A TRANSDISCIPLINARY SYNTHESIS MODEL OF THE COMPLEX SOCIETAL SYSTEMS: An intelligibility frame of rural communities areas

Ion IONESCU [1]

Abstract

It is obvious even for the most ardent loyal stubborn supporters of the dominant scientific paradigm (based on Newtonian mechanics, Cartesian dualism, Aristotelian logics, etc.) that there have been many unexpected unwanted unintended events and problems that cast a shadow not only on science but on the very validity of our worldview. Human societies are a part of the long term evolution of the Earth, which is characterized by the successive complication of the physical, chemical, biological, organic, societal entities. The societal systems share several traits with the other complex systems: the principles of thermodynamics, the physical-chemical reactions, the non-linear dynamics, organizational limitations etc. (that is they follow norms and rules from all types of complex systems). By means of growing complication, the systems acquire emerging features. Complexity can be studied by means of complexity. Can one integrate the above mentioned concepts (and many more) into a transdisciplinary synthesis model in order to ease the understanding of occurrence, evolution, self-organization, and the functioning of complex systems. We suggested such a model comprising. Let us add other suggestions regarding subtle interventions upon systems. Since we are currently concerned by the problematic of the sustainable development of rural territorial communities, the closing of gaps and the construction of their competitiveness, we suggest an intelligibility frame drawing from the above described model.

Keywords: *transformations, scientific paradigm, growing complication, self-organization, self-reproduction, models for dynamics simulation*

1. There are significant *gaps*[2] between countries, regions, communities and we hoped that they would be diminished by certain *reforms* of institutional arrangements, by cultural and mentality changes. The *replacement of the elite* did not have compelling results for that matter, and neither did the new political lot, that is there were no *great transformations*, *fundamental turns*, *magical solutions*, *miracles*… The situation only became more *complicated* and 'the market', 'the state' and 'the civil society' play the leading roles in the management of the present and the future of countries, regions, communities. The working logics and genuine action are still those of the *development of society and man by nature exploitation*,

[1]"A.I.Cuza" University, Faculty of Philosophy and Socio-Political Sciences, Department of Sociology and Social Work; Bd. Carol I no. 11, 700506, Iaşi, România; ion@uaic.ro

[2] Distancing between communities, regions, societies, disagreement, disproportion, mismatch between situations, state of affairs and attitudes; lack of harmony between conceptions, events, facts.

the value-added is still rooted in *depriving the other(s) of their power, wealth or knowledge…* One speaks of *European integration*, the linkage between local spaces to the European one, but everybody wants to have more than the others, something better, something else and the fascinating and (reckless) consumer society makes us waste raw materials, labor, energies. There are ever more consumer products being made in order to be immediately replaced, there is mass production in a sophisticated manner and according to fashion trends[3] or to luxury for luxury's sake, even when there are *crises* in the world. We throw a lot of things to garbage despite the fact that *future generations should benefit from at least the same amount of resources*, the same production potential and a stable balance between nature and anthropic elements. It is ever more clear, because of the signs we see in our everyday life, that *a certain type of growth is put to question, comes to an end and another one must be invented*. A genuine sustainable *democratic society* has a solid base and its citizens are one with nature and responsible for what they do and happens to them. The *diminishing of gaps and poverty* is a major current problem for reasons related to the survival of the humankind as a whole. The proposed *plans*, *policies*, *programs*, *projects*, *models*, *solutions* are reductionist given the complexity of the world we inhabit. The community and societal facts and phenomena integrate simultaneously economic, technical, social, political, cultural etc. dimensions. *Globalization* seems to induce a sort of addiction of societies to a coherent set of principles, values, laws, norms, rules intended to ensure a *globalizing cohabitation*. In fact, it is difficult to create such an 'addiction' if we *did not choose – a long time ago and we do not choose now – the way by deciding upon it together*, if we do not honestly sum up what we managed and how we did it, as well as predict what we want to manage and how exactly do we want to do it in the future.

It is obvious even for the most ardent loyal stubborn supporters of the *dominant scientific paradigm* (based on Newtonian mechanics, Cartesian dualism, Aristotelian logics, etc.) that there have been many unexpected unwanted unintended events and problems that cast a shadow not only on science but on the very *validity of our worldview*.

> If for a long time the universe, nature, society seemed to be mysterious and frightening forces (individual perceptions leading to their spontaneous figurative intuitive mental *shaping*, to graphic symbolic representations and mythical-magical rituals etc.), during the *emancipation through knowledge and action* people shook off these *models* of the occult non-physical and unworldly traits and forces. From *mythos* to *logos*, the emancipation meant the break between sciences and religion, art, etc. *Scientific theories* also 'distanced themselves' from *philosophical (metaphysicizing) speculation* but the philosophies were not repudiated (especially those that *drew on*

[3] What becomes unfashionable in a short period of time before the *fashionable* object exhausts its potential (such as clothing, electronics, cars etc.).

