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PHILOSOPHICAL FOUNDATIONS OF THE SCIENTIFIC AND TECHNOLOGICAL COMPONENT OF MODERN ECOLOGICAL SAFETY

L. Yurchenko¹, L. Gontarenko¹, S. Hovalenkov¹

¹National University of Civil Protection of Ukraine, Cherkasy, Ukraine

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Abstract

Environmental safety of objects, states and processes on the eve of the next qualitative leap in the structure and dynamics of science and production is considered in the context of a radical reorientation of scientific and technological progress.

Paying attention to the social, political, economic and moral prerequisites of the globalization reorientation of society, attention is drawn to those opportunities that have appeared in society in modern times.

The study of the phenomenon of environmental safety is structured in the work in such a way that a person no longer simply confronts the object as something external, but turns into a constituent part of the system that it changes.

The work provides some basic parameters of the state of ecological security in Ukraine, including the period of war.

Modern science and technology, which are the basis of technologies, including environmental protection, fragment the world in a fundamentally different way than in previous eras, bringing new types of objects into the orbit of human activity – complex self-developing systems with human participation. The study shows that the development of such systems is accompanied by passage through special states of instability (bifurcation); at these moments, influences lead to the emergence of new structures, levels of organization, transforming the previous ones.

The course of evolution clearly shows that the promotion of bio-saving technologies takes place on a number of levels: low-waste technologies, environmentally friendly production, bioautonomous processes, rising by extrapolation to the degree of biosphere-compatible technologies or autotrophic production. In the given chain, each subsequent element cannot function without the previous one. And there is no reason to simplify the situation, believing that in the future production will be based exclusively on bioreproduction. It will probably contain elements of bioconservation, bioregeneration, and bioautonomy.

It has been established that a person is subject to such influence as an object not only of the biosphere, but also of technology and the primary source of technogenic influence on the environment, which must be taken into account during the formation of the philosophical basis of the strategy of environmental security of society.

Key words: ecological safety, science, technology, man, biosphere.

Statement of the problem.

All over the world, there is a fairly active reorientation from the installation on acceleration of scientific and technical development to the ideology of survival. In essence, this means that the search for means of resolving contradictions between technological advancement and preservation of the environment, achieving complete balance between these spheres, comes to the fore. Ignoring this unity, forgetting that not only technologies, but also nature itself is the basis of human activity. one of the epistemological and activity reasons for environmental problems. That is why the thesis on the essential unity of scientific-technological and environmental components is one of the foundations on which the solution of environmental problems will be built.

Correct those shortcomings of the technology system that rely on continuous growth. It is fundamentally impossible to achieve sustainable development on it, no matter how much we improve the system of natural resource management.

It should not be thought that a purely consumerist attitude towards nature is inherent only to representatives of the so-called civilized world. The predatory destruction of nature has always existed. And in earlier times, the same consumerist attitude towards nature with

the same sad consequences can be traced among other peoples. The difference of the modern era is that now the principle of utility is global in nature, in contrast to the local one in previous eras. The system of universal utility is the substantial basis that unites all partial and special manifestations of human civilization.

All human existence, his mentality and system of values are placed exclusively in the technological-economic plane.

While paying tribute to the social, political, economic and moral prerequisites for the globalization reorientation of society, one should pay attention to the opportunities that have emerged in the era of technology through the power of human creations.

Analysis of research and publications.

The system of universal utility is the substantial basis that unites all partial and special manifestations of the scientific and technological component of civilization. Only 13 % of the world's population currently lives in developed countries, and its share in pollution and destruction of nature is 70 % [1, p.58]. This is the price of a high standard of living for humans.

