T.N. Sosnina

BIOSPHERE

(analysis of value parameters)

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In 1999 the author was awarded the medal of V.I. Vernadsky's Fund "For the contribution into the stable development" for the distinguished achievements and implementation of the program of the steady social, economic and ecologic development. The suggested research-work «Biosphere: analysis of value parameters» is the logic continuation of the analysis of the actual problems of modern production implemented by T.N. Sosnina.

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ANALYSIS OF VALUE PARAMETERS

Translated from Russian into English

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Анализируются стоимостные параметры биосферы с учетом качественно-количественных ее характеристик. Предлагается вариант интерпретации стоимостной оценки процессов деформации живой и неживой природы под воздействием антропогенной деятельности с позиций закона бережливости В.И. Вернадского, анализируются пути сохранения потребительно-стоимостных и стоимостных свойств биосферы.

Обоснована целесообразность трансформации двухкритериальной теории стоимости, основу которой составляют учет издержек по производству продукта и оценка его полезности, в трехкритериальную теорию баланса стоимости, где экологическая составляющая выполняет функцию ключевого критерия.

Biosphere: Analysis of Value Parameters / *T.N. Sosnina.* – Samara: Samar. state aerospace un-ty. State Architecture-Construction Academy; 2009. – 168 p.

Value parameters of biosphere in the view of its qualitative-quantitative characteristics are analyzed. Interpretation variant of value estimation of deformation processes of organic and inorganic nature under the impact of anthropogenic activity from the view point of V.I. Vernadsky's law of economy is suggested. Besides, the ways of saving the use value and value properties of biosphere are analyzed.

The expediency of transformation of two-criterion theory of value into the three- criterion theory of the balance of value, where the ecologic component

performs the function of the key criterion has been founded. The calculation of the expenses on the production and estimation of its usefulness makes up the basis of this theory.

The book is intended for teachers, postgraduates and students. It will be helpful to all people who are interested in socio-economic problems of ecology. It may be used in process of training as well at teaching students on speciality “Engineering protection of the environment”.

The author is awarded with a diploma of the Fund of Domestic Education and is a laureate of the contest for the best book of 2005 among the teachers of higher institutions of Russia.

ISBN 978-5-7883-0718-3

To commemorate the memory of my brother

GONCHUKOV PAVEL NICKOLAEVICH

I d e v o t e….

His searching mind, spiritual purity and kind heart could not have been realized during the time that was given by the fortune, but the ideas which were born in our joint thoughts about the existing and the future are present on pages of the book given.

PREFACE

The edition of the book, suggested to the readers' attention is the logical continuation of the previously published works of the author (V.I.Vernadsky's doctrine about noosphere as a theoretical basis for solution of the ecological problems of the present. – M.: ИНИОН of the Russian Academy of Science, 1976: Subject of labour and modern production. – Publishing house of Saratov University, 1984; Material and informational flows of production. Theory of functioning. - T.1. Samara, 1997; Doctrine of biosphere and noosphere as the theoretical basis of ecological strategy of a society // Noosphere, 2001, № 9; 2002, №13. In these works, the problems connected with the search of objective and subjective reasons of overcoming ecologically dangerous situations in the sphere of production and life have been considered.

In the beginning of the 21st century, the humankind cannot help experiencing a sense of sharp anxiety about the present and future of both our children and grandchildren. Nature that once gifted us life is dying itself preparing the same end to Homo sapiens if we do not undertake any measures in the nearest future.

In other words, the 21st century has presented a bill to the humankind; and both the present and the future of our biosphere depends on its payment.

A lot has been said and written about the global problems since the middle of the last century. However, the situation does not change proportionally to the rate of the negative processes that are taking place at a global scale. There exist a great number of reasons and the main one

is that a society in the person of its political, economic and intellectual elite underestimates the danger. It considers the time interval to be a sufficient one and changing of ecological situation is possible in favorable direction within the frameworks of this interval. It is expressed in amorphism and instability of most state and public structures that have ecological status but actually do not justify it: entrepreneurs` uncertainty in availability of “green business”, ignorance and deafness that have become a standard for mass media, which prefer “to see” a problem when it attains the scale of Chernobyl, a certain neglect of educational system at all levels to disciplines of the biological cycle, as well as in a persistent propaganda of consumer mode of life with such slogans as “Take everything from life!”.

The reader has the right to object to the author’s opinion and to think that he is too categorical. Might it be so that the depth of shocks that “the living matter” of the Earth is experiencing is a fruit of our imagination in many respects?

Let us turn to the researches where the ecological problems are regarded not only from the professional point of view, but also from the interdisciplinary approach. Such approach allows revealing some unusual, hardly compatible properties of biosphere from the view point of some established ideas. Multidimensionality of “transition” of human history onto a new stage makes obvious reorientation of social consciousness to nature perception in all sets of its measurements.

The concept of sustainable development that has been established for the last decade implies a combination of economical, ecological and social policy. In essence, it is spoken about the creation of some new model of development that corresponds to the realty of global economics of the third millennium. The states that follow the ecological policy show a tendency to the growth not in the last turn thanks to the increase of a share of production of ecological goods and services. During the 1980s and especially during the 1990s the attitude to green business had been changing sharply: ecologically oriented industries more often were regarded as a sphere of perspective development and in a number of

cases as an only alternative of survival and prosperity. There exists a reason to consider exactly the ecological factor as one of the most important while developing the strategy of increasing Russia's competitiveness.

The author makes an effort to interpret biosphere in use value and value terms from the position of the theory of three criteria of value and puts forward an objective to systemize information on the given problem, besides gives a "frame" description of use value and value parameters of biosphere taking into account V.I. Vernadsky`s law of economy.

In the later works, these ideas are being revealed more thoroughly. In monograph "Products of nature and a society: comparative analysis" the main parameters of the products of natural and anthropogenic nature: geneses, evolution, elementwise analysis, phenomenon of split character of the substance basis are investigated. The postulates of bio-logistics and production logistics are considered; the variants of their investment understanding from the standpoint of the theory of the subject of labour are suggested.

Phenomena of value of the product of labour are analyzed in its triune quality as organic unity in the later work "Value: economic, ecologic and social aspects (methodological research)"

Realizing that the reader cannot accept everything that is suggested unambiguously, the author will consider the goal to be achieved if her ideas make the reader think and implement a scientific search in given direction.

The author expresses the gratitude to many people and organizations contributing to the completion of the present work.

I want to express my acknowledgement and thankfulness to Rector of Samara State Architecture-and-Construction University, President of Samara Regional Department of the Russian Academy of Ecology, Doctor of Technical Sciences, Professor M.I. Balzannikov for attention and support in publication of the book in Russian.

I would like to thank Rector for Scientific Work, Doctor of Technical Sciences and Professor N.G. Chumachenko. Owing to her assistance, the ecological problem takes one of the priority directions in research developments of SSACU.

Long–term cooperation connects the author with the stuff of scientific-and-technical library of Samara State Aerospace University after academician S.P. Korolyov (Director T.S Gadalina). She has been rendering assistance in solving the problems that arise during the research process and promotion of the book nearer to the reader.

I am deeply acknowledged to Rector of Samara State Aerospace University after academician S.P. Korolyov, Corresponding–member of the Russian Academy of Science, Professor, Soypher V.A., Deputy-Rector Corresponding-member of the Russian Academy of Science, Doctor of Technical Sciences, Professor Grechnikov F.V. who assisted in publishing of "Biosphere" in English.

The author is sincerely grateful to Head of Foreign Languages Department of Samara State Aerospace University Merkulova L.P., my dear translators Besrukova E.I. and Pigareva M.N. whose labour and efforts made it possible to translate the book into English.

They can rightly be considered the co-authors of the book. The foreign reader has got an opportunity to get acquainted with the contents of the book, with a number of opinions of the Russian scientists on ecological problems.

I hope that you, my dear readers will begin to think at the most complicated interdisciplinary object, i.e. the system "nature-society-man" and together with the author you will try to do your best to keep our Home – the wonderful Planet – the Earth in good state.

Ad cogitantum agendum homo natus est!

FROM THE AUTHOR

"Being in ecstasy when fighting with nature and with those who think differently, we have missed two great truths. The first one is that the humankind exists and is developing at the expense of nature. The second one is that a mutual aid and not an opposition at all is a basis of existence on the Earth. The mutual aid is primary and the fight is secondary.

While people had been fighting for a piece of bread, they might have been forgiven. But when they are trying to sink the ship where they are all together sailing in the ocean of non-existence, they can not be forgiven. Nobody will reach Promised; it is true, is not it? In addition, neither a tsar nor God will be able to help. Only by common efforts it is possible to come to a well-being."

Reymers N.F. Ecological manifesto // Hopes for the humankind survival. Conceptual ecology. М.: ИЦ «Молодая гвардия», 1992. С.360

The descendants will not understand us: how could such intelligent creatures have led themselves to the verge of ecological disaster? Are they the creatures who have calculated the space orbits, have developed analogues of

their brains unprecedented by their speed, the creatures who have decoded the mysteries of hereditary codes?

Now we have come to extreme line beyond which there is either a death or sharp accelerated personification and ecologization of scientific and technical progress."

Yashin A.L. "The grandchildren will not forgive us. Kuibyshev: Publishing house, 1990.P.9

1. BASIC CATEGORICAL APPARATUS OF THE THEORY OF VALUE PROCESSES

1.1 Analysis of concept “product of labour” and the following terms related to it: welfare, wealth, commodity, capital

Concept “labour” (lat. – productus – produced) means: 1 – result of human labour; 2 – substance obtained chemically from other substances; 3 – food products. We are interested in the first interpretation of the term “product”. Let us distinguish three basic meanings explaining its sense:

material and process state;

finished and final, intermediate product;

use value and value;

This is caused not only by the necessity to define the author`s attitude to the semantic meanings of the term “production “used in scientific publications, but also by a necessity to give proof of its status applicable to the theme of the present research.

In its first meaning product comes forward as a materialized object in which nature and social beginnings form material substance. Natural beginning is a base of a material product, at the same time social beginning is some labour realized in it. Both components are the same in space-time respect and they actually merge.

When quoting T. Cuper, K. Marks in his work “Critics of political economy” pays attention to its organic correlation between natural and social in a labour product. If we take “from a loaf of bread the labour of a

baker, a miller, a farmer, etc. spent on it, what is left then? Several ears of grass that grows and is not suitable for any human consumption" [1].

But if we take from a loaf of bread its material basis, only "illusory objectiveness" of expended human labour will be left as some recollection of the spent efforts.

Social beginning is the special feature of a material state of the labour product that allows revealing something common with the type of labour products quite different in their nature contents. The social connects types of products with each other making them comparable and separates from nature objects. Labour product is a carrier of human`s aim that is consistently being realized in space-time interval: "nature object – product of labour – final product." Between these extreme states "the process of constant transition from some kind of activity to some kind of existence as well as some kind of motion to some kind of materialization is being performed." [3] Otherwise, nature objects experience a set of metamorphosis before becoming a final product. It is worthwhile representing this metamorphosis in the form of labour objects replacing each other. They are conditional, primary and secondary products. Being a conditional or potential product, object of labour is the object of nature that had become the object of theoretical research. In fact, it does not differ from the nature objects that continue to exist in its "pure form." However, a conditional object is already different from the object of nature because a man started studying and evaluating its consumer properties. In this sense we understand the following words of K.Marks: "…being taken abstractly and separately, nature fixed in detachment from a man is nothing for him" [4].

Primary products of labour are objects of nature that have become objects of changing in the sphere of material production. Here labour tears off the link of nature objects with mother's body (the Earth), converting them into primary labour products. The result of their functioning is some raw material (finished, intermediate product).

Primary objects of labour form the basis for the secondary object of labour in processing and recycling industries. A primary object of labour is

different from a secondary one, because object of nature here does not serve as an object in its primitive kind, but materials transformed by labour are finished products (raw materials).

Social beginning consistently realized in the natural whole plays the role of a system formation connecting three basic elements of structure of the object of labour (conditional, primary and secondary) in the single whole that is functioning. “A process is dying away in product…Something that has been revealed in a kind of activity on a worker’s side steps forth in the form of resting property on the side of a product… in the form of a being.” [5]

In its second meaning, product acts in finished and final form. Differentiation of these concepts does not exist in a rough sense of the word that is why the alternative versions are the evidence of it.

Final product is defined as an index, which characterizes the result of production at a micro level [6] as total amount of finished production in its monetary terms, as well as a part of gross product with a deduction of industrial consumption of a material [7]. Besides, final product can be defined as a complex of production resources and means of consumption [8], as gross national product [9], as a final section of nature-production chain: “natural materials – economics – final production” [10], as well as value estimation of some product of finished production [11].

Final, intermediate product respectively is defined as a fragment of nature-production chain. It is intended for primary processing of a resource [12] as a part of circulating resources of non-finished production, or goods and services totally expended in the process of production. [13]

There exist some approaches to determination of the concepts we are interested in taking into account the logics of production cycle within the limits of which all the stages of technological processes and operations complete with the output of finished or final production. The following terms are used in literature as well: “full product” or product that is formed after subtraction of intermediate product. [14] Maximum product [15] or increment in production expressed in physical (natural) units is produced by every additional unit of variable expenses of the given kind at invariability of all other kinds of expenses [16], resources [17] and others.

Polysemy of interpretations of such concepts as “final”, “finished” or “intermediate” product is a direct consequence of their insufficient theoretical study.

Can we consider final product to be a finished one, indeed and vice versa? For an enterprise, the product is final in that sense that it “closes” some concrete technological chain. However, this product may be some intermediate output from the view point of more extensive production process in its existential respect. This product may be some intermediate output that is ready to be included into new, more complicated production processes.

Is it possible to delimit clearly the finished and final product according to some reason in its infinite variety of production flows? Some steps were undertaken in this direction and were brought together to quite convincing argumentation from our viewpoint. Consequently, the means of production and items of consumption are final product in its natural form and in its monetary term is the value of consumed means of production transferred on the product and reproduced value, i.e. national income. [18]

Let us try to find some boundary between finished and final products according to the objective basis from positions of the theory of object of labour, appealing to material basis of finished and final products-objects of labour-integrated process. Functioning of the object of labour (a process itself) anticipates the appearance of both finished and final products taking into account their peculiarity and commonness.

Therefore, final product may be recognized as such on condition that it passes in succession all the stages of functioning of object of labour – process of integrity: conditional, primary and secondary. They anticipate the appearance of final product. They are the products able to satisfy social need in means of production (means of labour, conditions of labour), means of life support (means of human life and society), which turn to wastes after completion of their life cycle.

In the framework of such interpretation, finished product is always an intermediate one, as it passes only a part of a cycle within the limits of

object of labour-integrity. It is either the result of functioning of a conditional object of labour (product of labour of a scientist, a conductor, an architect, a geologist and so on). Finished product attains a quasi-final form with respect to technological process where it is produced. Its "destination" is to become a part of some other technological process in the framework of which *ad litteram* (literally) final product can be produced. For example, product of labour of a scientist, a conductor, an architect is materialized in the conceptions, projects and drafts; product of labour of mining industries is materialized in ore or non-ore raw material, metallurgic, machine-building, processing branches, production of construction materials-hiring vehicles, bricks, concrete and so on.

In theoretical respect, the processes described above can be fixed as a certain kind of a link of natural and social beginning of the product.

Object of labour of mining branches (as well as in analogous spheres of human activities: farming, forest utilization, hydro electrical station and so on) is necessary to separate primarily from the body of nature, "to saturate" with labour and make it suitable for further application. "All the objects that should be torn by labour out of their direct link with the Earth are the essence of the objects of labour. For example, the fish being caught is separated from its habitat-water, the tree being cut in the forest, the ore being extracted out of entrails. [19]

Mining industry, farming, hydroconstruction, etc. come forward as the linking chain between nature in the own sense of the word and the system of processing industries.

In any situation, conditional object of labour foregoes a primary one, a primary object of labour foregoes a secondary one and a secondary object of labour foregoes a final one.

Conditional object of labour differs from objects of nature only by the fact that humankind has started studying and evaluating its properties

(the first variant of finished product). Primary object of labour differs from a conditional one thereby, that here a nature substratum begins to change its form under the influence of living and materialized labour.

The result of functioning of primary object of labour is raw materials. It attains an ability to enter the most complex technological regimes (the second variant of finished product). Ore, wood and construction materials are one qualitative state, but ingot of metal and wooden constructions are some other. In the second case, the information parameter of a product substratum is higher and gives an opportunity to apply it in more complex production cycles (both ingot and wooden constructions are prepared for participation in different types of production). The secondary object is different from the primary one by the possibility of creation of finished product inside it (ore and forest materials do not posses such possibilities)

Secondary object of labour is able to satisfy more diverse spectrum of man's needs than primary object. Information originating from a person and means of labour is put over the information received by substratum of primary and secondary objects of labour.

Finished product is a total sum of various types of industrial activity of a man (a society) that has not passed all the stages of functioning of object of labour-integrity: zero, primary and secondary.

Final product is a total sum of a human social industrial activity that has passed all the stages of functioning of labour-integrity and can be used in production and individual consumption. [20]

Further, we will use the concepts "finished" and "final" product according to these definitions.

In its third meaning product of labour comes forward as use value and value.

Continuing to analyze the content and the form of product, we start from the fact that the quality of the social is fixed here as use value and the quantity of the social as value.

Actually, having become the objects of labour, nature objects acquire use value of higher order in the process of human activity than they had before. "…in the process of labour the products of the past processes of labour are applied and labour consumes them for developing new products with higher, more mediated use value". [21]

Presence of common base (labour expenses in general or some abstract labour) gives us an opportunity to compare various use values, which are materialization of the concrete labour that fixes its specification. Conditional object of labour makes objects of nature the object of a certain kinds of activities (a geologist, a designer, an architect etc.) and forms primary use value and value of future product as a possibility that can be materialized further.

Unlike conditional object of labour, primary object of labour realizes its use value properties directly, becoming an object of industrial and individual consumption and indirectly if it continues to change its use value and value in processing industries.

Absorbing new portions of living and materialized labour, secondary object of labour transfers its substratum in qualitatively new state and satisfies historically stipulated spectrum of man's (society's) needs in final use values.

Completing consideration of three basic meanings of the term "product of labour", it should be taken into consideration that it essentially supplements with its characteristic "a nest" of concepts attended by wealth, welfare, commodity and capital.

Their definitions may be found in some modern publications. For example, welfare is a materialized object that makes positive contribution into economic well-being. [22]

Wealth is everything that is valued by people as a means of satisfaction of their needs. [23]Wealth is a generalized term by which such concepts as "material wealth", "spiritual wealth", "capital wealth" and "natural wealth" are substituted in the description of economic-

mathematical models. [24] A set of definitions of wealth that specify its sense should be taken into account.

Antiwealth is a commodity or a product that possesses some negative usefulness for the consumer. [25]

Free goods are unlimited welfare and it is quite different from the welfare that can be given by the state free of charge (for example, medical care) or everything that is available for everyone because of the absence of the right of property for them (for example, air). [26]

(Free) Gratuitous welfare – is a welfare that does not require any production or distribution in a society. Its demand is so large that the price is equal to zero. For example, the sun`s light. The amount of welfare is more than people's demand and its consumption by the same people does not result in welfare shortage for others. [27]

Intermediate welfare – is a welfare that in a greater degree is used in production processes of other commodities rather than in final consumption. The most characteristic examples are steel and wood. For instance, coal can be applied for production of both electric power and steel, as well as for direct warming of dwelling. [28]

Final welfare is a welfare that is intended for consumption and is not used as a resource of production. [29]

Capital welfare or welfare being produced is used as a factor of production for further production. [30]

Economic welfare is a means of satisfaction of people's needs, and is available for people in a smaller amount than their needs. [31]

Social welfare is goods or services that people use jointly and that can be fixed in someone's private property. [32]

Let us consider in detail various interpretations of concept "social welfare" taking into account its insufficient theoretical processing. All the authors acknowledge the presence of two main characteristics with concept "social welfare", absence of competition (non-competition) in

consumption and impossibility to exclude non-assignment from the process of consumption, not speaking about disagreement in the essence of understanding their content. There arises an argument relatively to the dominance of one of the characteristics. [33]

Historical practice of development of market economy has proved the fact of permanency of existence of a number of material and nonmaterial reproductive welfare that is either not supplied by market or is supplied by it in insufficient quantity. The main reason is market inefficiency, organic "defects", market defects. At the same time welfare (commodity), which is spoken about, is socially necessary, moreover, it fulfills important social functions. Not only classical kinds of welfare such as national defense, fundamental science, prophylactic medicine, etc. relate to a number of such commodities, but also ecological welfare whose value had been defined by the end of the 20th century – air, aquatory, landscape and so on.

Side by side with concept "welfare", "wealth" is widely used as analog. The latter is characterized by a number of shades. Wealth is everything that is valued by people. Word "material" does not have any sense in combination with such words as "wealth" or "well-being". [34]

Wealth has market value and can be exchanged by money or welfare. It includes financial welfare and assets, skill, that is everything that can be profitable. These elements are regarded as wealth, in case, when they may be sold and bought at a commodity market or monetary markets.

Wealth may be divided into two main types: material wealth embodied in physical and financial assets, which is called a capital, and nonmaterial wealth, which is called a human capital.

All kinds of wealth possess one main property – ability to benefit. The benefit is a return from wealth. Thus, wealth is a stock and making a profit is a flow.

Discounted value of profit flow makes up a value of wealth stock. Wealth can be interpreted as a characteristic of national status.

National value is the most important indicator of economic state of a country and it represents in monetary terms a set of welfare, produced and accumulated by society during its industrial activity. [36]

National wealth is a sum of purely own capital of all managing subjects which are the residents of given country on this or that date. National welfare is equal to the sum of all residents' assets of the country with deduction of all financial obligations. [37]

National wealth is money value of all actual industrial, material and intellectual values of the country, accumulated during its history. Primarily the national wealth came to a sum of consumption and production needs. However, technical, social and spiritual progress has qualitatively changed the limits and structure of national wealth. The explored natural wealth, natural resources, scientific potential, cultural – and – educational level of population was included in national wealth structure as some special elements. [38]

Concepts "wealth" and "welfare" are also often defined with the help of terms "capital" and "commodity".

According to F. Dgaster, national wealth is disclosed through:

- funds of material capital (buildings, equipment, earth and so on);
- funds of nonmaterial capital (technological buildings, R&D results);
- funds of human capital (skills, abilities, moral and physical health);
- funds of physical media (atmosphere, landscape and other characteristics of geographical environment);

Capital is a production – technical apparatus, created by people from nature substances for increasing their forces and broadening the possibilities of producing necessary welfare. [39]

Material welfare is subdivided into:

- wealth of single use (food products, manufactured goods with warranty period of one year):
- welfare of prolonged use, intended for everyday life (refrigerators, washing machines, furniture, cars and so on);

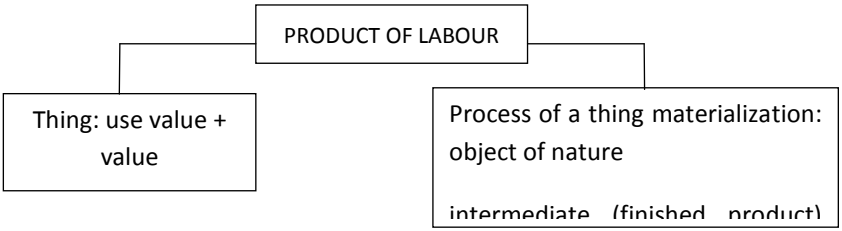
- production welfare or capital welfare (means of production as a component of labour process);
- welfare as services, moment of production and consumption of this welfare coincides at time. [40]

Labour product acquires the form of commodity in terms of market economy. Commodity is the product produced for consumption and exchange at the market. The term is used in a narrower sense for designation of agricultural and mineral resources. [41]

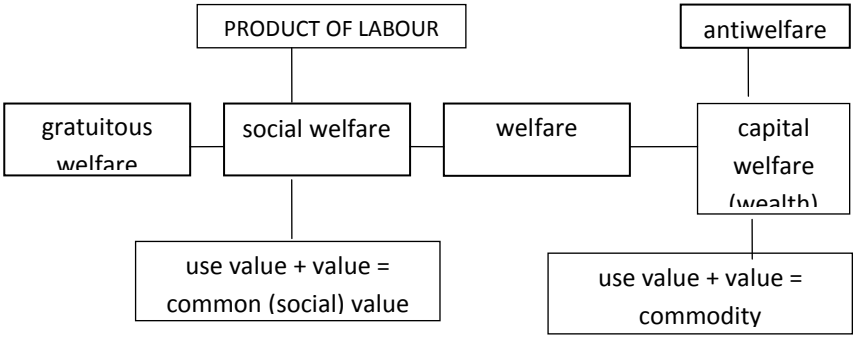
Anti-goods are secondary and external for the subject of economic activity. They are not taken into account at calculating cost consequences ("products") such as water and air pollution. They are considered to be some kind of antisocial "anti-goods" (in contrast to useful commodities), and the result of their neutralization as social commodity (services). [42]

Analysis of concept "product of labour" and such terms related to it as "welfare", "wealth", "capital", "commodity" allows representing their correlation in the following three basic schemes.

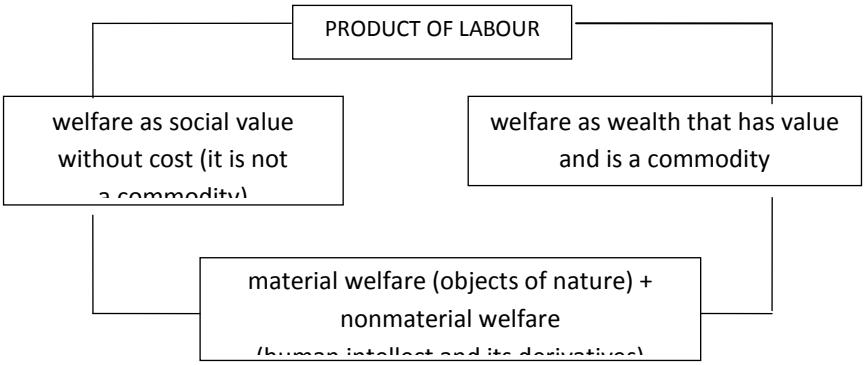
Scheme №1



Scheme №2



Scheme №3



Nowadays product of labour should be regarded in ecological context, as a modern society does not take into account in a proper degree the resource potential of the planet. The first scheme gives a common picture of theoretical interpretation of content and a form of product of labour. The second reveals a contradiction between social and capital welfare status. The third one fixes the specific character of commodity and non-commodity variants of product interpretations that allow revealing possible tendencies of social development.

1.2. Historic and logical and information interpretation of concepts “use value” and “value”

At the end of the 20-th century, it is necessary for economic science to reconsider its conceptual backgrounds connected with interpretation of basic concepts “use value” and “value”. It is worthwhile considering the problem discussed in historic-logical and information aspects.

Approaches to interpretation of concepts “use value” and “value” are given in works of economists beginning with A. Smith to P. Samuelson.

1. “Labour is solely general, equally and solely exact measurement of value, or an only measure by means of which we may compare each others` values of various commodities in all times and in any places.” [43]

2. “Value has two different meanings: usefulness of some subject, a possibility of buying other subjects that gives a possession by the given subject. The first one can be called “use value”, the second one – “exchange value.” [44]

3. “Value of commodity is defined by the amount of labour contained in it. It means that commodity is exchanged by the same amount of labour in any other kind of use value … labour time is a measure of value.” [45]

“Rarity…(irrespective from proportion of demand and supply) makes up an element of value, so far as, what is not rare itself, which is a rarity negation and what is gifted by nature does not have any value because it does not come forward as the result of production. [46]

4. “Use value as it is, first of all expresses the attitude of an individual to nature [47].

“Use value fixes objective properties of a commodity and they make it definitely useful.” [48]

“Nature is in the same degree a source of use value as well as labour itself is only a manifestation of one of the forces of nature, human working force.” [49]

5. “Under value in subjective sense is understood the meaning of material welfare for human well-being. In particular, subjective exchange

value is called the meaning that a thing acquires for some subject owing to its ability to give it other material welfare at exchange, while exchange value in objective sense represents nothing different as ability of a thing to be exchanged by other material welfare." [50]

6. Value of commodity output is the result of juridical agreement of "collective institutes" (corporation unions, trade unions, political parties). [51]

7. Welfare serves as a means of meeting demands or serves as condemn pronounced by our judgment concerning usefulness of objects. Welfare value is subjective and is defined by consumers' preferences.

8. "We could ask with the equal right if value is regulated by usefulness or expenses of production, as well as we can ask if we cut a piece of paper by the top and bottom edge of scissors' blade. [53]

9. "Usefulness is abstraction that means subjective satisfaction, usefulness from product consumption. It is impossible to measure usefulness. Usefulness is the analytical construction that intended to explain the scheme according to which consumers rationally distribute their restricted income among commodities which are useful for them." [54]

10. "Value, i. e. exchange value of some thing is expressed in a definite place and in a definite moment in units of the last thing, the amount that can be received there and then in exchange for the first one. Thus concept of value is a relative one and expresses the relation between two things in a concrete place and concrete time." [55]

11. Use value is: 1) usefulness, that is an ability of a thing or services to satisfy a man's demand; 2) a thing or services are carriers of usefulness. Use value forms material wealth without dependence from its social form. Nature gives us some kind of use values in its finished state (air, water and so on). However, their predominant mass is product of labour. [56]

12. "Value is a manufacturer's labour materialized in a commodity. The value of a commodity is defined by the amount of social labour and

time, necessary for its production. Commodity value consists of constant and variable capital, as well as surplus value." [57]

13. "Usefulness of a thing, its properties owing to which it can satisfy a personal demand, makes it use value.

Use value may directly satisfy a person's needs or serve as a means of production of material welfare. Many things, which are not created by human labour, have use value. For example, water in a source, fruits of wild trees. Nevertheless, not every thing that has use value is a commodity. A thing must be intended for exchange in order to become a commodity." [58]

14. "Value can't be a property, objectively inherent to a thing. Value has just something that is valuable from the point of view of a consumer whose subjective estimation gives properties of value to a produced welfare. People estimate various material and spiritual welfare not as the result of socially necessary labour expended on their production, but because of inherent usefulness. Only usefulness is able to give labour expenses social character. First of all, value is a category of exchange." [59]

It is evident for us, that when determining use value content, the authors converge in opinion that: 1) usefulness acts as its attributive quality or ability to satisfy these or those human needs. (2, 6, 7, 9, 11). Use value is created by nature and human labour (4,11), but it can't be use value without being an object of labour (11, 13). In many respects the same happens to interpretation of value. It is confirmed that it possesses such characteristics as materialization in a labour commodity (1, 3, 12), revealing value essence as a relation of a thing (a commodity) to other things (commodities). (1, 3, 5, 10, 14).

Distinction of the points of view is fixed on cardinal parameter: recognition (non-recognition) of value characteristics. One considers a value to be a distinctive property of a commodity being conditioned by the fact of labour materialization (1, 3, 4, 12); others deduce usefulness proceeding from subjective estimation of produced welfare that possesses

a value from consumers' point of view (5, 7, 14). The third admit synthesis of approaches to be a rightful one. (8, 10).

Let us reproduce the arguments of the supporters of labour theory of value. And its opponents who give their preference to the theory of a maximum usefulness, as well as compromise points of views. Let us pick out three topic blocks. In the first one it is spoken about the arguments by means of which the approaches to determination of production factors are based, as well as the concepts of wealth (usefulness, value), including the means of measurement of the latter.

In the second block the stress will be made on the analysis of points of view on the ratio of human needs to possibilities of their satisfaction, measures of understanding of this "interaction" consequences in the context of historically established form of man's (society's) exchange, as well as nature (environment of production and habitat) exchange.

In the third block, the effort to understand arguments of the second marginal wave was undertaken. The purpose of this effort consisted in synthesis of asymmetric theories, theory of value and theory of maximum usefulness.

The first block.

Characterizing factors of production, the representatives of value of labour and usefulness converge in opinion that in the basis of production activity, i. e. a man's labour and nature welfare used by him (use values) lay in the basis of value.

However, the essential difference is found in interpretation of significance of each production factor in value formation. K. Marks considered labour to be "the only use value that is able to resist capital" [60]; the supporters of maximum usefulness are inclined to determine the basis of value as a kind of combination of many factors (earth, labour, capital, organization) [61].

Further, concept "wealth" (value, use value) in interpretation of the representatives of labour value beginning from A. Smith to K. Marks is

fixed by the following theses: “labour is the father of wealth, the Earth is its mother”. “On the one hand, wealth is a thing, it is embodied in things, material products, on the other hand, wealth is value – it is simply a power to dispose others’ labour … In all its forms wealth takes up a material form, no matter weather it is a thing or a relation mediated by a thing”.[62]

Supporters of the theory of maximum usefulness confirm the following: “wealth is everything that is valued by people. Word “material” does not have any sense in combination with such words as “wealth” or “welfare”. [63]

The difference of approaches is also seen by determination of economic zone within the framework of which value can be created. Marxism comes from the thesis “time of circulation is not a positive element that creates value” [64]; “value is created by production expenses that finally are brought together to working time.” Opponents suppose that value is formed exactly in a circulation sphere, “in the centre of entire theory there should be the idea that value is a product of subjective estimation of material welfare by the participants of exchange.” [65]

The character of value (wealth) measurement is also a consequence of such types of alternative approaches. K. Marks believed that “Value of product is equal to raw material value plus value of a destroyed part of labour tools that had converted into a product and was destroyed in its primary form along with labour value. In other words, value of product is equal to expenses, as well as it is equal to a sum of prices of those commodities that were consumed in the process of production” [66].

Supporters of the theory of maximum usefulness suggest some other criteria: “inclusion of material welfare value, which is defined by the importance of that concrete demand (or partial demand) that takes the last place in a set of needs being satisfied by the presence of available stock of material welfare of a given kind. The value of a thing is measured by the magnitude of a maximum usefulness of a thing. This state is a central point of our value theory. All the further is connected with it and derived from it”. [67]

K. Menger (the founder of Austrian school of marginalism) considers that value is subjective not only in its essence, but in its measure. Labour expenses and the amount of labour or other welfare on production of that welfare, whose value is spoken about, are not in direct connection with magnitude of value. [68].

The second block.

Characterizing a man's needs (society's needs) Marxism arises from the thesis: "If wealth is considered as a material one, it consists in a variety of needs … and necessary needs are such individual's needs and this individual is restricted to a subject of nature… Luxury represents an opposition in respect to this nature need." [69]

An individual's or a society's needs can be satisfied by means of direct development of production that gives rise to problems of interdependence of the latter with nature environment as a source of live and natural condition of production.

Coming forward as an object of production consumption, nature products may be free, without value, and those that are created by man's labour (society's labour). The amount of needs, as well as the means of their satisfaction represents itself product of history and in a greater degree, they depend on cultural level of a country …, and in a greater degree on the conditions and habits, as well as life claims under which the class of collective labourers was formed. [70]

Thus, the needs are conditioned by the action of objective and subjective beginnings. Analysis of production genesis leads K. Marks to the conclusion that: "In the time of capitalism nature becomes a subject for a person, only a useful thing, since it stops being recognized as a self-pressing force, it becomes an object of exploitation … " [71]

Supporters of the theory of maximum usefulness consider the needs in the same keystone but with some essential "amendment": the needs are conditioned by the subjective claims of a man or a society only. Though being admitted, the objective is out of "frame" and is not related to a class of the determinants: "dual explanation of phenomenon and value by

means of two different principles – usefulness and production expenses – appears to be unnecessary and unsatisfactory …we explain people's attitude to material welfare just by the importance they imagine from the point of view of human well – being" [72],

The third block.

