

Model of the self-organization and sustainable development of the global system

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Abstract. The modern theory of economic development that is based on models of economic growth does not have a well-grounded category apparatus; it views only one stage in a cyclical development – economic growth. From system and informational viewpoint the work studies the following categories: development, sustainability and sustainable development. The work suggests two laws that form a system: the law of conservation of economic potential and the principle of self-organization. With usage of these regularities non-linear dynamic model of development of a complex economic system has been formulated and offered on the example of the world economy. The order of modeling and the principles of findings have been proposed.

Key words: System sustainable development, System self-organization, sustainable development of the global system.

1) Introduction

Scientists' interest in problem of economic development increased in the second part of the XX century when there arose a sharp contrast between developed countries of “the golden milliards” and the third world countries which were defined as developing countries or countries with developing economy. The contrast in the level of income among countries of the world community determined scientists' interest in analyzing conditions for nation welfare as well as in maintaining these conditions for highest possible period of time. The necessity of such analysis predetermined using the mathematic modeling of the economic growth. The first significant result was the

combined model of Harrod-Domar based on changes of the main economic parameter which influences economic growth – the rate of investments. With increase in understanding influence of human capital, technologies and population upsurge on economic growth, the task of optimal economic growth was developed in the form of Solow and Solow-Swan's model with the function of Cobb-Douglas to be used. The growth of technologies and the population upsurge are also introduced into the model. These factors influence the main parameter of economic growth – fixed capital per worker, which defines efficiency of labour that is the economy growth rate.

Later there appeared models of economic growth by Ramsey, Braun, P. Romer, the models of technological changes, the model of Uzawa-Lucas with two sectors, Schumpeter models of endogenous growth. With the help of these models scientists studied factors that influenced economic growth, among these factors were human and physical capital, technological changes, diffusion of technologies, migration and population upsurge, environmental pollution. Besides, an American economist W. Rostow studied conditions for sustainable growth of long duration. The works by S. Kuznets became the base for further development in understanding sustainable economic growth. According to Simon Kuznets, sustainable economic growth is a process of increase in productivity of national economy which has to exceed the population upsurge for the highest possible period of time. Thus, efforts of economic theory in the XXth century were directed at analyzing conditions that provide long-run economic growth. Then the concept claiming that economic growth lies in necessity of maintaining equilibrium state of economy with economic methods during the highest possible period of time was formed.

Almost all these approaches being expressed by mathematic models of economic growth did not find their qualitative application in economies of developing countries and later in the second part of 80-90es of the XXth century they did not find an application in analysis of economic behavior of countries with transitive economies.

There were approaches towards forming models of economic development including those which take into account structural changes in economy. For example, Arthur Lewis's model with two sectors; later this model was expanded and formalized by J. Fti and G. Ranis, the model of H. Chenery and others.

Being based on the experience of countries with developed economies, these models and theories connected with them turned to analysis into developing economies of the third world countries.

Further the elaboration of sustainable development theory reached the basic formal assertion widely accepted in the world as a category that is follow: "Sustainable development is the development that serves needs of today's generations and does not place possibilities for their usage by future generations under the threat" (WCED, 1987).

Correspondingly, the basic category of sustainability has the following formulation: "Sustainability is putting technical, scientific, ecological and economic social resources in order so that the resulting system can be maintained in an equilibrium state for some time and in space" (WCED, 1987).

The work of G. Brundland's committee resulted in categories stated above.

Thus, “sustainable economic development” and “sustainability” categories came from the environment of analysis into conditions for optimal economic growth basing on the postulate which necessitates exceeding the growth of national production against population upsurge. However, today there is no well-founded answer to the question: “Why have these models not given the practical result in countries with developing and transitive economy?” What do the existing models of economic growth not take into account? Why are the existing models of development inadequate for changes occurring in many kinds of economies in the world?

2) The system of approach to the theory of sustainable economic development

It is obvious that the reason why existing models of economic development are inadequate for actual changes in economic life consists in approach towards understanding the concept of the following categories: “development”, “sustainability” and “sustainable development”. There is a need for accurate understanding the content of these categories; understanding should be based on adequate mathematic apparatus from natural sciences.

