

# New Doctrine: Ecological Infrastructure With Ecologization

***Ecological infrastructure with all-embracing ecologization can be basis of guaranteeing of high quality life environment***

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**Abstract**—New doctrine about “ecological infrastructure” was created in view of necessity of improving of polluted city environment [2]. New notion “ecological infrastructure” includes the all-embracing complex of all natural resources (minerals, atmosphere, hydrosphere, lithosphere, and biosphere), artificial constructions and systems, socio-economic and socio-psychological medium, providing a support of environment of human life at all levels - from the whole country up to cities, to separate buildings and engineering constructions. High-quality ecological infrastructure must be created on Earth for possibility of creation of healthy environment, taking into account necessity of preservation of nature, flora and fauna, of ecological equilibrium, and of natural evolution. New concept of ecological infrastructure can be basis of guaranteeing of high quality life environment on Earth in future healthy cities. Ecological infrastructure includes interactive among themselves completely natural environment, quasi-natural cultural environment, artificial technical environment of cities, socio - psychological and socio - economic medium.

**Keywords**—*ecological infrastructure; natural environment; quasi-natural cultural environment; artificial environment; all-embracing ecologization*

## I. INTRODUCTION

Ecological infrastructure is wide evolving complex of natural, natural-anthropogenic, and completely artificial objects and systems, providing the conditions of preservation of the environment of human life in cities and larger territories [2-6]. Living environment is a dynamic social-ecological subsystem of natural and artificial objects and phenomena, factors of material and spiritual culture, including natural, technogenic, socio-psychological and socio-economic that interact among themselves and with the internal human environment. The space environment and the internal environment of the planet influence on environment of life of nature and human; the internal environment of the human body also is environment of life. This extended interpretation of life environments allows creating a more objective presentation of them. Factors of ecological (environmental) infrastructure evolve along with the evolution of the planet, interact with each other and with humans and affect the living environment (fig. 1).

Ecological infrastructure is fundamentally different from the known (traditional) infrastructure (table 1). Traditional infrastructure includes the production and social infrastructure, as well as sometimes the natural resources, the living conditions of society. All these components can be included in the environmental infrastructure, provided their ecologization [6].

Following components of ecological infrastructure maintain, restore, and provide environment of human life in both urban and rural settlements and large territories:



Figure 1. The living environment: 1 - space; 2 - global; 3 - distant; 4 - neighbor; 5 - nearest (house); 5a – internal environment of the body

- Positive living environment and a safe space and global environment. -Environmentally well-founded volume of all natural ingredients of natural landscapes: the atmosphere, the lithosphere, the hydrosphere, and the biosphere. -Environmentally well-founded complex of natural protected territories - reserves, national and natural parks, green areas, protective forests, etc. - Ecological, wasteless, «soft» technologies and systems of construction, industry, energy, transport, agriculture, water, forestry, farming, waste disposal, etc. - Ecological civil (residential and public), and manufacturing (including agricultural) buildings; Nature restoring and nature regenerative buildings and structures. - Clever («intellectual») buildings, cities. -Harmonious, beautiful and comfortable architectural and physical environment of the city. -«Elastic» socio-ecological

systems of cities and countries. -The system for the maintenance of the ecological balance with environmental zoning of territories. -Buildings, enterprises, institutions, warning and eliminating adverse natural phenomena and social discomfort, regulating environmental situations (monitoring system, quality management environment, cleaning, etc.) (tab. 1).

Table 1

Ecological infrastructure

Near and far space environment, objects and phenomena	Global Earth environment, natural environment, resources	Cultural nature	Artificial environment with entropy and negentropy objects	Internal environment of the human body
Objects and phenomena of space influencing on living environment	Saved by 2/3 of the planet's natural resources and nature	Eco-logically well-founded area of cultural nature in cities	Traditional infrastructure with its deep ecologization	The needs influence on internal healthy environment of the organism
Resilience socio-ecological systems of cities and countries				
Socio-economic environment				
Socio-psychological environment				

Maintenance of the living environment also may be provided by elements of traditional infrastructure, after their system ecologization: - Natural resources, including (especially) renewable energy. - Production and delivery system. - Removal and recycling system. -Energy, transport, communications, roads, etc. -The provision of materials and manufacturing processes for environment (water, air, temperature, etc.). -Buildings and engineering structures, transporters, warehouses, etc., to ensure the flow of production processes. - The state of society, the absence of a crisis, ensuring environmentally friendly needs of cities and countries. -Ecological ethics and esthetics, human ecology. -Ecological settlements to ensure urgent (priority) and all other well-founded needs.

