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ON THE MODELING ASSESSMENT OF SUSTAINABLE DEVELOPMENT INDICATORS

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Abstract: The paper presents a new approach to the formulation of assessment criteria for sustainable development in a unitary concept of maximum generality. Starting from the disadvantages of expression in very different units of the plurality of indicators and sub-indicators, the large number of them, we propose a new method of assembly / aggregation of these indicators as needed even in a single global indicator.

1. INTRODUCTION

Europe 2020 proposes three priorities wich are mutually reinforcing:

- *Smart Growth*: developing a knowledge-based economy and innovation;
- *Sustainable growth*: promoting an economy more efficient in terms of resource use, greener and more competitive;
- *Inclusionfavorite growth*: promoting a high rate of employment, ensuring social and territorial cohesion.

Sustainable development aims to ensure basic conditions of environmental, economic and social systems without jeopardizing the ability of present and future functioning. It must primarily ensure a balance between socio-economic systems and elements of natural capital [3], [8], [9], [10].

2. SUSTAINABLE DEVELOPMENT INDICATORS

According to the report made by the European Commission in 2009, Bruxelles, sustainable development strategy involves addressing the following seven areas, from table 1:

Table 1. Key challenges in terms of sustainable development at EU level

Key challenges in terms of an EU-wide sustainable development	1	Climate change and ecologic energy
	2	Sustainable Transport
	3	Sustainable Consumption and Production
	4	Conservation and management of natural resources
	5	Public Health
	6	Social inclusion, demography and migration
	7	Global challenges of poverty and sustainable development

Climate change and ecologic energy

Given this first key challenge in terms of sustainable development, the European Union has taken a leadership role to combating global climate change.

In this respect the EU needs to define the direction they want to evolve until 2020, including :

- "20/20/20" objectives (*reduction of GHG emissions* - greenhouse gases - by 20% by 2020 compared to 2005, increased by 20% the share of RES - *renewable energy* - total energy consumption by 2020, *increasing energy efficiency* by 20% during 2020;
- 75% of the population aged between 20 and 64 should be have a job;
- 3% of GDP (gross domestic product) The EU should invest in research and development (RD);
- Early school dropout rate should be reduced below 10% and at least 40% of the younger generation should be have an universitary education;
- number of people at risk of poverty would be reduced with 20 million.

Sustainable Transport

To implement sustainable transport, EU has assumed the responsibility for that, until 2020, 10% of transport fuel consumption to come from renewables (including biofuels, renewable electricity and hydrogen.

Sustainable Consumption and Production

A Communication on public procurement for better environment, offering each member of the European Union to achieve a binding target of 50% green procurement, since 2010.

Conservation and management of natural resources

In terms of conservation and management of natural resource, global demand for natural resources is growing rapidly and will continue to increase due to population growth which is expected to reach 9 billion people by 2050. Measured by the ecological footprint is estimated that population growth would exceed 30% of what the planet can sustain long term.

Public Health

One of the main objectives of the Community Action Programme on Public Health (2008-2013) is to provide comparative information on the health of European citizens through the development of health indicators and data collection necessary.

Social inclusion, demography and migration

The number of EU working age population will start to decrease until 2013, knowing a decrease of about 39 million (12%) until 2050 compared with 2008. The aim of the European Union and the challenge lies in harnessing the full potential of Europe's population: growth rates of labor employment, productivity and successful integrationof migrants.

Global challenges of poverty and sustainable development

Globalization is a force that must have sustainable development in the foreground, accompanied by measures to tackle global poverty.

European strategy in terms of sustainable development sets out guidelines on the implementation of sustainable development issues in the European Union and covers economic, social, environmental and financial.

Since 2009, the EC proposed a plan consisting of five stages of developing a sustainable development system measurability, so:

Step 1 - extending the GDP(Gross Domestic Product) indicator with environmental and social indicators.

It is proposed to express a global RCI (Responsible Competitiveness Index) index with four basic components:

- Economic development;
- Policy Drivers;
- Business Action;
- Social Enables.

Step 2 - bringing timely information to decision makers (GDP, climate information). He proposed a new SEIS (Shared Environmental Information System) environmental system of the EC.

Step 3 - reporting on the social allocation of goods, the level of inequality, poor people, etc. It evaluates the cohesion policy, the allocation of environmental funds, reducing waste.

Step 4 - EC tables to be developed to improve the quality of sustainable life on earth, annual measure of improvement.

Step 5 - introduction of national environmental and social bills.

3. QUANTIFYINGINDICATORS

We can see that, first the nature and size of different indicators, many components, makes the pursuit of global sustainable development is difficult, using heuristic grouping several conditions.

Given the existence of systemic modeling results further propose a model for tracking the development of sustainable development, as follows:

a). Sub-indicator/indicator propose expressing each form of error expressions in relation to the value achieved during the last:

$$\varepsilon_i = \frac{y_i - y_{i-1}}{y_{i-1}} \quad (1)$$

b). Establishing the overall error expression using the method of composing such errors a degree of error theory:

$$\varepsilon = 1 - \prod_{i=1}^{n}(1 - \varepsilon_i) \quad (2)$$

With these elements we examine the evolution of sustainable development, for example using a direct expression of total error above, or may be prosecuted for the second consecutive report:

$$\frac{Y_n}{Y_{n-1}} = 1 + \varepsilon \quad (3)$$

Y_n from the last relationship is defined as a global indicator of the period.

c). To study the evolution of curvature a longer period, we use an expression of the ratio of curvature of four successive equidistant time points used in the study of systems [1], as follows:

$$R = (Y_K - Y_{K-1})(Y_K - Y_{K-2})/(Y_{K+1} - Y_{K-1})(Y_{K-1} - Y_{K-2}) \quad (4)$$

The relationship can be expressed and related variables consecutive errors.

4. CONCLUSION

The proposed indicators system are easy to follow, easy to automate, quantifiable and comparable. Also traces the history of the global indicator, it becomes possible to ascertain whether the development falls on a curve evolution trends defined by the points above, or there is a point of discontinuity with the changing direction of evolution.

Solutions support the existing global trends on the unified approach ofmodeling through a unique methodology, including methods of information technology, allowing the tracking, reporting and easy comparison of results at the zone, country, continent and world.

In these circumstances can be established a set of indicators even with expressions in natural units, which allow a single global standard encompassing all the important factors in development.

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