

## SUSTAINABLE TRANSPORT' S INDICATORS. COMPARATIVE STUDY: EU-27 AND ROMANIA

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### ABSTRACT

Sustainable development is one of the most important target of the European Union. Between EU Sustainable Development Strategy's challenges, sustainable transport represents an essential aim. According to EU statements, "to ensure that our transport systems meet society's economic, social and environmental needs whilst minimizing their undesirable impacts on the economy, society and the environment". Our work is a comparative study between EU-27 and one of its member country (Romania) regarding the set of sustainable transport's indicators, as a statistical overview of progress towards the accomplishment of EU sustainable development strategy's goals in this sector of activity. As a result of our statistical analysis, we present some measures that can be taken to increase the sustainability of european transport, focusing on reducing the adverse effects of transport activities on the environment and promoting solutions in order to minimise the vehicle's emissions and costs and thus, to meet the sustainability objectives and to contribute to a sustainable quality of life.

**Keywords:** *sustainable transport, indicators, sustainable development, transport mode, EU-27, Romania, environment*

### 1. INTRODUCTION

Sustainable development is an essential goal of the European Union, focusing on the life quality increase and taking into account economic, social and environmental aspects.

An important part of European Union Sustainable Development Strategy is represented by the indicators that measure the progress towards the accomplishment of strategy's purposes. More than 100 indicators characterize sustainable development in European Union, but a global overview is given by headline indicators. Thus, in the field of transport, energy consumption of transport relative to GDP (gross domestic product) is the headline indicator used to evaluate sustainable transport. On level 2, we find two subthemes – Transport and mobility, Transport impacts – with specific indicators, such as: Modal split of passenger transport, Modal split of freight transport, Energy consumption by transport mode, Greenhouse gas emissions from transport, People killed in road accidents. [2]

### 2. ENERGY CONSUMPTION OF TRANSPORT RELATIVE TO GDP IN EU-27 AND ROMANIA

This indicator is defined as the ratio between the energy consumption of transport and GDP. The energy consumed by all types of transport (road, rail, inland navigation, aviation) is covered, including commercial, individual and public transport, with the exception of maritime and pipeline transport.

Table 1. Dynamics of Energy consumption of transport relative to GDP in EU-27 and Romania in the period 2000-2010 (%)

Year	EU-27	Romania
2000	100	100

2001	98,7	113,9
2002	98,2	111,8
2003	98,3	112,0
2004	98,7	107,2
2005	97,8	96,2
2006	96,6	92,5
2007	95,0	92,7
2008	94,1	97,6
2009	95,7	105,1
2010	93,3	100,5

Source: Series of statistical data, [9]

While European Union recorded a decrease in the dynamics of this indicator in the period 2000-2010, in Romania its evolution is oscillating in the same period with successive increases and decreases. This fact is due to the instability of economic and social policies promoted. The lowest level of the indicator was recorded in the year before accession to the EU (92.5% in 2006).

### 3. TRANSPORT AND MOBILITY

#### 3.1. Modal split of passenger transport

Both in the EU and in Romania the largest share in the structure of passenger transport is held by vehicles, on the 2nd and 3rd places being the public means of transport (buses, coaches) and trains.

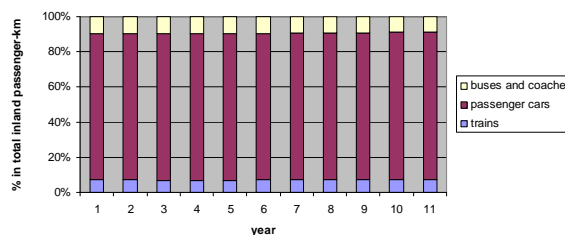


Figure 1. Structure of passenger transport in EU-27 in the period 2000-2010

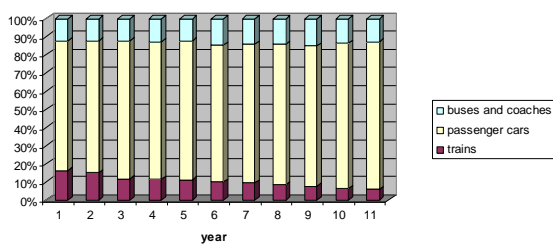


Figure 2. Structure of passenger transport in Romania in the period 2000-2010

3.2. Modal split of freight transport

At EU level we observed that in the structure of freight transport prevail road transport with all its shortcomings, especially in terms of effects on the environment. Compared with the structure presented in the EU-27, Romania has a surprisingly favorable situation. Even if freight transport by road has the main place in its structure, in recent years it is used more and more the inland waterways transport and the rail transport (see data from 2010 in table 2). National authorities are focusing on the growth of intermodal transport promotion as a solution for efficient transport activity in Romania.

