ANALYSIS OF THE SUSTAINABILITY CONCEPT FROM THE LIVING LOGIC SYSTEM PERSPECTIVE

Mihai-Cristian TRANDAFIR, Ph.D. Student
School of Advanced Studies of the Romanian Academy (SCOSAAR), Romania
E-mail: arh.trandafir@gmail.com

Abstract: *Concept with different meanings, depending on the domain in which it is involved, sustainability is represented in the literature as a synergy between society, economy and the environment. The paper addresses the concept of sustainability from a wider perspective of the living logical system whose evolutionary tendency is to preserve the qualitative identity, but not punctually, rigidly, but maintaining its in a "sustainability tunnel", within which it may suffer alterations of punctual identity, but not of "tunnel" identity. In order to clarify the concept of a living logical system, the work presents a logical construction of the system, the poietic system, the self-poietic system, and defines the concept of a auto-poietical societal entity based on the predicates of sufficiency*

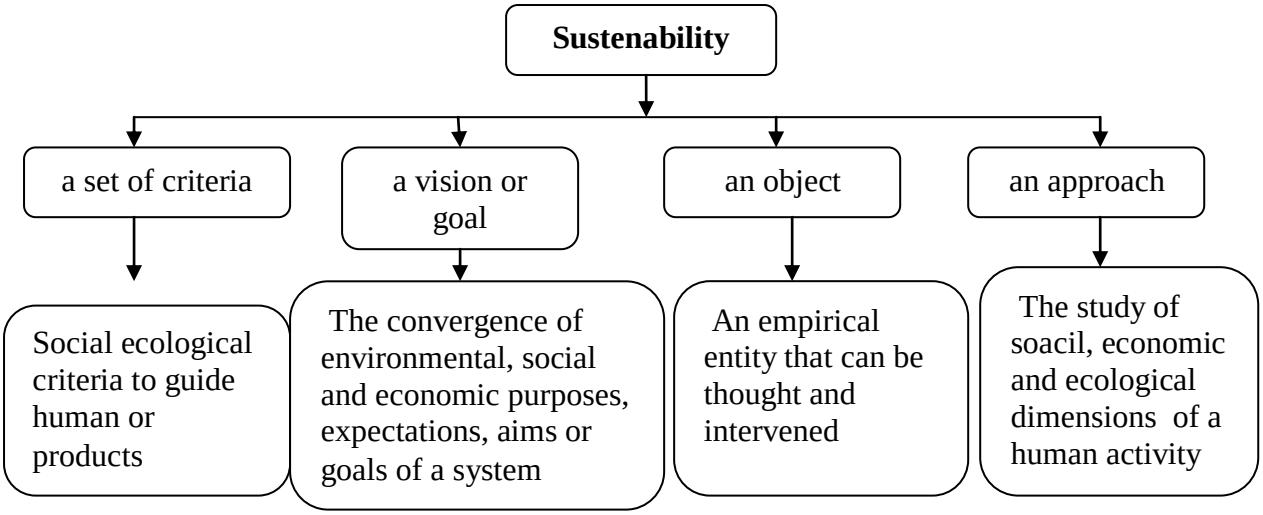
Key words: *sustainability, auto-poietic societal entity, living logic system, predicates of sufficiency*
JEL Classification: *A10, O10*

1. Introduction

Global concept, with local significance (Dinga, 2009, p. 43), the concept of sustainability has been shaped throughout its evolution, starting from 1972, under the impact of the different currents of intellectual and political thinking (Kidd, 1992, p.3), which gave it different meanings, sometimes contradictory, depending on the area in which it was used.

In the political discourse, of the specialists of the different fields, as well as in the institutional practice, the stability is asserted, most often, in a multidimensional aspect, as a synergy between society, economy and environment. (Rosen, 2018) and is interpreted under different meanings (Salas - Zapata and Ortiz - Muñoz, 2018): either with reference to the integration of a set of environmental criteria or social qualities in human actions, or as an objective of humanity, or conceived as an entity that exists and can be represented and studied, or as a reference to the study of the social, economic and environmental variables of a reference system (Figure 1).