It is interesting similarity and difference between concepts of ecological infrastructure and of living environment. The similarity consist in that several components of the ecological infrastructure, supporting high quality living environment is both factors of this living environment: they are parts of nature and cultural nature, they are human living environment. Natural and cultural environment help to support in building a high-quality living environment, at the same time, they are life environment. All the elements of traditional infrastructure must be ecologically to enter

as components in ecological infrastructure. The ecologization is necessary for industrial and residential buildings, engineering structures, other components of the artificial environment of the city and the country. All human thinking and activities must be ecologically well-founded [1-6]. The first is environmental education, knowledge of laws of ecology, environmental philosophy and ethics, the second is the ecologization of the material culture, created to meet human needs, the foundation of which served and serves the nature (materials, energy, landscapes, etc.).

A persons as a species can exist and develop only in a healthy natural environment of life on Earth [1, 2]. This provision makes as very important task of creating high-quality ecological infrastructure, and reduces the negative trends of technological evolution. The role of ecological infrastructure as the basis for the preservation of life, as the foundation of «sustainable» ecologically supports development is paramount. This provision is particularly important, as adopted by the UN program «Sustainable development» («Agenda-XXI») is not realized.

The downside of the ideology of «sustainable development» is that it orients the humanity first of all on development; this is a development that withstands the nature, rather than preservation of nature and environment, vital man, without which it would not be able to survive. The concept of «sustainable development» is controversial, and the sustainable development, apparently, is unattainable. Therefore, it seems logical replacement of “sustainable development” concept on “preservation, restoration and maintenance of high-quality living environment on the basis of broad environmental infrastructure”, which will allow environmentally soundly oriented thinking and actions of citizens for a solution the most important problems of preservation and restoration of the living environment.

The unique biologically well-founded place of humankind is Earth; its environment is the only acceptable and favorable environment for humanity. Ecological infrastructure options may be realized only under conditions required «resilience» the living environment as a socio-ecological subsystem, which is provided by its ability to adapt in a changing World. «Resilience» living environment that includes ecological and social components is its ability to return to its original state after the changes under the influence of negative factors, the ability to withstand internal and external exposure without changing the basic functions.

Artificial and cultural environment of the city include buildings and structures along with climate of the city, cultural nature and elements of the natural environment, preserved in the city. In addition to these environments a man are in material and spiritual cultural environment that includes all created by the man, his national and ethnic characteristics, knowledge, abilities, skills, level of intellectual, ethical and aesthetic development, norms of morality and right, attitude to nature, etc. Many of these environments overlap and

interact (fig. 2). This complex composition of human living environment must ensure ecological infrastructure.

Ecological infrastructure serves to conservation and ensuring environmentally sound environment quality of life as the at all levels, from the whole country to the cities and individual buildings and engineering structures. Ecological infrastructure in scale of the country is interoperable between a developed and natural territory, the ratio of which must be environmentally justified to maintain homeostasis and the ecological balance; necessary combination of natural protected areas, ecological territory framework and ecological corridors, large technological systems of traditional infrastructure, renewable energy and renewable natural resources, monitoring system. Ecological infrastructure in the scale of the city is the ecological production and social infrastructure, ecological framework city and green corridors, soil-vegetative layer, ecological, smart and multifunctional buildings, phyto-melioration system, permaculture, ecologically restored landscapes and ecologically reconstructed buildings, a supportive healthy urban environment, favorable conditions of life.

