# THE ROLE OF INNOVATION FOR SUSTAINABLE DEVELOPMENT IN E.U MEMBER STATES[1]

Ph.D and senior researcher **Dalina ANDREI,**
Economic Forecasting Institute, Romanian Academy
dalinaandrei@yahoo.com

***Abstract***
*Sustainable socio-economic development represents the central component of the European Union's 'Sustainable Development Strategy' document. The E.U's economic capacity for innovation, competitiveness and eco-efficiency is here analyzed through indicators like: R&D, labor productivity, eco-innovation and energy intensity The progress of these indicators, in its turn, is analyzed for individual EU Member States in the aim of a large picture drawn for how exactly the EU has performed in terms of objectives and targets written in the initial 'Strategy'. Ultimately, this below paper bases on the 'Eurostat' data on the 2000-2015 interval.*

***Keywords:*** Sustainable development, R&D expenditure, eco-innovation

***JEL Classification:*** O11, O32

***Introduction:*** about eco-innovation and appropriate concepts

Sustainable socio-economic development is a central component of the European Union's 'Sustainable Development Strategy'. This document is used for promoting innovative, competitive and eco-efficient economy. Such an economy is assumed to provide high living standards, full and high-quality employment throughout the European Union. The innovative, competitive and eco-efficient economy will harmonize the three main pillars of sustainable development: (a) economic development, (2) protection of the environment and (3) social justice.

[1] This paper is part of the annual research theme called "Competitiveness, performance and sustainable development in a multi-dimensional approaching" of the Institute of Economic Forecasting and concomitantly dedicated to the 150th Anniversary of the Romanian Academy of Sciences.

The economic capacity for innovation, in its turn, is likely to be assessed and analyzed by indicators like R&D, labour productivity, eco-innovation and energy intensity.

R&D expenditure is linked to education, innovation, employment, labor productivity and economic growth. R&D is important for the economic prosperity and competitiveness of EU member states. Also, eco-innovation allows economic prosperity to rise while preserving the environment and more efficiently using natural resources.

Then, formation of human capital (i.e. skills, knowledge and experience of individuals or of populations) through education and training deepens academic knowledge and innovative technologies, will also make a contribution to job creation, to pluses of labor productivity and resource efficiency in their use. Labor productivity, in context, is an important determinant of an economy's future competitiveness and long-term economic growth.

Sustained economic growth, however, when is not associated with some eco-efficiency improvements, might seriously damage the natural environment, and well-being once more in the long run. Sustainable development is the one that can increase economic prosperity minimizing pressures on natural environment or natural resources' availability.

The economy's energy intensity is another important indicator in such a respect, through highlighting progress when economic growth decoupling from environmental degradation.

Employment, in the same context, is basically essential for the economy's well-functioning and competitiveness. Rising employment can help society become more 'inclusive', reduce poverty and inequality inside and between regions and social groups. Apart from generating the income needed to achieve good living standards, paid work provides opportunities for a meaningful social engagement that promotes the sense of self-worth and some purpose for social inclusion. Just imagine that and how in contrast high and persistent unemployment would be able to lead to converse social exclusion, degradation of individual skills and to poverty that in turn certainly brakes all previously expected economic growth.

Young people are particularly vulnerable to weak and endangered economic circumstances. Improving their education and employment opportunities would be some key to social inclusion and to the sustainability of our economic system.

And now the concept of eco-innovation is a fairly recent one in the literature. It seems to have come up in a book published by Claude

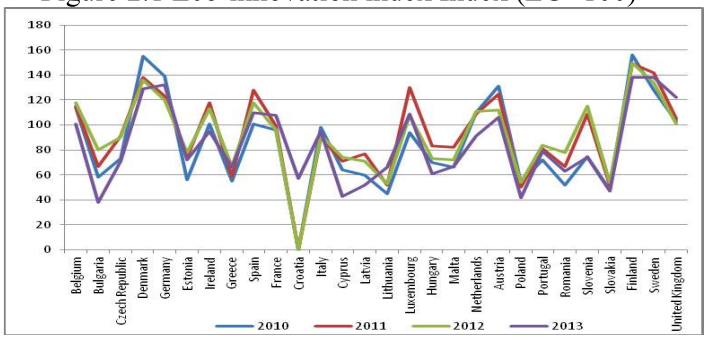
Fusser and Peter James2. Then, the same Peter James defines eco-innovation in another article as "new products and processes which provide customer and business value… while significantly decreasing environmental impacts". In facts, eco-innovation regards improvements of newly produced goods and services, lowering the use of natural resources and avoiding the use of harmful substances etc. On the same basis of 'good environmental impact without compromising social and economic objective', it is eco-innovation that is expected to create new jobs and even new market products.