Reproducing the arguments of approaches that had been established in the framework of the theory of expenses and the theory of maximum usefulness, let us consider the conclusions that belong to Western researchers that had critically reinterpreted these points of view.

Marginalists of "the second wave" had become the fathers of neoclassical trend of economic theory. They combined the theory of expenses of classics and the subjectivists' theory of maximum usefulness into two-criterion theory based on simultaneous commensurability of expenses and maximum usefulness.

Having looked at asymmetry of approaches with the eyes of an analyst- synthesizer, A. Marshall had concluded that both of the theories - the theory of labour expenses and the theory of maximum usefulness are one – sided, the latter sees in value the development of the subjective estimation of the commodity by consumers. Marshall "connected" the poles considering a commodity value in an equal extent dependable on production expenses and usefulness. The problem of value (cost) had started being solved by means of coordination, combination of labour expenses, working time and labour results (quantity and quality of usefulness) in context of market exchange allowing to make a commensurability of labour expenses with usefulness of social commodity.

A new strip in the development of modern economic theory had started. The problems to be solved for humankind were put on the surface. First of all, they are ecological realities "not joining end to end" with economic and socio-political practice. Nowadays economists, philosophers, politicians, everyone who deals with analysis of a complicated complex of ecological problems make an effort to overcome such sort of "scissors".

A. Marshall concentrates his attention on concept “cosmopolitical wealth”, (“it is nothing different than the concept of national welfare spread on the entire area of the Globe”. Ya. Tinbergen formulates the concept “about research of humankind” according to which all natural resources should belong to all population of the Earth. A. Pechcheii speaks about the necessity of “fundamental reforms in production sector since owing to his primary character he turns out to be indissolubly connected with ecological, social and political problems of our time”. The authors of Rome Club Declaration (December 1993) consider the transition to “new models of humankind orientated to value changes, ecological development of partnership’s sense”, etc. to be necessary.

From our point of view, it is no doubt that the synthesis tendency of both labour value and maximum usefulness is a perspective one. However, in order “to gain power” and attain “necessary acceleration” it is able only by taking into account the ecological consistency, that is, the synthesis should be not two-criterion as the margenalists of the second wave suggest but it should be a three – criteria synthesis.

Ecological parameter is searching for its niche in economical instrumentation.

The searches in this direction are being implemented sluggishly. A very strong tendency continues taking place and it has a status of regularity – orientation to a society of consumer type, the main program of which is “maximum of efficiency and maximum of production output”.

The society behaves “like an ostrich hiding its head into the sand, in fact ignoring socio – economic and socio-ecological ‘water-line” of spaceship “the Earth”, to be exact the potential of biosphere to satisfy rapidly growing claims of humankind to biosphere resources. The theory of value in its contemporary variant should be interpreted in ecological key. The stage of categorical “penetration” of various concepts into each other will be painful. Terminological “ambitions” may become the essential obstacle and may “code” miscalculations and errors automatically in the new theory of economy, i.e. the theory of humankind survivability.

From our point of view a conceptual background of the theory of value, balance (this is our conditional title of modern socio-economic approaches based on three-criterion status) may become such concepts as use value, usefulness, value including value of maximum type. In addition, cost, exchange value, price, demand and supply, abstract and concrete labour necessary to use in informational context that implies their quantity – qualitative allocation.

Use value of material and spiritual welfare comes forward as an informational equivalent of the natural beginning of a product.

The subjects of the first or natural, "gifted" nature in informational sense are worth considering as hypothetical use value that is the value which fixes this or that man's (society's) attitude to nature resource. It may change in a wide range of meanings, conditioned by the measure of demand of natural welfare by a society.

Value comes forward as an informational equivalent of the social beginning of a product. Expenses of living and materialized human labour in concrete and abstract forms are fixed in it. Information parameters of man's resources can be represented by spectrum of "buffer" variants or artificial (natural-social and socio-natural) formations. In these cases, these or those combinations of value and use value will come forward as an information analogue of natural-social and socio-natural beginning of a product.

Information expression of use value and value (of natural and social beginnings) implies quality-quantitative differences.

Use value quality expresses:

1) objective differences of use value (inorganic, organic, social, artificial nature);

2) objective differences of use value of biotechnosphere as the global whole (some separate parts of the whole);

3) subjective differences of use value from the point of view of their pragmatics (usefulness) for an individual (a society);

4) subjective differences of use value from the point of view of their parameter of value for an individual (a society);

5) objective-subjective differences of use value from the point of view of possibility and necessity of their cognition by a man (a society).

Use value quantity is expressed by constant and variable values, which fix the following:

1) objective differences of use values on the levels of:

- inorganic nature (elemental particles, atoms, molecules, geochemical cycles, landscapes and so on);
- organic nature (macromolecules, sub-cellular structures, cells, substances, organs, organisms, biocenosis and so on);
- social nature (information potential of an individual, of a group, of a society);
- artificial nature negenthropy potential of production means, recreational and everyday socio-cultural spheres);

2) objective differences of biotechnosphere use value on the level of global the whole and some separate parts of the whole;

3) subjective differences of use value according to the parameter of their usefulness to an individual (a society);

4) subjective differences of use value according to the parameter of their value for an individual (a society);

5) object – subjective differences of use value from the point of view of a possibility (necessity) of their cognition by an individual (a society).

Quality of value is expressed by synchronic and diachronic fixation of the expenses of concrete labour necessary for:

1) changes of use value properties of various information status (dead, living, social, artificial nature);

2) providing stability (improvement) of biotechnoshepe use value as a global the whole (separate parts of the whole) taking into account information balance of functioning of a planet as a habitat of a society and as an industrial and nonindustrial environment of its activity;

3) revealing pragmatic parameters of use value, its usefulness for an individual (a society);

4) determining acsiological characteristics of use value, its value for an individual (a society);

5) cognition by a man (a society) of different use values from the point of view of possibility (necessity) of this process in the framework of some concrete space, i.e. time.

Quantity of value is expressed by constant and variable magnitude where expenses of abstract labour are registered. This labour is necessary for the following:

1) changes of use value properties of different information status (dead, living, social artificial nature);

2) providing stability (improvement) of information biotechnical parameters as global the whole, some separate parts of the whole, saving information variety and diversity of a planet (principle of balance);

3) revealing pragmatic parameters of use value, its usefulness for an individual (a society);

4) determining acsiological characteristics of use value, its usefulness for an individual (a society);

5) cognition by a man (a society) of various use values from the point of view of possibility (necessity) of the use of its information potential in some certain space, i.e. time.

Delimitation of concepts “use value” and “value” in their quality-quantitative expression is in principle significant in theoretical and practical sense. It allows us to “see” some new turnings in solving

discussion problems and to mark essential moments of reformation of modern production processes.

Let us try to do it applicably to analysis of use value and value parameters of biosphere as a habitat and industrial activity of an individual or (a society).

1.3. Determination of concepts "biosphere use value" and "biosphere value"

Product use value and value represent themselves important but not an only expression of their essence from the point of view of economical approach. Ecological approach gives an opportunity to reveal some additional value parameters of a product that are still beyond the limits of theoretical interpretation. They are not fixed as some specific component of its price. Value staging of expenses connected with the following is meant:

– restoration of organic and inorganic nature violated by anthropogenic affect;

– application of technological regimes taking into account the parameter of biocompatibility;

– implementation of nature-protection measures.

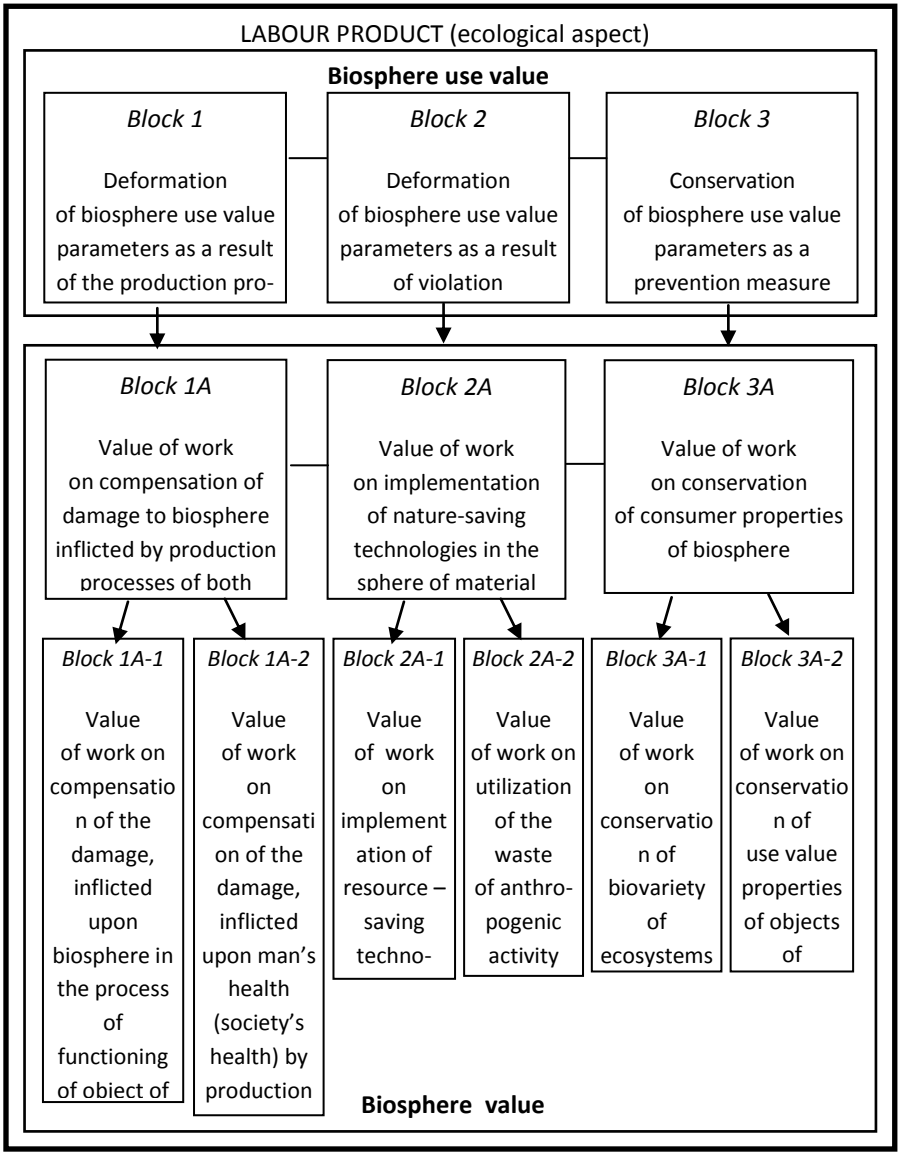
To our mind, the suggested scheme gives us the idea of use value and value of a product with some changes in biosphere, essentially adding to its economic status-characteristics.

Biosphere as global use value and value changes rapidly under the influence of production processes of a great amount of products that are produced by a society with the purpose of increasing comfort of its existence. This circumstance still does not find an adequate reflection in use value and value respect because a society is not counting expenses connected with the necessity of biosphere preservation as a habitat of a

living matter in a proper way while counting expenses connected with labour.

Organic and inorganic nature that comes forward as a means of product manufacture can advance a society only up to some definite limit, i.e. there exists some objective limit of our claims to a biosphere. This limit is the evidence of the fact that a biosphere being in two-unified quality (a habitat and a production environment) requires in terms of a market system of economic management some careful registration of a value assessment as a process - a result of biosphere functioning, as well as the process - the result of production activity of a joint society).

The scheme of biosphere use value and product value



Analysis of system “biosphere – production – society” gives us a chance to calculate the parameters of biogeochemical cycles of a planet and production activity of a man in their permissible proportion.

Market implies making a profit as a priority objective of production. That is why it is worth considering biosphere as use value and value in the environment of ecological crisis.

None of these things exists in the world: adequate use value and value assessment of natural resources or ecological damage inflicted upon biosphere. However, some approaches to the solution of these problems have already appeared.

Fragmentally, the registration of value and use value of a biosphere is being realized in connection with the production of use value and value of labour products. Understanding biosphere as a value, saving of which is an indicator of humankind civilization and its ability to save our planet for future generations is expressed in the following:

– assessment of nonmarket commodities acquires “civil rights” (atmosphere air, soil and flora covering, cleaning capacity of water reservoirs are meant, etc.). [73];

– idea of increasing natural resources efficiency as one of the first-turn tasks of global society becomes popular: “Wealth extracted from one unit of natural resources is able to be increased and ought to be increased 4 times. We are able to live two times better and at the same time to spend two times less.” [74];

– idea of full value compensation of borrowed natural resources by a user including environmental expenses significant for future generations is being confirmed in public consciousness. [75];

– demand to understand the economic process not as some odd, endless, circular exchange of values between production and consumption but as the process within the framework of which expenses connected with the depletion and pollution of biosphere are taken into account. [76];

– consumers’ psychology is subjected to some critical re-interpretation. It is orientated to anthropocentrism values that conquer

new and new supporters of biosphere centrism and supporters of value of ecocentrism culture who see the sense of human existence not in conquering nature and accumulating of material wealth but in moral perfection of a man. [77];

– categorical apparatus is being elaborated on and by means of this apparatus analysis of ecological cost, ecological value and nature capital is possible. [78];

– complex socio-ecological and economical estimation of biosphere finds more and more understanding, it allows us to overcome false imagination of living and inorganic nature as a pantry from which the humankind can extract necessary welfare following only the principle of making maximum profit. [79].

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2. BIOSPHERE USE VALUE OF THE PRODUCT: MAIN PARAMETERS

2.1 Deformation of use value parameters of the biosphere as a result of the process of producing finished and final products

Biosphere today is the universal object of man's labour. Even where it does not directly affect organic and inorganic nature the planet "feels" the influence and pays the "debt" back to people entering a long ecological crisis.

Dear reader, let us make an attempt to consider a biosphere in use value terms taking into account a great damage inflicted upon it by anthropogenic activity. The damage is prodigious both quantitatively and qualitatively. It has been known since the first reports of the Rome club. Such kind of information has become classical. Biosphere is being deformed on the level of global background pollution of the atmosphere (nitric oxides, carbon, sulphur, heavy metals etc.), global ocean (oil and its products, pesticides etc.); on regional and local levels we can see negative transformations of flora and fauna (disbalance of regulation processes of plants' water condition, changes in forest age composition, scantiness of fauna), the ability of landscape to reproduce resources is destroyed etc. as a result of these processes the health of people all over the planet is getting worse, the period of man's active labour life is reduced, the gene pool of humankind and the planet's "living matter" as a whole is modified. Penetration into the nearly outer space expanded the area of anthropogenic pollution which can also bring about unpredictable consequences.

Intensive use of biosphere's resources by the humankind, impetuous growth of the rate at which it gets polluted by the industrial and domestic

waste makes it necessary to analyze anthropogenic pressure in terms of use value.

Deformation of biosphere on the level of finished product can be shown by the example of mining industries, on the level of final product by the example of processing industries. The objects of extraction are the mineral wealth of the Earth, the land, waters, atmosphere, plant and animal life and even the man. Mining industries affect organic and inorganic nature directly extracting the necessary ores, building materials, products of forests, seas and air. At least 300 billion tons of minerals are mind annually worldwide, the soil layer is shifted by an order more, which affects the natural state of about 400 thousand hectares of the Earth's surface (soil excavation accounts for 60%; 37% are occupied by the sites used for attendant rock, 3% of losses are caused by soil deformation and other damages associated with underground works). With the current technologies, for example, for 1 ton of mind coal there are about 3 tons of solid, liquid and gaseous wastes. Extraction of non-metallic mining and chemical materials and production of building materials means dozens of tons of waste per 1 ton of the product.

In the nearest future the bulk of mining is to double every 10 years moving to deeper levels (open iron ore quarries are now 150 to 500 metres deep, dead rock dumps near the quarries are 100 or more metres high). In the countries where underground mining has been going on for several centuries, mine levels are as low as 4000 metres. As mine working goes deeper, its area expands. The extent of horizontal and slant mining is measured by dozens and even hundreds of kilometers, mineral tails amount to billions of tons and occupy millions of hectares changing the landscape beyond recognition. Extraction of liquid and gaseous raw materials gives rise to negative transformation of the Earth's bowels (there are changes in temperature conditions, speed of flowing and temperature of underground waters). As a result, the rivers and lakes situated on the surface of the Earth grow shallow; karst develops (solution

of rock by natural waters leads to the formation of caves, cavities and craters). Intensive working of mineral deposits is accompanied by the transformation of natural landscape into anthropogenic one: new forms of relief come into being created by closed (dumps, waste banks) and open (quarries, trenches, channels etc.) mining. Specific forms of relief develop in the course of construction work due to the motion of the Earth's surface (sagging, slumps, subsidence and cracks).

In parallel to these processes the following consequences of anthropogenic effect can be observed: changes in the nature of geophysical and geochemical fields, the quality and directions of natural geological processes, distortion of the rhythms of functioning of natural and technogenic objects causing accidents and catastrophes.

Construction is a specific area of people's labour activity exceptionally with a high degree of ecological responsibility. It is conditioned, first of all, by the fact that here the components of nature are involved in the production process during comparatively short periods of time intensively forming anthropogenic landscape.

Complex construction technology follows a complicated pattern of interrelated technological operation and it is not always possible to estimate the influence of separate technological processes making up construction technology on the environment. Most vulnerable are the objects of lithosphere and hydrosphere, which make up integral losses in locally and regionally confined flora and fauna. I.I. Mazur and O.I. Moldavanov suggested determining the damage caused to nature as a result of complex influence of construction technogenesis $(U_c)_\Sigma$ as follows:

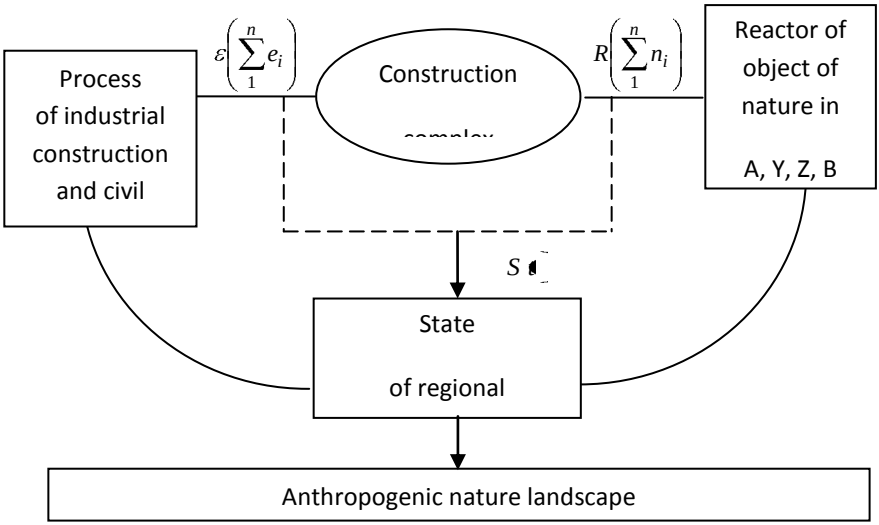
$$(U_c)_\sum = U_B\, U_A, U_G, U_L \,.$$

Correlating the losses according to V.I. Vernadsky geosphere components, we can find a relative estimation of conventional losses showing the extent of danger construction technologenesis:

$$P_A = {U_A}/{U_B}; \qquad P_G = {U_G}/{U_B}; \qquad P_L = {U_L}/{U_B};$$

In terms of engineering construction technogenesis is seen in the progress of industrial construction $U_{en.c}$ and civil engineering $U_{er.c}$, that is $(U_C)_{\sum} = U_{en.c} + U_{er.c}$, which form anthropogenic landscape on a local or regional scale.

Formation of Anthropogenic Landscape in Construction Region



Among extractive industries, there is also agriculture and forest utilization whose functioning is accompanied by progressing soil degradation. It is a consequence of chaotic belling, ploughing, intensive processing of the soil and various factors – physical, chemical biological acting on it. Deformation of soil formation processes – the basis for the

planet's "living matter" existence –reveals serious diseases the symptoms of which can be seen everywhere.

The soil is rapidly losing its value signs of the original state: the basic functions of the soil are regressing. Humus losses in the black have been 25 to 30 per cent in the past thirty years, the use of mineral fertilizers without the necessary organic ones brought about the destruction and depletion of these practically non-renewable resources. According to the International Information Centre (1993), 56 per cent of the world's soils are subject to degradation. Particularly hazardous for the planet's future is the destruction of forests that used to occupy over 70 per cent of the Earth's dry land. At present, they cover not more than 35 per cent of the Earth's surface and are being destroyed at a rate of 20 hectares a minute, which is 18 times faster than their growth rate. Meanwhile the time needed to make possible further commercial use of the forest ranges from 30 to 200 years! [1].

In parallel to this the scope of resource production of organic nature objects (fishing, hunting, using "side" products of forest and meadows in spite of their quantity and quality leaving much to be desired) is growing.

Water resources present a varied range of use-value "free" matters used by man both as means of production and as means of life support.

By the early XXI century problems developed connected with changes for the worse: due to the negative processes caused by anthropogenic damage is expressed in terms of changes in natural water and chemical regimen of rivers as a result of their economic use, landscape pollution, river-bed regulation, water withdrawal and spill of water into the river net.

Hydrological consequences of using territories and channel flow regulation are diametrically opposed: the increase of ecologically unfavorable flow peculiarities is accompanied by the weakening of various negative consequences brought about by disturbing natural processes of

flow formation in the course of its regulation. The overwhelming majority of kinds of economic activity at water intakes enhance ecologically unfavorable features peculiar to unregulated flow: fluctuations of river water expenditure, variability of water quality indices.

Anthropogenic effect on flow formation increases the danger of floods, hillside, gully and channel erosion, making water more turbid and worsening light condition of river biocenosis development. While turbidity increases, river water is getting more and more contaminated by organic and mineral substances, sewage waters, which lead to river biocenosis toxicosis weakening or even stopping the process of water self-purification.

Depression of underground waters manifests itself in the reduction of free or pressure surface of the water to the level of natural or artificial (gullies, valleys) drain which is accompanies by earth surface subsidence. This effect is particularly pronounced in urban areas. For example, the city of Houston (USA) has gone down by 3 meters, Mexico by 10 meters, in Tokyo and Osaka the earth surface in places goes down at the rate of 18 centimeters per year, and in San-Joaquin valley (USA) at the rate of 37 centimeters per year [2]

Natural waters are subject to chemical and heat pollution by salts (chlorides, sulphates, nitrates etc.) from mining and agricultural sources, which violates the natural rhythm of aquatic ecosystem. Excessive withdrawal of water for drinking, economic and technical purposes deforms water balance and damages natural waters. The Global Ocean «adding up» the pollution of all other media (air, soils, waters) become its involuntary collector as, unlike other media, it has no purifying outflow. Pollution comes from the atmosphere with precipitation in the form of dust and aerosols, from the land with the flow of rivers because of direct industrial water spill. Pollution destroys normal aquatic ecosystems changing them qualitatively (effect of blue-green algal substitution). The ocean today has the other function. It may be considered as:

1) «A universal mine» where various deposits are concentrated: ores, oil, gold, platinum, mercury, chromium etc.

2) A possible source of energy.

Humankind is intensively using another natural resource – atmospheric air which servers the dual function: provides plant and animal life, including man, with the necessary gaseous elements (oxygen, carbonic acid gas etc.), softens temperature parameters, protects the Earth's surface from cosmic, ultraviolet and other kinds of radiation as well as from meteorites and other space objects most of which burn in the atmosphere (natural functions); provides industrial processes with oxygen, nitrogen, hydrogen and neutral gases (artificial, anthropogenic function).

In the past 100 years the oxygen content of the air has decreased, mostly due to forest felling by 240 billion tons and is still decreasing, 95 per cent of this amount being used in technological processes. For example, a jet liner uses as much oxygen in a 1000 km flight as does a human being in a year. Flying from America to Europe a plane uses 35 tons of oxygen in 8 hours (by comparison, the same amount is produced in the same period by 25 thousand hectares of forest) [3].

The threat of oxygen starvation is quite real. Oxygen is generated by green plants in the process of photosynthesis - 100 billion tons every year. The planet's oxygen is completely restored with the help of living organisms in the course of 5200 – 5800 years. Over the period of millions of years, the share of accumulated oxygen has amounted to 21 per cent, but its stocks, formerly considered to be inexhaustible, are decreasing catastrophically as a result of intensive economic impact. If the amount of oxygen in the atmosphere drops to 16 per cent it will mean the ending of the basic natural processes such as breathing, burning and rot, that is, of life itself. [4]

Special mention should be made of industrial use of natural landscapes as "mining industry". They are increasingly regarded as such

because the worsening of ecological situation forces the society to reconsider the functions of natural landscape taking into account its role in preserving man's comfortable psychological and physiological state. Emerging of landscape architecture testifies to the fact that harmonious combination of natural and anthropogenic landscapes is a prerequisite for the society's comfortable existence.

Unwise treatment of landscape brings about irreversible changes, its structure is completely destroyed and it loses its ability to reproduce resources and media. Landscape pollution by alien components of the anthropogenic type eventually affects all of it, which is accompanied by forming geochemical, geomorphologic and thermal anomalies inflicting damage to plant and animal life, to a man as an organic part of the latter.

Deformation of biosphere's use value parameters in the process of functioning of mining industries is accompanied by the effect useful for the society – obtaining use value on a natural basis (socio-natural formation modified by labour) that may be used both for personal and industrial purposes of two kinds.

The first variation of use value satisfies man's physiological and everyday needs (natural product used as food; construction materials stone, detritus, lime, gypsum, bitumen, tar; timber and woodwork, etc.) These products can be considered finished: objects of nature complete their life cycle after passing the stage of labour objects.

The second variety of use value satisfies man's objectives mediated by production processes of a given degree of complexity. It exists in two variations:

- as raw materials for manufacturing industries;
- as an auxiliary natural factor without which functioning of hydroelectric plants, a helium-wind plants etc. are impossible.

Here we are dealing with use value that must be included in specific technological process as this is a necessary condition for their life cycle (variations of finished product).

Thus, fresh fish used as a foodstuff is use value, or something man gets `free` though this `gift` can be obtained only by using fisherman's services (remember the proverb:` he who would catch fish must not mind getting wet`). Fish – natural use value – acquires a new status and turns into a final product (used as food) or a finished one if it becomes an object of labour in fish-processing industry. Similar examples: water flow can produce electric current only passing the turbines of a hydroelectric plant; wind can do that if there is a wind power plant to transform kinetic energy of a wind flow; a flow of solar energy is transformed into a suitable kind passing through a helium-device. Technical facilities (hydroelectric stations, wind- or helium-power plant) rather than water flow, wind or solar rays by themselves can transform a natural resource into product useful for man.

Thus, transformation of objects of nature into products in the framework of mining industries is accompanied by the results of two kinds: obtaining new use value (finished and final products) and negative quantitative and qualitative changes in biosphere's basic characteristics.

Damage caused to nature can be shown by the example of processing industries the aim of which is `to transfer` use value of a finished product to a level of higher social significance – use value and the value of final product.

Manufacturing industries (ferrous metal industry, rolling, chemical and petrochemical industries, production of machines and equipment, construction materials, objects of light and food processing industries etc.) deform the environment damaging air and water, landscape, plant and animal life. We are not considering final products of the military complex. This specific kind of manufacturing industry follows the negative pattern (its function is destruction, not creation). The scope of damage caused to biosphere by this "production process" can be estimated, for instance, by such parameter as "radioactive pollution". Over 1800 nuclear have already been exploded at 95 testing areas of the world, 25 per cent of them over the Earth's surface, which resulted in its radioactive contamination, its level is comparable with the damage caused by the Chernobyl catastrophe [5].

Steel smelting is inevitable accompanied by its dispersion affecting all the components of natural environment. One ton of crude copper accounts for 2.09 tons of dust which contains up to 15 per cent of copper, 60 per cent of ferric oxide, arsenic, mercury, zinc, lead (4 per cent of each). Smelting furnaces exhaust nickel, cobalt, molybdenum and other metals into the atmosphere.

Industrial regions, consequently, are transformed into `technical landscapes`. Many air pollutants react, forming substances of unknown origin, which have no analogues `known to nature` [6].

Smelted metal embodied in final products eventually wears out and corrodes. The average service life of steel products is about 15 years. The same is true of items made of ferrous and non-ferrous metals. Products made of precious metals (gold, silver, platinum) dissolve in the environment.

As a result, we are faced with metallization of soils, water and air. Metals contained in soils considerably exhaust the process of soil formation. The pressing of metal on organic nature including man is growing as dramatically. Anthropogenic metals get into the Global Ocean with the river flow and via the atmosphere. The amount of iron brought to the Global Ocean by rivers `in a natural way` is 25 million tons a year, the anthropogenic constituent adds to it additional 320 million tons. A similar situation holds with other metals.

The damage done to the biosphere by industrial activity reflects on the society's (individual's) health. A man is a link of "living matter", and cannot help experiencing the negative impact of anthropogenic processes and suffers as much as plants and animals do. Polluting its own habitation – the biosphere – the humankind `obtains` a bunch of somatic and mental diseases. Because of migration processes, contaminants get from the soil into the human body following the food chains: soil – plant – human; soil – atmospheric air – human; soil – water – human; soil – plant – animal – human.

The research, carried out in the recent decades shows that the causes of such widely spread diseases as cardio-vascular pathology, malignant

tumors, nervous and mental disorders, injuries, genetic anomalies etc. are connected with ecological trouble.

Man's health has become more delicate, capacity to resist internal and external aggression has gone down, today we are quite sensitive to infections and our abilities to feel (smell, see, hear) are much lower than they used to be. We live longer than our ancestors did, but we do not have their vigour: 60 per cent of the planet's inhabitants are neither healthy nor sick (`third state`). Any pathology caused by civilization is polyethiological: it develops as a result of the whole range of unfavorable conditions affecting a man repeatedly. Stomach ulcer has become the disease of the century; high blood pressure is getting increasingly widespread affecting the younger age groups. Deaths caused by hearts attacks have become frequent; the number of malignant tumour diseases is growing as well as the number of those suffering from diabetes and other metabolism troubles; the number of newborn babies with congenital defects is alarming.

A specific group of troubles includes the so-called `functional diseases` caused by distress, loneliness, depression that affects people living in `concreted spaces`: insomnia, drugs addiction, alcoholism, smoking, and, finally, immune system destruction – AIDS. The number of disabled people is growing: today there are more than 500 million of them.

A dramatic increase of the number of genetic diseases is also to be expected due to environment pollution. These occur because the environment is deformed by mutagens in the form of chemical, physical and biological factors, which can cause a break in a human's somatic and embryonic cells. At present about 10 per cent of the new-born babies have such defects and the rise of genetic load beyond 10 per cent is likely to entail grave, in many ways unpredictable, consequences [7].

Dramatic deterioration of megapolis environment quality brought about desurbanization, or depopulation. The desurbanization process is rapidly gathering speed: the well-to-do part of the population is moving to healthier suburb districts, leaving multistoreyed blocks of flats for private

houses (up 86 percent wish to do so). Desurbanization gives birth to a special trend in urban development that denies a positive role of big cities. The idea of desurbanization was most consistently formulated in the book of American architect F.L. Right «A Disappearing City» and in his city project in which blocks of flats and public buildings of the urban type are located among agricultural lands [8].

Health and life of the population today is the object of risk analysis.

The total amount of damage caused to the population's health and life in a certain area for the number N of people can be determined according to the following [9]:

$$Y(N, \Delta S) = N \sum_{i=1}^{k} (n_i(\Delta S) - n_{i\text{фон}})\, T_i ,$$

where Y (N, ΔS) – is the amount of time lost by the population of N people due to the increasing number of cases of illness and deaths caused by lowering the environment quality by the magnitude ΔS;

$n_i(\Delta S)$ – is the number of i-th type illnesses (deaths) recorded in conditions of reduced environment quality (usually for 10 000 people annually).

$n_{i\text{фон}}$ – is the number of i-th type illnesses (deaths) under `normal` condition of environment;

T_i – average duration of i-th type illness;

N – the number of people living in the area under consideration (if necessary, divided by 10 000);

k – the number of disease types under consideration.

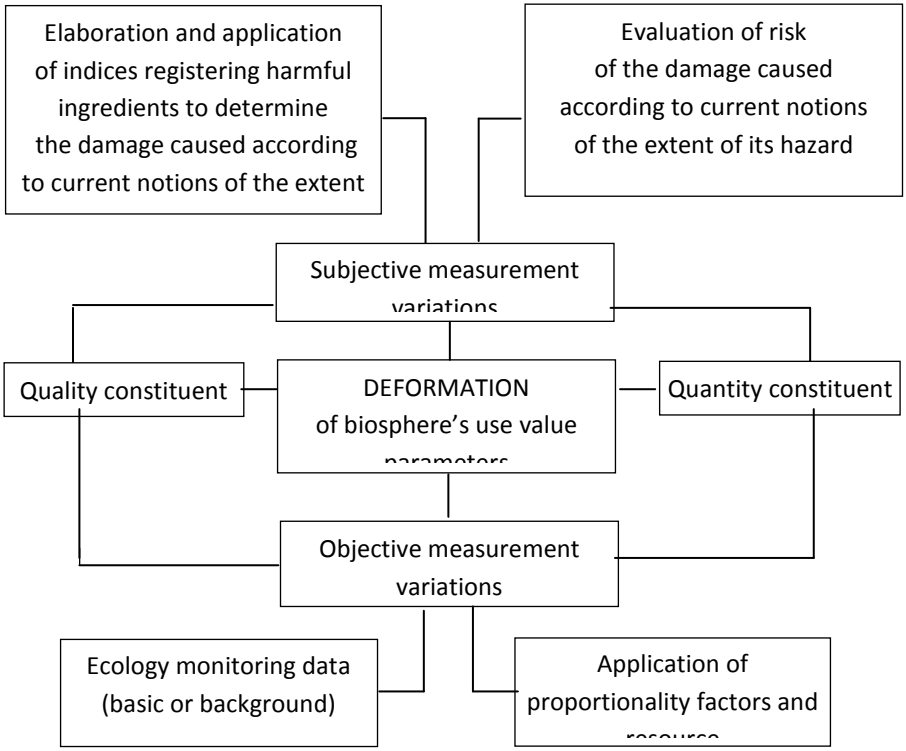
It is worthwhile considering the deformation of biosphere's use value parameters in terms of quality and quantity by determining the objective

and subjective damage constituents, using proportionality factors and resource depletion indices; indicators by means of which dangerous anthropogenic ingredients entering the environment and the degree of risk caused by one or another kind of environment deformation are determined (see the diagram).

A universal scale for measuring the damage caused to biosphere by humankind does not exist. The practice of using objective (natural) and subjective (social) scales makes it possible to estimate the processes of biosphere's anthropogenic destruction in genetic terms only.

The objective scale records changes in biosphere that take place beyond people's will, but with their participation; *the subjective one* records our concepts of the degree of hazards of the processes deforming biosphere.

Diagram of deformation of biosphere's use value parameters


Elaboration and application of indices registering harmful ingredients to determine the damage caused according to current notions of the extent
Evaluation of risk of the damage caused according to current notions of the extent of its hazard
Subjective measurement variations
Quality constituent
DEFORMATION of biosphere's use value parameters
Quantity constituent
Objective measurement variations
Ecology monitoring data (basic or background)
Application of proportionality factors and

Objective quantitative and qualitative parameters of biosphere's use value damage are represented by: biota primary product damage; degree of heat- and moisture-exchange disbalance; changes in natural artificial subsystems.