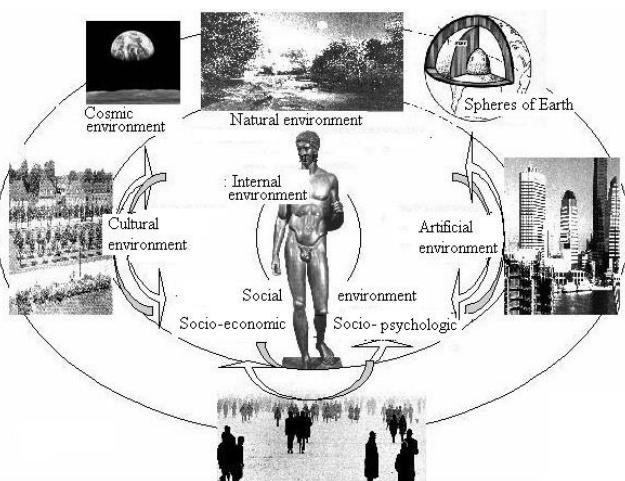


Figure 2. Composition of the living environment

The material basis of the formation of cities social environment serves the quality of life in the cities: the creation of a harmonious and beautiful city, upbringing a love for the city, the construction of residential houses with high quality living environment, ecological blocks in cities, maintaining communication and security, environmental services, environmental education and training, environmentally-support design and construction. In terms of infrastructure, include environmental building materials, energy-saving and energy-active buildings, reducing system, storage and processing of wastes. Ecological infrastructure includes ecological and economic monitoring, geographic information systems, environmental assessment, indicators supporting development, environmental assessment and monitoring of the building complex. Ecological infrastructure does not include negative objects of traditional infrastructure (fig. 3).

Nature retreats under anthropogenic influence; researchers propose only one way to restore the ecological balance and the natural environment: to reduce the area of anthropogenic modified and built-up land, return a significant part (about a third used land) «mastered» and the contaminated areas in the natural state. Such return is not possible in condition of perceived growth of urbanized territories and increased the number of humanity. However, in our opinion, this return may be replaced an «elastic», «sustainable», high-quality ecological infrastructure at all levels, integration of urban areas, environmental preserving and nature conservative, nature restoring building, biopositive reconstruction of settlements, buildings and engineering structures that will create a fundamentally new biopositive city and separate objects, related nature, not detached nature and included in natural



ecosystems.

Figure 3. Traditional infrastructure is negative for the life of the city without its ecologization

Ecologization is an hierarchical system (from global up to local) of knowledge, actions and decisions of ecological education; of preservation of the life environment; of maintenance of ecological equilibrium; of reduction of negative influences of human activity on the natural environment; of gradual transition to the positive interaction directed on preservation and restoration of nature and environment of life, with use environmentally safe and nature restoring methods of managing, with increase of efficiency of use of resources and primary consumption of renewable resources, with gradual transition to negentropic technologies [2-7]. Author would like to propose basic actions of ecologization:

1. Recognition of necessity of conversion to dependable balancing development with guaranteed survival of humanity and nature.
2. Acceptance by the states of the uniform "Agenda-XXI" with decisions concerning survival of humanity and nature in conditions of new global challenges and new negative influences.
3. Acceptance by the states of the uniform basic laws directed on constant democratic changing of governments and on constant their renovation.
4. Acceptance by the states of the uniform basic laws directed on exception of excessive riches and poverty, on equal access of inhabitants of planet to all resources, on equality of rights.

5. Recognition of negative role of excessive riches in development of world (greedy rich people will spoil our planet).

6. Acceptance by the developed states of the uniform basic laws directed on exception of unfounded rapid growth of needs in developed countries; reduction of ecological footprint and its leveling in scale of planet.

7. Deep recognition and consensus about real ecological ways of World development: constant economics growth or gradual conversion to zero economic growth and to reduction of speed of development for preservation of nature, resources and humanity.

8. Global analysis of presence of vitally important resources necessary for survival of humanity (carbohydrates, drinking water, forest, etc.).

9. Consensus about decision of problems of access to vitally important World resources of all humanity.

10. Global analysis of possibility of exception of terrorism owing to guaranteeing of equality of rights, exception of poverty, respect for all religions, etc.

11. Creation of well-founded (foolproof) ecological infrastructure with all-purpose ecologization of all activity in cities and countries. Creation of negentropic technical sphere. Analysis of optimum allocation of cities and people on territory of planet.

12. Acceptance by the states of the uniform international sanctions for pollution of nature and exhaustion of resources.

13. Decision of problems of preservation of races and nationalities. Maintenance of equivalent development of separate races and nationalities.

14. Liquidation of excessive arms. Interdiction on creation of excessively effective arms. Ecologization and reduction of arms, elimination of nuclear armaments, prohibition of wars is of fundamental importance as elimination of absolutely entropic objects (fig. 4).

