

**THE RESEARCH OF THE ECONOMIC AND ECOLOGICAL
EFFICIENCY OF INTERNATIONAL ROAD FREIGHT
ИССЛЕДОВАНИЕ ЭКОНОМИЧЕСКОЙ И ЭКОЛОГИЧЕСКОЙ
ЭФФЕКТИВНОСТИ АВТОМОБИЛЬНОГО ТРАНСПОРТА
ПРИ МЕЖДУНАРОДНЫХ ПЕРЕВОЗКАХ ГРУЗОВ**

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In the European Union, heavy-duty vehicles (HDVs) are currently responsible for 27 % of road transport carbon dioxide (CO₂) emissions. Trucking poses threats to the environment from two major quantifiable sources: air pollution and noise [1].

В Европейском Союзе, на долю большегрузных транспортных средств в настоящее время приходится 27 % выбросов углекислого газа на автомобильном транспорте. Грузоперевозки создают угрозу для окружающей среды за счет загрязнения воздуха и шумового загрязнения.

Key words: trucking, ecology, economics, vehicle emissions, road tolls.

Ключевые слова: грузовые перевозки, экология, экономика, выхлопные газы, дорожные сборы.

INTRODUCTION

The HDV sector comprises a mixture of different types of trucks, buses and coaches. These include vehicles used for the transport of goods exceeding 3.5 tonnes (trucks), as well as those used for passenger transport that have more than eight seats (buses and coaches). The sector is characterized by many different vehicle categories, technologies, sizes and weights as HDVs are typically customized for specific clients and uses.

Below, there are the main statistics pertaining to the HDV sector (as of 2018):

– there are 6.3 million trucks on the EU's roads. With more than 1 million trucks, Poland has the largest truck fleet in the EU, followed closely by Germany and Italy;

- trucks are on average 11.7 years old in the European Union. Greek trucks are the oldest ones, with an average age of almost 21 years;
- nearly all trucks in the European Union run on diesel (96,1 %), petrol fuels only 1 %;
- there are 77 commercial vehicles per 1,000 inhabitants in the EU, Portugal has the highest number per inhabitant: 119;
- the European truck market is dominated by just six manufacturers: Daimler Trucks, MAN Truck and Bus, Volvo Trucks, Scania, DAF (Paccar Group) and Iveco [2].

ECONOMIC AND ECOLOGICAL EFFICIENCY OF INTERNATIONAL ROAD FREIGHT

The environmental impacts of trucking have received a great deal of attention, particularly in comparison with the impacts of rail. Trucking poses threats to the environment from two major quantifiable sources, air pollution and noise. In addition, the use of trucks contributes to land-use related environmental stresses and to the environmental impacts of accidents. The table 1 summarizes emission factors from a number of sources, developed in two different countries. The data are expressed in grams/tonne-km. Trucks are as well a significant source of road noise, and they may be a more significant source of noise than other modes of freight transport [3].

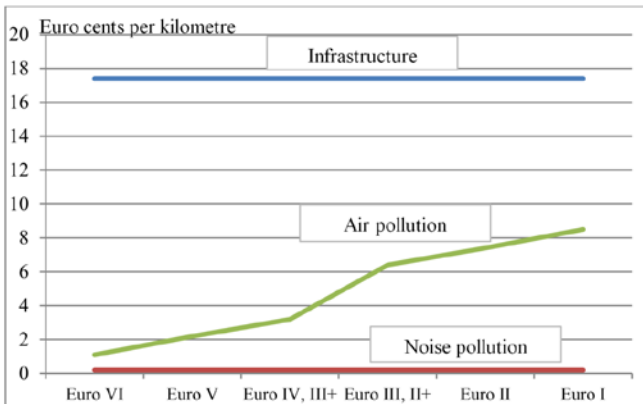
In Europe there are at least two systems for road charging – tolls and "vignettes". Tolls are payments mainly proportional to distance, charged to users on the basis of the number of kilometers (although subscription schemes often also exist), while in the case of vignettes, payments are in connection with a pre-determined time of usage such as one week, one month or one year, generally with wide access to the road framework and for an unlimited amount of kilometers.

Table 1 – Truck Air Pollution Emission Factors, in grams/tonne-km

	Kürer (Germany)		Schoemaker & Bouman (Netherlands)			
	Local	Long-haul	Trucks	Trucks & Trailers	Truck-tractors & semi-trailers	Road freight overall
CO	1,86	0,25	2,24	0,54	0,34	0,90
CO2	255	140	451	109	127	211
HC	1,25	0,32	1,57	0,38	0,34	0,68
NOx	4,1	3,0	5,65	1,37	2,30	2,97
SO2	0,32	0,18	0,43	0,10	0,11	0,20
Particulates	0,30	0,17	0,90	0,22	0,19	0,39

In Germany, the toll rates are set down in the German Federal Trunk Road Toll Act. The total amount is based on the distance that a vehicle or a vehicle combination travels on a road subject to toll and a toll rate in cents per kilometer, which includes a share each for air pollution, noise pollution and infrastructure costs:

- the proportion of the toll rate for the infrastructure costs depends on the axle and weight class;
- the proportion of the toll rate for noise pollution is charged equally for all vehicles as a lump sum for all vehicles;
- the proportion of the toll rate for air pollution caused is determined based on the emission class (Picture 1).



Picture 1 – German toll rates as of 01 January 2019 in eurocents/km

The distance between Warsaw and Luxembourg (a big logistics hub) is 1313 km, with more than a half of the way passing through Germany (747 km). Given an average rate per kilometer of 1 Euro, it is possible to calculate the benefits of using a Euro 6 truck in comparison with a truck with the Euro 3 emission class engine. According to the official information on toll rates, it costs 139,7 Euros to drive a Euro 6 truck on German territory. In contrast to the first option, the second option will cost a trucking company 179,3 Euros, which is almost 30 percent higher than in the case with the Euro 6 truck.

INFERENCE

Despite the high price of trucks with the Euro 6 emission class engine it is more profitable for large logistics companies to gradually renew their fleets as the cost of operations on a foreign territory alongside with large cargo turnover make it economically unviable to use old trucks. However, small companies might not be better off using brand new trucks since they cannot recoup their investments in a short period of time due to low cargo turnover.

Fleet size and the emission class standards pay an important role in the distribution of permissions to perform international road transport of goods.

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