2. Some innovation related data and specific measurements

**2.1 Eco-Innovation Scoreboard (Eco-IS)**

This is to be found as primary tool3 assessing and illustrating eco-innovation performance across the EU Member States. This Scoreboard aims to capture the different aspects of eco-innovation by applying 16 indicators grouped into five thematic areas that are: (1) eco-innovation inputs, (2) activities, (3) outputs, (4) resource efficiency and (5) socio-economic outcomes. A corresponding index shows how well individual EU Member States do perform in different dimensions of eco-innovation, as compared to a corresponding and concomitant EU average, and indicates also corresponding strengths and weaknesses. The Eco-IS (Figure 2.1) complements other measurement approaches of innovativeness in the EU member countries and aims to promote a holistic view on economic, environmental and social performance.

Figure 2.1 Eco-innovation index Index (EU=100)




The Eco-Innovation Scoreboard (Eco-IS)
Calculations based on Eurostat data

2 "Driving eco-innovation; a breakthrough discipline for innovation and sustainability" , Claude Fssler , Peter James, 1996. Pitman Publishing, ISBN 0 273 62207 2

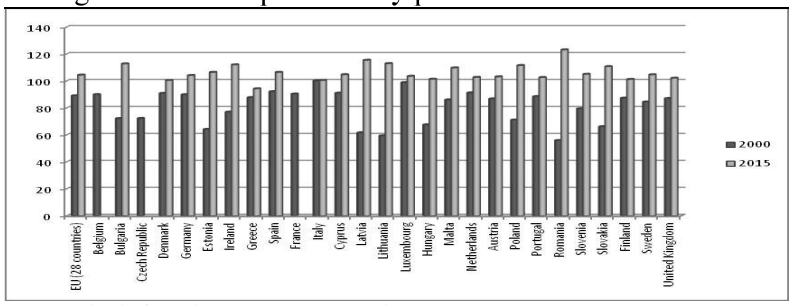
3 According Eurostat

**2.2 Labor productivity**

This indicator is measured by output of workers per hour worked. First, since 2000 labor productivity continuously raised in the EU member countries up to 2007, then there came the 'Lehman episode' of the recent crisis, followed by a longer term significant deterioration of economic conditions. Labour productivity (Figure 2.2) in the EU goes down from EUR 31.3 per hour worked in 2007 to EUR 30.7 in 2009. During crises , the productivity rise slowdown and reflect immediate lowering investment when high economic uncertainty. In the same crisis context, low productivity might equally come from companies that prefer not to fire, but to keep labour during the downturn. This labour will so be underused and productive capacity spared. Then, in 2010, labour productivity rebounded in the EU area to its pre-crisis levels and continued to grow in the following years.. In 2013, output per worker was EUR 32.1 per hour worked as counterpart of a slow economic recovery. During the post-crisis economic rebound, first productivity rose as firms intensified work on existing employees; hiring new workers so was rather likely to be delayed. And it was then for newly raising productivity when finally more workers were hired. Shortly, labor productivity rose during the 2000-2013 intervals the way that nearly all the EU Member States look to have taken advantage of. Improvements in labor productivity were most highly resented by the Central and Eastern part of territory, in Latvia (+100 %), Lithuania (+89.3 %), Romania (+86.7 %), Estonia (+62.9 %) and Slovakia (+61 %).

According Eurostat data, in 2013 Luxembourg and Denmark had the most highly efficient workers producing outputs, over EUR 50 per hour worked. At the other end of the spectrum labor productivity equally lowers below EUR 20 per hour, plus large differences in productivity rates and their dynamics within the EU are being identified, together with equally significant structural weaknesses.

