

## STATISTICAL STUDY ON ENVIRONMENTAL PROTECTION IN ROMANIA, FROM THE PERSPECTIVE OF SUSTAINABLE DEVELOPMENT

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**Abstract:** Widely debated concept, at least in the last three decades, sustainable development remains an important objective of mankind, even in the third millennium. Objectives of sustainable development, in our country, are contained in several categories, which are grouped into „critical challenges” and „inter and trans-sectoral issues”. „Critical challenges”, according to this approach, are the „protect the environment” and „protection of human development.” The authors, in this article, they want to perform a statistical analyse to indicators at protecting the environment, so one of the most important directions of sustainable development. After that, they tries to find solutions to the most urgent environmental problems.

**JEL classification: C82, O11**

Keywords: sustainable development, protect the environment, statistical analyse, evolution, strategy.

### 1. INTRODUCTION

Sustainable development is one of the most circulated concepts of recent decades, but at the same time, addressing strategies of most major world governments today. One of the definitions of satisfactory and comprehensive perceive sustainable economic development as „the type or form of economic and social development to ensure the consumer’s satisfaction without compromising or prejudicing those of future generations, or ability to meet the present generation without compromising the ability of future generations to meet their own needs, economic prosperity and environmental preservation must support each other”<sup>1</sup>. Thus, sustainable development must take place, in terms of conceptual, amid major principles characterizes as follows:

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<sup>1</sup> Ciurlău C., Enea-Smarandache I., Murărița I. **Coordinates of sustainable economic development, The Annals of The University from Craiova, Universitaria Publishing House, Craiova, 1999.**

- *concern for equity and fairness between countries and between generations;*
- *long-term vision on the development process;*
- *systemic thinking, the interconnection between the economy, society and environment.*

Economic development, however conceived and defined, not an end in itself but the way to satisfy his needs vital human society as a whole, and to provide pleasure to live.

Introducing the principles of sustainable development in the Romanian public policies held for the first time, the spur discussion in the United Nations and its specialized agencies, by assuming the obligations precise statements and conventions to which our country became a party. Joining the European Union imposed a more concrete nature of these concerns, targeting mainly the adoption of a new philosophy of development that would ensure the settlement of issues related to economic, social and environmental.

Thus, in 1997-1999, the Romanian Government developed the National Strategy for Sustainable Development (with assistance from United Nations Development Programme). This strategy formed the subject of interim reports by the European Commission on the implementation of sustainable development objectives, after Romania's accession to the EU (July 2007). National Strategy for Sustainable Development (NSSD)<sup>2</sup> is the result of obligations assumed by Romania, as EU member state, according to the objectives agreed at EU level and methodological requirements of the European Commission. The measures taken by Romania to meet the eight targets set in the UN on global issues of sustainable development are presented in the Second Report on the Millennium Development Goals, adopted by the Government on 18 September 2007. Both these documents, as well as measures taken to implement them, are sufficiently relevant to efforts to deal with key challenges and meet European Union targets included in the „Sustainable Development Strategy” (SDS).

Objectives of sustainable development in Romania, from NSSD, are included in several categories, which are divided from the very beginning, the two main groups: „critical challenges” and „inter and trans-sectoral issues.” Among the „key challenge”, we find two main orientations: „environmental protection” (following „Climate change and clean energy”, „Transport”, „Production and consumption”, „natural resources”) and „protection and human development” (targets the „public health”, „Social inclusion, demography and migration”, „Global poverty and sustainable development challenges”). „The themes of inter and trans-sectoral” strategy of sustainable development are concerned about the „Education and Training”, and „Scientific research and technological development, innovation”.

Objectives of sustainable development in Romania were established for time horizons 2013, 2020 and 2030. Sustainable development objectives for 2020 aim generally near or touching the average EU level, while the horizon 2030, the targets placed in the middle and over.

Full connection to the new vision of our country to develop, own EU and widely shared throughout the world, that of sustainable development, based on the finding that, after a painful transition to democracy and market economy, Romania has yet to be recovered significant differences from the other EU members, while learning and putting into practice the principles of sustainable development in the context of globalization.