The lower objective limit to the damage is the critical state of biosphere when further anthropogenic effect disturbs its stability and deprives it of its ability to self-recovery (unregulated forest felling and land plaguing, reduction of surface waters run-off, water reservoirs volume, underground waters reserve etc.)

Ecology monitoring- regular and long run observations of the quality of atmospheric air, water, soil and other components of biosphere is an efficient way of establishing the critical state of natural systems.

The objective scale of measuring the damage caused to biosphere assumes applying diagnostic potential of biological accumulation, Buffon's, deactivation and absorption factors, as well as indices of river pollution, popularity index, Chapman's sheet surface index.

Subjective quantitative and qualitative parameters of biosphere's use value damage are represented:

– by a system of indicators: TPD (maximum permissible dose); TPS (maximum permissible contaminant concentration); TPD (maximum permission discharges); TPY (maximum permissible level) etc.;

– biosphere damage risk extent estimation. The lowers subjective damage limit is the individual's (society's) discomfort interfering with their normal activity. An example is threshold value of harmful effect of this or that substance the concentration of which causes changes in the human body beyond its physiological adaptive reactions.

The subjective, socially determined scale for measuring biosphere's damage is based on the systems of substance toxicity degree indicators. According to the State standard, they are divided into four classes: 1) extremely dangerous, 2) dangerous, 3) low-toxic, 4) not dangerous. For example MPC contaminants in the soil arable layer, in water reservoirs

used for economic and domestic purposes; MPC of substances in the atmosphere, landscape etc.

The subjective scale of estimating biosphere's deformation quality includes defining concentration, visibility/invisibility of the extent of risk (ecological, technical, physical and geographic etc.)

The analysis of quantitative and qualitative use value characteristics of biosphere would be incomplete and even distorted unless account is taken of zero labour object functioning stage which precedes the process of forming use value of both final and finished product. It is the stage of theoretical interpretation of the product forming process (geological and ecological examination, ecological and economic, social forecast etc.) For example, geological examination is a research and estimation of possible ecological consequences of construction or functioning of mining and manufacturing carried out by a specialist or a group of specialists (experts). [10]

2.2 Deformation of biosphere's use value parameters as a result of violation of Vernadsky's law of Economy

Biosphere, as has already been mentioned, is forced to perform two functions that contradict each other: to serve as the environment for "living matter" [1] and as the environment for humankind's industrial activity. During the millennia of its existence society has become used to certain comfort, while the comfort has been (in the recent centuries!) rather artificial than naturally essential. Now that the "gold billion" is trying to solve the problem of preserving their privileged status at the

[1] The term "living matter" was introduced by V.I. Vernadsky. It is the totality of all organisms existing now expressed numerically in their elementary chemical composition, weight, energy. Living matter is inseparable from biosphere, it is its function and at the same time "one of the most powerful geochemical forces of our planet". The total weight of living matter is estimated as 2.4 – 3.6 10 tons (dry). Pants (phytomass) absolutely predominate in "living matter", the animals (zoomass) play a smaller role as well as microbes.

expense of other peoples and states the stability of biosphere's use value characteristics is becoming a pressing one both in economic-and-political and social-and-ecological respects.

The problem dates back to the 70-s of the previous century when the mineral resources situation in the western world started changing for the worse. The cost of import of raw materials in the period from 1970 to 1977 in the USA, for example, increased 10-fold. Technically and economically advanced states started initiating research in using secondary materials. Experts' calculation showed that more than 2/3 of natural resources involved in production processes can be restored and returned to production cycles. The funds invested in research of this kind and elaboration of ecologically preferable technologies in USA amounted to about 6.5 billion dollars were spent on stimulating collection of materials, their sorting and regeneration [11].

Beginning in the 1980s utilization of technological and exploitative wastes has become one of the most important social, economic and technical tasks. It was recognized that those guilty of causing damage and the removal of wastes should pay for it. However, there is a gap between the recognition of the necessity to pay for the damage caused and the realization of it in practice, a gap that is hard to overcome. As practice shows, monopolies do not display a persistent will to cut down their profits and expenses, to take account of changes in biosphere's parameters for the worse. As a rule, production costs associated with waste utilization are shifted on to the population, the consumers. In other words, the problems are automatically "transferred" year in, year out, decades after decades, to another level, giving rise to new difficulties.

Is it possible to solve the problems related to ecological and economical well-being finding a compromise for nature and society? Are there any real prerequisites for this? The questions cannot be answered

unless the mechanisms of the "nature-society" system[2] are interpreted theoretically and the dialectical links characterizing it are analyzed from the point of view of preserving biosphere's use value parameters.

Since we are dealing with a multi-aspect object – biosphere – we establish the sequence of considering it, recognizing the following points:

– defining the terminological status of "biosphere";
– analysis of the essence of Vernadsky's law of economy;
– considering the varieties of functioning of "biosphere society" system;
– identifying quantitative and qualitative characteristics of damage caused to biosphere as a global use value.

Point one. Many papers are devoted to the analysis of such concepts as "biosphere", "nature" and "society". We are not attempting here to consider the whole variety of approaches that can be found in literature [12], but we specify our attitude to them. Our interpretation of the term "biosphere" is based on Vernadsky's theory of biosphere-noosphere. Formally, the concept "biosphere" was first used by I. B. Lamark (early XIX century), and as applied to its geological component, by E. Suess (late XIX century). From their point of view, biosphere is the sum total of all organisms inhabiting the planet's surface. Their environment is inert matter[3]. V. I. Vernadsky went considerably further. His biosphere is the unity of the planet's living and dead matter directly connected with Cosmos the study of which is its building material. *"The matter of biosphere* due to them (studies of space) is imbued with energy *it becomes active* (italicized by V. I. Vernadsky), it collects and distributes the energy

[2] On metamorphoses in understanding the terms "nature, society (social)", on the author's attitude to them see: T. N. Sosnina object of labor. Philosophical analyses. Saratov. Published by Saratov University, 1976. pp 31-34.

[3] Biosphere as an integral planetary phenomenon was investigated by outstanding scientists and philosophers. Great contribution to this investigation was made by Iamettric and Humboldt, Darwin and Poulliet, Sohelling and Hegel and others. In Russia the problems of living matter analysis were successfully dealt with by N. A. Severtsev, V. D. Dokutchayev, V. A. Timiryazev, V. I. Sukhechyov and others. But V.I. Vernadsky certainly was and remains the first in the constellation of these great names. It was he who "saw" the Earth from space half a century before the first space flight and realized that humankind is a force capable of radically changing the planet's appearance.

received in the form of radiation in the biosphere and, in the long run, transforms it into energy in the Earth's crust – free energy capable of doing work [13]. Space radiations emitted by all celestial bodies embrace the biosphere, they penetrate it and understanding them is a matter of the future. But it is certainly not them but the Sun's rays that define the main features of biosphere's mechanism. Understanding of how solar radiation influences the Earth processes is enough to get the initial, but accurate and deep *understanding of the biosphere as the terrestrial and space mechanism* [14].

Thus, V. I. Vernadsky poses the question of biosphere in its philosophically deep interpretation focusing on its orderliness (as V. I. Vernadsky calls it), peculiarity of development mechanisms and close interaction (in all its manifestations) with space radiation.

Vernadsky's works contain several approaches to defining biosphere revealing its content from different points of view: "in essence, biosphere can be regarded as part of the Earth's crust engaged in transforming space radiations into effective Earth energy – electrical, chemical, mechanical and thermal" [15].

"Biosphere is the only area of Earth's crust occupied with life; life is concentrated only in this thin outer envelope of our planet; it contains all the organisms always separated from the inert matter surrounding them by a distinct border that cannot be broken.

A living organism never engenders in it. Dying, living and deteriorating, it gives its atoms to biosphere while incessantly taking them from it – but living matter always has its origin in something living"[16].

"Biosphere includes the Earth's troposphere, the oceans and a thin layer in continental areas not more than three kilometers deep. Man seeks to increase the biosphere's extent" [17].

"Humankind has become the whole. There is not a single piece of land where man would not be able to survive if he needed to…" [18].

“Humankind, as the whole, is becoming a powerful geological force. The humankind, its thought and labour are faced with the problem of restructuring biosphere in the interest of freely thinking humankind as an integrated whole… This new state of biosphere we are approaching without noticing it is noosphere” [19].

“Noosphere is the final of the many states of biosphere evolution in geological history… We are entering noosphere” [20].

Vernadsky’s above-mentioned judgments of biosphere testify to the fact that the great scientists constantly deepened the content of the idea beginning with the statements that the Earth’s organic and inorganic matter is linked with the energy of Cosmos and that living matter inhabiting the biosphere as the whole geological envelope of the planet transforms its appearance and concluding with the statement that with the emergence of Homo sapiens and humankind being transformed into a geological force biosphere becomes noosphere – a qualitatively new state.

V.I.Vernadsky was the first to make a reasoned analysis of the biosphere functioning theory taking into account its system quality, organization peculiarity, possibility of development in the mode “efficiency- optimum”. He saw that the orderliness of biosphere’s existence in structurally functional and space-time aspect is created and preserved during billions of year DUE TO THE ACTIVITY OF LIVING ORGANISMS. The forms of this activity- biochemical work in biosphere- consist in circulation of matter and energy flows among the chief structural components of biospherical integrity: rock, natural waters, gases, soils, plant and animal life.

Point two. V.I.Vernadsky regarded biosphere as a special geological body whose structure and functions are determined by the peculiarities of the Earth (planet of the solar system) and Cosmos while living organisms, populations, species and all living matter- as forms and levels of biosphere’s organization. In the biosphere’s world of organisms, there is fierce struggle for existence-not only for food, but also for the necessary gas, this latter kind of struggle being the most important as it is gas that normalizes reproduction.

At the same time, life producing free oxygen in the Earth's crust generates ozone, which protects biosphere from cosmic radiations.

Biogeochemical processes pulse, stand still and intensify according to the law of economy. The phenomenon of economy in using vital chemical elements by living matter was discovered before V.I.Vernadsky by K.M.Von Baire who pointed out that economy is a property of living matter and is exhibited within the organism itself. An element once entering it passes a long row of transformations before leaving it and getting lost. The organism admits into its system the amount of elements necessary for its survival, avoiding any surplus.

V.I.Vernadsky found it possible to treat the problem of economy as a law governing all living matter. He wrote in "Biosphere": "We can observe the manifestations of the law of economy in innumerable biological phenomena. Atoms forming some kind of living matter captured by a single whirl return with difficulty if at all to biosphere's inert matter. Organisms devouring others, parasites and symbiotic organisms, saprophytes that immediately transform the remains of life just secreted into living matter, new generations obtained by reproductions- all these dissimilar innumerable mechanisms trap atoms in the changing environment and keep them in the whirls of life transferring them from one to another.

All this takes place during the whole life circle, hundreds of millions of years." [21] Every form, every level of living matter "withdraws" the necessary elements from the environment and returns the "processed" in forms acceptable for biosphere, some species consume substances directly from the environment, other use products processed and secreted by the first; the third- by the second; the fourth- by the third and so one until the substance returns to its original state finding itself in the environment. For example, living organisms can "pass" through themselves the whole supply of water available on the Earth in approximately 2 million years and that of oxygen in 2000 years. The

complete hypothetical circle of atmospheric carbonic acid gas via the fixed forms of living matter can return to atmosphere in 300 years etc.

Living matter actively regulates geochemical migration of atoms; due to this, the stability of biosphere has been maintained for hundreds of millions of years of geological history. Biospheric migration of chemical elements tends to manifest itself in the highest degree possible. Involving inorganic substance in “whirls of life” organisms in the course of time can penetrate into formerly inaccessible parts of the planet increasing their geological activity.

In this paper “Evolution of species and living matter”, V.I.Vernadsky draws the readers’ attention to the necessity of preserving variety of animals and plants species. He writes that there are not more than three thousand different kinds of minerals known, while there are several million species in organic nature. This multiplicity of forms is the result of long evolution, the product of which is their harmonious whole. Destruction even of one species damages the whole and leads to the depletion of organic nature’s gene pool, which cannot but affect biosphere. Living matter functioning becomes possible only on condition that certain physical and chemical parameters of biosphere hold over milliards of years of “biosphere’s geological history”. Beyond these “limits,” the very foundation of biosphere- its orderliness- is destroyed.

What are the physical and chemical parameters that, according to V.I.Vernadsky, provide for the functioning of biosphere’s “ancient biochemical” cycles? The answer to this question is of basic importance for it helps to orientate in the coordinates of biosphere’s functioning and to discover its normative state.

Biosphere is a complex of systems of the kind “vital activity object-living organism” connected with each other. V.I.Vernadsky assumed the fact of two levels existing in nature: the first level comprises autotrophs; the second one – heterotrophs and mixotrophs. Autotrophs (green plants,

bacteria) build their body directly using inorganic substances; heterotrophs (animal including a man) do it using organic matter; mixotrophs (non-green plants) use compounds created by both organic and inorganic matter.

V.I.Vernadsky did not regard living matter differentiation of this kind as a sign of autonomous (in a literal sense) existence of plants and oxidizing bacteria. To put it otherwise, the primary level, the universal object of vital activity is in any case formed by inorganic nature "There is not a single organism", - Vernadsky emphasized, "That is not related in its breathing and feeding, if only in part, to inert matter [22]. It should be taken into account that the interrelationship "living matter- object of vital activity (organic and inorganic media)" acts in accordance with the law of economy, which regulates biosphere's biogeochemical process. Adhering to it living matter economically uses necessary chemical elements and compounds and has no aggressive waste. All kinds of living matter while interacting with the object of life support take for a long time or forever a strictly determined composition of elements; they use efficiently enough each of them within the limits of their biological cycle completing the latter according to the formula: "take the necessary – use it economically – return the remains in a form acceptable for the environment".

The unusual approach to defining the role of living organisms in biosphere made it possible for V.I.Vernadsky to evaluate, in a new way, the scale and depth of the consequences of living matter activity and, most notably, man's industrial activity for the Earth's present and future. The outstanding scientist did not just determine the amount of living matter on the Earth, he also substantiated the conclusion that with the advent of human society the latter has become a great geological, and probably cosmic, force. Indeed, man as a biosocial being continues the evolution of organic matter in specific forms unique to him. He becomes the bearer of the universal type of relations (the object of vital activity is complemented by the object of labour, while the planet becomes the

latter). “His (man’s) power is connected with his brain, with his intellect and labour guided by intellect” [23]

If living organisms including higher animals do not find favorable conditions for their survival in the environment they adapt to new ones, and they die if they fail to do it. People, with the help of tools, are capable of making products, not supplied in small quantities, by nature.

Consuming natural environment, society supplies itself with means of subsistence; it manipulates material flows of labour, instruments and objects of labour. It accounts for the fact that humankind despite its infinitesimal biomass is able to affix an “anthropogenic seal” to nature. Gradually man is creating a second (artificial) environment “complementing” the first (natural) one and interacting with it ignoring the law of economy.

Living matter that is aware of itself and the world around it in the person of Homo sapiens radically changes its affect on nature and opens a new era in the history of the Earth. The geochemical function of organisms in biosphere before man’s advent – this circumstance is particularly stressed by V.I.Vernadsy because of its extreme importance – fitted in circulation of substances without damaging nature. The processes of forming and destroying living matter were balanced. With man’s advent their nature changed, first gradually and since the XX century the changes have become profound and abrupt which is connected with the making of humankind acting as “a whole with regard to the rest of the planet’s living population” [24]

We can mention three stages of interaction between society and biosphere. One is based on appropriation economy, the second – on production (agricultural) economy, the third – on production (industrial) economy. Nowadays there is the fourth type – self –reproduction economy (post-industrial production).

Only a small part of chemical elements released as a result of anthropogenic activity is involved in subsequent production cycles. Thus, these elements become ballast that is not indifferent to biosphere; moreover, it destroys the established biogeochemical cycles. V.I.Vernadsky introduces the concept of "biogenic migration of atoms" for analyzing the spectrum of organisms' connections with the environment: unicellular organisms breed with the help of biogenic migration of first series atoms, while multicellular ones do it by biogenic migration of second series atoms. The third biogenic migration is connected with humankind's activity. It takes place under the influence of man's will and intellect and manifests itself as the biogeochemical function of society. Thus, man initiated the beginning of the process of transition from biosphere to biotechnosphere – modified biosphere: humankind proved to be able to initiate various chemical processes through intellect and technology, not through physiological activity of the body.

The pattern of these changes can be defined quite accurately in the context of the law of economy. Before the social factor in biosphere became the dominant one, its effect in the plant and animal world manifested itself in well-defined evolution of living forms. As for the socio-biological level, the anthropogenic constituent is acquiring the decisive role (man acts according to his level of empirical and scientific knowledge about the environment more or less successfully) which does not always and everywhere agree with the law of economy. The result of this kind of disproportion is the disruption of biosphere's functioning: all the structural links of the latter are receiving huge amounts of compounds that disorganize living matter. Man can synthesize today about 10 million of various substances, just over 2 million of these can be found in nature. Humankind uses about 80 per cent of the substances being in the dark about their toxicity and possible effect on the environment and on itself. Direct and indirect anthropogenic effect proved to be negative in atmosphere, hydrosphere, lithosphere and organic nature (plant and animal life including man).

According to V.I.Vernadsky's theory, there is only one way out of this situation: man's activity should conform to the algorithm of functioning of the planet's old biogeochemical cycles, that is, with the law of economy. Pondering over this problem V.I.Vernadsky thought it was necessary to make the conclusion: NOOSPHERE, a qualitatively new state of the "ball of life" is to become the final stage of its evolution.

To understand noosphere it is fundamentally important to see the continuity of biosphere's structural organization, the inevitability of emerging of a new form of its existence or a new unity of organic and inorganic matter that emerges as a result of interaction between biosphere and society. The structure of biotechnosphere (the present state of biosphere) and noosphere (the future state of biosphere changed the humankind's thought and activity) was regarded by V.I.Vernadsky as a derivative of the development of biosphere and geosphere:

1) division of geosphere into elements is the basis of structural differentiation of biosphere (inorganic and organic nature form geobiosphere);
2) structural division of biosphere serves as a foundation for elements of biotechnosphere (the first and second nature form biotechnosphere as a peculiar combination of natural and artificial, creates by society, nature);
3) elements of biotechnosphere become elements of noosphere (biotechnosphere in the optimal variant of its functioning becomes noosphere).

V.I. Vernadsky holds strictly to this all-round approach. The scientist considered several variations of interrelated division of geobiosphere.

THE FIRST one is based on the geographical principle: concentric layers are differentiated on the vertical section of the planet, each of those possesses special properties of troposphere; crust of weathering; hydrosphere; stratosphere; precipitation sphere; metamorphic sphere; granite sphere.

THE SECOND one is based on the classification of the Earth's crust chemical elements. Six geochemical groups are distinguished: cyclic elements, biogenic elements, noble gases, radioactive, rare earth, inert and trace elements.

THE THIRD one is based on the availability of various forms of living matter (way of feeding, environment, upper and lower life limits are taken into account).

THE FOURTH one is based on the geochemical function of living matter in all its forms except man.

In his paper "Scientific thinking as a planetary phenomenon", V.I.Vernadsky outlined the fifth variant of the structure that characterizes the anthropogenic stage of biosphere's evolution – biotechnosphere. It is achieved in accordance with the extent to which man realizes the power of his intellect and labour concentrated in object, means and results of his activity. In this connection V.I.Vernadsky distinguishes such stages as mastering of fire and tools which laid "the foundation of man's advantage over higher animals", "domestication of animals and growing cultivated plants that took a long time decades ago". These objects and means of labour made it possible for man to "change the living world around him and create a new kind of organic nature that had never existed on the planet".

Analyzing the stages of biosphere's evolution V.I.Vernadsky drew three conclusions:

1. "Man as he is observed in nature, like any living matter, is a certain function of biosphere.
2. Man in all his manifestations makes up a certain regular part of biosphere's structure.
3. "The explosion" of scientific thought in the XX century was prepared by all the past of biosphere and has deep roots in its structure. It cannot stop or reverse.

It can only slow down its pace … biosphere will inevitably become noosphere sooner or later" [25]

The spontaneity of man's relations with nature must be "removed" by reasonable regulation. For the realization of this process, it is necessary not only to develop science and technology, but also to perfect the social organization of society and people's activity. V.I.Vernadsky, as a scientist, concludes that humankind acting as a geological factor manifests itself biologically as the whole. [26]

As for the social aspect, people have always acted separately except for the initial stage of history. In the XX century "the idea of humankind's unity, people as brothers, has gone far beyond separate individuals who approached it in their intuitions or inspirations, it has become the motive force of popular masses' way of life and a task of state institutions. It is still far from being accomplished. Conditions are created slowly, with numerous stops and it makes its realization possible" [27]. The absence of humankind's unity on the global scale reduces the possibility of science development and consequently, retards the pace of biosphere's transformation into noosphere. Scientific thought is a planetary phenomenon, which corresponds to the essence of noosphere – creating, on a strictly scientific basis, an envelope of the planet as a self – organizing dynamic system.

V.I.Vernadsky gave a comprehensive substation of the thesis: transition from biosphere to noosphere is predetermined by the development of material and spiritual production. Does the development of sphere of production support this conclusion? What transformation are we dealing with? What is its mechanism? The answer assumes establishing changes that take place in the object of man's activity for man is the foundation and the result of material and spiritual production.

The object of labour in material production affects the environment with its waste products. These are generated at the stages of resource and manufacturing production, and, since all kinds of products are to be moved in space, there are waste products of transportation industry. The object of labour in present-day material production, having changed

qualitatively, can result in WASTE connecting up to the planet's GEOCHEMICAL CYCLES to the extent of how close the way of its functioning is to the optimum variant and contributes to the transition of biotechnosphere to noosphere.

The object of labour in spiritual production, having a unique ability to join the object of labour in material production at any stage including finished and final product influences biotechnosphere, slowing down or spending up the process by the very choice of the object of cognition. If the choice is correct and timely, the way from the object of spiritual production to the object and product of material production BECOMES SHORTER and, consequently, the transition from biotechnosphere to noosphere IS INTENSIFIED.

Now biotechnosphere is in crisis. It is to end, via scientification of production and everyday life, in stabilization and further in biotechnosphere getting out of the non-equilibrium state. The transition to noosphere depends to a great extent on how soon the planet's hotbeds of pollution dangerous for the living matter will become the object of scientists' work, how accurately the knowledge obtained will be used with regard to biosphere parameter of compatibility in the object of labour of material production and, consequently, in finished and final products its functioning results in.

Comparison of relation "object of labour of material production-biotechnosphere", "object of labour of material production- noosphere" is indicative in this respect. Reversible relations of biotechnosphere (object of labour-biosphere) exist ALONSIDE irreversible ones (waste-biosphere's ballast). Harmonious combination of these opposing in their nature relations is IMPOSSIBLE. Therefore, if measures to protect environment are not taken at a certain stage of biotechnosphere's evolution global cycles are broken. In noosphere the situation is to change radically due to the formation of a new kind of relations: "wastes not assimilated by biosphere-biochemical cleaning cycle-wastes assimilated by biosphere",

which solves the problem of ballast formation in biosphere, at any rate for the complex of biologically harmful products of anthropogenic activity. In the noosphere or biotechnosphere regulated by man (society) acquainted with the laws of its evolution biogeotechnocycles prove to be CLOSED and REVERSIBLE.

The comparison of relations “object of labour of material production-biotechnosphere” and “object of labour of material production-noosphere” allows concluding the following: elimination of disruptions in the planet’s biogeotechnocycles is possible provided the transition is made from uncontrolled forms of management to deliberately regulated ones, which make it possible not only to reduce the quantities of all kinds of waste products, but also to change them qualitatively. In other words, the object of labour in material production- the source of pollution- is able to meet the requirements of the biosphere compatibility parameter if the functioning of all its stage- zero, primary and secondary- is changed. V.I.Vernadsky’s theory of biosphere and noosphere cannot but lead to the conclusion: second nature, as well as the first one, must be GOVERNED by the law of economy: the supply of chemical elements to the sphere of material production should be minimal both qualitatively and quantitatively; what has been captured should be used as many times as possible; the elements that cannot find application in a given production process should be diverted to the adjacent ones; the compounds that cannot be further regenerated are to be rendered harmless as they enter biosphere (this is a vital prerequisite for connecting up to the planet’s ancient biogeochemical cycles). To complete this chain, according to V.I.Vernadsky, it is necessary to process waste products and products that go out of use by autotrophs since the highest forms of living matter, that is, heterotrophs, can assimilate only chemically pure, homogeneous elements without damaging themselves. Therefore, chlorophyll plants and oxidizing bacteria are to act as “connecting” links; only they can feed on isotopic mixtures. Involving lower biological forms in the production process would provide the best solution to many complicated ecological situations. Is it possible?

Science is making steps in the direction of using autotrophic organisms in resource production and manufacturing, agriculture and transport. V.I.Vernadsky’s forecasts that microorganisms can yield the greatest

ecological effect in industry in view of their physiological parameters proved to be true. He describes their technological parameters:

1. The unicellular are omnivorous, their ability to accumulate chemical elements is high enough (the limiting concentration is in the range of 1 to 10 per cent of the living matter weight).

2. Concentrating organisms can be found in large quantities. This is predetermined by the specific nature of their reproduction. No living creature can complete with them. In favourable conditions division takes place every 30 minutes (two bacteria now become four in 30 minutes etc). V.I.Vernadsky calculated that if all the bacteria generated within 36 hours or even less maintained their viability they "would cover with a thin single-layer blanket the surface of the Earth that reproduction of green herbs or insects would take years to cover". The speed of the unicellular reproduction is close to the speed of sound. The number of generation of bacteria that follow one another within 24 hours is the same as the number of generation of human beings within 5000 years.

3. Microbes are very undemanding and widely spread. "They are scattered everywhere: we find them in soils, sludge, water basins, in sea water" [28].

4. The use of microbes in production can be regulated by means of temperature regimes (most bacteria perish at 70-80 C, but they can easily withstand temperatures a few degrees below zero).

Economic and therapeutical indicators are important point IN FAVOUR OF using microbes in resource production.

First of all, they can help in mining out-of-balance ores. If we take into account the fact that "poor" deposits make up 65 per cent of the total number comment is superfluous. Today many countries already have to turn from exploitation of rich ores to mining poor ones.

Secondly, bacteria can assimilate strictly specified chemical elements, which make it possible to use them in processing flotation concentrates at concentrating mills. This is one of the promising directions in ore metallurgy. Thus, tin concentrates contain 9 per cent of copper and 7 per cent of arsenic as impurities, which are technologically difficult and

economically unprofitable to remove. As for microbes, they find such elements without faults.

Thirdly, many bacteria are capable of “working” in extreme conditions (they withstand radioactive emission 10 times lethal dose for humans).

Fourthly, microbiological processing of ore bodies leaves the soil cover and relief intact. The advantages in this respect are obvious. Microbiological resource production factories operate in the USA, Mexico, Spain and Australia.

In manufacturing industry the law of economy can be effected through the processes of intraproduction (the smaller circle) and the interproduction (the greater circle) functioning as well as through treatment of waste spilled into biosphere, the use of natural technologies and natural technical equipment. The first variety is represented by technology, which, ideally, imitates natural processes, the second one – by a system of mechanical, physical and chemical, or biological clearing processing. Circle technology (using no pipes, without waste water) is gaining acceptance since it provides regeneration of raw materials (solid, liquid and gaseous). Returning raw materials and products out of use to their starting point for reusing in the primary process cycle makes it possible to connect the smaller and greater production circles.

In agriculture, the law of economy can well be consistent with man’s production activity if migration processes of chemical elements in biosphere “coincide” with the nature of migration processes generated by man. Elimination of components alien to the environment here also occurs via a biochemical cycle: in-depth study of functions of microorganisms in the soil; creation of chemical weed- and pest-killers possessing reduced stability in natural conditions (they quickly break down into products presenting no harm to biosphere); introduction of biological methods of fighting plant pests and diseases. In healthy soils all the work is done by bacteria, fungi and organisms. Multiple uses of chemicals destroy this

miniature well-organized world transforming it into a sterile matrix unable to assimilate or produce anything without using a greater amount of chemicals [29].

The law of economy manifests itself in its optimal variant when the substratum of the labour object starts functioning like a “natural machine”. Industrial catalysts can play the part of the latter, for they literally “wake up” the substance acting as the object of activity and “transform” negative efforts of the latter into positive ones in line with man’s purpose.

Biological catalysts, enzymes are ideal in the respect; they help to regulate each chemical process that is taking place in the bodies of plants and animals practically with lightning speed. Biocatalysts are used in food processing industry and agriculture and give an enormous economical and ecological effect. They serve as a universal “natural machine” with the help of which man can turn counteracting characteristics of nature object substratum into assisting ones that meet the requirements of the law of economy.

In this case, man puts a natural process-labour object functioning following the pattern of a natural machine-between nature and him. Using such ways of production organization refers, first and foremost, to chemical industry. When catalytic reactions take place, the artificially produced matrix makes it possible to put the reacting molecules in place by force, which provides the required process direction. It is inconceivable that the process itself will be vested with all the functions of the automatic control system, as it happens, for example, in plants. In some cases, control will be accomplished by an auxiliary parallel chemical process, which can be considered as a “chemical computational machine”. It is believed that many processes, which now pass a number of stages in succession, yielding intermediate products, will be controllable. We will get not the chemical products but the items they are intended for at the output of an automatic chemical plant. Multiple transformations, which a

piece of iron ore undergoes before it becomes, for example, a bearing or a wheel, will merge into a single process without any intermediate stages or semi-finished products". [30] As theoretical and experimental studies of catalysis are developing the latter is becoming the powerful tool of controlling production processes with regard to the law of economy, that is, it helps noosphere to come into being.

Mastering nanotechnologies opens new horizons that currently are hard to imagine more or less accurately. Direct manipulation of atoms, "assembling" them into any substance is becoming the real possibility. According to forecasts, production of molecular machines will become a fact in the coming decades [31].

We can see that V.I.Vernadsky's ideas concerning the possibility to "connect up" technologically humankind's activities to the planet's biogeochemical cycles with regard to the law of economy are already being realized. However, the great scientist and humanist was concerned about the facts that the great part of humankind has no opportunity to judge correctly what is happening and life is against the main prerequisite for creating noosphere. It results from a number of factors. Some of them cannot be left out of account in view of their prognostic character:

- the condition of science under the existing state system;
- the idea of humankind's "scientific brain centre";
- the necessity of the society's realizing its planetary quality.

V.I.Vernadsky writes in his "Naturalist's Thoughts": "Science does not conform, in the current social and state condition of humankind's life, to the importance it really has now. It tells on the status of men of science in the society, their influence on humankind's state measures, their participation in state authority, and, most of all, on how the ruling groups and politically conscious citizens, that is, the country's "public opinion" evaluate the real power of science and special importance of its statements and achievements in life…

The new idea is coming forward that sooner or later inevitably wins in a state's real time-the idea of state unification of humankind's efforts… So far not a single state has spent on a systematic and planned basis sizable state funds on solving great scientific theoretical problems, on tasks distant from present-day life, for its future, on the scale of state needs quite often mistakenly regarded as such" [32].

V.I.Vernadsky believed the humankind's task was to create better living conditions for the next generations by means of conscious state scientific work. He identified this process with the formation of noosphere. Its realization is impeded by the fact that "science's demands have not been formulated, their inevitability and usefulness for humankind have not been perceived; they have not been expressed in social and state structure. No state forms have been developed that would make it possible to solve quickly and easily interstate problems among which there are inevitably most problems connected with the formation of noosphere in fiscal and financial terms" [33].

Science is a manifestation of action of society's combined thought. V.I.Vernadsky thought that its importance as a creative force, as a real possibility of creating national wealth quickly and on a mass scale should become the aim of state policy. Scientific thought should not conflict with the state power, for it is the main source of national wealth, the main force of the state. The fight with it is an unhealthy, transient phenomenon in the state system. He estimated the quality of state policy in the context of its accepting the priority of science". The freedom of scientific quest is the main condition of the work's maximum success. It does not tolerate restrictions. The state that offers it maximum scope and puts minimum obstacles achieves the maximum force in noosphere and is the most stable in it. Boundaries are established by the new ethics connected with scientific progress [34].

Logically, this line of V.I.Vernadsky's reasoning resulted in the thesis that with increased importance of science, which is in its essence

fundamentally democratic and supernational the structure of the state itself should change completely, its democratic foundations should get stronger.

It is remarkable that the great scientist and citizen sympathized with the ideals of socialism considering them to be in keeping with the biogeochemical concepts and the concept of noosphere.

The scientist viewed the idea of planning, the establishing of Gosplan (state plan) in our country as worthy of attention and interpretation. “The issue of planned uniform activity aimed at mastering nature and proper wealth distribution, connected with the recognition of unity and of all people has become urgent, new forms of scientific fraternity “stand out”- non-state organized forms of world scientific environment. These forms are more flexible, more individual…” Life is putting forward the idea of humankind’s scientific brain centre. It is unlikely to “leave the historical arena it has already ascended.”

Parallel to this important process, according to V.I. Vernadsky, another one should take place –aspiration of working people’s democratic and social organizations to gaining maximum scientific knowledge.

V.I. Vernadsky’s teachings are imbued with the sense of *unity of the Earth*, humankind, science, Cosmos. “Man has realized for the first time that he is the *planet’s* inhabitant can think and must think and act in a new perspective, not only in the perspective of an individual, family or kin, states or their alliances, but also in the perspective of the planet” [35]. The scientist’s appeal to form the biospheric type of thinking is still actual at the beginning of the XXI century and civilization still gives preference to positivist, mechanistic, technical principles of culture in which man *does not feel* himself as a part of nature; *does not consider* all living matter to be an interrelated organic whole; *does not estimate* nature (people, animals, plants, ecosystem) as essences valuable in themselves. Humankind is still to develop universal consciousness. Planetary, cosmic

importance of thought is not measured only in terms of its cognitive and real productive power. It possesses a higher measure –*a measure of man's responsibility before humankind, kin, environment that has given birth to him, that is, the biosphere.* This responsibility should become a moral imperative both for political leaders, scientists and for each individual. Today we, the inhabitants of the Earth, are to give much thought to the fact that ecological coordinates of our being have revealed themselves as strictly negative.

Biosphere is no longer able to:

1) "support" the military industrial complex, that is, material flow of the destructive type;

2) "maintain" material flows of population (qualitative parameters and proportions that have taken shape nowadays) at a proper level;

3) meet the excessive, conditioned not by biological, social, but solely by social and prestigious character, needs (disproportions of functioning material flows of production and services).

Today society has the only possibility: co-evolution way of civilizations development, for biosphere is swiftly changing taking values exactly converse to noosphere's parameters and completely excluding the existence of humankind on the Earth as one of the forms of "living matter ". In modern conditions, the preservation of biosphere's stability should become the common goal of people regardless of political and state differences, geographic position, historical traditions etc.

Thus, the violation of the law of economy that governed biosphere's functioning for millions of years brought about deformation of human environment and exposed life on the Earth to mortal danger.

Biosphere's use value parameters can be preserved if humankind manages to subordinate material production to the law of economy using the achievements of science and engineering and disciplining minds and behavior of people.

Progressing global economic crisis makes the society tend to the revision of its function of "geological force", though the pace of this process is sluggish. This is taking place in the situation when the technogenous type of production and anthropocentric purposes, which sanction it ideologically and technologically, remain practically indifferent to the outrageous fact: only 2 to 5 units of the substance withdrawn from biosphere are transformed into finished and final products while the overwhelming mass returns to the biosphere as aggressive ballast destroying the basis of its existence!

