

# Development of countryside by the building of agrarian socio-eco-complexes

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**Abstract – The agricultural sector reformation through the combined development of agricultural and construction technologies with creation of an agricultural socio-eco-complexes national network was proposed in this research. It was determined the basic formation principles for such complexes which is erection of ecological buildings and structures with the usage of local renewable organic materials, organic agriculture and livestock. The proposed model can provide Ukrainian people by affordable housing, useful work with green technologies in tourism and in scientific spheres; provide restoration of cultural heritage.**

Key words – sustainable development, environmental construction, green architecture, spatial planning, heritage, socio-eco-complex

## I. Introduction

Ukraine is primarily an agricultural state. Its formation occurred under the influence of the processes that passed in the villages. Nowadays Ukrainian government has a difficult task to revive the village which is the center of national traditions’ preservation such as: honoring the family and established relations between generations, which have a significant influence on the formation of the Ukrainian mentality.

Nowadays agricultural sector is one of the most important parts of Ukrainian economy. Today more than 14 million people are employed in the agricultural sector, and only 620,000 of them are working in the large farms – agro-holding companies. The core components of the government’s policy are support for micro and small scale enterprises (MSEs) and integrated housing development. Extremely important factor for the agricultural sphere is not only increase in production rates but also the development of rural social infrastructure, thus we are faced with the necessity for a governmentally funded program to ensure affordable housing in the regions [1].

So, development a scientifically sound model of strategic and spatial planning at the regional levels, which should be based on the main principles of sustainable development: improving economic performance and energy efficiency, social orientation, environmental friendliness, preservation of cultural heritage is an important and actual task.

Disicion of this task was a general goal of this research. The formation of new eco-villages type and their integration into the existing system of settlement was proposed on the base of global tendency of sustainable development.

## II. Basis for countryside sustainable development

The concept of a national project to build agrarian socio-eco-complexes is developed on the basis of globalization trends’ analysis and awareness of Ukraine’s role in the global labor division. Other notions taken in to account are the principles of sustainable development, the features of modern post-industrial information society (‘knowledge society’), the formation of «national idea», the modern technologies of natural farming, the study of international experience of ecovillages’ existence, the innovative energy-efficient construction and information technology implementation. It is also very important to consider the historical relationship both to the ancient agricultural Tripoli culture that was present on the Ukrainian lands and existence of the Cossack ‘Zimovniki’ and the hamlet of farms.

The term ‘sosio-eco-complex’ means established residential space in which the industrial, scientific, educational and recreational activities are integrated into the environment in a way that supports healthy and thorough development of the individual and helps to develop responsible attitude towards future generations.

The village is a place of the most natural living conditions for human. Because land provides with the feed and the physical work which can make the body healthy and cultivate positive living traits (perseverance, focus, optimism), of course it requires the creation of appropriate social conditions.

Combination of environmental building technologies with modern bio-agricultural technologies can solve socioeconomic problems of the modern village - to provide affordable quality housing, safe and useful work with green technologies for land, in tourism and in scientific spheres; to create a new attractive youth ideology of cultural heritage restoration and cultivation of healthy life and modern thinking according to global trends in sustainable development. Fig.1

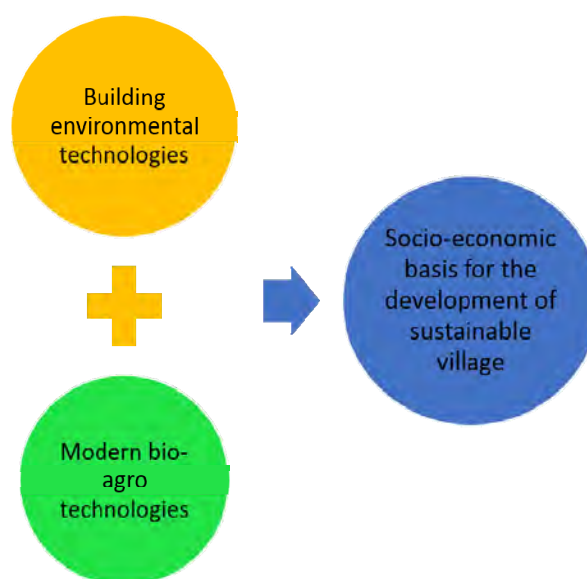


Fig. 1. Theoretical basis for effective countryside development

Practical implementation of the measures for the development of affordable ecotechnologies construction and production in countryside by creating a network of high-tech socio-eco-complexes needs to develop a new regulatory and legal framework of large-scale government programs [2].

