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EVALUATING ENVIRONMENTAL SUSTAINABILITY IN THE EUROPEAN UNION

L. DUGULEANĂ[1] C. DUGULEANĂ[2]

Abstract: *The paper refers to the environmental dimension of sustainable development in the European Union, emphasized by the Europe 2020 Strategy, presenting the dynamics of greenhouse gas emissions between 1990-2011 in the European Union and in Romania, and also the forecasting until 2015. The modern analysis of decoupling between two indicators: GDP and the greenhouse gas emissions was used for showing the way of these relative changes during 2005-2011 in the EU countries.*

Key words: *environmental sustainability, annual average dynamic rate, GDP, greenhouse gas emissions, decoupling analysis.*

1. Introduction

Sustainable development, established in the Europe 2020 Strategy, has economic, social, cultural and environmental dimensions.

The environmental dimensions are characterized by the indicators: greenhouse gas emissions, share of renewable energy sources in final energy consumption and energy efficiency.

The headlines indicators for environmental and climate changes established by the Europe 2020 Strategy are: greenhouse gas emissions should be reduced by 20% compared to 1990, the share of renewable energy sources in final energy consumption should be increased to 20% and energy efficiency should improve by 20%. The paper establishes the extent to which these targets could be attained considering the evolution of these indicators until the most recent year for which there are recorded data, i.e. 2011.

The relative positions of the EU countries with reference to the environmental dimensions which define their processes of sustainable development will be based on the data from EUROSTAT.

2. Greenhouse Gas Emissions -Dynamics in the European Union between 1990 and 2011

The United Nations Framework Convention on Climate Change is an international treaty about global warming which was agreed in 1992 at the Earth Summit in Rio de Janeiro.

This treaty was followed in 1997 by the Kyoto Protocol, which established the legal problems for reducing the greenhouse gas emissions**,** which conduct to global warming and climate changes. The Kyoto Protocol contains a basket of six greenhouse gases with effects on climate change. Based on the Global Warming Potential (GWP) of carbon dioxide as a base unit, the measures for Global Warming Potential (GWP) for other gases were established as relative warming effects. The greenhouse gas emissions are expressed in

[1] Dept. of Management and Economic Informatics, *Transilvania* University of Braşov.
[2] Dept. of Finances, Accounting and Economics, *Transilvania* University of Braşov.

units of CO_2 equivalents and this does not include emissions of land use, land-use change and forestry, the emissions from international aviation and international maritime transport.

In 2002, the Marrakech Accords established the general directives for the real implementation of the reduction in greenhouse gas emissions.

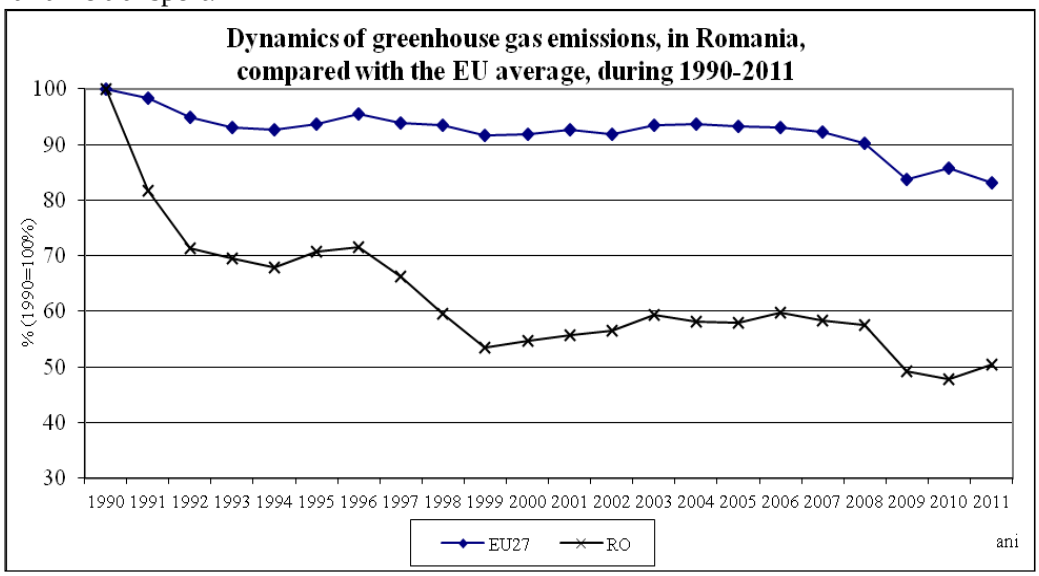

Fig. 1. *The dynamics of greenhouse gas emissions in Romania and European Union, during 1990-2011*

The Europe 2020 Strategy establishes that the greenhouse gas emissions [13] should be reduced by 20% as compared to 1990.