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<sup>2</sup> ***National Strategy for Sustainable Development of Romania, Horizon 2013-2020-2030, Romanian Government, Ministry of Environment and Sustainable Development, United Nations Development Program, National Centre for Sustainable Development, Bucharest, 2008.***

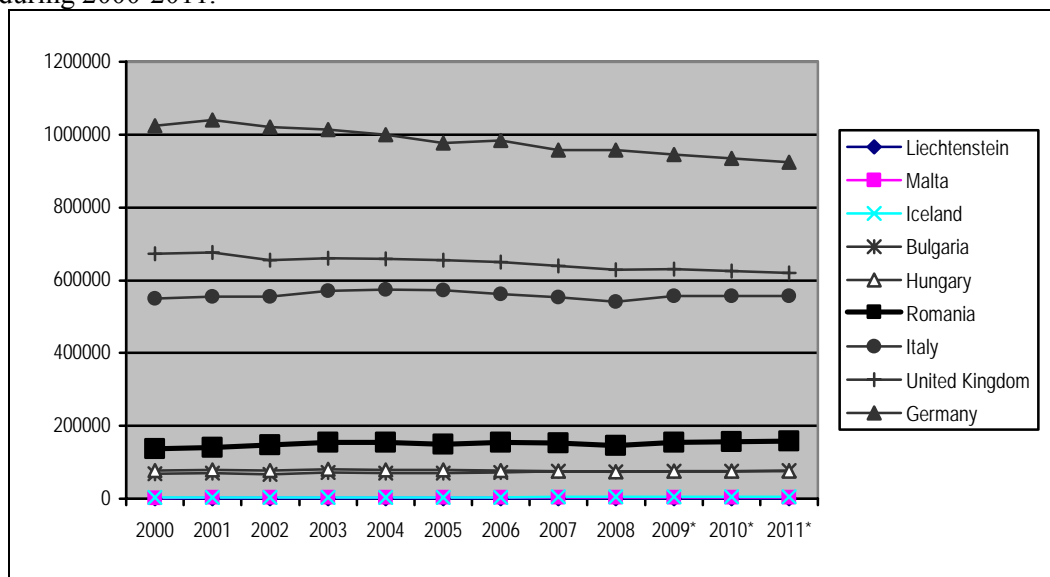
## 2. EVOLUTION OF ENVIRONMENTAL PROTECTION INDICATORS FOR SUSTAINABLE DEVELOPMENT PERSPECTIVE

Indicators to assess the protection of the environment, sustainable development of Romania, during this period had very different evolutions. For a better perception of the situation, we considered useful to the dynamics of these indicators in the European context. Graphics will play in the development of our country compared to the general level of the European Union (EU27), the first three and last three ranking countries, but also Hungary and Bulgaria, neighbouring states and can, therefore, to form a local image.

### A. Climate change and clean energy

A first group of indicators is included in **climate changes and clean energy** title that derived from the EU SDS is the overall objective which is „to prevent climate change by limiting emissions of greenhouse gases and negative effects on society and the environment”<sup>3</sup>. Romania’s objective to Horizon 2013, aims to „meet the energy needs on short and medium term energy security and creating conditions for the country’s long-term compliance with the requirements of a modern market economy, safe and competitiveness”<sup>4</sup>.

The most important indicator in this category, otherwise only for which complete data at European level is **Greenhouse gas emissions by sector (source: EEA), 1000 tonnes CO<sup>2</sup> equivalent**. This indicator is reflected in the emissions of greenhouse gases, in which the different greenhouse gases are weighted by their global warming potential. In Figure no. 1 we represented the dynamics of greenhouse gas emissions, the European Union during 2000-2011.



Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc210>, from 03.06.2011, for the period 2000-2008, the authors estimate for 2009-2011.

\*) forecast

Figure no. 1. Evolution of “Greenhouse gas emissions by sector, 1000 tonnes CO<sup>2</sup> equivalent”, in the European Union in the period 2000-2011.

<sup>3</sup> Idem.

<sup>4</sup> Idem.

The lowest recorded levels of Liechtenstein (annual average in the 12 years, equivalent to 262.9 thousands of tonnes equivalent CO<sup>2</sup>), Malta (average 2914.6) and Iceland (average 4210.8) and are highest in Germany (average 981,665.9), United Kingdom (average 647,472.0) and Italy (average 558,740.0). Romania (average 150,513.1) is placed above neighbours: Bulgaria (72,313.8 thousand tonnes) and Hungary (77,098.5 thousand tonnes). Although, in principle, a high level means an adverse event must be taken into account the size of the economy that produce these emissions (see the extremes of the ranking: Liechtenstein and Germany). I gave up representation of EU27 values, because the very high levels have made it impossible perception of other countries in the graph.

Another relevant indicator for the „climate change and clean energy”, although no data for the entire period (2000-2011), *Share of renewable energy in gross final energy consumption (%)*. In figure no. 2 is the dynamics of this indicator in the European Union in 2006-2011 and target for each country.