Point three. What should be the variants of the system "biosphere – society" functioning? The question is for from being rhetoric! Many modern investigators are trying to answer it.

L.V.Leskov, for example [36], suggests six scenarios of western civilization's development, two of which are "preservation of the current situation" (1) and "transition to noosphere " (6) are connected with identifying possible biosphere's evolutions and radical changing of its use value characteristics.

Scenario	**Main factors**
1. Preserving the current situation	Transnational corporations' control over the world market. Renovation of developed countries' technological structure.
2. World totalitarian	"Gold billion" strategy. Slow pace of the third world's

system	development.
3. New middle ages	Demographic explosion in the countries of the third world. Technological braking. Loss of socio-cultural unity by the west.
4. World community split	Aggravation of conflicts between the world force centres. Minimized chances of stabilization Numerous military regional concepts. Terrorism.
5. Environmental disaster	Spasmodic worsening of ecological situation on the planet.
6. Transition to noosphere	Support of fundamental science, high technologies, education. Strengthening of the world unity

The system crisis existing in the modern society has brought it to the verge of bifurcation. Assessment of relative evolutionary scenarios of civilization development in the 21st century leads to the conclusion that its chances for the safe future do not exceed 45 per cent in case of scenarios 1 and 6. In both cases the key that opens the way to the future of our planet is the primacy of fundamental science, high technologies, and, as a prerequisite for applying them in practice, is the formation of **Educational Society**.

However, well-being is quite different according to scenarios 1 and 6: the second one means the steady movement towards the controllable future, while the first one is nothing more than a model of delayed catastrophe. During the decades that will follow the boundaries defined by L.V. Leskov's forecast in the first case, the west is almost certain to start "sliding down" to one of the unfavorable deadlock scenarios. In the author's opinion, the unfavorable deadlock variant is more realistic as the western economic and political elite does not realize yet that the ideology of dividing countries into North (rich) and South (poor) has no prospects, and the intellectual work at noospherization business programs on a scale required for success does not get sufficient impetus to development.

If the circumstances are lucky for the world community, the North and the South will transform into a qualitatively new, steadily self-developing social and political system many features of which were predicted by V.I.Vernadsky in his theory of noosphere.

Forecasts of the kind were and are being made. It is spoken about the peculiarity of visioning certain stages of the process, but not the principles and the outcome of the latter. [37]

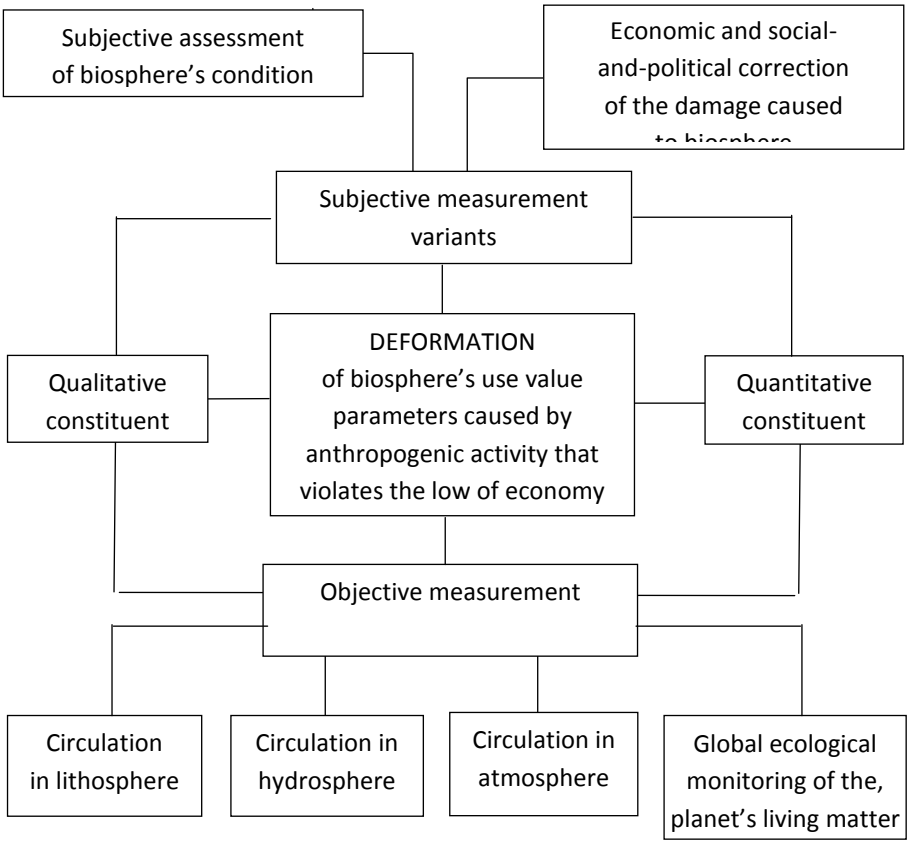
Point four. Qualitative and quantitative parameters of the deformations characterizing use value parameters of biosphere in terms of violating V.I.Vernadsky's law of economy can be viewed in the objective and subjective variants (see the diagram).

The objective “vision” of qualitative and qualitative changes in the use value of biosphere is currently fixed by ecosystem homeostasis damages caused by ecologically dangerous technologies and aggressive wastes.

The subjective “vision” reflects individual (group) assessments of damage caused to biosphere, which show the degree of competence for analyzing and taking decisions in one or another ecologically alarming situation, that society has achieved.

The “ancient biogeochemical cycle” functioning according to the law of economy came into being at the same time as life on the Earth originated (about billion years ago). Since that time the process of exchange, transformation of chemical elements among the components of biosphere has been continuous. The circulation takes place using, mostly, solar energy (photosynthesis) and, partially, the energy of chemical reactions (chemosynthesis). As a result, biosphere, as a whole, transforms into a qualitative new state: new circulations come into being through which the elements like lead, mercury, artificially synthesized compounds (insecticides, defoliants), etc. are spread widely.

Diagram of biosphere use value parameters’ deformation caused by anthropogenic activity



Today the circulation of oxygen, nitrogen, water, carbon dioxide, phosphorus, sulphur, biogenic cations etc. differ from those that took place in compliance with the law of economy. They change the quality of global processes for the worse. Figures and facts indicate the scope of the transformation.

1. The total amount of free oxygen in the atmosphere, $1.18 \cdot 10^{15}$ tons, has accumulated because of plants' photosynthesis during the whole period of existence of living matter. Now free oxygen is generated at the rate $1.55 \cdot 10^{9}$ tons per year, while 2.16·10 tons are consumed during the

same time, i.e. consumption exceeds supply by an order of magnitude [38].

2. Hydrosphere balance upset is 9 per cent of its natural quantity: heavy metal contamination has increased 10-15 times as compared to the 19^{th} century; the oil film covers one fifth of the ocean's aquatory.

3. The changes in lithosphere calculated as percentage of the initial natural quantity amount – in rock to over 300 of the volume of solid substances involved in the biotic circulation of dry land. The rate of soil cover destruction has risen from 4-6 up to 12000 times.

4. The total mass of biosphere is about $1.8 \cdot 10^{12}$ tons of living matter. If this seemingly enormous amount of matter could be uniformly distributed over the Earth surface, it would cover the latter with the layer just 1 centimeter thick [39].

Anthropogenic emission of chemical macro- and microelements that accompany production (technological waste and final products gone out of use due to physical and moral depreciation). It leads to the breaking of the proper course of biological processes. This is reflected in biomass reduction (as compared to 1850) by 7-25 per cent of its natural quantity (the productivity on the land, respectively, by 20 per cent and that in the ocean by 30 per cent) [40].

5. Human impact on biosphere is comparable to geological processes. The following figures indicate that it is rightful to compare the biological and the technical in their global and cosmic essence [41].

Biological substance of dry land	
Biomass	$2\text{-}3 \cdot 10^{12}$ tons
Bioproducts	$11 \cdot 10^{11}$ tons
Technogenous substance of dry land	
Technomass	$10^{11}\text{-}10^{12}$ tons

Technoproducts	10^{11}-10^{12} tons

Relative energy indicators of technogenesis (erg/year, according to different authors) and natural Earth forces are as follows:

All technogenous substance	$2{,}21 \cdot 10^{27}$
Technogenous heat losses	$1{,}55 \cdot 10^{27}$
Earthquakes	about 10^{26}
Volcanism	$1{,}5 \cdot 10^{26}$
Radioactive decay	$1{,}4\text{-}3{,}0 \cdot 10^{28}$

According to some estimation, technogenous substance consumes potential energy of the biosphere approximately 10 times faster than accumulates in the Earth's crust. The constructive function of technogenous substance, therefore, is manifested much slighter than the destructive function [42].

Growing population is an objective indicator of the damage done to the biosphere by humankind's vital activity. Today humankind is using practically all parts of the Earth suitable for living. The number of people exceeds the number of animals comparable to us in terms of size and feeding in one hundred thousand times. The society "separated" from the rest of the biosphere at a certain stage having created artificial environment. Now, when the anthropogenic pressing has reached the global level, we are confronted with the acute problem of our effect on biosphere. The "reverse side" of this process shows itself – the influence exerted on the society by the deformed environment.

Violating the law of economy humankind cannot help experiencing the consequences of deformation of biosphere's use value parameters: use value characteristics of the society are also changing for the worse.

Calculations show that humankind is now at the stage of the population explosion during which the population will increase just two-fold (approximately to 12 milliard people). T. Malthus's population principle according to which population growth is limited by resources and

hunger is called into question today giving way to the demographic imperative. If in the past population was meanly characterized by quantitative growth, in today's world the quantity will be stabilized while the quality of the life of population will be the criterion of the development [43].

Changes in age structure will be followed by a deep restructuring of society's values with an emphasis on the spheres of health care, welfare, education and science. A new sense of responsibility for the biosphere as environment and for production activity will be developed. According to S.P.Kapitsa, "No doubt, these fundamental changes in the society's values are the main problem at the new stage of humankind's evolution that is going to come in the foreseeable future" [44].

In total, objective changes taking place in the biosphere are registered as the results of global monitoring investigation. Living matter, in all its forms including man as a social-and-biological species is the basic constituent of ecological information. All the other variables in various combinations are viewed relative to this "biological core" [45].

Ecological monitoring is a system of prolonged observation in space and time, it provides in formations about the condition of the environment with a view to assess the past, present and future basic parameters of the biosphere (the quality of atmospheric air, water, soil landscape components, sources of contaminations and waste concentration).

The typology of ecological information automatically reflects a great number of variables each of which is registered starting from the highest level. Here V.I.Vernadsky's logical constructions are "at work".

The first logical premise consists in the statement that in simplified presentation the Earth's envelopes reflect the dynamic equilibrium of independent variables, such as temperature, pressure, physical state, chemical composition of substance etc.

The second premise consists in the statement that all the Earth's envelopes (geospheres) established empirically can be described through

the variables that form kinds of equilibrium studied by Gibbs: thermodynamic equilibrium (temperature and pressure); phase equilibrium (physical state of substance-gaseous, solid and fluid);chemical equilibrium (chemical composition of substance).

The third premise amounts to the fact that this system misses another independent variable – living matter possessing an autonomous internal thermodynamic field and internal equilibrium of all variables, which makes it possible to isolate living organisms as an independent variable [46].

In 1972, the global observation system (GOS) was set up under the aegis of the UNO to observe the environment. The tasks of the GOS are to study the interactions between man and environment, to provide early warning of potential dangers. GOS comprises three components: the global system of environment monitoring, the international register of toxic chemicals and the international reference system INFOTERRA. The consumers of the latter include any organization, institutions or enterprises interested in obtaining information concerning the environment. In industrially developed countries the research institutes and higher schools make up 46 per cent of the whole number of consumers, government institutions account for 34 per cent and industries account for 11 per cent. In developing countries research institutes and higher schools account for 23 per cent, government institution – 46 per cent and industries – 15 per cent [47].

Global monitoring investigations, while reflecting objective parameters of the biosphere, contain, along with these, subjective points for value judgments which cannot be totally “separated” from the individual, groups, states, social structures coordinating the society’s activity at different levels as well as from the specific technical instrument of their methodological support.

A peculiar feature of primary ecological information is its strict subordination to economic tasks with the collection procedure being made as cheap as possible. The variables to be measured as well as the number of them should be just necessary and sufficient to provide the reliability of practical action in a certain subject area. To be sure, almost

everywhere the real sets belonging to one or another type of information appear to be blurred.

We shall consider the subjective assessments of biosphere measurements from three points of view: the first one is connected with the analysis of the axiological component of research work; the second one-with the value judgments of citizens, organization, public movements concerning the quality and quantity of the damage caused to the environment: the third one-with the interpretation of possibility and necessity of the quality of biosphere's evolution negative tendencies being influenced by political and economic structures.

The first kind of biosphere use value parameters' measurements is based on V.I.Vernadsky's methodical principles that make it possible to interpret the crisis phenomena in the "nature-society" system and to take steps in order to achieve man's (society's) harmony with the environment. This becomes possible only if the society "does not dominate over nature, but obeys to it". We can assess the ecological situation only on the basic methodology, but not separate research developments that representatives of certain disciplines often focus on, because scientific potential is mobilized in methodology "as a single organism" including the organic, the non-organic and the social. This approach allowed V.I.Vernadsky to create his theory of noosphere as the new state of biosphere. The great future will unfold before humankind if people understand and do not use their intellect and labour for self-destruction" [48].

The given tasks were recognized as dominated ones. Declaration on science and use of scientific knowledge accepted at the World Conference "Science for the XXI century: new obligations" (July 1, 1999). The tasks are formulated as follows: "All people live on one planet and form the part of the biosphere. We have come to understand the role of general immanent dependence of our future on the safety of global life support system and all forms of life. Science should serve humanity and contribute to deeper understanding of nature and society by each person, to the creation of a stable and healthy environment in the interests of the present and future generation".

The participants of the conference pointed out that “along with obvious benefits the use of scientific achievement and the expansion of human activity also have such consequences as the degradation of environment and technological disasters. Science is to perform its main function: serve as a powerful means of cognition of natural and social phenomena. This role will increase as the complex nature of society-environment relations is getting better understood” [49].

The analysis of the axiological constituent of the research devoted to the global crisis and the degradation of qualitative and quantitative use value characteristics of the interaction between the objective scientific knowledge and the subjective form of its expression. There exist mutually exclusive assessments of the global ecological situation [50]. Some authors adhere to the anthropocentric interpretation of humanity’s way of development while others adhere to the biocentric ones.

The existence of alternative approaches and the scientists’ desire to take into account the ecological context in their research express the specificity of individual and group scales of values. The latter are formed under the effect of two forces: the external force determined by the society’s goals and manifested as “pressure” on science from the outside (the objective basis of a scientist’s subjective preferences) and the internal one determined by the logic of immanent development of science itself (the objective basis of its subjective efficiency).

This explains in many ways why there is always a gap between the following: what science gives to humanity and what it could give.

The most beneficial situation for the society is the situation when the scales of values are in harmony with each other. The latter circumstance is a derivative of social, not research, nature and not the research character.

Objective difficulties of other kind epistemological ones are also inherent in science, as science does not possess truth in the last instance and cannot foresee all the consequences of human activity. This feature, however, does not prevent science from being a reliable and indispensable instrument of defining ways that lead to harmonious

relations between society and nature. Science is the objective imperative to the subjective one,
i. e. any source of biosphere contamination at any stage of manifesting its aggressiveness, incompatibility with the law of economy can become the scientists' object of labour. Inside the material production the following problems are being sold: ecologisation of technology, creation of wasteless processes, methods of clearing the atmosphere and water resources of harmful contamination; processing of solid waste, specifying sparing ways of its burial etc. [51]

New horizons open up with the introduction of noospheric technologies into industrial practice. It makes possible to direct the "behavior" of microparticles, to use efficiently the substance of nature without contradicting the algorithms of its natural existence, to act with regard to the law of economy (metal complex catalysis, modeling of biocatalysts, mastering "technologies" used by organic nature in its laboratories in vito etc.) Nanotechnology is to play a special part in the life of humankind and biosphere: a tunnel microscope makes it possible not only "to see" individual atoms, but also to act upon them. It becomes possible to manipulate atoms, to use them to compose any kind of substance. According to forecasts, production of "molecular machines" will become a real fact in the decade to come [52].

The second kind of biosphere use value parameters' measurements is related to the value judgments of citizens, organizations, public movements as to the quality and quantity of damage caused to biosphere as global use value.

The "Planet's Health" referendum carried out in 1992 by F.Gallup International Institute serves to illustrate this issue. The aim of the referendum was to let ordinary citizen of the world speak their mind on ecological problems [53]. Other examples include public organizations and ecological movements (Greenpeace, Eurosite, International Green Cross and other).

The third kind of biosphere use value parameters' measurements gives the idea of interpreting the feasibility and necessity of correcting negative

trends in biosphere's evolution on the part of political and social-and-economic structures.

Attempts to assess the state of biosphere were taken at three international conferences held under the auspices of UNO. The first one (Stockholm, 1972) appealed to the governments of the world's countries to revise the strategy of demographic and technological development promptly with regard to the ecological situation; the second one (Rio de Janeiro, 1992) recognized the necessity to achieve stable development and environmental protection with the aim of equitable satisfaction of the present and future generations' demands; the third one (Johannesburg, 2002) discussed issues of putting into practice the adherence to stable development declared by most countries.

The reports presented at the Johannesburg Summit contained the statement that the greater past of the world does not balance rates of the social-and-economic development with the rates of damage done to the biosphere, following the values remote from those that might provide stable development. "The activities of state officials, planners, legislators for regulating processes in the society, economy and environment are still subordinated to the growing material needs of "market fundamentalism" [55].

Progress in dealing with social and economic problems is more often a by-product of the efforts in giving impetus to economic development – this is the general conclusion made by UNESCO (UNO).

The problems of feasibility and necessity of measuring the resources of biosphere have become since the object of discussion and theoretical analysis of the Club of Rome 1960s, which unites the most far-sighted statesmen, businessmen, scientists, people of art who strive not only to estimate the degree of danger in the world ecological situation but also to direct humankind toward the way out of the crisis. Global models, such as: "Limits of growth", "Beyond the limits of growth" and other have been elaborated by the order of the Club of Rome.

In 1990s, the report of the Club of Rome “Factor four. Half of expenses, double return” was published. Its authors are world-famous specialists in the area of environmental protection.

In the authors’ opinion, the book is to change the direction of technical progress and to give a new dimension for the parameters of biosphere and society development. “Persistent growth of labour productivity is a rather doubtful program. Scarce resources are being wasted at the same time. If the productivity of using resources were increased fourfold, humankind would be able to double its wealth while reducing the load on the environment by half” [56].

Assessing the theoretical and practical sides of the global models elaborated by V.Leotiev on the instructions of UNO and by the order of the Club of Rome, the prominent world specialists consider that it should be taken into account that the unity of intuitive and discursive points really present in them: the interpretation of the current state of biosphere is impossible without overcoming the dichotomy “subjectivity-objectivity”. The model’s “subjectivity” (in terms of introducing constructive transformation elements into it) should be taken into account not less carefully than the “objectivity”. The problem of verifying the global models is complicated by the fact that they cannot be analyzed outside the context of social and political realities in which laws manifest themselves only as tendencies. Their verity is finally determined in the course of society’s energetic purposeful practical activity aimed at changing the reality in compliance with the optimum obtained on the model [57].

As to the interdependence of the economic, social and political constituents, there is a significant difference between the interpretations of biosphere’s present and future. The biosphere’s supplies are being inexorably depleted by the amount of the resources withdrawn. Because of this, instructions concerning the remaining resources lead to the conflict between the generations. The tension of the situation consists in the fact that in case of renewable resources the interrelation between their use at present and the possibility of using them in future is even more complicated than that for non-renewable resources.

The existing low efficiency (2-5 per cent of the original quantity of matter) way of carrying on management does not provide due attitude to natural resources. The problem of measuring biosphere's potential with various kinds of economic, political and social levels, in view of this constraint, does not only remain urgent but "raises" the importance to a power.

Let us consider the reasoning of diametrically opposed interpretation of feasibility and necessity to correct negative tendencies of biosphere evolution by the example of various ways of carrying on management.

One variant is represented by the point of view formulated by V.K.Gorshkov, K.Ya.Kondratiev, S.G.Sherman who assume that the natural biota functions using the principle of competitiveness of interaction of the autonomous individuals and acts according to the laws of the market. The latter exists in the biosphere primordially. The factor of competitiveness in the economic strategy of society based on using biosphere's resources achieves the maximum result with the greatest number of competitors who interact and solve certain problems of "communities". The calculations made by the authors show that under free market conditions change of technologies takes place at intervals of about 10years while the time of biosphere's resources depletion (anthropogenic cycle interval) exceeds 100 years. For this reason, the humankind is in the state of seeming abundance of resources as the technologies used by the society are too fast for biosphere's depletion and degradation to follow. Resource-depletion technologies turn out to be more competitive and quickly oust resource-saving ones destroying natural communities.

In conclusion, market economy leads to the planet's global depletion though in local areas its condition may be stationary and even improve due to the "open" matter circulation. If humankind makes a transition to centralized management on a global scale, the correction of negative tendencies will be possible and more successful. The authors state: "With economic use of biosphere the international tax of up to 99 per cent of an enterprise's income should be introduced. It would be used to compensate the damage caused to biosphere and to maintain the

existence of people living in the regions that renounce extensive use of undisturbed territories"[58].

Another variant has been proposed by A.Anders and I.Quarner in the book "Economy of natural resources". The authors analyzed market potential in the sphere of careful exploitation of natural resources and found out the weak points and corrective opportunities of market regulation by the state. They came to the following conclusion: "Increase in prices for dwindling resources stimulates activity in the sphere of the search of resources and (as far as technically feasible) in the area of recycling processes. The rates of independent technical progress caused by price changes reduce the costs of resource production and raise the efficiency of using resources. Besides, the working of deposits that used to be economically unprofitable becomes attractive. Thus, market does not behave in this situation like a rabbit facing a boa. It would be imprudent to deprive market of its distributive function in view of its seeming inability to ensure the future ".

However, the authors formulate the general conclusion in a "Compromise key": "Market provides adaptation processes which make it possible to avoid the fatal pattern of development, yet, there is no reason to trust it blindly…as there is no any guarantee that the market processes will run smoothly…" [59].

The global nature of ecological problems indicates the necessity to consolidate efforts of all the countries for their solution, the impossibility to overcome the ecological crisis without cutting down all kinds of armament, the senselessness of waging nuclear and any other wars because they inevitably lead to universal degradation of biosphere, the necessity and feasibility to develop qualitatively new ways and means of society's interaction with nature, the basis of life. Higher efficiency of UNO bodies' activity concerning the environment, giving them new powers are to make their ecological recommendation norms, obligatory on the planetary scale.

Public environmental movements have become the remarkable feature of the social and political life of the world community since 1970s and their activity has quickly transformed into political parties.

Green political parties today have become active not only in Europe, but also in Asia, Africa and America. The greens are looking for fundamentally new ways of achieving political success trying to attract the public attention by various ways to the necessity and feasibility of treating the world in which man lives and which has gifted him life properly.

The green movement in our country has had its share of difficulties. In March 2004, the organizing body discussed the basic terms of setting up the Green Party of Russia [60].

2.3 Preservation of biosphere's use value parameters as a preventive measure and the foundation of society's survival

Previously we were dealing with the ways of neutralizing the damage caused by man to biosphere, now we shall consider the measures society takes to preserve biosphere as self-sufficient.

At the pre-anthropogenic stage of evolution biosphere remained stable? and the periods when dynamic equilibrium was broken, resulted in life spiraling to new stages of development: about 1.2 billion years ago, procaryotic anaerobic biosphere was replaced by eucaryotic aerobic biosphere [61]. Six or seven hundred billion years ago oxygen concentration in the atmosphere brought about the formation of the ozone layer which made it possible for life to spread from the ocean to the dry land and became a starting point for the biological diversity on land and in water.

About 3.5 billion years ago new catastrophic restructuring of biosphere took place associated with transformation of living matter, its transition to an intelligent form. Evolution of living matter entered the course of looking for social forms, which was finalized in Cro-Magnon man of the modern type. Further, the society having improved the technology of stone treatment and having created metal tools, became the monopolist in the animal world and caused the Neolithic crisis.

"Separation" of humankind from the rest of the animal world was the result of its overcoming. The process of forming artificial circulation of substances began. New substances of the anthropogenic type started entering the biosphere.

The biosphere's appearance changed qualitatively: the ''second nature'', or biotechnosphere came into being, artificial biogeocenose and substance circulations that had not hitherto existed came into existence. Intellect was becoming the vital factor of biosphere's development [62].

Today, society, acting as a geological force of the Earth, has become the cause of global ecological crisis. In these conditions, humankind is increasingly becoming aware of preventive measures necessary to preserve biosphere with a view to checking negative tendencies [63].

Environmental changes in 1972-1992 and expected trends up to 2030

Characteristics	Tendency for 1972-1992	Scenario for 2030
1	2	3
Reducing the area of natural ecosystems	Reduction at a rate 0.5-1.0 percent a year on land, by the early 1990 s preserved about 40 per cent	The tendency remains approaching nearly complete elimination on land
Consumption of primary biological product	Consumption growth: 40 per cent on land, 25 per cent – total (estimate of 1985)	Consumption growth: 80-85 per cent on land, 50-65 per cent – total
Change of greenhouse gases concentration in the atmosphere	Growth greenhouse ga-ses concentration from tenths of a per cent to first per cent annually	Growth of concentration, acceleration of CO_2 and CH_4 concentration growth due accelerated biota destruction
Ozone layers depletion, growth of the ozone hole on the Antarctic continent	Depletion by 1-2 per cent a year of the ozone layer, growth of the area of ozone holes	The tendency remains even if ХФУ emission is terminated by 2000
Forest area reduction (especially tropical forests)	Reduction at a rate of 117 (1980) to $180^{+}_{-}20$ thousand square kilometers (1989) a year; reforestation to reduction ratio 1:10	The tendency remains, reduction of forest area in tropics from 18 (1990) to 9-11 million square kilometers, reduction of forest area in the temperate zone
Desertification	Desert area growth (60 thousand square kilometers a year), growth of technogenic desertification, toxic deserts	The tendency remains, possible rate growth due to moisture circulation reduction on land and pollutant accumulation in soils
Soil degradation	Growth of erosion (24 billion tons annually), fertility reduction, pollutant accumulation, acidification, salinization	The tendency remains, growth of erosion and pollution, reduction of agricultural lands per capita
Ocean level rising	Ocean level rising by 1-2 mm annually	The tendency remains, possible acceleration of

ocean level rising up to 7 mm a year.

Окончание табл.

1	2	3
Natural disasters, technogenic catastrophes	Growth by 5-7 per cent, growth of damage by 5-10 per cent, growth of numbers of victims by 6-12 per cent a year	The tendency remains and gets stronger
Extinction of biological species	Rapid extinction of biological species	The tendency remains and gets stronger as biosphere is destroyed
Qualitative depletion of land waters	Growth of waste water volume, point and area sources of contamination, amount of pollutant and their concentration	The tendency remains and gets stronger
Pollutant accumulation in media and organisms, migration in trophic chains	Growth of mass and number of pollutants accumulated in media and organisms, environment radio activity growth, “chemical bombs”	The tendency remains and possibly gets stronger
Life quality worsening, growth of diseases associated with environment pollution including genetic ones, origination of new diseases	Growth of poverty shortage of foodstuffs, high death-rate among children, high level of morbidity, lack of pure drinking water provision in developing countries; growth of genetic diseases, high level of accident rate, growth of medicine consumption, growth of allergic diseases in developed countries; AIDS pandemic in the world; immune status lowering	The tendency remains, growth of shortage of foodstuffs, growth of diseases associated with ecological damage, including genetic ones; expansion of the area of infectious diseases, emergence of new diseases

Since the middle of the 20th century, humankind has been directing environment protection measures to substantially deformed biosphere. Qualitative and quantitative parameters of its use value are represented by the processes of the planet gene pool impoverishment, negative transformation of the Earth's geographical envelope within the limits of which there is exchange of matter, energy and information between the lithosphere, atmosphere, hydrosphere and living matter.

The quality of environment depends, first and foremost, upon the variety of plant and animal life, in this regard circulation of matter is similar to bank circulation: the more intensive it is, the more stable is the biogeocenose system, the higher the "TURNOVER INTEREST" we can afford to use without touching the "FIXED CAPITAL" [64]

Living matter producing the Earth's biomass helps keep its biogeochemical cycles undamaged. As forests are getting scarcer the environment for many species of plants and animals is becoming less favourable, their genetic variety is changing for the worse. This is extremely dangerous in the prognostic aspect since the majority of the genetic bank of wild animals and plants is still not investigated. As for the deformation of the living matter "architecture", no matter how it proceeds, it is fatal for the biosphere and humankind as its constituent.

Species extinction is also acquiring a destructive character. The extinction of any taxon from subspecies and higher [65] as a result of natural evolutionary processes, man's premeditated or unpremeditated action, leads to the destruction of living beings.

The situation is also aggravated for another reason: there is direct purposeful destruction of living matter by unregulated hunting, fishing etc. In prehistoric times, one species became extinct every 2000 years, while nowadays the pace has grown catastrophically. Estimates of the processes differ (from 1-5 species a day to 20-30 species a year). In any case, extinction is 10 000 times faster than natural. The loss of one species brings the threat to 10-30 others. Specialists believe by 2010-2015 biosphere may lose up to 10-15 per cent of species that make it up. This pace of extinction has never been known in the palaeontological chronicle

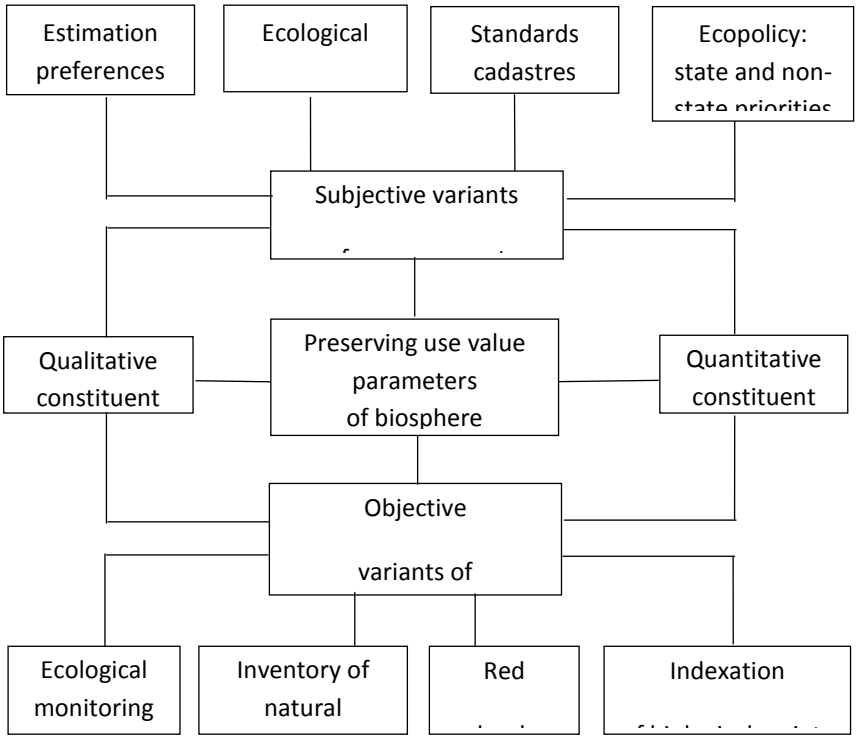
of the planet. As a result, many natural functions maintaining equilibrium in nature are lost. Besides, the extinct species can never be restored. What are the consequences of this situation for humankind? Nearly a half of medical preparations used in pharmacological practice include active substances obtained from living organisms. Genetic material of wild species is necessary to renovate the hereditary material of domestic animals and cultivated plants.

Undoubtedly, the protection of the gene pool and biological variety of the planet is possible only if preventive measures are taken. It requires the following actions: to preserve the variety of population systems that escaped extinction; to restore the systems whose structure is damaged; to create new population systems in regions with the required natural, historic and economic conditions [66].

Painfully and much later than it should have been done, humankind is coming to the conclusion that in many cases it is more preferable not to intrude in nature, to limit claims on it, to preserve the geographical envelope of the Earth, which constitutes a self-realizing and, to some extent, a self-restoring system of interrelated components and complexes of a lower rank.

Yet let us consider objective and subjective variants of measuring biosphere's quantitative and quantitative parameters in the context of environment protection problems (see the diagram).

Diagram of preserving biosphere's use value parameters



Objective variants of measurement may be represented by the data that fix the society's efforts to prevent, preserve and reproduce biosphere's resources; the degree of species stability, population in biocenose is indexed; coefficients that systematize data on biosphere's qualitative and quantitative characteristics are defined.

Subjective variants of measurement make it possible to reflect, on the one hand, individual (group) estimates of the feasibility and necessity of nature conservancy measures, and, on the other hand, to establish the efficiency of measures (law, economic, political, social, ethic and others) taken that help society to preserve biosphere as the abode of living matter and the sphere of Homo sapiens' activity.

Let us consider the objective variants of measuring biosphere's use value. The basic constituent here is the monitoring system that gives owing to regular lengthy observations, information on the state of environment, feasibility and necessity of its protection at present and in future.

Expeditionary and stationary systems are the main types of ecoinformation measuring system.

Expeditionary investigations are oriented mostly to genetically homogeneous areas with a great variety of ecosystems. Stationary ones are oriented to conducting lengthy annual observations of the same components of biosphere according to the adopted pattern.

Collecting stationary information is particularly important at natural reserves [67]. Direct visual observations and score estimates of direct object counting are traditional forms of collecting data. Inventory, classification [68], averaging of numerical indices according to types, analysis of relations between variables, construction of appropriate approximation dependences present common forms of processing data.

Nowadays practically all organizations in one way or another involved in biosphere investigations combine their efforts to develop an agreed-upon system without ecological data. Since 1980s, the environment information system (CORINE) has been functioning in Europe, the nature monitoring centre of the International Environment and Natural Protection Union has been set up. Their main task is collecting and processing data characterizing the world's biological variety [69]. Cambridge University that acts as a coordinator has the following information at its disposal:

– on the status of animal and plant species as well as their descriptions (47000 plant species and 18000 animal species);

– on the places in a critical condition that need to be protected (tropical forests, savannas, coral reefs, about 9500 text files);

– on observations in nature and in conditions of anthropogenic effect in 70000, transects.

The centre publishes the Red book [70], the list of protected areas, research profiles on analyzing biological variety, develops standards, thesauri (protocols) on nomenclature, classifications etc on a regular basis.

The main ideology of ecological database development is connected with the realization of important international programs. The first program was the global resource information database; followed by the international noosphere-biosphere program (INBP) which integrated practically all international global programs of such kind.

In order to specify resource saving zones, to protect landscapes and buffer zones it was found appropriate to use the practice of concluding international conventions and agreements [71].

RESOURCE SAVING ZONES cover native territories and aquatories possessing valuable biological variety including ones where the existing environment problems threaten degradation of biosphere's potential and where it is necessary to create the rest zones for resource valuable species. These are exemplified by territories included in international Conventions on fishing and protection of biotic resources in the Baltic Sea and straits; on the protection of sea resources of the Antarctic Regions etc.

PROTECTED LANDSCAPE ZONES_cover native territories possessing informationally valuable objects the existence of which is threatened. For example, wetlands of international significance allotted for preserving birds' localities, the basin of Lake Baikal, etc.