Figure 2.2 Labor productivity per hour worked 2010=100

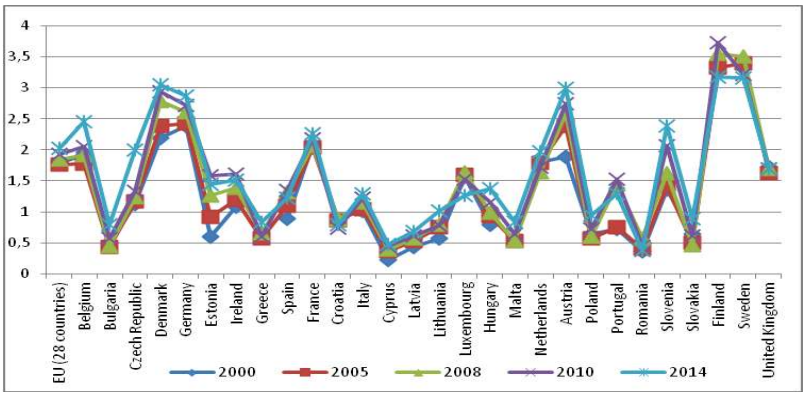



Calculations based on Eurostat data

### 2.3 R&D expenditure in GDP

The indicator of R&D expenditure (Figure 2.3) relates to GDP, is primarily expected to show this ratio at different points in time. R&D expenditure in GDP4 slightly increased in the EU during the same above 2000-2014 over-decade period. In context, its 3 % threshold is targeted by the 'Europe 2020 Strategy'; while currently it is lying about 2%. It is also important to be revealed that public sector still plays by far the primary active role in such a strategy.

Figure 2.3 : Total R&D expenditure % of GDP




Calculations based on Eurostat data

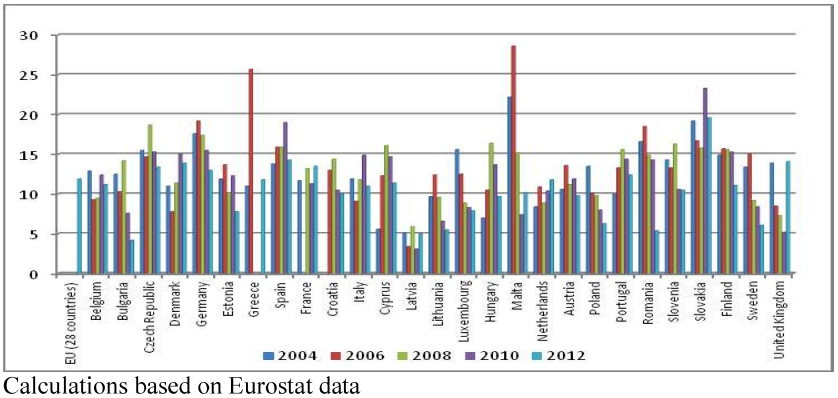
Besides, this indicator proves limited and could become controversial. When just expenditure is measured, all that might here result is a R&D intensity number, and not a result-based on R&D activity. Moreover, sources of R&D expenditure (e.g. public or others) stay hidden. Also, national accounting systems might fail to draw accurate situations about. Individual salaries dominating such expenditures bring another limit in through not here identifying a true stable value standard – researchers are supposed to be remunerated by amounts bearing enough ups and downs during not quite long periods according to general economic conditions in a country. Here there might be added limitations of innovation reflecting by R&D expenditure and so on.

[4] As in detail, the indicator provided is called GERD (Gross domestic expenditure on R&D) as a percentage of GDP. "Research and experimental development" (R&D) contains creative work undertaken on a systematic base in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications" (Frascati Manual, 2002 edition, § 63 ). *(Source Eurostat)*

### 2.4 Turnover from innovation

According Eurostat, this indicator (Figure 2.4) is defined as the ratio of new products turnover in the total enterprise's output turnover. It is based on the Community innovation Survey5 and covers at least all enterprises with 10 or more employees. An innovation is a new or significantly improved product (good or service) introduced to the market or the introduction within an enterprise of a new or significantly improved process.

Figure 2.4 Turnover from innovation % of total turnover




Calculations based on Eurostat data

### 2.5 Community Innovation Survey (CIS)

This is a survey of innovation activity in enterprises. This survey is made to provide information on the innovativeness of different industries by individual industrial enterprises and by types of these, by various types of innovation itself and by other aspects of innovation development6. Community Innovation Survey7 provides statistics broken down by countries, type of innovators, economic activities and several size classes. This survey is currently carried out every two years across the EU area. Enterprises are classified by country, economic activity (NACE), size class and type of innovation activity. The survey bases in practice on questions asked and focused

[5] See 2.5 below.

