

SUSTAINABLE ECONOMIC GROWTH AND ECO-EFFICIENCY

Associate Professor PhD **Mariana LUPAN**
'Stefan cel Mare' University of Suceava, Romania
marianal@seap.usv.ro

Lecturer PhD **Angela Nicoleta COZORICI**
'Stefan cel Mare' University of Suceava, Romania
angelac@seap.usv.ro

Abstract:

The current economic and social contexts have brought forth the issues regarding growth and sustainability. The concept of growth has always been linked to an increase in consumption levels, and this inevitably led to pressures on the environment and on the resources that support human activity. Given these circumstances, the question whether we can avoid an environmental disaster while maintaining economic growth, has become more stringent.

We chose to approach this aspect by examining the concept of eco-efficiency, a concept that embodies aspects of both economic efficiency and environmental efficiency. Eco-efficiency can be regarded as the effectiveness with which resources are used in order to create products and services that satisfy human needs. Based on this idea, the last decade has produced an increasing number of studies on eco-efficiency and how it can be measured and implemented in the production of goods and services, but also in the field regarding demand patterns.

An analysis regarding the aspects of eco-efficiency at the macro level of the Romanian economy is in line with the current environmental concerns, thus I have chosen to cover these questions, as well as the evolution of the locale economy towards a more sustainable development. The outcome of the examined aspects shows that, in spite of an increase in eco-efficiency levels, energy and material consumption and emissions have increased. This raises the question if measuring economic and environmental efficiency by reporting to the GDP value is becoming obsolete and if there is a need to reevaluate eco-efficiency indicators in order to measure the transition to a greener and more sustainable development from different points of view.

Key words: sustainability, eco-efficiency, economic growth, environmental efficiency, sustainable development

JEL classification: O13, F43, F55

1. INTRODUCTION

From the historical point of view, the concept of economic growth has always been closely linked to the growth of the consumption levels, and this fact has led to unprecedented pressure for on the environment and on the resources that are available to the modern world. During the post-war period, when there were numerous approaches to the concept of the economic growth (economic progress, technical and scientific revolution, organization and management of the labour factor), the natural resources were seen as free goods (with zero costs and in unlimited quantities). Thus, acting in the spirit of the theories and models of economic growth in that period, the world countries, especially the economically powerful countries, have created the conditions for entering into the crisis of this model of economic growth. In these circumstances, since the 1970s, there has arisen the question whether the measurement of the economic growth, strictly in terms of GDP, should be replaced by a "balanced" economy, operating within the limits of growth, naturally imposed by the environment.

However, "growth arrest" did not win the political support, and in the 80s there has appeared the concept of exploring the idea of decoupling the economic growth from the negative consequences on the environment and to combine the long term environmental sustainability with the need for economic growth.

Given this paradigm, for maintaining the world economic growth same time avoiding the production of an ecological disaster is appropriate to amend the current concepts and values, to change the structures, to relocate the economy and life, a profound modification of the current mode

of goods consumption is necessary, in an attempt to build a sustainable society. One of the concepts that incorporate these factors is the eco-efficiency concept which has its roots in the concept of sustainable development, its primary objective being the sustainable use of the natural resources.

The global natural capital is limited and exhaustible, and the use of resources in a more effective way that does not endanger the environment and the welfare of the next generations is proving to be an imperative requirement under the conditions of the current global crisis which threatens not only the economy and the financial world, but also calls in question the future of all systems which form the modern world.

There is therefore a question mark on the efficiency with which the resources are used, on the profitability and sustainability of production, and the concept of eco-efficiency is the increasingly seen as an answer to this problem.

2. ASPECTS REGARDING THE SUSTAINABLE DEVELOPMENT AND THE ECONOMIC EFFICIENCY

The concept of sustainability was launched by the report "Our Common Future" of the Brundtland commission and defines the sustainable development as being "that sort of development that tries to meet the needs and aspirations of the present without compromising the ability to satisfy those from the future" (The Brundtland Commission, 1987). The sustainable development can be seen as a process of improving the opportunities that allow the man, as an individual, but also the communities, to ensure the coverage of needs, aspirations and the full potential for a prolonged period of time, while maintaining the sustainability of the environmental systems.

The eco-efficient development encompass all the human activities as an integral part of nature, the term referring to two essential and intensely debated aspects in the current economic and social context: development and sustainability. In terms of sustainability, this not only solves the current difficulties of the economy, but also immunizes it. The sustainable development requires a continuous adaptation of society and economy, in order to allow a better management of the present and future crisis, being perceived as an opportunity, a solution for us to no longer face such problems in the future.

The concept of eco-efficiency aims to maintain a balance in business, being "located" between the term of ecology and profitable operations. Simply, it is about doing more with less and being environmentally responsible, aspect that allows the environment exploitation without affecting its regenerative capacity.

