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THE DEVELOPMENT OF NUMBERS AND STRUCTURES OF VEHICLES IN SLOVAK REPUBLIC

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Introduction

The aim of this article is to examine the relationship between the development of numbers and structures of vehicles in Slovak Republic and the development of traffic infrastructure and partly also the influence on the environment and other factors. In summary, the White Paper "Plan of uniform European area - creating a competitive traffic system using resources efficiently" [1] mentions that transportation systems have provided a high degree of mobility within Europe even though the system is still increasing in performance in terms of speed, comfort, security and convenience. Depth evaluation ex post, which a commission carried out showed that some elements of the traffic system have improved in last decade (mainly in efficiency, safety and security), there was no structural change in a way of operation system. The inability of previous policies to modify the current form of transportation is a major cause of unsustainable trends: growing emissions of CO2, continued dependence on oil and increasing congestion. How is the situation in Slovak Republic in terms of development of numbers and structures of vehicles and congestion of traffic infrastructure and emissions of CO2?

Analysis of registered vehicles in the Slovak Republic

The analysis of registered vehicles was completed on a database of registered vehicles of Presidium of Police Force of the Slovak Republic (PPZ SR) at the date of 31.12.2011. The database contains more than 2,5 million vehicles of all categories according to records of appropriate inspectorates of transportation.

The analysis of registered vehicles is also composed of the analysis of selected groups of vehicles by age in Slovak regions and throughout Slovak Republic at the date of

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31.12.2011. These have been based on an analysis of vehicles by type and categories identified significant groups of vehicles to their numbers in the records and the purpose of use in operation.

Analysis of the age structure is processed on the date of first registration of the vehicles in the database of Presidium of Police Force of the Slovak Republic. In the past, they have also recorded data about year of manufacture of vehicle, but this data has not been mandatory since the date of 1.3.2005. However, most outputs from the register of vehicles do not contain this data, which is really important from authors´ point of view. The analysis of environmental acceptability selected the vehicles; it means fulfillment of prescribed emission limits was processed in resolving technical study [2].

The basis for this analysis has been the data of first registration of vehicles and the dates of entry into force of the emission limits (Table 1).

Table 1 The emission limits and the dates of entry into force of the emission limits

Emission limit	Date of entry into force
Euro 5	1.10.2009
Euro 4	1.10.2006
Euro 3	1.1.2000
Euro 2	1.10.1996

Source: MDVRR SR

Here it is important to know that some vehicles can meet the emission limits in advance.

Comparing the structure of registered vehicles in the regions of Slovakia

The table 2 includes the changes in the number of registered vehicles in Slovakia by category. Here, two separate analysis have been carried out of vehicle registration by categories, which were based on the period from 30.6.2010 to 31.12.2011. The table 2 reflects the evolution and change over a period of 1.5 year. During this period there has been a particularly sharp increase in the number of categories M1 and N1, the numbers of vehicles categories of N2 and N3 a total fell to 2645 vehicles. Trailers increased mainly the numbers in category O1. Buses have fallen to 495 vehicles (M2+M3).

Table 2: The changes in the number of registered vehicles in Slovakia by registered categories from 30.6.2010 to 31.12.2011

	Category of vehicle									
	M1	**M2**	**M3**	**N1**	**N2**	**N3**	**O1**	**O2**	**O3**	**O4**
SR-06/2010	1 634 541	1 219	8 141	205 852	32 543	52 567	162 501	13 486	3 455	29 112
SR-12/2012	1 738 945	1 113	7 752	213 702	30 132	52 333	170 020	15 160	3 403	29 444
Change	**404**	**-106**	**-389**	**7 850**	**-2 411**	**-234**	**7 519**	**1 674**	**-52**	**332**

Source: Processing of authors

The comparing of age of analyzed selected groups of commercial vehicles in the regions of Slovakia including the average age of the whole country is shown in Table 3.

	Average age in whole Slovakia (years)
Truck, N3	5,6
Lorry, N3	17,2
Lorry, N2	15,2
Semi- trailer, O4	5,0
Trailer, O4	14,8

Source: Processing of authors based on data PPZ SR

The youngest of the analyzed groups are semi- trailers of category O4 and trucks of category N3. The average age of trucks trailers in the Slovak Republic is 5,6 years.

