

# Measures of Environmental Performance

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## *Abstract*

*Sustainable development was recognized and accepted easily as a vision for a future in which the “limits of growth” are respected while the wealth and welfare of humans continues to increase. Governments, companies, communities, and even individuals are now aware that environment needs more consideration and some effort should be invested in protecting or restoring it. Most of these efforts mean higher costs and lower incomes or profit, contradicting the basic tenets of economics. Nevertheless, there is an area where the interests could and should meet. This area is efficiency, and since it could be interpreted from the perspective of environmental outcomes, is eco-efficiency. Reducing water consumption, energy use, amount of waste that is generated, volume of discharged waste water means for a company less costs. In case that these reductions are occurring and production is steady or even increasing, efficiency is improved, along with the environmental performance of the company. The paper explains the rationale of eco-efficiency concept and makes comments on a number of quantitative approaches.*

**Keywords:** *environmental performance, sustainable development, eco-efficiency, environmental impact, environmental pressure.*

**JEL classification:** Q53, Q56

## **Introduction**

Environmental performance is becoming a necessary pattern for any economic initiative and it is considered important at national level too. In very general terms, environmental performance means to enforce measures that provide the protection of environmental factors – air, water, soil, ecosystems. This general understanding covers a wide range of actions that could be examined in terms of

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efforts invested in performing them or the outcomes measured by environmental quality indicators.

Reducing environmental impact or restoring damaged ecosystems are, in most of the cases, resource intensive processes, regardless to their paternity – private enterprise or governmental agency. On the other hand, increasing pressure from competition on global markets and budgetary discipline require a high degree of accountability for all spending, including the ones invested in environmental goals.

The confrontation of these processes lead to the emergence of the eco-efficiency concept and its applications in environmental management at different levels. Basically, this is an area of convergence between economy and environment in terms of interests. Its potential contribution is not enough to resolve the environmental challenge as a whole. Nevertheless, strategic approaches of sustainable development at global and European level include eco-efficiency as an avenue for action that brings a crucial contribution to the accomplishment of more general goals. Although environmental performance means a wide range of interventions, the accomplishments could be measured by using eco-efficiency indicators.

The paper examines eco-efficiency in conceptual and practical terms in various settings and provides a brief review of indicators proposed for its measurement. Thus, there are revealed the reasons and critics of its use as means of sustainable development, managerial approaches for application at micro and macroeconomic levels.

## **1. Efficiency and sustainable development**

The concept of sustainable development was launched by the *Our Common Future* report under the lead of Gro Harlem Brundtland, Director of United Nations Commission for Environment and Development. The report provides the definition of the concept and the vision upon a future in which between economic growth and environment act feed-back mechanisms that deliver high stability. Basically, sustainable development means to promote harmony between humans and between humans and nature.

Practical translation of sustainable development in action is provided by the original report, but also by a number of documents prepared within successive international debates. Among these more prominent is Agenda 21, widely accepted by states that participated to the United Nations Conference on Environment and Development at Rio de Janeiro and reviewed at the Rio+10 Conference (Johannesburg, 2002). In order to incentivize and follow up the progress made, the United Nations in collaboration with numerous international organizations and national representatives also enforced the Millennium Development Goals program (Rojanschi et al., 2006).

From these documents, the main avenues for action toward sustainable development are: increasing efficiency, promoting technological innovation, global

environmental management, decoupling and dematerialization and environmental economy (Bran et al., 2011).

Increasing efficiency in using materials and energy means, among others, to be sure that what is processed for human interest from the natural resources of the planet it is not engaged in transformation with harmful potential unless it is justified by human needs, their deployment being considered legitimate. In other terms, it is pursued the avoidance and reduction as much as possible of wasting. Since by increasing efficiency an economic advantage could be also obtained it results that there are not needed important social and economic changes for the application of these measures. The general understanding is that more efficient use should cover all material and energy resources used by society, given the fact that needs evolve in accordance with the structural changes featuring the development process. The vision according to which the structure of needs should be controlled and remodeled (Georgescu-Roegen, 2004), although indicated as being necessary is less accepted. This could mean, for example, to drop weapon production in favor of food production.