"Strategy of development of ukrainian agriculture sector 2020" determined and approved the basic principles and priorities of social development of rural areas, among which the most important are organizational, economic and legal measures aimed at improving the life support of the rural population in conditions of the private sector in agriculture. In particular:

- assistance backward villages and regions;
- providing government loans for housing and other construction workers of agriculture;
- financial incentives and other persons in rural areas;
- better serve the rural population and development of material base of establishments of social and cultural;
- improve the planning and building of settlements in rural areas, etc.

Implementation of the principles of this target program in conjunction with the creation of a legal framework for the construction of low-rise affordable housing and social organizations socio-eco-complexes priority and providing conditions for the development of bio-agricultural technologies - the key to sustainable development of Ukraine as an independent and prosperous state.

### III. Environmental building technology - basis for the creation of socio-eco-complex

**Territorial distribution of target settlements (socio-eco-complex).** Today there is a global trend towards networking ecological villages. An example of this is an international consortium Global Ecovillage Network - an association of individuals and communities (ekoposelen) who devote themselves to lifestyles that takes into account the needs of future generations. Members of the network adhere to the principle: live so that natural resources are restored, use environmentally technology environment to give more than take.

Eco-village began to form around the world in the 60s of XX century, and the world ecological villages movement emerged in the 90 - th in response to the pressure of modern civilization on nature and man. The foundation was laid in 1991, when the fund Gaia Trust convened a meeting of representatives of Denmark in ekospilnot to discuss strategies for further development of the concept ekoposelen.

In 1994 was launched ecological villages` Information Service. In 1995 in the Scottish village of Findhorn (Findhorn) the first international conference of ecological village members has been conducted. It was called "eco-village and community self-sufficiency for the XXI century". In 2001, the Global Ecovillage Network received a special consultant status with the Economic and Social Council (UN - ECOSOC), and became a partner of the United Nations Institute for Training and Research (UNITAR).

Formation of ecological villages is generally spontaneously and autonomously in Ukraine. At first glance eco-village and socio-eco-complexes are the same thing, but it is not quite as in our reality. Today, eco-village is single settlement of naturalists` hermits in Ukraine. Creation of separate settlements contributes to the popularization of the idea of sustainable development, but it does not solve global problems.

Thus, the implementation of the concept of creating the socio-eco-complexe provides for the withdrawal of a large portion of the population of cities and resettlement of people in eco-complexe integrated into the environment, and that will satisfy all human needs. In eco-complexe will be maintained the lifestyle, that will bring balance to the inner world of man, make it harmonious with respect to each other and to the environment.

One of the most important issues is the formation of eco-complexes and their integration into the existing system of settlement. Eco-complexes are formed in the structure of national and natural parks, on the territory of natural systems, in the system of rural settlement. Of the above areas, the integration of eco-complexes in rural settlement is necessary for the implementation of the principles of sustainable development of the area. This is especially sound problem for the industrialized regions characterized by a dense network of large cities, high rates of urbanization, environmental problem.

After analyzing the accumulated theoretical and practical experience the following distribution model of ecological villages was proposed depending on their social indicators - scientific basis or agricultural base. Fig.2



Fig. 2. Structure of territorial socio-eco-complexes distribution relative to town

It is proposed the formation of two types of eco-complexes: high-tech socio-eco-complex "Science-Cultural-soaio-eco-complex" (Greenhouses, science and research centers of green technologies, tourism) which is situated closer to city and soaio-eco-complex "Agrarian socio-eco-complex" (agricultural activities, maintenance

of recreation and tourism) which is situated father from city. The principle aims of such transformations in spatial planning are the economic development with the preservation of biodiversity and comprehensive management of natural resources [2].