The number and structure of selected commercial vehicles by emissions limits in the Slovak Republic is in table 4. From analyzed groups of vehicles the most ecologically sound is the truck of category N3, the worst structure of environmental friendliness by emission limits is the lorry of category N3.

Table 4 The number and structure of registered vehicles in the Slovak Republic by emission limits

	Euro 2 and less	Euro 3	Euro 4	Euro 5 and more
Truck, N3	2 341	9 807	6 567	4 840
% proportion	9,9	41,6	27,9	20,5
Lorry, N3	11 478	3 574	1 871	521
% proportion	65,8	20,5	10,7	3,0
Lorry, N2	14 290	8 141	2 475	823
% proportion	55,5	31,6	9,6	3,2

Source:Processing of authors based on data PPZ SR

Vehicles meet the emission limits Euro 2 and less in categories N2 and N3 represent a significant part of these categories. In category N2 there is the proportion of 55,5 % and in category N3 there is the of proportion 65,8 %.

The development of numbers selected registered vehicles in the Slovak Republic from 2003 to 2011

The analysis development of numbers registered vehicles is developed based on a database of registered vehicles PPZ SR by type and by Regional traffic inspectorates of registered vehicles. The data available since 2003 reflect the status of registered vehicles at the date 31.12.2012. The development in the Slovak Republic from 2010 to 2011 of numbers registered vehicles has almost stopped (see table 5). Inter-annual rate of growth is less than 2% in these years.

Table 5 The development of numbers registered vehicles in the Slovak Republic from 2003 to 2011

	Year								
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Vehicles	113 663	125 470	138 060	172 772	196 132	227 208	246 656	252 851	256 855

Source: Processing of authors based on data PPZ SR

The average inter-annual rate of growth from 2003 to 2011 for passenger cars is 6,1 %.

Table 6 The development of numbers registered passenger cars in the Slovak Republic from 2003 to 2011.

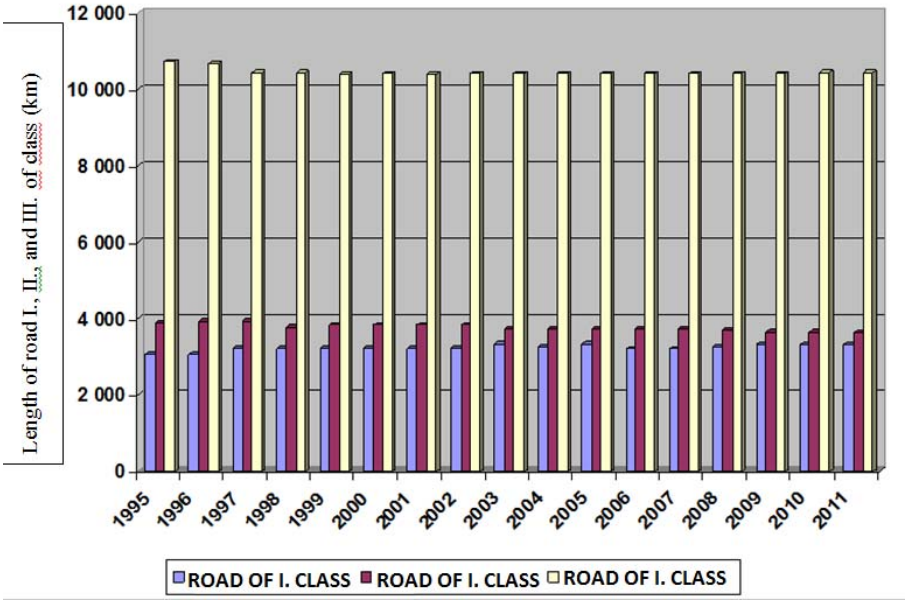
	Year								
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Passenger vehicles	1084927	1145360	1161638	1333025	1433245	1544182	1668378	1668378	1748598