The first author who discussed and analysed the fundamental paradigm of the development in the light of eco-efficiency is Nicolae Georgescu-Roegen. In his paper „The Entropy Law and Economic Process”, the author highlights the fact that during the economic processes the material degradation occurs, and this cannot be used in future economic activities. From this perspective, the author says, the world economy must respect the overall environmental limits regarding the load capacity of the ecosystems, the setting of the biological and geodynamic cycles, the balance of the climate system, limits that are being considered by Roegen as already achieved. (Roegen, 1971)

In terms of defining the concept, the eco-efficiency has received a number of definitions, among which the most notable is the one given by WBCSD (World Business Council for Sustainable Development) which states that the eco-efficient development is achieved through the production of goods and services at competitive prices that satisfy the human needs and bring quality to life, but at the same time, these reduce the environmental impact up to a level at least equal to the capacity of resource sustainability given by the planet Earth. (WBCSD, 2000).

According to the OECD, the eco-efficiency expresses the efficiency with which the ecological resources are being used in order to meet the human needs, such inclusion may be expressed as the ratio between output and input, the output representing the value of goods and services produced by a company, a sector, or by the economy as a whole, and the input representing the sum of the environmental pressures on the environment that the company, the sector or the economy generates in order to produce those goods and services.

The European Environment Agency addresses the eco-efficiency as a strategy aimed at decoupling resource use and pollutant release from economic activity, in order to achieve "more welfare with less use of nature" (EEA, 1999). The Eco-efficiency therefore requires changes in production and consumption patterns that lead to the sustainable use of resources and natural capital.

The complexity of the concept, but also the possibility of approaching it from several points of view has led to eco-efficiency transformation from a pure theoretical notion into a management philosophy and an "instrument" that is available to companies and states in order to reduce their ecological footprint and to become more responsible towards the environment and society.

3. KEY ELEMENTS OF ECO-EFFICIENCY

Reason of the need to protect the environment, but also to increase the economic performance, the eco-efficiency is a management concept of the production factors that is based on the economic use of technology in order to reduce the resource consumption and the impact on ecosystems, of the man-made products and services.

The Eco-efficiency calls for companies and states to assume the responsibility that they have towards the environment and society and to rethink the economic activity through innovation and competitiveness. In order to highlight the eco-efficient businesses and companies, WBCSD has identified a series of elements that demonstrates this quality (WBCSD, 2000):

- ✓ Reducing material intensity use;
- ✓ Reducing energy intensity use;
- ✓ Reducing dispersion of toxic substances;
- ✓ Enhancing recyclability;
- ✓ Maximizing the use of renewables;
- ✓ Extending product and service durability;
- ✓ Increasing service intensity and quality.

The seven elements identified by the WBCSD, can be further grouped into three categories of objectives relating to eco-efficiency, namely (WBCSD, 2000):

- ✓ Reducing the consumption of resource;
- ✓ Reducing the impact on nature;
- ✓ Increasing product or service value.

By reducing the resource consumption in the production of goods and services, there is intended to minimize the energy use, the raw materials, the water and the land resources as well as the increase of the recycling capacity and of the products and services sustainability. Reducing the environmental impact results in the reduction of the pollutants in air and water emissions, the reduction of waste dispersion and of toxic substances, but also it will favour the sustainable use of renewable resources. In this way it can be supported an efficient economic growth with the possibility of reducing the bills on the use of energy, water and raw material, which represents a sustainable development strategy at both micro and macro levels.

There is also a fourth goal in addressing business in terms of eco-efficiency, namely implementing an Environmental Management System integrated in the company's general management system which can ensure that sustainability-related risks and opportunities are identified and managed accordingly.

4. SHORTCOMINGS OF ECO-EFFICIENCY CONCEPT

One of the main problems that arises when questioning the concept of eco-efficiency is the one which emphasizes that fact that in addition to an overall strategy of increasing the eco-efficiency and encouraging sustainable development, a sufficiency strategy is also necessary (Stanciu, 2006). This strategy would require not only setting some limits for various types of pollution or stimulating more effective the consumption and production patterns, but should limit

the amount of the consumed natural resources. Thus, the term of eco-efficiency is not comprehensive enough in order to determine the unsustainable consumption trends and how one could intervene in order to reduce these trends, and the assessment of eco-efficiency by simply measuring the improvement of value per impact can lead to an increase in the impact of the activity against the environment.

It is necessary to deepen the concept and to define some indicators that show the total level of the resource consumption as well as the intensity of key resource use, such as energy, water, raw materials and the earth, in sectors of the economy that are experiencing the greatest demand (food production, consumption of goods and services, transportation, house building).

An obstacle to the sustainable development is represented by the costs. Every organization aim to a sustainable development, but growth requires investment. Global market demand for products, services and more "green" processes is constantly expanding. However, many green solutions are costly in financial terms, compared to the conventional alternatives, particularly in terms of expected future capital costs, and most investments, even those that clearly reduce the long term costs such as the energy efficiency, require a previous additional investment (Zenghelis, 2012).

5. THE EVOLUTION OF THE ECO-EFFICIENCY IN THE ROMANIAN ECONOMY

At governmental level, the sustainable development can be seen as the ability of a macroeconomic system to achieve a balance between the economic, social and environmental dimensions, in the development process, optimizing the economic and social profits without prejudicing the corresponding potential of the benefits for the future generations (Pop, 2007).