15. Acceptance of global interdiction on large-scale meddling in nature and in humanity, which can be inadmissible for nature and for person.

All-purpose ecologization is the wide and deep system, which is directed on support of ecological equilibrium, on preservation and restoration of the nature, on use of environmentally safe and restoring methods of managing, on improving of all built environment. The important part of the ecologization is achievement of ecologically well-founded parity between the transformed and natural territories.

Maintenance of the healthy environment of life, unconditional preservation of necessary volume of the natural environment and the ecologization of other environment of life which cannot be left in a constant condition in view of its constant transformation, are possible only at knowledge of the major ecological postulates explaining evolution of the nature and feature of interaction with it of the person. Achievement of harmony in interaction with the nature, the ecologization of thinking and activity should be based on

knowledge of laws of development of the nature, its reaction to influences of the person. All-purpose ecologization of thinking and activity must be critical goal of humanity. Quickly proceeding anthropogenic evolution becomes more and more pernicious for nature of planet. This evolution has resulted in deviation of nature and in appearance of attributes of global ecological crisis. The complex of problems, negative for the person and for nature, quickly grows. The prospective reason of irrational mutual relation of the person with nature consists in the phylogenetic features of thinking caused by a complex structure of a brain. Unique way of correction of this situation is transition to deep, universal ecologization of thinking and activity of the person, and to ecologization of the broken nature.

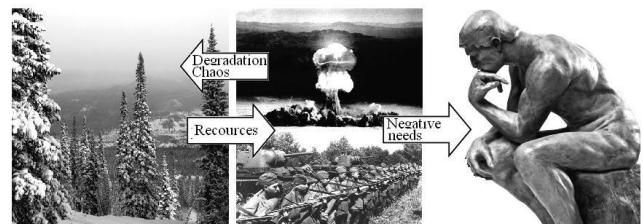


Fig. 4. Absolutely entropic wars and arms

Basic conception of all-purpose ecologization. Major unsolved (or insoluble) and very difficult problem of interaction of the person with nature, which demands of universal ecologization, is distinction of the majority of the artefacts and of natural objects. This distinction consists in entropy of overwhelming majority of the artificial decisions (fig. 5), and in negentropic nature.

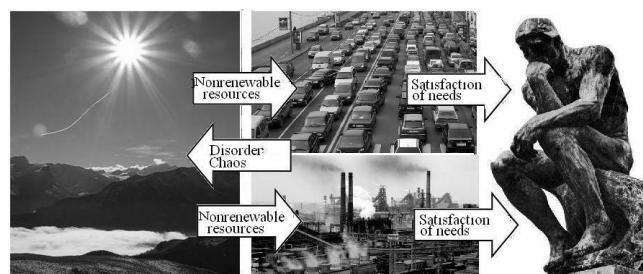


Fig. 5. Entropy of artefacts

The wildlife resists to entropy. In cooperating system «humanity - nature» is necessary to reach convertibility of processes to not raise a level of entropy. Opposition of entropy is negentropy, regulation and organization of system. The animate organism struggles with environmental chaos by the organization and ordering, importing negentropy. Therefore, it is possible to explain behavior of self-organizing systems. Property of animate systems to resist to irreversibility of natural processes is negentropy. It concerns animate systems, which are more ordered, and are more certain in comparison with systems of a lifeless nature, including with the artificial world (the majority of artefacts), the created person. Basic difference of objects of wildlife from the majority of tech-

nical objects and technologies is negentropy of animate nature.

All animate nature has sharp distinctions as highly organized systems. Self-organizing and self-control of natural systems are directed on achievement of equality to their zero-entropy, at relative invariance of subsystems and надсистем. For maintenance of convertibility of processes, there were mechanisms of self-control, including hierarchy of natural systems.

The majority of the technical artefacts exist for the account of big downturn of a level of organization of environment [1]. It is possible to note the attributes of natural objects, which testify about negentropy [2 - 6] (tab. 2).