Source: Processing of authors based on data PPZ SR

Comparison of the development of number vehicles by selected factors

Comparison development by length of roads and intensity of road transport

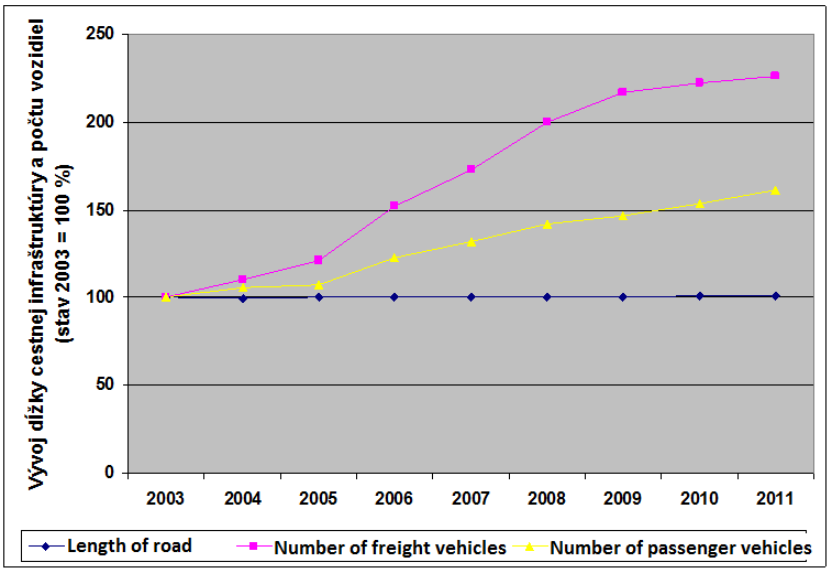
Availability and quality of road infrastructure creates conditions for economically, environmentally and socially acceptable and sustainable operation of vehicles. It significantly affects the modal splitting of work between freight and passenger transport as well. Picture 1 shows development of length of roads I., II. and III. of class in the Slovak Republic. Since 1995 the length these categories of roads have grown minimally. Solutions to improve the quality of infrastructure and accessibility of territory is building more capacitive infrastructure, especially for long-distance and transit transportation by form highways and express road. The lengths of highways were 430 km and of express roads were 242 km at the date of 1. January 2012.



Picture 1 The development of length of roads I., II. and III. of class in the Slovak Republic

By consolidation of monitored parameters, picture 2 is showing development of length of traffic infrastructure and numbers of registered freight and passenger vehicles since 2003.

The length of infrastructure has grown just minimally. The number of registered vehicles has grown significantly mainly to freight vehicles.



Picture 2 The length of road infrastructure and registered vehicles in the Slovak Republic, status in 2003= 100%

Growth of numbers of registered vehicles and its operation on road infrastructure also raises intensity of road transportation.

Results from national traffic census in 2010 confirmed that intensity of transportation has grown significantly compared with year 2005. In 2010, it was realized ten times in four-hour intervals for each from the approximately 2660 places by time.

The result of national traffic census calculates the annual average of daily intensities (RPDI) of concrete parts of the road infrastructure. The RPDI is the number of groups of the real vehicles per 24 hours in the profile of communication on specific parts of the infrastructure.

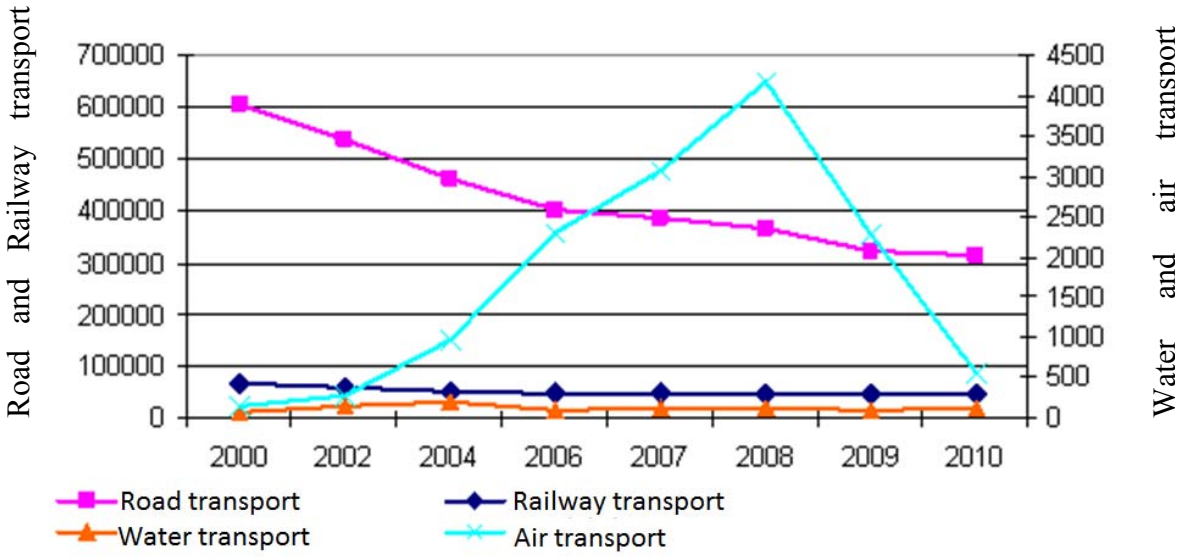
In table 7 The intensity of transportation from 2005 to 2010 on the busiest parts of roads in the Slovak Republic by territory.

