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The environmental impact of road transport mobility

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Abstract

This article focuses on road transportation issues and environmental impact and mentions the different types of environmental pollution. Also, it points out the reason why the negative impact of road transport is continuously increasing. In relation to the environment, the traffic is the biggest source of greenhouse gasses and dust, posing health and safety risks to all being. The trend of increasing pollution is directly proportional to the increase of goods and human transportation needs. The increase in greenhouse gas emissions is an ecologic issue, mainly caused by individual car traffic.

Keywords: Road transport, Environment, Pollution

Introduction

Automobile transport negatively contributes to the emission of CO and others more than 160 hydrocarbon pollutants, most of which are in milligram or trace amounts. The most harmful pollutant of road traffic is benzene or benzo(a)pyrene. In urban and busy junction, the concentration of the pollutants is particularly high, despite the most modern vehicles are equipped with a catalytic converter. The busy intersections also cause a high noise intensity, which is the biggest issue in whole European Union countries. Large areas of highways, car parks and parking spaces for trucks heat air in the hot weather which contributes to overheating of the environment and thus changing the microclimate and creating inverse effects. Rainwater is quickly discharged into the rivers and does not soak into the subsoil. This process causes the drainage of the field and directly contributes to water pollution and a reduction in the quality of domestic water. Also, it contributes to cost increases for water cleaning from oil leaks, detergents and other pollutants.

The negative impact of road transport

On one hand, road transport is inevitable, but on the other hand, it negatively impacts the environment in several forms. Due to the new road construction, the large network of roads does not allow water to seep into the subsoil and heat the road surroundings which pollute surface water with detergents, oils, petroleum products, and microscopic wheel rubber particles. Roads have a negative impact on wildlife and creating barriers to animal movement. Usually, motorways are being divided into sections thus blocking the natural migration of animals and causing the mortality. Also, extensive land areas are being used for new roads construction, building petrol stations, roadhouses and car parks etc. For example, a kilometre-long road takes about 6.5 hectares of land. Around the motorways, the traffic noise and road dust are increasing due to road traffic. However, traffic pollutants are considered to be the most negative impact of road transport. By discharging the exhaust into the air, the oxides of sulphur, carbon and nitrogen released. Road traffic produces the highest share of emissions from all types of transport where only the individual car emits an average of 140 g / km into the air and in the past, it was even much more. [1]

Air pollution by passenger and freight road transportation

Transport, related to the environment, is a major source of emissions and pollutants such as greenhouse gases and noise and vibrations. Also, it creates pressure on the field and affects spatial arrangement as well as causes health and safety risks. The negative environmental impacts are driven by increasing transport expectations from companies which reflects the higher claims on infrastructure. Recently, in Slovakia, the growth of emission production from transport is influenced by two fundamental factors. The first negative impact is the rapid growth of environmentally adverse road transport, especially from individual car traffic. The second factor is the increased car performance and fuel consumption, but, lately, was reduced, because of the replacement of old vehicles to new ones with more eco-friendly parameters. Those new vehicles contain a three-way controlled catalytic converter that controls and reduces the emissions of the toxic gases and pollutants. However, mainly road transport contributes to the overall production of emission and pollution from car traffic and the contribution of other modes of transport is very small. Individual car traffic accounts for 80.0% of CO production, 16.4% of road freight transport, 1.3% of road public passenger transport, 2.3% of air, water and rail transportation.

One of the significant pollutants is a solid particulate matter generated from car exhaust and tire wear and road surface material. Their increased concentration may also cause serious health complications, such as cardiovascular or respiratory diseases. Nowadays, the tire waste can be found in almost every water source and thus every person can be contaminated. Currently, scientists are investigating the impact of these microparticles on the human body. [2]

Figure 1 – Exhaust pollutants [6]

Particular matter PM10a PM2,5

In Slovakia, as well as in most of the European countries, the biggest problem in air quality is pollution by PM10a and PM2,5 of dust particles contained in exhaust gases of a motor vehicle. Also, it is necessary to include other solid particles released from tires and road surface abrasions, car brakes wear and even from winter road maintenance material which stays on the road mostly half of the year and are distributed to the air by wind turbulence (secondary pollution). However, the health danger of dust pollution depends on the size of the particles.

The particle with more than 10 micrometres in diameter affects the upper respiratory system by causing some irritations such as coughing, sneezing and conjunctival irritations. But, the smaller particles with less than 2,5 micrometres in diameter can easily penetrate to the lungs, or to affect the blood circulation. [5]

Nitrogen dioxide

Some studies point to a connection between respiratory diseases and long-term exposure of the population to high concentrations of nitrogen dioxide emissions from intensive car traffic in densely populated areas. Nitrogen oxides are waste gases that irritate the airways what may cause their narrowing. Modernization of stationary sources has contributed to the overall decrease in nitrogen oxide emissions since 1990. Despite the vehicle fleet renewal, still up to 50% of nitrogen dioxide mainly comes from car traffic.