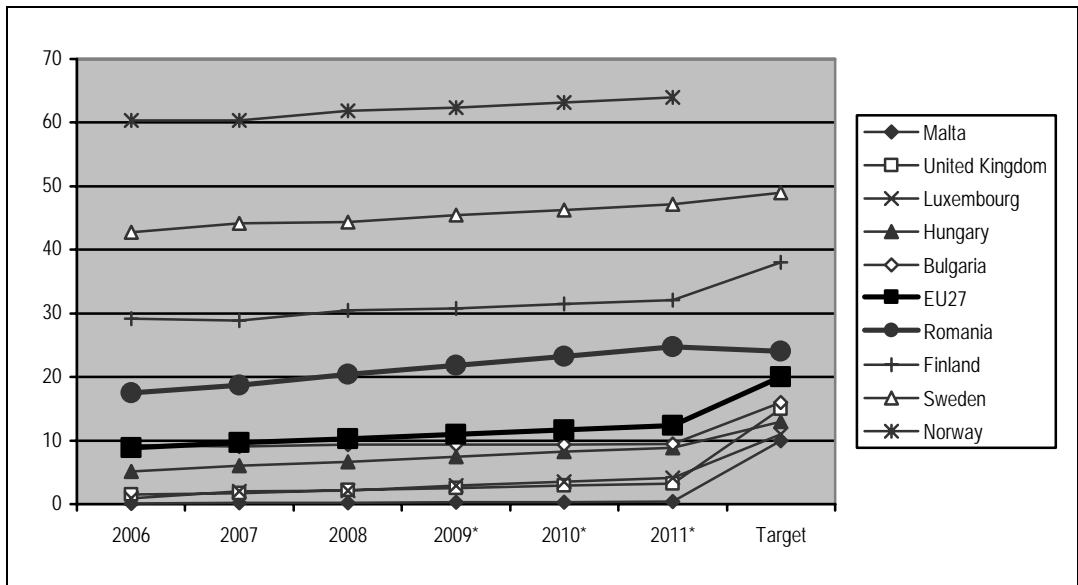
Lowest levels recorded for Malta (annual average in those six years, 0.2%), United Kingdom (average 2.3%) and Luxembourg (average 2.6%) and are highest in Norway (average 62%), Sweden (average 45.0%) and Finland (average 30.5%). In the EU27 the annual average is 10.7%, Romania has a value of 21.0%, while lower values have been our neighbours: Hungary 7.0% and Bulgaria 9.3%. Depending on the difference between the target and the estimated level of the indicator in the last year of the study period, the first place is Romania (with a negative value of -0.7%, which means that in 2011 the target will be exceeded, so hard to believe, however), followed by Austria (0%) and Estonia (1.6%). The last places are Ireland (11%), United Kingdom (11.8%) and Latvia (12.5%). At EU27 level the difference is 7.6%, and our neighbours have seen values: Hungary 4.1% and Bulgaria 6.5%. Must, however, made no mention that for Norway specified target level, and provided that records annual values of 60% is reasonable to consider that first, in terms of this criterion (share of renewable energy in gross final energy consumption), is Norway.

### **B. Sustainable transport**

In relation to **sustainable transport**, EU's overall objective is to ensure that transport systems meet society's needs, while minimizing unwanted impact on the economy, society and environment. Romania aims for 2013 to promote a transport system to facilitate movement of people and goods at national and international level, in line with European standards<sup>5</sup>. In Figure no. 3 is rendered dynamic of *Volume of freight transport relative to GDP* in the European Union during 2000-2011.

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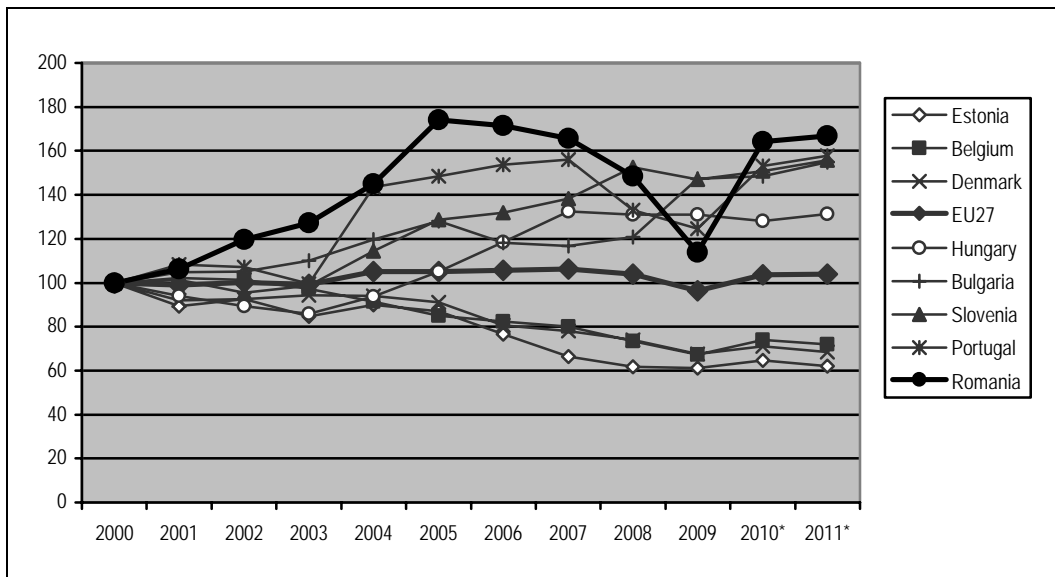
<sup>5</sup> **Idem.**



Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc110>, from 19.10.2011, for the period 2006-2008, the authors estimate for 2009-2011.

