CONCEPT OF SUSTAINABILITY – A LOGICAL APPROACH[1]

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Abstract
The paper aims to achieve a definition of the concept of sustainability and of sustainable system from a logical perspective. In this respect, it introduces and defines (through the sufficiency predicates) the concept of logically vivid system and, on this basis, are discussed a logical concept of sustainability, respectively of a sustainable system in general are discussed and built up. Sustainability is considered in light of identity preservation of the systems, as a static anchor, on one hand, and of the concept of automatic stabilizers as a dynamic anchor on the other side. Finally, the two sufficiency conditions for a logically vivid system be sustainable are identified: the presence of hyper-cycles, respectively the absence of positive feed-back.

Keywords*: sustainability, logically vivid system, automatic stabilizer, dissipativeness.*

JEL classification*: A10, O10*

Introduction

(1) What matter does the paper cover?

The paper aims at to treat the issue of system sustainability, from the point of view of logical features which could ensure on this sustainability. In this end, the paper re-visits the current definitions in the field, in order to get a more rigorous and consistent understanding of the main concept implied.

(2) Why is the studied matter important?

Generally, the current literature is working with the concept of system in a natural science view. The paper proposes a new and probable revolutionary concept, i.e. the logically vivid system. This concept is the only that can sustain in a theoretical way the crucial issue of the sustainability, because in a natural world we find not sustainability, but only durability. So, the importance of the study matter consists in a new conceptual foundation of the sustainability issue.

(3) How does the author intend to answer this matter?

The main method the authors intend to answer the matter of system sustainability is a logical one. This means identifying the sufficient and necessary predicates (attributes) that a system must verify so it be "declared" sustainable. This method is consolidated by an analysis concerning the three "C": completeness, consistency, and coherence.

(4) What is the relation between the paper and the already existent specialized literature?

Firstly, there are many misunderstandings concerning the concepts of logically vivid system, sustainability, evolution, etc.

Secondly, the concept of sustainability is defined in a "civil" way, that is un-appropriate for a scientific approach.

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Thirdly, the current literature treats the concept of sustainability in many particular cases, but very rare in an abstract consideration, so the mentioned concept cannot be used in general research.

Preliminaries

In order to discuss, in the most general manner, the problem of sustainability, we need to clarify first, which is the entity to which we refer when we are interested in sustainability. As it resulted from what we said before, sustainability is a definitory characteristic, but a characteristic of what? We will make some considerations in this matter:

a) reality presents itself, in the most general form, under the following „categories":

- numen: incognoscible essence, as the most appreciated philosophical system consider;
- phenomenon: form under which the numen appears to the knowing subject;
- process: manner of existence of the phenomenon (by process we understand, in the most common way, the variation of the phenomenon);
- system: manner of process systematization, at the level of the knowing subject.

Therefore, the knowing subject has access to its exterior reality (and interior, of course) through the system, because it must order, make intelligible what appears. It seems therefore that sustainability should be investigated in connection with the system. This is how we will proceed.

b) The system will be defined, in the most general way, as the logic sum of the following "ingredients":

- A multitude of elements, not necessarily homogenous, whose significance, for the knowing subject, doesn't require more analytical levels of examination;
- A multitude of relations, of any kind (substantial, energetic, informational, entropic) between the composing elements;
- A membrane, of whatever nature (physical, institutional, cognitive etc.) which separates the system from its environment;
- A multitude of relations between the composing elements and the exterior of the system (the accomplishment of these relations requires crossing the membrane).

Therefore, we can say that the sufficient predicates for the existence of a system are:

- A multitude[2] of *elements*[3] (discernible or not among them): $\mathbf{E}$;

- A *membrane* which includes the composing elements and which excludes everything else from the rest of the environment: $\mathbf{M}$

- A multitude of *connections between the composing elements*[4]: $\mathbf{C_I}$;

- A multitude of *connections between the system and the exterior environment*: $\mathbf{CO_O = X_S + Y_S}$, where X represents the connections which show inputs from the environment into the system, and Y represents the connections which show outputs from the system into the environment.

Therefore, the logic description of the actualization of a system is: $\mathbf{G_S = \{E, M, C_I, C_O\}}$. We consider that the sufficient predicates do not generate new necessary predicates; therefore, they coincide with the necessary predicates. Therefore, the logic description of a system is: $\mathbf{S \equiv G_S = \{E, M, C_I, C_C\}}$.

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[2] In the meaning of the theory of multitudes.

