

Sufficient predicates of sustainability

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Abstract: *Although, it is widely used, there is no consensus among researchers in defining the concept of sustainability. The various scientific debates available in the literature consider that the concept of sustainability should be approached in an integrated manner, which involves the maintenance and the improvement of the welfare at the economic, environmental and social level, taking into account both the importance of the processes and the output of the system.*

The paper aims to clarify the concept of sustainability through an examination of different opinions and controversies existing in the literature regarding this concept. Also, the paper presents the concept of sustainability analyzed from the perspective of system and proposes a definition of sustainability by exposing the sufficient logical conditions for a system to be qualified as a sustainable system. Are analyzed concepts such as: logically vivid system, autopoiesis, weak sustainability, strong sustainability, sustainable development.

Keywords: system, sustainability, sustainable development, logical conditions

JEL Classification: A10, O17, P00

Introduction

The paper is organized as follows: the first part of the work presents the opinions and the controversies existing in the literature regarding the concept of sustainability; the concept of sustainability is analyzed from the perspective of the systems and also are analyzed concepts such as: "weak sustainability" and "strong sustainability".

Secondly, there are exposed the sufficient logical conditions for a system to be classified as a sustainable system. Finally, there are presented the conclusions resulting from the exposures proposed in this work.

In the literature are found many definitions of the concept of sustainable development, but the most commonly used definition is the one proposed by the World Commission on Environment and Development, headed by Gro Harlem Brundtland, Prime Minister of Norway, in 1987. According to the Brundtland Report ("Our common future"), sustainable development involves "ensuring a development so as to allow satisfying the needs for present generations without compromising the ability of future generations to satisfy their own needs."¹

This definition reveals equity within generations and intergenerational equity.

Another definition of sustainability is given by David Pearce, referring to sustainability as "concerned with the development of society where the costs of development are not transferred to the future generations, or at least makes efforts to compensate such

costs."²

Sustainable development in the opinion of John Elkington is defined in three words: "People, Profit, Planet", so he proposes the Triple Bottom Lines model. This model takes into account the three pillars of sustainable development: the social, ecological and economic environment.

The concept of sustainable development has become increasingly known after the "Earth Summit" Conference, organized by the United Nations in Rio de Janeiro in 1992. During the same conference it was developed the plan known as Agenda 21.

Sustainability is defined by Pearce, Barbier, Markandya (1990, p.3) as: "requiring some constancy in the stock of natural environmental assets". Dasgupta (1995), Nordhaus (1992) consider that the sustainable ways are no different from the optimal ways. Pezzi (1989) emphasizes "undiscounted relative welfare of generations".

1. Sustainability and sustainable development - an analysis from the perspective of systems

Further we will analyze the concept of sustainability and the concept of sustainable development from the systems perspective. Both concepts are treated fairly ambiguous in the literature and there are various controversies about them.

First we will clarify the concept of sustainability and the concept of durability. Although, in the literature the concept of durability is used as a synonym of the concept of sustainability, Dinga E. makes a clear

² Pearce, D.W. și Atkinson, G. , Capital theory and the measurement of sustainable development: an indicator of weak sustainability, 1993, Ecological Economics.

¹ "Our Common Future", Brundtland Report, Commission on Environment and Development, Oxford University Press, Oxford, 1987

distinction between the two concepts. So, a system is durable “whether the maintenance of its identity does not require the intervention of the cultural subject” and a system is sustainable “whether the maintenance of its identity requires the interventions of the cultural factor.”³

According to Gallopin (2003), the analysis of the two concepts, sustainability and sustainable development, involves the integration of economic, social, cultural, political, ecological factors and the approach in terms of systems may be more useful than analytical approaches, because it involves the connection, relationships and context.

Therefore, it is important to make some remarks on the system concept. According to Dinga E., the system can be defined as a logical sum of the following sufficient predicates:⁴

- a multitude of components, discernible or not between them;
- a membrane which includes the components and excludes everything else from the rest of the environment;
- a multitude of connections between the components, which actually represents the functionality of the system;
- a multitude of connections between the system and its external environment, which is known as the system behavior.

From the perspective of the open systems, the system behavior depends not only on the system itself, but also of factors, elements, or variables that come from the environment (known as input variables); on the other hand, the system generates variables

that influence the environment (known as output variables).

A proposal of common attributes for socio-ecological systems is made by Gilberto Gallopin (1994). Thus, socio-ecological systems must have the following attributes:

- availability of resources;
- adaptability and flexibility;
- general homeostasis;
- stability;
- capacity of response;
- self-reliance;
- empowerment.

Gallopin (2003) considers that the systems must be adaptable and flexible, which implies a degree of plasticity to detect changes; otherwise the system would become rigid and could possibly enter into a collapse.

It is interesting the Gallopin approach on the general homeostasis, referring to the following concepts: stability, resilience and robustness. In this way the system must have the ability to maintain the values of the main variables around a given trajectory (or state) in the case of stability; in the case of resilience around a given domain of attraction, and in the case of robustness around of a given system structure.

Regarding the system capacity of response, Gallopin refers to the system’s ability to cope with change, focusing on adaptability, homeostasis and system awareness.

Self-reliance represents the system’s capacity to adjust its interactions with the environment.

The empowerment denotes the system’s capacity not only to respond to change, but also to innovate and to induce the change in other systems in order to achieve its own goals. But this attribute is specific only for human system, and is not valid for the ecological system.