At the same time, it should be noted that consumerism should not be confused with consumption – the satisfaction of needs that correspond to the inner

nature of man and without which human life itself is impossible. Consumerism is the predominant direction of consumption contrary to spiritual life, often associated with the satisfaction of pseudo-needs, a striking example of the manifestation of ecological scientific and technological anti-culture. Pseudo-needs can be of two types: those that exceed real needs and those that replace them (often due to the impossibility of satisfying genuine ones) and that have their own internal and external determinants. Some are associated with the artificial formation of needs, while others have predominantly psychological properties, although both are rooted in social disharmony.

In general, there is every reason to assert that the limitations of modern environmental safety are the result of the action of certain social and cultural factors, which can be influenced to a certain extent through the organization of public life. Higher spiritual values should regulate everyday needs and their differentiation. A new rethinking of man's place in the universe is needed: to consider man not as a conqueror of nature, but as its organic component. The idea of a comprehensive scientific and technological control over nature is the fruit of arrogance that arose when it was believed that nature existed only for the comfort of man [2, p.44; 3, p.25].

Therefore, the term "coevolution", that is, their common evolution, better conveys the essence of the problem posed. Coevolution, according to M. Moiseyev and I. Frolov, means such a directed development of human society and its influence on the biosphere, which not only does not destroy the biosphere, but contributes to its further development and ensures progress [4, p.149].

In scientific circles, there has long been a discussion of the strategic task of changing the vector of technological development in the environmental direction [5, p.45; 6, p.126; 7, p.95]. We are talking about the adoption without delay a whole range of new state and interstate economic guidelines that contribute to the creation of environmental safety.

Prospects for economic growth in the context of the theory of sustainable development and environmental safety are associated with solving global problems of preserving resources for future generations [8, p.54].

At the 17th century French philosopher C. Montesquieu wrote that nature always acts slowly but optimally. Even in its ultimate goals, it requires moderation: to behave according to the rules and in accordance with the conditions. If it is forced, it quickly becomes exhausted and directs all its remaining strength to preserving itself, completely losing its productive capacity and reproductive power [9, p.150].

As a result of evolution and continuous development, humanity has become the most powerful amplifier and accelerator of not only technological but also natural processes, the main transformer of the latter. It is he who now determines the nature of the relationship between the scientific and technical sphere and environmental safety [10, p.112].

Analyzing the materials of the works [11–13, 15], the natural resource potentials that influence the

formation of competitive strategies for the integration of Ukraine into the global ecosystem were considered. Emphasis is placed on the contradictions that arise between the natural environment, the wealth of its resources, and the strategic location of Ukraine. They simultaneously open up opportunities and create challenges for environmental security.

Statement of the problem and its solution.

The fact that man himself has entered the sphere of technical objects and, thus, directs his skill to himself, again and again producing inventors, manufacturers and consumers of something remains without the attention of researchers. Based on this, the goal of this work was to analyze and study the problem of the influence of scientific and technological achievements on man, as an object of both the biosphere and technology, on the formation of the ecological safety of society as a whole.

Today, it is possible to state a deep ecological crisis in the country, which causes a sudden drop in environmental safety during the wartime crisis.

The environment is not a silent victim of war. In academic circles, specific data on the destruction of natural resources are heard [14, p.214]. About 1.24 million hectares of protected lands were affected by hostilities [15] Constant shelling and explosions disrupt geological and hydrological properties, lead to the death of flora and fauna, destroy ecosystems, pollute soils and cause loss of biodiversity.

As a result of the invasion of Russian troops, more than 1,970 territories and objects of the nature reserve fund were damaged, which suffered significant destruction from the actions of the aggressor [13, p.9].

On July 30, 2024, the Cabinet of Ministers of Ukraine approved the Concept of the state target program of comprehensive water supply for the territories affected by military actions for the period until 2030.

This document is revolutionary not only because of the challenges associated with providing water to the frontline regions. Now we cannot afford to move slowly towards a "good" state of water resources. The new program provides for funding from international aid for 57 %, the state budget for 37 % and local budgets for 6 % [16]

The program includes three key tasks and 57 specific measures, including:

- construction of water supply systems;
- reconstruction and overhaul of hydrotechnical structures;
- cleaning of riverbeds and reservoirs;
- usage of underground water for diversification of water supply sources [16].