The analysis shows that models of economic growth as well as development models based on this approach do not function during long periods of time in economies of countries with an unstable (transitive) political system. Institutions of implementation of economic policy strategies that are based on applying existing models of economic growth are missing. This fact causes all attempts to create qualitative economic changes in society during all periods of time to fail.

In accordance with N. Konradiev’s and Schumpeter’s approaches contemporary scientific theory has a great number of works on models of cyclic economic growth. Owing to these works we can clearly see time limit of classic and neoclassic models of economic growth; these models describe only one stage in a cyclic development – equilibrium or the stage of economic growth.

Models of cyclic development are not a substantial instrument for analyzing the process of economic development either.

The general theory of systems and the information theory provide other approach to qualitative understanding of the phenomenon of economic development.

Development is considered as the process of accumulating structural information that increases the level of system organization.

The general system theory holds development as the change of system states during a long period of time. Every state of a system is characterized by structural and quantitative characteristic.

Thus, in the process of system development there is a change of structural and quantitative characteristic. It shows the evolution of the system structure that adapts the latter to environmental impact. In economic system environmental pressure lies in population development and in limit of natural resources. The adaptation of the system

takes place due to accumulating structural information, which raises sustainability on the basis of increase in the quantity of system organization.

Materials covered above testify the following conclusion: the model of economic development should contain the parameter that would characterize the structure of economic system in the sense of conditions and interaction regulations of economic agents among themselves. Numerical solutions of this model should show the evolution of this structure, which provides sustainability of a social system during a long period of time in the sense of its integrity. The political structure and the monetary system serve as a structure for a social system.

Thus, the category of “sustainability” takes a new content. The theory on sustainability which originates from works by Puankare and Lyapunova has a rule to answer two key questions:

- What exactly do we investigate for sustainability?
- Sustainability concerning what or in a sense of what do we investigate?

From all abovementioned information in the context of system-information understanding of sustainable development of social system we can claim that:

1. We investigate the process of social system development for sustainability; this system consists of political and social subsystems where the political system is the structural characteristic whereas the economic system gives the quantitative indicators of its states.
2. We investigate sustainability in the sense of maintaining integrity of the social system during a long period of time with regard to population development in the condition of limited resources.
3. The sustainable development of a social system is the consecutive , periodical change of its states during a long period of time, directed at increase in system sustainability (in a sense of maintaining its integrity) on the basis of restructuring its relations – evolution of a system structure. In a mathematical sense we can give more strict definition as to sustainability of social development that is based on availability of undetermined behavior in a social system.
4. The sustainable development of a social system is a consecutive change of states where all possible trajectories of its development are attracted to the area of sustainable positions in a phase space. The area is defined by the set of attractors characterizing the treatment of system functioning for a given period of time.
 - 4.1. The set and the structure of attractors are defined by the quality and the type of a political structure.
 - 4.2. The sustainable development of a social system is the movement of economic environment where solution to the system non-linear differential equation, describing it in the form of equation of economic environment movement, is sustainable against impact of managing parameter.

3) Self-organization of social systems

As we know the concept self-organization came to social sciences from physics, after the phenomenon chaos was discovered through the works by G. Haken, I. Prigogin and other scientists.

In natural sciences self-organization independently complicates the structure in conditions of strong instability of environment with the aim to maintain its sustainability against impact of environmental factors. Self-organization is peculiar to objects of inanimate and animate nature.

In case of social systems self-organization has a few levels:

The first level is a microlevel – the level where economic agents compete among themselves for limited resources and wealth; it results in optimizing their market distribution.

The second level is a macrolevel – the level where rules of economic game among agents concerning resource allocation and wealth distribution based on political subsystems as an optimal macroeconomic policy are formed independently. It maintains optimal resource allocation and wealth distribution among economic agents during a long period of time.