scientific discoveries). The antique and Renaissance philosophy created and deepened the idea of the leap from *transcendence* to *immanence* in conceiving and explaining nature, the idea of *autonomization* of the transformation of nature on the one hand, and the divine intervention on the other. The emancipation from myth and supernatural took place in a clearer and coherent way at the beginning of *modernity* when the *model of the unity* between microcosm and macrocosm, order, harmony, continuity was suggested. The *de-anthropomorphization* and *desacralization* took place gradually along *analytical quantitative research* that searched for a *physical-mathematical intelligibility* of nature and society. The result was the *mechanist model* that was criticized by those who suggested *more complex models* and did not accept *outerness* without *innerness*, *objectivity* without *subjectivity* and looked for nature secrets not only at its physical level but at the level of *consciousness activity* as well. The *critique of pure reason* replaced the Cartesian dualism (mind-body), the epistemological dualism (thing in itself – phenomenon). According to Kant, the 'definitive' worldview must take into account the link between the way natural phenomena take place and the way art happens, as well as the connection represented by the *necessity realm* and the *freedom realm*. Fichte believed he had discovered the common origin of the *layers of existence* in its *self-consciousness* (having knowledge as a starting point one can reach other phenomena, in a one-way direction). Schelling wanted to prove the *sameness of nature and thought* (they are both governed by the same forces), Hegel suggested the *dialectic method* of unraveling the *antinomic and dynamic unity of being* (from *identity* to *difference* and vice-versa)[4], as the Hegelian dialectic synthesis (*thesis-antithesis-synthesis*) was thought to be the explanatory key to all reality. Scientists also looked for the *unitary explanation* of the world. Any *particular* thing is also *universal*, and science is not content to look at things in an isolated abstract and static manner, but in a unitary harmonious simple configuration, knowing that each of the *reality levels* or *stages* brings something new and irreducible when compared to the others. Everywhere there are *indetermination* areas making room for *improvement* or *decadence*. Every reality level is a transcendence of the previous ones. Bergson spoke of the 'vital impetus' as a *trend*, as an *action*, something that *one does*. Universal order and harmony are more easily explainable if one assumes the existence of a principle for the creation of all the phenomena at the various levels (physical, informational, existential). 'To be' means 'to relate', according to Heidegger, the ego comprises the non-ego, *otherness* and *ipseity* are interchangeable. *Coexistence* is a fundamental trait of existence, regardless of whether we observe it as a singular being or a relational being. Existence is the realization of its own possibilities.

It is obvious to many that the theories that have guided us for so long are not useful now when we have to account for the *accelerated evolution of society*, when he have to understand the '*logic of emergency*'. These are not the first reactions to this accelerated evolution…

[4] *Identity* generates – by its repetition and opposition – *diversity and novelty*, *quantity* opposes *quality* and they find a common denominator in *measure*, *universality* is opposed to *individuality* and the meet in concept or idea.

Nothing new (that is the system we live in is just, and the negative aspects are momentarily unexpected consequences); *profound mutation*, according to others (that is inequalities are inherent to the system; in society, the poor, the unemployed etc. are not momentarily unexpected consequences, but inherent to the operation of the system; therefore, the system is the problem). There is *nostalgia* among those who regret the model of the agrarian society, with a stable 'monolithic' organization, having strong and clear-cut religious convictions, hierarchical social classes, indisputable national and ethnic identities…

Human societies are a part of the long term evolution of the Earth, which is characterized by the *successive complication* of the physical, chemical, biological, organic, societal entities. The *societal systems* share several traits with the other complex systems: the principles of thermodynamics, the physical-chemical reactions, the non-linear dynamics, organizational limitations etc. (that is they *follow norms and rules from all types of complex systems*). By means of *growing complication*, the systems acquire *emerging* features.[5] *Self-organization*, *self-reference*, *self-reproduction* etc. are attributes emerging beyond a certain *complexity threshold* and are not comprehensible by means of simplistic mechanicist biologist theories. They require *new theories* and *new formal instruments*: non-linear dynamics, the theory of chaos, the theory of fractals, the theory of cellular automata, networks theory, cybernetics etc. They require that we doubt and *denaturalize the epistemological and ontological habits* we take for 'natural' and 'for granted'.

The *hypothetical-deductive model* was suggested as an alternative to the *hypothetical-inductive model* (where the accumulation of occurrences lead to generalizations). We create hypotheses, we use existing theories, we generalize and predict on the bases of their deductions (a successful prediction is an adequacy plausibility test for hypotheses and theories, a successful explanation leads to predictions that come true). Scientific knowledge is a network of hypotheses and logically (and mathematically) interconnected theories that makes data meaningful.

Such models generated replies, objections that they are grounded in 'positivism' and 'mathematical logics', that the support for models, the focus on formal attributes of scientific explanations distract one from the status quo, from the practical practices and complex processes, that the goal of the hypothetical-deductive model is *to state what things should be like* and not *to state what they are like* – because the prescriptive-normative function is a nuisance as there are many events in society that are not captured if taken into account by this model.[6]

[5] That come out of a medium after they crossed it.

[6] Robert W. Rieber (ed.), 2006, *The Bifurcation of the Self. The History and Theory of Dissociation and Its Disorders*, Springer Science, New York.

Despite the fact that the knowledge gained through the use of such models was taken as a step forward in social sciences, it is criticized by the partisans of the *grounded theory*.[7]

There is no model with universal support, but models are necessary because they organize knowledge on a given system. *Shaping* is not limited to the construction of a *formal model*. The model is a goal-oriented simplification that is obtained by 'abstractization' and aggregation. Those that refer to the dynamics of the societal system should be *models for dynamics simulation* of continuous discrete and hybrid systems: a *continuous* system includes state variables that permanently change (are described by differential equations); there is a finite number of state changes in a *discrete* system in a finite period of time; *hybrid* systems combine continuous and discrete behavior. These models can be *determinist* and *stochastic* (inputs are given in the former and a unique set of outputs in the latter; the stochastic systems present several outputs). *Multilevel shaping* ensures a more adequate *understanding* of social systems and their dynamics.