Table 2. Modal split of freight transport in EU-27 and Romania in the period 2000-2010 (%)

Year	Mode of transport					
	Railways		Roads		Inland waterways	
	EU27	RO	EU27	RO	EU27	RO
2000	19,7	49,1	73,7	42,9	6,5	7,9
2001	18,8	43,1	74,8	49,6	6,4	7,3
2002	16,5	34,4	77,2	57,3	6,4	8,2
2003	18,2	30,4	76,0	62,4	5,8	7,1
2004	17,9	27,8	76,1	60,8	5,9	11,4
2005	17,7	21,7	76,4	67,3	5,9	11,0
2006	18,0	19,4	76,3	70,5	5,7	10,0
2007	17,9	18,9	76,3	71,3	5,8	9,8
2008	17,8	19,0	76,3	70,2	5,9	10,8
2009	16,6	19,4	77,5	60,0	6,0	20,6
2010	17,1	23,5	76,4	49,2	6,5	27,2

Source: Series of statistical data, [9]

In terms of energy consumption by mode of transport (expressed in 1000 tonnes of oil) on the first place in the EU-27 and in Romania is road transport, followed by international air transport, railways, domestic aviation and domestic navigation, as it is shown in table 3 and table 4. For example, domestic navigation consumes 46 times less fuel than road transport in 2009.

Table 3. Energy consumption by transport mode in EU-27 in the period 2006-2011

Year	Road	Rail	International Aviation	Domestic Aviation	Domestic Navigation
2006	304775	7548	44957	6704	7306
2007	309035	7757	46099	7063	6788

2008	305481	7725	47257	6832	6809
2009	300245	7303	43763	6134	6417
2010	299744	7397	43160	6273	6093
2011	297576	7319	44489	6026	5926

Source: Series of statistical data, [9]

Considering statistical data presented in table 4, we observe the same ranking of transport mode by energy consumption in our country.

Table 4. Energy consumption by transport mode in Romania in the period 2006-2011

Year	Road	Rail	International Aviation	Domestic Aviation	Domestic Navigation
2006	3999	147	155	2	41
2007	4055	264	124	105	85
2008	4665	245	135	129	78
2009	4796	200	149	85	55
2010	4404	221	166	111	59
2011	4548	286	93	133	52

Source: Series of statistical data, [9]

4. TRANSPORT IMPACTS

The second category of sustainable transport indicators are those relating to the effects of transport activities on population and environment.

Referring to greenhouse gas emissions by transport mode, in the period 2000-2010, at EU-27 level we observe an oscillatory evolution, registering significant increases, in average 1.3% per year, until 2008 and then declines in 2008-2010 on the background of world economic crisis. For the same period, in Romania there are increases of carbon emissions' levels, less in 2005-2006 and 2009-2010, as we can see in figure below.

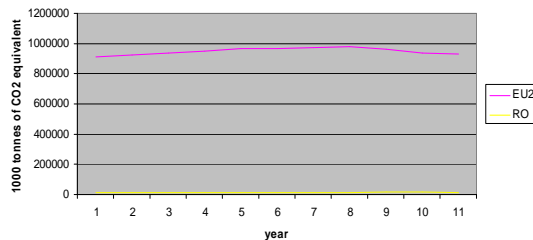


Figure 3. Greenhouse gas emissions by transport mode in EU-27 and Romania in the period 2000-2010

Regarding people killed in road accidents, Romania accounts 4.4% of the number of deaths in EU-27 due to road accidents in 2000 and in 2009 its share has doubled to 8.1%. In terms of number of deaths per million inhabitants, Romania's situation is worrying, because the values are approximately equal to those of the EU-27 in 2000-2003, and after 2003 they exceed them considerably (for example, in 2008 the number of deaths per million inhabitants in the EU-27 was 78 and in Romania 142). This is due to insufficient developed and modernized road infrastructure in our country and to the lack of investment in the transport sector.

Table 5. People killed in road accidents in EU-27 and Romania in the period 2000-2009

Year	Number of killed people		Number of deaths per million inhabitants	
	EU-27	RO	EU-27	RO
2000	56427	2499	116	113
2001	54302	2461	111	112
2002	53342	2398	109	111
2003	50351	2235	102	103
2004	47290	2418	96	113
2005	45346	2461	92	121
2006	43104	2478	87	120
2007	42496	2800	86	130
2008	38875	3061	78	142
2009	34500	2796	-	-

Source: Series of statistical data, [9]

### 5. MEASURES TAKEN TO INCREASE THE SUSTAINABILITY OF EUROPEAN TRANSPORT

An important measure taken to support sustainable transport was represented by the “MoMo-model”, a global transport spreadsheet model that includes all modes of transport and most vehicle types and covers 29 countries and regions.