PROTECTED AREAS_form native territories that serve the environment protection purpose playing the role of buffer between natural and the anthropogenic systems. For example, the buffer zone of nature reserves and parks in Sri Lanka, nature protection forest areas in Finland, etc.

Areas of the world heritage and biospheric nature reserves form the category of the international rank. The idea of creating biospheric reserves emerged in the framework of UNESCO Program. Their status was first formulated in the project "Man and biosphere" in 1970. Biospheric nature reserves are representative parts of ecosystems the main goal of which is

to preserve the genetic variety and the complex nature of biological communities in natural conditions.

The questions related to the measuring of natural object's consumer properties are far from being settled. The suggestion has been made that it is fundamentally impossible to meet the conditions required, at least, at the present stage of civilization development. Opinions of this kind are based on the difference of existing approaches to the assessment of the significance of natural object. One point of view is determined by the sum of consumer properties of immediate utilitarian interest; according to the other point of view, the assessment does not depend on the subject's needs but depends on the quality of the object perse (in itself).

In the first case the feasibility and necessity of obtaining given things (mostly material ones) are taken into account first and foremost, while in the second one the unconditional right of all living organisms TO EXIST is taken as the basis. Thus, the concepts of biosphere's value are based on different concepts of its status. Combination of utilitarian and existential approaches in given proportions determines nature-protection and ecological value of natural objects. The set of nature-protection value criteria used by different authors is given in the table below.

In some cases all the conditions necessary for stable development of certain biological species or parameters characterizing their ecological niches are taken into account when defining ecological value. This approach makes it possible to make the assessment significantly less subjective. Nevertheless, its use is limited by the availability of information on the conditions of existence of different plant and animal species. Polycriterial systems of assessment assume solving a number of complicated tasks: introduction of measuring scales to identify criteria values; assessment of their relative significance; substantiation of principles of their integration into a single synthetic criterion. The scales are presented by the nominal, ordinal, interval and numerical types.

Criteria nature-protection value [72]

Criterion name	Criterion type

1	2
1. Variety	Scientific
2. Rarity, unique character	Scientific
3. Size	Scientific, economic
4. Natural character	Scientific
5. Representability	Scientific
6. Ecological fragility	Scientific
7. Significance as a reservoir for preserving wild nature	Scientific
8. Probability of anthropogenic damage	Economic
9. Educational potential	Scientific
10. Period of observation	Scientific, cultural and historical
11. Recreation potential	Recreational and aesthetic
12. Possibility of creating buffer zones and defining clear dividing lines	Economic
13. Productivity	Scientific, economic

Окончание табл.

1	2
14. Geographical position	Economic
15. Availability	Economic
16. Potential efficiency of protection	Economic
17. Cultural value	Cultural and historical
18. Form	Scientific
19. Attractiveness	Recreational and aesthetic
20. Age of biological communities	Scientific
21. Recoverability	Scientific
22. Potential value	Scientific
23. Land cost	Economic

The nominal type includes scales built on the binary principle: presence-absence. The object being assessed can either possess or not possess the required property. The ordinal scale allows for the introduction of ranks for each criterion, for example, species variety in a certain area can be high, low or medium. The admissible relations are: equivalence, “more”, “less”. The interval and numerical scales use the continuous spectrum of values of parameters being assessed with the help of four arithmetic operations. The difference between the two types is that numerical scales have a well-defined zero point. In some cases the average value of the parameter measured for the total of the objects being assessed, can serve as the zero point.

Other methods of assessment - weight-addition, multiplicative use models and alternative ones also find application.

In accordance with the aim preserving nature variety, rare and fragile natural formations are of the greatest ecological value. If it is possible to preserve such objects, others survive as well.

The rarity criterion is applicable to both biotic and abiotic properties of ecosystems. Unlike the variety criterion, however, it cannot be directly measured and requires the introduction of ordinal scales. Recourse is most frequently made to the following kinds of biological species rarity: those in jeopardy of destruction; endemics; peripheral species and reducing-quantity ones. The average mark on the ordinal scale serves as a measure of rarity for all species living in the area being assessed or the number of species falling in the category “rare” [73].

Recoverability of biosphere component use value parameters is a promising value criterion. It can be measured in the time required to reconstruct the same kind of communities in the same area or in material expenditures required to achieve the result.

The reference parameter, or the ideal ecological norm plays a special role in the aspect of preventive nature-protection measures. Orientation to this parameter makes it possible to specify ecological standards or specifications following which it is possible to develop legal mechanisms of providing ecological well-being of the protected objects and of the population’s heath. Anthropogenic effects have the objective limit: the load on the environment cannot exceed 1 per cent of biota biosynthesis products, which guarantees the stability of ecosystem functioning. Vegetative reclamation, protective forestry, agro-melioration etc. help maintain oxygen balance and self-restoration of biosphere.

Let us consider the subjective variants of measuring biosphere use value. They are represented, on the one hand, by value judgments and individual (group) actions and, on the other hand, by ecological priorities fixed in the state law standards. Taken together, both variants give the idea of qualitative and quantitative constituents of the protection of biosphere as a whole and of its individual components in particular.

The population's attitude to the problems of environment protection – a phenomenon of public opinion and practical action – is defined quite clearly in the results of sociological investigations conducted both on a global and on a regional or local scale.

The "Planet's health" referendum (1992) initiated by the International J. Gallup Institute provided data on 22 largest countries of the world and represented the opinions and behavioral ecological attitudes of 2/3 of the Earth's inhabitants.

The results of the analysis suggest that in most cases people prefer to put direct responsibility for the condition of environment on the state leaving minor roles for themselves. It is remarkable that the pattern is characteristic of rich countries while in poor ones people think it is more natural that the responsibility should be delegated to them. In four out of six poor countries and in three out of five moderate-income ones respondents think they are able to improve the environment condition. On the contrary, this belief is shared only in three out of 11 rich countries. People in poor countries, as the table given below shows, are able to provide greater efficiency of civil nature-protection activity.

The questions: "Who, in your opinion, is more responsible for environment protection in your country – the government, the industries, enterprise or individual people and social groups? What impact can, in your opinion, individuals and social groups have on the solution of ecological problems- high, moderate, insignificant, low?" were answered as follows: (see the table [74]).

Citizens and Environment Protection

Country	Responsibility for protection			Impact of social groups			
	Govern-ment, per cent	Business, per cent	Citizens, per cent	High, per cent	Mode-rate, per cent	Insignifi cant, per cent	None, per cent
Calculated as part of GNP							
India	44	16	34	39	41	14	3
Philippines	49	8	43	57	36	5	1
Turkey	49	23	25	51	28	11	4

Chili	36	22	39	47	33	16	3
Poland	33	54	9	17	25	36	16
Mexico	41	12	43	59	27	7	4
Brazil	26	12	60	47	28	15	7
Hungary	48	20	25	9	20	40	26
Uruguay	42	11	43	41	32	17	7
Russia	55	28	9	17	30	28	15
Korea	31	37	28	48	46	4	2
Ireland	61	16	19	43	33	15	4
UK	53	26	12	30	40	22	6
Netherlands	35	39	23	17	51	24	4
Canada	50	19	23	43	44	10	2
Germany	38	31	25	13	52	25	5
Denmark	37	31	24	22	44	24	8
USA	44	20	29	38	43	12	3
Finland	40	43	12	19	42	35	1
Norway	57	21	17	43	38	11	4
Japan	37	35	16	11	40	25	7
Switzerland	32	29	36	36	47	14	1

To assess citizens' participation in environment protection activities the question was asked: "Have you personally done anything to protect the environment? a) – gave up using products the manufacture of which causes damage to nature; b) took part in the activities of an ecological organization; c) voted for or worked for the election campaign of a candidate with a pronounced environmental program ". The answers can be seen from the table (see table [75]).

We can see that boycotting ecologically harmful goods is the most common of the three types of action. More than a half of respondents in 16 out of 22 countries admitted doing so. Naturally, respondents in rich countries with a wide range of goods where not only their prices are of interest proved to be more inclined to it. In each country, however, at least ¾ of respondents claim to be "green consumers".

Country	a, per cent	b, per cent	c, per cent

North America			
Canada	77	12	15
USA	37	11	19
Latin America			
Brazil	26	4	9
Chili	75	10	13
Mexico	49	8	11
Uruguay	49	6	7
East Asia			
Japan	40	4	14
Korea	49	10	6
Philippines	56	42	33
Central Asia			
India	27	18	19
Turkey	50	8	22
East Europe			
Hungary	41	6	12
Poland	41	3	24
Russia	42	3	24
Scandinavia			
Denmark	65	10	18
Finland	72	5	21
Norway	70	6	23
Central Europe			
Germany (West)	81	10	18
UK	75	10	10
Ireland	63	9	17
Netherlands	68	7	21
Switzerland	83	9	32

In most countries from 5 to 10 % of respondents claimed their participation in one or another environmental group or organization. Membership in such organizations is distributed over all regions. The countries with the highest level of ecological activity – India and Philippines belong to the poorest ones.

The last-named from of activity (electoral situation) is particularly pressing for countries where green parties are at work. But it can also be

observed in other countries where candidates take into consideration people's concern about ecological problems. The data of sociological investigations carried out in Russia in 1994-1996, 1999-2000 testify that according to the answers concerning people's willingness to participate personally in public ecological actions, movements or organizations 31 per cent of respondents are ready to take action in case of danger; 1.4 per cent are members of ecological parties or associations; 7.8 per cent take part in actions of this kind only occasionally. Ecological actions are considered quite useless by 28.5 per cent of respondents, and 18.1 per cent do not see any need for this kind of activity leaving it to experts.

The question: "Which is more important today: to provide economic growth or protect the environment?" was answered as follows: 39.1 per cent of respondents said it was more important to provide economic growth; 32.3 per cent claimed it was more important to protect the environment; 28.6 per cent found it difficult to answer. The question "Do you agree to give away part of your income so that the money could be used to prevent environment pollution?" was answered in the following way: 12.8 per cent agreed without reserve; 45 per cent agreed but made certain reservation; 26.9 per cent did not agree.

A special part in solving nature-protection problems is played by state structures through the instrumentality of which it is possible to define ecological priorities, to provide their legal status in normative documents of different complexity and scale (from global, interstate documents to local ones).

Ecological priorities at the international level are defined by such fundamental documents as the world environment protection strategy (developed in 1980 with the UNESCO assistance); the World nature charter (adopted by the UNO General Assembly in 1982).

At the suggestion of Japan and Senegal in June 1972 the UNO conference on environment protection took the decision to mark annually on June 5 the International Environment Day. At present there is a ramified network of intergovernmental and non-governmental

organizations whose purpose is to combine the efforts of states, business circles, scientific and public organizations to protect and restore natural resources.

Assistance in solving problems essential for the biosphere is given by: *the Global legislators' organization for balanced environment* (set up in 1989, participants – parliamentarians of EU, Russia, USA, and Japan);

European Federation for nature and animals protection (set up in 1990, participants – 54 associations from countries of Europe, South Africa and USA); *European Environment Agency* (set up in 1990, participants – EU States); UNO Committee for stable development (set up in 1993);

Interstate Ecological Council (set up in 1992, participants – 9 CIS member states); *International Standardization Organization* (set up in 1947, participants – 107 organizations); *Committee for Environment and stable Development* (set up in 1989); *Interparliament Union* (set up in 1989, participants – parliamentarians from 131 states); *UNO Environment Program* (functioning since 1972, participants – 58 member states of UNO); *UNESCO Program "Man and Biosphere"* (functioning since 1972, participants – 110 UNESCO member states); *International Nature Protection Union* (set up in 1948, participants – 800 organizations from 125 countries of the world etc.) [77].

Besides, dozens of conventions, agreements and protocols have been signed with a view to regulating interstate relations: the *Vienna Convention on Ozone Layer Protection* (adopted in 1985, participants – 129 states); *Convention on Biological Variety* (adopted in 1992, participants – 167 EEC states); *Convention on Wild Fauna and Flora Protection* concerning fauna and flora under the threat of extinction (adopted in 1973, participants – 119 states); *Forest Convention* (adopted in 1950, participants – 10 European states); *Frame UNO Convention on Climate Changes* (adopted in 1992, participants – 59 states) and others [78].

Problems of financing nature protection measures are dealt with by a number of foundations and institutions: *World Wide Nature Foundation* (set up in 1961, participants – 6.2 m. permanent sponsors and national

associations from five continents); *Global Ecological Fund* (set up in 1990, participants – developed and developing countries); *World Bank* (set up in 1995, participants – 154 states); *Financial Agreement on Environment* (functioning since 1992, participants – EU states); *V.I. Vernadsky Non – Government Fund* (Russia, functioning since 1955) etc.

Numerous social organizations, research and educational institutions, individuals are making significant efforts to protect biosphere. Thus, *International Environment Academy* since 1990 has been arranging intensive training courses, workshops and classes for supervisors of public and private economic sectors of the countries of Central and East Europe, developing countries, teaching the skills of seeking solutions to specific environment and development problems; *Scientific Committee on Environment Problems* has been participating since 1696 in carrying out projects in the essential ecological directions (stable development, biogeochemical cycles, global ecosystem changes; publishing reports on research conducted). *International Independent Political and Politological University* in Russia since 1992 has been supporting the formation of a new outlook and way of life, training specialists in ecological management, environmental policy and ecological law, implementing research programs on the urgent problems of ecological development. *International Union of Biological Science* since 1992 has been supporting research programs on medicinal plants, bioindicators, global changes, cadastres, biological education. *International Society of Ecological Economics* with over 500 members from 49 countries has been involved since 1990 in supporting innovative approaches to studying ecological economics, coordinating the activities of educational environmental programs etc.

Organization of global information service, formation of the database on biosphere's condition to forecast its development for the nearest and remote future would be impossible without constant state and interstate support.

The following services function with the assistance of UNO: the World Nature Protection Monitoring Centre, the Global Resources Information Database, The Global Network of Information and Observation of the

Environment; the information system of environment protection legislation; the information centre of climate changes under the UNEP; the International Information Biological Science Network; the Coordination European Environment Network etc.

Both the International Conference in Rio de Janeiro (1992) and the Johannesburg Summit (2002) were devoted to the problems of biosphere protection. The UNO conference in Rio de Janeiro passed the "Biological Variety Convention", emphasizing the importance of protecting the planet's living matter, which came into force on December 29.1993. This day, December 29, is recognized as the day of the planet's biological variety.

Measures of nature protection at the federal and interstate levels are stated in national strategies and plants. Their elaboration has been carried out since 1980 and is supported by the International Union of nature and natural resources protection. Governments establish the immediacy of solving ecological problems; they elaborate variants of ecologically and economically preferable projects and approve the priorities of nature-protection legislation. It is the prerogative of the state to develop ecological standards, cadastres, norms of biosphere's resources exclusion, to register its condition, to carry out ecological examinations, to implement state ecological control. Ecological standards are of legal significance since they determine quantitative and qualitative indicators of natural objects' condition, establishing the legal mode of their use.

Large – scale activity in the area of developing standards and norms dates back to mid – 1960s. In the 1980 s nature protection bodies of over 100 states approved different variants of ecological standards and norms.

In Russia GOST 17.00.01-76 is the general standard of nature protection – activity. Besides this state standard there are also standards accepted at factories and in branches of industry. GOST 17.00.04 – 90 establishes the "System of standards in the area of nature protection and improved use of natural resources. Ecological certificate of industrial enterprise" was introduced in June 1, 1990, in the interests of nature protection.

The system of cadastres is one of the ways of regulating nature – protection activity in the Russian Federation. It registers the condition of the country's natural resources showing their species composition, physical and geographic characteristics, quantitative and qualitative indicators and economic value. The best known is Land cadastre which contains data on land users, quantity and quality of lands, soil bonitation and economic evaluation of lands.

The Land cadastre was approved by the Russian Federation Government Decree No. 622 of August 25, 1992. The fundamental principles of the State water register are outlined in the "Central regulations on the order of implementing the state water cadastre" [79].

There are also state cadastre of deposits and raw materials; state forest cadastre, cadastre of especially protected objects and territories, soil cadastre, hunting cadastre etc.

Quantitative and qualitative parameters of nature protection are specified by limits. For example, hunting norms for one or another population establish the number and sex-and-age composition of animals to maintain natural density and structure of populations (the limit to shooting ducks by an individual hunter in one day etc). The soil disturbance (damage) norm defines the rated magnitude of groundwater optimal position for growing and forming harvest and field works;

The norm of load on landscape reflects the amount of anthropogenic effect that does not result in damaging its social and economic functions (GOST 17.8.1.01 - 86); the greenery planting norm is measured by the area of general use lands planted with trees and gardens per one inhabitant (GOST 28329 - 89); the norm of natural resources exclusion is hard to define. At present it is measured by means of expert judgments [80].

In accordance with the requirements of the Russian Federation Law "On environment protection" (1991), Federal Law "On ecological examination" (1995) where preparing and taking decisions of social and economic nature various alternatives of activity are analyzed to the point

of abandoning it altogether, given weighted ecological, social and economic estimates of each of them – EIA (environmental impact assessment).

For example, in construction the EIA procedure involves timely revealing, analysis, assessment and taking account of pre-investment, town-planning. Pre-design and design documentation for possible impact of the construction on the environment or its components: the water basin, upper layers of the lithosphere, surface and underground waters, soil, plant and animal life.

In Russia the EIA procedure is regulated by the clause on environmental impact assessment (Supplement to the Order of Russian Ministry of Nature of June 18.1994, No. 222) [81].

At present the economic mechanism of environment protection is implemented which corresponds to the criteria of the transition – to-market economy period. Its main feature is that it is based not on centralized financing of nature-protection activity, but mostly, on economic methods of regulation and stimulation. In 1991 the principle of "payment for using resources" was fixed in the Law "On environment protection" (clause 20).

In accordance with the Russian Federation Government Decree No. 632 (1993) the mechanism of stimulating environment protection in regions was defined which makes it possible to use the funds allotted for nature protection in a greater measure.

Since 1991 a unified system of non-budget state ecological funds has been functioning in Russia. It comprises federal, republic, krai (territory), oblast (regional) and local ecological funds. They exist due to the money deduced from enterprises as payment for pollutant emissions or spills, realization of confiscated hunting and fishing implements and other sources. The norms of deductions to ecological funds are legally fixed: 60 per cent are allotted to the realization of nature-protection measures on the local scale (in cities and districts), regional measures (those carried

out in Federation subjects such as krais or oblast) account for 30 per cent, federal ones - for 10 per cent.

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3. BIOSPHERE VALUE OF A PRODUCT: MAIN PARAMETERS

3.1. Value of works on damage compensation inflicted upon biosphere by production process of finished and final product

Biosphere value reflects expenses, which the society will have to agree to, if today or moreover in perspective, it plans to save quality-quantitative parameters of biosphere in acceptable form for "living matter" including Homo sapiens.

Estimates on charges of recultivated type connected with the restoration of objects of nature deformed by the production process reflect the expenses that could be recognized in a sufficient extent neither quantitatively nor qualitatively. These expenses are not included into the enterprises' expenses and in a set of operations, which are registered by the system of national accounts (SNA). [1]

Some positive changes have become noticeable in connection with the concept of erective development worked out by UNO. According to its recommendations, the indices of economical account and statistics of environment, as well as natural resources are subjected to co-ordination.

However, these measures have to be regarded as the first approaching to the solution of the problems of such kind. There are several causes:

1) exploitation of nature environment today does not correlate with the expenses and does not influence the size of GNP;

2) absence of clear differentiation between concepts "circulating assets" and "fixed assets"; the criteria of economic control is unambiguous and can not be applied to all kinds of natural resources;

3) in the main, different functions of natural resources do not have any market value and are expressed in physical units;

4) data on actual expenditure on prevention from worsening natural environment quality, and its restoration is used by the method of indirect market estimation and by this, data on expenses is in essence a lower limit of an estimation of nature environment qualitative state. Because of these reasons, the parameter of deformation value estimation of nature environment under the influence of production at present does not give an idea of actual processes taking place in organic and inorganic nature. In this sense, the introduction of complex ecology-economic registration is necessary. On the other hand, it is necessary for parameter determination of inside ecological product; on the other hand, it is necessary for wider interpretation of macro economical parameter of population welfare. [2]

We may have an idea of some experience in the sphere of expenditure registration on removal of ecological damage after being acquainted with B.L. Vorkuev's arguments.

He regards the value parameters of work on prevention from pollution or its removal by application of inter-industrial balance, which allows measuring something that does not yield any direct measurement, as well as allows calculating prices at various intensity of fight with sources of pollution. B.L. Vorkuev applies the following equalities to estimate the value of final product:

$$\omega \cdot X \cdot X + \omega_{n+1} = \overline{P} \cdot Y + \overline{P}_{n+1} \cdot X_{n+1};$$

$$\omega \cdot X + \omega_{n+1} \cdot X_{n+1} = P \cdot Y + P_{n+1} \cdot R;$$

$$\omega \cdot X + \omega_{n+1} \cdot X_{n+1} = P \cdot Y + Y_{n+1} \cdot P.$$

If *R* = zero, final production value in prices taking into account a fight with the pollution in amount of $X_{n-1} < \upsilon \cdot X$ is expressed by two components:

$$P \cdot Y = \overline{P}_{n+1} + \overline{P}_{n+1} \cdot X_{n+1},$$

where $\overline{P} \cdot Y$ – is final product value in prices without taking into account expenses on pollution removal and $\overline{P}_{n+1} \cdot X_{n+1}$ – is value of work on

pollution removal in a bulk of X_{n+1}. Final product value in prices, which include expenses on removal of all pollution, may have the following form:

$$PY = PY + P_{n+1} \cdot Y_{n+1},$$

where $P_{n+1} \cdot Y_{n+1}$ – is potential expenditure on a part of pollution removal in amount of Y_{n+1}. Otherwise:

$$PY = \overline{P} \cdot Y + P_{n+1} \cdot X_{n+1} + P_{n+1} \cdot Y_{n+1}.$$

Thus, final product value in prices that includes expenses on removal of all the contaminants are represented by the following components: $\overline{P} \cdot Y$ is final product value in prices without taking into account expenses on pollution removal, $\overline{P}_{n+1} \cdot X_{n+1}$ – is value of work on pollution removal in amount of X_{n+1} and $P_{n+1} \cdot Y_{n+1}$ – is a value of work on pollution removal in amount of X_{n+1}.

B. L. Vorokuev calls these expenses potential expenditure. This expenditure is not taken into account at calculation of actual production expenses. Neither consumers nor manufacturers of production are informed through prices about their real value. [3]

V.P. Ephimov [4] suggests using of damage estimation that is inflicted upon environment by the branches of material production. Degree parameter of natural resources restoration according to the following formula:

$$C_в = \frac{P_в}{P_a} \cdot 100,$$

where $C_в(D_r)$ – is degree of resources restoration that have undergone anthropogenic affect, %;

$P_в$ – amount of restored (recultivated) resources;

P_a – the total amount of natural resources that have anthropogenic affect.

N.F. Reymers, who examined the damage inflicted upon environment by anthropogenic activity, suggested regarding it in static and dynamics. Besides, he suggested regarding ecological value as an extra charge that arises as a result of necessity of economical investment for neutralization of direct, mediated or indirect ecological damage which follows this or that kind of economic activity.

For example, open mining of minerals causes a long chain of direct and indirect damages including depletion of natural resources such as withdrawal of large areas of fertile lands, changing of water rate on immense territories, deflation of toxic mountain rocks, infliction of damage upon population's health because of the reasons given above, decreasing of yielding capacity of agricultural plants, spreading of geochemical type of domestic animal diseases and so on.

In N.F. Reymers opinion, ecological price should be calculated taking into account the damage decrease in time, because chain reactions in nature usually result in intensification of unfavorable effects. Consequently the resources being violated are getting more expensive continuously (for example, resources of rest which were not included into ecological estimation before and today they can't already help being taken into account).

During exploitation, energy and substance of natural resources are gradually degrading to the forms, which are less applicable in quality-quantitative respect for application in economics and make necessary the reflection of their actual physical state in ecological value. [5]

Special attention is paid to value estimation of soil covering which is the basis of functioning of "living matter".

L.B. Golubev [6] suggested some variant of calculation of cash expenditures value on restoration of soil fertility by means of formula that describes the dependence between soil fertility level and content of humus in soil

$$C_r = Y_o \cdots K \rightarrow Y_o = \frac{C_r}{K}$$

where C_r – is content of humus in soil, ton per hectare;

Y_o – is content of organic fertilizer, ton;

K – humusification coefficient.

Knowing the amount of organic fertilizers in physical weight, equivalent changing of humus in soil and normative of expenses on application of their unit (for example, 1 ton of dung), it is possible to calculate cash expenditure value on the usage of all amounts of fertilizers:

$$З_y = Y_0 \cdot З_{cy},$$

where $З_y$ – expenditures on application of organic fertilizers, roubles;

$З_{cy}$ – normative of expenditures on the usage of organic fertilizer unit, rouble/ton.

V.L. Dmitrienko [7] thinks that it is possible to estimate ecological effect ($Э_{nэ}$) of any mode of the earth exploitation according to the formula:

$$Э_{nэ} = C_m \cdot П_n \cdot \underline{O} \text{ (rouble)},$$

where C_m – restored value of 1 ton of soil in the given expenses, roubles;

$П_n$ – Prevention of soil losses, ton per hectare.

Landscape principle of restoration of lands damaged by industry dominates in majority of countries in the world. It demands their restoration as an integral natural complex.

Different approaches to the solution of re-cultivated problems are used in dependence on local conditions. In the USA - it is afforestation and pastures creation being provided by specialized enterprises under the aegis “services of natural resources protection”. In England such kind of work are commissioned to owners of mining industries. In Germany the programs of recultivation are being made up simultaneously with the programs of introduction of development (mining industries are supposed to save soil covering and forest species of plants for filling damaged plots).

Static procedures, which are used in Russia for estimation of damage inflicted by anthropogenic activity provide for accounts of such components as air, water, earth, flora and fauna, depths.

Thus, damage inflicted by anthropogenic pollution of the Earth surface can be calculated by the formula [8]:

$$S = \Pi \underline{O}(P_1 - P_2);$$

where Π – is a polluted area of grassland;

$\underline{O}$ – is an amount of agriculture production according to calculation 1 hectare of grassland;

P_1, P_2 – is a purchasing price of agricultural products before and after pollution, thousand/rouble/unit.

M.Y. Schersheva researches the effect of biosphere pollution in quantity-qualitative expression and connects it with the final result of production making an emphasis on dynamics of environment state, i.e. all production stages, first of all, the stage of planning: “It is quite clear now that the neglect of estimation of environment impact on the stage of development here and there results in such damage, which is many times superior to the size of expected direct profit. The situation after Chernobyl

nuclear power plant disaster is considered to be the extreme event (sums demanded for elimination of its consequences cannot be compared with expenses on any careful estimation of similar projects)" [9].

Thus, nowadays there exist some methods, which allow us to determine the damage inflicted by worsening of environment because of anthropogenic impact. These methods give us the order of losses registration, the ways of their calculations, as well as the ways of revealing the dependence between the degree of environmental pollution and the size of damage and so on. G.D. Kulagina writes the following: "Money terms of damage are determined differently in various methods by amount of losses of gross added value; by amount of expenses on measures of elimination of the consequences of worsening of the state of environment components and their reproduction; by changing of economic estimation of a polluted component and others. These methods require further improvement and development" [10]. To our mind, the weak point of methodical development of recultivation problems is in its use - value and value expression and besides, it is one of the main reasons of underestimation of ecological component of the cost of both finished and final products.

Compensation of damage inflicted by production process (basic factor) and deformed habitat (secondary factor) upon a man (a society) is not included into the cost of finished and final products. This hidden biosphere value exists in a kind of some virtual parameter.

Principles of ecological estimation of natural resources, where anthropologic component dominates, are an important circumstance, which witnesses the necessity of a serious procedure of calculation of the damage value; the damage is inflicted upon biosphere by industrial activity.

In the framework of expenditure concept, for example, economic estimation of 1 hectare of the land is determined by the formula:

$$O = K \cdot \frac{Y_y / T_y}{Y_c / T_c},$$

where *K* – is the cost of 1 hectare land development in modern conditions (average about the country);

Y_y/T_y and Y_c/T_c – is the ratio of yielding capacity to expenses on production of agricultural project accordingly on the plot being estimated and about the country.

In the framework of rental estimation natural resources value is calculated as some difference between production value being obtained at exploitation of natural resources and a normative level of individual expenses spent on its production.

Economic estimation of natural resources *R* based on rental concept is calculated according to the formula:

$$R = ag(Z - S),$$

where a – is a coefficient, which takes into account time dynamics of such parameters as *z*, *s* and *g*, as well as the effect of future expenses depreciation and the results (the factor of time);

g – is a coefficient of the "efficiency of natural resources (is defined by yielding capacity of agricultural plants and land distribution among them, utilization coefficient of mineral resources reserve and so on);

Z – locking expenses on production being produced by natural resource exploitation, roubles;

S – individual expenses on production obtained by exploitation of natural resources, rouble.

Absolute effect of natural resources reproduction $Э_a$ is determined by formula [11]:

$$Э_a = E_a \cdot C_н \cdot П_н,$$

where $C_н$ – national economic cost of product of management nature, rouble;

$П_н$ – national economic product of management nature, rouble.

From our point of view, right are the researchers who confirm that under the conditions of established cost relations some charge for natural resources with taking into account actual and future labour expenses should be provided. The charge, based on virtual expenditure is intended for compensation of socially necessary expenses connected with reconnaissance, guard, natural resources restoration and other natural economic work. The charge, based on future expenses expresses the essence of economical estimation of natural resources and is being implemented with the purpose of compensation of ecological potential losses (for example, withdrawal of agricultural land from economic circulation), as well as stimulation of rational exploitation [12].

Examining ecological potential as a resource combination of this or that area and considering it as a part of national wealth that should be subject to money estimation, A.N. Golitsin [13] suggests calculating it by the following formula:

$$Ц_{э.п} = Ц_з + Ц_л,$$

where $Ц_{э.п}$ – ecological potential;

$Ц_з$ – value of land reproduction (agricultural grassland);

$Ц_л$ – value of forests.

Damage inflicted upon man's health is considered to be a "hidden" one.

It is still impossible to manage to estimate a true scale of this damage, though we have been operating by such concepts as "professional" and "environmental diseases", "ecological safety as a state of protection of every separate person, state or environment" for a long time [14].

There exists a point of view that about 80% of modern diseases by one way or another are connected with the negative effect of anthropogenic

changes of biosphere. It is also confirmed by the results of inter-branch comparison.

The higher are society's expenses on ecology, the longer life expectancy is. However, such kind of information is being realized slowly and sometimes by pushes (rising of interest, decrease, indifference).

Great attention has been paid to the problem of "ecology health" recently and first of all, from medico-social and philosophy-social point of view. [15] Let us dwell on the researches, where use value and value characteristics of health are characterized.

French Doctor of Law F. Sent-Mark undertook a fruitful effort to reveal the essence of economical component of a man's health. He calculated nature destruction and man's health expenses, using the index of life environment by means of which the common state of natural life conditions at a given moment and for some definite geographical zone is being fixed concretely.

Biological wealth index was recognized as a basic one. It was being determined by a sum of 5 ingredients: green area, water area, purity of air, level of noise pollution and purity of water [16].

The author suggested calculating green area index by means of application of quality coefficient to amount of available green areas per capita. This coefficient includes four objective criteria (kind of flora, concentration of harmful phenomena, remoteness from place of living and work, availability).

Biological wealth indices imply quantitative damage estimation and effectiveness of measures on restoration of natural environment. For example, it is difficult to imagine "stillness" as a commodity from the point of view of traditional sense content. Such expression as "Buy stillness!" seems to be unusual. Meanwhile, in conditions of city environment, for attaining such deficient product as "stillness", it is required to make much effort (social-necessary labour, finance credits).

Noise disturbs citizens of cities greatly. Depending on its power and frequency it causes different pathologies such as headache, noise in the ears, worsening of hearing, insomnia , deafness, anxiety, serious stomach-intestinal diseases, neural and heart disorder and so on [17].

The fact of man's communication with nature, its moral-aesthetic, therapy component is valuable, though it has not been expressed in figures yet.

"Value of individual need in nature" suggested by F. Sent-Mark deserves attention. It is possible to define it as objective or subjective one by means of comparison of degree of importance for satisfaction of given need with other collective needs. F.Sent-Mark suggested 3 groups of criteria of given type: two objective types-attendance and "the scale of unsatisfaction"; one subjective type - polls of public opinion. He writes the following: "It is possible to build a scale of satisfaction for every element of nature environment that would show optimal rate and arising seriousness of their deficiency basing on biological criteria for air and water, or psycho-sociological criteria for green zones. To define the level of unsatisfaction for every element on this scale means to show a relative seriousness of their deficiency" [18].

The author specifies the situation referring to reaction capacity of Boulogne forest. If for example, a walk about Boulogne forest lasts in average 2-3 hours a day and for most walkers it is the only exercise per day, the value of this exercise can be defined at least as the value of such spectacle as a cinema, a performance or a concert, that is about 15 franks. In addition, the destruction of this green zone if it were covered by concrete would cause capital loss that can be evaluated as sum, at least, of a century profit. That is value of unsatisfaction connected with destruction one hectare of Boulogne forest may be estimated totally in 100000 franks multiplied by 100 years = 10 million franks, by the way expenses on park caring, a sum of socio-economical expenses caused by degradation of nature environment are not included [19].

B.Kommoner sees the direct link between worsening of environment state and labour conditions. He writes the following: "Mainly, both

happened as a result of introduction of new technologies with the aim of obtaining immediate profit. I am ready to swear: new technology has led to appearing of a hidden debt to nature in a kind of natural environment degradation, so as to debt to a worker in a kind of labour conditions worsening. Both these debts represent themselves non-paid production expenses" [20].

Yu.Yu.Tupitsya [21] puts forwards the question of necessary registration of mutual transformation of ecological and economical effects, conversion of ecological potential into economical and vice versa.

He considers both strength and stability, which are favorable for interdependence of a man's life in nature, to be a dominating beginning of ecological potential.

Mathematical interpretation of the situation is expressed by the formula:

$$Э_n = H \cdot П,$$

where $Э_n$ – ecological potential of a district;

H – amount of resources of good quality in given territory;

П – strength (stability) of favourable ecological interdependence in natural environment, surrounding a man.

M. Chernoushek studied a complex of problems connected with determination of personal ecological area value that is a man's microenvironment. Though value parameters were not included into the sphere of author's interest, analysis, carried out by him gives a background for application of his conclusions in cost-value aspect as applied to the estimation of production and home environment influence upon a man's health state [22].

In N.F.Reymers opinion, today value expression is possible for a set of ecologically symbolic phenomena such as desurbanization (decrease of population in large cities because of sharp worsening of quality of natural and social environment); effect of sadness of new cities (phenomenon of increased people's diseases in new city districts); development of phitohygiene (projects of city-gardens; "green plants"; forest parks; phenomenon of psychological landscape "pollution") [23].

S.N.Cherezov suggests considering life activity conditions in the context of rental relations.

Sometimes significant differentiation is inherent to conditions of life activity of any society. The differentiation can be analyzed according to 3 main directions: quality of natural environment; level of habitat pollution; provision of all amenities.

Jointly the given directions form a natural basis of ecological rent envisaging registration of regional differences in expenses on man's reproduction. The author illustrates it by some pieces of information about the European part of Russia and the Ukraine - putting them into the table [24].