Figure 1. Acceptance of the concept of stability



Source: Adaptation after Salas-Zapata & Ortiz-Muñoz, 2018.

Beyond these "civil" meanings, applicable to particular situations, under which the concept of sustainability is addressed in the current literature, (Dinga & al, 2011), academic research changes the paradigm of systems modeling, focusing its scientific approaches towards theoretical, abstract modeling. of systems, conducive to the fundamental research approach.

In this context, the paper addresses the concept of sustainability from a broader perspective, of the theoretical approach, according to which sustainability is a paradigmatic manifestation of progress in knowledge and action, of man and society. (Dinga, 2009, p. 44).

Sustainability is analyzed through the prism of clear differentiation from sustainability: while sustainability refers to living logic systems, "a new and probably revolutionary concept" of an ecosystem type, of different economic policies, sustainability refers to non-living logical systems, such as there are stones, buildings, etc. (Dinga, 2011).

The construction of a living logical system, which can theoretically support the concept of sustainability, involves the conceptual clarification and logical definition of five concepts: the concepts of system and poietic system, auto-poietic system, societal entity and auto-poietical societal entity, identifying the distinctive characteristics and the predicates of sufficiency of each.

2. The concept of system

The concept of system is used mainly in different fields of science and technology, of the economy, in nature and in society with definitions adapted to the context in which it is integrated, of which we mention by way of example:

• a collection of objects arranged in an orderly form, which in a certain sense is directed to a purpose or a target (Dolga, 2010);

• a set organized by doctrines, ideas or principles usually meant to explain the arrangement or functioning of a systematic whole (Merriam-Webster Dictionary);

• any set organized by resources and procedures in interaction or interdependence, real or abstract, for performing a set of specific functions (Dolga, 2010);

• a set of connected things or devices that work together (Cambridge Dictionary).

For the purposes of our paper, we used the definition of the system concept approached in theoretical research, according to which the system is conceived as a cut from reality (either objective or subjective or a mixture of the two), which verifies the following predicates of sufficiency (Dinga, 2009, pp.373-374), which we represented schematically in Figure 2:

• A set of component elements, discernible between them: (E)

• A membrane that separates, in a breakable manner, the environmental components: (M)

• A set of connections between the components (intra-membranatic): (CI)

In terms of logical aspect, the structure of a system is the conjunction of two predicates of sufficiency of the system:

$S = (E) \wedge (CI)$, where S is the structure (1)

and is defined as the totality of the component elements of a system and the connections between them.

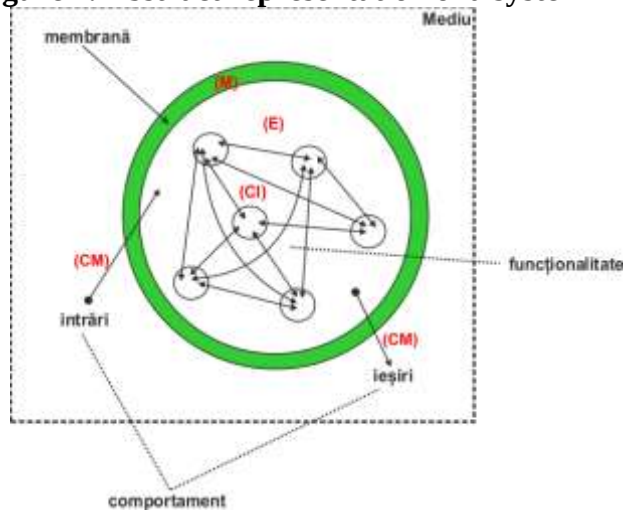
Once a system is born (either real or cognitive, fictional), it generates a predicate of necessity:

- The set of connections between the system components and its environment (CM)

In terms of logical aspect, the new predicate of necessity is thus generated:

$[(E) \wedge (CI)] \rightarrow (CM)$ (2)

Figure 2. Abstract representation of a system



Source: Dinga, E., 2018. *Growth, development and economic sustainability*. Bucharest: Romanian Academy Publishing House, p.56.