The third level is a metalevel – the level where the political structure and institutions of a social system are restructuring independently; we can witness it in the countries with transitive economy and we call it the process of transportation.

Correspondingly first two mechanisms of self-organization are implemented within sustainable functioning of a system. The third mechanism appears when the integrity of a system is under threat that is sustainability exceeded its boundary values.

Thus, the constant optimization of resource allocation and wealth distribution among system agents is the base to maintain its integrity for a long period of time. It is implemented through independent actions of economic system agents; actions are based on regulations laid down in a political structure that is through developing and implementing macroeconomic policy.

4) Correlation between self-organization and social system development

The process of forming and implementing optimal macroeconomic policy as well as its flexible correction in case of inaccuracy is the process of accumulating structural information for a long period of time. It connects with the fact that system being based on feedback laid down in a political structure receives the information about its current state. This forms the managerial decision by way of macroeconomic policy.

We can witness the evident fact about interrelation between self-organization and social system development as well as connection between level of self-organization and

sustainability of system in the sense of its capacity to optimize macroeconomic policy and to react to economic and social destructive changes.

Self-organization is the mechanism of social system development where the quality of political structure defines possibilities of social system concerning sustainable development in the sense of transfer from crisis to economic growth without conflicts.

5) Principles of self-organization and sustainable development

There are two laws playing a defining role for sustainable development aimed at maintaining integrity of a system in conditions of population surge:

1. Principles of minimum dissipation of system resources are formulated as follows:

“Every subsequent state of a system dissipates less resource than the previous one. In economic sense in every subsequent state resources are allocated in more optimal way than in the previous state; it expends economic effect, compensating increase in environmental impact.” The principle of minimization of dissipation or scattering minimization that is optimization of resource allocation for production and distribution of goods for consumption naturally decreases resource dissipation. In other words the process of optimizing or implementing the principle of minimization of dissipation has a reverse direction concerning resource dissipation – production output (Y). The counteracting force F as for dissipating of system resources called as the principle of minimization of resource dissipation opposes to economic growth or rate of production output Y' with the coefficient k that reflects structural qualities of the system – its institutions (political system) to produce useful work concerning optimization of resource allocation for producing goods to be consumed as well as reaction rate of the political system towards unfavorable economic changes in the form of structure adjustments in the current macroeconomic policy and changes of its direction in case of fallacy by non-conflict way through changing party in power to opposition. Putting it in other words, it is force that reflects the value of self-organization of the social system S. It can be recorded as:

$$S = -Y' K_s \quad (1)$$

the sign «-» means opposition of effect of force that compensates dissipation where S – the quantity of self-organization;

Y' - economic growth;

K_s – structural coefficient reflecting usefulness of the system structure as for producing economic effect when optimizing resource allocation for production and goods for consumption.

2. The law of conservation of system economic potential.
 - 2.1. Economic potential – system ability to produce economic effect.

2.2. Social system transferring from one system into another in the process of social and economic development maintains economic potential unchangeable.

It means the following:

When in the process of economic growth social system transfers from one state into another one it maintains the ability to produce economic effect and to create economic effect necessary and sufficient in order to maintain system sustainable in terms of preserving its integrity.

Economic potential of the social system is the ability to execute the work as for producing economic effect; this ability is produced by the system transferring from one state into others, which provides system integrity or sustainability of economic development process.

Economic potential is the potential ability of the economic system to execute the work as for producing economic effect when transferring from one state into another one in the process of economic development necessary and sufficient in order to guarantee system integrity or sustainable development in conditions of increasing population and scarcity of limited resources.

$$P_{(E1)} = P_{(E2)} = const \quad (2)$$

Interrelation between sustainable development and self-organization can be seen in the figure 1.

6) Mathematical formalization of sustainable development

From information stated above it follows that the model of economic development should show:

- the evolution of social system structure during some time
- boundary conditions of sustainability of system development
- replacement for treatments of system functioning

This is extremely important! Being based on economic growth models, economic development models show only one treatment of functioning - adaptation, that corresponds to economic growth state – equilibrium state. At the same time we know that restructure of economic relations that forms a new structure and maintains sustainability occurs at times of crises laid in nature of economic cycle through bifurcation treatment of functioning.