Although originally the concept of the eco-efficiency was introduced in order to measure the efficiency with which the companies are using the resources, at the present time, it is used to assess the evolution at the macroeconomic level and the impact that an economy has on the progress in the environmental issues. Measuring the eco-efficiency at macroeconomic level relies mostly on using as an economic indicator the GDP correlated with the pressures on the environment; here it is most of the time about the levels of the utilisation of energy, water and materials, the levels of emissions of greenhouse gases and waste generation rates.

For a coherent analysis regarding the level and the evolution of the Romanian economy eco-efficiency, we consider that it is necessary to analyse the energy efficiency issues that Romania is facing. In order to highlight the natural and energy resources there are followed two main goals: reducing consumption and using as effectively as possible the natural resources with the help of the economic processing technology (reducing waste and pollution) and using the alternative energy sources. Thus, from the analysis of the available data we can say that the energy intensity of the Romanian economy together with the emissions of greenhouse gases have constantly decreased in the recent years and energy imports decreased to 18.6% of the total energy consumption, Romania being on the 3rd place at EU level regarding the energy independency (EuroStat, 2014). One advantage for the environment is that the renewable energy has come to replace about 20% of the primary energy production (Figure no. 2), thus reducing the consumption of the non-renewable resources.

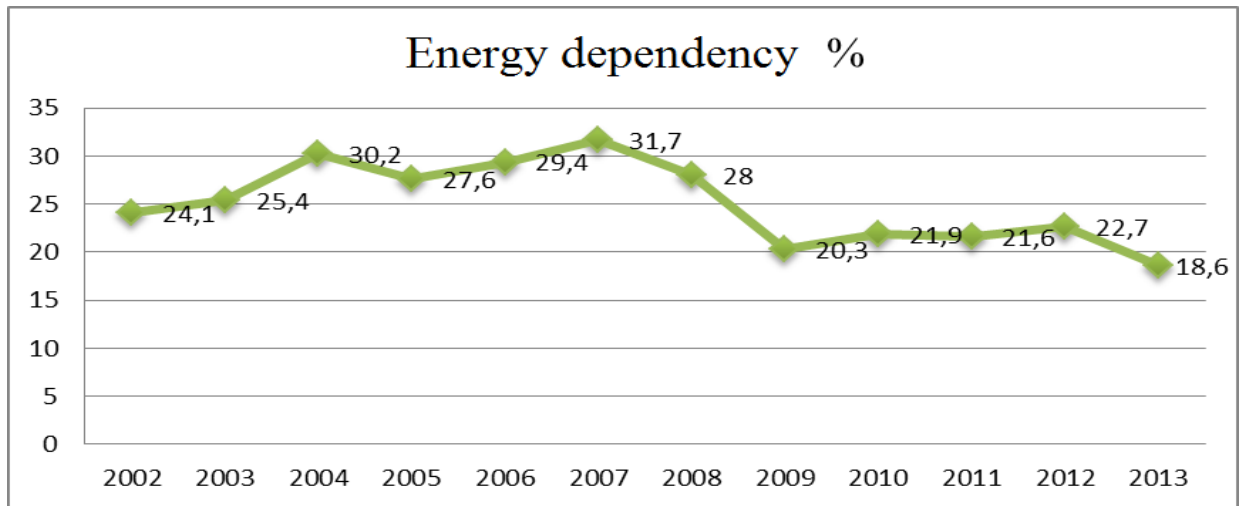


Figure no 1. Energy dependency
Source: EuroStat, Sustainable Development Indicators, 2014

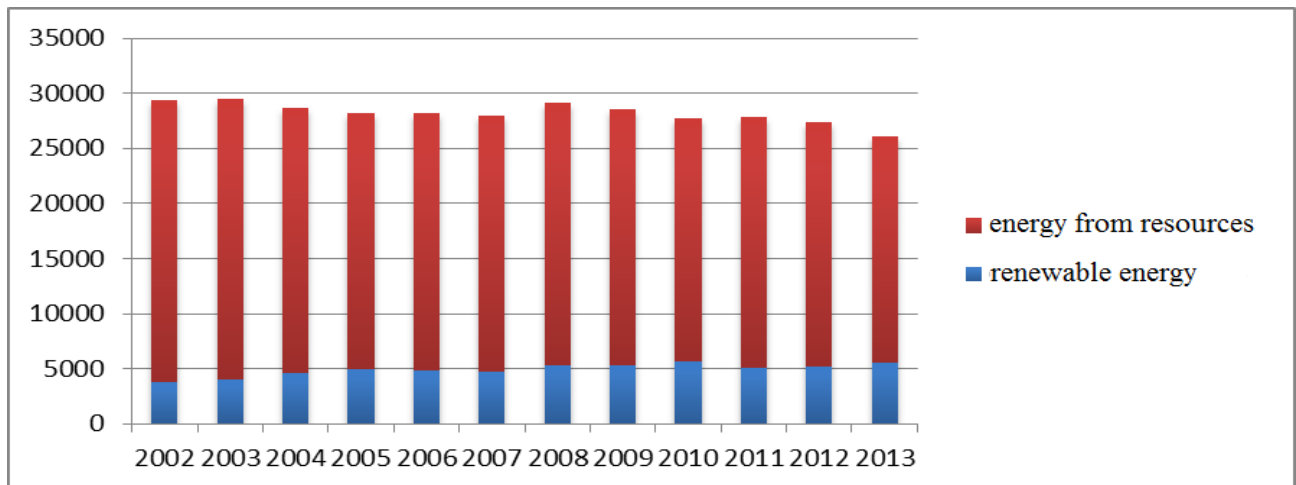


Figure no. 2. Primary energy production
Source: EuroStat, Sustainable Development Indicators, 2014

