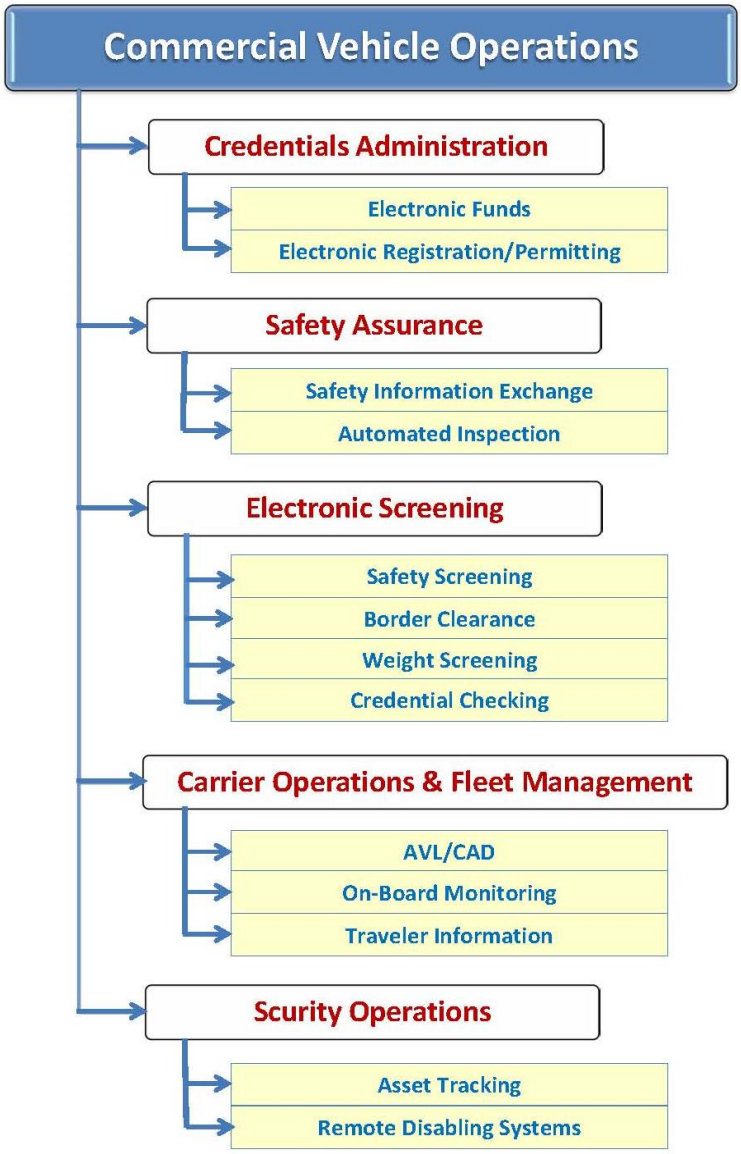


Figure 11. Commercial Vehicle Operations



CONCLUSIONS

The major part of economic activity of the country is developed in the DURANA region. As a concequence, even its impact on environmenal pollution is considerable. One of the solutions to diminish this influence is the creation of a National Center of Monitoring and Management of the Traffic.

This Center, being part of a multimodal platform of goods and passengers transport, would make possible the application of Intelligent Transport Systems. This implementation would be in accordance with the directives of the EU and the standards approved by it.

Most of the legal framework, imperative for the coordination of the units that constitute the architecture of ITS, is required to be fulfilled. In order to do this, it is crucial to focus on the experience of some of the most developed countries of the EU.

The results attained from the usage of ITS in the echo-environment are not always straight and easily perceptible. However, they are always measurable and form an evident benefaction in the refinement of the standard of living for the population.

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