

**Vasiljević Saša<sup>1)</sup>**  
**Rajković Dragan<sup>2)</sup>**  
**Dorđević Miloslav<sup>3)</sup>**

1) Student, Faculty of Mechanical  
Engineering, University of  
Kragujevac, Serbia,  
[vasiljevic.sasa036@gmail.com](mailto:vasiljevic.sasa036@gmail.com)

2) High Technical School of  
Professional Studies, Kragujevac,  
Serbia

[draganraj2001@gmail.com](mailto:draganraj2001@gmail.com)

3) High Technical School of  
Professional Studies, Kragujevac,  
Serbia  
[m.djordjevic.kg@gmail.com](mailto:m.djordjevic.kg@gmail.com)

## ECOLOGICAL ASPECTS OF VEHICLES IN ROAD TRANSPORT

**Abstract:** *The very life on Earth is based on ecological laws. Road traffic has a negative impact on the environmental aspects, such as environmental pollution to the emission of harmful gases, such noise and vibration created by its own land vehicles. Some road traffic with their vehicles is the biggest polluter of the environment, and the largest source of negative effects on the environment. The impact of these negative effects from the ecological point of view is large and higher than the all contaminants. The great impact of these negative effects is simple and expresses itself in the quality of life and what is more important to human health. However, reducing the negative impact on the environment with no official source of the vehicle in road traffic is possible. Engineers with their skills can reduce the negative impact on the environment, and therefore can improve the quality of life of people. This paper outlines some of the solutions and the ways in which it is possible to improve the quality of life and the ecosystem.*

**Keywords:** *Vehicles, ecosystem, pollution, road, traffic.*

### 1. INTRODUCTION

The problem of environmental pollution in today's world represents a huge problem which in every thought needs to be reduced, that is having the same pollution reduced. We have different contaminants, for example different factories or industry by itself, traffic and with it all means of traffic and even some natural occurrences like forest fires. Being said, the problem of negative effects on the environment are big and we need to ask ourselves how can we reduce all these negative effects.

When the word is about negative effects which road traffic has on ecological aspects, especially in today's world where life without transport is unimaginable, as well as because of the development of industry and because of some other activities which people conduct, these effects of influence from road traffic are truly big because of the pollution which vehicles emit as well as from the vibrations and noise coming from the same vehicles.

A different aspect with which vehicles influence ecological systems can be viewed from the aspects of the sole vehicle after its life

cycle, then usually users throw away their vehicles into nature and with it also pollute the environment. Beside all negative effects which we listed, there is also a huge problem represented by traffic accidents, traffic jams and also urban environments have bad traffic networks, inadequate public transport, technically not functional vehicles, the disregard of traffic culture and so on. But, a huge role in the fight against negative effects on the environment have engineers which can by construction of propellants, even if it doesn't represent an easy task, influence on the reduction of negative effects.

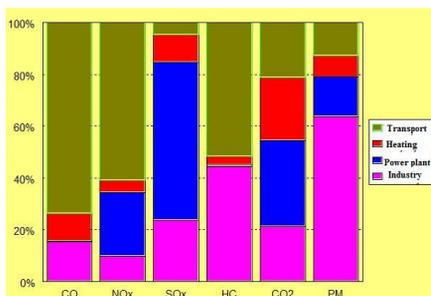
The subject of this paper is the research on the influence of road traffic on the ecosystem in comparison to some other views of traffic as well as other sources which also effect the environment in a negative way.

The aim of this paper is besides the learning of influences of traffic on ecosystems, is also the suggestion of some measures and the use of modern devices on vehicles so these negative effects can be reduced.

## 2. ANALYSIS OF NEGATIVE INFLUENCE ON THE ECOSYSTEM FROM ROAD VEHICLES IN COMPARISON TO OTHER SOURCES

The pollution of living environments today represents one of the biggest problems with which modern humanity is being put face to face, and above all engineers and ecologists who have the aim of reducing the pollution of living environments. Today we have different contaminants starting from industry up to natural occurrences. One of the leading contaminants of living environments is traffic, the reason behind is simply that traffic represents a part of transportation engineering, life and the basic functionality of people cannot happen without transportation which has a huge impact on contamination but also on the quality of life of humans and the ecosystems.

