

Sustainable Development of Spatial Habitat Environment as a Challenge to Civilization

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Abstract. Article is devoted to an actual problem - explore the concept of a sustainable Habitat Environment that includes new construction and architectural direction of ecology, as well as trends in the development of urban planning and architecture as integrated the ecological system. The purpose of the article is to present modern developed ecological approaches to the creation of residential Habitat Environment in new socio-environmental conditions of the development of society for sustainable coexistence with the surrounding cities Environment without causing her critical damage. A leading approach to the study of this problem is based on critical thinking, experimental and theoretical bases of practical developments, as well as identifying the best ways to apply them in practice, because the design opens completely new possibilities in architecture and construction. Materials, articles and examples may be useful for the formation of the theory and practice of resource-saving spatial habitat Environment that lets you shape material and technical equipment brand new eco-space ensuring the quality of his life.

1. Introduction

With the recent emergence of a number of signs of ecological crisis in society arise principally new trends in socio-ecological development of humanity, as well as in architecture. Preservation of natural conditions for a normal life on Earth makes us pay more attention to the problem of sustainability Environment, includes new concepts for construction and architectural Ecology, sustainable urban development and architecture.

Architecture as a system of artificial space is influenced by taking place in the world innovation revolution. In terms of development of scientific and technological progress occurs attraction to architectural research of new sites of knowledge that allows you to create completely new eco-space, ensuring the quality of life. In this regard, it is very important to thoughtful introduction of technological innovations, which often does not pass without leaving a trace for the Environment.

2. Relevance of the issue

The last century was the century of significant economic and environmental shocks, human-induced, accompanied by enormous social and political changes. The result of these violations is the modern ecological crisis, which is largely associated with architectural and town planning and technological processes, with the increasing volume and rate of economic activity as a result of urbanization [1].



Development of the concept of sustainable architecture and urban development requires extensive research in connection with exceptional complexity and relevance of this issue.

Application of ecological approaches to the creation of residential Environment is developing the progressive tendency in architecture and calls-to-action critical reflection of the theoretical bases, experimental and practical elaborations, as well as the identification the most rational methods of applying them in the practice of design. This problem has attracted many professionals involved in the formation of spatial Environment habitats in the context of the concept of sustainable development [1], [2], [3], [4], [5], [10], [15], [21], as well as proposing concrete solutions and numerous development performed within the framework of this concept [6], [7], [8], [11], [12], [13], [14], [16], [17], [18], [19], [20]. The architects have a choice - designing temporary objects either using durable materials or using cheap, low-cost on their recycling or use materials.

3. Problem statement

The purpose of this article is to review the concepts related to integration as a hierarchical system of knowledge, actions and decisions on Environment, keeping the preservation of the ecological balance, reduce the negative impacts of human activities on natural Environment. This will require a number of activities aimed at the conservation and restoration of nature with using saving and regenerative practices, with increased resource efficiency and consuming renewable resources. There is also a need to develop and implement such technologies, which allow producing high-quality products without the use of industrial technology major in mass production and no pollution Environment.

4. Theoretical part

When generating the resource-saving existing Habitat Environment design methods based on resource-intensive technologies did not resolve the accumulated environmental problems. Therefore, in the world of architectural theory and practice over the past years there has been a lot of work that can be seen as the emergence of a new architectural vision of resource-saving spatial habitat Environment [2]. The logic development of architectural space suggests an alternative understanding of resource-saving architecture as a new spatial system. View change occurs on consumption - saving as "not-consumption", zero consumption or denying consumption [3]. Study this issue reveals the following *Eco-concept of sustainability architecture*:

4.1. The main eco-concept modern architecture is a *sustainable city*, which involves the maintenance of ecological integrity and natural resources combined with the use of new technologies and various innovations. The main feature of the sustainable city is the use of renewable sources of energy, allowing the city to reduce the dependence on mineral resources and make a positive contribution to the ecology of the city. In addition, it is important to create zero-energy buildings, gardening, energy savings and low power consumption in buildings, comfortable interior climate and air quality, as well as using *recycled* materials [4].

4.2. The concept of using renewable sources of energy instead of minerals creates a model of the *city is without carbon*. Many organizations and companies consider it advisable to suspend the use of fossil energy, and humanity must go to the "post-carbon" of the city. This led to some outstanding innovation in energy efficiency; use of renewable energy-carbon waiver should be the goal for urban development in General [5].