[6] Such as the objectives, the sources of information, the public funding or the expenditures.

[7] The Community Innovation Survey (CIS) is a part of the EU science and technology statistics

on organizational and marketing innovation and about product and process innovation (Figure 2.5).

The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new to the firm (or significantly improved). This includes products, processes and methods that firms are the first to develop and those that have been adopted from other firms or organizations. On its negative side, the one of limitations, the same above exclusively expenditure measuring problem remains reported on innovation.

Figure 2.5 More concepts related to CIS

| Concept | Explaining |
|---|---|
| Product innovators | Those who introduced, during the period under review, new and significantly improved goods and/or services with respect to their fundamental characteristics, technical specifications, incorporated software or other immaterial components, intended uses, or user friendliness. Changes of a solely aesthetic nature and the simple resale of new goods and services purchased from other enterprises are not considered as innovation. |
| Process innovators | Implemented new and significantly improved production technologies or new and significantly improved methods of supplying services and delivering products during the period under review. The outcome of such innovations should be significant with respect to the level of output, quality of products (goods or services) or costs of production and distribution. Purely organizational or managerial changes are not included. |
| Organizational innovators | They have implemented a new organizational method in the enterprise's business practices, workplace organization or external relations. |
| Marketing innovators | They have implemented a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. |
| Enterprises with innovation | These had innovation activities during the period under review, including enterprises with on-going and abandoned activities. In other words, firms that had innovation activities during the period under review, regardless of whether the activity resulted in the implementation of an innovation, are innovation-active. |

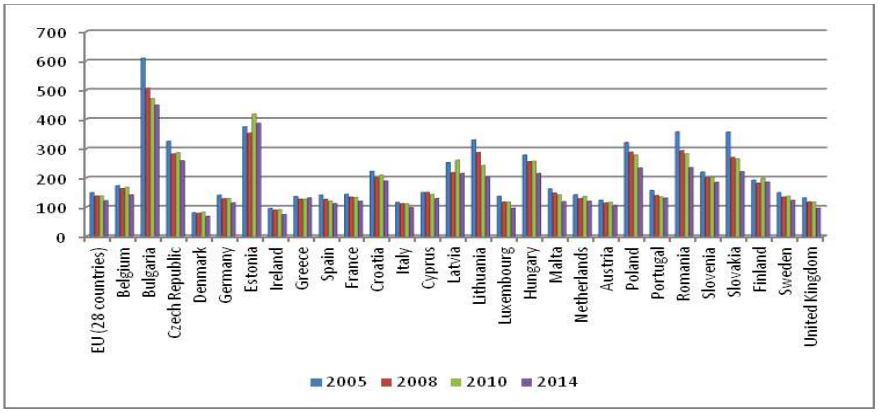
(Source: Eurostat)

**2.6 Energy intensity**

This indicator is the "ratio between the gross inland consumption of energy and the gross domestic product (GDP) for a calendar year"8. It measures the energy consumption of an economy and its overall energy efficiency and does express in kilograms of oil equivalent per 1 000 EUR. The gross inland consumption of energy results as the sum of the gross inland consumption of five energy types: (1) coal, (2) electricity, (3) oil, (4) natural gas and (5) renewable energy sources. The GDP figures are taken at chain linked numbers referred to the year 2010. The energy intensity ratio (Figure 2.6) is determined by dividing the gross inland consumption by the GDP. Since gross inland consumption is measured in kgoe (kilogram of oil equivalent) and GDP in 1 000 EUR, this ratio is measured in kg. per 1 000 EUR.

Energy intensity ratio improved in the EU, after declining by 15.9 % between 2002 and 2013 as a result of absolute decoupling of gross inland energy consumption from economic growth.