As it is already known we have more ways via which we contaminate our living environments and with it the ecosystem, but that way we have also more sources of harmful materials. When the word is about the emission of harmful gasses, the picture called Diagram 1 shows the major sources of the harmful materials.



**Diagram 1** – Showcase of participation from some sources of harmful substances where: CO- is Carbon-monoxide, Nox – represents nitrogen oxide, SOx- Sulphur oxides and HC – Unignited carbonhydrogens, CO2 – Carbondioxide, PM –matter

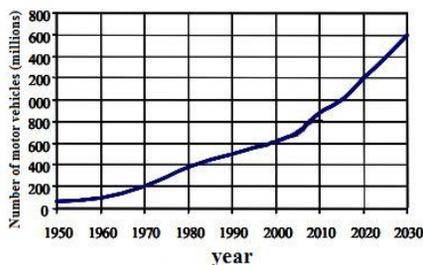
According to a research by the International union of railways in Germany the participation in the emission of harmful substances according to various transports is: road traffic emits 66-69% of all harmful effects on ecological aspects, when the word is about transport via railways the emissions are around

3-26% and water transport participates with 1-8% of all negative effects. According to a research from Holland 87% of all lead emissions inside the atmosphere comes from road traffic. The big problem of contamination of living spaces is especially seen in high density population areas, where the need for the transport of passengers is big. With that in correlation with the investigations done in the US the results are that passenger vehicles and buses pollute the air 30 times more than the railway.

## 3. HARMFUL ECOLOGICAL INFLUENCES WHOSE SOURCES ARE VEHICLES

The biggest pollution whose sources are vehicles represents the pollution of the air itself, and it is inevitable, especially vehicles who use motors with internal combustion as their propulsion unit. But, as said in the former part of the paper, vehicles represent one of the biggest air contaminators. Also almost all of the fuels used for combustion as a result give unburned particles or with one word soot, who is really harmful for people since he is cancerous.

The problem of air contamination is that we also have a problem with the contamination of land surfaces and water surfaces. As it has been mentioned before vehicles with a internal combustion engine, contain a high amount of harmful matters in their products, like soot, fusions of lead, nitrogen oxides and so on. The dissolution of gases in water is greatly increased even on low temperatures, so that the pollution of water for example in the Northern Ocean in the last 50 years has risen for 5 percent. Also besides the pollution of water by road vehicles, there is the pollution of land surfaces, because the surface of land can also be contaminated with contaminants from the atmosphere. Another way how the surface is being polluted but also water is the discarding of vehicles into nature and that way these vehicles can degrade the ecosystem. All vehicles in themselves have highly toxic materials, with the disposal of these vehicles their toxic materials influence the waterways, land and by a small part the atmosphere as well. On the second diagram the trend of growth in the number of motor vehicles in the world is shown.



**Diagram 2** – Tendency increase in the number of motor vehicles

Besides the emission of harmful substances from vehicles in road traffic, the harmful substances are also shown in the form of noise from the vehicles themselves has a bad and negative influence on the quality of ecosystems. Noise is one of the consequences of movement of vehicles (because of all the parts on the vehicle, the motor working, because of internal movement of the vehicle as in the movement of pneumatics on the road etc,...) as well because of traffic jams inside towns. A special problem of noise is on the corridors near some settlements where the speed of vehicle movement is much greater, and the level of noise can be even bigger.

Beside all the contaminations of ecosystems which come from vehicles are also vibrations which come to happen during the movement of vehicles. Vibrations can also be seen having negative effects on the quality of life and the ecosystem itself.