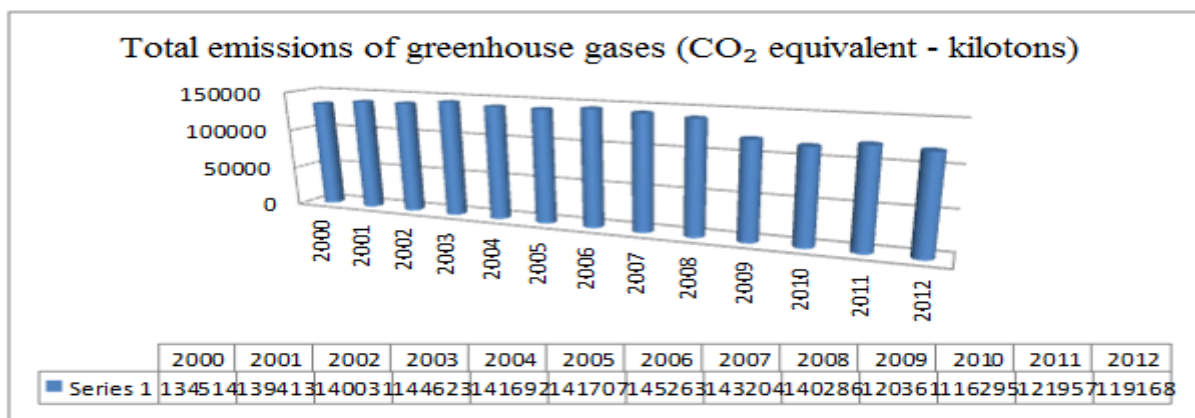


Figure no. 3. Total emissions of greenhouse gases (CO₂ equivalent - kilotons)
Source: EuroStat, Sustainable Development Indicators

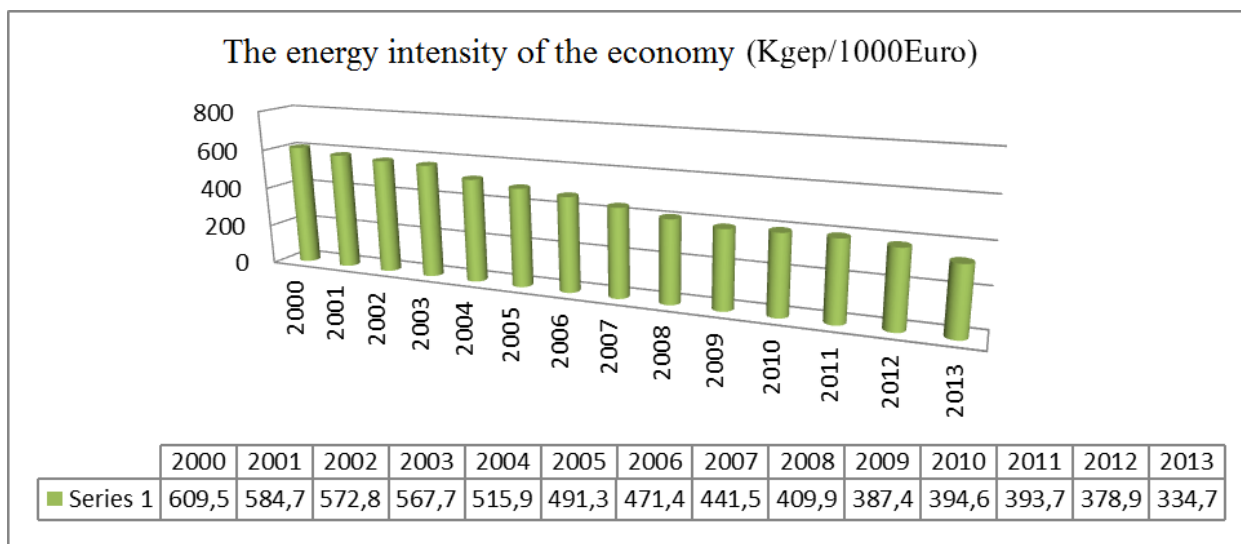


Figure no. 4. The energy intensity of the Romanian economy

Source: Sustainable Development Indicators, 2014

Furthermore, according to the EuroStat statistics, Romania's economy is ranked on the second place at European level in terms of energy intensity of the economy (Bulgaria being on the 1st place) and is far from reaching the European average of the economic energy intensity (Table no. 1)

