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## Updating of Ecological Economics Within the Framework of Systems Approach

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*In the article, introduction into the new scientific branch—economics of sustainable development—is given. This direction is called to consider traditional ecological and economic spheres as a whole closed system. The aim of such a system is to satisfy current generation requirements in full subject to preservation of future generation needs. The preconditions of sustainable development economics are discussed. Subject, main method and key tasks of new scientific branch are formulated.*

*Keywords: ecological economics, economics of sustainable development, the systems approach, economics, natural capital.*

### 1. Introduction

For the past fifty years economics has been changed considerably. The modern economics adsorbed the most recent achievements from other branches of science: mathematics, cybernetics and the theory of systems. The every economic entity is considered as an open system, hence it is a complex cybernetic system which is capable for self-organization. In spite of the high level of current studies of empirical material, the crisis within economics is obvious because the modern economics require thorough and detail development of its models and methods.

After the needs of practice the modern economics gives ever more consideration to the issues of environmental resources conservation and to the increasing of efficiency of natural resource use.

Particularly, from the end of 1980-th new scientific branch—the ecological economics—began its development. The founders of ecological economics, R. Costanza, H. Daly, A.-M. Jansson, P. Söderbaum, J. Bartholomew and others, made a great contribution to promote the new ideology. The ecological economics became widespread and well-known part in the “field” between economics and ecology.

So, the founders define the ecological economics as interdisciplinary branch of studies, which considers the relations between ecosystems and economic systems in the most common sense (Costanza, 1989).

The main distinction between ecological economics and environmental economics consist in a different approach to consideration of the ecosystem value. In ecological economics,

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the Earth ecosystems are the main carriers of quality, which value is infinite. Ecosystems give to humanity the flow of ecological services.

Meanwhile, the environmental economics is only a part of neoclassical economics, but not a standalone science with its own paradigm.

The ecological economics uses an analogy with the capital in traditional sense, so the capital is used to produce goods and services. The aggregate of natural assets, which give to humanity the resources and ecological services, is called the natural capital. Nowadays, a thorough search of the balancing paths between ecological, economic and social goals for the interest of current and future generations is carrying out.

In the foundation of environmental economics methodology, the same approach lies. The most studies in ecological economics claim that it is necessary to steadily improve the techniques of natural resource and ecosystem services assessment, so the market will regulate everything else. The main spectrum of studies in ecological economics is within the framework of the sustainable development concept. Conservation of constant and nondecreasing value of natural capital of the particular territory (Total Natural Capital, TNC) is the main condition of sustainable development. Since  $TNC = RNC + NNC$ , where RNC is the renewable natural capital, NNC is nonrenewable natural capital, so to keep intact the TNC, we should reinvest the nonrenewable capital income into renewable capital. R. Costanza and H. Daly consider the development, which provides the mode of production and consumption that not reduce the natural capital, as a sustainable. Frequently, it is pointed out that just external environment is the main limiting factor of the economic systems growth rate at present. In turn, uncontrollable spending of natural capital implies the reducing of assimilative potential, which is not capable to handle the increased anthropogenic load. To

improve of the ecosystems services and the quality of natural capital estimation is one of the main tasks of ecological economics.

Ecological economics advanced significantly in the solution of environmental problems considering the interaction between biosphere and society. Besides the cost estimation methods, ecological economics widely uses the normative approach, which assume the development of ecological regulations and standards. Ecological economics suggest that the well-balanced and sustainable economics have to interact with natural ecosystems, because the primary living requirements are always satisfied by ecosystems. The biosphere resources could not be excluded from the civilization perspectives, the Earth population could not replace it. So are the main ideas of ecological economics.

The development of ecologically oriented economics is based upon some main principles of sustainability:

- The substances and materials, which were exhausted from lithosphere, could not be systematically accumulated in the ecosphere.
- The substances and materials, which were produced by the society, could not be systematically accumulated in the ecosphere.
- Physical conditions, which support productivity and diversity in the ecosphere, could not imply the systematic land deterioration.
- Resource use should be effective and agreed with the satisfying of human requirements.

Unfortunately, the vast literature in ecological economics keeps intact the traditional economics paradigm and substantially take up a defensive position. Such ecologization of economics is palliative, as far as it doesn't "touch" the control object—economic system.

Strictly speaking, it is not the ecologization of economics, but “economization” of ecology. This way of thinking simplifies the problem of interactions between economics of human and economics of nature. This simplification bears on the “old” common methodology of studies. Though, it states multiple interactions between ecosystem and economics, each subsystem is considered separately.

## **2. Introduction into economics of sustainable development**

Among the indicators of modern paradigm of development we should mention the main—inability to solve the new tasks, which follow the road of human economy development within biosphere. The next scientific paradigm experiences crisis, when the practice present much more abnormal facts, which are not fit in the system of laws and rules of current paradigm. For a while, the society doesn’t pay attention to these anomalies, because new observations are not realized immediately as a law to take into account for decision-making. For example, during the last thirty years, the obvious facts, that prove demonstrably the degradation of natural complexes and deterioration of the environment, are stated. The human society began to correct the current paradigm using the new tools. For example, it could be useful to establish the penalty fees, to account the cost of environment protection in self-cost, price etc. Various methods of administrative and economic account are multiplying now. But after all that actions abnormal facts doesn’t disappear. Every new anomaly is an evidence against the obsolete paradigm. The “face-lift” doesn’t really help—the paradigm change is needed.