When observing the main trends in the evolution of societies (at least after the Second World War), one notices that some of the *events*[8] may be taken as *progress* (improved the life quality of significant numbers of populations), and others as *negative side effects* (disturbed the quality of life, freedom, expectations, desires of certain segments of the population).

One notices that there has been 'progress' especially in science and technology (fossil fuels, oil, renewable energy, nuclear resources – that liberated people from intensive labor, as well as the extraction and use of raw materials to produce goods leading to material affluence, and extended transportation

[7] At first, the *grounded theory* is a reaction to the mainly quantitativist concerns in social sciences. Glaser and Strauss (*The Discovery of Grounded Theory*, 1967:7) noticed the existence of an 'embarrassing gap between theory and empirical research'. They suggested that the inductively created theory be modified taking into consideration the gathered data, with a view to the interaction between data analysis, theory and sampling. After data gathering there is data analysis and the generation of categories. The data is continuously compared which leads to the construction of categories and relations between them; the categories may be refined consequently, may become more abstract; their arrangement in a logical frame can be modified as data is gathered and analyzed; the researcher is always ready to (re)build concepts as they come out of the data; case selection is made by *theoretical sampling* with the goal not to get to 'representative samples', but to identify the cases that can make a difference for theory reconstruction; the *negative case* – that does not fit the *developing theory* – must be examined mainly so that one should be able to accordingly modify the theory; one does this until there are no more disproving cases. Instead of helping to pre-determine the nature of the research, the *grounded theory* becomes part of the research. Some supposed that *grounded theory* meant the approach of the study subject without a pre-established conceptual frame; however, in order to choose a research theme, one must have previous knowledge about it, pre-conceived ideas about it. The researcher's own view can also shape the scientific endeavor.

[8] 'Social life can be conceptualized as being made up of countless *happenings* […]. Most happenings reproduce social and cultural structures without significantly changing them. *Events* can be defined as relatively rare subcategories of happenings that significantly transform the structures' (Sewell, 1996, 262, in *Bifurcations. Les sciences socials face aux ruptures et à l'évenement*, La Decouverte, Paris, 2010, 11).

infrastructure facilitating mobility, and communication networks that improved information exchange between people, between people and machines, and computers and the new informational and communicational technologies, findings in biology and medicine, etc.). 'The negative side effects' are all climate changes (because of the CO_2 emissions and pollution), greenhouse effects, soil erosion, water pollution (surface and ground), pollution with chemical and radioactive waste, the extinction of species, the negative impact of biotechnologies (especially the genetic ones that cause mad cow disease, for instance, and SARS[9]), the degradation of human health, addictions, racism, intolerance, violence, criminality, the collapse of the planned economy systems, the dilemmas of democratic states, the privatization of common goods, the unequal distribution of wealth, the rise in debt, the terrorist movements, etc.

The progress at the material, physical level of things can be analyzed by *controlled reduction to simple parts* (using the reductionist method of the sciences of the physical), but the negative effects, the economic, political, sociological and psychological problems cannot be analyzed in the same manner. *Complexity can be studied by means of complexity*.[10] The most significant characteristics of the *complex systems* are the *holistic* ones, they do not come from a certain component, but are *collective emergent effects* resulting from the interexistence, inter-dependence, cooperation etc. of the parts of the system. Self-organization, morphogenesis, self-regulation, life, conscience are emergent synergic attributes of the collective effects of several processes in the systems.

Can one integrate the above mentioned concepts (and many more) into a transdisciplinary synthesis model in order to ease the understanding of occurrence, evolution, self-organization, and the functioning of complex systems?[11] E. Schwarz[12] suggested such a model comprising: the concept of *system* according

[9] Severe Acute Respiratory Syndrome.

[10] The theory of complexity in computer science studies the complexity of algorithms. One notices the complexity in time and that in space (the complexity in space refers to the memory volume necessary to calculi, and that in time to the necessary time for the calculi), and they are both expressed as *n* functions (*n* is the measurement unit of the input data). Complexity is expressed by *big O* and retains the term that grows the fastest together with the growth of *n*, because this terms has the greatest impact on the execution space (or on the occupied space) of the implementation of the algorithms, and the other terms become negligible in the case of higher values of *n* (http://ro.wikipedia.org/wiki/Teoria_complexitatii).

[11] A *complicated* ensemble is a simple addition of pre-existing separable components. A *complex* ensemble is a construction starting from a number of components interconnected into a thick network of relations, so that the modification of a part in the system may lead to the modification of the system that can modify the parts.