Mathematical apparatus that corresponds to issues was created long ago and it was meant to solve tasks of non-linear dynamics. The contemporary methodological problem of applying non-linear models in economic theory consists in applying mathematic apparatus of discreet dynamics where it is impossible to point out the structure and to show its evolution during some time. It can be done only with models of non-linear dynamic systems that function non-stop.

7) The model of development and self-organization of the global system (world economy)

The example of self-organization and development of a complex system can be seen while studying changes in the states of the world economy during the period from 1825 to 2035.

In the context of growing conflict tendencies of the XXIst century it is getting evident that existent institutions of the global system – supranational organizations and the system of international exchange of resources – do not provide development of the global civilization without conflicts. Therefore the most urgent task of nowadays is to make a forecast as to forming such social institutions that can guarantee coexistence of local civilizations(nations) without conflicts as well as sustainable development of the global system of the XXIst century.

The system of rules about interaction between nations (civilizations) as a political structure of the global system of the XXIst century on the basis of the common planetary constitution can be referred to these institutions. The system of international monetary and financial relations that is the basis for exchange of resources among civilizations should be stated in the common planetary constitution as well.

The global system is aimed at maintaining its homeostasis or keeping humankind safe. Sustainable development of humankind lies in maintaining the global system integral for a long period of time. The necessary condition for this sustainable development is institutions which provide compromise base for interaction between local civilizations within the global system. To solve this task we need to define conditions which form both stability of a social system “the global system” and boundary limits of stability ensured by rules of interaction and in the context of which sustainable development occurs.

Thus, the forecast concerning sustainable development of the global system(world economy) is the task of forecasting and forming institutions of the global system which can provide sustainable development of humankind.

The solution of the task about defining conditions of sustainable development of the global system helps us to make the following conclusions:

- general approach allowing us to describe the main properties of the global system in a simplified form and its development with indicating feature parameters.
- mathematical formalization of the global system and its development basing on outlined characteristics as a non-linear dynamic system.
- making simulation modeling on the basis of laid down system of differential equations describing development of the global system.
- analysis of experiment results that can help to realize the following items:
 - about the character of the global system behavior in the process of development.
 - about the main system properties that form the process of development and its stability.
 - about conditions for system functioning; the conditions have to be implemented to provide stability of development.

8) Sustainable development of the World Economy: system approach

The author of the monograph “Self-organization of the World Economy” formulated the concept of development and self-organization of a social system the world economy (the global system) and made the corresponding model. The model represents the main characteristics of the system itself and its development. The model is represented in the figure 1.

The system development is regarded as the process of changes in system states. Every system state has a structural and quantitative characteristic and specific time interval during which the structure keeps its integrity.

The model of the world economy development describes the system behavior within the period 1825-2035.

The idea about development process lies in the base. The process is considered as accumulating structural information on the basis of mechanism of self-organization as the result of struggle between two contrary tendencies: organization and disorganization. Definite structural and quantitative characteristics allow us to define three states of the world economy system in the process of its development. The first two states are real whereas the third one is predicted. The structural characteristic for every state is the system of international monetary and financial relations that function during specific time interval. Political structure of the global system– availability or absence of supranational institutions of regulating interactions among ordinary system agents as to exchange of resources on the basis of international labor division – can also be referred to structural characteristics.

The process of GDP growth for countries that participate in international exchange of resources can be called the quantitative characteristic. Countries making up the so-called “triad”: Europe – the USA – Japan are taken as the base as more than 60% of world goods turnover during specific time interval falls on these countries.

Every state of the global system corresponds to a 70-year cycle of development. Every cycle combines conflict as well as non-conflict phase of development. A conflict phase is implemented through the bifurcation mechanism of development and low rates of GDP growth. Non-conflict phase is implemented through the adaptation mechanism of development and uneven increase in GDP. Every phase of a cycle corresponds to a definite period of development that changes each other like mechanisms of development.