The structure of the system necessarily generates the external connections of the system. External connections are called system *functions*, because they are observable from the perspective of the cognitive subject as exercising certain connections of interest for that subject. It can be stated, therefore, that the structure generates the function.

3. Poietic system, auto-poietic system

3.1. Poietic system

The configuration of a poietic system implies the definition of the concept of poieticity (based on which the concept of self-poieticity and, respectively, auto-poietic system will be defined) starting from its distinctive characteristics:

- Poieticity is a property (either of a system, or of a process, or of a phenomenon); given the delimitation of properties in (a) simple properties (features that do not need to be defined, understood or operationalized by other, more primitive features) and (b) compound properties (those properties that need to be defined, understood or operationalized, of more primitive properties), we state that the property of poieticity is a compound property.
- The primitive properties that underlie the concept or property of poieticity, which we consider and predicated by sufficiency for defining the concept (property) of poieticity (P) are the following:
  - **(**P1) structuring potential: this is a predicate of sufficiency that refers to the capacity of the entity concerned to create, modify, preserve, update etc. structures, either with reference to itself or to its environment.
  - (P2) integrative potential: this is a predicate of sufficiency that refers to the capacity (potential) of the entity concerned to capture influences from the environment (or even from within the entity itself), influences that integrate either in its structure or in its functionality.

By noting the poieticity with P, we have:

$$P = (P1) \wedge (P2) \quad (3)$$

A poietic system (SP) is the system that verifies the two predicates of sufficiency of the poieticity and can be logically described in this way:

$$SP = (S) \wedge (P) = (E) \wedge (M) \wedge (CI) \wedge (CM) \wedge (P1) \wedge (P2) \quad (4)$$

3.2. Auto-poietic system

Starting from the definition of poeticity, we can define the concept (property) of suto-poietics (AP), which requires two additional predicates of sufficiency::

- (AP1) *self-reflexive capacity:* refers to the capacity (potential) of an entity to observe, record (memorize) and evaluate its state of identity with itself.
- (AP2) *conservative capacity:* refers to the capacity (potential) of an entity to generate actions - impulses - to deal with the impacts that have occurred from the perspective of maintaining the identity of that entity.

Noting the property of auto-poeticity with AP , we have:

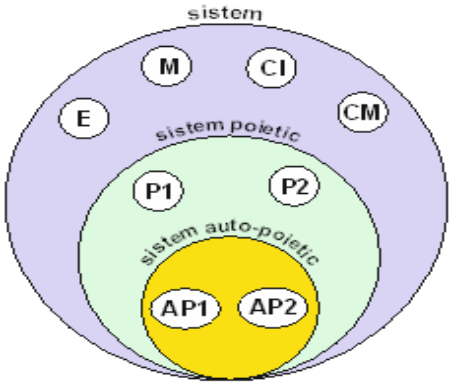
$$AP = (P) \wedge (AP1) \wedge (AP2) = (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \quad (5)$$

An auto-poietic system (SAP) can be logically described as follows:

$$SAP = (SP) \wedge (AP1) \wedge (AP2) = (E) \wedge (M) \wedge (CI) \wedge (CM) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \quad (6)$$

Synthesizing, the concepts, poietic system - auto-poietic system are represented graphically, in logical sequence, in figure 3.

Figura 3. The logical construction of: system – poietic system – auto-poietic system



Source: the author

Auto-poieticity generates, once established, a series of new predicates of necessity, respectively:

- **(**APN1) The benign accumulation of disturbances: it is a predicate that allows the storage (storage) of influences coming from the environment of the entity or from within it. The benign characterization of the accumulation of these influences aims to indicate that this accumulation does not produce immediate effects on the entity although, over a certain threshold of this accumulation, effects of change can be triggered, including at the depth level (ie at the structural level);
- (APN2) The entropic dissipativity: is a predicate that allows (or requires) the entity (system) in question the ability to maintain or decrease its entropy. This means the ability of the entity to extract non-entropy from the environment (including from other entities / systems with which it interacts) and to pour entropy into the environment (or into other entities / systems, as appropriate).

The problem of measuring entropy in other entities/systems than in natural ones - where entropy has its significance from thermodynamics - will not be examined in this study.