Table 2

Comparison of natural negentropic objects and artificial objects

Homeostatic negentropic wildlife (flora, fauna)	Artificial objects
Maintenance of homeostasis	Now all artefacts are entropic objects. The first artificial objects was practically negentropic (the tame animals for receipt of food and other resources, wood dwelling, wood boat, the horse as an vehicle, fields for cultivation of food, a bee as «factory» of honey, etc.)
High level of the organization	
Natural materials	
Consumption only renewable resources	
Consumption of resources in view of resource potential of territory	
Existence in limits of «niches»	
Element structure (basically «easy elements»)	
Convertible processes, circulations of substances	
Non-interference in nature	
Granting of «niches» for flora and faunae	
Participation in various forms of symbiosis and antibiosis	
Entering into nature only waste products acquired by the environment	
Natural wastelessness	
Sensory ecological compatibility	

Author proposes seven levels of all-purpose ecologization:

First level: ecologization of thinking, education and upbringing:

1. Ecologization of thinking. Creation of all-purpose continuous system of ecologization of thinking: ecologization of city environment, of all activity in cities, of social, psychological and economical needs

2. Ecologization of education. Creation of all-purpose continuous system of ecological education; ecologization of all educational courses, of all educational buildings

3. Ecologization of upbringing. Creation of all-purpose continuous system of ecological upbringing

Second level: ecologization of spiritual culture:

1. Ecologization of philosophy, ethics and rules. Creation of new philosophy of plurality

2. Ecologization of art. Support of natural kinds of art

3. Ecologization of science. Support of humane and ecologically well-founded science; support of negentropic direction in science

Third level: ecologization of all landscapes components:

1. Restoration of air quality. Enactment of «Air's code»; control of air pollution; improvement of quality standards; deep cleaning system; liquidation of dangerous pollutants; phytomelioration; townspeople needs ecologization; ecologization of townspeople activity

2. Restoration of drinking water quality. Enactment of «Water's Code»; enactment of program «sustainable consumption of water»; program «Water's saving»; reduction and stoppage of water pollution; collection of rainwater from hard covers; ecologization of townspeople activity

3. Restoration of soil's quality. Enactment of «Soil's code»; restoration of natural soil's quality; introduction of ecological microelements and other ecological additions; phytomelioration; construction of biopositive buildings and engineering structures (deliverance of soil-vegetable stratum from construction, introduction of soil-vegetable stratum in roofs and walls surfaces); biopositive reconstruction of buildings and city; biopositive restoration of city landscapes; ecologization of townspeople needs and activity

4. Restoration of flora and fauna. Enactment of «Flora and Fauna Code» for city; enactment of program «Sustainable flora in city»; introduction of «Green corridors» in city; use of «permaculture» principles; creation of «wild nature» regions in modern city; introduction of sustainable and native fauna; ecologization of townspeople needs and activity

5. Restoration of relief, landscape and hydrosphere. Enactment of «Code of city's landscapes»; restoration and prosthesis of broken landscapes components; restoration of ground water (quality and natural condition); Ecologization of townspeople needs and activity

Fourth level: ecologization of material culture:

1. Ecologization of transport. Enactment of program «Ecological Transport»; encouragement of ecological transport; transport pollution's minimization; miniaturization of transport; encouragement of pedestrians and bicycles by social and urban measures; ecologization of townspeople needs and activity

2. Ecologization of energy complex. Enactment of «Sustainable Energy» program; energy saving, energy waste utilization; miniaturization of energy installations; use of closed energy cycles; use of renewable energy sources; use of energy mixtures; use of new ecological energy sources; ecologization of townspeople needs and activity

3. Ecologization of industry. Enactment of «Ecological sustainable industry»; use of closed cycles in industry; miniaturization of industry; ecological and biological technologies; «clever» technology use; use of renewable materials or materials with big re-

serves (resources) in earth; ecologization of townspeople needs and activity

4. Ecologization of agriculture. Enactment of «Ecological sustainable agriculture» program; encouragement of ecological adaptive agriculture; biological farms, use of closed cycles, renewable energy, independence from external energy, water and other sources; ecologization of townspeople needs and activity

5. Ecologization of city. Enactment of «Healthy City» program; achievement of ecological balance of city and environment; use of biopositive buildings and engineering structures complex; visual ecology, odor ecology, sound ecology in city; creation of beautiful and ecological city; ecologization of townspeople needs and activity

6. Ecologization of arms. Reduction of arms, elimination of nuclear armaments, prohibition of wars

7. Ecologization of new electronic technologies of intercourse (Internet, etc.). Support of natural technologies of education, of intercourse, etc.