[3] Logically, even just one element is enough to make this predicate exist. The predicate which refers to the connections between the elements of the system will be understood in this case as a multitude of auto-connections (it is not necessary to suppose that this element is, in turn, a system consisting of more than one element, because we would enter the trap of the argument with infinite regression).

[4] As said before, the multitude of connections also includes the-connections.

In order to get to the analysis of the artefacts, we want to bestow an additional qualification on the system, the qualification of logically vivid system. We consider that the following additional sufficient predicate may transform the system into a logically vivid system (SLV):

- *dissipativeness*: maintenance (or even decrease) of the entropy inside the membrane, at the cost of accelerating the entropy from the environment of the system[5]; we will note this sufficient predicate by $\mathbf{D}$.

Therefore, the logic description of SLV actualization is: $\mathbf{G_{SLV} = \{S, D\}}$.

The existence of a SLV generates, in our opinion, the following new necessary predicates:

- *auto-poietic capacity* (self-generating, self-organizing, self-reproducing); we note this new necessary predicate by $\mathbf{A}$; the logic formula for the generation of this new necessary predicate is: $\mathbf{D \rightarrow A}$;

- *non-linearity* (doesn't allow predictions[6], because predictions exclude novelty[7], rather only the decrease of the incertitude regarding the future[8]); we note this new necessary predicate by $\mathbf{N}$; the logic formula for the generation of this new necessary predicate is: $\mathbf{D \rightarrow N}$;

- *invariance of the total complexity*[9] (maintenance in a permanent invariant state,[10] of the logic sum between the inner complexity of the SLV and its external complexity – the external complexity is also called ecological complexity and it expresses the level of SLV metabolism with its environment); we note this new necessary predicate by $\mathbf{I}$; the logic formula for the generation of this new necessary predicate is: $\mathbf{SLV \rightarrow I}$.

Therefore, the logic description of a given SLV is: $\mathbf{SLV = \{G_{SLV}, A, N, I\}}$.

Let us notice that the logic description of a SLV develops two particularly important characteristics:

• *Presence of the potential for identity preservation* (or for quality preservation). This means a specific capacity of the SLV to ensure the observer that it is the same SLV. Hence, some problems which require examination: 1) why doesn't this characteristic exist in the case of the systems too; 2) why isn't this characteristic implicit in the new necessary predicate named "invariance of the total

[5] Also see our study, *Dissipative systems and sustainability*, published in Theoretic and applied economy, no. 3/2008 (the ideas from the study have also been presented and debated within the Seminar of Methodology and Logics of the Economic Knowledge „Nicholas Georgescu-Roegen", in session no. 4/2007). The study also proposed a demonstration of Prigogine's principle of the minimum production of entropy, as well as a logic model of the entropic interaction.

[6] Predictions exclude novelty, being mere morphological combinations of the known elements.

[7] As we will subsequently see, novelty is associated to emergence, which is inconsistent with computability, with the deliberative planning.

[8] Although it is possible to argue against the independence of the three new necessary predicates (it seems that non-linearity might be regarded as a necessary consequence of the self-poietic capacity), we prefer to assume this possible logical non-rigorousness, with the purpose to highlight the crucial importance of the predicate of SLV non-linearity.

[9] Let us notice that the invariance of the total complexity is not a necessary predicate of a system in general. At the same time, there is no logic connection between the (relative) invariance of the set of identity parameters of a system and the invariance of the total complexity of that system.

[10] We cannot speak with full rightness about the character of continuity (therefore we will ignore this possible attribute of the invariance of the total complexity), as long as the hypothesis of the quantum nature of the macrocosmos is not accepted at the ontological level(although the quantum nature of the microcosmos is accepted at the ontological level and, furthermore, the principle of correspondence is introduced, which makes intelligible at the level of the macroscopic epistemic subject, the directly non-intelligible microscopic).

complexity" or in the new necessary predicate „auto-poietic capacity; 3) why isn't this characteristic just the fourth new necessary predicate.

