Abstract
The automotive industry and road transport are considered to be one of the most important source of air pollution with CO₂ (carbon dioxide), NOx (nitrogen oxide) and other harmful components. As such, the governments and the competent institutions will implement different regulations that will ensure lower emissions for the entire range of vehicles in order for a better cleaner environment.

Keywords: Environmental regulation, automotive industry, emissions

JEL Codes: F18, F23, F64, O13, Q40, Q53

1. Introduction

During the recent years the environmental protection has become a priority for all the specialized institutions, from national governments, independent institutions, to regional unions’ common institutions. The main objective is to improve the quality of life for every citizen, by reducing the greenhouse gas emissions (carbon dioxide – CO₂) and other harmful pollutants, like the Nitrogen Oxide (NOx).

In the European Union’s case the set objectives are even more ambitious, as the organization wants to also reduce the noise pollution made by vehicle and the emissions of fluorinated greenhouse gases that are used by the mobile air-conditioning units.

For achieving these objectives the legal infrastructure has to constantly change, to be up to date, with the same rate as technology evolves or even faster.

The most influenced sector by these regulations is the automotive one. It has been a real challenge for all the car manufacturers to constantly create new products that not only have to look good, but perform well and are compliant with all the technical, safety and environmental regulations, and all within a reasonable price.
2. Emission standards and environmental institutions across the world.

Canada. The Environment Canada (EC) or Environment and Climate Change Canada is the institution responsible for the coordination of the environmental policies as well as preserving and enhancing the environment. Its activity is based on a set of rules, called CEPA 1999 (the Canadian Environmental Protection Act). The regulations are aligned with the American legislation and apply to the entire range of vehicles from passenger cars, to trucks, buses and motorcycles.

United States of America. The emissions standards are managed by the EPA – Environmental Protection Agency. Probably the biggest difference between United States and the rest of the world is the fact that the state of California can issue tighter regulations regarding vehicle emissions. Of course, they have to be approved by the EPA, first, before coming into force. This means that the other American states have two options regarding which environmental regulations will be implemented: either the national ones issued by the EPA, or the ones issued by the state of California.

Europe. The emission standards are defined in a series of European Union’s directives staging the progressive introduction of increasingly stringent standards. These regulations are known as Euro norms and they came into force in 1992 with the Euro 1 norm.

The Euro 2 and Euro 3 norms were implemented after 4 years. For the next two norms (Euro 4 and 5) the time gap was a bit bigger of 5 years.

Currently all the automotive manufacturers that operate within Europe must comply with the Euro 6 norm that came into force in 2015.

Japan. The Ministry of Environment is the designated institution that issues and implements the environmental policy.

In 1968 was issued “The Air Pollution Act” which was the first law that regulated all the pollution sources. This set of rules have been constantly updated until 1978.

In 1992, the Ministry of Environment issued another law concerning the air pollution with NOx for 196 communities in the Tokyo, Saitama, Kanagawa, Osaka and Hyogo areas.

It’s mentioning the fact that all the cars in use must comply the new car emissions from 1997/1998 which means that those standards are retroactively applied. The respective owners have only two options: either modernize their cars by fitting them with NOx and particle mass (PM) control devices, or replace those cars with newer models.

China. SEPA (China's State Environmental Protection Administration) is the competent institution for this field of activity.
The first regulation that controlled the car’s emissions was issued in the year 2000 and it was an equivalent of the Euro 1 norm. Four years later a more stringent emissions standard came into force, and it was the equivalent of the Euro 2 norm.

The National Standard III, which the equivalent of Euro 3 norm was issued in 2007 and in 2010 Standard IV.

According to the Chinese Ministry of Environment, the latest regulation, Standard V, began to be implemented in 2016 and will be fully implemented in 2018.

3. Automotive industry overview.

It must be said that the environmental impact of passenger cars and vehicle is not a big one, by all means. The statistics show, that at global level almost 16% of the carbon monoxide emissions come from cars and trucks, while at the European level the figures are a bit smaller, at 13%. By comparison the biggest source of pollution with CO₂ is the energy producing sector.