[12] E. Schwarz, 'Toward a Holistic Cybernetics. From Science Through Epistemology to Being', *Cybernetics and Human Knowing*, 4, 1997. He suggests an ontology where the viable persistent systems can maintain, change, die out, that he developed as a general theory of viable autonomous systems. This research was stimulated by the work on lectures on *Introduction to rethinking systems*, by the theories of I. Prigogine, Erich Jantsch (1980), Maturana and Varela (1979) etc.; Schwarz identified the common traits of these different approaches and built a transdisciplinary

to Ludwig von Bertalanffy,[13] as an invisible entity whose inner structure has emerging attributes, the concept of *relation* as it appears in the cybernetics of N. Wiener[14], *circular causality loops*, *self-reference*, *self-organization*, *self-regulation*, *self-reproduction* or *autopoiesis*.[15] In this model the world is no longer considered to be one of moving objects, in space and time, according to eternal laws (as in mechanicist sciences), but rather a *network of complex interconnected systems*:

- non-permanent dynamic ensembles, made up of interacting elements;
- whose morphogenesis[16] emerges in opposite and complementing processes of integration and differentiation;
- the whole and its parts, interdependent entities, can change as every system is a holon[17] made up of holon subsystems that can combine to form supersystems (nature has a fractal structure of the holon of holon of holon … type[18]), and all react through self-organization to the tensions emerging

epistemological-ontological metamodel. The main idea is that the best scientific theories (in biology, ecology, social, political, economic sciences) do not solve many of the problems facing society nowadays. The improvement of society and turning it into a viable social system does not imply only other relevant pertinent theories, but a profound transformation of our way of deciphering the world.

[13] In 1937 L. von Bertalanffy suggested the concept of 'open system' that would gradually evolve into the 'general theory of systems'. One can notice and acknowledge objects everywhere having systems attributes, that is objects made up of dynamically interacting elements, that cannot be reduced to the sum of their parts. In 1954 he founded the Society for the Study of General Systems intended to look for the isomorphic attributes of concepts, laws and models from various fields, to foster their transfer from a field to another and encourage the unity of science through improved communication between specialists. General Systems Yearbook comprises annually articles on this issue.

[14] He presented his theory in *Cybernetics or Control and Communication in the Animal and the Machine* (Hermann & Cie Editeurs, Paris, The Technology Press, Cambridge, Mass., John Wiley & Sons Inc., New York, 1948) that shook and even scandalized scientific and philosophical thinking in the second half of the twentieth century. Cybernetics is the shaping of exchanges after the study of information and the principles of interaction; specifically the science of self-regulatory systems, the science that does not concern system components, but their interactions and global behavior.

[15] F. Varela, *Autonomy and Autopoiesis*, in G. Roth and H. Schwegler (ed.), *Self-Organizing Systems: An Interdisciplinary Approach*, Frankfurt and New York, 14-24; H. R. Maturana, F. J. Varela, *The Realization of the Living*, 1991, Dordrecht.

[16] The development of the forms of an organ or living organism.

[17] Holon (Greek ὅλον) is simultaneously a whole and a component. Arthur Koesler in *The Ghost in the Machine* (1967) believes that a holon is simultaneously an autonomous whole in its relation to the parts, and a part when it is considered dependent in the opposite way. This makes holons stable and able to survive upheavals, and at the same time provide the context for the proper functioning of a larger ensemble. *Holarchy* is a holon hierarchy functioning as a self-standing whole super-coordinating the parts, as a part depending on the controls of the higher levels and coordinating with their environment. A holon can be the smallest subatomic particle, people, societies, cultures, multiverses (comprising many universes). At a non-physical level, words, ideas, sounds, emotions, etc. are simultaneously part of something and have their own components.

[18] The theory of fractals is a particular application of the chaos theory, used in numerous fields (including economics, statistics, etc.). Benoit Mandelbrot coined the term 'fractal' (from the Latin word *frangere* meaning to break into irregular parts), as he was considered the 'father of fractal geometry'. In his book *The Fractal Geometry of Nature* he stated that: *The clouds are not spheres, the mountains are not cones, the coastlines are not circles, and the bark of the trees is not smooth*… . A

in their relation to the environment, in noise conditions,[19] of entropic astray, fluctuations, (probable) propensity to a maximum entropy,[20] of non-entropic propensity, circular causality, self-organization, self-regulation, self-reproduction, self-reference, self-genesis.

- short term changes, *conflicts*, may lead to three types of anticipated results: return to the configuration previous to the conflict (and changes); metamorphosis, thorough changes of configuration (and of conflict agents); regression, destructuring, the destruction of one or more conflict agents;
- long term changes, *evolution* – that is not predetermined ! – results from the build up of local short term changes of the survivors and are due to the dissolving of energy, conflicts, spontaneous feedback loops, self-organization etc. The systems that survive the great number of conflicts, dissolving etc. may take on organizational and holistic attributes that improve on their *viability* (in other words, the systems learn to survive, *learn to be*). *The learning of living* fosters processes that foster survival.

The world as a complex system has an ontological structure (*the existential level*) that permanently communicates with the *physical level* and the *informational level*. Complex systems are characterized by *cycles that make them stable* – material recycling (2), functional feedback loops or homeostasis (3), existential self-reference (5) and *cycles that account for changes* that help the system survive when unexpected events occur: physical self-organization or morphogenesis (1), self-production of living organisms or autopoiesis (4), self-creation or self-genesis (6). At the physical level, complication seems to favor the ability of systems to multiply their survival strategies. At the informational-organizational level, circular logic (self-reference), as well as self-regulation, self-organization, self-production (autopoiesis) help the system face the growth in dissipative entropy. At the existential level, knowledge, identity, self-consciousness increase the capacity of complex systems to depend less on the blind laws of matter…

---

fractal object is difficult to capture in its complexity as it implies an imagination effort from the observer, his/her mental participation. Fractals are *self-similar forms*, that is the structure of the entire system is reflected in every component. Nature abounds in self-similar forms (branches looking like trees, mountain tops having the same shape as the entire mountain, small clouds as replicas of big clouds, etc.). According to Mandelbrot, *…There have always been large areas of science where simple analytical models could hardly be applied. Natural phenomena were too complex. When it came to them, people raised their shoulders in vain and uttered qualitative theories, gross approximations or did not utter anything at all. These are the fields where fractals have a multitude of applications*.