\*) forecast

**Figure no. 2. Evolution of “Share of renewable energy in gross final energy consumption (%)”, in the European Union in the period 2006-2011.**



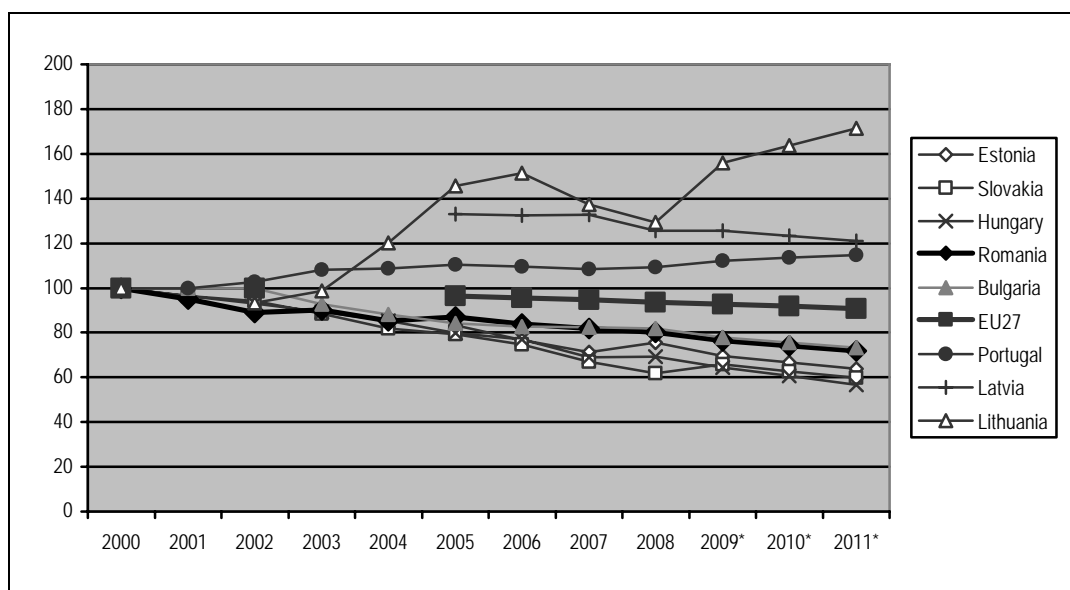
Source: Eurostat, [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tran\\_hv\\_frtra&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tran_hv_frtra&lang=en), din 11.10.2011, for the period 2000-2009, the authors estimate for 2010-2011.

\*) forecast

**Figure no. 3. Evolution of “Volume of freight transport relative to GDP” in the European Union in the period 2000-2011.**

Lowest levels recorded by Estonia (annual average in the 12 years, 78.9%), Belgium (average 85.4%) and Denmark (average 85.6%) and are high in Romania (average 136.1%), Portugal (average 127.7%) and Slovenia (average 123.1%). In the EU27 the annual average is 102.1%, while our neighbours have lower values for Romania: Hungary (110.9%) and Bulgaria (113.4%). Classification of our country at the forefront of this ranking shows how important transport is in the GDP.

In Figure no. 4 is given dynamics of *Volume of passenger transport relative to GDP*, in the European Union during 2000-2011.



Source: Eurostat, [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tran\\_hv\\_pstra&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tran_hv_pstra&lang=en), din 11.10.2011, for the period 2000-2008, the authors estimate for 2009-2011.