After more than two decades of its emergence and at least one in which sustainable development shaped policy making, the conceptual dispute is still very vivid. Tens of definitions and many more interpretations feed the arguments for the vague pattern of the concept. In addition, there were identified a number of weaknesses in the theoretical foundation, but also in the means of delivering sustainable development. The most important critics refer to transforming causes in solutions and superficial treatment of several aspects.

In the first range it could be found the increase of efficiency. Thus, increasing efficiency under pin decisions at microeconomic level and led to the current unsatisfactory situation, meaning unfolding environmental degradation. In addition, its effects are cancelled by the increase in number of units that are produced. This suggests that it is more important to reduce consumption and creates a major contradiction with the current social-economic structure (Bleahu, 2001), based mainly on the concept of consumption society, that promotes consumption regardless to its environmental implications, because consumption is the main engine of contemporary economy.

## **2. Eco-efficiency applications**

The eco-efficiency is the short form of saying “do more with less”. Its formal proposal as action framework and definition was performed by the World Business Council for Sustainable Development in 1992. The Rio Conference recognized eco-efficiency as means for companies to implement Agenda 21 in the private sector.

Eco-efficiency is defined as the delivery of “competitively priced goods and services that satisfy human needs and bring quality of life while progressively reducing environmental impacts of goods and resource intensity throughout the

entire life-cycle to a level at least in line with the Earth's estimated carrying capacity." The critical aspects of eco-efficiency are:

- reduction in material and energy intensity of goods and services;
- reduced dispersion of toxic materials and wastes;
- higher degree of recycling for products,
- wider use of renewable energy sources;
- expanded period of using goods.

The strategies for improving eco-efficiency are known as "Factor 4" and "Factor 10", and also the "cradle- to-cradle" approach.

"Factor 4" is a strategy based on a quadruple increase in resource efficiency using existing methodologies whilst avoiding negative impacts on the overall quality of life. The framework of labor productivity is expanded upon resources. By using best available technology, advanced engineering and improved production methods, fewer resources are required to produce more products and services. Therefore, the availability of resources is increased over a wider period, allowing the access of future generations.

"Factor 10" is a similar strategy with the previous, but is further reaching in its vision. According to it, in the next 30 to 50 years eco-efficiency should be improved ten times, leading to dematerialization. Its basic assumption is that the current pattern of resource consumption in which 20% of the global population is responsible for the use of 80% of the natural resources is not sustainable. It also puts a great trust in technological innovation, but also on policies, services and manufacturing processes.

"Cradle to cradle" is an approach that considers nature as model. In fact, it considers all materials as possible feed for a certain component of the system, which respects the parsimony principle of nutrient circulation in nature (Bran & Ioan, 2004). The final outcome is a system that does not produce waste and does not uptake new materials from nature. It is thought with a broad application that comprise along with industry urban development, buildings, economic and social systems. In its narrow interpretation there are enacted the so called industrial ecosystems that provide factual evidence on the workability of the strategy (Ioan & Radulescu, 2009).

The characteristics that are common in these strategies are:

- recognizing technological innovation as solution toward sustainable development;
- accepting market, and thus businesses, as main agents of transformation;
- accepting the need of continuous growth, since it could be fitted within environmental restrains by changing its patterns.

These details reveal that eco-efficiency is concerned with: reducing the consumption of resources; reducing the generation of wastes in its broader understanding that includes emission, waste waters and solid waste, and increasing product or service value, by providing more benefits for the user of products and

services via improved correspondence between needs and functions of products and services or via expanded period of use.

### 3. Measuring eco-efficiency

As it was argued previously, environmental protection should go beyond intentions and declarations. It should provide results, concrete outcomes that could be measured and compared against objectives set by policies and strategies.

The occurrence of these results will not become obvious in short run in terms of environmental indicators for the same reasons why environmental degradation is not immediately observable. Thus, it should be designed indicators that measure progress and highlight accomplishments or failures (Bran & Hincu, 2009).