[19] Microscopic convulsions of space-time quantum, thermal noise, etc.

[20] In thermodynamics it reflects the irreversibility of macroscopic physical processes, allows for the assessment of the degradation of a system's energy. A measure of thermal state of physical systems, that grows during an irreversible transformation and stays constant during a reversible transformation. In the theory of information, a fundamental measure of the quantity of information compared to an element of the sent message.

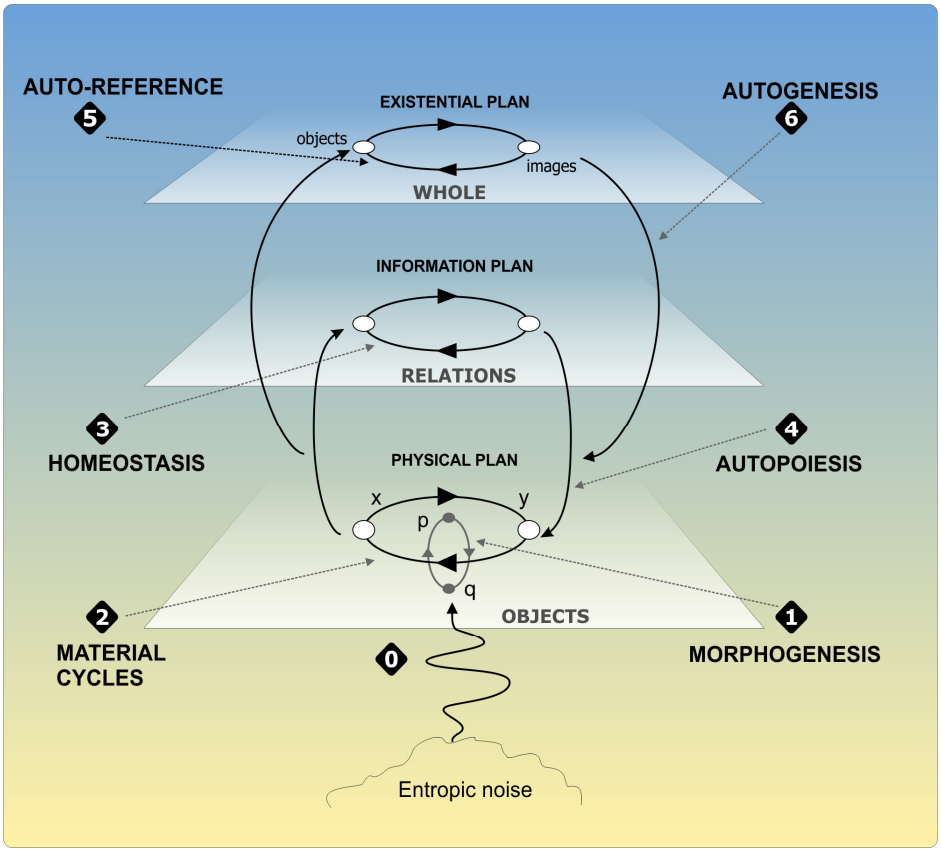

Figure 1: Conceptual model

There are several *principles* to bear in mind when studying *socio-human complex systems*:

- they are natural systems with systemic attributes; the members of the system influence it, of course, but it is not their logical and conscious construction (as in the case of a house or an engine); the social system is a collective, historical and daily construction, having global characteristics that cannot be controlled; even images can manipulate it, but the power of images is limited and the system can come out clean…;
- the observers of the system are part of the system they check; self-reference is an important attribute of complex societal systems, so the viability of society could be improved if our self-image and our image of others, life, labor, development, etc. were more suited to the real causal relationship in our society;
- self-referential systems can be self-reproductive, only that one should ask oneself whether the current society reproduces itself… Is the growth of

economics, finance, money, etc. – in fact, a stage in the evolution of sustainable societies – suited to the damaging extension of certain types of people and institutions and not others?

- the viability of societal systems depends on the existence of *stabilizing cycles*: the recycling of materials, self-regulation, self-reference, and of *change cycles*: self-organization (morphogenesis), self-production (autopoiesis), self-creation (self-genesis). The honest identification of these circular processes can help us build a guide for the assessment of the viability of a social organization;
- the viability of society is enforced if it has a more pertinent self-image, more adequate than the partial models produced by specialized fields. Formation, growth, education with a view to sustainable development of society are very important. One must disseminate the knowledge of global characteristics and existential categories of complex systems, as well as stimulate ethical thinking about them.

Donella Meadows, one of the authors of a report for the Club of Rome (*The Limits to Growth*, 1972[21]), wrote other studies on the management of complex systems, including *Places to Intervene in a System*.[22] She drew on the observation that complex systems include *leverages* – for instance, industrial plants, a town, an economy, etc. – where small-scale local under pressure etc. action can lead to changes in various parts of the system. One must identify them, the way to use them, because by understanding these *leverages*, *fulcra* one would gain access to extremely useful information that could help solve serious problems, collateral effects such as unemployment, famine, economic stagnation, pollution, resource depletion, etc. According to Meadows, physical and cybernetic aspects are important (energy, raw materials stocks, feedback loops, etc.), but one must also identify other leverages and fulcra:

At the physical level of systems:

- constants, parameters[23], etc. (that is taxes, subsidies, standards, etc.);

[21] According to Meadows, *If the current trends in worldwide population growth, industrialization, environment pollution, food production and resources depletion hold, this planet reaches its growth limits in the next 100 years. This would probably result in a sudden and uncontrollable drop in population and industrial capacity.*

[22] Meadows, D., 1997, in http://www.developerdotstar.com/mag/ articles/places_intervene_ system.html.

