УДК 332.142.6:332.

Roman Povoroznyk, PhD candidate,
Academy of Municipal
Management

RELATIONS BETWEEN SOCIAL AND ENVIRONMENTAL COMPONENTS IN THE SYSTEM OF ECOLOGICAL AND ECONOMIC SECURITY OF A STATE

Annotation

The specifics of the development of the ecological, technological and social systems are made certain. The scientific process of the development of the systems of various natures is formed on the basis of synergistic approach of the state.

Keywords: *bifurcation, mechanism of regulation, environment, natural system, synergistic approach.*

Анотація

Визначено специфіку розвитку екологічної, технологічної і соціальної систем. Сформовано науковий процес розвитку систем різноманітної природи на основі синергетичного підходу в державі.

Ключові слова: *біфуркація, механізм регуляції, навколишнє середовище, природна система, синергетичний підхід.*

Аннотация

Определена специфика развития экологической, технологической и социальной систем. Сформирован научный процесс развития систем различной природы на основе синергетического подхода в государстве.

Ключевые слова: *бифуркация, механизм регуляции, окружающая среда, естественная система, синергетический подход.*

Introduction

We know that historically natural disturbances of various spatial and temporal scales play a role in the evolution of nature, causing and activating the mechanisms of regulation of natural systems. With the development of industry and the density of population these mechanisms have undergone significant changes and become of a life-threatening nature. This is primarily due to the growth and expansion of the amplitude of anthropogenic perturbations in the environment. V. I. Vernadsky noted that in the history of the earth's crust critical periods in which geological activity is enhanced in its pace can be found. During these periods the most important and most significant change in the structure of living matter, which is a clear expression of the deep geological significance of the plastic reflection of living matter, takes place.

Analysis of resent research

Problems of environmental policy, philosophical and social aspects, the relations of the problems of sustainable development, globalization and economic transformation are investigated in the works of O. Belarus, O. Vrublevska, M. Zgurovsky, Maciejko, O. Osaulenko, A. Romanovich, I. Synyakevych, A. Ursula, T. Tunytsi, E. Khlobystov.

Statement of research objective

– to determine the specifics of environmental, technological and social systems;

– to form the scientific development of the systems of various nature on the basis of synergetic approach of the state.

Results

Numerous studies, which had been performed over the past decade, have shown that the frequency of catastrophic phenomena in nature and their magnitude increases continuously, causing an increased risk of loss of life and increase of economic losses, violation of social infrastructure. Thus, there were about 650 natural disasters that killed more than 25 thousand people and caused economic losses of over $ 35 billion in the world in 2009. In 2010, the loss of lives due to natural disasters amounted to almost 11 thousand people. And economic loss reached 55 billion dollars [9].

In 2003, natural disasters killed more than 50 thousand people. Economic losses totaled of more than $ 60 billion. In the United States in 2004 a record for the number of tornadoes – 652 was set, while the previous record of the year 1992 was 399 tornadoes. Beginning of 2004 was characterized by the increasement of extreme situations, and the year ended with a global catastrophe on December

26, bringing in Indian Ocean with the loss of hundreds of thousands dead. Only in Sri Lanka the damage was estimated at 3.5 billion dollars. The tragedy repeated on March 28, 2005, when the earthquake measuring 7.6 points was located only 200 km. southeast from the epicenter of the catastrophe which took place on December 26 and resulted the deaths of hundreds of people and the massive destruction in Indonesia and Malaysia. Only in 2004 there were 19 earthquakes with a capacity greater than 5 points [5, p. 28].

A progressive development provides stability for a long period of the functioning of the system. In its dynamics the crisis with the controversial traffic system takes three important functions:

– a substantial reduction (or qualitative transformation) of obsolete elements of the ruling system, which has already lost its potential;

– strengthening of the unstable elements of the new system of the future cycle;

– testing the strength and transferring into inheritance of those components of the system (usually both elements of upper system and super system) that accumulate, gather in and move into the future (sometimes partly being modificated) [4, p. 106].

Most often the changes in the earth's biota are associated with the direct influence of space factors. Of course one cannot reduce all causes of catastrophic changes in the biota of the Earth only to the space factors. There is no reason of denying the value of the natural disasters, which are related to space factors in the history of Earth. But they all have local significance and seeing the basic for the foundation of the organic world in them would be at least careless. All global and regional catastrophic events known to the geographical history can be well explained by terrestrial processes.