By integrating these new predicates of necessity into the definition of the auto-poietic system, we can complete the logical definition of the auto-poietic system, thus:

$$SAP = (E) \wedge (M) \wedge (CI) \wedge (CM) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2) \quad (7)$$

4. Societal entity

The conceptual delimitation of the societal entity implies the clarification of the concepts of *social* and *societal*.

4.1. The concept of social

The property of sociality is given by a more primitive property, of community, by which we undestand the property that the component elements of an entity to develop a limited number of functions that are common to all elements.

The concept of community involves defining attributes: a) spatial coexistence; b) power hierarchy; c) non-void intersection of individual / group interests; d) non-void intersection of the resources usable / used by each individual / group.

Therefore, the sufficiency predicate must be separated into two components:

- CIp - the multitude of inter-component connections with a "private" character, ie autonomous
- CIc - the set of "public", ie non-autonomous, inter-component connections, which involve all the components of the system

As a consequence, the property of social (or social) is manifested in all cases of entities (systems) endowed with subjects (cultural or non-cultural) in which there are connections of the *CIc* class, such as bees, ants, humans, some species of animals (lions, wolves)

A definition of the social could thus be formulated:

An entity (system) has *social* caracteristic if the subset of *CIc* is not void.

4.2. The concept of societal

According to systems theory, the set of connections between the component elements of a system generates what is called the functionality of that system.

Sociality (the attribute of social) refers only to the set of *CI* (more precisely, to the subset of *CIc*, where

$$CI = (CI_c) \cup (CI_p) \quad (8)$$

The connections between the component elements of the system and the environment of that system generates what is called the behavior of the system.

We also divide the CM set into two subsets:

- CMp, by which we distinguish the subset of the "private" (autonomous) connections between the component elements of the system (entity) and the environment of that system (entities), respectively
- CMc, by which we distinguish the subset of "public" connections (common, non-autonomous) between the component elements of the system (entity) and the environment of that system

$$CM = (CM_c) \cup (CM_p) \quad (9)$$

The logical features of the four subsets and the correlations between them are:

- $CI = (CI_c) \cup (CI_p)$
- $CM = (CM_c) \cup (CM_p)$
- $(CI_c) \cap (CI_p) = \emptyset$
- $(CM_c) \cap (CM_p) = \emptyset$
- $CI_c \cap CM_c \neq CI_c$
- $CI_c \cap CM_c \neq CM_c$
- $CI_p \cap CM_p \neq CI_p$
- $CI_p \cap CM_p \neq CM_p$
- $CI_c \cap CM_c \neq \emptyset$
- $CI_p \cap CM_p \neq \emptyset$

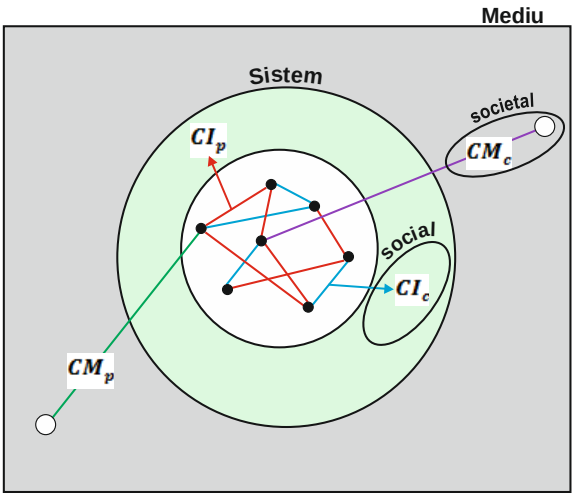
A definition of *societal* could be formulated as follows:

An entity (system) has *societal* caracteristic if the subset of CM_c is not void0

.

It is necessary to mention the fact that an entity cannot be societal if it is not a social entity first, thus signifying the impossibility of the existence of a social entity that is not societal, (situation depicted synoptic in figure 4), the distinction between social and societal being rather methodological in character.