[23] For instance, *parameters* are in the lower half of the leverage effects, they have a low long term impact, do not change behaviors; a system does not become more stable by changing parameters, and it does not radically stagnate. Parameters (derived from the Greek words *para* meaning 'near' and *metron* meaning 'measure') are the proper measure of a physical, technical system, of a phenomenon, any measure that defines the state of a system of volumes (time, pressure, volume, etc.), a constructive or functional characteristic, a measurement unit of quantitative and qualitative aspects or economic processes and phenomena. Its measurable measure, a strictly determined behavior criterion, allows for a simpler explanation of the main attributes of an ensemble.

- buffers,[24] stabilizing stocks, collectors;
- flow circuits (the structure of the system can impact on its functioning; the structure is a lever one can act upon).

At the relational level:

- negative feedback loops – the control that tends to stabilize processes; they maintain a certain value close to the objective(s) due to the precision and speed of the return of useful accessible information;
- positive feedback loops – the control that tends to speed up or slow down processes; the self-enforcement loops are sources of growth and sometimes (when information is not controlled) collapse;
- the information flow as a fulcra, nonmaterial lever including learnings and new information dissemination; according to D. Meadows, this is a cheaper and more available lever than the modification of infrastructures.

At the existential level of systems:

- the existential dimension of a system reflects its global state and identity and comes from its physical and relational structure;
- the existential status of the system can be manipulated at will; of course, an external action can resonate within the system, but the result depends on its history, structure, inner organization and the management goals of the leadership, etc.;
- those who have a good knowledge of complex societal systems and their dynamics can be more successful in influencing them than mechanic engineers, talk-show hosts…

Let us add other suggestions of Meadows regarding subtle interventions upon systems:

- system rules, incentives, stimulants, punishments, constraints are very important (one must pay more attention to the rule, norm, law-makers);
- the power to induce change in systems, to make them evolve and self-organize refers to the ability of a system to change itself by creating new structures, by adding new negative and positive feedback loops, by encouraging new information flows, by making new rules, etc.;
- the objectives of a system impact on all of the above mentioned components;
- the paradigm of a society is an idea everyone shares; all the hypotheses, ideas, concepts, subjacent theories make up a paradigm, therefore the re-analysis of all of them could lead to new paradigms;[25] paradigms are difficult

[24] A collector that can regulate flux variations (for instance, the oil radiator where the heat stock can be used if necessary).

[25] Culture and conscience are not genetically inherited…; a contemporary individual may be as uneducated, unconscious, primitive, stupid as one from … the Stone Age or the Middle Ages… In this sense, people stand on various levels: the level of *beliefs* (that is religious beliefs as well as rationalist-empirical ones) and conviction that these are the Truth, the only way of understanding the world; the level of *worldview through paradigms*, aware that there are other possible paradigms; the level of questioning with (scientific) honesty: what is a paradigm? Can we only see the world through paradigms? Is it necessary that we have one? Etc.

to change, but this is not an impossible task (one can draw on a different view on things[26]).

2. We suggest that the understanding of our natural, economic, social environment, successful knowledge, intervention and action call for a profound transformation of consciousness, ontological and epistemological questions that are vital for the present and the future. Since we are currently concerned by the *problematic of the sustainable development of rural territorial communities*, the closing of gaps and the construction of their competitiveness, we suggest an *intelligibility frame* drawing from the above described model. As already shown, a model seems to be more complex as it approaches the reality of the societal world as it is.

Every *rural territory* has to answer *internal and external demands*, which means the continuous redefining of its *interests*. *Local territories* and their *identity* were a well-known collective synthesis, and, at the same time, Europeanization has become a threat and an opportunity: a *threat* because it tends to suppress territorial and identity boundaries that ensured so far the protection of products, traditions etc.; an *opportunity* because it allows the valuation of products, traditions, their marketing regardless of the isolation state of the territory, of distance and time. Europeanization may favor the *revitalization* of local territorial communities, but there remain many *problems relating to the (in)equality of the chances to develop*.

Now there is the severe issue of the *competitiveness* of these territories precisely when they are forced to face competition, generalized competition. Rural territories have to *(re)affirm their local identity*, acquire and have the *ability to answer problems* at a global and local level, *try their own answers* as the market and relations change, *develop integration instruments* into larger spaces and networks guaranteeing safety, *value their peculiarities*, make exchanges, prove their *solidarity*, open up the *dialogue* between all local socioeconomic and cultural actors, people and institutions, foster *participation* and *involvement*.[27] In other

[26] There was a society where everybody knew that a problem could not be solved; then someone arrived there who did not know the problem could not be solved and solved it…