Figure 1 presents the evolution of dynamic indices of greenhouse gas emissions with fixed base in 1990.

The decreasing tendency in Romania followed the GDP decreasing tendency after the Revolution, as a consequence of the significant economic reforms from a command to a market economy.

Since 1992, Romania has complied with the European target, but only because it is a developing country.

To achieve this target of 20% reduction as compared to 1990, each Member State agreed and updated their specific limits of greenhouse gas emission for 2020 compared to 2005 [8].

Figure 2 contains a cutting up from Figure 1, for the period 2005-2011, of the same evolution, which can be better seen in this way.

The economic crisis started at the end of the year 2008, as clearly shown in the chart from Figure 2, and the greenhouse gas emissions decreased in 2009, both for the European Union and Romania.

But in 2010, at European level, the decreasing process was stopped; in 2010 there was a slow increase and in 2011, the figure returned to the level from 2009, but in Romania the slow recovery from 2009-2010 took place in 2011.

The forecasting for the following three years, 2012-2015, can take into account two sub-periods: either 2005-2008, when the evolution of gas emissions was quite constant, or 2005-2011, the recent period which considers the new starting level after the economic crisis began.

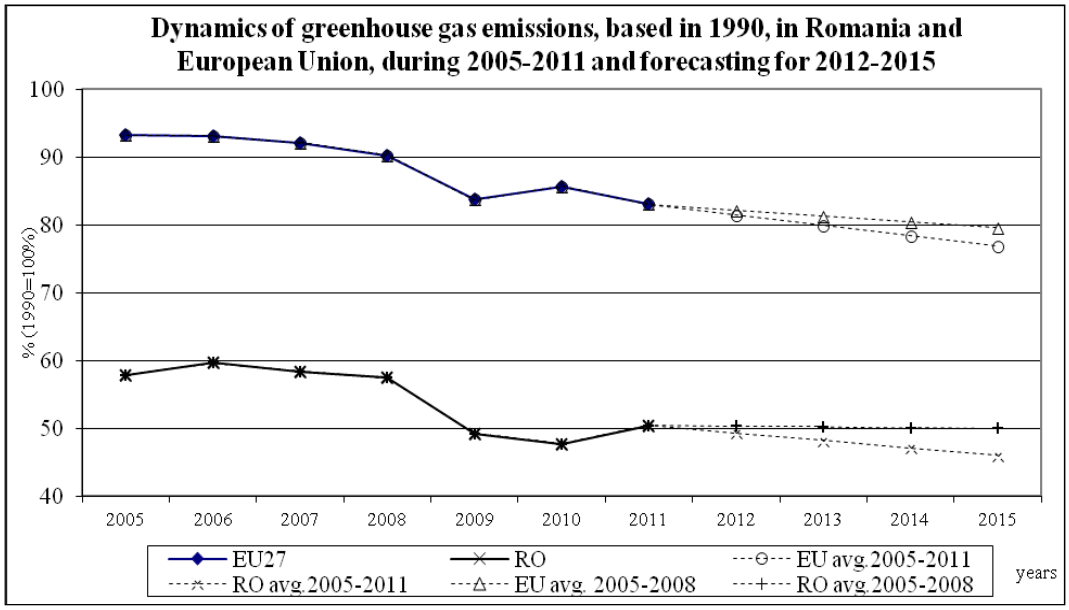

Fig. 2. *Scenarios of the dynamics of greenhouse gas emissions, in Romania and the European Union, during 2012-2015*

Considering the first sub-period 2005-2008, it seems to be correct from the statistical point of view, because it is significant for the annual average dynamic index to be calculated.

The calculated value of this indicator applied to the forecasting of greenhouse gas emissions gives higher figures for future values, than when considering the same indicator calculated for the sub-period 2005-2011.

The lower forecasting for the EU level and for Romania is based on the annual average dynamic index calculated for 2005-2011, when the decrease in 2009 was also considered.