Nature conditions and territory differentiation of life value

Region	Estimation of nature conditions $\sum_E$	Index of needs J_{needs}	Index of prices J_{prices}	Index of life value J_{lv}
Ukraine	3,75 - 4,00	0,97	0,89	0,85
Central regions of the Russian Federation	3,4 - 3,6	1,00	1,00	1,00

Murmansk region	2,2 - 3,1	1,52	1,16	1,7

Accepted designations and initial formulas:

$\sum_E$ – integral estimation of natural nature conditions, balls $\sum_{E\max}$ =5;

$$J_{needs} = \frac{\sum p_e q_1}{\sum p_e q_0};$$

$J_{prices} = \frac{\sum p_1 q_1 \cdot \sum p_1 q_e}{\sum p_0 q_1 \cdot \sum p_e q_e} \cdot J$ – prices (average geometrical) without tax, fees or prices of collective – farm market;

$J_{lv} = \frac{\sum p_1 q_1}{\sum p_0 q_0} \cdot J$ – index of life value of a lonely worker taking into account the prices on vegetables and fruits in autumn period;

q_0, q_1 – rate of consumption of material welfare and services for basic district and for district being compared accordingly;

p_0, p_1 – prices and tariff of basic district and of district being compared accordingly.

It is clearly seen from the table that while the quality of nature environment is worsening, the value of life is essentially growing.

Value of work connected with elimination of damage inflicted upon man's health by production process and deformed nature environment can be expressed in statistics and dynamics.

Statically reliable growth is being observed during the last years according to professional indices of sickness rate.

On average about 12-13 thousand of professional illnesses are registered per year in Russia [25]. Estimation of biosphere use value and value should be calculated taking into account an increase/decrease of ecological damage in time.

A man's discomfort serves as a lower limit of such kind of damage that hampers his normal life activity (production, being, rest); an upper limit is a man's comfort and optimal (conditionally ideal) state of nature environment.

Various time intervals and degree of environment influence upon man's health can be fixed by one-moment (statistics) and permanent (dynamics) states.

At present static and dynamic parameters of biosphere use value and value can be taken into account by environmental impact assessment, which allows analyzing various alternatives of activity taking into account saving of habitat and man's health.

Quality-quantitative assessment of habitat pollution, its value estimation is based on experts' polls and mathematical modeling.

Thus, if pollutants are regarded in a kind of m-dimensional area, whose coordinates are reflected by corresponding pollution coefficients, complex coefficient is represented by geometrical sum of pollutants, functioning in biosphere and influencing health. V.G.Gmoshinsky shows it by means of formulas and tables [26].

$$G_{об} = \sqrt{(G_{n-r}(j))^2 + (G_{ж}(j))^2 + ... + (G_m(j))^2},$$

where $G_{об}$ – coefficient of complex pollution;

$G_m(j)$ – coefficient of pollution at potential pollutant;

m – is a number of pollutants.

Basic assessment of habitat pollution according to significance of pollution coefficient

The meaning of pollution coefficient	Verbal assessment of habitat
$G_{n-r}(j)<1;\quad G_{ж}(j)<1$	Fairly healthy (conditions of a sanatorium or a reserve)
$G_{n-r}(j)=1;\quad G_{m}(j)=1$	Normal
$G_{n-r}(j)>1;\quad G_{ж}(j)>1$	Contaminated (polluted)

Assessment of habitat pollution degree by meanings of contamination coefficient $G>1$

Coefficient of habitat pollution by dust-gas and liquid contaminants $G(j)$	Verbal assessment of habitat pollution degree
before 1,0	Harmless
1 - 1,99	Small
2 - 2,99	Essential
3 - 3,99	Intensive
4 - 5,00	Highly intensive
more than 5	Catastrophic

The success of elimination of damage to nature and a man's health depends on fullness and reliability of information provision. Expenditure on this kind of work tends to permanent growth. The evidence to this is a complexity of ecoinformational data base formation; the necessity of improvement of functional, organizational, spatial - time structure of control over environment state; taking measures on creation of effective technical and program means with the help of which a reliable estimation of de-

gree of habitat exhaustion as well as worsening of a man's health state is possible.

3.2. Value of work on introduction of nature saving technologies in the sphere of material production and life

Not a single branch of production and consumption achieves 100% conversion of material - power resources into a product (goods and services): "By-products" being formed demand some additional assignation connected with their conversion into demanded commodities.

Resource-saving technology represents (itself) this or that set of technological operations providing product manufacture with minimum consumption of natural substance (complex usage of nature objects; circular technologies providing usage of main and by-products in adjacent industries and so on). We have some positive variants of changes of quality-quantitative parameters of production and life wastes that in a greater degree correspond to natural cycles of biosphere. Such kind of highly effective economic management does not lead to deep negative transformation of natural environment. It is represented by conventional and innovation variants. Both of them are expensive, but the second one is preferable in prognostication respect.

Value of work of traditional resource-saving type is worthwhile considering if we follow the logics of labour objects functioning as well as functioning of product-value chain.

Technologies being applied in mining industries differ by various degree of extraction of useful components and value estimation of the effectiveness of this process.

Index of degree of useful components extraction from a deposit according to V.P.Ephimov [27] is examined by the formula:

$$C_u = \frac{k_u}{k_n} \cdot 100 ,$$

where C_u – a degree of useful components extraction, %;

k_u – amount of components being extracted from natural raw materials;

k_n – amount of components contained in raw materials.

In order to reveal the effectiveness of complex extraction of ingredients contained in natural object, it is important to estimate the value of initial raw materials according to the components contained in it, as well as value of actually extracted useful elements.

The formula given above takes the following form:

$$C = k \frac{\sum (k_1 p_1 + k_2 p_2 + \ldots + k_n p_n)}{\sum [(k_1 p_1 + k_2 p_2 + \ldots + k_n p_n) + (k_{1n} p_{1n} + k_{2n} p_{2n} + \ldots + k_n p_n)]} 100 ,$$

where $k_{1..2..n}$ – components extracted from raw materials;

$p_{1..2..n}$ – prices of components extracted from raw materials;

$k_{1n..2n..n}$ – components which are contained, but are not extracted from raw materials;

$p_{1n..2n..n}$ – prices of components which are contained, but are not extracted from raw materials.

It should be stressed that a complexity of application of material resources in the process of their extraction is not being evaluated in full measure. Losses of such kind make up by extraction from 25 up to 40% including all value meanings.

Index of complexity of application of natural substance is a leading one at estimation of value parameters of the product of labour in technological processes of manufacturing industry.

Saving of material and financial resources is attained here by means of:

1) application of wasteless (low-waste) production; introduction of circular technologies, allowing application of substance repeatedly;

2) introduction of final product, which is out of usage, into economic circulation;

3) application of cascade reutilization in adjacent industries.

Value - economical expression of such technological operations was researched in 60-80s of the last century [28]. A basic thesis is clearly formulated: effective exploitation of natural resources is capable of making a profit, since that part of them which is repeatedly involved into production process, decreases pollution emitted into environment qualitatively and quantitatively, hence, saving those resources which would have to be invested into their cleaning in addition.

Index of material capacity of production is calculated as a ratio of expenditure of raw materials and materials in value expression to commodity [29]:

$$MI_k = \frac{Value\ of\ expended\ \ raw\ materials\ and\ materials}{Commodity\ \ realized\ \ in\ wholesale\ \ prices\ of\ \ an\ enterprise}.$$

The advantage of index of production material capacity consists in allowing representation of material and financial resources saving dynamics which is determined by many factors in a generalized form.

At present, the index of specific material capacity of production for calculation of product value is used; it is determined by the following formula:

$$M_{y\partial.np} = \frac{M_{np}}{\Pi_c},$$

where M_{np} – expenditure of materials on production of a commodity unit either in natural or in value expression;

Π_c – aggregate useful effect of a commodity use during its normative period of service, a unit of useful effect (in natural, monetary expression, or in balls) [30].

Index of material capacity is also regarded in the context of functioning of low waste or wasteless industries [31].

Under wasteless technology is understood the ideal production model, which is not being realized in full measure, but only partially in a kind of low waste technologies [32].

The first stage of transition to wasteful production implies the full application of by-products, which are being formed in the main technological process. Wastes become some additional source of raw materials, as a rule they are cheaper in comparison with natural analogy.

The second stage of transition to a low-waste production consists in changing of main technologies, when it is possible to lock technological chains, that is repeatedly (theoretically infinitely) use mineral resources (water, air and so on) in production, since in overwhelming majority they don't lose their basic qualities: water remains water, iron remains iron, copper remains copper and so on. Closed systems of water supply are the example of such kind. They provide relatively quick repeated entering of used water into technological cycles or domestic water supply.

In a set of branches of industry up to 80% of water is used repeatedly, as well as up to 100% is used in orbital space stations. Index of natural resources saving in the framework of wasteless (low-waste) technology and use of secondary resources is measured by the formula:

$$P_э = P_1 - P_2,$$

where $P_э$ – amount of saved resources owing to application of wasteless (low-waste) technology and additional involvement of secondary resources into economic circulation;

P_1 – the size of resources being consumed by basic technology and basic amount of secondary resources use;

P_2 – the size of resources being consumed by use of wasteless (low-waste) technology and additional involvement of secondary resources into economic circulation.

Coefficient calculated by the following formula is used as a value index, achieved by an enterprise of ecologization level.

$$k_б = \frac{П_{б.п}}{П_{в.п}},$$

where $k_б$ – coefficient of wasteless production, rouble;

$П_{б.п}$ – production of wasteless production, rouble;

$П_{в.п}$ – gross output of production, rouble.

Material expenses of wasteless production are defined by the formula:

$$M_{бп} = B_{гп} \cdot П_{ср},$$

where $B_{гп}$ – mass of production, ton;

$П_{ср}$ – average weighted price of mass unit of material resources, p.

The following formula shows the effectiveness of waste application [33]:

$$Э_{исп.о.} = \frac{П}{I_к},$$

where *П* – increasing (decreasing) of profit at the expense of realization of secondary raw materials or at the expense of their application by output production at some concrete enterprise, as well as changing of payment size for environment pollution and for natural resources;

$I_к$ – aggregate capital investment in production funds in event of every recycling into some definite kind of production, rouble.

Transition to wasteless (low-waste) technology is connected with significant capital investment. Determination of payback term and feasibility of reduction of primary raw materials consumption for production of final production is necessary for this purpose. [34].

Locking effect can be achieved not only in the limits of this or in that definite production but also out of it, (cascade use of substance in connected manufactures): wastes of one enterprise become raw material for other. This guideline is being realized well at territorial-industrial complexes [35].

In value relation, a variant of use as a secondary resource finished production, which is out of use, is a winning one. It has both economic and ecological expediency. Thus, every ton of scrap-metal delivered to steel-making shops, replaces up to 4 tons of natural raw material (iron ore, coke coal and limestone allowing saving capital investment and exploitation expenditure. Repeated use of 2 million worn tires gives an opportunity to

obtain up to 750 thousand tons of rubber, approximately 150 thousand of chemical fiber and almost 40 thousand tons of steel and so on.

Unconventional resource-saving technologies (synonyms: ecotechnology, geotechnology, noospheric technology) represent a variant of substance conversion in processes imitating natural ones.

The author gives a theoretical background of such technologies in a set of his publications [36].

Use of microbes for extraction of useful components from “poor” deposits, which make up 65% of its total quantity, is preferable in ecological relation as applied to a primary labour object.

As applied to a secondary object of labour (in processing industries) noospheric technologies are represented by industrial catalysis, which takes into account organic nature experience (metal-complex catalysis, achievement in the field of chemistry of immobilization systems, application of biocatalysis principles in chemical technology and so on).

New horizons in the field of innovation technologies, which are difficult to imagine exactly now, are open with the development of nanotechnologies.

V.I. Vernadsky’s ideas of connection of industrial processes to biogeochemical cycles of the planet are becoming real ones: more often a man places natural processes between himself and nature in which labour object “merges” functionally with the means of production activity, providing its ecology-economical effectiveness.

Together with this, simultaneously the humankind will have to solve a set of complex problems connected not only with its activity as an initiator of production, but also as a means and an object of its own reproduction.

V.I. Vernadsky is a deep thinker and humanist, who had realized such kind of danger. He was disturbed by the idea that an enormous part of

humankind does not have an opportunity to judge properly about what is going on. Today this anxiety proves to be real.

Value of nontraditional technologies is rather high and demands deep theoretical researches and applied development [37].

Biosphere value should be regarded in the aspect of possibilities, which are connected with waste utilization of anthropogenic activity up until recently. Its emission into environment has represented the least expensive way of utilization used by enterprises. In most cases direct emission with minimum recycling remains the chipset way. However, such situations cannot be accepted from ecological, economical or social point of view.

The following practice of waste utilization has appeared historically:

1) Technological variant: waste is being formed at production stages of final product (wastewaters, dust, solid formation, etc.). They enter environment either directly in a kind of pollutants practically uncontrolled in their toxicity degree, or indirectly after purification cycle. Some portion of wastes that can not be neutralized is burnt, stored, dispersed or buried.

2) Exploitation variant: wastes are formed in a kind of final product that is already out of use and “has finished” its life cycle.

It should be stressed that even today when mass of wastes is impetuously increasing [38], we only are approaching economic estimation of wastes, considering as before that it is cheaper to throw away than recycle.

Equations according to interindustrial balance type can be constructed for every kind of wastes. These equations allow choosing and estimating effectiveness of various variants of environment saving.

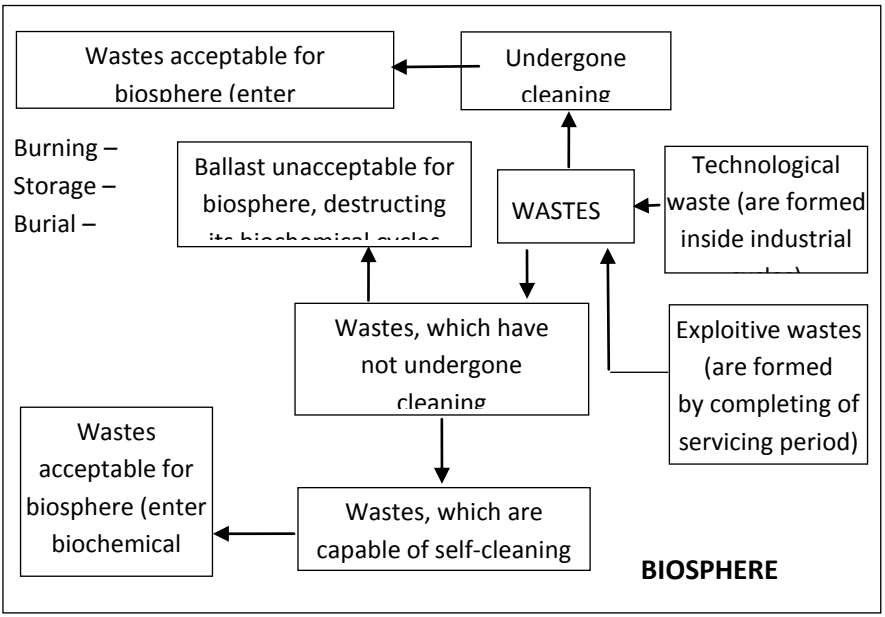
Some special attention should be paid to wastes, which are capable of entering biogeochemical biosphere cycles independently (see the scheme)

Self-cleaning effect is inherent to biosphere whose components (atmosphere, aquasphere, soil) are able to restore natural structure partially, removing impurities under the influence of natural processes.

It is a pity that nowadays the Earth is losing this property in connection with uncontrollable growth of anthropogenic pollutants.

Cleaning facilities assist to increase the effect of waste self-cleaning. Cleaning of production is implemented by mechanical, physicochemical and biological means. The latter is considered to be the most drastic kind of cleaning from the point of view of the requirement of biosphere parameter of compatibility [39]. For example, processing systems of wastewaters usually consists of three subsystems: preliminary (primary); secondary; final, tertiary (biological).

Scheme of anthropogenic activity of waste utilization



Solid components are removed at the first stage; at the second stage, the organic substance is restored and water gains quality, allowing its use in various technological processes (technical water); at the third stage, the

filtration through layers of recovered carbon completes the process of cleaning.

If we take the value of water cleaning at the first stage as a unit, then at the second and third stage this conditional economic index, correspondingly it will make up 2 and 10 units [40]. The problem of substance removal which is formed as a result of cleaning itself is a serious one.

Developed industrial countries carry out the greatest amount of local cleaning, supporting by this quality of their environment on the basis of unlocked balances, and consequently, freely consuming someone else's ecological resources, by analogy with man's keeping his flat clean leaving rubbish out of it [41].

Since cleaning facilities are expensive, the simplest techniques of waste utilization are applied in mass scales. They are dissipation, burial, storage at ranges. From ecological point of view, such technique is wasteful, since localizing waste, society irrevocably loses resources, which are contained in them and pollutes the earth practically forever.

The problem of burial of radioactive wastes remains actual and unsolved.

Let us consider waste utilization of technological type formed in mining and recycling industries with the purpose to specify its value parameters.

The majority of mining industries aspire to take off creams from deposits and make maximum profit by little capital investment. As a result, poor in content of useful components and hardly extracted raw materials are left in places of mining or are put on the surface and form dumps. According to specialists' estimation, their mining allows extracting useful components with the same success as at the first stage of deposit exploitation.

Some interest represents a possibility of using cavities and excavation forming in crust after completing industrial exploitation as secondary

“resources”. If we take into account that more than 40 thousand mining enterprises extract about 30 billions m^3 of mountain mass annually in the world, the problem of use of worked out areas gain economical and ecological color.

The new role of mining working is highly diverse: refrigerators, climatologic hospitals and oil and gas storage, underground hothouses and so on.

While using this potential of mining industries, its production value parameters may change with worsening or improvement of financial or ecological structure.

The period when many kinds of raw materials with high content of necessary elements and compounds were deposited in a small depth passed long ago.

Nowadays in order to obtain necessary raw materials it is required to work out a great amount of mountain mass and use deep mines and expensive equipment for this purpose. It is getting worthwhile transiting to mineral resources mining by means of physical-chemical and microbiological methods economically and ecologically.

From economical and ecological point of view, for example, copper mining is preferable by underground leaching (it is 3 times cheaper than by mines and besides, 9-10 times decreases the expenses of living labour). Table salt, potassium and magnetism salt, sodium saltpeter, copper vitriol, soda, etc. can be mined by underground dissolution. Using solutions of acids and alkalis it is possible to convert minerals containing gold, silver, rink, uranium, beryllium, etc. into a liquid state.

Use of gaseous and “sulphuric” bacteria may fundamentally change the principle of mining and enrichment of mineral resources (to extract ore from the depth up to 10 km, stop using people in hard underground work).

In the framework of recycling industries, (functioning stage of secondary object of labour) wastes are very high, as well as in mining industries. Widely published statistical data need not to be commented.

Every year more than 3.5 billion of solid fuel and about 2.5 billion of oil products with slag formation more than 700 million tons of slag is burnt in the world.

As the result of industrial activity more than 700 billion m^3 of wastewaters, 250 millions tons of dust and ten million tons of toxic gaseous substances are emitted annually.

According to estimation of foreign specialists, every year after being used a greater part of chemical substances (about 20 million tons) gets into soil, water reservoirs, atmosphere and consequently goes past a consumer.

Annually about 45 m^3 of waste waters of various degree of pollution is emitted by enterprises in Russia and about 36 million of dust and gaseous waste enters the atmosphere.

By the beginning of 1997, about 14000 million tons of toxic waste had been accumulated in our country. An increase per year makes up about 90 million tons, including 0.28 million ton of wastes of the first-class danger, 2.17 million tons of wastes of the second-class danger [42].

Wastes practically have never had economic estimation and consumption.

Ecological crisis has made doubtful the quality of environment in connection with the damage inflicted upon it, that is “has highlighted” the problems of value expenses connected with anthropogenic activity. It turned out that the market system maintains effectiveness by use of natural resources and wastes in case it acquires monetary value but gives malfunction, if the price is undercharged or more over, if it is absent at all. Planned economy had the same disease. Because of a set of reasons, prices on production wastes, as well as on natural blessing were charged centrally in the USSR. They were very low and consequently did not contribute to introduction of ecologically preferable kinds of production and did not stimulate corresponding economical behavior of producers and consumers.

Finally, the situation leading to deepening of natural environment and not to its easing was created. Nevertheless, the practice dictated its own. The soviet scientists undertook the steps in the direction of determination of natural resources and determination of value estimation of production wastes. Besides, they undertook the steps in the direction of searching for basic grounds of price formation, as well as determining of norms limits, standards that fix both statics and dynamics of environment qualitatively and quantitatively, it made possible to make up corresponding rate scale.

Researchers concentrated their attention on interpretation of the essence of ecological value according to the following principle: a) the source of pollution; b) the sacrifice of pollution pays.

Principle “a” relies upon the thesis: expenditure connected with prevention, limitation and reduction of pollution is compensated by source of pollution.

Principle “a source of pollution pays” was recognized in 1972 by organization of Cooperation and Development, besides, it has been recommended for use since 1982. According to it, product (commodity) value should comprise both the value of recycling and burial of wastes.

Some specific difficulties have arisen with practical use of “a sacrifice pays” principle, since on the one hand, the sacrifice as an agent of economical (ecological) action can’t determine quality-quantitative damage being inflicted by it exactly enough, on the other hand, can’t express it adequately.

Since 1973, the western countries have found that it is worthwhile introducing tax for contamination of environment. Theoretical basis of such kind of payment “was developed by N Li”. He put forward three axioms: individual interests determine a man’s behavior; prices act as signals, which control a man’s behavior; compromises between behavior and prices should be achieved by price control.

These assumptions implied accounting, at least, two objective factors: natural recourses and wastes should have value because of its exhaustion; market stands at necessity of overcoming some specific contradiction:

value determination of primary and secondary natural resources in its essence being not private taking into account interest of an individual.

How should the value of ecological expenses be distributed among the sources of contamination provided that everyone uses the profit from improvement of environment?

To work “for oneself” for entrepreneur is natural, but divide the profit with “everyone” is a question.

Planned centralized economics could not cope with some other dilemma: a necessity of determination of ecological price of primary and secondary resources allowing for the sake of everybody to provide expediency of their calculation from the position of adequate value. The steps in the direction of determination of value of production and consumption of wastes have been undertaken both in our country and abroad.

West has concentrated its efforts on determination of payment for environmental pollution and wastes from position of use of maximum permissible emission and maximum permissible discharge value.

By this, initiators were considered not only those who directly created stress upon environment, but also those who destructed it using toxic products. The main difficulty of calculation of charge for pollution consisted in entrepreneur’s aspiration to make high profit and he was little interested in the reduction of damage done by his enterprise. Finally, he preferred to increase overhead expenses, increasing prices on the production of the enterprise, which was pollutant. The pollutant pays formally but actually, the consumers compensate the damage. Thus, the problem from economical and ecological one was transferred to socio-moral level, in a surface of compromises between “my” and “not my, but common”. In this key, the western researchers were inclined to support the idea of eco-capitalism, implementation of ecological taxation reform, when it is supposed that rivalry should not take place between company

inflicting the damage upon environment and the company trying to save it. Rivalry should take place between companies, which make everything possible for saving of environment. ”The authors of the report to Rome club “Factor of four” orientate to a new “reading” of economics which takes into account the planet’s resources, its possibilities to absorb production wastes [43].

Native scientists had been studying intensively the problem of value estimation of wastes right up to the beginning of 1990s.

Let us pay attention to the works of the researchers of this spectrum - B.V.Danilov-Danilyan, M.Kozeltsev, S.P.Burmatova, P.K.Balandin, V.I.Chetvyrev.

Taking into account the scheduled norms of the payment for emission, V.Danilov-Danilyan and M.Kozeltsev had found it worthwhile correlating them with the possibilities of enterprises: “It is worthwhile introducing the charge for emission with relatively small rate. It gives enterprises an opportunity to adapt to a new situation with perspective of increasing of the rates.

The payment should be differential according to various features, in particular, according to a territorial one.

The stoppage of the growth of the payment at normalization of ecological situation should be implemented differentially in dependence on quality indices of the environment. Gradually the growth of the payment (in our opinion, it should make up about 20% per year) will synchronize the regulation of this economic mechanism parameter with regulation of the rest” [44].

O.P.Burmatova has researched the estimation of effectiveness of economical and ecological utilization of wastes. In her opinion, it is necessary to compare expenses (capital current) on production of this or that output by means of utilization from wastes, as well as by the use of

some conventional kinds of raw materials. So, if the given expenses on utilization of wastes are represented by C^1 and at the expense of the use of other kinds of raw materials are represented by C^2, consequently, the production of the given kind of output according to variant that envisages waste utilization will be economically effective when $C^1<C^2$ [45].

R.K.Baladin considers that ecological profitability index should be one of the most important criteria of operation of the enterprise, notably not a pursuit for profit, but aspiration to harmonic conformity of production and environment [46].

V.I.Chetyrev suggested charging the payment from enterprises not for the use of mineral raw materials, but on the contrary, for the part, which did not have further application in production.

He calculated the size of payment for the use of resources in the following way [47]

$$P = V_{omx} \cdot K_{omx} \cdot O_{omp} \cdot П,$$

where P – payment for use of natural resources, roubles;

V_{omx} – amount of waste formation at enterprise, tons;

K_{otx} – coefficient of waste formation at production in total amount of raw materials being consumed;

O_{omp} – estimation of 1 ton of secondary raw materials of the enterprise taking into account the branch effect at their use, roubles;

$П$ – normative of payment collection for natural recourses (conditionally is equal to 0.1).

Since the payment for pollution depends on composition and intensity of technological agents, the research works on determination of norms, tests, emission limits, discharge, etc. were initiated. They fix quality –

quantitative contamination parameters in accordance with priority scales. Corresponding toolkit on providing control over environment pollution, as well as on determination of standards of influence upon it was created in our country.

In 1980-1981s, the first inventory of industrial emission with determination of the harmfulness coefficient of production, maximum amount of contaminants established for enterprises taking into account technical capabilities was implemented.

Beginning with 1990s, the normative of permissible emission of various substances per time unit, usually per year was established for every enterprise. For the atmosphere - this is maximum permissible emission (MPE), for the water – this is maximum permissible spill (MPS).

Besides, ecological passports of enterprises with the issue of corresponding normative documents were introduced, where the level of resources used by an enterprise, as well as the degree of influence upon environment were reflected by means of index system.

In conformity with the Federal Law "About production and consumption of wastes" (1998) the passports on dangerous wastes were introduced. The document certified belonging of waste to a corresponding kind or class of danger.

By the presence of normative of registration of quality – quantitative state of wastes, estimation on prevention of ecological risk with the emphasis on searching for economical methods of ecological preventive measures has appeared.

Practice of approval of plans of waste utilization that are made up with a glance of generally important state interests appeared to be significant.

As applied to the situation in modern Russia, the development of new and adaptation of already used market instruments (methods) of decrease of environment pollution are actual. It is a complicated process, which requires attention to a set of factors and details, as well as consultations with the public representatives and support on the part of entrepreneurs.

"Perestroyka" in Russia and years after it that were being accompanied by total stealing had turned the country into a large dump.

References to experience of the USA, Western Europe are useless and very often are harmful, since these countries have already been leaving their rubbish in Asia and Africa for long.

Russia, which has been living through total destruction of centralized management system in both politics and economics, is transferring to de-centralized methods of management of wastes [48].

Some negative tendencies have appeared which are connected with the growth of many indices of specific expenses of natural resources and pollution. Some polluting and resource-intensive sectors managed to survive during the crises of 1990-s, whereas many resource-saving and highly technological production had practically disappeared.

It is impossible to underestimate the fact of decreasing stress on environment and decrease in production under these conditions. Nowadays the embryo of a new economic system is being formed. If this embryo of economical future is carrying "anti-ecological compatibility" in its gene, then in case the economical growth starts developing, it will be difficult to prevent further degradation of environment.

3.3. Value of work on preservation of consumer properties of biosphere

Humankind with great delay has come to the idea that environment is the highest value and economical reality has money expression.

It is cheaper for a society to save the environment rather than to invest money in elimination of inflicted damage.

We are going to consider the value of conservation activity taking into account some objective and subjective basis.

Objective basis of ecological value implies calculation of expenses issuing from the status of the object itself, its role in a chain of hierarchy dependences, which provide productivity of biosphere.

Subjective basis of ecological value implies calculation of expenses issuing from peculiarities of human perception, expediency of this or that conservation activity.

Objective basis of ecological value takes into accounts the limits of expenses for the support of functioning of "old bio-geotechnical cycles" of a planet whose malfunctions result in ecological crisis and finally in global disaster.

Subjective basis of ecological value takes into account society's measure of readiness, its concrete individuals to pay current and capital expenditure directly (during their lifespan), but also indirectly (during lifespan of their children, grandchildren and other generations).

In N.F. Reyms's opinion, ecological value is the extra charge arising because of necessity of economic investment. It serves for neutralization of ecological consequences of economic activity necessary for calculation taking into account the increase of damage during the time (energy and the substance of natural resources during exploitation are gradually degrading to the forms that are less suitable for economic use) [50].

According to V.V. Snakin, Yu.G. Puzachenko and S.V. Makarov, ecological price is the measure of equivalent exchange between a society and environment [51].

Concept "real aggregate value of nature" is an analogue of "ecological value (price) introduced by F. Sent-Mark who analyzed value of nature in a kind of "a sum of its commercial cost and value for a man."

F. Sent-Mark was one of the first, who tried to define the value of nature protection issuing from two levels of expenses:

- value of optimal prevention of harmful phenomenon, decreasing their propagation up to “a level of inconvenience”;

- value of stabilization of harmful phenomenon allowing supporting already existed level in spite of the development of economics.

F. Sent-Mark illustrates profitability of environment protection, showing that it is much lower, than its restoration value.

For example, annual expenses on fireproof protection of Aquitaine Forest are 60 times cheaper than their restoration after fire. It is suggested to calculate the value of nature protection from the point of view of moral-aesthetic value for a man, when its decrease or disappearing (for example, decrease of green plantations in the cities) can be calculated by “the value of unsatisfaction” [52].

V.Girusov, S.N.Bobylev, A.L.Novoselov, I.P.Chepurnykh consider that ecological value of nature should be determined on the base of adequate price or economic estimation of natural resources (nature services), as well as based on the market estimation, rent, expenditure approach, alternative value, general economic value (cost) [53].

Indubitably, all these definitions are working. However, from our point of view, the term “ecological value (price)” needs correcting. It is worthwhile using when it is spoken about preventive protection of object of nature, about measures undertaken by a society before the negative changes of living and dead matter are established.

As a rule, in literature on economics, the payments which have any attitude to nature use include all kinds of expenses creating not only theoretical but also practical “dissonance”, since one thing is to invest money in elimination of the damage which have already been inflicted and

the other thing is its prevention. If preventive capital investment "distribute" taking into account time grid, then a success of financing "is transferred" to a higher stage which demands from a society some other actions. What kinds of payments are used taking into account nature-protection policy?

Expenses can be divided into the following groups: financing of measure, directed to prevention of harmful substances emission (spill) and providing control over the state of environment;

– financing of nature-protection industry

– financing of research work, which is connected with nature-protection theme.

Expenditure on nature protection is a part of state budget and is formed from the capital investment of private sectors.

In all countries, the given expenditure is increasing both in its relative and absolute indices. According to existing estimation, they make up from 0.5 to 5% and sometimes up to 12% of gross national product in developed countries (in Russia more than 0.4%). [54]

Total amount of expenses on nature – protection measures is a sum of non-recurrent capital and current investment. Calculation of given expenses is expressed by formula [55]:

$$Z = C + E + KB,$$

where Z – the given expenses;

C – current expenses;

E – return ratio;

KB – amount of capital investment

For revealing economical profitability of nature-protection measures at different levels of economic management (state, region, branch, enterprise) index of absolute effectiveness of nature-protection expenses is used. It reflects the annual growth of ecologically safe production ratio to nature-protection capital investment that had caused it [56].

$$Э_пМ = П/К,$$

where $Э_пМ$ – absolute economic effectiveness of nature-protection measures, roubles;

П – production growth of ecologically safe output at the expense of nature-protection capital investment, roubles;

К – size of nature-protection capital investment, roubles;

With the purpose of nature-protection financial provision a set of mechanisms is used: incentive (subsidy, privilege, credit, tax exemptions and so); compulsory (payment, tax, fine, sale of rights on contamination and so on); restoration or compensatory (creation of special funds, insurance procedures and material compensation to a state, regions, firms and
so on).

Calculation of effectiveness of nature protection is a complicated methodological problem that hides many white spots. In understanding of the effect of “nature protection”, time factor plays an important role, since it is not transferred automatically to the future. For example, while increasing a harvest, a forest pelt itself can give a smaller economical effect, than a field strip which was on its place, however, on the whole “a strip-field” is more effective than a plot of land before creation of a forest strip.

Modern statistics of environment suggests a set of techniques of calculation of the effectiveness of nature-protection measures. The effectiveness is considered to be attained on condition that not only the

ecological effect is achieved, but also economical, social which is a by-product of given activity. A generalized index of the effectiveness of ecological protection is expressed by the following formula [57].

$$Э = (\Sigma(P_{ecolog} + P_{econom} + P_{soc})/З),$$

where P_{ecolog} – aggregate ecological result;

P_{econom} – aggregate economical result;

P_{soc} – aggregate social result;

$З$ – ecological expenses.

Speaking about the effectiveness of nature-protection measures, we cannot avoid the questions connected with its state implication. In this respect the experience of the USSR, as well as the countries of Eastern Europe, seems to be model in comparison with the experience of western countries.

It is difficult to dispute on failures in ecological economy, since they originate from its essence: uncertainty and non-foresight stipulated by basic purpose, i.e. making a maximum high profit (quick result when under-recording long-term damages and profits).

Failures in rigidly centralized command economies were stipulated by the absence of proper control over public ownership of the means of production, which belong to all and simultaneously to nobody in this production system.

Three common properties, which had influenced the environment quality negatively, were inherent to both capitalist and socialist economic management systems. These properties are the following:

– acknowledgement of natural blessing to be practically free;

– unwillingness to take into account the necessity of reflection of expenses and profits in the use of natural resources taking into account long-term perspectives;

– absence of economic and social incentives that positively influence the solution of nature-protection problems;

It should be stressed that the market economic management system had to acknowledge the effectiveness of the mechanisms of the state regulation while solving ecological problems. It is worthwhile refusing of indiscriminate estimation from the experience of the USSR and countries of national democracy. The principle of ancient Romans Suum cuigui tribyere (render everyone his own) has never let down those who followed it.

Socialism is based on the principle of denial of private property, including the nature environment and its resources. No doubt, it is positive. However, one thing is to have this plus and quite different thing is to use it properly in economics. They did not manage to do the second thing because of the objective reasons (historical peculiarity of the development of the Soviet state) and the subjective ones (incapability of the political elite of the USSR to realize the importance of economical, social and ecological problems in complex taking into account long-term perspective).

Annually, five-year and long-term plans of economical development were made up in our country. For the last few years, they included social component and were called “State plans of economical and social development”. Optimal variant would be “State plans of economical, ecological and social development.” Nevertheless, we have not “reached it” [58]. As a result, they did not succeed in realizing of the advantage of socialist economic management system – potential, which is inherent to social ownership by natural resources and blessing.

The advantage remained a potential possibility. The state has been oriented (especially during the recent years) to the development of mining

industries that result in depletion of depths, soils and water resource. Though nature-protection financing programs were impressive because of its size, money was not being spent according to its nomination. [59]

A set of regional and branch economical programs was developed in the USSR without taking into account the ecological requirements. It had resulted in negative economical and social consequences (assimilation of virgin and deposit lands in Siberia and Kazakhstan, irrigation of deserted lands in Aral region, construction of the Kara Kum channel and so on).