[27] People's, inhabitants', citizens' participation is neither a law, nor a norm or rule, but is related to the *individual responsible commitment*. That is why one can identify *levels*, *degrees*, *thresholds* of participation as beneficiaries, contributors, assisted persons, inhabitants, citizens, newcomers, etc. *Participation* is learned everyday, the *participants* have to acquire a 'stock of knowledge and experience', of *successful* experience. If they feel responsible of the results of their own participation (including the decisions that concern them), people can learn from their successes/failures, can gain better control over their own life and responsible integration into their community and society, they will use their mind and body to self-organize and self-determine. One cannot talk of *participatory democracy* when people are inquired only prior to elections, only when they are asked for *taxes*… There have to be actions *at the level of the inhabitants' informing*, *of the grasping of their opinion*, *of the construction of minimal agreement*, *of direct involvement in the decision-making process*. The emergence of the *awareness of the participation* of the inhabitants can start from *getting to find out about* common problems, from the *conviction* that they have common interests in the block of flats they share, on their street, neighborhood, village. Association practices can lead to the (re)discovery

words, rural territories must become *self-aware*, able to *build their visibility*, *draw attention to the media*, *renew their vision*, *enter networks* together with other territories, etc., and all this in the context of a certain infrastructure, certain mentalities, when young people migrate and local people age, professionals do not return to their native village… As such, one should pay even more attention not only to physical material resources, but to the informing, communication, interrelations and possibilities of collective action. The comprehension of the complexity of the current local territory calls for a systemic constructivist theory, a clinical endeavor. Its study starts from vague knowledge, as the pragmatic objective consists not only in the re-cognition of the situation, of the strengths and weaknesses, threats and opportunities, but pertains to the *logic of the project*, of the encouragement of a *proactive approach*, of the *anticipation of risks and troubles* that can affect the territory. The *integrative model* focuses on the *solidarity of faith* in the circumstances of the growth in complexity (experienced solidarity increases complexity when the members take on effectively proactive stances in the context of course changes, identifying opportunities and threats[28]). The technological, financial, judicial, human, informational etc. components increase complexity as well. *Complexification* and its corollary, *uncertainty*, increase fear. How can we *concert* all this in order to create a new model, an *intelligibility frame* of the current rural territory?

Local collectivities detect, identify then combine available *resources* and *competencies*. This listing is intended to structure physical resources, relational and

of traditional solidarities, to *presents*, *exchanges*, even to the rediscovery of *sacrifice*. *Empowerment* is the learning process by which even the poorest and most miserable and vulnerable inhabitants learn how to 'speak up', to take control over their life, make use of their *capital*. *Direct contact* with situations, *social sympathy*, *sympathetic perspective* can be a driving force for successful actions of community development. It is important to create *meeting points* as close to the inhabitants as possible, to identify an *enlarged adhesion pool*. Participation, involvement, initiative cannot be separated from the *interest* in organizing, negotiating, benefiting from opportunities. If the interests of the inhabitants are different, then their strategies are different: some may be civically active, others economically or politically, culturally, religiously, educationally active in parental, symbolic networks, in associations and social occasions, etc. Alongside the *social, economic dimension of participation* and the *personal* one, one must not forget about the *spiritual dimension* of participation. *Communities* are often associated with *communion* and they both call for the *involvement* of their members in environment protection, health promotion, education regarding family life, the observance of the human rights (in order to prevent abuses, discriminations) etc. *The real existence of opportunities and means to take part effectively* requires a lively and open *exchange of ideas*, the *knowledge (of the problems) of the other*, the employment of *clear messages*. Everybody should evaluate their *convictions*, be ready to *change their own way of thinking*, be *able to mutually respect*, ready to *learn from the others* while respecting their convictions and points of view. *Participatory thinking* involves perceptions, representations, ideas, theories on the happenings of a community and it can take shape when similar and different people enter dialogue, avoid (pre)judgments, discover qualities of all the other members of the group. *Participatory behavior* involves making clear and share the rights and duties of every individual in order to act for the community good, observing autonomy and individual independence.

[28] Edgar Morin, 2005, *Introduction à la pensée complexe*, Points Essais, Paris, 124

informational competencies in order to generate *development policies*. One can hypothesize that the *existence or nonexistence of a physical infrastructure*, of *networks of relations between the actors of the local territory*, of available information etc. *can be a driving force or an impediment to its construction, deconstruction or reconstruction*. The physical infrastructure, the relational network, the available information allow for the mobilization of local competencies around a *shared common goal*, which fosters ways of learning, knowing, intervening, acting, etc. *The community learns to survive, to be*. Because of the *inequalities of access* to physical, relational, informational resources, people and institutions come to *inequalities of evaluating* local history and traditions, current situation, problems and solutions. The outsiders who want to get involved in the mediation and the making public of development cannot comprehend the real trajectory of the territory. The content of the information the members exchange is affected if they are unable to form relations networks. The history and trajectory of certain local actors do not allow them or forbid them to invest in their future. Displayed but unshared relations, even if they concern sustainable development, do not reproduce in a sustainable way and compromise the valuation of the territory, the construction of the social thread and the passing on of the collective heritage. New processes such as globalization, Europeanization, progressive introduction of the information technology affect administrative decouplings, favor the emergence of virtual territories, the construction of the information society. If they do not integrate and fuel such processes, there is the risk that rural territories be marginalized nationally and internationally. The informing, knowledge, communicating and acting endeavor may favor the creation of a territorial *formal capital*, the first stage of any *policy on development through programs and projects*. The infrastructure, communications networks, economic, social and environmental stakes are of interest for all the bearers of the different codes (the assumption is that *local actors exchange information – which generates energy at the individual and/or collective level*; *confers trust and credibility to the received information*, and as soon as *communication* is established, the actors enter networks, transfer competencies, energy, make projects etc.). Such collective and checked hypotheses may be the beginning of the *endogenous local development policies*, of *constructing competitiveness* in the competition relations between territories, of accepting their fate. The territory together with its rites and rhymes, heroes, symbols and values that make up its history compose what paces up the maintenance and change of the local territorial communities. Drawing from this, one objective can be the creation of an institutional, informational, behavioral arena where people and institutions can share perceptions, enrich knowledge, state competencies and accomplish successful actions. Of importance is the political environment, the recognition of the local public authority (technical and administrative), as well as the mobilization of the various categories of local actors. As they appropriate the territory, there ends an important stage of the construction