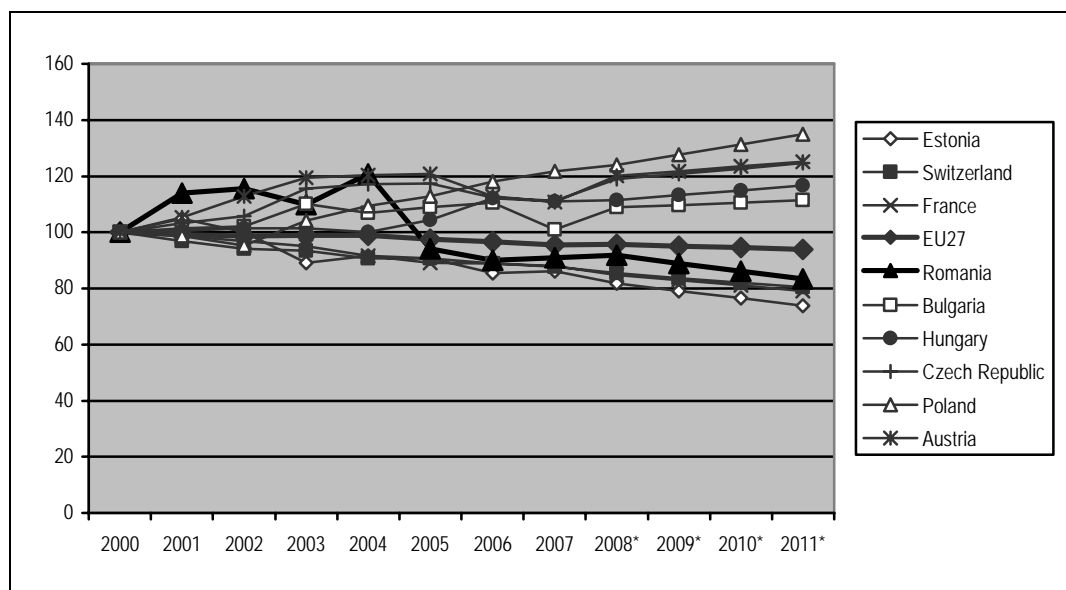
\*) forecast

**Figure no. 4. Evolution of "Volume of passenger transport relative to GDP", in the European Union in the period 2000-2011.**

Lowest levels recorded by Estonia (annual average in the 12 years, 75.9%), Slovakia (average 80.6%) and Hungary (average 84.1%) and are high in Lithuania (average 133.4%), Latvia (average 121.5%) and Portugal (average 106.5%). In the EU27 the annual average is 95.0%, while at regional level, Romania (85.8%) is placed between neighbours: Hungary with 84.1% and Bulgaria with 89.7%.

*Energy consumption of transport relative to GDP (Index 2000 = 100)* reflects the ratio of energy consumed by the transport industry and GDP. To estimate the numerator of this relationship, determine the energy consumed by all types of transport (road, rail, inland navigation and aviation), including commercial transport, private and public, except for shipping and pipelines. In Figure no. 5 is shown the variation of "Energy consumption of transport relative to GDP" in the European Union in the period 2000-2011.

Lowest levels recorded by Estonia (annual average in the 12 years, 88.3%), Switzerland (average 89.5%) and France (average 89.7%) and the raised are those of Austria (average 116.1%), Poland (average 114.8%) and Czech Republic (average 114.1%). In the EU27 the annual average is 97.1%, while at regional level, Romania (98.8%) is placed below the neighbours: Bulgaria with 106.8% and 107.3% Hungary.



Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdtr100>, from 11.10.2011, for the period 2000-2007, the authors estimate for 2008-2011.

\*) forecast

**Figure no. 5. Evolution of "Energy consumption of transport relative to GDP", in the European Union in the period 2000-2011.**

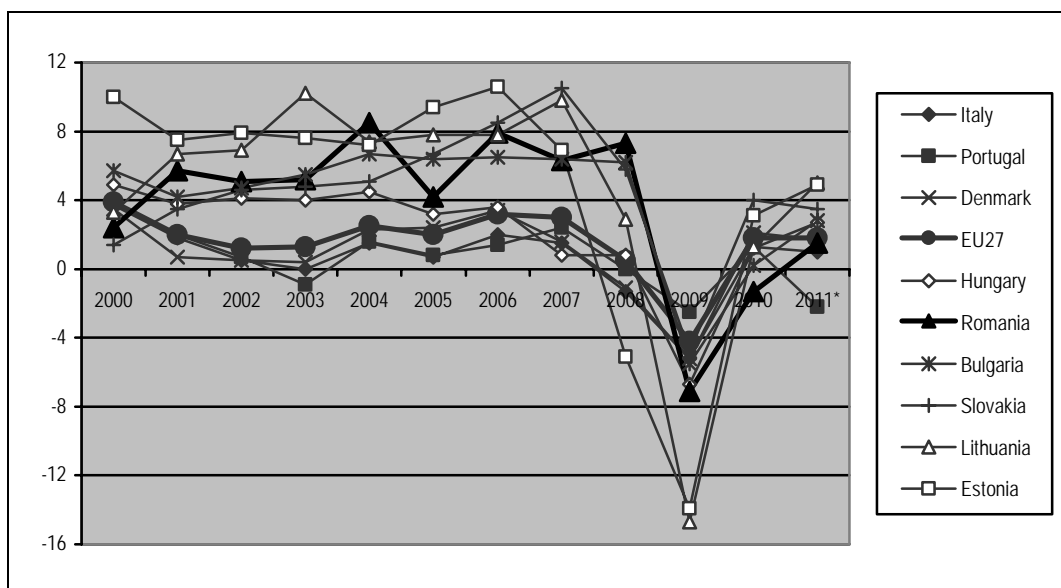
### C. Production and consumption

The objective of the EU on **sustainable production and consumption** practices aimed at promoting sustainable consumption and production. In our country, the target for the horizon 2013, aimed at eco-efficient management of resources, and promotion to maximize their production and consumption model enabling sustainable economic growth and gradual approximation of the average EU performance.<sup>6</sup>