We consider sustainable development as a change in system states that keep its integrity and maintain it within boundary limits of stability for a long period of time. It happens on the basis of forming a new structure of a system with adaptation to environmental pressure: population growth and limited resources. The stated above conflict trends are external demonstration of the pressure.

9) Sustainable development of the world economy – non-linear dynamic system

Above-stated model of development and self-organization of the global system (the world economy) allows us to make the following conclusions about properties of the model under research.

There are two oppositely directed processes lying in the basis of system development; originally they are its natural quality: dissipation – resource dissipation and the principle of minimum dissipation – scattering, expressed by optimizing resource allocation for production and goods for consumption on the basis of current stipulated rules of cooperation – institutions.

The factor that produces dynamics is population growth for a long period of time.

The natural property of the system – dissipation of resources – is expressed by unlimited consumption of goods in conditions of limited resources for their consumption; it also predetermines the necessity of independent forming the system structure in order to provide efficient resource allocation for production and goods for consumption, i.e. self-organization. The natural property of the system – non-equilibrium – is also caused by two contrary trends.

All hierarchic types of the social system have the property of dissipation and min dissipation of resources, for example, a country, a regional, civilized system and a global civilization. We can see the fractal symmetry of the main properties of the social system “the global civilization”.

The system development happens by cycles with the interval of about 70 years. Every cycle of development goes through a conflict stage (50 years) and a non-conflict stage (20 years). They are implemented through the bifurcation and the adaptation mechanisms of development correspondingly. Old system relations are being restructured and new relations are being formed at the stage when the bifurcation mechanism of development works. This process is followed by decreasing quantitative indicator of development.

Whereas at the stage of the adaptation mechanism the development occurs without conflicts and is followed by uneven growth of quantitative indicator. Every cycle of development corresponds to one system state. Every consecutive state of the system possesses more complex structure and from the economic viewpoint it is more effective than the previous one: it provides the system integrity in conditions of the environmental pressure. Stability has its borders within which sustainable development occurs. When the system leaves the limits of stability it stimulates states of extremely non-equilibrium kind. It also leads to further indefinite behavior of the system where the global conflict can happen or self-destruction of the humankind can be one of the possible versions of development.

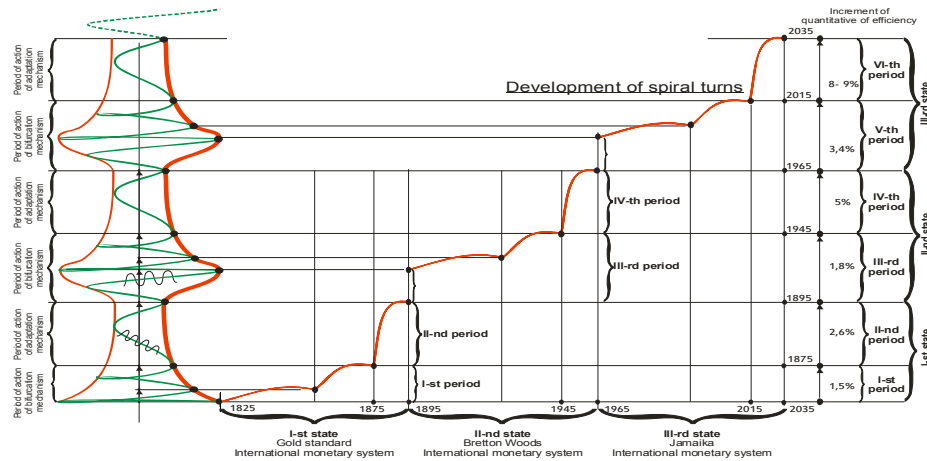


Fig. 1. The model of development and self-organization of World economy for interval of time 1825-2035 years

Therefore the main condition for keeping the system integral consists in maintaining stability of the system “the global civilization”. **The main objective of studying non-linear dynamic system behavior – development of the global civilization on the basis of modeling and conducting numerical experiments – is to calculate the stability limit as well as the conditions for maintaining the system within the estimated borders**

We can also see the complication of the system structure: self-organization in the form of the mechanism that implements sustainable development on the basis of spontaneous complication of the system structure.