As the chart from Figure 2 shows, the good thing is that the level of greenhouse gas emissions in the EU will attain the target of 80% in 2015 as compared to 1990, before the established final year 2020.

3. Decoupling Analysis in Environment Economy

The concept of decoupling [1, p. 15] was used by EUROSTAT in the 2011 Monitoring Report of the EU Sustainable Development Strategy, which evaluates the progress of the EU member countries.

Decoupling refers to breaking the link between two variables characterizing two different spheres. Considering the economic activity and the environment, usually one variable is the leading force of development, expressed as GDP, and the other consists of the environmental pressures and restrictions such as: waste producing, pollutants of water, air or using the natural resources, like raw materials, energy or lands.

The decoupling of the two variables appears when the growing rate of GDP is greater than the rate of the pressure over the environment, during a certain period.

The decoupling is considered to be *absolute* when it implies the stability or the decreasing of the significance pressure over the environment, while the economic force is increasing. The absolute decoupling is clearly a favourable situation.

The decoupling is considered to be *relative* when the changing rate of the environmental variable is positive, but lower than the changing rate of the economic variable.

In monitoring the Europe 2020 Strategy, there are two environmental indicators projected to be the subjects of decoupling analysis: resource productivity and energy consumption of transport relative to GDP.

The resource productivity monitors the quantity of gross added value (GDP) generated by an economy during a certain period by using one unit of material (National consumption of raw materials); it is the ratio between the two macroeconomic aggregates.

The energy consumption of transport relative to GDP compares the consumption of transport energy with the GDP growth.

4. Decoupling Analysis for the Greenhouse Gas Emissions and GDP in EU, during 2005-2011

Using the decoupling analysis for another environmental variable, such as the greenhouse gas emissions, also proves to be a good idea in evaluating EU member countries efforts to reduce the contaminants' level and for maintaining a clean environment.

Both for the EU GDP and for the greenhouse gas emissions annual average dynamic rates are calculated (%) between 2005 and the most recent years for which data are recorded, i.e. 2011.

A change of these two indicators is significant, clearly favourable or clearly unfavourable, if this change is greater than positive the value of 1%.

If the annual rate of EU GDP is greater than 1%, it is clearly favourable. If the annual rate of greenhouse gas emissions is lower than 1%, it is also clearly favourable, but it should be clearly unfavourable if its rate should be greater than 1%.

A variation between 0% and 1% involves that no significant change occurred. This kind of situation is appreciated to be moderately favourable or unfavourable, depending on the change direction.

In the EUROSTAT Reports, some weather icons are used to better appreciate the kind of changing:

- clear favourable situation 
- unfavourable change or moderately favourable 
- moderately unfavourable change 
- clearly unfavourable change 
- not sufficient data ": ".

The indicators used are evaluated depending on the extent to which decoupling appears. These icons are used for all the EU headline indicators of the sustainable development strategy.

In Figure 3, the decoupling analysis is applied for the greenhouse gas emissions and the EU GDP level, between 2005 and 2011. The two axes which mark the negative and positive dynamic rates separate four frames.

The absolute decoupling is the situation when the environment pressure decreases**,** while the economy increases – meaning that there is a clearly favourable situation.

The countries from the fourth frame are in this clearly favourable situation. Slovakia is in the best position with an annual growth rate of GDP higher than 4% and a decrease in greenhouse gas emissions of about 2%.

Then Romania and Czech Republic have close values equal to 2.53% for GDP annual dynamic rates, but Romania is in a better position because the greenhouse gas emissions decreased in average every year during the analyzed period, to a higher extent, 2.26%, than in the Czech Republic, 1.38%.

Both countries had good positive relative values of GDP annual growths.