#### 4. INFLUENCE ON HEALTH AND THE QUALITY OF ECOSYSTEMS

As it has been already mentioned, the vehicles themselves act negatively on the ecosystem not just from aspect but many, starting from the pollution of the air to the pollution of waterways and green surfaces. When the word is about air pollution, it is especially harmful for the health of humans. The emission of harmful gasses greatly influences the health of people, the lead which is in these gasses can damage vital organs, it influences the brain and the nerval system as well as the blood and heart. But nitrogen oxides do not just act negatively on the health of the population but also on the entire ecosystem. Nitrogen oxides have the consequences of forming acid rain, which besides the direct

influence on the health of people, can also influence plants with which we feed ourselves, and can influence the quality and health of plants. Besides it also influences global warming and the creation of the glass dome effect, which brings us to the further negative influences on the human health and to the increase in the sea level and the change of plant and animal life. On picture number 1 the influence of some pollutants on the health of people and the environment are shown. We can conclude that nitrogen oxides have the biggest influence, by themselves or in combination forming harmful unions..

Uticaj	PM	HMs	POPs	SO <sub>2</sub>	NH <sub>3</sub>	NO <sub>x</sub>	NM VOC	CO	CH <sub>4</sub>	CO <sub>2</sub>	N <sub>2</sub> O
Lokalni (zdravlje)											
Regionalni											
Kisele kiše											
Eutrofikacija											
Prizemni ozon											
Globalni											
Efekat GHG (indirektni)											
Efekat GHG (direktni)											

**Figure 1** – Shows the influence of some elements on the health of people and the environment, where PM- are soot, HMs – heavy metals, POPs – longterm organ contaminants, SO<sub>2</sub> – Sulphur dioxide, NH<sub>3</sub>- Amonia, NO<sub>x</sub>- Nitrogen oxides, NMVOC – nonmetal vaporious organ unions, CO- carbonmonoxide, CH<sub>4</sub>- Methane, CO<sub>2</sub>- carbondioxide, N<sub>2</sub>O- Nitrogen-sub-oxide, GHG- gasses with the glass dome effect.

The vehicles alone produce up to three times more harmful gasses than their weight is, having in mind that in the US anually 60000 residents die because of the consequences of polluted air, in Great Britain that number is bigger than 10000. But, undoubtful are the consequences which road traffic has on humans, because as it was mentioned before it affects his health. Besides health a usual rpbolem are also uncomfortable smells in cities, whose sources are vehicles and their emissions, which also greatly influences the quality of life and living. But it also doesnt show itself solely on humans but also on the animals and the ecosystem as a whole which is being compromised that way.

The problematic of pollution becomes even greater with the use of fuels which arent allowed by some laws and norms or the use of



pollution via gass emissions have changed. With the all growing development of new propulsion systems in the sense of noise sources the pollution as far as noise is concerned is being reduced. Watching the table number 1. We can see that older vehicles have a higher level of harmful emissions. It is because of that reason why older vehicles are being pulled out of use, the drivers need to be stimulated to change their old vehicles for some newer models.

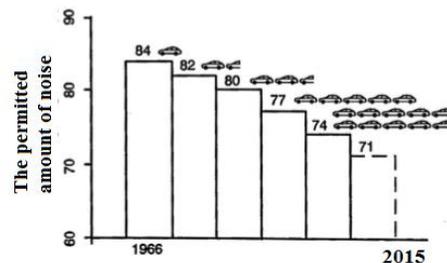
**Table 1** – Values of harmful emissions of gasses and the year of vehicle production

The year of production	Value when to turn off the vehicle		Well tuned engine	
	CO, %	HC, ppm	CO, %	HC, ppm
pre -1968	7.5-12.5	750-2000	2.0-3.0	250-500
1969-70	7-11.	650-1250	1.5-2.5	200-300
1971-74	5.0-9.0	425-1200	1.0-1.5	100-200
1975-79	3.0-6.5	300-650	0.5-1.0	50-100
1980	1.5-3.5	275-600	0.3-1.0	50-100
1981-93	1.0-2.5	200-300	0.0-0.5	10-50
LATER	1.0-1.5	50-100	0.0-0.2	2-20

Also it is possible to eliminate the harmful gasses with the use of vehicles on alternative fuels or with the use of some modern day propulsion for example electric motors. It is important to say that it is often said that such vehicles have a zero emission of harmful gasses but that isnt necessarily true, they indirectly polute the living environment because they still need somewhere to produce their electricity, for example thermalplants or even some other source. It is also possible to use vehicles which have hybrid propulsion which contaminate the living environment for 50% less than their counterparts which use internal combustion engines. With the use of such propulsion the depletion of natural resources like fuel is reduced.