In the summer of 2024, critical pollution of the Sea of Azov was recorded in the temporarily occupied Henichesk district, in particular on the Arbat strait. Sea water has become dangerous not only for people, but also for marine fauna, especially dolphins, which are characteristic of this region [15]. These systems are synergistic, as they include elements of the biosphere, technology and society and require appropriate analysis.

Biosphere synergetic systems are characterized by fundamental openness and irreversibility of processes.

Human interaction with them occurs in such a way that human action itself is not something external, but is included in the system, modifying the entire field of its possible states. A person no longer simply confronts an object as somehow external, but turns into an integral part of a changing system. In the process of activity, it constantly faces the problem of choosing a line of behavior in the biosphere in accordance with the level of its ecological culture. Moreover, this choice itself is irreversible and often cannot be unambiguously determined. Therefore, in the safety of synergetic systems, prohibitions on certain strategies of interaction, potentially containing catastrophic consequences, begin to play a special role. These prohibitions should be reflected in a certain way in the ecological culture of the twentieth century.

Engineering activities and technical design increasingly deal not just with a technical device or machine that enhances human capabilities, and not with the “man-machine” system, but with complex system complexes in which the local natural ecosystem (biogeocenosis) into which this process should be implemented, and the socio-cultural environment accepting the new technology, are considered as components of a single whole technological process associated with the functioning of human-machine systems. This entire complex in its dynamics appears as a special object, open in relation to the external environment with characteristic properties of self-regulation. It is introduced into an environment that, in turn, does not simply act as a neutral field for the functioning of new systemic technological complexes, but is an integral living organism [17, p.198]. This is how modern science imagines the global ecosystem – the biosphere. In this case, technological innovations can no longer be imagined as the processing of natural material [18, p.128]. After all, if a person is included in the biosphere as a self-developing integral system, then his activity can resonate not only in the nearest, but also in remote parts of the system and in certain situations cause its catastrophic restructuring. Forced processing by a person of a synergetic system, in which he himself is included, can entail undesirable consequences for the person himself. In this case, limitations of activity are inevitable, aimed at choosing only such possible scenarios of changing the world, in which survival strategies are ensured [19, p.312]. And these limitations are determined not only by objective knowledge about possible lines of development of objects, but also by value structures, understanding of good, beauty, intrinsic value of human life, and, ultimately, by ecological culture.

All these new tendencies of human behavior in the biosphere and new strategies of its life activity are nothing but manifestations of modern ecological culture, laying the foundations of a special type of civilizational progress [20, p.416]. Further sustainable development will be based mainly on the principles of ecological culture and, obviously, will differ significantly from the technogenic development that preceded it. It is difficult now to specify in detail the ways and means of future changes in the deep values of technogenic culture, but the fact that these changes have already begun in the

direction of the formation and development of ecological culture can be recorded as a historical fact.

All previous centuries-old experience of mankind was aimed mainly at research and use of individual fragments of the natural environment in order to obtain the necessary material goods. Therefore, it turned out to be very “fragmentary” and “specialized”. Restoration of the disturbed balance was carried out by nature itself. Now its renewable potential is almost exhausted. And it is in our interests to immediately come to its aid. Here, of course, science plays a huge role. Throughout human history, the role of science has not always been one coffee. In the course of accumulation of specific material, generalization and knowledge of the laws of development of nature, the influence of science increased. Already in the 17th century, the complex of fundamental sciences began to develop rapidly, which ensured a powerful rise in production technology. The explosion of scientific creativity, according to V. Vernadsky, became a grandiose phenomenon [21, p.325]. He assessed this phenomenon quite positively, since scientific activity during turning points has a creative, not destructive character.