The pace of economic development in Romania, the last decade, was among the most consistent compared with EU27 states. **Gross domestic product** has seen a constant increase in 2000-2008, growth emphasized by Figure no. 6, while 2009 reflects the shock of the previous year in all countries.

Lowest levels recorded for Italy (annual average in the 12 years, 0.6%), Portugal (average 0.7%) and Denmark (average 1.0%) and are high in Estonia (average 4.7%), Lithuania (average 4.5%) and Slovakia (average 4.5%). In the EU27 the annual average is 1.6%, while at regional level, Romania (3.8%) is placed between neighbours Hungary (2.2%) and Bulgaria (4.2%). Increases in the period 2000-2008 ensured the gradual reduction of the gap and allow EU countries to continue reforms to the general objectives of the Lisbon Strategy „more growth and more employment”. However, it should be noted that until 2004 was GDP reached in 1989.

<sup>6</sup> Idem.



Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsieb020>, din 28.05.2011.  
\*) forecast

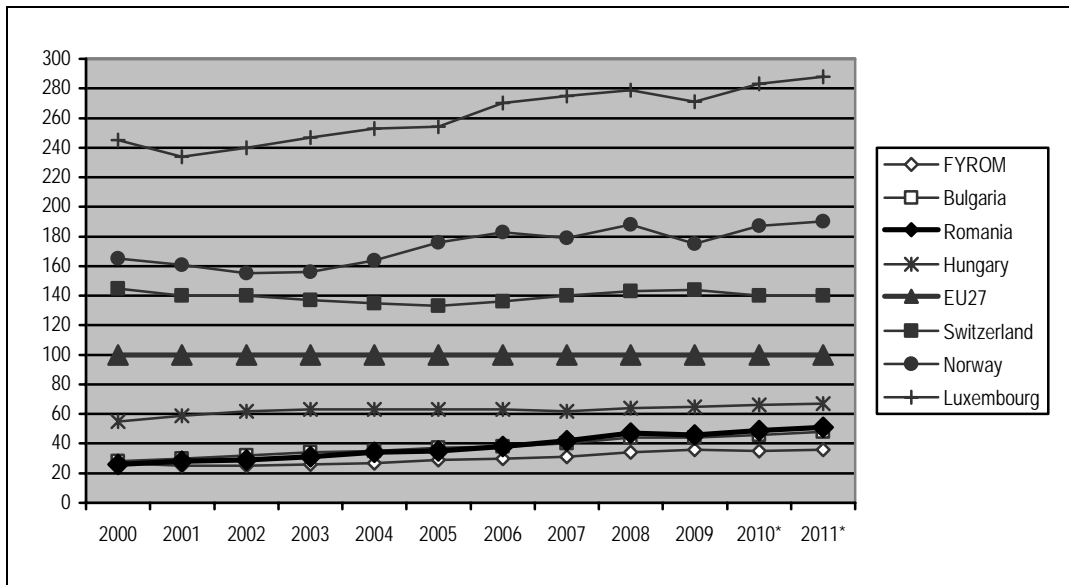
**Figure no. 6. Evolution of "Growth rate of GDP volume", in the European Union in the period 2000-2011.**

Evolution of *GDP per capita in Purchasing Power Standards (PPS) (EU-27 = 100)* in the EU27 during 2000 to 2011, is shown in Figure no. 7.

Lowest levels are recorded by FYROM (annual average in the 12 years, 30.14% of the EU), Bulgaria (average 37.99%) and Romania (average 38.02%), and the highest are those of Luxembourg (average 261.61%), Norway (average 173.18%) and Switzerland (average 139.34%). At the regional level, Romania is placed between neighbours Bulgaria and Hungary (62.66%). So our country is far from the levels recorded in the EU27, and very far from the top states.