(1) The sufficient predicates used to describe the actualization of a system don't allow any kind of conclusions regarding the evolution of the system. Therefore, no evaluations can be made whether the identity of the system is preserved or not. Hence, the conclusion that the problem of the identity can be raised only in connection with the logically vivid system, regarding the actualization of that logically vivid system (regarding only the predicates of sufficiency, not regarding the new necessary predicates). Indeed, the predicate of sufficiency named dissipativeness contains the suggestion of evolution, therefore it allows to discuss the matter of SLV identity;

(2) The new necessary predicate "invariance of the total complexity" only tells us that a relation of replaceability[11] exists between the variance of the inner complexity of a SLV and the variance of its external complexity. Therefore, if there are no limitations of this replaceability (the nature of these limitations is completely obscure for us, at this moment) we can say nothing, on the basis of this new necessary predicate, about the preservation or non-preservation of SLV identity. Therefore, we cannot accept the implicit character of this characteristic in the signification of the new necessary predicate "invariance of the total complexity". This characteristic is not implicit in the new necessary predicate "auto-poietic capacity" either, because the denotation of this predicate of self-generation or self-reparation doesn't ensure us on the perfect self-regeneration or self-reparation, also because of the new necessary predicate named "non-linearity". Therefore, we may witness the return of the SLV, through its auto-poietic capacity, to an initial or previous (generally speaking) capacity, but it is obvious that the failure of a perfect return, over a specific level, causes the loss of SLV identity;

(3) This is a more difficult question. Indeed, one might consider that we have a fourth new necessary predicate, "preservation of the identity", but in this case it would mean to stipulate that any SLV is invariant, that it can not evolve in any way (or, evolution, in the broadest meaning of the word, means alteration of identity). In order to avoid the absurd situation in which any SLV is, by definition (because the new necessary predicates enter, as sufficient predicates, in the logic definition of the concept) invariant, lacking evolution, static, we need to exclude this characteristic from the multitude of the new necessary predicates. Furthermore, such a new necessary predicate would be inconsistent with the new necessary predicate "invariance of the total complexity" which, as already shown, signifies SLV variance, on condition of the replaceability between the variance of the internal complexity and the variance of the external complexity.

It is necessary to develop further the concept of identity preservation because, on its basis, we will introduce the logical conditions of sustainability. As previously mentioned, we will discuss this concept exclusively in terms of quality, or logically; the aspects of quantification, observation/recoding or measurement are not of interest for us, for the time being.

The preservation of identity can be analysed from the perspective of the nature of this preservation. Thus, we may have the following types of identity preservation[12]:

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[11] We draw attention on the following crucial aspect: the replaceability rate between the internal complexity and the external complexity is not necessarily 1 (it is obvious that it is negative), because of the new necessary predicate named "non-linearity". If this rate would be 1, it is furthermore possible to demonstrate that there is no global variation of entropy within the logic assembly "SLV-complementary environment", while we know from the second law of thermodynamics that, at the global level, there is a permanent increase of entropy. It would be interesting to study the existence of the continuous, or quantum (discrete) character of the replaceability rate between the two categories of complexity, because on the basis of these studies we might give a quantitative definition of SLV identity. For the time being, this research is beyond the scope of this study, hence we will make just some qualitative considerations.

[12] The first three classes of identity preservation originate in a genealogical perspective. Given the diversity of the classification criteria of the potential for identity preservation, the genealogical criterion seemed to be the most adequate, particularly since it is preferred in the field on nature science.

- *full identity preservation* (at individual level): it refers to the preservation of all necessary predicates of the SLV. This means that the necessary predicates E, M, C_I, C_O are preserved[13];

✓ example: the system of banking saving, as individual of the system of saving

- *special identity preservation* (at species level): it refers to the preservation of the structural aspects of the analysed SLV. This means that the necessary predicates E, C_I, C_O are preserved;

✓ example: the system of banking saving, as individual of the system of using the available income;

- *general identity reservation* (at genus level): it refers to the preservation of SLV metabolism. This means that we have identity preservation in the necessary predicates C_I, C_O. The difference between the formal preservation of identity and the special preservation of identity is that the nature of SLV composing elements doesn't matter any more, rather the relations between them and between them and the environment;

✓ example: the system of using the available income as individual of the system of aggregate demand formation

- *formal identity preservation* (at the level of causality): it refers to the preservation of the generative mechanism of a SLV;

✓ example: preservation of the equation describing a specific process makes that process preserve its formal identity (that equation may represent the specific process, either graphically, or in other intelligible form which allow recognition).

• *Presence of the automatic stabilizers*. This characteristic is an immediate consequence of the auto-poietic capacity of the SLV (necessary predicate, as we have seen). The capacity of self-reparation, self-generation means the capacity to restore the initial conditions, after they have been possibly disturbed either by system functionality[14], or by its behaviour[15]. The restoration of the initial conditions signifies, theoretically, an action of negative feed-back. Therefore, this characteristic can very well be named "presence of negative feed-back". We prefer, nevertheless, to make reference to the automatic stabilizers because the negative feed-back has the connotation of purely natural process, while the automatic stabilizer al has the connotation of an artefact. In the case of the SLV which includes man/human society, almost all the mechanisms of negative feed-back are artefacts. It is obvious that similarly with the potential of identity preservation, this characteristic too, cannot be considered another necessary predicate. Indeed, if it would be a necessary predicate, it would be redundant with the necessary predicate of the auto-poietic capacity; therefore, the condition of independence of the multitude of necessary predicates would no longer be met.

