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ANALYSIS OF THE THEORETICAL BASIS OF ECOLOGICAL SETTLEMENTS IN THE DYNAMICS OF THEIR HISTORICAL DEVELOPMENT

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In recent years, there has been a sharp increase in the proportion of urban population worldwide. According to UN-Habitat research [1], about half of the world's population will live in urban areas, and by 2050 this share is projected to increase by 66%. High levels of urbanization have a negative impact on the environment, creating the preconditions for man-made disasters, destruction of the biosphere, depletion of natural resources, which in turn leads to serious irreversible environmental disasters, such as climate change.

One of the clearest examples of how to solve acute environmental problems associated with a high level of urbanization and not to threaten the future of the planet is the creation of energy-efficient ecological settlements that will provide favorable and comfortable living conditions for the population.

Energy-efficient ecological settlements are fully integrated into the natural environment on basis of on the rational use of resources and alternative energy sources, solid waste sorting, reuse of building materials, the use of ecological transport and the cultivation and consumption of organic products.

The world's first ecological settlements appeared in the 1970s in the Western countries. It was then that the so-called "communities", "communities", "permaculture centers", "tribal estates", "spiritual settlements" and "communes" were born. It is known that in the United States were created about two thousand ecological settlements. The crisis processes in the economic, social, cultural and spiritual spheres of life were created the impetus for the abrupt transition of people to the "community" [2].

Examining the history of ecological settlements in the world, identified three main stages of development, are identified presented in table 1 [3].

Table 1

Development of the world's first ecological settlements

1 stage. Late 40's - early 50's. The beginning of the formation of the protest movement. Alternative settlements of community type.

Predominance of communist and anarchist ideologies.

Protest motives.

Stage 2. Late 50's - 70's. The consequences of the protest movement led to socio-environmental instability.

Stage 3. After the 1970s. Reorganization of existing communities into ecological settlements. Creation of new formations considering ecological, town-planning, economic and socio-cultural principles of the organization. Own eco-village.

A new approach to design and development of environmental awareness.

As for the development of ecological settlements in Ukraine, this movement was launched much later, around 1976. According to the research by the Global Network of Eco-Settlements of Ukraine, scientists, residents of the ecological settlements and volunteers who worked at creating the manual "Sustainable Communities of Ukraine" [4], the first and most famous community is the Exaltation of the Cross Labor Brotherhood, founded in Chernihiv in 1889. The area of this settlement was almost 20 thousand hectares, which was famous for its high agronomic level.

The first scientists to study the history of world ecological settlements were such researchers as R. Gilman [5], J. Dawson [6], D.L. Christian [7] and others.

When ecological settlements began to develop rapidly around the world, researchers from various fields of science became interested in this issue.

The basis for the study of environmental problems of the ecological settlements were developed: Tsygynchko S.P. [8], Karpov, N.V. [9], etc. ;

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The technical aspects were considered on the basis of the fundamental works: Rat G.I., Mordinova M.A. [12], Koshcheeva S.V., Volkova O.M. [13]; dissertation of Taysayeva V.T. [14];

The study of urban principles of the organization of ecological settlements are carried out on the basis of the theoretical works of Savinsky NV, Skladanovsky MG, Bendersky Yu.B. [15] Sadykova A.A., Mironenko V.P. [16]; Sadovnikova S.V., Zadvernyuk L.V. [17].

Analyzing the development of ecological settlements as well as the fields of science in which this issue was considered, we can conclude that eco-

settlements are increasingly attracting the attention of scientists in the fields of economics, namely the rational use of resources; ecology - waste sorting and recycling, passive construction, use of ecological transport; urban planning - principles of organization and functional zoning of the territory. All abovementioned studies are aimed at solving the problem of significant growth of urbanization and achieving the goals of sustainable development.

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OPTIMIZATION ALGORITHMS FOR SOLVING SCIENTIFIC AND ENGINEERING PROBLEMS

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In recent decades, new computational methods have been proposed to solve complex practical problems. The development of various computational algorithms inspired by wildlife is one of the most important achievements of science and engineering. Such algorithms provide an improved basis for problem solving and decision-making.

Examples of life activity, taken from biology and observed in nature, served as a prerequisite for the development of many complex algorithms for solving various optimization problems in the real world. Such algorithms are subdivided into evolutionary computing (EC) and swarm intelligence (SI) algorithms. The first category includes algorithms inspired by the law of "survival of the fittest" or the principles of "natural selection", while the second is based on algorithms inspired by the collective intelligence of a swarm or the behavior of insect colonies and other animal communities.

Evolutionary algorithms (EA) are based on the process and mechanisms of biological evolution. According to Darwin's theory of natural selection, competition among individuals for limited food resources in nature leads to the dominance of the strongest individuals over the weak (survival of the fittest). The process of evolution through natural selection helps to maintain the diversity of species and their adaptability to the environment. EAs distribute adaptation characteristics through an iterative process that accumulates and improves through trial and error. Variants of solving the problem are members of a virtual population striving to survive in the environment specified by the objective function of a particular problem. In each case, the evolutionary process improves the population of individuals, usually using models of evolutionary mechanisms such as genetic recombination and mutation.