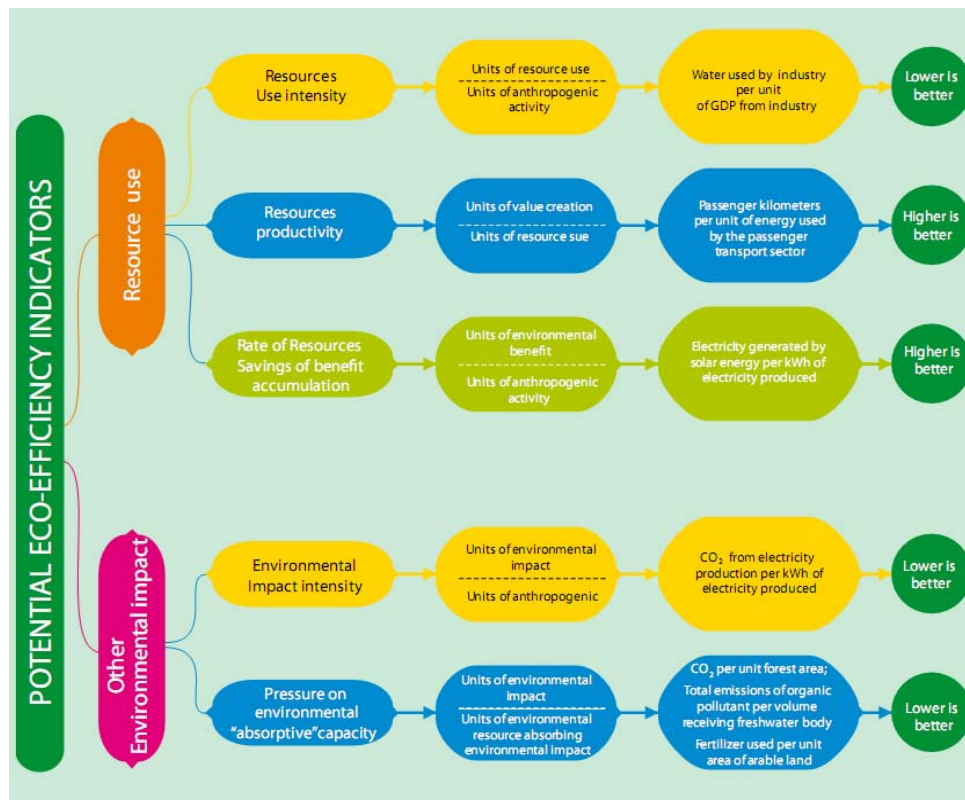


Figure 1 Framework for eco-efficiency measurement at national level

Source: UNESCAP (2006) *Green Growth at a Glance. The way forward for Asia and the Pacific*. Economic and Social Commission for Asia and the Pacific.

In the construction of eco-efficiency indicators there are considered eight principles: to be relevant and meaningful; inform decision making; recognize the diversity of business, support benchmarking and monitoring, to be clearly defined, measurable, transparent and verifiable, to be understandable and meaningful to stakeholders, to be based on overall evaluation of operations, products, services, and to recognize relevant and meaningful issues related to upstream (suppliers) and downstream (product users).

Measuring eco-efficiency is made by calculating the ratio among the value of products or services and the environmental influence. Considering the range of indicators that could be used for these two terms of the equation, eco-efficiency indicators are split in general indicators, that could and should be determined in any business, and business specific indicators that will be determined in accordance with the patterns of production activity.

General indicators comprise: for *value of products and services*, quantity of goods and services and net sales; for *environmental influence*, energy consumption, material consumption, water consumption, greenhouse gas emissions, ozone depleting substances emissions.

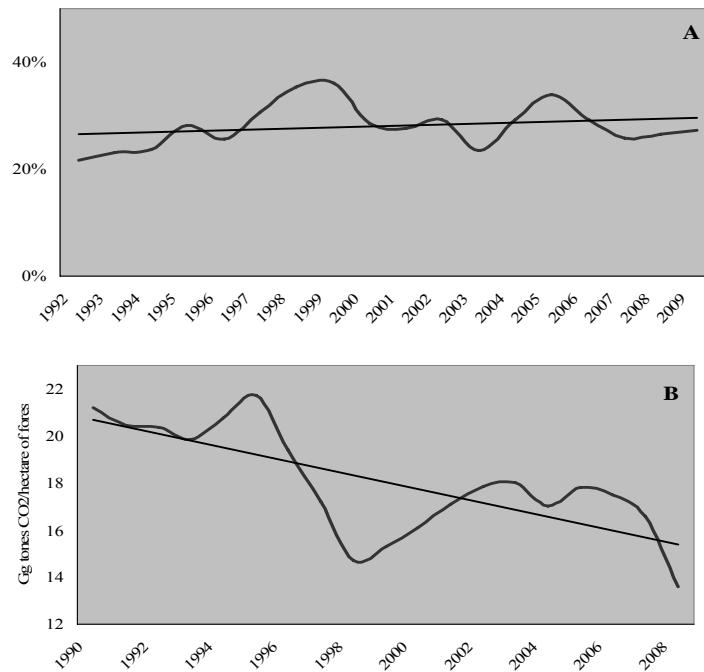
Eco-efficiency is basically a microeconomic concept, but its application could be expanded at macroeconomic level too. Thus, UNESCAP provides a framework to assess eco-efficiency at national level (see fig.nr.1).