Ecologization reflects the important tendency of the modern science. Indeed, many branches of science have stopped their splits and now they are searching the synthesis. Such a trend is widespread between natural sciences

and humanities. The methodological approaches, which realize the principle of integrity, are very important for understanding of modern problems following the road of civilization development, the problems of modern economics.

The ecologization of economics is a necessary condition and, simultaneously, is the main part for transition towards the sustainable development. It moves emphasis of economic analysis from the cost and intermediate results to the final results of economic activity and forecasted trend of development. In fact, ecologization of economics means ecologization of the whole social and economic lifestyle and the transition to the new type of economy.

The new economics—economics of sustainable development—requires not only investment or new technologies, but, first of all, methodological and social innovations, priorities and change of civilization development tasks. While the human economic activity was considered as a small value relative to the natural potential, the last is treated as conventionally deficit-free, and macroeconomics is not considered as a subsystem of the whole ecosystem. During the last decades, the scale of economic activity has been increased dramatically, so the problem of regulation between natural potential and economic growth is stated important to solve.

Transition towards the concept of sustainable development is linked with the appearance of new style of thinking, new world-outlook, especially within the framework of economics. The new branch—economics of sustainable development—is shaping now. Comparatively recently, the methodological approach, which takes into account the multiple interactions, between ecological, economic and social systems, was considered as a progressive and widely used in the studies of different scholars. Such an approach suggests to consider all named above systems as equivalent and isolated, nonmetering the hard

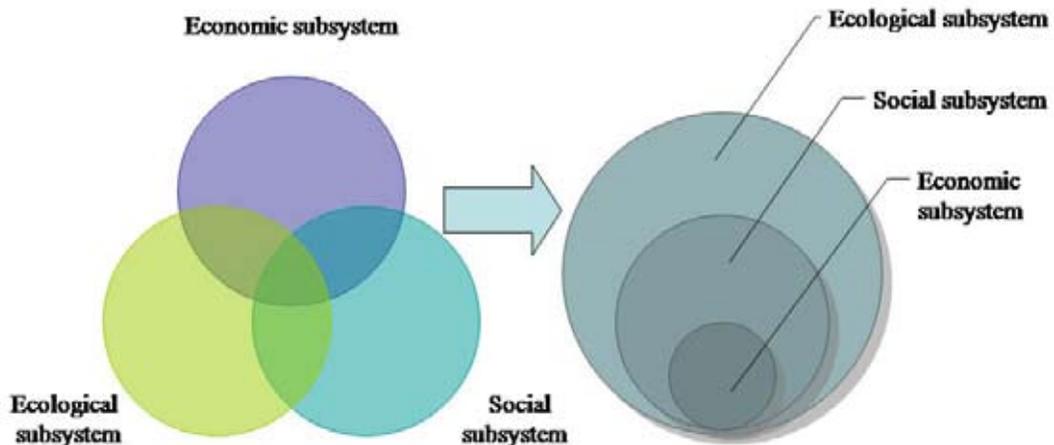


Fig. 1. Evolution of sustainable development concept

hierarchy within the framework of more large system. From the viewpoint of new development paradigm and modern methodology of holism, this approach appears to be too simplified. Within the economics of sustainable development, ecology, economics and society are not three different branches of science and practice, but closely interfacing and interdependent subsystems of the comprehensive whole (Fig. 1).

The new world-outlook within framework of sustainable development is generating on basis of brand new model of interaction between biosphere and human. All components of the global system are considered as its subsystems. The principle of hierarchy and collateral subordination is in force here. This approach mitigates the grave contradictions between ecological requirements and social and economic interests. Modern consumption and irreversible exception of renewable natural resources (air, fresh water, land, biomass, bioproduction, biodiversity) is limited by the opportunities of natural self-reproduction and its assimilative potential. Macroeconomics is considered as a subsystem of the big ecosystem–ecosphere. The main condition of sustainable development economics is the collateral subordination of tasks, so the subsystems tasks should obey

the tasks of upper system. Hence, the task of self-preservation of economic system is the secondary relative to the task of biosphere self-preservation.

Within such a way of thinking, every economic system (firm, plant, city, country) is considered as social, ecological and economic system (SEES) subject to hard hierarchy of development tasks: instead of traditional tasks of infinite economic growth, the task of natural complex integrity preservation becomes the capital. Moreover, it is necessary to preserve the environment (in the most broad sense) and, finally, to improve the quality of life. Only the next steps of SEES optimization should be dedicated to maintain the tasks of economic development. So, the economic developments tasks should be regulated by the social and economic standards (rates). Such economy fits into biosphere cycles preserving the environment for the whole creation. One of the main methodical approach of the sustainable development economics is the normative approach, the main control process is that one of regulation for natural and production potentials of the system. Thus, transition towards the economics of sustainable development is linked with the main conditions: a) change of control object, b) change of development

tasks, c) comprehensive use of ecological and social standards. The modern consumption and irreversible exception of renewable natural resources is limited by not only the capacities of self-reproduction of the nature, but also by social and medical-biological standards.