Figure 4. The logical construction of the concepts of social, respectively societal



Source: graphic construction of the author, based on his own research

The concepts of social entity (ES) and societal entity (EST) - a social entity that has the non-CMc crowd - can be formalized as follows:

$$ES = (S) \wedge (CI_c) \quad (10)$$

$$EST = (ES) \wedge (CM_c) \quad (11)$$

5. The sustainability of living logic systems

Defining the concept of sustainability from the perspective of living logical systems, implies the prior definition of the autopoietic social entity (ESTAP) and of living logical systems (SLV).

5.1. Autopoietic social entity

In order to obtain the logical formula of the autopoietic social entity (ESTAP), we will add, in a conjunctive way, the sufficiency predicates of self-poeticity:

$$ESTAP = (EST) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2) \quad (12)$$

The analytical development of the formula leads to:

$$ESTAP = (EST) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2) =$$
$$= (ES) \wedge (CM_c) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2) =$$
$$= (S) \wedge (CI_c) \wedge (CM_c) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2) =$$
$$= \underline{(E) \wedge (M) \wedge (CI) \wedge (CM)} \wedge \underline{(CI_c)} \wedge \underline{(CM_c)} \wedge \underline{(P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2)}$$

5.2. The concept of living logical systems

The living logical system (SLV) is that societal entity that verifies two more predicates of sufficiency:

- (SLV1) nonlinearity in operation: this predicate requires that the equations for describing SLV operation are nonlinear,
- SLV 2) invariance of total complicability: this predicate requires that the logical sum between the degree of internal complicability (g_{CI}) and the degree of external complicity (g_{CE}) be invariant (constant). From a formal point of view we will write:

$$d(g_{CI}) + d(g_{CE}) = 0 \quad (14)$$

The logical formula for defining the living logic system will be as follows:

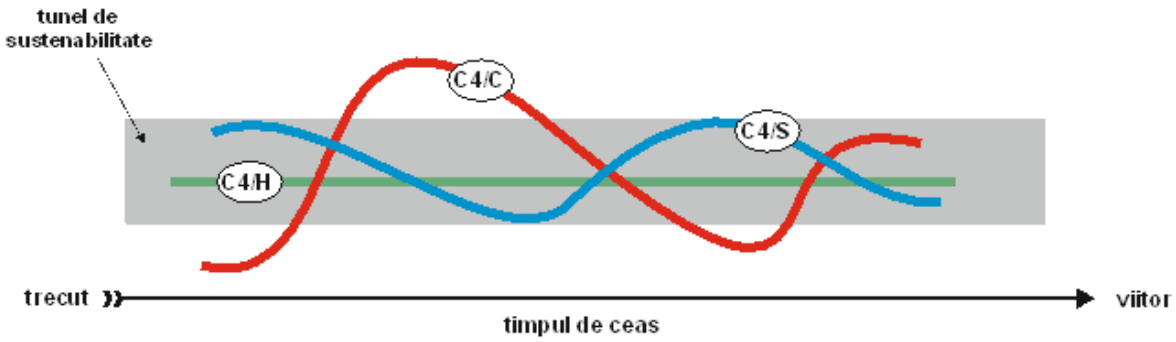
$$SLV = (ESTAP) \wedge (SLV1) \wedge (SLV2) \quad \text{where :} \quad (15)$$

$$ESTAP = (EST) \wedge (P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2) =$$
$$= \underbrace{(E) \wedge (M) \wedge (CI) \wedge (CM)} \wedge \underbrace{(CI_c)} \wedge \underbrace{(CM_c)} \wedge \underbrace{(P1) \wedge (P2) \wedge (AP1) \wedge (AP2) \wedge (APN1) \wedge (APN2)}$$

The clasiffication criterion of ESTAP, regarding the evolutionary direction of ESTAP, captures the general tendency (or specific, as the case may be), usually in the medium or long term of the changes that ESTAP manifests (or accepts, as the case may be), and allows us to identification of the following ESTAP classes:

- ($C4/H$) *ESTAP homeostasis:* characterize those ESTAPs whose evolutionary tendency (direction) is to preserve (preserve) punctually their qualitative identity, to remain identical with themselves. These ESTAPs are characterized by rigidity;
- ($C4/C$) *ESTAP cyclical*: characterizes those ESTAPs whose evolutionary tendency (direction) is to alter, alternatively (periodically or periodically) the qualitative identity. These ESTAPs show a high degree of flexibility and reversibility;
- ($C4/S$) *ESTAP susteinable*: characterizes those ESTAP whose evolutionary tendency (direction) is to preserve (preserve) its qualitative identity, but not in a punctual, rigid way, but by maintaining it in a "sustainability tunnel", within which it can suffer alterations of the punctual identity, but not of the "tunnel" identity.