**Architectural forms and organization of socio-eco-complex interior space.** Planning and structure of existing eco-villages is being formed. And, proposed conception of planning structure for socio-eco-complex was developed not only on the base of existing eco-villages plans bud on the historical peculiarity of the territory, social-economic situation and sustainable standards as well. The formation of the master plan, on the one hand, a form of communal living arrangement affects settlement - the development of an active nucleus - the center and centripetal relations, on the other hand, the implementation of the principle of "Movement for relief that does not disturb geomorphological energy flows" of all environmental components - urban planning of the territory (buildings, transport frame, engineering systems, landscaping, etc.). In general, ecological village typical compact monocentric or polycentric city structure, maximum inscribed in a natural frame was taken for socio-eco-complex basic structure.

The scale of ecocomplexe and the optimal number of residents must provide the conditions under which all residents are familiar with each other and with each can have the influence on the development of ecocomplexe. According to the results of social research the upper limit of the group of about 500 people, and the optimal number is 300 people. It is given, that if the average composition of the family is 3 - 4 people, then the optimal number of individual residential buildings in socioecocomplexes can be 70 - 100 houses [3].

The socio-eco-complex principles: autonomy, self-sufficiency, sustainability, environmental friendliness, structural, architectural and planning - landscape flexibility, providing necessary social objects, respect for traditions and national identification.

System maintenance and service range of objects due to the type and size of settlement, activity and area of interest of the community. For small socio-eco-complexes center is the "common house", together with the main lawn, forums and church. Along with traditional objects of trade and consumer services there are forseen several objects: schools, temples and churches, buildings meditation and yoga, spiritual centers and environmental development of educational, research and cultural centers, arts and business centers, herbs and home center environmental protection, laboratory design and eco-tourism.

Socio-eco-complex consists of low-rise buildings, 1-3 floors, modular or free, depending on the landscape. Eco-housing is integrated into the natural environment: shaping, planning, construction materials, scale and image are dictated by the type of the surrounding landscape. Eco-friendly living space should be comfortable, power effective and economically affordable living space to ensure harmonization and minimum load on the environment.

Along with the development of the optimal structure planning and constructive eco system, special attention is paid to morphogenesis. Planning and finance generally

rectangular free. But the building is dominated by a free, flexible, bionic planning. Volume: sphere, hemisphere, cylinder, complex bionic form.

**Socio-eco-complex residential building construction.** Constructive solution of houses: wood frame, with the filling of the internal space frame lightweight concrete based on renewable organic material (straw, grain crops, hemp fire, et al.). Presented a constructive solution has been developed on the basis of laboratory studies of thermal insulation characteristics of local renewable building natural material, carried out in SHEI "Prydneprov'ska State Academy of Civil Engineering and Architecture".