Figure 1. Global CO₂ emissions by economic sector\(^1\)

![Figure 1. Global CO₂ emissions by economic sector](image)

The pollution with nitrogen oxides (NOx) and particle mass (PM), as mentioned in the beginning of the article, are the other components regulated by the environmental agencies’ laws. Although they are present in all types of cars (whether they are equipped with petrol or diesel engines), the diesel engines’ emissions have a higher content of these two pollutants. As a result, during the recent years the diesel technology has been dramatically improved in order to respect the regulation in force.

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\(^1\) Organisation Internationale des Constructeurs d’Automobiles – Climate change and CO₂ brochure
The Dieselgate scandal drew attention in an unwanted manner towards the diesel engine cars, making people think that diesel engines are the biggest pollutant and they cannot be made compliant with the environmental legislation, so they must be banned. This is partly true because the diesel engine must be improved in order to be less pollutant, and to comply with the new regulations. The problem is the time frame needed for implementing this technology. The competent institutions issue tighter and tighter emissions regulations, and the automotive manufacturers do not get enough time to test all this technology.

Of course, this scandal about diesel engines and their emissions is only one side of the story, as the optimistic emissions and consumption rates were issued by the manufacturers, for petrol cars, proved to be difficult, if not impossible, to obtain in real life. The explanation behind this situation is the fact that all manufacturers test their newest cars in ideal situations (minimum traffic conditions, optimum weather, only one passenger and so on). The solution is to change the legislation for the testing methodology that will involve more real testing conditions. Of course, it’s impossible to replicate all the conditions that a car will face in its entire life, but a more realistic approach can and it will be applied.

In theory and in real life, as well, the diesel technology is very competitive and in terms of performance, a diesel engine can keep up the pace with the petrol engines with no problem. And it saves fuel, in the process, too.

As a testament of performance, the German car manufacturer Audi released in 2006 a race car that was equipped with a diesel engine and, surprisingly, won all the competitions it competed in, two years in a row. Those victories are even more rewarding if we consider the fact that Audi was the only manufacturer races that raced cars equipped with diesel engines.

Figure 2. Passenger car fleet by fuel type in Western Europe in 2016

2 Source: European Automobile Manufacturers Association
The consumers’ trust in the diesel engine was even further put to the test because during the investigation in the Dieselgate scandal, it was revealed that Volkswagen is not the only car manufacturer that cheated at the emissions tests. Almost all the European manufacturers admitted that one way or another their diesel cars cheated the emissions tests.

Despite that, the diesel engine still has a lot of supporters. For instance, Dieter Zetsche, aka Dr. Z, the chairman of Daimler AG, stated that “it’s worth fighting for the diesel engine”\(^3\). The statement was made in spite the fact that Daimler had to recall over 3 million diesel cars, in order to make them run cleaner.

Statistically, at the European level, more and more people choose to buy a new car equipped with a diesel engine, mainly because of the cost reductions with fuel.

In 2016, the share of new diesel cars bought by Europeans was of 41.3%, higher than the previous year, when 40.97% new diesel cars were sold. An interesting fact is that the share for alternative fuels diminished for 2016, compared with 2015, as more buyers were attracted by conventional fuels (petrol or diesel).

In analyzing the sales figures for Western Europe, one would see that the diesel cars are even more popular, as 49.5% of buyers for new cars will opt for this type of car.