Recent problems of the civilization development can be considered as a synergistic effect of interaction of natural and social systems. Therefore, it is clear that understanding the concept of sustainable development is impossible without research of the concept of the «development» from the standpoint of synergetic.

Now the formation of a new scientific understanding of the processes of the systems of various natures on the basis of synergetic approach is taking place. Synergetic provides two stages of the development. The first stage is characterized by stationarity. During this phase there are no fundamental qualitative changes in the state of a system; evolutionary processes are rigidly determined, future states are predicted if the general trend of the development is found. But finding the system in a steady state requires a certain internal and external conditions that allow the system to maintain stable internal equilibrium with its instability with the environment. For biological systems this state is called homeostasis. In the case of inorganic systems, internal equilibrium is supported by the continuous production of energy within the system, or with the help of a constant flow of needed energy from the outside. Hovewer, under the influence of external influences, or as a result of internal contradictions, stationary state sooner or later ends, and in the development a new phase comes, characterized by the violation of internal balance and the loss of stability. The way out of this crisis is possible only with the output in one of the possible qualitatively new stable states. The system settings, under which the crisis appears, are called the critical point of development – bifurcation point. A further crisis development phase is completed the transition to the new system in one of two ways: either the destructive path that destroys the ordered system, or a constructive way – the transition to a stable state with a higher level of organization than the previous steady state [3, p. 109].

At the point of bifurcation several areas of potential extensions of the development after the crisis appear. Their number is determined by the characteristics and conditions of its interaction with the environment. «Choice» is defined in the action of a system of one of the fluctuations that occur during this period. For complex systems it is crucial to have openness, character interaction with the environment, where energy (substance, information) enters by providing a way out of crisis. From classical thermodynamics it is known that in the absence of such interaction (isolated system) any conversion processes of some types of energy into other end up with the irreversible conversion of energy into the heat that dissipates uniformly within the system. Such energy loss creates an increasing chaos that is numerically characterized by an increase in entropy. Thus, in isolated systems there is an inevitable historical process of entropy production up to the maximum value in a state of thermodynamic equilibrium, which is the simplest state of this system.

In an open system that got into a crisis situation the flow of energy into the system takes place, if there is an external source of energy. If the value does not add the excess to the energy losses within the system, the exit from the crisis will be

of a destructive nature, accompanied by a partial or complete destruction of an ordered system. Destructive way out of the crisis mechanisms is implemented in order to achieve equilibrium of states. The transition is not an equilibrium system at some intermediate equilibrium state which is accompanied by an increase of entropy, which means the reduction of organization. The destructive exit from the crisis is often observed as an unambiguous transition.

The specialty of the synergetic approach is in the recognition of its constructive way out of the crisis. The existence of such a path means that the matter is characterized not only by a destructive trend of development, but also by a creative trend, without which it is impossible to explain the emergence of a new one. If the mechanism of destructive trends inherent in the pursuit of systems in order to achieve equilibrium, the self appear as a physical basis for the mechanism of creation takes place. The main condition for the manifestation of self-organization is the additional energy coming from the outside in order to completely cover the energy dissipation that occurs in the system. This is a necessary, but insufficient, condition for a constructive solution of the crisis. Exiting the crisis stage is constructive if the system becomes qualitatively new state with a higher level of organization other than to the phase of bifurcation. Such a transition can occur in the form of giant collective fluctuations, during which the elements of the system that showed only the ability to chaotic far action suddenly find the ability for a close action, unifying elements into a single coherent group [7, p. 246].

The evolution of branching paths in the critical points of the development, random or uncertain nature «of choice» after the crisis of the evolutionary path prevent an accurate prediction of the future based on the trends observed in the previous stationary phase.

From the standpoint of synergetic approach the fundamental question arises on which relationship is there between the concepts of «organization», «development» and the basic for the synergy concept of «self-organization». In fact, self-organization is the establishment of the order by the means of the coordinated interaction of the system components during the absence of external influences. As for the value of self-organization the development is necessary to define a broader concept since it includes both the organization of the environment and the organization of themselves in a form of progressive and regressive processes. The system will be ready for self-organization and progressive development if it satisfies at least the following requirements:

– the system must be open;

– the system processes are to be cooperative (the system components should be consistent with each other);

– the system must be dynamic and be far from equilibrium.

The main condition among the above stated conditions is a condition of openness whereas in open system other requirements are met almost automatically [6, p. 159].