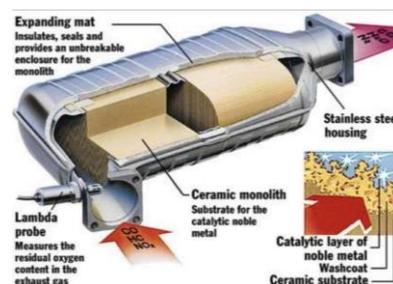
Besides such norms there is also a law regulation on the level of a country. Law norms prescribe the exact amount of harmful mater which is allowed per vehicle starting from noise all the way up to the emission of harmful gasses. 40 years before norms were brought which limit the level of noise which cars produce and it is currently 74 dB, but it is expected that in the future the noise reduction

norms will be even more strict, especiallz for the emission of noise which originates because of the contact between pneumatics and roads. Of course and the construction of vehicles today is like that that modern vehicles have up to 12 times less noise than the vehicles from 1966, and with it the border value has been transferred in accordance to ECE law books.



**Figure 3** – A showcase of the allowed values of noise from vehicles and the difference between the levels of noise of older and newer vehicles, [4]

Another of the possible measures presents devices which can be placed on the vehicle, for example catalyzers. The catalyzers can be constructed to have a dual purpose. The first purpose is to reduce the level of harmful emissions and to decompose them, but except that it has also a purpose in the reduction of noise levels which are made by the engine that is propulsion system, and acts like a silencer. Such an purpose for the catalyzer can be achieved with the adaptation of the construction of it and with the use of materials which can absorb noise and the harmful gas emissions. Noise like the emission of harmful gasses, is possible to be reduced or eliminated in a certain degree with the use of newer vehicles, vehicles with electric power or with the use of vehicles which are hybrids. On picture number 4. we have a catalyzer and its basic elements.



**Figure 4** – Catalyzt

When the word is about noise one of the ways it is possible to decrease the level of noise on a vehicle is in covering certain parts of the vehicle in materials which can absorb noise of a certain frequency. Besides big corridors, the need for protection against noise may arise, especially when right next to settlements, because practise has shown that along such corridors there is a higher level of noise than allowed, on a distance of 50 to 300m. In such environments one of the measures which is possible to use is the deployment of protective railings that is panels which stop the spreading of noise in settlements and reduce the strength of noise from vehicles, on picture 5 there is an example of such a panel as well as how much noise reduction it provides. Which directly leads to an increase in living environments in places which highways pass through the settlement. Besides the last mentioned way to stop the spreading of noise into environments near highways, there is also the possibility of covering the highway in a tunnel made of materials which can reduce the noise that way lowering the level of noise greatly. Automobile waste represents a separate problem and with it is a big problem for the entire ecosystem.



*Figure 5 – Illustrates the reduction of noise by means of safety barriers, [7]*

In addition to the above ways in which prevents noise to the village near masigrala there is a way to cover the entire stretch of road apsobvujućim materials or to create a tunnel from such materials, thus leads to the large attenuation of noise. An example of such a

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solution is shown in picture 6.



*Figure 6 – An example of how to reduce the level of noise on the road near the settlement, [7]*

The way in which it is possible to eliminate this negative influence on the ecosystem is basically not to leave vehicles at the end of their life cycle in nature, but rather recycle them. Of course it is needed to stimulate all users to simply take their vehicles to recycling and get some certain commodities when buying a new vehicle, and even bigger commodities in case the user decides for an ecologically better vehicle like an electric car. With the decrease of influences from waste materials from vehicles we would also save gross resources. With the development of recycling facilities for vehicles we would have new job spots open.

## 6. CONCLUSION

Vehicles represent one of the leading sources of environment contamination and with it one of the major factors, which negatively influence the ecosystem. Vehicles themselves pollute living environments in different ways from their creation to the end of their lifecycle. All negative effects on the ecosystem need to be reduced or have their influence decreased, with the help of engineering solutions, norms and laws and devices made from absorption materials.

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