We can make the conclusion that “the global civilization” system has properties peculiar to non-linear dynamics. The system can function in two different modes – bifurcation and adaptation converting from one functioning mode to another one in the developmental process. The system has the property of self-organization as well. The main function of the system lies in the development through which its aim (to maintain the integrity) is implemented.

The processes of production and consumption are regarded as the main properties of the system that generates development.

The fact that the system is maintained in limits of sustainable development through the process of development helps to keep the system integrity.

10) Formalization of the global system development

The global civilization system is regarded as global economic environment where countries and their group organizations are ordinary agents. Every agent has the same properties as the system: they can be open, non-equilibrium, dissipative, self-organizing; they can also have the aim – to maintain integrity through the main

function (development). Development is caused by contrary processes – the process of production and the process of consumption and is implemented through two types of the development mechanism: the bifurcation mechanism and the adaptation mechanism.

We can watch the fractal symmetry of all general properties ranging from the global system to its ordinary agent.

Development, the main function of the system, is viewed as the movement of economic environment. Basing on the assumption about maintaining boundary limits of system stability we solve the task of stable movement of environment and sustainable development of the global civilization in the context of fixed main properties and system characteristics.

At the first stage we study behavior and properties of an abstract non-linear dynamic system on the basis of reduction and fractal symmetry of the main properties. At the second stage we model and examine the behavior of specific the global system.

11) Modeling and model of self-organization and development of the global system.

On the basis of outlined properties we make a mathematical model of non-linear dynamic system – development of the global system, where:

- phase variables – ordinary agents of a country that has a property to dissipate resources in the form of production and consumption expressed by rate of production output Y' and its index – economic efficiency E_y and property of optimizing resources for production and goods for consumption expressed by value of self-organization S and its index K_S – structural coefficient of self-organization;
- space they belong to is the phase space or global economic environment;
- the main function is the development expressed by global economic environment traffic. Thus, ordinary agents of the system can be described by two phase variables (E_y, K_S) , correspondingly phase economic space they belong to is recorded as $F = F(E_y, K_S, t)$

where E_y - economic efficiency – **qualitative characteristics** of development, parameter that characterizes system capacity – ability to produce economic efficiency and dissipativity;

K_S – coefficient of self-organization – **structural characteristics**, parameter that reflects economic usefulness of system structure and characterizes minimization of dissipation or ability to optimize resource allocation for production and goods for consumption;

t – time.

Development of the global system is recorded in the form of environment traffic equation like Burgers

$$\frac{dY'}{dt} + Y' \frac{dY'}{dL_Q} = K_S \frac{d^2Y'}{dL_Q^2} \quad (3)$$

where: t – time interval during which system is investigated

Y – production output during time interval under analysis (estimated in GDP)

$Y' = \frac{dY}{dt}$ - rate of production output or economic growth during time interval

under analysis (for further record of equation we take $Y' = G$ (growth))

$Y'' = \frac{d^2Y}{dt^2}$ - rates of economic growth of a system during time interval under analysis.

L_Q - qualified work that produces additional product (number of population in time interval under analysis)

Quantity of self-organization $S = Y' K_S$ – counteracting force F as for dissipating of system resources called as the principle of minimization of resource dissipation opposes to economic growth or rate of production output Y' with the coefficient $K_S = S / Y'$ that reflects structural qualities of the system – its institutions (political system) to produce useful work concerning optimization of resource allocation for producing goods to be consumed as well as reaction rate of the political system towards unfavorable economic changes in the form of structure adjustments in the current macroeconomic policy and changes of its direction in case of fallacy by non-conflict way. In other words, it is force that reflects the value of self-organization of the social system S .