Development in the emission of greenhouse gasses from the transport sector is influenced by ecological negative road transport (mainly from individual car traffic) and by growth in transport performance and consumption of fuel. [5]

Why does the number of passenger vehicle is increasing?

From the worldwide aspect, the use of a passenger car has a long-term growth trend, which either has not missed Slovakia. As well as in other European countries, a passenger car is gradually becoming an essential part of almost every Slovak household.

In the communist regime, the passenger vehicle, as well as the rate of automobile population, were usually measured by the number of cars per 1,000 inhabitants. In this period, the share of passenger transport was low and developed relatively slowly, which related to several reasons. Mainly, it was the unavailability of vehicles and car price and so on. However, the rapid development in the automobile industry became after the change of the regime because the market was not saturated yet. There are several reasons why in our country, the use of passenger vehicles tends to be

growing. First of all, there have been some changes in the way people live. Also, mobility is more important than before. In the past, people used to travel for work or moved out closer to work to live near the factories. But in the 1990s, these businesses have been closed, and that's why people had to find the work further away from home and for that reason the mobility has increased.

Figure 2 – traffic congestion [7]

Much more people are working in the non-productive sector of the economy with more flexible working hours. The ability of public transport (such as bus and train) to respond flexibly to the diversity of working hours and the increasing rate of the irregular journey is limited Therefore, a private vehicle became much more convenient transport means of commuting to work because it offers lots of advantages over public transport. The main advantages of owning a private car are timing, flexibility and freedom, especially when deciding and choosing transportation to work. Also, people like to travel and discover new places, which anyway promotes different modes of transportation. Additionally, due to today's lifestyle, influenced by virtual mobility, the variability of the daily activities people often do at different locations and routes such as travelling to work, taking children to school, shopping in a supermarket, sports activities, visiting relatives, etc. is growing. Therefore, a private vehicle is the most suitable and practical travel means for the modern lifestyle. Also, public or suburban transport, such as the train or bus, to rural areas such as villages with smaller settlements are reducing, or even terminating the routes. Nowadays, the prices of passenger vehicles are more affordable due to the increased of massive production. But the price is low not only for new vehicles but also for used ones, and that's why it is affordable for almost every family to own more than one car. And this is one of the reasons, why the number of newly registered vehicles is growing every year.

Cars registered in the Slovak Republic

The development in numbers and the increase of vehicles being registered from 1995 till 2005 is displayed in Table 1. For these twenty-two years, the number of registered vehicles has doubled from 1.5 million to over 3 million. But also, in this period, the number of registered vehicles has a growing trend. The average number of decommissioned vehicles is around 60,000 units per year. The number of newly registered vehicles is between 100,000 and more. The increase in vehicles registration does not indicate a saturation of the market, and so it is necessary to assume the continuous growth of newly registered vehicles.

Vehicles registered in the Slovak Republic

Vehicles registered in the Slovak Republic

	1995	2000	2005	2010	2013	2014	2015	2016	2017
Vehicles registered in the Slovak Republic total (number)	*1 498 160*	*1 751 840*	*1 801 117*	*2 339 358*	*2 622 939*	*2 725 538*	*2 843 809*	*2 949 007*	*3 077 648*
Passenger cars	1 015 794	1 274 244	1 303 704	1 669 065	1 879 759	1 949 055	2 034 574	2 121 774	2 223 117
Trucks	102 634	110 714	160 089	252 866	261 840	265 424	272 955	278 274	285 645
Buses	11 812	10 920	9 113	9 350	8 821	8 876	8 939	8 804	8 937
Road tractors	-	3 281	14 141	23 183	27 561	28 429	29 928	31 016	31 090
Semi trailers and trailers (including bus trailers)	175 740	201 269	188 411	226 333	251 217	262 781	272 892	277 740	286 071
Motorcycles	81 847	45 647	56 366	59 649	74 228	80 932	88 804	95 426	102 997
Quadricycles	-	-	-	3 935	6 189	7 022	8 017	9 232	10 177

The number of registered vehicles in the Slovak Republic is shown in Table 1. [4]

Conclusion

The continuous growth of the automobile sector indicates the economic prosperity of our society. But it is essential to understand, that in the present time, mainly ecological, not only economic indicators are monitored. Because human society is still in a stage of evolution, so then people need to realize the consequences of consumption and try to reduce emissions and environmental pollutions. For this reason, one of the most important challenges and tasks, not only for Slovakia but for the whole European Union are to reduce energy intensity in road transport to minimum levels and to become a eco-friendlier society. For instance, the European Parliament by 2030 suggested a reduction in carbon dioxide emissions by 31 per cent from light-duty vehicles. As well as, the production of new vehicles, made after

2030 is expected to reduce emissions by up to 37.5 per cent.

Therefore, in the coming years, it is necessary to prepare comprehensive concepts of air quality management strategy for the Slovak Republic. Also to achieve good air quality throughout the whole country, as well as, to meet the values of human health, ecosystems and vegetation, and to aim to reduce the significant environmental impact of road transport.

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