1. Logic conditions of system sustainability

On the basis of what we have determined in the above paragraph, we propose to investigate the logic conditions of sustainability of a given system.

2.1 Logic concept of sustainability

From what we said so far, we obtained a definition of sustainability, at least for the economic systems. Nevertheless, we are interested in a more general definition, which to apply to any SLV, irrespective of its nature.

First, we will say that the distinction durability-sustainability has an "image" in the distinction „SLnV – SLV" (SLnV signifies logically non-vivid system). SLnV is a system in equilibrium or

[13] The attentive reader had already noticed that any sufficient predicate also is a necessary predicate, although not any necessary predicate is a sufficient predicate (for instance, the new necessary predicates are not sufficient predicates).

[14] According to the cybernetic theory, system functionality means the assembly of relations of any kind between the elements composing the system (within the membrane).

[15] According to the cybernetic theory, system behavior means the assembly of relations of any kind between the system and its environment (by crossing the membrane).

tends, irreversibly, towards a state of equilibrium[16]. The systems which are in equilibrium or which tend towards a state of equilibrium are characterised by durability. The durable systems are characterised exclusively by finality. On the other hand, SLV, the dissipative systems, are far from equilibrium or tend to go farther away from equilibrium[17]. They have a purpose. Figure 1 shows the fundamental distinctions between a SLV[18] and a SLnV:

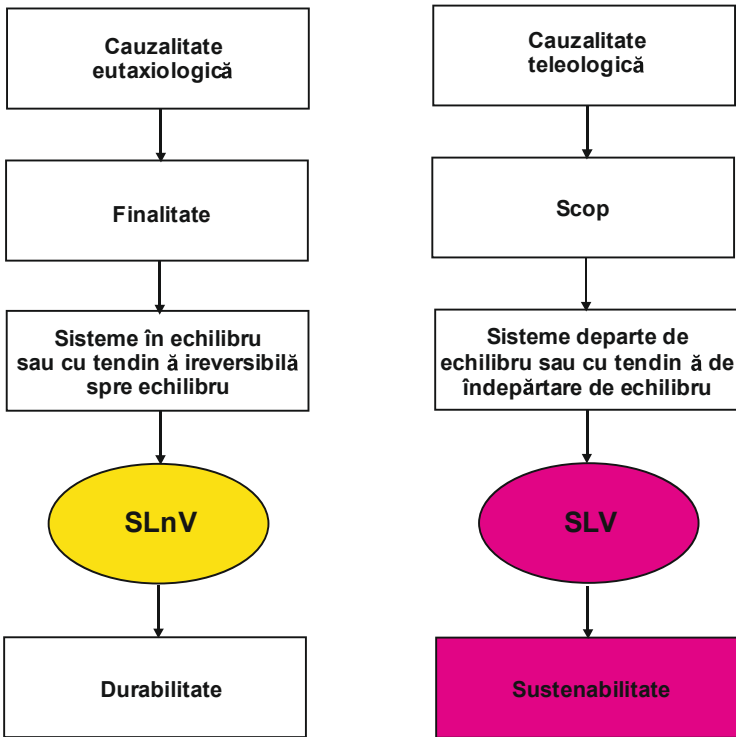

Figure 1: *Basic distinctions between SLnV and SLV. „Location" of sustainability*

Second, taking into account the necessary predicates of a SLV, it results that it has, at the same time, potential for identity preservation (by its auto-poietic capacity) and potential for identity differentiation (by non-linearity). Because of this reason, a SLV is not necessarily a sustainable system (SS). The necessary predicate of the invariance of the total complexity ensures only that the "losses" from a type of complexity are compensated by the "gains" from the other type of complexity, but it is obvious that a variation in excess of a specific level of the terms of the logic sum mentioned earlier, may result in the loss of identity preservation. The key concept here seems to be the *recognition* of the identity profile. By recognition of the identity profile of a SLV we understand the fact that the observing/recording subject notices a sufficient overlapping of the list of attributes specific to a particular SLV at the moment of reference t_r and at the moment of evaluation t_e. The significance of the syntagm "sufficient overlapping" is crucial for our discussion. Actually, we have

[16] Here, the concept of equilibrium must be taken in its most general meaning, that of entropic equilibrium.