On the assumption of above-said, we can define the economics of sustainable development as a science of human behavior subject to limited natural resources and environment. Using actual terminology, one can use more thorough definition, which treats sustainable development economics as the most important part of economics, which studies the human behavior subject to social and ecological limits. The main system object of sustainable development economics is the social-ecological-economic system developing within the framework of above-mentioned limits.

New paradigm implementation can occur only if the development of brand new laws, strategies and programs taking into account the triunity of ecological, social and economic tasks will be made. The analysis of current system of laws in various subject of society life shows that its authors haven't used such a systems approach, which is widely discussed, but not implemented in practice at all.

The main thesis of sustainable development economics are the radical change of development paradigm, the change of humanity role, the definition of economic growth limits, the preserving of planet's natural capital. This statement is supported by the numerous empirical materials and global reports of international organizations concerning the degradation of the human environment ("Our common future...", 1989; Environmentally..., 1991; The World..., 1992 etc.). Well-known negative tendencies are keep on, and new threats appear. By the way, the scholars avoid more fundamental generalizations and forecasts on basis of those empirical information. Economics of sustainable development should

bear on the discipline set concerning the interaction between human being as a biological individual and as a personality–social entity–and his natural and social environment. The diversity of living standards, high polymorphism, culture existence, capacity of transition and inheritance of acquired knowledge and skills—all this extends significantly the subject of our study. The sustainable development economics includes a wide variety of themes and problems, which are not discussed by the economists. The main task of economics is that one of production and distribution of goods made by human labor. Unfortunately, the mainstream of modern world-recognized economics ignores the degradation of human environment and apparent global ecological crisis.

The planetary consequences of human economic activity point out the primary importance of sustainable development economics. It occupies significant place in humanities, and could become the main link between the natural sciences and the humanities. Relying on anthropology, sociology, human ecology, systems theory, sustainable development economics widely extends the borders and touches, on the one hand, demography, medicine, geography, on the other hand, history, sociology, ethnography, psychology, ethics. But its main role is in capacity to objective analysis of the modern civilization state and forecast of its development. Only economics of sustainable development can be the most close to the answer a question *quo vadis?* The distinctive feature of the sustainable development economics is its focus on comprehensive consideration of the main problem—safe inclusion of human economy into the nature economy. Economics of sustainable development is of a great interest for the specialists in the theoretical and applied economics, sociology, informatics and complex systems control.

### **3. Subject, methods and the main tasks of the sustainable development economics**

It's useful to recall the sustainable development concept. So, the model of social-economic life of society, which is realizing to satisfy the requirements of the current generation subject to the needs of future generation, is called economy of sustainable development.

Methods—the main tools and means of perception—are used to study the human behavior, to provide acquisition of new knowledge about the subject of study. In our case, the subject claims development of new research techniques. On the other hand, it is necessary to understand that the methods should fit content of subject. Economics of sustainable development uses various research methods. Among them there are traditional methods of analysis, synthesis, induction, deduction, analogy, and methods derived from contemporary systems theory, self-organization theory, synergy theory and organization theory. Economics of sustainable development widely uses tools of modeling as a good method of scientific abstraction. This model helps to clearly understand the subject.

Solution of global and national problems should take into account particularities of economic systems behavior, public ideology and politics. Proof of the main axiom of sustainable development economics—economic activity must

obey the economics of nature laws and, hence, should fit into the economics of Earth nature—claims the solution of hard social, ecological and economic problems. We hope, economics of sustainable development can just contribute the main scientific foundation for complex study of accumulated problems of further civilization development.

### **4. Conclusion**

Subsequent development of the world economic system, which is aimed to infinite growth soever and based on traditional paradigm of development, will inevitably cause ecological and social disasters and the spread of poor and rich countries development level. Practical problems mentioned above issue the new problems prior to modern economics.

In the given article we tried to prove shaping of the new scientific branch within framework of classical economics—economics of sustainable development. The given scientific branch is called to consider widely discussed problems of intensive Earth ecosystems damage from the point of view of systems approach paradigm. It is precisely the concept of sustainable development that can combine ecological and economic systems into a single object and provide the ability to solve the stated problems of modern ecological-economic sciences.

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## **Модернизация экологической экономики на основе применения системного подхода**

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*В статье дается введение в новое направление современной науки о взаимодействии природы и человека – экономику устойчивого развития. Данное направление призвано рассматривать традиционные для эколого-экономической науки экологическую и экономическую сферы в рамках единой замкнутой системы, целью развития которой является максимально возможное удовлетворение потребностей текущего поколения при сохранении возможности удовлетворения потребностей будущих поколений. Обосновываются предпосылки возникновения экономики устойчивого развития. Формулируются предмет, основной метод, ключевые задачи.*

*Ключевые слова: экологическая экономика, экономика устойчивого развития, системный подход, экономическая теория, природный капитал.*

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