In this approach, indicators are differentiated by how the types of environmental influences: resource use and other environmental impact, which includes mainly release of various pollutants.

#### **4. Romania – dynamic of certain eco-efficiency indicators**

Since its engagement in the European integration process, Romania becomes increasingly involved in various projects that pursued a wide range of environmental goals. Although, most of these goals do not reflect domestic priorities but are important at a higher level, serving the European interest, they could create favorable impacts in terms of quality of life and even international competitiveness.

Computation of data for two types of eco-efficiency indicators shows that the trends are in harmony with these goals, although the evolution is not constant, being featured by up and down episodes (fig.nr.2). Thus, the proportion of renewable energy source in electricity production records several peaks and fallings between 22% (1992) and 36% (1999), but the overall variation is positive, equaling a 6% improvement. For the second indicator, carbon dioxide emissions per hectare of forest the trend should be downward and this is happening, despite the peak recorded in 1995 (21.71 Gg tones carbon dioxide/hectare). At the end of the period the emission burden for each hectare of forest is 7.59 Gg tones less.



**Figure 2 Evolution of eco-efficiency indicators for Romania. A. Proportion of hydroelectricity production from total electricity production; B. Carbon dioxide emissions per hectare of forest**

Source: own computation based on data provided by National Institute of Statistics and UNFCCC

### Conclusions

Sustainable development is recognized as the framework for our future at many levels and most of the strategic thinking uses its tenets. This includes global approaches prepared by the United Nations, but also European and national strategies. Among the methods envisaged for its accomplishment, improved efficiency found an important role, although it is accepted that there are several limits. The most important critic in this respect is the fact that increased consumption rate would cancel the improvement brought by higher efficiency.

Eco-efficiency is a concept proposed in a business framework which expands basic tenets of management to environmental aspects. It refers to the environmental impact corresponding to the unit of product or service delivered to consumers. The environmental impact can be expressed in terms of resource consumption (materials, energy, water) or release of pollutants (various emissions, sewage, solid waste, toxic substances).

Although stemmed in business philosophy, eco-efficiency found its way in policy making at governmental level. There are available various proposals of eco-efficiency indicators at this level. Computation of some of them for Romania

reveals good trends, but also the feasibility of using eco-efficiency as means for recording environmental performance.

### References

1. Bleahu, M. (2001). *Privește înapoi cu mânie... Privește înainte cu spaimă*. Bucharest: Economica Publishing.
2. Bran, F. & Ioan, I. (2004). *Ecologie generală*, Bucharest: ASE Publishing.
3. Bran, F. & Hincu, D. (2009). "Measuring eco-efficiency", *Quality – access to success*, 10(12), pp.49-52.
4. Bran, F., Radulescu, C.V., Ioan, I. & Popa, C. (2011). *Sinergii globale în direcția protecției mediului*. Bucharest: Universitara Publishing.
5. Georgescu-Roegen, N. (2004). *Legea entropiei și procesul economic*. Bucharest: Expert Publishing.
6. Ioan, I. & Rădulescu, C.V. (2009). "Eco-industrial synergies", *Quality – access to success*, 10(11), pp.43-46.
7. Rojanschi, V., Bran, F., Grigore, F. & Ioan, I. (2006). *Cuantificarea dezvoltării durabile*. Bucharest: Economica Publishing.
8. UNESCAP. (2006). *Green Growth at a Glance. The way forward for Asia and the Pacific*. Economic and Social Commission for Asia and the Pacific.