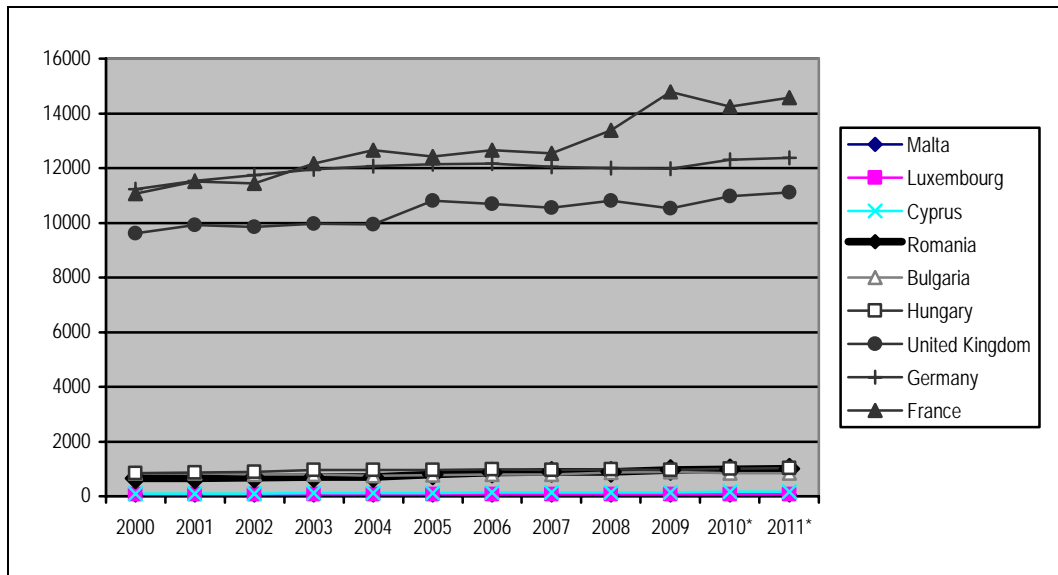
**Consumption.** In light of this category, we will track *Electricity consumption of households (1000 toe)* – being both a representative indicator and one of the few for which European data. The indicator reflects the amount of electricity consumed by households, covering the use of electricity for space heating and water, and all electrical appliances. In Figure no. 8 we find represented the evolution of "Electricity consumption of households" in the European Union in the period 2000-2011.





Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsieb010>, din 28.05.2011, for the period 2000-2009, the authors estimate for 2010-2011  
 \*) forecast

**Figure no. 7. Evolution of “GDP per capita in Purchasing Power Standards”, in the European Union in the period 2000-2011.**



Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdpc310>, din 03.06.2011, for the period 2000-2009, the authors estimate for 2010-2011.  
 \*) forecast

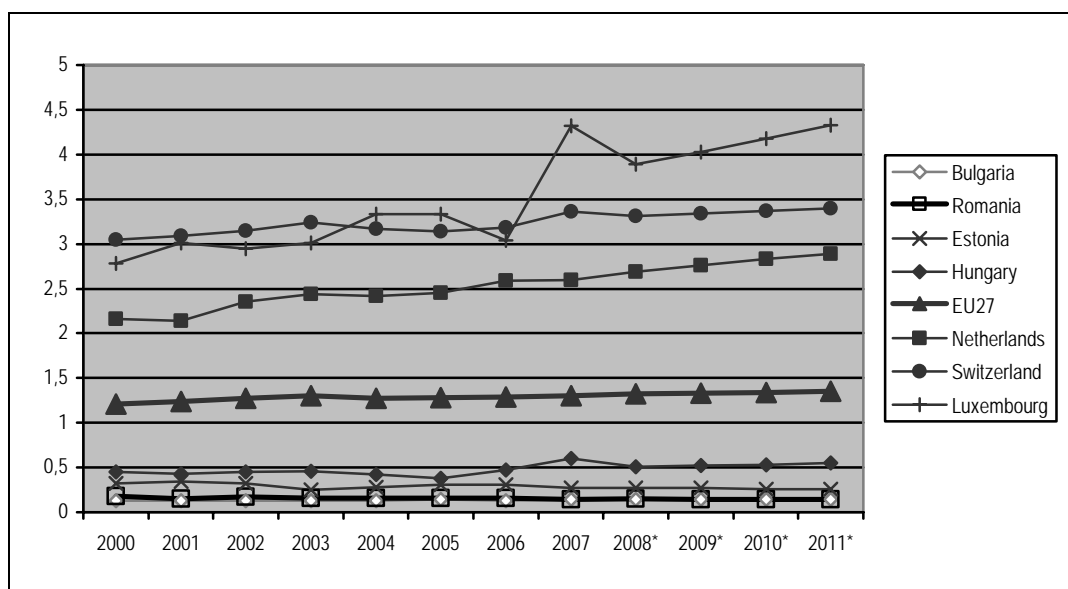
**Figure no. 8. Evolution of “Electricity consumption of households”, in the European Union in the period 2000-2011.**

Lowest levels recorded for Malta (annual average in the 12 years, 53), Luxembourg (average 72) and Cyprus (average 126) and the highest are those of France (average 12,785), Germany (average 11,958) and United Kingdom (average 10,397). EU27 level (average 68.697) is high compared to the other has not been presented. Regionally, Romania (average 814) is placed between neighbouring Bulgaria (average 821) and Hungary (average 951).