At the same time, scientists' responsibility for the negative environmental consequences of their achievements should be increased. A huge army of scientists and engineers is busy developing means that have a destructive effect on nature, and a very small share of them are solving problems of preserving the environment. If we analyze how many institutions are aimed at snatching nature's riches from us, and how many are aimed at establishing the boundaries of “permitted” (until empty from the point of view of the country's strategic interests and the fate of future generations) influence on nature, it becomes obvious that such a comparison is far from in favor of protecting the natural environment. That is why demands for social regulation of scientific activity are increasingly heard [20, p.416].

The greatest humanist and scientist V. Vernadsky protested against the thoughtless use of science. Unfortunately, many of Vernadsky's predictions were either forgotten or failed to be appreciated. First of all, this concerns nuclear physics and the creation of the atomic bomb. The consequences of the horrific “experiments” are dozens of regions with millions of terminally ill people.

In general, the issue of the environmental consequences of the development of science and technology is quite complex, since the goals are based on good intentions, and the results are often harmful. Often, technical innovations based on scientific achievements worsen the environmental situation. Are scientists responsible for these negative environmental consequences? References to the fact that it is not the scientists who are learning about the world that are to blame, but those who apply their discoveries, may justify them, but not science as a whole, since only what has already been created can be used. What a scientist is determined by, all other things being equal, is also determined by the understanding of responsibility, the civic maturity of the scientist, and, ultimately, his environmental culture. Consequently, the problem of

synthesis of knowledge and ethical values arises. Man, by the level of his knowledge, has reached the status of a negative environmental factor and can no longer be guided by value-neutral scientific knowledge, because it can lead humanity to destruction. The moral side of science, regardless of its national, state, religious or philosophical manifestation, becomes fundamental for the scientist. And this cannot be ignored. “Do no harm!” – this generally recognized imperative has not only an ethical and medical, but also a deeply vital and moral meaning, the loss of which in scientific and technical or other practical activities threatens the destruction of not only the so-called environment. It is equivalent to human suicide.

Undermining trust in science, and thus in reason, is often provoked by the conclusions of scientists predicting completely opposite consequences. At one time, they spoke and wrote quite actively about the safety and environmental friendliness of nuclear energy and the usefulness of biostimulants. This position is one of the reasons why our contemporaries do not understand the full extent of the seriousness of the future environmental catastrophe. It is becoming obvious that it is important to rationally overcome the negative consequences of this dilemma. Of course, we are not talking about the “unity” of scientific recommendations. “It is precisely because,” believes V. Hosle, “that disagreements depend on different knowledge, on the dissimilarity of hypotheses, on the difference in emphasis when assessing information, that a scientist is obliged to clearly define the assumptions he has adopted, unambiguously correlating his forecasts with them. Disagreements will remain, but the educated public will then be able to better understand the reasons for such discrepancies” [12, p.57]. Disagreements between the conclusions of scientists are due to various reasons. First of all, they are motivated by interests. For example, the depletion of the Earth’s ozone layer, the greenhouse effect was envisaged by the Swedish scientist, Nobel Prize laureate in chemistry S. Arrhenius back in the late 19th century centuries. However, for a long time this was ignored.

There is a widespread misconception that any truly scientific study of environmental issues necessarily improves the decision-making process within the framework of environmental protection activities, helping to remove uncertainty about the consequences of implementing scientific and technical projects and to select environmentally sound options. Such illusions are supported by both manufacturers seeking to obtain environmental indulgence for the scientific and technical innovations they introduce, and environmental protection specialists trying to demonstrate the practical value of their work. The required accuracy of environmental forecasts achieved so far is not very high. The interests of scientists, as a rule, are too narrow and are determined by the specifics of a particular science. Therefore, there is no guarantee that the relevant processes and changes will be identified in the course of scientific research, or that information will be collected on the spatial and temporal scales necessary to resolve management issues. Moreover, factors that have not played a special role in the history of existing ecosystems often acquire decisive

significance when the environment changes significantly under the influence of human activity. Observations carried out in limited areas or water areas, in limited time intervals, can only be used with great caution to predict the development of the entire ecosystem as a whole.