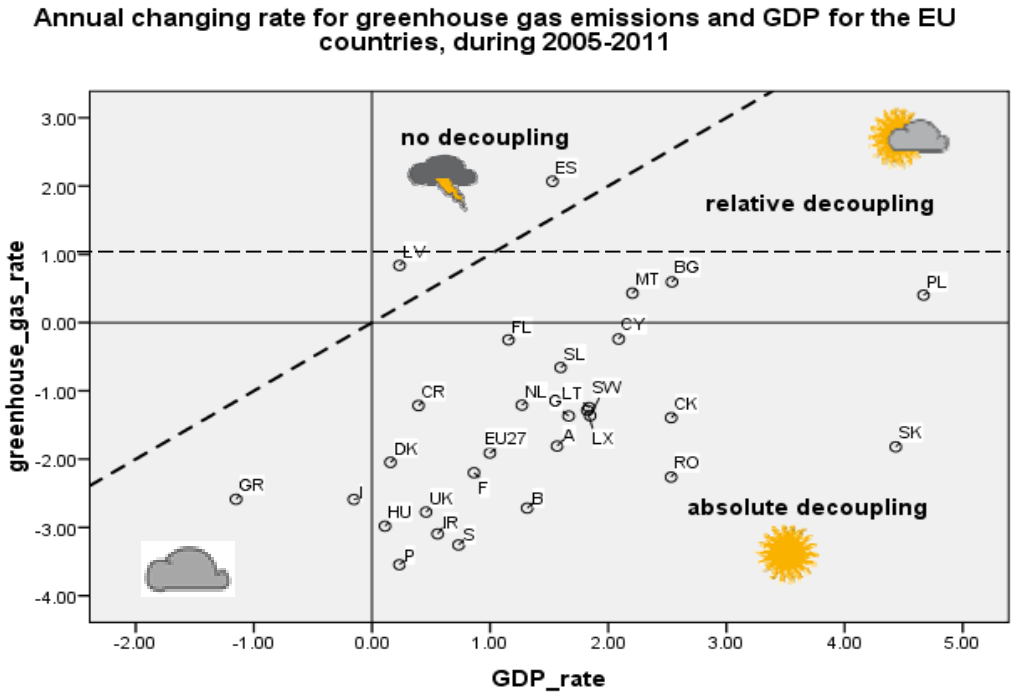

Fig. 3. *Decoupling analysis for greenhouse gas emissions and GDP in the European Union, between 2005 and 2011*

The dotted line in the first frame shows a potential trajectory of the evolution of the link between the two indicators: if the GDP increased by 1%, the greenhouse gas emissions would also increase by 1%. The meaning of the dotted line in the third frame represents the reduction by 1% of the greenhouse gas emissions when the GDP decreases by 1%.

All the countries situated under this limit, but in the first frame, have positive values of average dynamic rates and greater than those of average dynamic rates of greenhouse gas emissions in those countries.

During 2005 - 2011, Poland had the highest value of the annual growth rate of GDP, greater than 4%, followed by Bulgaria and Malta with less than 3%. For these three countries the average dynamic rates of greenhouse gas emissions were lower than 1%, but with positive values.

The countries from this part of the first frame can be considered in a relative decoupling and in a moderately favourable situation.

The two countries placed over the dotted line, in the first frame, are in a no decoupling case, meaning that the average dynamic rates of greenhouse gas emissions were higher than the annual growing rates of GDP.

Estonia and Latvia are both in this critic situation of clearly unfavourable change.

Greece and Italy are placed in the third frame, with negative values for the GDP relative change, but the greenhouse gas emissions decrease to a greater extent, indicating a moderately unfavourable change.

Greece had the worst position, recording a decrease with more than 1% on the average each year during the analyzed period.

Even if the greenhouse gas emissions decreased yearly with more than 2% on the average, there is a relative decoupling with an unfavourable tendency.

5. Conclusion

The evolution of the dynamic indices for the greenhouse gas emissions in Romania showed that during the entire period between 1990 and 2011, the relative decrease was greater than 20% with a fixed base in 1990.

Making the forecast in different ways, the objective of Europe 2020 Strategy should be attained even before the final year 2020.

The decoupling analysis unfolds the image of positions for all the countries of the European Union, in their efforts for economic growth in the conditions of reducing the greenhouse gas emissions.

A comparison of the countries can be drawn considering that moment and the average of EU27 regarding the economic growth and environmental politics for reducing the greenhouse gas emissions.

The average dynamic rate of EU GDP is about 1% while the greenhouse gas emissions decreased each year by approximately 2% on the average.

The average growth rates of GDP of almost all the countries were positive during 2005-2011, even considering the economic crisis starting in 2009.

With the exception of Italy which had a growth rate close to 0%, Greece appears to be the single country with a negative evolution of GDP.

Latvia and especially Estonia have problems caused by the greenhouse gas emissions. These two countries have to seriously consider some measures for implementing the environmental politics in order to achieve the forecasting purposes of Europe 2020 Strategy.

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