The central problem of sustainable development is ensuring the sustainability of the social system. Society is a special subsystem of the biosphere. There are substantial differences in the processes of inorganic and organic matter, the subsystem which is a society. The evolution of inanimate matter is fully described by the laws of physics and chemistry. To describe the dynamics of the living matter it is necessary to use the laws of physics and chemistry which are universal. But this is not enough to describe the processes of the living matter, where we have to introduce the concept of information or informational interactions that determine the rules of evolution. Under the condition of complexity of the system the role of the «living substance» in information processes of nature in its development is steadily increasing. At this level of organization of the matter its own system of laws that define the new structure of selection is formed. But the general logic of the development remains unchanged.

Social systems are inseparable from the nature, as they are the highest part of their evolution and, simultaneously, after a long process of development become more and more autonomy, causing more and more influence on the biosphere – the total pattern of interaction between nature and society which is associated with the formation of the noosphere as the higher level of the biosphere.

As the cause for various problems, conflicts, crises in the social system serve inconsistent rates of its individual parts. This lack of coordination or irregularity of parts leads to a clash of individuals, states, critical periods of conflict and war. An important factor of critical situations is the lack of co-operation between nature and the society, because development of relations between these two throughout the history of a mankind has never been agreed. Now, after five million years of the existence of Homo sapiens, in its environment there still no understanding of the necessarily to examine

the functioning of social and natural systems as a single socio-natural process.

The evolution of social systems is to accelerate the pace of change of world civilizations: neolithic, early pre-class, ancient, medieval, pre industrial, industrial. The last quarter of the twentieth century was characterized by a world-historical transition into a post-industrial civilization.

There are no doubts that for social and natural systems on Earth specific problematic situations have the impact on the development of anthropogenic global environmental crisis. Life, as it was claimed by V. Vernadsky, is geologically eternal, as it always adapts to new environmental conditions, but human survival in the new environment will be quite problematic.

From the standpoint of synergetic modern civilization is at the point of bifurcation. As the history shows, this situation is fairly typical for society and biosphere as a whole. Previous planetary bifurcation point dates back 10-12 thousand years ago in the Neolithic. It is called the Neolithic revolution. The reason for the disaster (as in the Paleolithic bifurcation) became the discrepancy of the norms of morality to the new technical possibilities that were opened up to the individual. A human used its intellectual abilities the most effectively and with that quickly destroyed all large ungulates and mammoths - the foundation of its own diet. As a result, a human was in the severe resource crunch. According to anthropologists, the world's population at that time decreased in many times. Neolithic man found a way out of crisis by the means of discovering farming and adjusting to cating. Only afterwards a human was completely separated from living rest of the world, beginning to create new biogeochemical cycles, new forms of inanimate matter, new species of animals. From this revolution the history of a society is taking place. The current crisis appeared because of the same reason as the Neolithic crisis – the lack of morals of the society and the increasing technical possibilities of the civilization, which are developing rapidly and inevitably lead to the destruction of the environment co-evolution of a man and nature [8, p. 103].

For the living matter often bifurcation points were related to climate change, which, in turn, conditioned space as well as purely planetary factors. The most significant impact on the human environment was in the early stages of the formation of Homo sapiens species. There is a hypothesis that 14-15 million years ago Earth's climate created more favorable conditions for ancestors of human life than those who were in the next 10 million years, especially in the equatorial zone which resulted in reducing the areas of human settlement and the decrease of the rate of evolution of this species [1, p. 66].

In the XX century the environmental problems developed into a general environmental crisis of global scale precisely because in this period a person was an active party to the interaction in the system «man – nature» and its activities drastically upset the ecological balance. In general terms, till the XX century the active side of this interaction was usually the nature – climate change, natural disasters had more impact on people's lives, their livelihoods than at a later date. Since the man had «violated» the law of natural evolution, came out of its jurisdiction and found a path of development, different from the way of other living organisms, social and natural history begun, the history of relations between two relatively autonomous principalities: society and nature.