of the new territory and of a more proper intelligibility frame. The members and the groups rethink their relation with the territory, physical space, integrate gradually the local feeling, the relation to the place in the collective and individual mindset. The (re)construction of the territorial identity cannot be reduced only to the economic products level, to the social or cultural problems, without the recognition of the political authority or the administrative authority recognized as partner. The territorial identity refers to the consciousness that ensures the emergence of a local space where the members feel responsible and play new roles in the relations networks. To (re)cognize, to communicate by participating in successful actions in a common project means to act upon individual relations and modify relations; the shared otherness may lead to the capitalization and the individual valuation of capitals; the organizational culture can therefore acquire sustainability. The territorial dynamics is due to the complexification of the functioning networks when there are social debates and valuation of energies. It feeds on inner signals and external information flows. The answers one finds out provide a set of directions, knowledge and experience shared in order to act. Their capitalization offers the local territory, in persistent uncertainty, a new strategic vision. Researchers, interveners, formers, inhabitants may become actors of the sustainable development of the territory.

References

1. Basarab, N., (1999), *Transdisciplinaritatea*, Polirom, Bucharest
2. Benedek J., (2004), *Amenajarea teritoriului şi dezvoltarea regională*, Presa Universitară Clujeană, Cluj-Napoca
3. Bertacchini, Y., (2004), ‘Le territoire, une entreprise d‘intelligence collective à organiser vers la formation du capital formel’, in *Communication & Organisation*, 25, Bordeaux
4. Bertalanffy, L. von, (1968), ‘General System Theory’, in *General System Theory: Foundations, Development, Applications*, Braziller, New York
5. Bonnet M., Desjeux D., (ed.), (2000), *Les territoires de la mobilité*, Sciences sociales & sociétés, PUF, Paris
6. Botez, M., M. Celac, (1980), *Sistemele spaţiului amenajat*, Editura Ştiinţifică şi Enciclopedică, Bucharest
7. Bourdieu, P., (1980), *Le Sens pratique*, Paris, Minuit
8. Boutot, A., (1997), *Inventarea formelor*, Nemira, Bucharest
9. Callon, M., Latour, B., (1991), *La Science telle qu’elle se fait*, La Découverte, Paris
10. Gleick, J., (1987), *Chaos. Making a New Science*, Penguin, New York
11. Haken, H., (1985), ‘Synergetics – an Interdisciplinary Approach to Phenomena of Self-organisation’, in *Geoforum*, 16/2
12. Herbaux, Ph., (2004), *Le Développement territorial. Regards croisés sur la diversification et les stratégies*, Edition Adicueer (Association des Directeurs d'Instituts et des Centres Universitaires d'Etudes Economiques Régionales), Poitiers
13. Ianoş, I., (2000), *Sisteme teritoriale*, Editura Tehnică, Bucharest

14. Le Boterf, G., (2010), 'Les enjeux de la compétence collective', in *Le Monde*, May 23rd
15. Lévy, P., (1997), *L'intelligence collective*, La Découverte/Poche, Essais
16. Malița, M., (ed.), (1979), *Sistemele în ştiinţele naturii*, Editura Academiei, Bucharest
17. Mandelbrot, B., (1982), *The Fractal Geometry of Nature*, Freeman H. W., New York
18. Meadows, D. *et. al.*, (1972), *The Limits to Growth*, Universe Books, New York
19. Morin, E., (2005), *Introduction à la pensée complexe*, Points Essais, Seuil, Paris
20. Petrea, D., (2002), *Abordarea integrată între tradiţie şi actualitate*, Studia „Babeş-Bolyai", *Geographia*, 1, Cluj-Napoca
21. Pinchemel, Ph. and Geneviève, (1995), *La face de la Terre*, Armand Colin, Paris
22. Prigogine, I., Isabelle Stengers, (1984) *Metamorfoza ştiinţei. Noua alianţă*, Editura Politică, Bucharest
23. Prigogine, I., Isabelle Stengers, (1997) *Între eternitate şi timp*, Humanitas, Bucharest
24. Pumain, D., Saint-Julien Thérèse, (2001), *Les interactions spatiales*, Armand Collin, Paris
25. Schwarz, E., (1997), 'Toward a Holistic Cybernetics. From Science Through Epistemology to Being' in *Cybernetics and Human Knowing*, 4, 1, Alborg
26. Seligman, A. B., (2001), 'Complexité du rôle, risque et émergence de la confiance', in *Revue Reseaux*, 108, 19
27. Stănciulescu, Fl., (1989), *Dinamica sistemelor mari*, Editura Academiei, Bucharest
28. Varela, F., (1989), *Autonomie et Connaissance. Essai sur le vivant*, Seuil, Paris
29. Wiener, N., (1985), *Cybernetics or Control and Communication in the Animal and the Machine*, M.I.T. Press, Cambridge
30. Wagensberg, E., (1999), 'Complexité contre incertitude', in *La Recherche*, 326