All of the above means that when assessing the environmental impact of projects – and such studies are vital – their results should not be perceived as the only correct ones. The most dangerous thing is to ignore the uncertainty that lurks behind them, since such a policy can reduce the consistency of the decisions the management system makes and lead to possible unpredictable consequences. Analyzing the specifics of the methodology of scientific environmental assessment of scientific and technical projects, the author quite clearly outlines the main laws and basic principles that should be remembered during environmental assessment and decision-making [9, p.182].

At the same time, it should be noted that the direction of science is closely connected with the social processes taking place in society. The thesis that science develops only under the influence of its internal logic is nothing more than a positivistic myth, needed only by those in power to hide their managerial influence on science. Science and technology in the state are an instrument that largely depends on human values and needs, an instrument that is far from perfect, but extremely necessary. In this combination, science not only reflects the world, but also creates it with the help of technology, revealing at the same time the spiritual potential of man. Orientation towards the preservation and spiritualization of nature should become the main thing in science.

In order for science to become a means of environmental safety and to be able to solve environmental problems, it must be not only a “production force”, but something more. Of course, to the extent necessary, it must also perform its function of ensuring the material well-being of the population, but not be limited to it. The synthesis of the ancient value paradigm of science (knowledge for the sake of knowledge) with the utilitarian concept of science that was formed in modern times, and which is provided to it by the corresponding level of environmental culture, must embody both the objectivist and utilitarian approaches in a more general system of values, the basis of which is man and nature in their integrity and interrelation.

The possibilities and results of progress give rise to quite diverse technologies for obtaining the same type of product, differing in the costs of labor, material, energy resources, as well as in the means of metabolism and the environment, that is, the level of consumption of natural resources, the amount and composition of waste. The very process of creating new technologies, new machines, and means of labor is key to progress both in the field of production and in the rational use of natural resources. But it should be remembered that in developing a new technological policy in today’s conditions it is advisable to take into account the methodologically fruitful conclusion that the gap between the expected and actual risk from the use of new technology is becoming wider, and this difference is even greater the higher the welfare of society. This

thesis, perhaps, is especially consistent with the process of greening technologies, since the modern production infrastructure of our country is not nature-protecting in nature, but an open-loop nature-consuming one. system. Technological scheme any production traditionally remains linear: natural raw materials or their semi-finished products are processed in the “womb” of the enterprise and come out as a finished product and waste, polluting water, air, soil and directly or indirectly affecting human health. The finished product after some time also becomes waste. In this chain of related processes, the most pressing issue is the scale of distribution and the degree of negative impact of pollutants.

Scientists have already begun to develop and implement ideas aimed at achieving the least ecologically risky and ecologically profitable forms of interaction between man and nature. However, on this path there are still more unsolvable questions, more inertia in thinking and actions than conscious, scientifically substantiated, more contradictions, illusions and dreams than original ideas and promising hypotheses, concepts, theories, practical applications. All this applies not only to general theoretical questions reflecting the interaction of society and nature, but also to special questions, in particular to the development of promising models of technologies capable of reducing environmental stress.

Scientific and technological research is usually abstracted from many parameters that influence technology: space (location of the technological object); time (optimal period of validity of a specific model); systemic connectivity (coordination of the work of a specific technological object with other objects); optimal use of matter, energy and information; reliability and safety; economic and environmental profitability. Designers, for example, are searching in a direction that would allow for the effective use of any emissions, on the one hand, and on the other, in the direction of creating chains of enterprises, where the waste of one becomes the initial products for another or for several enterprises. Such a scheme of bioconservation can also be attributed to low-waste technologies, predicting its enormous prospects. However, there is no reason for this. Firstly, such an “industrial monster” will at best be able to perform only a resource–energy–information–saving function. Secondly, there is still no objective scientific answer to the question: will these engineering solutions give a significant environmental effect. And finally, thirdly, the idea is of little waste (no matter what real decisions it may manifest itself in) not only does not contradict the idea of extensive growth, but even presupposes it.