[17] According to Prigogine's proposals (see, for instance, the *New Alliance – Metamorphosis of the science*, Political Press, Bucharest, 1984).

[18] A SLV van be both artefact and natural entity. For instance, the fiscal policy is and artefactual SLV, while an ecological pool is a natural SLV. A SLnV is always a natural entity.

here two correlated matters: the first one refers to the evaluation criterion – it is obvious that the observation/recording of the identity profile is always done from the perspective of a favouring criterion (for instance, the Turing test is done from the perspective of the criterion of rationality, more precisely, from the perspective of computability, not from a general perspective); the second refers to the threshold of observing the non-identity and it differs with the scientific background of=r general cultural background of the observing subject, with the technological possibilities to compare the two lists of SLV attributes. Once the evaluation criterion is accepted, and once the mentioned level can be detected, the operation of identity profile recognition is possible. If this identity profile is recognised, than the SLV is considered to be sustainable, otherwise it is considered to be unsustainable[19].

Therefore, on the basis of the above, we may try to give a logic definition of the concept of sustainability or, more precisely, of the concept of sustainable system. We will say the following:

A SLV is sustainable if, and only if its identity profile is preserved for an indefinite period of time (supposed to be infinite) within a tunnel[20] of recognition.

There is an extremely difficult problem that has to be discussed about this definition, problem which is not yet solved theoretically. This is about predictability within a SLV[21].

First, it seems somehow obvious that a sustainable SLV which, as the proposed definition says, has a trajectory which doesn't leave the identity profile of that system, should be a predictable system. Indeed, the recognition of the system by the observing/recording subject as the one that is already known about, should ensure on the fact that the margin of novelty[22] is so small (because the system doesn't leave a tunnel of predictability, which is a tunnel of necessary predictability, not of contingent predictability) that the future states of the system should be predictable[23]. However, things are not like that. As it is known, this predicate suspends the determinism in some points, named points of bifurcation (or fulgurant points), in which the choice of direction towards which the system will continue to evolve is the result of pure chance[24]. Therefore, due to the action of this necessary predicate, a sustainable system is not ipso facto a predictable system.

Second, a sustainable SLV is consistent with a poor predictability, so to say. We are referring exactly to the fact that, by definition, a sustainable system preserves its identity profile. This means that in the case in which the predictions limit to this preservation, they will be certainly verified. The poor predictability is what we understand by verisimilar scenarios, therefore they are not prognoses. As the scenarios are function of the model parameters, and as these parameters are the same with the parameters which control the preservation of the identity profile of the system, we draw the conclusion that, within the sustainable systems, it is possible to have poor predictability, in the form of the alternative scenarios.

[19] We are expecting subsequent research to propose a test of sustainability (of recognising the identity profile), to be used by the observing/recording subject (similar to the Turing test of computability).

[20] By definition, a tunnel is characterized by two limit thresholds (lower and upper) and by a direction of the travel given by the time arrow (therefore, ultimately, by the increase of the global entropy).

[21] The recent literature discusses the matter of the predictability, in general, for any system. An increasing number of researchers in this field reject the predictive capacity of a science as test of its scientificity.

[22] As it is known, novelty is unpredictable because it doesn't allow the mere morphological combination. Novelty implies emergence.

[23] Of course, we are speaking of predictability not in terms of probabilities (which only "increase" the microscopic indetermination for purposes of macroscopic knowledge), rather in terms of non-linearity.

[24] This time we are no longer confronted with a contingent (or, maybe, necessary) technological incapacity of the man to know the group of causal factors, incapacity which has been avoided by introducing the probabilities. We are confronted with a situation of indetermination generated by the so-called coupling of the phenomena which occurs in the dynamics of the system.

2.2 Logic conditions sufficient for a sustainable system

Identity profile recognition denotes that the examined SLV is sustainable between the two moments, t_{i_0} and t_{i_1}. But what makes us believe that sustainability preserves after the moment t_{i_1}? Actually, we have to determine just the logic conditions which, once verified, ensure us on system sustainability irrespective of the subsequent moments, $t_{i_1}^k > t_{i_1}$, where k is a time counter. There are two logic conditions for sustainability:

a) Presence of hyper-cycles, both in system functioning and in its behaviour (in the way that the two concepts, functionality and behaviour, have been defined previously);

b) Absence of the positive feedback.