Table no. 1. The energy intensity of the Romanian economy

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU 28	166,9	164,9	159,3	152,0	151,0	149,0	151,7	143,9	143,4	141,6
Bulgaria	866,2	849,4	823,5	759,9	711,7	661,4	668,8	705,5	669,9	610,6
Romania	515,9	491,3	471,4	441,5	409,9	387,4	394,6	393,7	378,9	334,7

Source: EuroStat, 2014

In order to identify issues regarding the environment and the energy consumption, but also in order to find solutions to deal with these issues at European level, there has been developed the package "Energy - Climate Change" as part the Europe 2020 strategy This sets a number of targets for 2020, also known as the "20-20-20 Objectives", covering the aspects of pollutant emissions and renewable energy, whilst establishing the following targets (Europe 2020):

- ✓ Reducing greenhouse gas (GHG) emissions by at least 20 % compared to base year 1990;
- ✓ increasing to 20% the share of the renewable energy sources in the overall EU energy consumption as well as reaching a target of 10% biofuels in the transport energy consumption;
- ✓ reducing at 20% the energy consumption by increasing the energy efficiency.

The European Commission proposes that these EU goals to be transposed into national targets and trajectories in order to ensure that each Member State tailors this strategy to specific national situation. Thus, as obligation assumed in its capacity as EU member state, Romania has aligned with these requirements concerning the energy sector efficiency and the national targets of the Europe 2020 strategy as well as the current values of Romania, all these are summarized in the following table.

Table no. 2. National targets Europe 2020

Europe 2020 objectives – Energy and climate change	Romania 2020 target value	Current values
Reducing greenhouse gas (GHG) emissions by at least 20 % compared to base year 1990	20%	56,55%
Increasing the share of renewable energy to 20%	24%	23,3% (including biofuel consumption) 22,2% (ignoring biofuel consumption)
Increasing energy efficiency and decrease energy consumption by 20%	19%	17,3%

Source: http://ec.europa.eu/europe2020/pdf/nd/nrp2012_romania_en.pdf

6. APPLICATION OF ECO-EFFICIENCY INDICATORS AT THE MACRO LEVEL (COMPARISON ROMANIA/EU 28)

While in the private sector the eco-efficiency becomes a more useful tool of products and services valorisation, with a low environmental impact, adopting a system for measuring the effectiveness with which a state consumes the resources, it becomes essential in the current economic and environmental conditions.

Assuming the eco-efficiency in the economy as a whole can be achieved on many levels, and national governments can set targets of eco-efficiency at macro, micro or regional levels, targets which fit within the objectives of the sustainable development and which are reflected in the national sustainable development strategies.

In order to analyse the eco-efficiency of Romanian economy, but also the progress towards a sustainable development, we considered it is necessary to emphasize a number of indicators regarding the efficiency with which the national economy uses the resources. Thus the rate of material and energy consumption, the generation rate of emissions of greenhouse gases, and the waste generation rate can be observed in the following charts.