Engineers and specialists in the field of technical sciences are more inclined to developments aimed at improving not the technology itself (with the ultimate goal of bringing it to the desired degree of little waste and bioconservation), but additional means and structures. The concept of “ecotechnology” has recently been used mainly as a synonym for such concepts as “waste-free technology” and “geotechnology”. With such a broad interpretation, virtually any production chain can be considered eco-technological –

environmental measures at this facility are provided for in one way or another. In addition, this specific infinity in assessing the environmental friendliness of a particular technology does not allow them to be scientifically classified as specific standards (models) of eco-technologies. It is also unlikely that such schemes can be considered biosphere-compatible technologies. This applies to biotechnology, microelectronics, robotics, etc., since their functioning in any case depends on accompanying technologies, for example, from the extractive industry. And they themselves will be polluting, although with other effects on the environment. At the same time, we will pay tribute to them as stage-by-stage solutions on the way to biosphere-compatible technologies, as biosphere-saving and biosphere- restorative.

It is noteworthy, for the optimal functioning of which, of course, the unconditional presence of high-molecular natural compounds is not required. Low-molecular compounds, and ultimately chemical elements, can be used as a raw material and energy source in such production. This will allow us to lock the production system, in which the used products become raw materials for the subsequent production cycle. Intensive utilization of the natural resources of the biosphere on a fundamentally different qualitative basis, on the one hand, and the creation of artificial equivalents of natural things, on the other, form objective conditions for the autotrophic functioning of production and, accordingly, the autotrophic existence of man. The use of this process in the future can be quite justified, but not because of the creation of artificial nature, not because of the replacement of the biosphere with appropriate technical devices, but because of the creation of such conditions under which the industrial, agricultural and recreational functioning of society would not be associated with further disruption of natural interrelationships and bio-conservation relations. Such ideas deserve attention and serious theoretical and engineering studies. First, they could be a transitional model from heterotrophic to autotrophic human existence. Secondly, they confirm the optimistic attitude towards solving social and ecological problems within our biosphere and, accordingly, reject the expediency of creating artificial settlements isolated from our planet and turning the biosphere into some kind of global technical device. The creation of such productions can and will be a justified stage on the path of society’s evolution, but it is clear that today this idea looks rather mythical.

At the same time, attention should be paid to the methodologically important thesis that the growing threat of a global ecological crisis is associated with the increase in production activities based on traditional mechanical equipment and technology. An alternative could be the use of fundamentally new equipment and technology in production, where natural forces and objects act as tools. This tendency is already beginning to manifest itself, but the remaining principles on the basis of which the new equipment and technology will function have not been studied at all; there is a need for objective knowledge about the biosphere. And this is very important, because the principles of the

functioning of “mechanical equipment and technology” are still accepted as the initial ones for modeling biotechnological processes. Finally, the issues of environmental efficiency and the consequences that may arise in the process of using “natural forces” in production remain in the shadows.

Based on the above, the question arises: how acceptable and promising are “ecotechnologies” for solving social and ecological problems? Can they be considered prototypes of “biosphere-compatible technologies”? It is impossible to answer this question unequivocally. But it is obvious that such systems at the construction stage necessarily require a huge amount of both natural and artificially created substances, energy and information. If according to technical parameters such models could become biosphere-compatible, then according to social parameters (creation of an artificial life support system for all of humanity, the ability to avoid mass psychophysiological stress, etc.) – it is unlikely. Bioautonomous technologies can also be seen as a stepping stone towards biosphere-compatible technologies.