Figure 2.6 Energy intensity of the economy




Calculations based on Eurostat data

Energy intensity is a measure for the economy's energy efficiency, a key indicator for measuring progress under the Europe 2020 Strategy for smart, sustainable and inclusive growth. The ratio is expressed in kilograms of oil equivalent (kgoe) per EUR 1 000, and to facilitate analysis over time the calculations are based on GDP at constant prices (currently chain-linked 2005 prices). If an economy

[8] According Eurostat

becomes more efficient in its use of energy and its GDP remains constant, then the ratio for this indicator should fall.
Gross inland consumption of energy within the EU-28 in 2014 was 1 800 million tons of oil equivalent (toe). Staying unchanged during the period from 2003 to 2008, gross inland consumption of energy decreased by 5.7 % in 2009; much of this change can be attributed to a lower level of economic activity as a result of the financial and economic crisis.
In 2010 9 , was a 3.8 % rebound in the level of gross inland consumption of energy in the EU-28 although this was followed by a similarly large (3.6 %) fall in 2011. After these three years of relatively large changes, 2012 and 2013 saw more modest rates of change as consumption fell by 0.7 % and 1.2 %. In 2014, the least intensive economies in the EU were Ireland, Denmark, the United Kingdom and Italy, which used the least amount of energy relative to their overall economic size (based on gross domestic product (GDP)). The most energy-intensive EU Member States were Bulgaria and Estonia. It should be noted that the economic structure of an economy plays an important role in determining energy intensity, : service based economies will have relatively low energy intensities, while economies with heavy industries (such as iron and steel production) may have a considerable proportion of their economic activity within industrial sectors, thus leading to higher energy intensity.
Across the 2003-2014 interval substantial energy savings were made in Lithuania, Romania, Slovakia, Bulgaria, Poland, Cyprus and the Czech Republic, as the amount of energy required to produce a unit of economic output (as measured by GDP) was reduced by 25.0 %. None of the EU Member States reported a rise in their energy intensity between 2003 and 2014, with the smallest decreases in percentage terms recorded for the Netherlands, Greece, Estonia and Italy.

## 3. Conclusion

Sustainable development has been defined10 as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development needs a lot of effort to build an inclusive and sustainable future for people and planet. In this order, for a sustainable development in necessary to connect three elements: economic growth, social inclusion and environmental protection. These elements are all

[9] Source Eurostat
[10] http://www.un.org/sustainabledevelopment/development-agenda/

vital for the well-being of individuals and societies. Also, eradicating poverty in all its forms is an indispensable requirement for sustainable development.

**References**


1. Eco-innovation observatory, "Europe in transition. Paving the way to a green economy through eco-innovation". Annual Report 2012 January 2013
2. Fussler, C. & P. James, 1996; Driving Eco-Innovation: A Breakthrough Discipline for Innovation and Sustainability, Pitman Publishing: London, 364 p.
3. Guvernul României.,inisterul Mediului si Dezvoltarii Durabile - Strategia Nationala pentru Dezvoltare Durabila a României Orizonturi 2013-2020-2030 ,Programul Natiunilor Unite pentru Dezvoltare Centrul Na□ional pentru Dezvoltare Durabila Bucuresti 2008
4. International Labor Organisation , ILO (2014), Key Indicators of the Labour Market, 8th edition, p. 111.
5. James, P., 1997; 'The Sustainability Circle: a new tool for product development and design', Journal of Sustainable Product Design 2: 52:57, http://www.cfsd.org.uk/journal
6. Madhavi Joshi, Shailaja Ravindranath, Gopal Kumar Jain and Keren Nazareth - "Sustainable Development:An Introduction. , 2007, Centre for Environment Education
7. OECD (2011), "How does education affect employment rates?", in Education at a Glance 2011: Highlights, OECD Publishing, http://dx.doi.org/10.1787/eag_highlights-2011-16-en
8. Pohoata Ion - Strategii si politici europene de dezvoltare durabila ,Universitatea "Alexandru Ioan Cuza" – Iaşi,Centrul de Studii Europene
9. Rizos, Vasileios, Arno Behrens and Igor Taranic : "Measuring progress in eco-innovation ", NETGREEN Policy Brief No. 1 / 1 June 2015
10. RATIU Mariana - "ECO-INNOVATION FOR A SUSTAINABLE FUTURE", University of Oradea Romania, Department of Engineering and Industrial Management in Textiles and Leatherwork, Universitatii str., no.1, 410087 Oradea, Romania
11. Stijn Rocher, Michael H. Stierle : "European Commission Directorate-General for Economic and Financial Affairs Household saving rates in the EU Why do they differ so much?
12. Sustainable development - socioeconomic development, Data from July 2015. Most recent data: Further Eur stat information, Database.

13. Thorvald Moe, The norwegian model of sustainable development. A policy orientedcapital framework for measurement and policies, Oslo, March 2007
14. Work for Human Development, Human Development Report 2015, Published for the United Nations Development, Programme (UNDP)