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<th>Diesel</th>
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<td><strong>Pro</strong></td>
<td>40% more efficient than petrol</td>
<td>lighter engine construction</td>
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<td>more torque at low engine speeds</td>
<td>more power than diesel, but at high engine speeds</td>
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<td>less fuel is used so less CO₂</td>
<td>cheaper to run, in terms of regular maintenance</td>
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<td>no need for tune-ups</td>
<td>lower NOx emissions’ levels</td>
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<td>heavier construction due to high compression rate</td>
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<td>higher levels of NOx emissions</td>
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4. **Effects.**

Due to the Dieselgate scandal, all the environmental agencies in the world are looking very suspicious at the car manufacturers especially due to the fact that even the big names like Daimler or BMW have admitted that they cheated at the emissions tests. The public is also skeptical about the manufacturers’ offered solutions for fixing the problems for all the cars they had sold. In the

\(^3\) AutoBild, Romanian edition, no. 16, 03.08.2017
same time applying those solutions for millions of cars sold worldwide is not going to be cheap, given the fact that all those cost will be entirely supported by the manufacturers. As a result, there is a constant fear that the build quality and the reliability for the future cars will not be the same as in the past.

In terms of future solutions for helping the cars run cleaner it’s worth mentioning the introduction of new catalytic convertors (which transform all the poisonous exhaust gases into less harmful ones with the help of precious metals) and the introduction of the DPF technology for the petrol cars (DPF stands for Diesel Particulate Filter – it filters all the suspended particles, which are usually soot, that result from the functioning of a diesel engine).

Another technical solution adopted by the manufacturers, is downsizing. Basically this means that the engines are smaller but the performances remain the same if not better than the smaller engines. For example a 1.4 liter engine, with this technology has the same technical specs as 2 liter one. The downsizing option along with the introduction of the start-stop technology (which shuts down the engine when in standstill traffic and starts it up when the traffic moves) will offer important fuel savings especially for those drivers that use their cars mainly in areas with intense traffic or in urban areas.

De-activating a number of cylinders inside the engine, when the car doesn’t need to use the entire potential is the newest technology applied in the automotive industry that is destined to reduce the CO₂ emissions. The downside of this new solution is the unknown impact upon reliability.

Probably the most change in the automotive industry is the adoption of the hybrid technology as a transitional phase towards alternative fuels such as hydrogen or electricity. This trend is going upwards as all the car manufacturers fight to offer the best solutions for hybrid cars in terms of performances and costs. Of course, the government aids in form of bonuses offered for buying new hybrid cars helps customers decide in favor of this type of cars.

5. Conclusions.

The next period will offer the automotive industry the chance to reinvent itself in order to comply with the tighter regulations. This will translate into huge amounts of capital invested in R&D, which further down the line means a more positive impact on the global economy.

As products, passenger cars and vans do not represent the biggest polluter within EU and at the global level as well.

On the other hand, governments and the competent institutions want to issue even tighter emission standards that will gradually result into the retirement of the conventional powered cars, as they will be replaced by the electric ones. Unfortunately, today’s technology does not ensure a comparable range as the conventional cars. Despite the fact that there are some manufacturers, like Tesla that offer a wide range of electric cars that promise a range almost the same as a petrol powered car, the final price of such a car is far higher than average consumers can afford. So the governments offer different
incentives for buying electric or hybrid cars as part of their fleet renewal programs. The scrappage bonuses, as they are known, are offered only if the customer scraps his old car and will buy a new hybrid or electric car. Unfortunately, the bonuses cover up to 10% from the final price, which make these type of cars too dear for most of consumers around the world.

**Figure 3. Integrated approach for reducing CO₂ emissions**

![Figure 3](image)

In order to reduce our negative impact on the environment we need to elaborate an integrated system that will cover not only the reduction of the carbon print in cars, or transportation, but in our entire lifestyle. In “The Stern Review on the Economics of Climate Change”, from 2006, the author, Nicholas Stern warns that implementing new and tighter regulations just for the automotive industry is the least efficient way to reduce the CO₂ emissions.

### 6. Resources:

3. Carrington, Damian – “Emissions from new diesel cars are still far higher than official limit”, The Guardian, August 30 2016, available at:

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4 Source: European Automobile Manufacturers Association – “Reducing CO₂ together”, 2017
Environmental Regulations And The Automotive Industry