Fifth level: ecologization of needs of inhabitants:

1. Ecologization of biological needs. Guarantee of clean drinking water and clean air in city and in houses; physical comfort in city and in every home; guarantee of necessary life space for every inhabitant; natural odors and sounds in city; ecologization of townspeople needs and activity

2. Ecologization of economic needs. Use of only ecological materials in buildings; use of ecological clothes; use of ecological food; use of ecological furniture; beautiful dwellings, planting of greenery design; ecologization of townspeople needs and activity

3. Ecologization of labor needs. Labor useful for earth nature; labor without use of nonrenewable, rare or dangerous resources; labor for world benefit; labor in nature protection and in nature restoration; ecologization of townspeople needs and of activity

4. Ecologization of social, psychological and ethnic needs. Ethnic architectural environment in city; ethnic landscapes in city; guarantee of civil freedoms; creation of intercourse possibility; creation of ecological groups; creation of beautiful and attractive image of city, blocks, dwellings; ecologization of townspeople needs and activity

Sixth level: ecologization of difficult global problems:

1. Ecologization of social-economic problems. Maintenance of a social equality, equivalent development and preservation of separate races, ethnoses, nationalities

2. Creation of negentropic artefacts and technologies

Seventh level: prospective ecologization of remote future:

1. Creation of all-purpose continuous system of ecologization of resource consuming

2. Creation of all-purpose continuous system of ecologization of landscapes of planet

3. Creation of all-purpose continuous system of ecologization of built territories of planet

4. Global ecologization of artificiality of environment, of life and of intercourse

5. Elimination of arms and wars

6. Preparation for mastering and ecologization of nearest planet

7. Creation of space system of prevention of space catastrophe

All-purpose ecologization of all directions of people activity may be the basis of creation of future realistic ecocities.

This principle makes the actual task of creating high-quality ecologization of the ecological infrastructure, settlements and large areas based on ecological infrastructure, ecological urban renewal and restoration of landscapes: it relates to the preservation of the entire natural environment and, consequently, of life on Earth. It is necessary a long ecological education and upbringing to achieve such a system and deep ecologization, with a view to establishing a new ecological sphere, the sphere of ecological intellect.

The program of conservation, restoration and protection of the living environment based on ecological infrastructure should be established based on hierarchical system approach. The highest level is a perpetual program for the country, the same programs for large regions and cities. Lower sub-levels for specific cities and regions is the program for sustainable landscapes and ecological balance, environmentally sound dynamic development, environmentally sound consumption of resources and needs.

Conclusion: Ecological infrastructure ensures the preservation and protection of the environment and human life, including in emergency situations and in the condition of catastrophic rise of ecological footprints of humanity. Habitat protection is possible by supporting broad and sustainable ecological infrastructure, and well-founded ecological footprints. Therefore, the most important and ultimate goal of all activities in any country and in any city is to create on the basis of systematic approach and on the basis of ecological infrastructure, using the eco-reconstruction of cities and eco-restoration of landscapes. Ecological, beautiful and healthy cities must be located in ecological balance with nature and ensuring residents high quality, environmentally well-founded living environment. This is the most important task of the every State, its decision is linked to the survival of the planet, ensuring ecological safety and healthy for future generations.

The some difficulties and features of co-evolution of the man and nature have resulted in its deviation and in occurrence of attributes of global ecological crisis. The prospective reason of shortsighted and irrational mutual relation consists in features of thinking caused by a complex structure of «triune» brain, including ancient and new structures.

The major purpose of humanity is its preservation together with nature of the Earth. In these conditions the actual purposes of humanity are: all-

purpose ecologization of thinking and activity; urgent reduction of ecological footprint of humanity; transition to zero growth and to reduction of some kinds of activity; to return to idea of preservation of 2/3 of Earth in natural condition; to maintenance of equal access of inhabitants of the planet to all resources; to studying of problem of optimum ecologically well-founded (instead of former chaotic) settling of people on territory of planet; to gradual achievement of social and economic equality (including satisfaction of well-founded needs); to exception of excessive riches and poverty; to exception of wars and reduction of arms.

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