It is based on the "ASIF" framework: Activity (passenger travel)\*Structure (travel by mode, load factors)\*Energy-Intensity = Fuel use.[4]

The model is used within the IEA (International Energy Agency) and it contains detailed by-mode, by-fuel and by-region historical data and projections to 2050 for the transport sector and its energy and greenhouse gas implications, based on hypotheses on GDP and population growth, fuel economy, costs, travel demand, vehicle and fuel market shares. It allows a comparison of marginal costs of technologies and total cost across all modes and regions for a given scenario. As we can see in figure below, due to this model, the sales are expected to triple by 2050 and the fuel economy target will be reached by 2020-2030. By 2050, plug-in vehicles will account for more than half of all sales, nearly 50% of energy is low-CO2 renewable in 2050.[7]

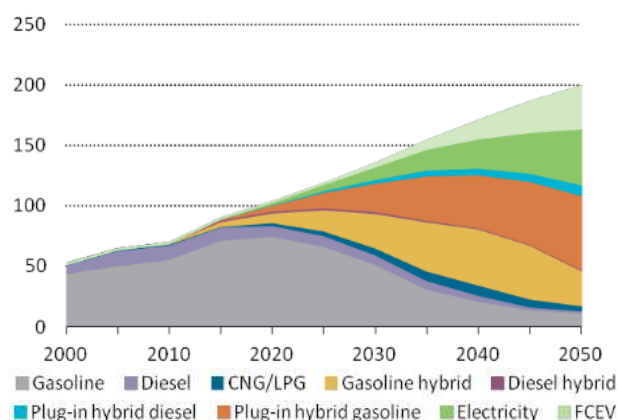


Figure 4. Improve case on fuel by 2050 due to “MoMo-model”

The White Paper on Transport, consider that a Single European Transport Area should ease the

movements of citizens and freight, reduce costs and enhance the sustainability of European transport. Also it claims that there should be a “Single European Sky” (regarding the capacity and quality of airports), a “Single European Railway Area” (this includes the abolishment of technical, administrative and legal obstacles which still impede entry to national railway markets) and a “Blue Belt” (in the seas around Europe that shall simplify the formalities for ships travelling between EU ports).[3]

One of the most important forum which focuses on reducing the adverse effects of transport activities on the environment and contributing effectively to sustainable development is the UNECE Transport Division (division of The United Nations Economic Commission for Europe, a forum where the countries of Western, Central and Eastern Europe, Central Asia and North America, 56 countries in all, come together to forge the tools of their economic cooperation), that facilitates the international movement of persons and goods by inland transport modes.[5]

Each UNECE country recognized that transport is an important tool to help meet overall sustainability objectives, so it consider that specific goals for sustainable transport may include improved service quality and quality of access to goods and services, safety, improved air quality, noise reduction, improved water quality, protection of natural habitat and open space, historic preservation, reduced carbon emissions, increased social equity, economic development, and a satisfying quality of life, as well as local goals consistent with the overall objective.[6]

So the UNECE is playing a key role in some areas of sustainability, like international access, road traffic safety, environmentally friendly vehicles and intermodal transport.[6]

### 6. CONCLUSIONS

Due to the fact that transport system provides the individual with access to basic social services, such as health, food, education, employment and recreational activities, this requires the transport system to be safe to ensure that human health is not at risk, in brief to ensure the development of sustainable transport. So, in order to support sustainable transport many things were made:

- Further market opening has taken place in aviation, road and partly in rail transport;
- The safety and security of transport across all modes has increased;
- New rules on working conditions and on passenger rights have been adopted;
- Transeuropean transport networks (financed through TEN-T, Structural Funds and the Cohesion Fund) were created, contributing to territorial cohesion and the building of high-speed railway lines;
- International ties and cooperation have been strengthened.

To accomplish the objectives of sustainable transport, it is required that all aspects of sustainable development to be considered (the three pillars of sustainability- economic, social and environmental, that are closely linked) in relation with five inter-related

transport areas: accessibility, affordability, safety, security and environment. Also the UNECE Transport Division states that sustainable transport policies can be financially beneficial, but it requires political commitment. [6]

In order to achieve a high level of sustainable transport, future development must rely on a number of strands such as:

-Improving the energy efficiency performance of vehicles across all modes. Developing and deploying sustainable fuels and propulsion systems;

-Optimising the performance of multimodal logistic chains, including by making greater use of inherently more resource-efficient modes, where other technological innovations may be insufficient (e.g. long distance freight);

-Using transport and infrastructure more efficiently through use of improved traffic management and information, advanced logistic and market measures such as full development of an integrated European railway market, removal of restrictions on cabotage, abolition of barriers to short sea shipping or undistorted pricing.

Transport is one of the biggest contributors to climate change and poor air quality, yet it is also a vital part of our modern society and economy. Adopting sustainable transport technologies and behaviours allows us to balance our need for mobility with more sustainable lifestyles. Sustainable transport strives to

identify solutions which reduce both vehicle emissions and costs.

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