Owing to the soviet scientists-economists, geographers, sociologists, philosophers, representatives of technical branches of knowledge much was theoretically interpreted and suggested taking into account the advantages of public property on natural resources and blessing.

Specialists had been implementing an intensive search for effect-forming basis of nature-protection investment.

The dominating point of view is that the ecological damage, which has been prevented by means of investment, may be regarded as the effect.

Concept “prevention of damage” has become a synonym of ecological effect in its specific “connection” with the environment-protection expenses.

Economics as science demanded development of unconventional approaches to estimation value of the effectiveness of ecological investment. Various variants of the estimation of absolute effectiveness of capital investment were suggested:

– by means of distraction of a part of accumulation fund from position of a contribution into the future national income when the threat of breaking norms and normative becomes a stimulating motive and regulator of nature-protection expenses; inclusion of national welfare of natural resources in aggregate value together with the main circulation funds; measurement of contribution of national factor into an increase of welfare “storage” and “flow” with reflection of these positions in a

balance of national wealth, increment of physical amount of national income [60];

– interpretation of the essence of productive forces, more exactly its natural component, i.e. natural resources and environment had undergone critical reconsideration. In the limits of the discussion being conducted during decades about the ratio of productive forces and object of labour, an approach to a labour object as a factor actively influencing the increase of effectiveness of social production was based [61]

– an approach to conservation activity as to some special kind of production, as to the process that increases environment use value, because of the environment elements being involved into economic circulation and used as a habitat, gain economic value; introduction of differential payment from enterprises for the use of natural resources, as well as for environment pollution with orientation of plans to financing of preventive measures excepting the possibility of breaking the optimal balance in a biosphere [62];

– some convincing reasons in favor of complex improvement of economical mechanisms of planned management of national economy taking into account ecological component are suggested in prediction respect [63].

The law of "Environment protection" was passed in December 19, 1991 at the 4th session of Supreme Council of the USSR, in spite of opposition of Council of Ministers. Nature-protection policy was put at the level of law provision: a system of payment for natural resources was developed, procedure of ecological funds expenditure was regulated; formation of Ecological Insurance Institute was envisaged and so on.

Western scientists in their turn realize that it is impossible to solve the problems of ecologization of economics at the expense of market mechanisms only. They criticized market models of development in respect to nature protection. On the other hand they suggested mechanisms of direct and indirect mechanisms of its state regulation.

The first variant is represented by the author's researches, who underlined a social component of nature-protection problems. Thus, F. Sent-Mark asks a question: "Would humankind be sagacious enough to

reject the system, which leads it to a suicide, in order to understand that it can't save the present society without destroying itself? Socializing nature is the only chance to save life on the Earth. Besides, it is the most reliable way to throw down dictatorship of "Golden Taurus", wake up in ourselves "a new person" by revival influence of new humanism" [64].

The same idea sounds in the works of B. Kommoner. In "Technology of profit" he claims: "If we choose ecologically justified and reasonable course, we ought to make the reasonable solution at last: i.e. to develop production not for the sake of personal profit, but for the sake of people, not for exploitation of one people by others, but for the sake of equality of all people, not for the development of the armament that destructs the Earth and people, threatens the world by the disaster, but for the sake of every person who wishes to live in harmony with nature and in peace with all people in the world" [65].

Some state regulation variants of "the activity of green business" taking into account the aspects of conservation activity were being developed by the western science.

The instruments of state regulation of nature management being used today in terms of market economy are grouped according to the following directions:

1. Realization of conservation activity by state organs without attraction of private capital, for which this kind of activity is not profitable (organization and financing of scientific development, implementation of monitoring, training specialists and so on). For example, in Japan financing of nature-protection measures is envisaged at federal (2-3% from expenditure part of the budget) and regional (5-6%) levels:

- Regulation of land tenure is acknowledged by the competence of federal or local organs of power. The latter have the right "to preserve natural resources", to transfer them in status of "wild nature zone";

- Implementation of large-scale measures of nature-protection type (afforestation of territories, building of cleaning constructions, water, forest protection, collecting and recycling of toxic wastes);
- Regulation of prices and tariffs on nature-protection measures, "smoothing out" contradictions between common national interests of nature conservation and growing claims to it of private companies and individual consumers.

2. Stimulation of conservation activity of private sectors by the state:
   - Funding and distribution of target loans and credits
   - Creation of accelerated amortization regime of ecological technique;
   - Encouragement of eco-business, orientating to production of ecologically clean production

3. Use by the state the measures of nature limitation and compulsion of the nature users to environment protection through the development of corresponding legislation that envisages the following:
   - Implementation of ecological expertise of economic objects;
   - Introduction of ecologic norms and standards;
   - Establishment of bans (prohibition), limitations in ecological indices;
   - Enclosing agreements between state organs and environment pollutants where some definite normative of its quality are envisaged.
   - Imposing of penal sanctions for breaking nature-protection laws before enterprise closure

4. Inducement by the state the of users of nature to the nature protection through the application of combined normative – market instruments of "indirect" regulation: introduction of inducement assignment for pollution; permission of purchase-sale rights for emission into environment, introduction of international ecological quotas [66].

Some serious works of nature-saving theme were introduced by V. Leontyev, D. Ford, V. Pareto, G. Hiks, X. Sato, I. Hirodze and others [67].

By experimental method, West and East were approaching the idea of expediency of combination of direct state regulation mechanisms, as well as economical stimulation mechanisms while conducting nature-protection policy.

Russian scientists continue to search for nature-protection mechanisms in conditions of transitional economics. They work in conditions of decreasing sizes of state financing of conservation activity and imperfection of legislation basis of ecological safety.

Native scientists are investigating the problem from philosophy-methodological and theoretical-applied positions supplementing each other. It is the most constructive method from our point of view. Philosophy-methodological basis of nature-protection is contained in the works of V. I. Vernadsky about biosphere and neosphere. This subject has been attracting attention of many scientists for the last decades (E.V. Girusov, V. K. Gorshkov, V. I. Danilov – Danilyan, S. P. Kapitsa, V. P. Kaznateev, N.N. Mouseev, Yu. M. Osipov, G.S. Smirnov, A. D. Ursul and others) [68].

In his monographs “Experience of philosophy of economy. Economy as phenomenon of culture and self-regulating system”. M., MSU Publishing house, 1990;”Backgrounds of the theory of economy mechanism”. M., MSU Publishing house, 1984), Yu. M. Osipov considers economy as a complicated self-organizing system, which is developing in the direction of neoeconomics. He comes to a conclusion that “organization of production process can’t already be an objective of economy. It can be the organization of noospheric production process only (i.e. all-round ecological process for nature, society, a man)”. New organization cannot already freely follow the principle “the more, the better” (output, value, profit) but should follow the principle “so much, how much is permissible” (“Experience of the philosophy of economy” p. 293). And further: “Historical development of human civilization puts forward a task of transition to ecology-economics (eco-eco), i.e. to economics, which subordinates to ecological imperative taking into account ecological criterion.

Ecology-economy is the economy of noospheric type in the sense that the humankind overall enters the way of conscious and integral perception and organization of noosphere, its complete establishment. Noosphere will appear to be not a zone of man’s activity only, his material

and spiritual culture, but ecologically stipulated planet-space world reflecting the effective equality of all the worlds: material, biological, social, spiritual". ("Backgrounds of the theory of mechanisms of economy" p. 347, 349).

In N. N. Moyseev's books "Man and noosphere", "Universum, information, society", in line with the concept "ecological imperative" (boundary of man's permissible activity), concept "ecological socialism" (a compromise between equality and the realized measure of non-freedom which is fixed in a system of moral ideas and the laws of the development of a society) is introduced.

N.N. Moiseev writes, "For its future a planetary society needs some strategy unit in interrelation with nature. In other words, this organism needs some unified Collective Intellect of a planetary scale, since humankind interacts with Nature as one the whole" [69].

Theoretical and applied researches concerning nature protection problems in their value expression, acquire still greater economic-mathematical direction [70].

First of all, it relates to financial provision of biodiversity conservation process.

Disastrous decrease of planet biodiversity was recognized at world society level and reflected in UNO Convention on biodiversity (was passed in 1992 by representatives of 167 states). In 1990s, a new scientific discipline appeared - Nature-protection Genetics intended for search of approaches to saving and rational use of Earth gene pool. However, are left open such key questions as "What should be saved? How should it be saved?" These questions demand large financial investment in scientific research in a set of directions:

Three important tasks were noted in Convention on biodiversity:

- conservation of biodiversity;
- rational use of its components;
- justified and equal in rights profit making, which appears as a result of the use of genetic resources.

If a utilitarian side of a problem is meant, conservation and stable use of biodiversity is important for providing people's needs in agricultural production, medical instruments and aesthetic services and so on. For example, about 4.5% of gross national product is produced in the USA annually (about 90 billion dollars) at the expense of wild kinds of flora and fauna. Value of medicine being produced in the world from wild plants makes up approximately 40 billion dollars per year.

It is unlikely that somebody will be brave enough today to confirm that ecology-economical damage from a loss of even a single species can be adequately compensated in future.

Expenses form the objective basis of ecological value (cost) of organic nature, i.e. expenses on conservation of genetic diversity of population systems in the process of their trade and artificial reproduction; on restoration of those systems whose structures have already been destroyed; on creation of new systems of population in those regions, where natural-historic and ecological conditions are still necessary.

In Yu.P. Altukhov's opinion, realization of these approaches will contribute not to extensive growth and destruction of biosphere gene pools connected with it, but to steady existence of the system "man-biosphere" in unlimited long row of generations [71].

The objective basis of the value of organic nature, i.e. flora and fauna, reflects fundamental value internally inherent to them: to preserve the balance of synthesis and decomposition of organic substance by biota with a high degree of precision, to stabilize quality-quantitative parameters of environment. In other words, some kinds of conservation activity are subject to value estimation. They contribute to conservation of biodiversity of water environment; forests which are a central element of biodiversity; "islands" of untouched biological wealth of a planet.

S.N. Bobylev and A.V. Ctetsenko considered variants of determination of economical value of nature on the example of especially protected natural areas [72].

Concept of total economic value, which appeared in 1990s, was a starting moment of their analysis. Total economic value is defined in a kind of sum of two aggregated indices: value of use (use value) and value of non-use

$$TEV = UV+NUV, \quad (1)$$

where *TEV* – total economic value (cost);

UV – value of use

NUV – value of non-use

In its turn, value of use is a sum of three components:

$$UV = DUV + IUV + OV \quad (2)$$

where *DUV* – direct value of use;

IUV – indirect value of use;

OV – value of postponed alternative.

Thus, value of total economic value (cost) of nature is a sum of four components taking into account formula (1) and (2):

$$TEV = DUV + OV+ EV, \quad (3)$$

where *EV* – value of existence

By determination of economic value of especially protected natural areas, S.N. Bobylev and A.V. Stetsenko reveal elementwise composition of the total economic value.

Direct value of especially protected natural areas consists of the value of wood (sanitary cutting); additional products (mushrooms, berries); medicinal plants; hunting and fishing; recreation activity; tourism.

Indirect value of use of especially protected natural areas is an index of all-possible profits; it includes carbon dioxide relation (softness of the greenhouse effect); water-regulation functions (protection against floods);

prevention of soil erosion; preservation of population health during rest in especially protected natural areas.

Value of existence, as a rule, can not be estimated by value indices attained by means of market prices, since there does not exist any market that evaluates aesthetic aspects: value of nature as it is; aesthetic value of nature for a man; his duty of nature saving for future generations and so on.

Value of postponed alternative is connected with conservation of biological resource for possible use in future. In this case, possible value is a corrected sum of direct and indirect value of use.

In modern economical conditions, especially protected natural areas have to prove their advantages in rivalry with alternative methods of use of some certain area, where there are biological resources. The following methods can be considered as alternative ones: management of agriculture, forest purchasing, mineral resource mining; different kinds of building and so on.

The main economical condition of biodiversity conservation of especially protected natural areas is execution of conditions expressed by the following formula:

$$B_b - C_b > B_a - C_a,$$

where B_b and C_b are corresponding profits and expenses from alternative variants of area use, the problems of value estimation of especially protected natural areas are not settled by this. The questions, connected with non-coincidences of global and local profit taking into account functioning of time factor need to be solved [73].

Subjective basis of ecological value (cost) of organic nature form subjective estimation of value by a man (a society) of this or that object of organic nature and readiness to pay for saving and restoration. People's attitude to saving of the blue whale, the snow leopard, the Ussurysky tiger

and etc. may serve as an example. In this case, value is expressed by a person's (group's) readiness to pay for providing existence and saving their habitat, even though individuals realize very well that they will never personally use these resources.)

Realization of the method of subjective monetary estimation of a living object is defined in many respects by moral-aesthetic directions of an individual. Thus, moral reasons in favor of conservation of biodiversity are based on the fact that biological organisms should be saved from disappearing, since the living creatures are valuable on their own.

Ecologists and economists take up measures on determination of the value estimation of the objects of inorganic nature, since the latter are condemned to degradation in an accelerated rate. By 2005, consumption of freshwater will have increased by 40%, two thirds of planet population will experience its shortage. Such important parameter as climate is also included into unstable regime of functioning. Process of deserting is going on intensively. It touches upon almost a quarter of land: 250 million of people have already suffered from soil degradation and it threatens one more billion of people in the nearest future.

Experts' researches of Maryland University allowed us to single out 17 categories of functions and services of nature, which nowadays require value estimation: climate regulation; gas composition of atmosphere, soil formation and so on. A summarized estimation of these functions was determined in 35 trillion dollars, it twice increases gross domestic product (18 trillion dollars per year) produced by humankind.

Problems of ecology-economical estimation of the objects of inorganic nature forming a basis of "biotic substance of a planet" require registration and financial investment in protection.

Objective basis of ecological value (cost) of inorganic nature makes up the following expenses:

1) on stabilization of present-day state of lithosphere, of air and water basins, as well as soil covering of a planet (mineral formation);

2) on conservation/improvement of landscape sphere as spatial-temporal dynamic element system of inorganic and organic nature

Clear classification of its directions is demanded for organization of statistical registration of conservation activity. There are many questions, which need to be answered. This is a methodological weakness of the given problematic development, absence of delimitation criteria of ecological, economical and social statistical parameters of nature-protection measures, as well as the presence of factors which are "out of frame" and are not taken into account at given stage of development.

At present various methods of index classification during analysis of nature objects from the point of view of determination of necessary capital and current expenses are used [74].

Let us consider the process of formation of ecological value on the example of value estimation of the decrease of emission of the greenhouse gases, softness of anthropogenic influence on the changes of the climate of the planet, using the results of researches of such native scientists as I. Bashmakov, E. Nikitina, V. Sokolova, A. Golub [75].

By the end of the XX^{th} century the annual world amount of the emission of the greenhouse gases had been estimated by 25,2 billion tons of equivalent CO_2 (more than 25% for the USA, about 25% - countries ES, 14% - China and more than 7% for Russia).

A huge financial investment is demanded for the solution of the problem of the stabilization of the Earth climate. Groups of scientists from different countries are working at estimation of expenses and profits from the decrease of the emission of the greenhouse gases, at development and introduction of corresponding economical mechanisms – taxes on carbon dioxide, schemes of domestic and foreign trade of quotas on emission and so on.

Experience of 1990s showed that it is possible to change the scales of anthropogenic emission and concentration of the greenhouse gases, and with minimum expenses. However, a single opinion exists in the world concerning the things that should be changed. Technical-economic and macro-economic analysis, Russia made the greatest sacrifices on the altar of the stabilization of emission of the greenhouse gases. Today Russia is on the first place in the world on the decrease of CO_2 emission (decrease of CO_2 emission has become a consequence of economic crisis, decrease of consumption of organic kinds of fuel, process of substitution of coal and oil products by gas in energy-balance of the country and so on). Nevertheless, the price turned out to be excessively high: about 4000 dollars losses of GDP per 1 ton of equivalent C that much exceeds the highest estimations of other countries, which are equal to 100 or even 600 dollars per 1 ton of equivalent C. In other words, decrease of emission at the expense of reduction of economic activity is unreasonable and expensive strategy.

Russian economists tried to determine a contribution of some separate factors into the decrease of emission. The following results were obtained: economic crisis – 73-78%; energy saving, standards and price policy – 8-12%; substitution of coal and oil products by gas – 5-6%; restructurization of economics – 10-12% [76]. Russia has an opportunity to sell a part of unused quotas for the emission of the greenhouse gases that would make up about 250 million tons per year. Trade of unused part of quotas may bring Russia from 3 up to 10 billion of dollars. An obstacle is the negative position of the USA, which had left Kiotsky protocol accepted in 1997. It envisaged introduction of quotas on the emission of the greenhouse gases, taxes on exceeding of quotas [77].

The subjective base of ecologic value (cost) of inorganic nature reflects the subjective estimation of this or that object of inorganic nature by a person (a society). The method of subjective estimation of ecologic value is “the method of expressed preferences”: inhabitants of this or that area are asked if they are ready to pay for saving of objects of nature (for example, saving of landscape at implementing hydro-technical and construction work and so on) .

Finally, analysts can calculate “the average sum” of readiness and having multiplied it by the total number of people get the total value.

Approaches being applied are the methods of transport itinerary expenses, hedonists price-formation to determination of unused value, or value of existence are conditional enough and require essential elaboration and further complex development [78].

Legal aspects of functioning of nature-protection economic mechanisms (biotic and dead) are investigated in theoretical and practical key [79].

Activity on attaining of value estimation consists of the following stages: apportionment of the subject of the estimation (kinds-forms of man’s activity) and the object of the estimation (for example, biogeosystems of some certain type); measurement of indices of the state of the object (statistics), finding characteristics of its future quality-quantitative states (dynamics) with their reflection in plans-forecasts.

There exists one more aspect of value estimation and value parameters in context of a commodity form.

Market economy regards nature through the prism of consumer’s relation, when production is both the main goal and the moving motive of the activity, (developed countries do not discover any wish to deviate from concept “golden billion”). The meaning of the private estimation of the consumers has sharply increased when the economic theory starts to understand under the value of a commodity only its usefulness. Here a factor of unpredicted action enters its power.

How should we separate useful things from useless things, something necessary from something that we can neglect? To what extent may consumers’ estimation of the present influence the future of a society, its habitat and production activity? Nowadays, voluntary-compulsory transition to the area of particularly subjective estimations and preferences, which are so numerous with all consequences stemming from this fact, takes place.

We are inclined to agree to the point of view according to which the market economy where profit is the main thing and all the rest is unimportant, needs to be fundamentally corrected taking into account both human interest and social value in respect to nature in terms of market relations. It is a necessity and economists cannot help taking into account this nowadays [80].

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CONCLUSION

Biosphere today is rapidly changing assuming use values diametrically opposed to those that can ensure survival of humankind – one of the forms of "living matter" – on the Earth. As the ecological crisis is acquiring global scale, it necessarily poses the question of its comprehensive methodological and philosophical interpretation.

The optimism of the future is to be carefully grounded today. Ensuring biological and social survivability is, undoubtedly, a planned, not a spontaneous process. Humankind is to solve, in shortest possible time, the problems of "transferring" material flows of production into the "space vehicles" functioning mode, which is characterized by a thrifty attitude to natural resources, including the potential of individual, to ensure self-renewal of biosphere and society in the context of harmonization of their relations.

The society with value orientation to Homo sapiens' needs (anthropocentric position) is to be replaced by another one oriented to protecting biosphere as the environment for production activity and human environment (ecocentric position).

Paradoxically, society guided by the principles of **economic profitability** does not take into consideration the fact that protection of biosphere assumes concurrently taking into account parameters of **ecological and social profitability**. Investigations along this line are carried out, as a rule, in terms of professional preferences; studies of interdiscipline, multifactor, methodological character are also called for.

Among recent positive phenomena is the tendency to the formation of ecological anthropocentrism, that is, a "transitional" position from the purely anthropocentric type to the ecocentric one: the centre of gravity is shifted from predatory destruction of biosphere towards the organization of economics conforming to V.I. Vernadsky's law of economy.

Today protection of biosphere's stability should become the common goal of humankind regardless of political and state differences, geographical positions, historic traditions, religious preferences etc. It is quite real because, first of all, the unity of ecological development can and must be the reason able to induce peoples and states to look for acceptable compromises and strategies based on relations that exclude military conflicts or reduce them to minimum; secondly, the stage of the planet's evolution when man (society) is

to take responsibility for further natural and social development is becoming inevitable.

Humankind is at the stage when universal consciousness and ecological culture – conditions necessary to transfer civilization to the noospheric way of development – are beginning to form.

Russia is justified in becoming the country where theoretical and methodological foundations of post-industrial development (V.I. Vernadsky's theory of biosphere and noosphere) were not only created but the country where these ideas can be put into practice.

APPENDIX

GLOSSARY

Admissible environmental pressure – anthropogenic load, the sum of individual homogeneous or heterogeneous effects that does not change the quality of environment or changing it within acceptable limits ensuring preservation and/or improvement of community's productivity (its structural and functional integrity). Its nature is that of a perspective normative that can be achieved by certain time, that is, in a predetermined period of time it can pass to the category of current normative. It corresponds to a relatively satisfactory condition of environment.

Anthropocentrism – an outlook and scientific approach regarding all phenomena and relations in terms of their significance for man.

Anthropogenic Effect on Geographical Environment (landscapes) – the effect of productive or non-productive activity of people on the structure and functioning of landscapes. It is classified according to forms and directions of man's activity (agriculture, industry, construction etc.); duration of effect; mode of effect (permanent, periodic, cyclical); consequences of effect (positive, negative) etc.

Bads – consequences ("products") of economic activity, secondary and external for the subject of economic activity (not taken into account when calculating the costs), such as water or air pollution, that are regarded as public "bads" (as opposed to goods), while the result of their neutralization is considered to be public goods (services).

Basic Planetary independent variables (according to V.I. Vernadsky): 1 – radiant energy of the Sun; 2 – thermodynamic parameters (temperature, pressure); 3 – phase state (gaseous, liquid, solid); 4 – chemical composition; 5 – living matter.

Biocenosis – the sum total of plants, animals and microbes with a certain composition and established nature of relations both among themselves and with the environment.

Biogeochemical cycle – the sum of cyclical processes of exchange and transformation of chemical elements (about 40) among biosphere's components (from inorganic form via living matter again to inorganic). The biogeochemical cycle uses mostly the Sun's energy (photosynthesis) and partially the energy of chemical reactions.

Biological Variety comprises all species of animals, plants, fungi, microbes, ecosystems and processes taking place in them. There are three levels of biological variety: genetic variety represents genetic information contained in the living matter of the planet, or a particular territory; species variety represents the number of species and the occurrence of their individuals on a particular territory; variety of ecosystems (landscapes) represents the number of various types of localities, communities and ecological processes. Biological variety is a specific case of nature's variety phenomenon.

Biosphere is the Earth's envelope where numerous small riemannian spaces of living matter are included in a dispersive form in states of space of Euclidean three-dimensional geometry of inert natural bodies. They are linked only by a continuous biogenic flow of atoms. (V.I. Vernadsky. The problem of time, space and symmetry. – In the collection: V.I. Vernadsky. Speculations of a naturalist. Time and space in organic and inorganic nature. Moscow "Nauka", 1975, p. 64).

Biospheric Product Use Value – equivalent to costs associated with the liquidation of organic and inorganic nature damage caused by the processes of the product's production, operation and utilization.

Biospheric product use value may be determined by the distortion of parameters of biochemical cycles and by the scope of financing associated with the necessity of protecting biosphere as the environment of man and the planet's living matter.

Biospheric Product Value – the costs of introducing ecologically oriented technologies and improving the existing ones by the product

manufacturer. Biospheric value of the product is part of its total cost that comprises the economic and social constituents as well.

Building Ecology – part of general ecology that studies geochemical and geophysical transformation of landscapes under the effect of industrial branches of the building complex. The theory of biosphere, landscapes and geographical ecology, human ecology, physical, economical and political geography, landscape geochemistry and geophysics, soil science and geobotany form the theoretical basis of building ecology development.

Civilization Diseases – pathological processes humans suffer from as a result of industrial production accompanied by environment deformation, destruction of natural ecosystems. The diseases are caused by human genome changing as a result of ecological niche destruction, growth of psychological pressure, excessive nutrition, abuse of medicinal preparation, smoking, alcoholism and drug addiction, environment pollution.

Cost of Biosphere – the sum total of the expenses society has to incur in order to maintain biosphere's ability for self-regulation and preserving basic consumer properties.

Cost of Ecological Damage – is determined by three categories of ecological and social losses: losses of human capital, related to health; those in natural systems, productivity and physical capital productivity.

Datum Level of Environment Pollution – taken into account when permission for the operation of a new object is granted. A state organization assesses the existing level of environmental pollution, checks that maximum permissible concentration of pollutants is complied with in certain elements of environment. In regions with high anthropogenic pressure, additional load of the environment should not exceed 1 per cent of the datum level of the environment pollution.

Desurbanization – reduction of population in big cities and of their relative production potential; takes place, mostly in developed countries due to the degradation of natural and social environment (noise, pollution, crime etc.). For example, the population of London reduced by 10 percent in last decade.

Eco/bio/centrism – a scientific approach in nature protection business, that places conservation of organic nature above all.

Ecobusiness – an area of economics which includes: 1. Enterprises ensuring prevention of pollution (production of special equipment, eco-friendly cars, monitoring devices, ecological examination services); 2. Enterprises with resource – saving technology (recycling, alternative energetics, production of "ecologically safe" goods); 3. Enterprises carrying out environment improvement activities (creation of ecologically improved places in a city, design for institution and industrial enterprises); Institutions financing ecological education. The concept of "ecobusiness" was formulated in Keydanran Charter (Japanese entrepreneurial organization).

Ecological Architecture (archology) – a line of investigations which analyses interrelations of architectural (artificial) objects and environment, the influence of these objects on people's health; developing methods and techniques of building "ecological" constructions and settlements that combine the satisfaction of human needs and maximum concentration of "wild nature" as well as optimal sufficiency of artificial plantations around architectural objects and a variety of aesthetic architectural forms.

Ecological Certificate (of an industrial enterprise) – a document of technical norms that represents data shown as a system of indicators reflecting the level of using natural resources by an enterprise and degree of its effect on the environment [GOST 17.0.0.04-90].

Ecological Education – the processes and the result of acquiring systematic knowledge and skills in the area of society's effect on the environment and consequences of such changes. The term was introduced at the conference organized by the International Union of Nature Protection in 1970.

Ecological Ethics – the theory of what is **proper** in relations of man, his economic activity and nature based on internal self-evident normal principles.

Ecological Load – according to Schmid-Blick, the amount of various substances spent on the production (realization) of this or that product. Thus, the ratio of final product and gold ore is 1:350000 and, consequently, the "ecological weight" of a 10-gram gold ring only in terms of the ore spent (without considering the materials used to process it) is about 3 tons. Three billion tons of coal burnt in the world annually carry the ecological load of about 15 billion tons of slag and water, as well as 10 billion tons of carbon dioxide produced in the process of burning coal.

Ecological Potential – organic nature resources of a given area. In the natural-and-historical sense, the ecological potential determines the whole variety of organic and inorganic nature. Form the economic viewpoint it is a component of national wealth. Monetary assessment should be based on the cost of restoration of primary biological produce – the bulk of living matter created by green plants.

(A.N.Golitsin. Foundation of Industrial Ecology.

Moscow 2002. p. – 162.)

Ecological Weapons – physical, chemical or biological means degrading the health of enemy population by changing their environment. Ecological weapons can be of the meteorological kind (effect on weather, ozone screen), the ecosystem kind, including biological weapons (effect on biotic components).

Efficiency of Nature Management – 1. Ecological and economical efficiency of using natural resources and the environment (compared to the circulation of substances and economic means within society). It is essential to consider not individual forms of nature management which in some cases may be pseudo-non-profitable (e.g. creation of nature reserves), but their complex, undertaking appropriate simulation and calculations The calculation should be carried out on a long-term, not on a short-term basis, according to the current practice (30, 50 and 100 years). 2. Ecological, social and economic efficiency of measures of presentation of negative effect of economic processes on the quality of human

environment. It is determined by analyzing the causes and consequences of this effect on the quality of environment, the costs of preventing and liquidating damage causes by non-observance of ecological demands placed upon products, processes and by-products of production; the efficiency of capital investments in measures to protect the environment (GOST 24525.4-80).

Equilibrium in the "Society-Nature" System

1. The state of interaction between society and nature under which using the environment by the society does not damage life support functions performed by natural or transformed ecosystems. 2. Constantly changing ratio between natural resources, natural conditions and the degree of using and modifying them by man. It is determined by the development of scientific, technological and educational potential, the extent of using political levers. The equilibrium is dynamic, that is why it is called dynamic quasistationary (state).

Final Product – the net result of man's (society's) production activity that can be used in productive and individual consumption. It appears as a result of functioning of labour object-process-integrity.

Finished Product – the net result of various kinds of man's (society's) production activity that has not "passed" all the stages of labour object functioning (zero, primary and secondary).

Geoecological Examination – analysis and assessment of possible ecological consequences of construction or operation of an enterprise carried out by a specialist or a group of specialists (experts). There are state, departmental and public types of geological examination.

Geomorphology of Urban Territories – a new line of applied geomorphological investigations that systematizes knowledge of city settlement relief, the functional purpose of the settlements depending on geomorphological conditions.

"Gold Billion" Countries – a concept referring to the most developed countries of the world with a population of about 1 billion people (the USA, countries of Western Europe, Japan etc.) which consume the greater part of the planet's natural resources, the fact that contrasts their share in the world's population. The gap between the levels of well-being of 20 per

cent of the developed countries and 80 per cent of the backward ones is increasing. By the early 1990's it had reached the point of 150 times.

Green Consumerism – changing consumers' preferences for eco-friendly products, boycotting goods that pollute the environment. These factors force the market to reduce the "polluting" component of products and services. In order to develop green consumerism, it is essential that consumers should be informed of ecological characteristics of the goods they buy.

Green Zone of City – territory outside the city occupied with the forests, parks and other territories planted with trees and gardens. It performs protective, sanitary and hygienic functions and serves as a place of the population's rest (GOST 28329-89).

Hedonic Pricing – a kind of evaluating an established preference similar to the household production function. For this kind of assessment, market-oriented prices are used so as to establish prices of goods and services that are not assessed, e.g. the selling prices of similar houses, one with a beautiful landscape and the other without it, can be compared in order to define the value (price, cost) of the landscape.

Ecological factors like "pure air", "quiet" are taken into account in commercial exchanges on real market.

Helioelectric Power Station (alternative source of energy) – an electric power station using the energy of solar radiation. There are thermal power stations (those concentrating solar energy) and photoelectric ones (those operated by solar batteries).

Homeostasis - the condition of internal dynamic equilibrium of a natural system maintained by regular renewal of its basic structures, matter-and-energy composition and constant functional self-regulation of its components. Homeostasis is characteristic of and typical for all natural systems – from cosmic ones to an organism and an atom.

Information Theory of Value – the theory based on the assumption that it is not labour but knowledge (inventions, organizational improvements etc.) that represents the source of value. As working time is reduced and the role of productive working time is becoming smaller knowledge and ways of its practical application replace labour as the

source of surplus value. In this sense, labour and capital used to be the central variables in the industrial society while information and knowledge are becoming the crucial variables in the postindustrial society.

Irreversible Changes of Environment – changes in environment-forming components or their combinations that cannot be compensated in the course of natural restoration processes including natural succession. Changes in environment-forming components may be natural (change of geological epochs) and anthropogenic (construction of a cascade of water reservoirs on a river cannot be compensated by natural processes).

Landscape Design – a direction in landscape architecture that considers purposeful designing of fragments of landscape architecture environment including ways of changing natural objects according to certain rules (giving them object forms etc.) with a view to their better adaptation to man's needs.

Landscape Reclamation – complex of activities directed to the restoration of economic, medical, biological and aesthetic value of damaged landscapes. There are technical and biological stages of reclamation. The technical stage involves preparing lands for subsequent purposeful use in national economy. The preparation includes planning, forming slopes, removing, transporting and applying soils and fertile layers, construction of roads, hydrotechnical and meliorative structures etc. The biological stage comprises measures aimed at the restoration of fertility, which are carried out after technical reclamation, as well as a complex of agrotechnical, vegetative reclamation activities aimed at the restoration of biota.

Law of Economy (formulated by V.I. Vernadsky) – the algorithm of using the virtual chemical elements by living matter. The elements required for the survival of living matter pass a long sequence of stages within the organism; they enter into a number of compounds before they leave the organism and are lost for it. Living matter takes only the necessary amount of chemical elements from the outside avoiding surplus.

The manifestation of the law of economy can be observed in innumerable biological phenomena.

(Biosphere. V.I. Vernadsky. Thoughts and sketches. Moscow, 2001, pp. 74-75).

Living Matter – the total sum of the Earth's living organisms. It is only in living matter on our planet that we can see the beginning and the end. The number of natural bodies in it is infinite, and they constantly come into being and die in the succession of living matter generations, but in inorganic nature they can exist indefinitely long.

(Biosphere. V.I. Vernadsky. Thoughts and sketches. Moscow, 2001, pp. 37-38. V.I. Vernadsky. Naturalist's speculations. Space and time in organic and inorganic nature. Moscow, 1975. p.70.)

Living Space – average area per one individual of population. When human society is considered living space is the area necessary to meet the needs of one person under given social and economic conditions. For the developed countries of Europe living space is estimated to be 0.6-0.7 hectares; for the USA – 2 hectares; including 0.6 hectares for growing food, 0.4 hectares – for growing technical crops, 0.8 hectares for maintaining the quality of environment and recreation and 0.2 hectares for ensuring the urbanization effect (buildings, roads).

Man in his individual and social manifestations is naturally linked to the biosphere materially and energetically; the link is never broken and does not differ essentially from other biospheric phenomena. Man is a function of biosphere in its definite time and space.

(V.I. Vernadsky. Naturalist's speculations. Scientific thought as a planetary phenomenon. Moscow, 1977. p. 32.)

Humankind – "a powerful geological factor surpassing in its consequences tectonic movements". *Ibidem*, p. 42

National Strategy of Nature Protection – developing such strategies was suggested in 1980 and is vigorously supported by the International Union of protecting nature and natural resources. Their aim is to reveal urgent needs in the area of environment protection, to stimulate wide discussion of ecological problems in the country, to develop ecological consciousness and to serve as the basis for taking decisions to establish national priorities in the area of environment protection, to allocate

labour and financial resources, to create institutional potential for solving ecological problems.

Natural (source) – substratum possessing certain natural properties. Different levels of substratum organization (inorganic, organic, social) possess specific properties of activity and self-organization.

Natural-and-Social of the Object of Labour – determines the stages of functioning of the object of labour – zero (conditional, potential) and primary.

Natural (source) of the Object of Labour – material substratum on which man (society) can imprint efforts of living and dead labour.

Natural Machine (technology) – a special type of organization of a production process within the framework of which it becomes possible to use the potential of natural matter as means of labour along the lines programmed by man. (T.N. Sosnina. Object of labour. Philosophical analysis. Saratov. Saratov University publishers, 1976. Chapter II. п.2. T.N. Sosnina. Object of labour and contemporary society. Saratov. Saratov University publishers, 1983/ Chapter III. п.2.)

Non-economic Assessment of Natural Objects – defining ecological, hygienic, social, social-and-psychological, moral (cultural), aesthetic, religious and other value generally not expressed in economic indices.

Non-economic assessment of natural objects is calculated conventionally in money terms as the sum that the society can and will sacrifice to protect objects of nature.

Noosphere – biosphere passing into a new evolutionary state and processed by the scientific thinking of social humanity. Growth of scientific knowledge is the main geological force creating the noosphere.