³ Dinga, E., *Ciclicitatea economică*, Editura Academiei Române, București, 2016, p. 23-24

⁴ Dinga, E., *Sustenabilitatea economică prin politici de ajustare în contextul globalizării*, Editura Academiei Române, 2011, p.83

Gallopín (2003) considers that sustainability does not require constancy; changing within the systems should not be excluded, but should be avoided the destruction of the renewal sources: these help the system to cope with the inevitable shocks.

“Weak sustainability” and “strong sustainability”

Further we will present the four approaches of the sustainability concept that are encountered in literature: weak sustainability, very weak sustainability, strong sustainability and very strong sustainability.

In the theory of economic growth, sustainable development is often translated as intergenerational equity, which is interpreted by a constraint on growth, this means non-decreasing prosperity (Pezzey, 1992). Also, Pezzey says that any temporary decrease in welfare involves unsustainable development. In this regard, Pezzey was referring to “sustainedness”, given that such a model can be assessed only after the fact. Also Pezzey refers to “survivability”, as a weaker alternative criterion, which allows a reduction in welfare as long as the consumption level exceeds a certain level of subsistence.

The concept of “very weak sustainability” is approached by Gallopín (2003) and Turner (1993). They consider that the concept refers to the substitutability of different types of capital and also refers to the fact that the ecological systems sustainability is important only if it is necessary for the sustainability of the human system.

Gallopín (2003) refers to the sustainability of the entire socio-ecological system which may be compatible with the notion of “weak

sustainability”. This involves protecting the ecological and biogeochemical processes that are irrecoverable if these were lost; processes that relate to the critical natural capital.

Also Gallopín (2003) refers to “strong sustainability” and “very strong sustainability”.

The concept of “strong sustainability” refers to the sustainability of the whole socio-ecological system, the system relying on the existence of connections between society and nature.⁵

The concept of “very strong sustainability” refers to the fact that natural resources cannot be substituted by human capital made; their exhaustion signifying an irreversibly loss in social welfare; this concept being more compatible with an economy in an equilibrium state.

Regarding the concept of “very strong sustainability” is supported by those who believe in “the right to life” of other species, which would imply that each component or subsystem of the natural environment, each species and each physical stock should be preserved (Pearce and Atkinson, 1995).

2. Sufficient predicates of sustainability

From literature review we notice that there are many definitions of the concept of sustainability. Further, we want to clarify the concept of sustainability by establishing the sufficient predicates. By sufficient predicates we understand those attributes, which once verified by an entity assign it a certain skill. Predicates of sufficiency must satisfy, taken

⁵ A socio-ecological system is defined by Gallopín et al., 1989, as a system which consist a human or a societal which is in an interaction with an ecological or biophysics component.

two by two, conditions of independence, consistency and completeness.⁶

In our attempt to clarify the concept of sustainability we consider that, first is necessary to clarify the concept of logically vivid system (the system concept was defined in a previous paragraph).

Dinga E. considers there is necessary an additional predicate of sufficiency as a system to qualify as a logically vivid system. This attribute is called dissipativity and it involves the concept of entropy. Moreover, Dinga E., sets out three necessary predicate of the logically vivid systems. These are: autopoiesis capacity, nonlinearity and invariance of total complexity.⁷

A logically vivid system is characterized by the presence of the potential of identity conservation and the presence of automatic stabilizers. The presence of automatic stabilizers is a consequence of autopoiesis capacity of the logically vivid systems. By autopoiesis capacity we understand the system's ability to restore the initial conditions if these have been disturbed by the system functionality, or its behavior.⁸

There are two sufficient predicates for the logically vivid system to be qualified as a sustainable system: (Dinga E., 2011)

- presence of hyper cycles;
- absence of the positive feedback.

⁶ Dinga, E., *Sustenabilitatea economică prin politici de ajustare în contextul globalizării*, Editura Academiei Române, 2011

⁷ Dinga, E., *Sustenabilitatea economică prin politici de ajustare în contextul globalizării*, Editura Academiei Române, 2011, p. 82-91

⁸ Dinga, E., *Sustenabilitatea economică prin politici de ajustare în contextul globalizării*, Editura Academiei Române, 2011, p. 84-91

We will notice the following aspects related to these sufficient predicates.

Considering the systems theory, we can say that a hyper cycle represents a group of successively or simultaneously cycles inter-related structural and functional, whereby in a number of coupled processes, the outputs from one process is partially or overall, the entries in another process.

Why is it necessary the absence of the positive feedback?

There is the possibility that the system to be removed from the recognition tunnel of the identity profile by the presence of the positive feedback.

Therefore, based on predicates of sufficiency, Dinga, E. defines the sustainability of the system "that characteristic of the system which is able to maintain on a desirable trajectory, in a default or acceptable band, an undefined period of time and on a global space of accessibility".⁹

Conclusions

The paper provides an analysis of the literature regarding the concepts of sustainability and sustainable development. Concluding what we exposed in this paper we can specify the following aspects:

- it is preferable the analysis of the sustainability concept from the perspective of systems;
- there are the following four approaches on the concept of sustainability: weak sustainability, very weak sustainability, strong sustainability and very strong sustainability;

⁹ Dinga, E., *Studii de economie. Contribuții de analiză logică, epistemologică și metodologică*, Editura Economică, 2009, p.46

- definition of the sustainability should be given after establishing the logical sufficient conditions for a system to be classified as sustainable one;

- there are differences between the concept of sustainability and the concept of durability.

Regarding the concept of sustainable development, we note that it refers to long-term

perspective, as regards the consequences of the present activities on the global development in the future. Accordingly, there are necessary cooperation programs at regional and global level as well as at the level of the partnerships between countries and groups of countries, which lead to viable solutions in the long term.

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