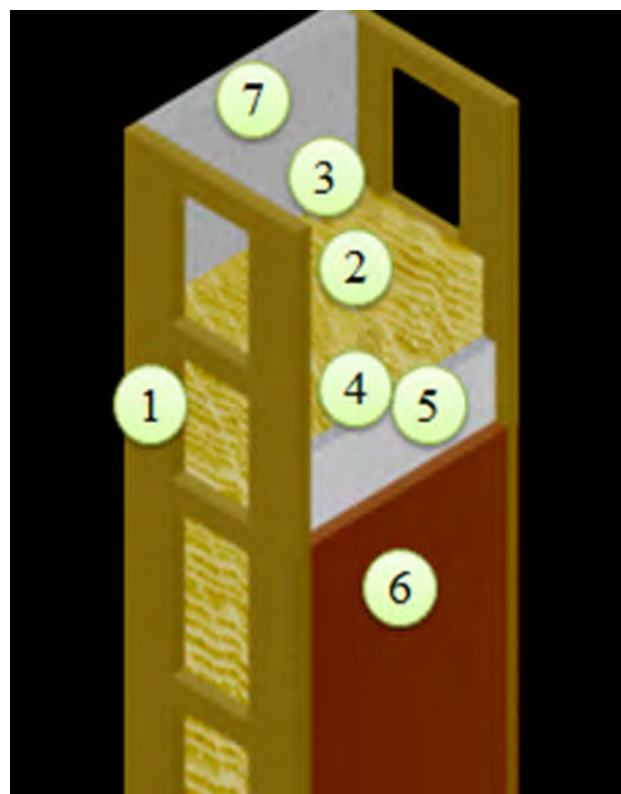


Fig.3 Constructive solution of wall outdoor enclosure  
 1 - wooden frame element - "ladder"; 2 - ecological local materials insulation (straw, lightweight adobe, pressed hemp or reed cutting, lightweight concrete with hemp), 400 mm;  
 3 - steam; 4 - windscreen; 5 - net; 6 - external decoration;  
 7 - interior decoration

The availability of housing is characterized by following criterias: low cost of construction and operation, short construction buildings. These indicators can be achieved by using structures and materials of low cost, efficient insulation materials, differentiation carrying, protecting, protective functions of structures, industrial construction method [4]. These features are taken into account during the development of energy efficient environmental design of industrial low-rise building for socio-eco-complexes with local renewable natural building materials.

The problem is solved:

a) use of prefabricated modular load-bearing structural elements – pillar in the shapr of "ladder", framework of floor and cover with fastening element on metal gear plates that together form a spatial frame;

b) parameters regulation of insulating properties of envelope by using one type of insulation material which changing thickness could be easily achieved by decreased or increased distance between the branches of pillars;

c) regulation of insulating properties of the wall frame structures for a given wall thickness by selecting the natural insulation material (straw bales cereals, chaff, hemp, flax chaff, chaff cane);

d) use for forming protective layers (internal and external) synthetic materials such as bricks - from local raw materials (soil-concrete).

The foundation of the building - tape or pile of reinforced concrete or soil-concrete. The size of the foot base is calculated based on the type of soil at the construction site. It should be taken into account the small proportion of construction due to light placeholder organic and external walls of the wooden frame. In the upper part of the design foundation embedded parts provided for fastening the frame of the foundation.

Environmental energy efficient external structure of local building materials formed by filling the gap between environmental rack filler of organic origin - straw bales cereals, tow hemp, flax tow, chaff cane or others.

The inner walls of the protective layer consists of vapor barrier, structures of brick or blocks of soil-concrete with high heat capacity, plaster [5].

The outer protective layer wall consists of wind barrier, air layer ventilated facade system, self-supporting wall of bricks or blocks.

Supporting structures of intermediate and attic floor is a farm with parallel chords. Heat insulation and soundproofing are ensured by completion of construction structures with natural organic origin insulation materials.

Coverage includes enzyme or truss structure which performs the function of waterproofing for the roof with reed mats and waterproofing film, mounted on the OSB sheets.

## Conclusion

The present study clearly shows the following:

1. Ukraine was aiming at modernizing its spatial planning through the development of economic activities, and the use of environmentally friendly construction technologies to the creation of a national network of socio-eco-complexes.

2. The basic principles of development of socio-eco-complexes are: ecological, technological, business and social activity of the inhabitants, the comprehensive development of individual.

3. Combination of environmental building technologies with modern bio-agricultural technologies can solve socioeconomic problems of the modern village - to provide affordable quality housing, safe and useful work with green technologies for land, in tourism and in scientific spheres; to create a new attractive youth ideology of cultural heritage restoration and cultivation of healthy life and modern thinking according to global trends in sustainable development

4. It is proposed the formation of two types of eco-complexes: high-tech socio-eco-complex "Science-Cultural-soaio-eco-complex" (Greenhouses, science and research centers of green technologies, tourism) which is situated closer to city and soaio-eco-complex "Agrarian socio-eco-complex" (agricultural activities, maintenance of recreation and tourism) which is situated father from city.

5. Constructive solution of houses: wood frame, with the filling of the internal space frame lightweight concrete based on renewable organic material (straw, grain crops, hemp fire, et al.).

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