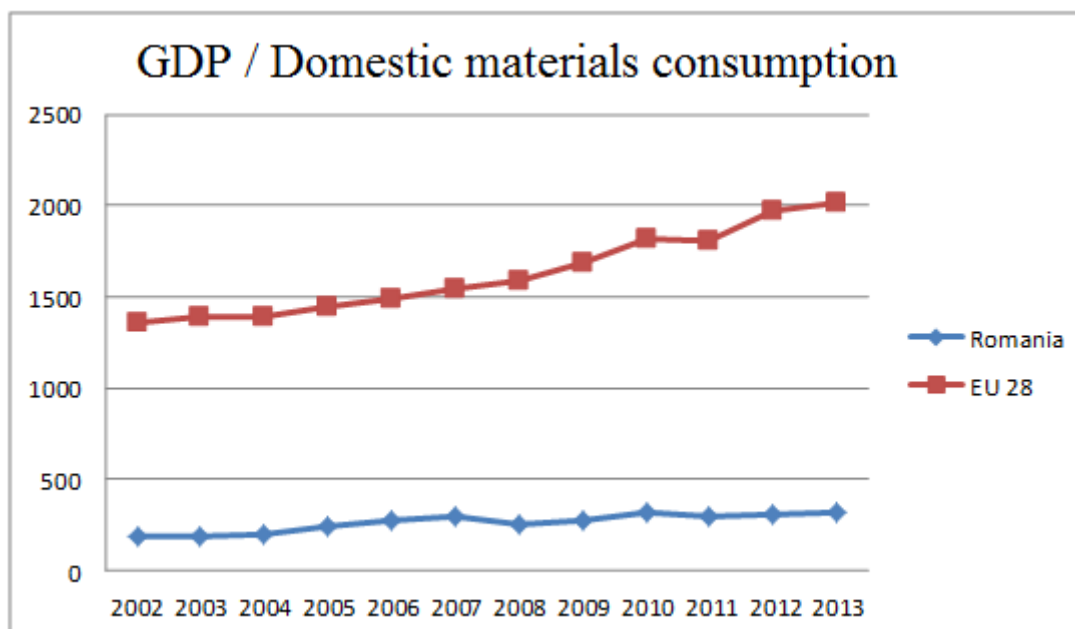


Figure no. 5. The rate of the materials use

Source: Calculations based on data available on EuroStat

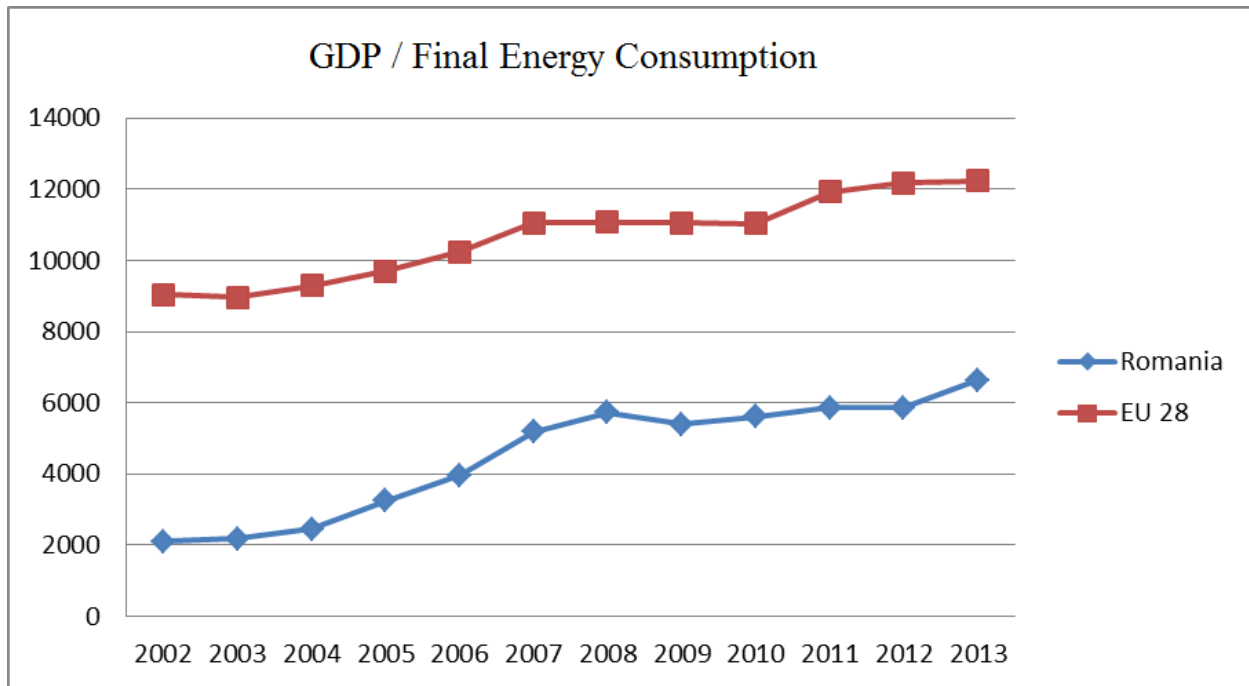


Figure no. 6. The rate of energy usage
 Source: Calculations based on data available on EuroStat

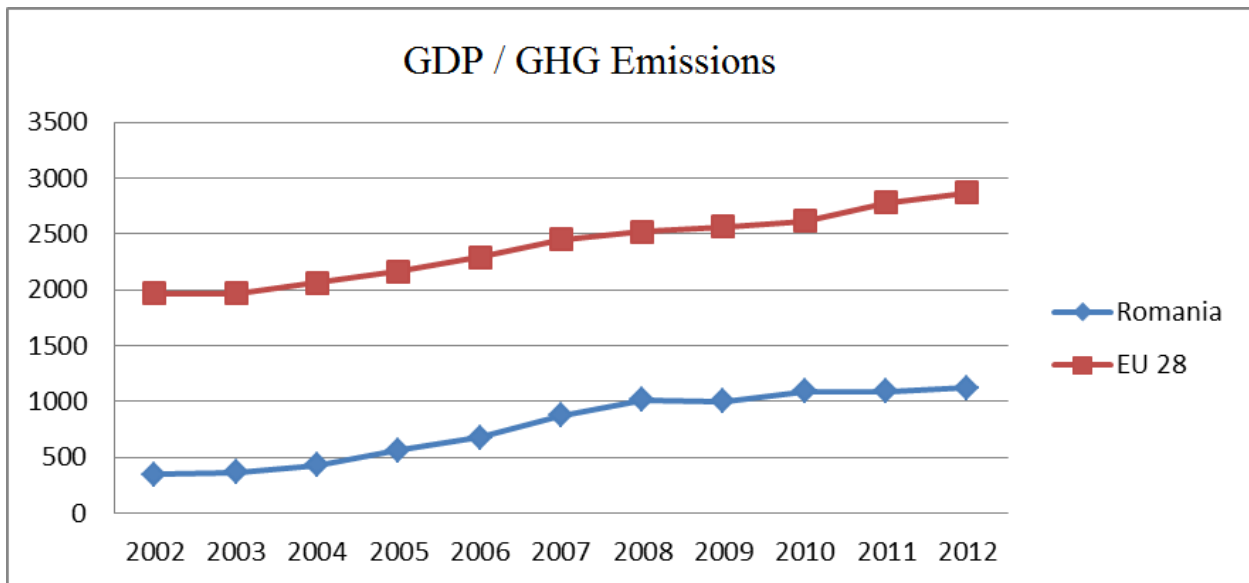


Figure no. 7. The generation rate of GHG emissions
 Source: Calculations based on data available on EuroStat