(a) Presence of hyper-cycles[25]

A SLV actually is the "headquarters" of a process (or of several structurally and functionally coupled processes[26]). Consequently, it makes sense to speak about the time (irrespective whether we are speaking of an intrinsic time, proper time, or of clock time, mechanical time) of a repeatable sequence of that process (or of the envelope of several coupled processes). The period of time in which such repeatable sequence occurs (the suggestion of fractality is irresistible here) within a process will be called cycle of that process. In terms of the theory of the systems or of cybernetics, a cycle[27] can be measured by the interval of time in which an input of the system which "hosts" the process is repeated (Figure 2 gives a synoptic representation of this idea):

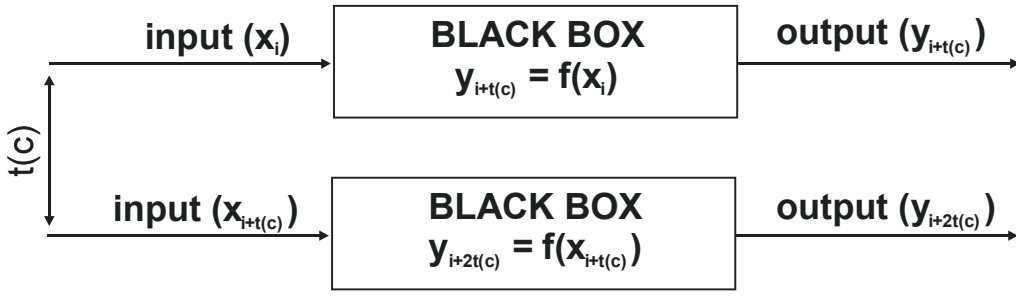

Figure 2: *Synoptic representation of the system cycle concept*

In most imaginable processes, the output can become, partially, input for the subsequent cycle of the same process or, most often, totally, or partially, input in the processes coupled to the original process. This idea which sets that an output of a process can become input in a coupled process[28] is the grounds for introducing the concept of hyper-cycle. Therefore, a hyper-cycle is a cluster, successive or concomitant, of cycles connected structurally or functionally, by which in several

[25] The concept of hyper-cycle has been inspired by the research in biochemistry of Manfred Eigen, regarding the self-organisation of the molecule (evoked in Friedrich Cramer, *Chaos and order. The complex structure of the living*, Bic All, Bucharest, 2001, p. 122).

[26] The expression „coupled" has a very precise signification here. It doesn't show a mere correlation; rather it refers to a reciprocal and permanent dependence between the coupled processes or phenomena (just about the way in which we speak, in the field of Econometry, of simultaneous equations), also from a causal perspective (although it is ironic to notice that the causal coupling is one of the phenomena or processes generating non-linearity, therefore, what we are mistakenly name non-causality or, at least, indeterminism).

[27] We consider that the duration of the cycle is constant throughout the "life" of the system. Otherwise, the acceptation of the hypothesis of a variable duration of the cycle doesn't change basically the reasoning or its conclusions.

[28] It is not necessary to add the syntagm „or within the same process", because a process is considered, by definition, to be coupled with itself.

coupled processes, the outputs from a process become partially[29] or totally, inputs for another process. This definition calls for comments:

1. The possibility of coupling the processes, as defined in this concept, implies adequacies or correlations of at least three categories:

- *Adequacy of nature*: the output of a process, which is to become input for another process, must be of the general nature of that input. The adequacy of nature occurs spontaneously within the SLV in which man is not present (it occurs, thus, by emergence), or deliberately in the SLV in which man is present (we are, of course, speaking of artefacts in this case;

- *Adequacy of cycle rate*: the rate of the process which generates the output must be equal with the rate of the process which uses this output as input, or it must by a submultiple of the latter (in this case, the first process will form stocks of output up to the coincidence between the rate of the process which uses the output as input and the corresponding number of cycles of the process which generates the output);

- *Adequacy of structure*: in the case in which the output of a process is not mono-qualitative, the coupling of the cycles of two processes involves the existence of an isomorphism between the structure of the output of a process and the structure of the process which uses the output as input. Of course, this condition is not rigid: it is possible that the input of a process consists of several outputs of several processes, so that their assembly verifies the necessary structure for that input. It all depends on the complexity of process coupling (of the cycles). Of course, the mirrored image is valid too: a poly-qualitative output may be distributed to several mono-qualitative inputs which are used as such by several processes, in agreement with the adequacy of nature that we mentioned previously. Figure 3 describes graphically these considerations inn the case of an open hyper-cycle (the input of the initial process(es) doesn't use the output of the last subsequent process(es), while Figure 4 describes graphically these considerations inn the case of a closed hyper-cycle[30] the input of the initial process(es) uses the output of the last subsequent process(es):

[29] The part from a random output of a process which doesn't form input for another process, must be consider as belonging to externalities. A externality is an output of a process whose finality is the increase of the global entropy through: decrease of the entropy in the system where this process develops in the case of the positive externalities, and increase of the entropy in the system where this process develops in the case of the negative externalities.