Conclusions

Thus, the process of theoretical and practical development of the problem of biocompatible technologies is moving in the direction of creating bio-saving, that is, models of low-waste technologies and “green production”, which is already functioning today in some industries.

Further, it elevates frugality to the level of bioautonomous, similar to the Biosphere models.

And, finally, to rise to bioreproducing, biosphere-compatible technologies. Such technological models,

in which the idea of “autotrophic production” is fully embodied.

In this chain, each subsequent element cannot function without the previous one. And there is no reason to simplify the situation by considering that in the future production will be based exclusively on bioreproduction – it will probably contain elements of biosaving, biorestitution, bioconservation and bioautonomy.

An analysis of the essence and trends of greening technologies shows that the process of transition from bio-plant to bio-autonomous, bio-reproducing ones is just beginning. The successes are still more modest. Various terminological exaggerations are especially dangerous from this point of view. Such concepts as, for example, “waste-free production”, acquiring a terminological status, through only theoretical installations and declared goals without confirmation of their specific engineering developments, first cause technocratic illusions, and then technologically hopeless situations.

The value reorientation of science on the basis of modern ecological culture requires greater balance in science, both “pure” and applied, since the distance between the ideal world of science and the reality of technical implementation, between the supposed and actual risk from the use of new technology is becoming increasingly significant.

Prospects for further research are seen in a deep philosophical analysis of biosphere-compatible technologies – matters of the future. And they will probably be preceded by ecotechnologies, revolution in productive forces, eco-intellectual in public and eco-cultural consciousness – in behavior for the formation of environmental safety of society.

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Юрченко Л. І., Гонтаренко Л. О., Говаленков С. С.

ФІЛОСОФСЬКІ ЗАСАДИ НАУКОВО-ТЕХНІЧНОЇ СКЛАДОВОЇ СУЧАСНОЇ ЕКОЛОГІЧНОЇ БЕЗПЕКИ

Екологічна безпека об'єктів, станів та процесів напередодні чергового якісного стрибка у структурі та динаміці науки і виробництва розглядається в контексті корінної переорієнтації науково-технічного прогресу.

Відаючи належне соціальним, політичним, економічним і моральним передумовам глобалізаційної переорієнтації суспільства, звертається увага на ті можливості, що з'явилися у соціумі за часів сучасності.

Дослідження феномену екологічної безпеки вибудовується в роботі таким чином, що людина уже не просто протистоїть об'єкту як чомусь зовнішньому, а перетворюється на складову частину системи, яку вона змінює.

Сучасні наука і техніка, які є основою технологій, у тому числі й захисту навколишнього середовища, принципово по-іншому фрагментують світ, ніж у попередні епохи, захоплюючи в орбіту людської діяльності нові типи об'єктів – складні саморозвиваючі системи з участю людини. У дослідженні показано, що розвиток таких систем супроводжується проходженням через особливі стани нестійкості (біфуркації); в ці моменти впливи призводять до появи нових структур, рівнів організації, трансформуючи попередні.

Хід еволюції з певною очевидністю виявляє, що просування біошадних технологій відбувається за низкою рівнів: маловідхдні технології, екологізоване виробництво, біоавтономні процеси, підносячись екстраполяційно до ступеня біосферосумісних технологій або автотрофного виробництва. У наведеному ланцюгу кожен наступний елемент не може функціонувати без попереднього. І немає підстав спрощувати ситуацію, вважаючи, що в майбутньому виробництво ґрунтуватиметься виключно на біовідтворенні. у ньому вірогідно будуть елементи і біозбереження, і біовідновлення, і біоавтономності.

Встановлено, що під дію такого впливу підпадає людина як об'єкт не тільки біосфери, але і техніки і першоджерело техногенного впливу на довкілля, що необхідно враховувати в ході формування філософського підґрунтя стратегії екологічної безпеки суспільства.

Ключові слова: екологічна безпека, наука, технологія, людина, біосфера.

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