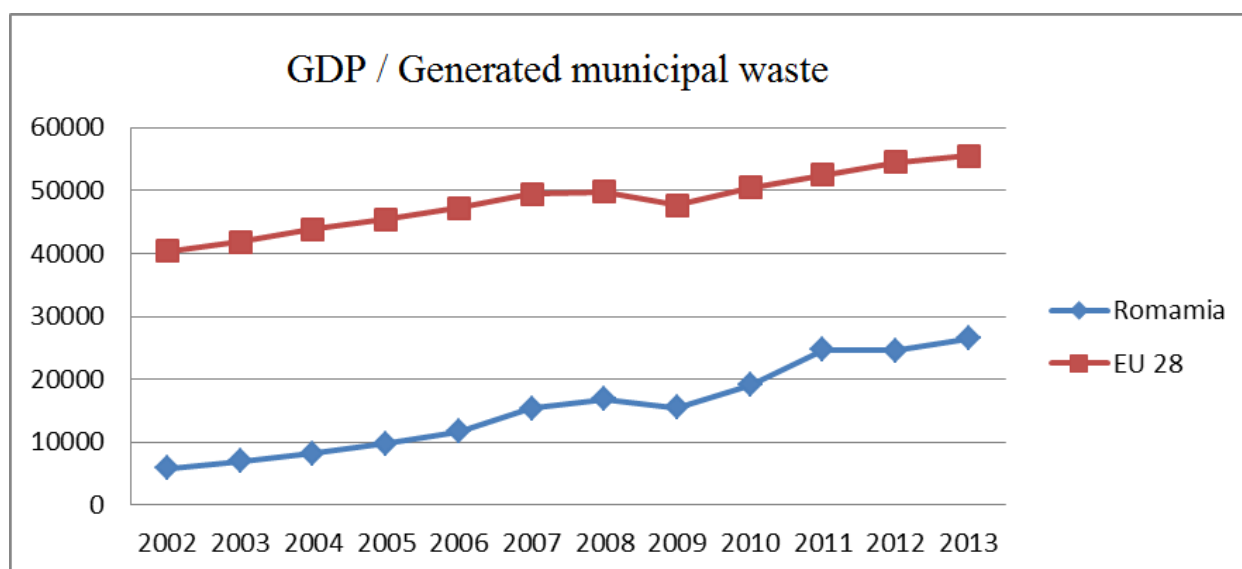


Figure no. 8. The generation rate of municipal waste

Source: Calculations based on data available on EuroStat

From the data presented it can be seen that the improvement of the resource consumption efficiency, at national level, is part of the trend registered in the European Union regarding the eco-efficiency growth. However, the lack of detailed information concerning these consumptions makes it difficult for an extensive analysis regarding other key aspects of economy efficiency, both in terms of domestic consumption (water use rate, land use rate) and in terms of identifying a broader overview and for a longer period time.

Another problem that results from the detailed analysis of macroeconomic eco-efficiency is that, despite the fact that on the whole it can be recorded an effective growth, this aspect may be due only to the growth of the GDP value, while the consumptions and the generation of harmful substances increase. Here comes the question whether the GDP has become an obsolete way of measuring the progress under the given conditions of a society that tends to satisfy the needs of humanity, in a most efficient way and with a price as low as possible on the environment.

7. OBSTACLES AT NATIONAL LEVEL REGARDING THE TRANSITION TOWARDS A SUSTAINABLE ECONOMY

From the economical point of view, the main constraints on national level concerning the transition to a sustainable development are the economy dependence on traditional fossil fuels, lack of funding and low participation of the banking system in supporting the energy efficiency programs. The weaknesses of Romania in the field of sustainable development were presented by the statistical data EuroStat (2014), including: the Romanian energy strategy for the period 2011-2035 which is not yet completed; transport networks of electricity, gas and oil are insufficiently modernized; alternative energy production is underdeveloped compared to the potential; increased emissions of greenhouse gases from transport by 18% (2012/2005); micro, nano and biotechnologies for health care and quality of life underdeveloped; in many cases, uncontrolled exploitation of the natural resources underground, land and water); insufficient financial resources necessary for specific investments. Another problem is the lack of the framework and vision in terms of creating "green" jobs, here is primarily needed a restore of a national network of vocational schools and university programs with agricultural and ecological profile, agriculture representing one of the most important areas at national level which can support the transition and then the adaptation to a system of sustainable economic growth.