#### D. Conservation of natural resources

On the conservation and management of natural resources, the overall objective of the EU is to improve natural resource management and avoiding overexploitation, recognizing the value of ecosystem services. Romania objective of Horizon 2013, reducing the gap with other EU Member States on environmental infrastructure, the development of efficient public services in the area.<sup>7</sup>

**Resource productivity (EUR / kg)** reflects relative to GDP the consumption of materials (CM). CM measures the total amount of materials used directly by an economy. This is defined as the annual amount of raw materials extracted from the national territory of the economy, plus imports and minus any exports. In Figure no. 9 is the evolution of “resource productivity (EUR / kg)”, the European Union during 2000 to 2011.



Source: Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdpc100>, din 11.10.2011, for the period 2000-2008, the authors estimate for 2009-2011

\*) forecast

**Figure no. 9. Evolution of resource productivity (Eur/kg), in the European Union in the period 2000-2011.**

Lowest levels recorded for Bulgaria (annual average in the 12 years of 0.13 Euros / kg), Romania (average of 0.15 Euros / kg) and Estonia (average 0.29 Euros / kg) and are highest in Luxembourg (average 3.52 Euros / kg), Switzerland (average 3.23 Euros / kg) and the Netherlands (average 2.53 Euros / kg). EU27 was 1.29 Euros / kg, while at

<sup>7</sup> Idem.

regional level, Romania is placed between Bulgaria and Hungary (average 0.48 Euros / kg). The very low resources productivity of our country registered (only Bulgaria is under us in this chapter) reflects an unfavourable situation for remediation measures are necessary strategic depth.

### 3. CONCLUSIONS

*Climate change and clean energy.* The light emission of greenhouse gases in the European Union in the period 2000-2011, Romania is placed above the neighbours (Bulgaria and Hungary) and away from the three countries leading the ranking (Germany, United Kingdom and Italy). The situation is, in principle, favourable, although it should be taken into account the size of the economy that produce these emissions. Share of renewable energy in gross final energy consumption in the European Union, from 2006-2011, shows an acceptable placement of Romania, at EU27 level and regional level. But noteworthy aspect here is that, depending on the difference between the target and the estimated level of the indicator in the last year of the study period, Romania is the first place.

*Sustainable transport.* The volume of freight transport relative to GDP in the European Union, from 2000-2011, places Romania in the lead, with 136.1%, far even overall EU27 average (102.1%). Although there are many factors to take into account in this analysis, we consider the position of Romania as being positive. The volume of passenger transport relative to GDP in the European Union, from 2000-2011, placing Romania (85.8%) between neighbours Hungary and Bulgaria, about 10% below the average of EU27 (95.0%). Depending on the energy consumption of transport relative to GDP in the European Union in the period 2000-2011, we find our country between neighbouring Bulgaria and Hungary, and this trend, and below the EU27 average annual - although the average last 12 years, we are above the EU27.

*Production and consumption.* Evolution of GDP growth rate in the European Union, from 2000-2011, shows how Romania is placed between neighbours Hungary and Bulgaria. If we refer to the EU27, we have a reason for joy, because our country recorded annual economic growth above the average EU27. If in 2000-2008, Romania was among the leading states that the level of growth in the coming years is unfortunately placed between the States late. This trend is not comfortable, especially in the light of the significant gaps that need to recover from the European average. According to GDP per capita at purchasing power standard in Romania compared to EU27, in the period 2000-2011, Romania is placed between neighbours Bulgaria and Hungary, but far from the EU27 average (only 38.02%). This indicator reflects a huge gap between our country and the rest of the EU27 states to reduce the gap which required significant efforts in the coming years.

*Consumption.* Electricity consumption of households in the European Union, from 2000-2011, placing Romania below neighbouring Bulgaria and Hungary, and a huge distance from the leading member ranking: France, Germany and United Kingdom. The causes are multiple, some objectives (unconnected of households covered by the network, low living standard, etc.) and other subjective (tendency to waste energy in the civilized world).

*Conservation and management of natural resources.* Depending on the productivity of resources (Euro / kg), in European Union in the period 2000-2011, Romania is placed between Bulgaria and Hungary, but far from the EU27. Remedy the adverse situations require significant efforts and measures depth of strategy.

Currently, no one questions the need for acceptance and adoption of sustainable economic development doctrine, because the only way responsible for the design of medium and long term development, consistent with national interest and international cooperation requirements. So, follow the objectives of sustainable development strategy and reporting underway to the European standards are the natural consequences of the evolution of human society.

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