At the same time it should be noted that the crisis is characterized not only for the functioning of the biosphere as a whole or in relationships between social and ecological subsystems EPS, but also for the internal mechanism of functioning of society. The social upheavals of human civilization rather convincingly demonstrate this pattern. By some estimations, over the past more than 5500 years, humanity has gone through the 14,513 wars, which killed 3,640 million people, destroyed property worth over 115.13 dollars kvintylliona. That would be enough for several thousand years for the population of Earth. The cost of wars always «goes up». A world thermonuclear war could destroy all the mankind in a few minutes. Power of nuclear charges in 1980 amounted to 8 thousand MT. trinitrotoluol (2 tons per inhabitant of the Earth). In the late 1980's the cost of the money spent on arms and ammunition in the world already reached 1 trillion dollars. This exceeds the appropriation of money of all countries on health, education and housing [5, p. 28].

In the context of the concept of sustainable development an important aspect is the recognition of the direction of primarily natural systems that would allow to differently tractate the natural-human systems. A pretty convincing argument of the historically oriented development is the process of biological development of each organism. Any earthly body is highly organized towards the open no equilibrium systems. Starting from inception to the degradation of the body it is a biological way

of historical development, which is potentially determined by the program contained in the genome. However, the body arises and develops in a certain external environment with which it interacts actively. In this way biological development is complemented by training, education, numerous external and often negative influences that shape the real path.

Under the influence of biological development programs and by external factors the system at certain stages of its development gets into a real crisis of states, from which it comes into a full compliance with the above described jump transition to a qualitatively new states. But here comes a new factor that plays a central role in the biological-oriented development. This factor is incorporated into the genome program, in other words, the presence in the body the information about its future state. The program access of a biological system from the crisis is one possible manifestation of self-organization. The crisis, which occurs under the influence of external factors, can create uncertainty of the future path, because there is a number of possible ways out of it. Similar crisis states can «beat» the system from the program provided with a direction towards biological path of development. [2, p. 88].

The signs of directed historical development are observed in many highly organized systems which comprise the scaled hierarchy of structures in the mega world. We can speak with enough confidence about the development of the biosphere of the Earth, the solar system. Now there is enough evidence that the universe as a highly open system is showing signs of directional development [2, p. 89].

Proving the existence of directed development of complex systems is a very complex problem. It is believed that self-organization under favorable conditions randomly performs a single act of transition into a state with a higher level of organization. But the whole development process consists of a series of interrelated stages of individual complications. It is questionable to explain the ability of the consistent existence of such phases by accident. We can assume that the necessary consistency of successive stages of self-existence is possible provided that the information about the future state of a system exists. And this information must be contained in the system.

Conclusions

Thus, the need to explain the directed development of complex systems creates some difficulties. Self-organization under the right conditions randomly performs a single act of transition into a state with a higher level of organization than in the initial position. But the directed development process consists of a series of interconnected single acts of complications. It is difficult to explain the consistently of existence of such single acts by accident. On the example of the program development of terrestrial organisms there is recognition that the necessary coordination of successive acts of self-organization is possible provided that the information about the future states, which undergo the development, exists. And this information should be contained within the system.

References

1. Анучин В. А. Географический фактор в развитии общества / Научн. ред. В. И. Куликов/ В. А. Анучин. – М. : Мысль, 1982. – 334 с.

2. Борщук Є. М. Стійкий розвиток як еколого-економічний фактор європейської інтеграції // Вісник Львівської комерційної академії. Серія економічна. Вип. 20. – Львів : Видавництво ЛКА, 2006. – С. 85–91.

3. Гор А. Земля у рівновазі: Екологія і людський дух. – К. : Інтелсфера, 2001. – 393 с.

4. Данилишин Б. М. Природно-техногенні катастрофи: проблеми економічного аналізу та управління. – К. : ЗАТ «НІЧЛАВА», 2001. – 260 с.

5. Иванов О. П., Друкин М. Д., Спиридонов Є. С. Техногенная деятельность и природные катастрофы // Энергия. – 2005. – № 9. – С.27–35.

6. Капица С. П. Синергетика и прогнозы будущего / С. П. Капица, С. П. Курдюмов, Г. Г. Ма-линецкий. – М. : Наука. 1997. – 286 с.

7. Природно-ресурсна сфера України: проблеми сталого розвитку та трансформацій / Під загальною редакцією чл.-кор. НАН України Б. М. Данилишина. - К. : ЗАТ «Нічлава», 2006. – 704

8. Толстоухов А. В. Самоорганізація ноосфери й глобальна екологічна криза // Практична філософія. – 2003. – № 1. – С. 101–104.

9. Washington profile [Електронний ресурс]. – Режим доступу: http://www.wasprofile.org/.