Social and cultural the blockages on addressing environmental problems occur also from the perception and behaviour of the population towards these matters. Although at national level there is a concern for the environmental changes, data from Special Euro barometer 372 regarding the

climate, shows that Romanians consider that economic development and environmental conservation are incompatible and in the context given by the current economic crisis (high unemployment rates and low levels of income), the general perception is that environmental concerns must be sacrificed in order to create new jobs and to restore the economic growth (UE Report, 2011).

Waste management and recycling issues are also less popular among Romanian citizens, and according to EuroStat, from all European countries, Romania recycles only 1% of the entire volume of the produced waste, the rest being disposed of as garbage, placing at the opposite pole from Belgium, which recycles 94% of waste.

Therefore, lack of financial resources and expert personnel, lack of strategies and policies for their implementation, but also public disinterest represent the major obstacles faced by Romania in the transition to a cleaner economy.

8. CONCLUSION

The transition to a clean economy should be regarded as an economic revolution that requires a series of efforts both on the part of governments, companies and the population, so that we can enter on the path of sustainable development. The Governments will have to act in the spirit of promoting sustainable economic growth policies, the companies will have to generate innovation in the production processes, and the population must change the consumption habits towards more efficient models from economic, environmental and social points of view.

However, the global economic crisis and the financial difficulties that we are facing are likely to lead to the investment redirection from the environmental protection and from the promotion of clean technologies to the difficulties from the financial markets. Preventing long-term consequences of an inefficient and polluting economic growth is essential, and this can be achieved only through a coherent public policy that should include environmental and consumer issues, industrial policy and development, research and innovation issues.

By its nature, the concept of eco-efficiency aims the economic activity transition towards a higher degree of sustainability and the acceleration of this process can be achieved by improving production and consumption and creating economic and political instruments in order to facilitate the implementation and fulfilment of some eco-efficiency targets which may be established at company level, by the industry or even by the national economy.

However, the development should take into proper account the constraints of our environment, rich but fragile. Only through eco-efficiency and optimization of human capital and environmental resources we can offer to all and to future generations the hope for a better quality of life.

BIBLIOGRAPHY

1. Brundtland Commission, (1987) *Our Common Future*
2. Romanian Government, (2012) *National Reform Programme 2011-2013 Implementation Report*
3. EEA, (1999) *Making sustainability accountable*
4. Krebs C., (2008) *The ecological world view*, Editura Csiro Publishing
5. Georgescu-Roegen, N., (1971) *The Entropy Law and the Economic Process*, Harvard
6. OECD, 1998, *Eco-efficiency*
7. Pop C., Pop V., (2007) *Management și dezvoltare*, Editura Tipo Moldova, Iași
8. Special Eurobarometer 372, *Climate Change, 2011*
9. Stanciu M., (2006) *Metode de cercetare a modelelor de consum*, în *Studii și Cercetări Economice*, Academia Română
10. WBCSD, (2000) *Creating more value with less impact*

11. Zenghelis, D. (2012) *A strategy for restoring confidence and economic growth through green investment and innovation*, Grantham Research Institute in Climate Change and the Environment, London

Web

1. http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf, [accesat la 28.03.2015]
2. http://www.eea.europa.eu/publications/Topic_report_No_111999, [accesat la 20.03.2015]
3. http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_ro.htm, [accesat la 18.02.2015]
4. <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>, [accesat la 20.03.2015]
5. http://ec.europa.eu/europe2020/pdf/nd/nrp2012_romania_en.pdf, [accesat la 25.03.2015]
6. <http://www.insse.ro/cms/rw/pages/index.ro.do>, [accesat la 20.03.2015]
7. http://books.google.ro/books?id=Tulj3nfXheQC&printsec=frontcover&dq=krebs+ecologic+al&hl=en&sa=X&ei=yOtTUEzcCc-Gswaf7IDYAg&redir_esc=y, [accesat la 18.02.2015]
8. http://www.keepeek.com/Digital-Asset-Management/oecd/environment/eco-efficiency_9789264040304-en, [accesat la 03.03.2015]
9. http://ec.europa.eu/public_opinion/archives/ebs/ebs_372_en.pdf, [accesat la 10.04.2015]
10. <http://www.iccv.ro/oldiccv/romana/articole/Modele%20consum%20metodologie.pdf>, [accesat la 20.03.2015]
11. <http://stats.oecd.org/>, [accesat la 10.04.2015]
12. http://www.wbcsd.org/web/publications/eco_efficiency_creating_more_value.pdf, [accesat la 20.03.2015]
13. <https://sustainabledevelopment.un.org>, [accesat la 10.04.2015]

ACKNOWLEDGEMENT

Angela Nicoleta Cozorici would like to specify that this paper has been financially supported within the project entitled “*Horizon 2020 - Doctoral and Postdoctoral Studies: Promoting the National Interest through Excellence, Competitiveness and Responsibility in the Field of Romanian Fundamental and Applied Economic Research*”, contract number POSDRU/159/1.5/S/140106. This project is co-financed by European Social Fund through Sectorial Operational Programme for Human Resources Development 2007-2013. Investing in people!