[30] Which, in other terms, referring exclusively to the economic systems, is expressed as active circular processes.

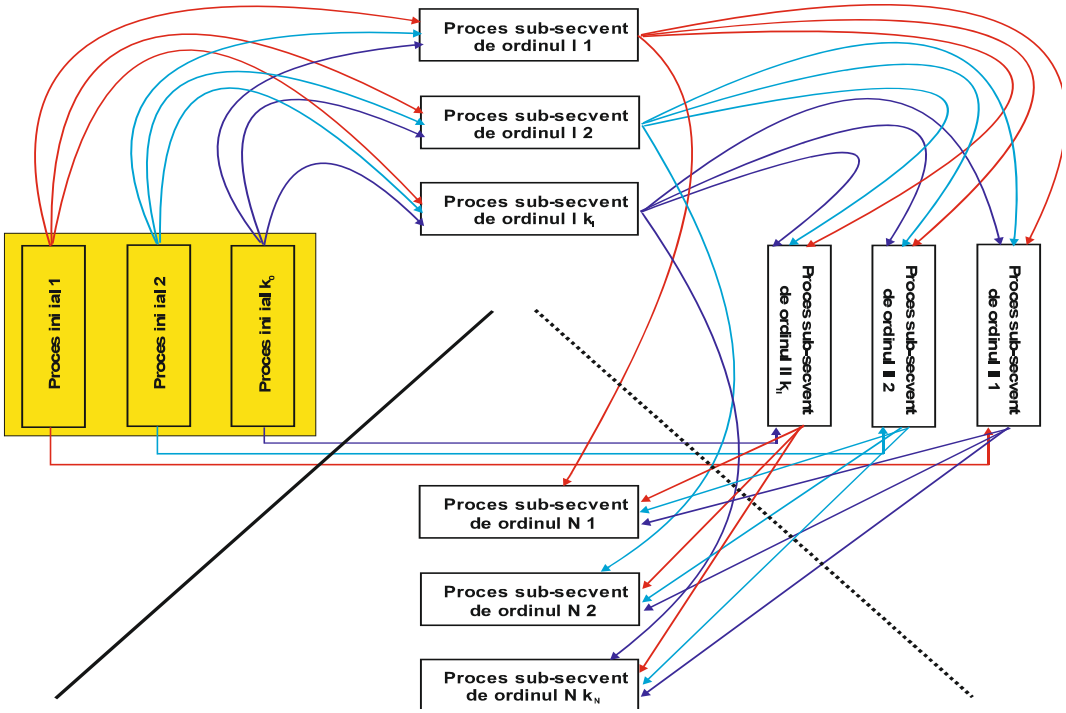

Figure 3: *Synoptic representation of an open hyper-cycle*

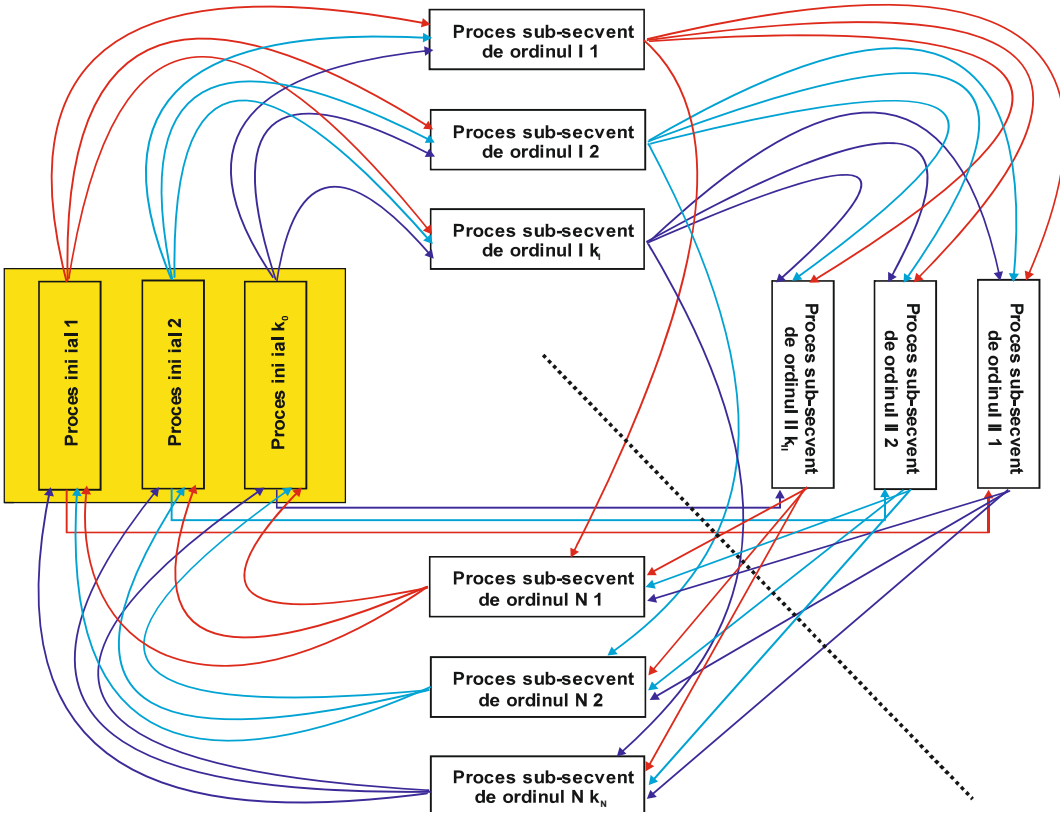

Figure 4: *Synoptic representation of a closed hyper-cycle*

3. The coupling of processes at the input – output level – refers both to the processes occurring within the membrane of the system, and between processes occurring within the membrane (from the system environment). As shown in our discussion about the necessary predicates of a SLV

4. As shown in the discussion about the necessary predicates of a SLV, the proportion of coupling between the processes within the membrane (coefficient of the internal couplings) increases in relation with the proportion of couplings between the processes within the membrane and the processes from the system environment (coefficient of external coupling) with the increase of the internal complexity in relation with the external complexity of the system (ecological complexity). Thus, the coefficient of internal couplings is much higher in man than in a river rock.

(b) Absence of the positive feed-back

The necessary predicate of the auto-poietic capacity implies automatic stabilizers, which means negative feed-back. This is obvious, because the sustainable SLV must preserve its identity profile by neutralizing or, ultimately, reversing the trend promoted by the non-linearity which necessarily appears within such systems. The presence of the automatic stabilizers doesn't ensure fully the absence of the positive feed-back. Positive feed-back often appears in the bifurcation points generated by quantitative accumulations, which cause disruptions in the process, unpredictability and emergence of novelties. The positive feed-back has the potential to take the system out of the tunnel of identity profile recognition. Consequently, we consider that the second logic condition for SLV sustainability is the absence of the positive fed-back in the processes which occur within the membrane, in the processes from the system's environment which are coupled with processes within