(V.I. Vernadsky. Naturalist's speculations. Scientific thinking as a planetary phenomenon. Moscow, 1977. p.21, 35.)

Object of Labour – part of natural environment (biosphere) that has become the object of labour (psychophysiological, intellectual) efforts of man who, using means of labour transforms objects of nature into

products having productive (means of labour) and individual (means for living: food, clothing, habitation) functions.

Object of Labour – Process – reflects the making of the social in the natural, transformations of objects of nature in space and time. It records the stages of the naturally-social (zero, primary, object of labour).

Object of Labour Process – Integrity – reflects the sequence of functioning of an object of nature in a space-and-time interval "object of nature-final product" (object of nature; zero object of labour; primary object of labour; secondary object of labour; final product).

Object of Nature – part of natural environment, element of biosphere.

People's Building Ecology – the sum total of people's practical experience in creating ecological dwelling, furniture, household utensils convenient for rural settlements, in producing building materials of local raw materials. According to architects' calculations, peasant houses were from 8 to 10 times cheaper than modern cottages.

Besides, they were a lot warmer since their heating required 5-6 times less fuel. In conditions of large-scale cottage construction and production of local building materials knowledge of people's building ecology is taking on great significance.

Plant Abundance Scale – the number and projecting coverage of individual plants estimated by eye in marks. For example, Gult-Drude scale using an approximate magnitude of projecting coverage: 5 – very abundant (plants close with their overground parts); 4 – abundant; 3 – not abundant; 2 – few; 1 – very few (plants are solitary).

Population Grow Power Coefficient – an integral indicator proposed by UNESCO and WHO (World Health Organization) specialists and determined on the 5 – mark basis. It takes into account average life expectancy in the country, children's death rate, quality of products, share of budget expenditures on social and environmental programs. If the population grow power coefficient equals 1, the society becomes degraded (in the USSR in 1992 it was estimated at 1.4).

Primary Object of Labour – a specific combination of the natural and the social, of concrete and abstract labour, characterizes kind of

production where primary effect of man (society) on an object of nature takes place (mining, agriculture, construction).

Resource Saving in Construction – made up of several components: designing buildings, communications, planning and complex construction ensuring minimum expenditures on construction, operation or liquidation; creating resource – saving kinds of building materials, products and suitable technologies for making them; developing new resource – saving methods of designing structures and construction technologies; economic exploitation of buildings and structures. Perfecting norms of construction design is the most important line of creating economic designs ensuring resource saving.

Resource-Saving Technology – the total sum of successive production operations ensuring the production of finished and final product with minimum possible consumption of raw materials, water, air and other resources for purposes of production, as well as minimum possible consumption of fuel and other sources of energy.

River Pollution Index – ecological characteristic of a river dependent on suprobiciness indices and river length.

Secondary Object of Labour – a specific combination of the natural and the social, of concrete and abstract labour which characterizes the kinds of production in which the secondary impact of man (society) on an object of nature takes place (manufacturing).

Social (source) of the Object of Labour – material fixation of the efforts of living labour and labour substantiated in means of activity in an object of nature. The social source makes it possible to reveal common features of objects of labour that differ in their natural content and to separate them from objects of nature.

Social-and-Natural (source) of the Object of Labour – determines the stages of functioning of the secondary object of labour including its result – the final product.

Species – in biology, the basic structural and classification unit; the sum total of individuals possessing common morphophysiological indicators, capable of interbreeding and occupying a continuous or partly

broken natural habitat. The total number of species on the Earth is estimated at 1.5 to 5 billion.

Territory Sanitation – providing conveniences (constructions, infrastructure) for the life, work and rest of people (water supply, sewerage, planting trees and gardens etc.) on a territory; forming a cultural landscape with maximum regard for the peculiarities of natural landscape; man and his activity on the territory.

Urban Development on Ecology – using landscape peculiarities of a territory by architects when planning and building cities and their districts; allotting about 50 per cent of its area for parks, public gardens, school grounds planted with trees; distribution of multistoried and low buildings that would ensure good ventilation in the city. Cities are major sources of biosphere perturbation. It has been found out that to ensure survival and functioning on 1 square km of urban territory an average of 18 square km of forests, 50 square km of arable lands and 133 square km of sea aquatory is required, that is, to provide a city with products and raw materials a territory 200 times larger than the area of the city it self is required. To ensure the assimilation of city waste products by natural systems it is necessary to have an area 500-1000 times larger than that of the city.

Waste Treatment – a technological process aimed at destroying harmful components of waste products. There are various kinds of treatment: biological waste treatment means destroying harmful substances with the help of special cultures; thermal waste treatment means processing waste products at a high temperature of 600-1000^{o} C; physical waste treatment means the exposure of waste products to light, radiation etc.; chemical waste treatment means combining harmful substances of waste into chemically harmless substances.

Wasteless Production – a conventional concept serving to denote economic activity including manufacturing, agricultural and construction industry that practically does not produce waste products harmful for nature. Resource-saving production, or production with little waste, would be a more accurate term to denote this concept.

World Nature Charter – the document passed by the UNO General Assembly in 1982; in accordance with it basic natural processes (matter

circulation etc.) should be maintained at a relatively constant level and all forms of life should have the possibility to survive.

World Nature Strategy – the international document developed in 1980 by the International Union of Nature Protection with the support of UNO. It is aimed at humankind's managing and using biosphere, ecosystems and species in such a way that they could be of stable use for the present generation and, at the same time, would keep their potential so as to meet the needs of the future generations.

Zero Object of Labour (synonyms: conventional, potential) – a specific combination of the natural and the social which appears in the object of nature under the effect of intellectual kinds of activity (sphere of spiritual production).

IT IS USEFUL TO KNOW!

Constitution of the Russian Federation claims in article 2 that a man, his rights and freedoms are the highest value. Among the ecologic rights, in particular, there is the right on receiving reliable information about the state of the environment (article 42). This right gives an opportunity to realize other important rights: right for favorable environment, for compensation of the damage inflicted upon the health or property by the ecological infringement of the law.

Appearing of the idea of complex nature-protection legislation and its active development is connected with appearing of the Acts of nature protection in the Union Republics (1957 - 1963).

Practical implementation of codification of the Union and Republican Nature legislations took its way to adoption of nature-protection legislation (Principles of land legislation, as well as Depths legislation; correspondingly Land laws, Water laws, Forest codex, Air laws, Wild life laws).

The concept of transition to the stable model of development at the basis of which there was an idea of dynamic and balanced development of economics, nature and society, was developed in Russia. Russia's transition would be implemented in three stages:

– the first (1996-2000) – period of development of corresponding normative-legal base

– the second (2000-2015) – period of solution of the most actual economic and ecologic problems of the country;

– the third (till 2050) – period of noosphere formation, inside of which a man (a society) will live in harmony with nature.

The problem of warming of the climate is put forward on the first place. By 2100 the temperature will rise by 2°C (with difference from 1° up to 3.5°) It means that the climate will return back to its interglaciers state. If the greenhouse warming happens in XXI century, its rate will be disastrous for the biosphere!

During the first decades the climatic zones may remove to the north (in the northern semi sphere) up to 300 km, and forest and steppe biocenosis adapted to climate of the XXth century will appear to be in an alien environment, first of all according to the *conditions* of moistening, characteristic of soils and environment. It will be the strongest *stress for Biosphere*, for economy on the whole. *Nobody has researched the consequences of this stress yet.*

December 19, 1991, RSFSR "Environment-protection law" was passed.

The habitat of more than 1/3 of the Earth's fauna is at the border of disappearing because of the catastrophie temperature increase of lower layers of the atmosphere.

According to the calculation, Russia may be deprived of up to a half of its present forest; vast areas of coastal line will go under the water.

According to Montreal Protocol, emission of chlorfluorocarbons into the atmosphere has started decreasing. Restoration of ozone screen to the level of 1980 is expected to happen by 2050.

Solution of ozone problem is the example of the real success of humankind in the nature protection activity.

Assistants of Pennsylvania University designed the prototype of generator capable of generating electricity by means of dissolution of the sewer flows.

The principle of work of microbiological fuel element was taken from nature (reactions flowing in an installation are analogous to those that flow in every biotic organism during the food processing). According to the words of scientists, today the effectiveness of the given unit makes up 10% from the maximum possible effectiveness. Quite real may become the situation, when microbiological fuel elements will be able to generate about 51 kW of electricity from wastes being poured into sewer out of town with the population about 100000 people.

American scientists have come to the conclusion that genetically modified plants cause irreversible changes in nature. More than a half of products of nutrition already contain the changed DNA chains: modified genes penetrate into biotic organisms by means of pollination or through food and cause mutation. The scientists claimed that in several years normal, unmodified animals and plants simply will not exit. Already now, they may be written in the Red Book in America. For the beginning, scientists took probes of wheat and soya beans. The result surpassed all the worst expectations: from 50 to 83% of plants contained artificially changed DNA chain. Obviously spreading of the genes is going on without any control. The seeds get into environment by transportation, cross with normal grass and give posterity. According to the experts' opinion, the only chance to save the gene pool for future generations is to create the genetic bank, where the samples of natural nature organisms will be kept. They still exist // "Biotic Water" March, 2004 p.9.

The land resources of the planet may be considered as almost completely exhausted but with the essential difference in the regions.

Forest resources have been destroyed by 80% of the area of the forests, which covered the Earth in pre-civilization period- about 5-6 thousand years ago.

About 3.5 milliard hectares of forest grassland, half of them in tropics and about 50% of water- bogs areas are left in the world. Correspondingly about a half of famous species of animals are under the threat of disappearing.

Besides, catastrophic is the situation with the resources of fresh water on the Earth. Its consumption increased 6 times in the XXth century! About the 2/3 of the population of the planet lives in the areas, where the withdrawal of freshwater makes up from 20 up to 40% from the available resources. Besides, this reserve is being polluted quickly.

Many rivers of the former USSR have turned into a chain of eutrophication water reservoirs and have become successors of dirty water.

Information on UNEP (United Union Environment Program) report (GEO project).

Purely anthropocentrism understanding of the term “landscape resource” dominates in the society untill now. It is considered that all planets’ wealth such as mineral resources, territories, water reservoirs, animals, plants, microorganisms is “resources for a man”. Meanwhile “planets resources” have existed for billion of years before man’s appearance. It should be remembered!

In the USA the gross product from tourism organization is evaluated by the sum exceeding 50 billion dollars per year. Foreign tourism is constant and the most important item of profit in many countries. It is not so much developed in Russia.

In fact, production competitiveness is some kind of difference between its use value and value of acquisition. Both of them are subject to measurement by numerous methods and imply alternative of actions. You see this difference is equally being increased both by the increase of use value and by the decrease of the value of acquisition. Is the author right?

Yakovlev G.I. Methodological approaches to the definition of competitiveness of industrial enterprise // SSAU Vestnik 2003. № 1 p. 182.

It is recommended that EU countries should allot from 3 to 5 % of Gross Domestic Product (GDP) for nature-protection purposes. The system of ecological “green taxes” is being developed successfully; the program of actions on environment has been adopted.

The Netherlands with its numerous widely famous funds (World Nature Fund, club “The Earth’s friends’ and others) are the absolute leader on nature-protection activity.

Global ecological perspective-2000 UNEP report on GEO project // Green world special issue № 5-6 p. 28-30.

The American Council for an Energy-Efficient Economy published a rate of ecologically clean and ecologically dirty models of the cars. Three main criteria were taken into account by making up the rate: the amount of fuel, the amount of exhausted gases produced at engine operation, as well as their “quality” – the presence of substances contributing to destruction of the Earth’s layer and consequently the global warming.

According to the results of the tests, the cleanest models of cars were recognized the following: Honda Civic GX, Honda Insight, Toyota Prius (gasoline-electrical engine), Honda Civic Hybrid (gasoline-electrical engine) and Toyota Echo. The most harmful for environment were recognized such models of cars as Volkswagen Touareq, Land Rover Ranqe Rover, Ford Excursion, Dodge Ram and Lexus LX 470. It is curious that the most expensive models of cars do more harm to environment, since they are equipped with very powerful, but not efficient engines. Washington Profile reports about it.

Twenty million people in Russia experience the influence of the weighed substances with increased concentration and besides, among them 2,4 million people are undergone the effect of concentration, that

two times exceeds maximum permissible concentration. About 5.6 million people live under conditions of another spread contaminant- nitrogen dioxin whose concentration is constantly increasing because of the increasing quantity of auto transport.

Report on the development of human potential in the Russian Federation // Green World. №15-16. 2003 p.14.

Ecological influence of the cities upon the environment is observed from space very well. For example, the ecological “trace” of London 125 times exceeds the area of the city itself.

Because of continuous interrelation of civilization with the biosphere components, three main areas of destabilization of nature environment have been formed on the Earth: North-American (the USA with bordering regions of Canada and Mexico); European and South East Asian. The main mass of pollution is received from these centres where natural ecosystems have practically been destroyed: North-American and European areas give 1/3 of the world mass pollution, South-East-Asian area gives 1/6 part, moreover, the total amount of pollution is quickly increasing here.

At present, the economy subsystem already influences 63 % of land surface, human civilization consumes up to 40% of pure primary production of biosphere, only 10% of it is used directly for consumption and 30% are being destroyed at the same time.

April 24, 2001 “Nature-Protection and Natural Resources-Protection Law of Samara region” was passed by Samara State Duma.

Seven stages of ecological tension from very low up to very high are noted according to the degree of changing of natural environment.

The Volga-river region is related to areas with very high ecological tension. // Green world. №13-14. 2002. p.8.

The quality of water in the Volga-river basin on the whole, according to some complex estimations corresponds to the third class (water is characterized as “moderately polluted”).

More than 4.0 million cubic meters of solid domestic wastes are annually formed in Samara region.

All this rubbish is placed at about 400 dumps and covers more than 2.5 thousand of hectares of land.

The technological level of dwelling in XXI century is rather high (complete computerization and automation, the Internet, energy dependence and so on. However, for the normal existence a man should restore one more property of human dwelling, i. e. a natural link with nature. Earlier a house (a cave, a hut, a yurt, a tent, etc.) was connected with environment by natural manner (everything was taken from nature and returned back to nature).

No special integration mechanisms of man’s dwelling were required in local biocenosis. A house was made from local natural materials and was a natural nature formation itself: its life activity entered the natural cycles by natural manner. Today the link of man’s dwelling with nature is destroyed.

Transnational Corporations (TNC) are the most powerful organizations that have ever been created by a man with the purpose of colonization. Today corporations are forming a policy for the next generations in the process of adoption of business solutions.

Nature becomes like a subsidiary part of transnational corporation, which is necessary for making a profit only.

A vivid example of the relation of TNC to observance of human rights is the access to information about the influence of corporations on the environment.

Company materials being spread in public allow getting only some common impressions about type of their activity. Very often, the population does not have any imagination about Transnational Corporations at all and how they influence the state of the environment and population's health. TNC demonstrate real state of their affairs reluctantly, including nature-protection measures, surprising at true sizes of their profit. However, using their financial and information facilities, TNC don't miss a chance to make *an advertisement* and create *the image* of socially responsible firms. They implement various charitable actions and the information about these measures is widely advertised.

More willingly, TNC represent technical information that is understood by public least of all. This information is very difficult to disprove or confirm without special knowledge. Argumentation is very simple in this case: companies have advanced technologies; consequently, the population and the public have nothing to be afraid of. As an example see the web site of "ОКИОК" Company http://www.okioc.kz/rus.

The world globalization is being accelerated. The increase of extreme wealth and extreme poverty threatens humankind's stability and together with this the global environment.

An island of rubbish as big as Central Europe has been discovered in the Pacific Ocean. According to the German magazine "GEO", "the island" weighs about 3 million tons, it is six times more than amount of natural plankton. Plastic objects predominate among the rubbish.

According to the scientist's opinion, "the island" situated between California and Hawaii is formed by the circular ocean streams, which "pick up" the rubbish near Japan and the USA coasts and carry it into the centre of the ocean.

At present in Russia, about 200 kg of solid domestic wastes and 800 kg of industrial wastes come in average on one person per year. About 63% of wastes are valuable raw materials and could be used repeatedly.

Every biological species (and a man is not an exception) is able to live in quite narrow limits of that environment to which it is genetically accommodated.

If the habitat of life is changing quicker than adaptation or reformation of the species in a new formation may happen, the organism inevitably dies.

To democratize nature means to make it accessible for everyone. Right for nature is one of the basic rights of a modern person. The nature protection only is not enough. It is necessary to put forward a question "Who will use it?"

Sent-Mark F. Socialization of nature. M, Progress, 1997. p. 280.

One of the problems threatening humankind and recognized by UNESCO is biological illiteracy of the population, the lack of information in the nuts and bolts of biology. // Green world. №21-22. 2003. p. 7.

Samara forestrymen announced "a year of Genko" a man, who decorated a bare across Volga steppe with deep forests.

Nestor Karlovich planted the trees along the fields. The productivity of wheat fields had increased in the places where the forest was. Seven years ago Genko strips were given the status of nature monument of Samara Region.

Hand-made forest protected Bezenchuksky, Kinelsky and Krasnoyarsky districts from ravines and drought. Nestor Karlovich gave his preference to oaks. They are 100 years old now. Exactly so many years have passed since the date of death of the famous forestryman. // Biotic water 2004. №10 p.3.

The scientists of Canadian University in Hamilton could determine exactly enough how different factors influence the expectancy of people's life. It was found that it is extremely harmful to live near the main roads: people, who live near the roads with heavy traffic die 2.5 years earlier in average, than all the rest people and the risk of premature death makes

up 18%. In this case the same harm is done to the health as at heart diseases or diabetes. “Ageing effect”, connected with the transport pollution only a little bit lower than the effect connected with chronic diseases. // Biotic water 2004. №9. p.12.

Specialists from 49 countries will take part in international project on full investigation of the Earth. Thousands of geophysical parameters of the atmosphere, as well as the parameters of the ocean and the Earth’s surface will be obtained. Moreover, the main point is in the possibility of putting a great number of uncoordinated data in good order. As a result, a computer database will be created. It will be the fullest and the most convenient for use, the planet image with all the streams, winds, changing relief and so on.

The project will take 10 years. Agriculture and public health, emergency services and many other social institutes of different countries will get an access to the new and valuable information. // Biotic water. 2004. №10. p.11.

The scientists from Dublin University have discovered a bacterium, which is able to recycle toxic wastes of chemical industry into biodegradation plastic.

The chance of solving not only the problem of security has appeared, but the chance of making economical and social profit from wastes as well. // Biotic water. 2004 №10. p.11.

400 million tons of chemicals are annually produced in EU countries, but all industrial and domestic wastes have been undergone testing on toxicity in conformity with the up-to-date demands. Only 3% from a large amount of various powders, liquids and gels have certificates of quality.

30 000 titles are included into the list of testing of ecological purity. The European Commission suggested a new instruction that binds all the enterprises of chemical industry to implement testing of their production.

It is expected that the new law will enter its force in 2005. // Biotic water 2003 № 11 c.8.

Polluted atmosphere air is considered one of the most important factors provoking the development of stroke. Polluted air is especially dangerous in hot and dry weather. // Biotic water 2003 №11. p.9.

Has the Volga – the main river of Russia been drying up? V.Krivoshey, the chief of the department of domestic waterways of Ministry of Transport answered this question. He confirmed that already now the vessels cannot sail in some parts of the river. The project on building of hydropower constructions and dams the approximate value of which is 10 billion roubles has been developed for problem solution // Biotic water 2003. №11. p.2.

The territory of Volzsky basin becomes a seismic dangerous zone. The specialists of Privolzsky Department of Academy of Mountain Sciences have come to such conclusion.

Today Volzsky basin occupies 8% of the territory of our country, about a half of population of Russia live here.

Fifty percent of industrial potential is concentrated here including energetic and mining branches. Taking into account that the danger of technogenic catastrophe is real, its consequences may turn out completely unpredictable.

Such kinds of changes in the region of Volzsky basin are explained by the technogenic reasons, consequences of which are comparable with the action of the following natural factors: 1) manufacture of rocks, storage of wastes on a limited area, that leads to changes in upper layers of the Earth; enthetic pressure from 12 water reservoirs of Volzhsky-Kama cascade;
2) as a result of oil production numerous emptiness is formed in a crust // Biotic water 2004. №4. p.6.

Real support by the society of ecology-educational activity is one of the guarantees of conservation and protection of nature. Exactly the social associations are able to help essentially in ecology-educational activity and attraction of the public to the solution of the problems of nature-protection.

CONTENT

ИНФОРМАЦИЯ О КНИГАХ Т.Н. СОСНИНОЙ

INFORMATION ON THE BOOKS OF T.N. SOSNINA

Материальные потоки производства (теория функционирования): учеб. пособие. Изд-во Самарск. гос. аэрокосм. ун-та, 1997. - 243 с. (15,25 п.л.).

Автором предлагается развернутое изложение методологии процесса труда с анализом базовых экономических, экологических, эргономических, социальных, психофизиологических и политических его параметров.

Автор впервые, используя ряд инновационных приемов, рассматривает теоретические основы функционирования материальных потоков средств труда, предметов труда и живого труда с фиксацией срезов последнего на уровнях единичного субъекта труда, групповых производственных общностей разного типа сложности (малая, средняя, большая группы, отраслевая и межотраслевая общности, глобальные потоки). Компоненты процесса труда представлены в виде 26 базовых моделей с учетом статического и динамического состояний, одномоментных и разномоментных, природных и социальных, качественных и количественных, внутренних и внешних, горизонтальных и вертикальных их характеристик.

Аргументируется вывод об уникальности свойств потоков предмета труда, субстрат которых в интервале «предмет природы – конечный продукт» непрерывно, последовательно, в полном объеме фиксирует плюсы и минусы производственной целеполагающей и целереализующей деятельности, суммарное ее влияние на состояние биосферы и социума.

Книга может служить учебным пособием для подготовки и обучения специалистов административно-управленческого профиля, организаторов производства, аналитиков-прикладников, занимающихся стратегическим и тактическим планированием, прогнозированием развития производств, а

также студентов философских, экономических, технических, социологических и географических факультетов.

Material streams of manufacture (the theory of functioning): Study guide – Published in Samara State Aerospace University, 1997. – 243 p. (15,25 p.s.).

The author offers the developed statement of methodology of process of work with the analysis of basic economical, ecological, ergonomical, social, psychophysiological and political parameters.

The author, using a number of innovative receptions, for the first time ever, considers theoretical bases of functioning of material streams of means of work, subjects of work and real work.

The author is fixing cuts of real work at levels of the individual subject of work, group industrial community with different type of complexity (small, average, greater groups, branch and interbranch community, global streams).

Components of process of work are presented in 26 base models in static and dynamic conditions, influenced by various natural and social, qualitative and quantitative, internal and external, horizontal and their vertical characteristics.

The conclusion about unique nature of streams of a subject of work, which substratum in an interval “subject of the nature - an end-product” continuously, consistently, in full fixes pluses and minuses of industrial activity, its total influence on a condition of biosphere and society.

The book can serve as the study guide for experts in management, manufacture planners, the analysts, engaged in strategic and tactical planning, forecasting of development of manufactures, and also for students of philosophical, economical, technical, sociological and geographical faculties.

Словарь трактовок понятия «информация» (обучающего типа): учеб. пособие Т.Н. Соснина, П.Н. Гончуков; Самарский

государственный аэрокосмический университет, Самара: 1998, 212 с. (13,25 п.л.).

Словарь включает 700 трактовок понятия «информация», используемых в различных отраслях знания: математике, информатике, логике, статистике, философии, лингвистике, экономике, эргономике, менеджменте, маркетинге, юриспруденции, биологии, экологии, географии, психологии, политологии, этике, эстетике и т.д., что позволяет читателю ознакомиться со значением данного термина не только с позиции индивидуально-профессионального интереса, но и с точки зрения широкого спектра семантических вариантов, используемых современной лексикой.

Учебное пособие создавалось с целью отработки на примере данного словаря навыков самостоятельной работы со всеми другими видами справочной литературы.

Словарь позволяет адекватно оценивать значение понятия «информация», статус которого постоянно обогащается и конкретизируется специалистами различных школ и профилей деятельности.

Книга рассчитана на преподавателей и студентов. Она полезна всем, кто интересуется проблемами информатизации общества.

Dictionary «Treatments of “information” (training type): Study guide. Under the editorship of T.N. Sosnina, P.N. Gonchukov; Published in Samara State Aerospace University, Samara: 1998, 212p. (13,25 p.s.).

The dictionary includes 700 treatments “information”, used in various branches of knowledge: mathematics, computer science, logic, statistics, philosophy, linguistics, economy, ergonomics, management, marketing, jurisprudence, biology, ecology, geography, psychology, political science, ethics, aesthetics, etc. This book allows the reader to familiarize with meaning of the given term not only from a position of individually-professional interest, but also from the view of a wide spectrum of the semantic variants used by modern lexicon.

The book was created in the purpose of working off on an example of the given dictionary of skills of independent work with all other kinds of reference books.

The dictionary allows to estimate the meaning of “information”, the status of which is constantly enriched and concretized by experts of various schools and structures of activity.

The book can serve as the manual for teachers, students and everyone who is interested in problems of informatization of a society.

Социальная экология и здоровье человека (социологический аспект): учеб. пособие Т.Н. Соснина, М.Э. Целина; Самар. гос. аэрокосм. ун-т. Самара, 1998.116 с. (7,25 п.л.).

Рассмотрен комплекс проблем, связанных с состоянием здоровья человека в социально-экологическом его измерении. Дается анализ медико-экологической и социальной информации о состоянии системы «человек-общество-природа» и возможных тенденциях ее развития, определяются факторы, влияющие на здоровье человека.

В социологическом ключе рассматривается специфика взаимосвязи биологических и социальных систем, обоснована необходимость «включения» в сознание современного человека биоэтической составляющей.

Учебное пособие может быть использовано при изучении таких дисциплин, как философия, социология, экология. Книга будет полезна всем, кто интересуется проблемами собственного здоровья и качеством среды обитания человека.

Social ecology and health of the person (sociological aspect): Study guide. T.N. Sosnina, M.E. Tzelina; Published in Samara State Aerospace University, Samara: 1998, 116 p. (7,25 p.s.).

The author considers the complex of the problems connected with a state of health of the person in its socially-ecological measurement. The analysis of the medical, ecological and social information about condition of system “the person-the society-the nature” is given, possible tendencies of its development, the factors influencing health of the person are defined. Considers, in a sociological key, the specificity of interrelation of biological and social systems and necessity of inclusions in consciousness of the modern person of a bioethical component is proved.

The manual can be used in studying such disciplines, as philosophy, sociology, ecology. The book will be useful to everyone who is interested in problems of own health and quality of an inhabitancy of the person.

Из урока в урок… изо дня в день: методическое пособие по экологии для учителей младших классов общеобразовательных школ Т.Н. Соснина, Г.С. Семдянова; Самар. гос. аэрокосм. ун-т, Самара, 2001, 91 с. (5,75 п.л.).

Предложен вариант методического обеспечения экологического образования и воспитания учащихся младших классов средних школ, в основу которого положен принцип технологических цепочек вертикального, горизонтального и диагонального типов.

Методический подход дает возможность в рамках существующих учебных программ последовательно и результативно реализовать из урока в урок, изо дня в день экологическую составляющую без отведения на эти цели дополнительных часов.

From lesson to lesson…day by day: the Methodical grant on ecology for teachers of elementary grades of comprehensive schools T.N. Sosnina, G.S.Semdyanova; Samara State Aerospace University, Samara, 2001, 91 with. (5,75 п.л.).

The author offers the methodological support of ecological education of pupils of elementary grades of high schools which is based on the principle of technological chains of vertical, horizontal and diagonal types.

The methodical approach enables within the limits of existing curriculums consistently and productively realize from a lesson to lesson, day by day an ecological component without assignment on these purposes of additional hours.

Биосфера (анализ стоимостных параметров). - Изд-во Самарск. гос. арх.-строит. ун-та, 2004. -195 с. (10,75 п.л.).

Анализируются стоимостные параметры биосферы, с учетом качественно-количественных характеристик. Предлагается вариант интерпретации стоимостной оценки процессов деформации живой и неживой природы под воздействием антропогенной деятельности с позиций закона бережливости В.И. Вернадского, анализируются пути сохранения потребительно-стоимостных и стоимостных свойств биосферы.

Обоснована целесообразность трансформации двухкритериальной теории стоимости, основу которой составляют учет издержек по производству продукта и оценка его полезности, в трехкритериальную теорию баланса стоимости, где экологическая составляющая выполняет функцию ключевого критерия.

Книга рассчитана на преподавателей, аспирантов, студентов. Она полезна всем, кто интересуется социально-экономическим проблемами экологии.

Biosphere (the analysis of cost parameters). Published in Samara State Aerospace University, 2004. – 195 c. (10,75 п.л.).

Author analyzes cost parameters of biosphere, in view of is qualitative-quantitative characteristics. The variant of interpretation of a cost estimation of processes of deformation of the alive and lifeless nature under influence of anthropogenous activity from positions of the law of thrift of V.I.Vernadsky Is offered. The ways of preservation of consumer-cost and cost properties of biosphere are analysed.

The expediency of transformation bi-criterial theories of cost which basis makes the account of costs on manufacture of a product and an estimation of its utility, in three-criterial theory of balance of cost where the ecological component carries out function of key criterion is proved.

The book will be useful for teachers, post-graduate students, students. It is useful to everyone who is interested in social and economic impact on ecology.

Стоимость: историко-методологическое исследование. Самар. гос. аэрокосм. ун-т, Самара, Изд-во СНЦ РАН, 2005. -396с. (24,75 п.л.).

Автором проведено историко-методологическое исследование интегральной природы стоимости, начиная с доклассического периода и завершая современными ее интерпретациями. Аргументируется вывод о целесообразности перехода к трехкритериальной теории стоимости, где используется методологический инструментарий теории трудовой стоимости и теории предельной полезности в контексте экологической составляющей.

Акцентируется внимание на проблемах отечественного образования с учетом кризисного состояния мировой экономической науки и задач российской высшей школы.

Учебное пособие предназначено для студентов, аспирантов, преподавателей, научных работников, всех, кто стремится приобрести знания в области экономической истории и методологии.

Cost: historically-methodological research. Samara State Aerospace University, Publishing house SNTS of the Russian Academy of Science, 2005. -396 c. (24,75 п.л.).

Author carried out historically-methodological research of the integrated nature of cost, from preclassical period to its modern interpretations. The conclusion about expediency of transition to three-criterial theories of cost where the methodological toolkit of the theory of labour cost and the theory of limiting utility in a context of an ecological component is used is given reason.

Author focuses on problems of domestic formation in view of a crisis condition of the world economic science and problems of the Russian higher school.

The manual is intended for students, post-graduate students, teachers, science officers, everyone who aspires to acquire knowledge in the field of economic history and methodology.

Продукты природы и общества: сравнительный анализ / Т.Н. Соснина – Самара: Изд-во Самар. гос. аэрокосм. ун-та, 2007. – 218 с. (13 п.л.).

Исследуются основные параметры продуктов естественной и антропогенной (искусственной) природы: генезис, эволюция, поэлементный состав, феномен «раздвоенности» субстратной основы.

В качестве альтернативных рассматриваются постулаты био-логистики и производственной логистики, предлагаются варианты инновационного их прочтения с позиций теории предмета труда.

Научное издание предназначено для студентов, аспирантов, изучающих теорию жизненных циклов продукта, инновационный менеджмент, логистику, теорию и практику управления, экологию, концепцию современного естествознания, философию, географию, политологию, геополитику.

Products of the nature and society: the comparative analysis / T.N. Sosnina,. Samara: Publishing in Samara State Aerospace University, 2007. – 218 c. (13 п.л.).

Key parameters of products of the natural and anthropogenous (artificial) nature are analysed: genesis, evolution, elemental structure, a phenomenon of bifurcation of substrat bases. As alternative bio-logistics and industrial logistics postulates are considered, variants of their innovative perusal from positions of the theory of a subject of work are offered.

The scientific edition is intended for students, the post-graduate students studying the theory of life cycles of a product, innovative management, logistics, the theory and practice of management, ecology, the concept of modern natural sciences, philosophy, geography, political science, geopolitics.

Стоимость: экономический, экологический, социальный аспекты. Научное издание. Т.Н. Соснина: Самар. гос. аэрокосм. ун-т, Самара. Издательство СНЦ РАН, 2008.- 428 с. (26,75 п.л.).

Феномен стоимости продукта труда анализируется в триедином его качестве как органическое единство экономической, экологической и социальной составляющих, что позволяет выявить основные параметры теории баланса стоимости, использующей методологический инструментарий теории трудовой стоимости и теории предельной полезности с учетом экологических измерений.

Экономический аспект потребительной стоимости и стоимости продукта раскрывается с учетом специфики функционирования «простых моментов» процесса труда (живой труд, средства труда, предмет труда), включая «пограничные» их состояния. Дается обоснование оптимальной потребительно-стоимостной и стоимостной модели процесса труда сфер материального и духовного производства, аргументируется практическая роль сквозной паспортизации параметров потребительной стоимости и стоимости как регулятора контактов «поставщик – потребитель».

Экологический аспект потребительной стоимости и стоимости продукта исследуется в контексте антропогенных процессов, разрушающих биосферу Земли. С позиций закона бережливости В.И. Вернадского рассматриваются варианты сохранения потребительно-стоимостных параметров среды обитания и производственной деятельности человечества.

Социальный аспект потребительной стоимости и стоимости продукта раскрывается в трех качественных состояниях: психофизическое, интеллектуальное и духовное воспроизводство совокупного социума (индивида).

Издание предназначено для студентов, аспирантов, научных работников, всех, кто стремится приобрести знания в области экономической теории и методологии, кто открыт к «общению» с гуманитарными, естественно-научными и техническими отраслями знаний в нетрадиционном, синкретичном их качестве, позволяющим мобилизовать совокупный потенциал науки для познания сложного междисциплинарного объекта - системы «природа-общество-человек».

Cost: economic, ecological, social aspects. The scientific edition. T.N. Sosnina,. Samara: Publishing in Samara State Aerospace University. Publishing house SNTS of the Russian Academy of Science, 2008.428 with. (26,75 п.л.).

The phenomenon of cost of a product of work is analyzed in its triune quality as organic unity of economic, ecological and social components that allows to reveal key parameters of the theory of balance of the cost using methodological toolkit of the theory of labour cost and the theory of limiting utility in view of ecological measurements.

The economic aspect of consumer-costs and costs of a product reveals in view of specificity of functioning of simple components of work process (real work, means of work, a subject of work), including their boundary conditions. The substantiation of optimum consumer-cost and cost model of process of work of spheres of material and spiritual manufacture is given, the practical role of through certification of parameters consumer costs and costs as regulator of contacts is “supplier – consumer”.

The ecological aspect of consumer costs and costs of a product is analyzed in a context of the anthropogenous processes destroying biosphere of the Earth. From positions of the law of thrift of V.I.Vernadsky variants of preservation of consumer-cost parameters of an inhabitancy and industrial activity of mankind are considered.

The social aspect of consumer-costs and costs of a product reveals in three qualitative conditions: psychophysical, intellectual and spiritual reproduction of cumulative society (individual).

The edition is intended for students, post-graduate students, science officers, everyone who aspires to acquire knowledge in the field of the economic theory and methodology who is opened for humanitarian, natural-scientific and technical branches of knowledge in their nonconventional, syncretical quality, allowing to mobilize cumulative potential of a science for knowledge of complex interdisciplinary object – systems.

Scientific edition

SOSNINA Tamara Nikolaevna

BIOSPHERE

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