Road	Intensity in 2010				Intensity in 2005 together	Difference 2010-2005	Change 2010/2005 (%)
	Passenger vehicles	Freight vehicles	Motorcycle	Together			
BA region							
D1- bypass Bratislava to Senec	85 939	14 943	0	100 882	78 971	21 911	27,75
D2- bridge Lafranconi, Bratislava to Vienna	74 215	13 874	0	88 089	50 821	37 268	73,33
Road II/502- Pezinok to Bratislava	21 829	2 525	95	24 449	23 548	801	3,39
TT region							
Intersection of R1 and D1 to Sereď	34 763	8 553	0	43 316	27 518	15 798	57,41
NR region							
Road I/51- Nitra to Trnava	30 331	6 792	73	37 196	27 997	9 199	32,86
TN region							
Road I/61 City centrum of Trenčín	37 295	4 360	104	41 759	27 280	14 479	53,08
ZA region							
Road I/11- Žilina to Čadca	33 404	11 097	97	44 598	28 993	15 605	53,82
BB region							
Cesta I/66- Banská Bystrica to Brezno	38 181	5 225	62	43 468	41 453	2 015	4,86
KE region							
Road I/50-	41 158	8 161	59	49 378	38 440	10 938	28,45

South bypass of Košice to Prešov							
PO region							
Road I/18-Prešov to Kapušany	23 753	6 230	73	30 056	20 455	9 601	46,94

Comparison the development comparison the development with urban public transport

Number of persons transported by public road transport and railway transport dropped more than 50 % from 2000 to 2010. In 2010 there was a continued drop in the number persons transported by air transport, which was caused by economic crisis and also two important airlines ended business in Slovakia.



Picture 3 The development in passengers transport by type transportation

As is obvious from chapter 2, the number of passenger vehicles as well as freight vehicles in the Slovak Republic increased and the number of buses decreased. This development is very unfavorable in terms of accomplishment of objectives set in White Paper of European Union.

Conclusion

One of the particular goals of White Paper is to decrease greenhouse gas emissions, this is consistent with long- term requirements of limitation of temperature rise caused by climate change below 2 °C. Also, overall objective of European Union is to decrease emissions by 80 % by 2050 compared to 1990. The emissions of CO2 related to transport should be decreased by around 60% by 2050 compared to 1990 [5]. It will be hard to accomplish these goals if the number of passenger and freight vehicles grows rapidly and number of buses decrease in new member states including the Slovak Republic. In terms of the Slovak Republic, number of persons transported by public passenger transport significantly decreases and utilization of passenger vehicles increases. Proportion of imported old passenger diesel vehicles what has a negative impact on dustiness in cities (see example [3]). Age of freight vehicles and related emission limits has not improved significantly in the Slovak Republic. The type of Euro 2 is the most important part of vehicle categories of N2 and N3. This represents 55,5 % share of category N2 and 65,8 % share of category N3.

The load of transport infrastructure increases mainly in cities but as well as on roads of I. class, where the capacity is not sufficient in term of traffic intensity. Occurring traffic congestion increases fuel consumption of cars and therefore higher pollution of the environment. Examples from abroad demonstrate that deployment of intelligent transport systems in management of traffic enables to increase throughput of roads. These applications are missing in the Slovak republic. On the other hand, a new law on intelligent transport system in road has come into force. The intelligent transport system according to [4] is an information and communication technology or the system placed in the traffic infrastructure or in vehicle, that is used for optimization and management of road transport, mobility management, safety and traffic flow improvement, streamline of administration and maintenance of roads, improvement of public transport services and reduction of the burden on the environment, interface with other modes of transport. The intelligent system ensures the transfer, collection, processing and exchange of information among service operators, providers of traffic information and users of transport infrastructure.

We will see what the application of this law bring to our conditions.

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