Figure 5. The ESTAP sustainability tunnel, classified according to the criterion regarding the evolutionary direction



Source: the author

5.3. Sustainable living logic system

Sustainability is "that characteristic of a process (phenomenon, system) of maintaining on the desirable trajectory, in a predetermined or acceptable "band", an indefinite period of time and on a global space of accessibility" (Dinga, 2009, p.46).

Dinga (2009, p.46) considers that a number of ascertainments are needed:

- Sustainability does not necessarily constitute a "hidden" feature of processes (systems), which may be unobservable or instrumentally inaccessible to the observer or the knowledgeable or actionable subject, in the sense of their uncontrollability, but is a possibility of these processes (systems) to be governable from the perspective of maintaining the mentioned trajectory;
- Sustainability should not be seen as simply maintaining stationarity; a sustainable process may also have targets that induce increases (eg GDP/capita) or decreases (eg inflation or unemployment rate), the essential condition being to stay in the tunnel;
- A certain "energy" balance analysis is possible, also in the case of sustainability;
- Sustainability can no longer subsist, (and often is not founded either) by itself, and, under the presence of dissipative processes (systems), is being necessary that it be ensured by energy exchange with the environment of the process (system) concerned, which includes information, currency, formal aspects, etc.
- From a philosophical point of view, the sustainability of the processes cannot be separated from the sustainability of the environment in which the processes take place; ensuring the environmental sustainability of an economic process would be sufficient so that the sustainability of the process is no longer objectively threatened.

Summarizing, sustainability must be understood as that property of a system to be replicated indefinitely, with a certain margin of invariance of the conditions of existence and functioning of that system, property of indefinite replicability of a system in those objective and subjective conditionalities that are accepted as desirable at the level of the system in question, conditionalities that, however, cannot and should not be considered invariant, but only desirable (acceptable, feasible, normed). (Dinga, 2019)

References

1. Cambridge Dictionary, 2020. *System*. [online] Available at: <https://dictionary.cambridge.org/dictionary/english/system> [Accessed 2 March 2020].
2. Dinga, E., 2009. *Studii de economie. Contribuții de analiză logică, epistemologică și metodologică.* Bucharest: Editura Economică.
3. Dinga, E., 2011. *Vectori de sustenabilitate în Strategia Europa 2020*. Prezentare IER.
4. Dinga, E., 2018. *Creștere, dezvoltare și sustenabilitate economică*. Bucharest: Editura Academiei Române.
5. Dinga, E., 2019. *Elemente de modelare a sustenabilității economice, Blog, Studii stiintifice*. [online] Available at: <http://emildinga.ro/studii-stiintifice>.
6. Dinga, E., Ionescu, C. and Băltărețu, C., 2011, *Concept of Sustenability – A logical Approach.* The International Scientific Session ”Challenges of the Knowledge Society”, N. Titulescu University, Bucharest, pp.954-966.
7. Dolga, V., 2010. *Mecatronică. Teoria sistemelor*. Timişoara: Editura Politehnica.
8. Kidd, C.V., 1992. The evolution of sustainability. *Journal of Agricultural and Environmental Ethics*, 5(1), pp.1–26.

9. Rosen, M.A., 2018. Issues, Concepts and Applications for Sustenability. *Glocalism: Journal of Culture, Politics and Innovation*, 3(40), pp.1-21.
10. Salas-Zapata, W.A., Ortiz-Muñoz, S.M., 2019. Analysis of meanings of the concept of sustainability. *Sustainable Development*, 27, pp.153–161.