the system's membrane. We may have a question here: by putting this imperative condition, don't we cancel any possibility of evolution of the system, even within the limits of the tunnel of identity profile recognition? We think that the answer to this question is a negative one: the bifurcation points which produce novelty, therefore evolution within the system, are not banned by putting this condition. They are still allowed, only that their emergence on the path of the system doesn't produce dangerous escalations endangering the maintenance of the system within the limits of the tunnel of identity profile recognition. In other words, the emergence of the bifurcation points, thus of novelty, is accompanied by an immediate restabilization of the system, without giving it the opportunity[31] to develop principles of leaving the tunnel of identity profile recognition. Therefore, putting the logical condition of absence of the positive feed-back is necessary, but this is not inconsistent with the predictable evolution of the sustainable system; however, this is a weak predictability, as shown before, predictability which allows emergence, thus novelty, in the evolution of the system.

Conclusions

(1) The main outcomes of the paper

The paper delivers the following outcomes:

a) Logically rigorous definitions for system, logically vivid system, sustainability

b) Complete sets of sufficient and necessary predicates for the concepts introduced and used in the paper economy

c) The "locations" of the misunderstandings of the used concepts.

(2) The implications of the paper outcomes

(a) A new paradigm of modeling the systems by the concept of logically vivid system

(b) A new methodology to design the definitions of the concepts: the logical method (identifying of the sufficient and necessary predicates)

(c) A new methodology to ensure on the scientificity of the definitions: the three "C" analysis.

(3) Suggestions for future researches

(a) The causal relation between globalization process and sustainability feature

(b) A deeper research of the hyper-cycles associated with sustainable systems

(c) Reassessing of the automatic stabilizers as crucial predicate for the sustainable systems.

Selected references

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[31] Here, the term of opportunity has its praxiological significance.