12) The analysis of equation shows that :

1. Equation contains nonlinear term $Y' \frac{dY'}{dL_Q}$ since qualification of ordinary agent's

work is the factor that originates nonlinearity proceeding from the simple consideration $Y' = Y'(L_Q)$. Nonlinear term shows the system property – dissipation, and reflects the accumulation of structural information in time and also dependence between rate of production output and change of population qualification along with change in its number. This term reflects the influence of structural information accumulation over the rate of production output.

2. Equation contains adhesive term $K_s \frac{d^2 Y'}{dL_Q^2}$, which reflects the system ability to resist resources dissipation or implement the principle of minimum dissipation of system resources that is to optimize their distribution on the basis of current structure.
3. Equation shows the evolution of structure, which enables us to make forecast of the future states of the system.
4. Sustainable decision of this equation will be a shock wave owing to competition between two opposite tendencies: dissipation and attenuation – minimum dissipation.
5. Equation formally describes the wave nature of economic cycles.

13) The model of global system development

The model is recorded in the following way:

$$\frac{dG}{dt} + G \frac{dG}{dL_Q} = K_s \frac{d^2 G}{dL_Q^2} \quad (4)$$

The managing system parameter – economic efficiency E_Y . Equation is examined by stability of decisions depending on value of managing parameter. It is necessary to determine what dimensions the managing parameter should have so that solution of equation could be stable. It is also necessary to designate what geometrical image of obtained solutions of equations will be equal to stable states. To get a numerical result we create the algorithm, program and carry out numerical experiment.

14) Objectives of simulation modeling

1. To get some idea as to qualities and properties of attractors in the given system of both modes of functioning which the system forms in the development process. Attractors are mathematical images of determined modes of functioning. Change of modes – switch of functioning from an ordinary to a chaotic (bifurcation) mode shows the change of quantity and character of attractors. In “the global civilization” system attractors are supranational institutions that determine rules of behavior for system agents. These attractors also decrease indefinite trajectory of development which helps to maintain system stability in a mathematical sense of description. Thus we receive a mathematical concept of institutions necessary for maintaining sustainable development of global civilization system.
2. To make a numerical calculation of borders of stable environmental movement within which the global system develops.
3. To get some idea about the character of change in number and in properties of system attractors for maintaining boundary limits of sustainable development of the global system.

4. To show interaction of sustainable development, self-organization and available boundary value of the stability of the system under study.
5. To show evolution of the structure of an abstract social system under research.
6. To show evolution and to make a forecast of the structure of international monetary and financial relations of the global system.
7. To show evolution of the structure and to make a forecast of forming the main political institutions of the global system in the XXIst century.

15) Afterward. To the problem of acting crisis of the world economy.

From all stated above we can see that the model has a forecasting potential which is checked on the basis of numerical experiments.

Consecutive complication of both international monetary system and world political system is obvious.

The world system in the period of its development from 1895 till 1945 formed a new structure of monetary and political relations; the designation of this structure was to provide economic growth of the world economy.

The bifurcation period (1965-2015) bears the same task, solution of which will enable the world economy to have a sustainable development.

If the previous cycle of the world economy development solved the problem of increase in supply of world money, that is to provide growing world production with world money, then at the current stage it is necessary to accomplish another main task: to provide the control over emission of world money. Along with this task the structure of world money and world reserve funds need to be changed

In the context of solving this economic problem another one (of a political character) also requires its solution. It implies developing a political control over military operations of the main regulators of functioning the world economy – they are countries that form more than 50 % from the world GDP: the USA, the EU and Japan.

These countries spent a great number of expenses from their budgets on local military operations in Iraq, Afghanistan, and earlier on the territory of the former Yugoslavia, Iraq and Kuwait. It provokes unprovided emission of national currency which is the basis of international accounts and this fact provokes a crisis in the world system.

Thus, on the basis of model we can draw two conclusions:

1. International monetary system will be complicated due to creating regional international monetary systems where all main elements of global monetary system will be reflected.
2. The world political system will find it necessary to develop a general planetary constitution – the collective treaty which will stipulate the rules in order to reach compromises – a joint agreement covering vital issues of global system development including limitation of military operations of any countries in the world community.

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