4.3. Saving *and planting trees* helps to get rid of carbon exhaust. Trees help naturally shade the building and artificially cool the room. A striking example of this is Cairo, where part of the carbon reduction plan is the *green belt*, which coupled with other changes leads to zero content of this substance in the atmosphere of the city. For example, in the UK communities form the eco-concept and build modern *eco-building BedZED* (Bedding ton Zero Energy Development), which is aimed at minimizing the allocation of carbon dioxide in the atmosphere (Architect Bill Chinmaya Dunster) [6].

One of the few cities in Europe that is not effective the implementation of the project of ecological housing, is the city of *Freiburg* in Germany, who plans to utilize solar energy in new compact green areas of the city where will be applied both active and passive solar technologies. An example of a green city of the future is also the *project of Bo01* in Malmö (Sweden) [7].

4.4. Photo-synthetic city. The ability to produce energy and food on the spot will become part of the urban infrastructure. Photosynthetic process in urban areas will reduce the negative impact on the environment, will replace the use of minerals and will bring significant environmental benefits. There is a positive trend of including urban infrastructure planning in the idea of "green infrastructure" and using the process of *photosynthesis* in the life of the city. Among these benefits is - pure water, rainwater collection and distribution, improving the climate and urban air purification. The idea of "green city" may contribute to the emergence of renewable energy based on photosynthesis, as well as the local production of food and wood. One of the most important potential types of bio-fuels of the future - *blue-green algae* that can be grown in large quantities on rooftops.

4.5. Organic farming as the rehabilitation of urban space. Currently, there are already examples of a new type of urban districts that take into account the space for gardens with a view to ensuring inhabitants of fresh food. Growing food in the cities can take any form. Examples of "edible" urban landscape showed that urban areas it is possible to use for growing fruit trees and edible perennials. Such entities may focus on rooftops, backyards and other places where citizens can grow food. The concept of *urban farming* does not require reconstruction of the entire city that can use free plots of land for *commercial* and public farms in abandoned areas. Such projects for the *rehabilitation of the land* allow making full use of the possibilities of urban space.

It is for this reason that the farm project *Dragonfly* prototype suggests urban farm with a complex of dwellings, offices and laboratories, as well as facilities for animals [8]. The Bionic Tower is like a living organism, is self-sufficient in terms of availability of water, energy and bio-fertilizers, because continuous self-sufficiency in the manufacturing process does not occur in material losses and all waste recycled [9]. This project meets the vertical farm address modern tasks of creating not only cleaner, but also more intensive production in terms of land use.

In addition to food role "urban agriculture" solves the problem of the further development of the Green Chemistry with the aim of creating biofuel called "second generation" fuels that uses the energy of waste recycling plants [10]. Project *Harvest green* involves mixing several directions of agricultural production in the same building that bears a positive synergistic effect: what is a departure in one block it may be a nutrient composition for other [11].

4.6. Autonomous energy-efficient objects as a new paradigm for survival. An example of this concept can serve as bio-climatic building with autonomous life support system - the project "*Dom-Ark*" (Studio architect A.N. Remizov) is able to provide its inhabitants with all the resources in all areas, including seismic, as well as stay afloat when lifting the level of the oceans. Bio-climatic building, equipped with autonomous life support system, developed as a response to possible climate change on the planet.

The draft of the future - *skyscraper hO2* + "*Atlantis*" - multistory building, "*raising down*" into the depths of the ocean the idea offered solutions to problems in mega-cities (Malaysian architect Sarli Adre Bin Sarkum). The upper floors of the underwater skyscraper are above sea level. On underwater floors are residential, industrial and Office premises [12]. This project uses a variety of technology - the skyscraper itself generates electricity using waves, Sun and wind. On the surface of underwater skyscraper can be forest, field, meadow, etc., and on the lower floors of apartments and offices. In connection with the problem of the survival of humanity in the modern world, the Belgian designer Vincent Kollebot presents his project as "environmental refugee ECOPOLIS for refugees from climate change". A floating City designed to accommodate 50 000 inhabitants and completely self-contained.

According to the author of a project *Lilypad* is the most comfortable way to survive any natural disaster [13].

4.7. **City-ECOPOLIS as new integrated Environment.** The formation of a mass movement to protect nature leads to the further spread of this form of attitude as "environmental awareness" [14]. In this connection, the end of the 70-ies in several countries simultaneously floats the idea of ecological city - *City-ECOPOLIS* where is regarded as human habitation Environment, offering him an affordable completeness of direct communication with nature. Its main task is to minimize any harmful effect of the city on his men. Development the concept of ECOPOLIS means striving to translate the city on "waste-free technology".

4.8. **Eco-efficient city.** This concept of cities and regions will go from linear to circular or closed system, allowing for a significant amount of energy and materials from *rubbish*. Eco-efficient cities will be less impact on the Environment, as can significantly reduce the volume of garbage, as well as reduce the need for natural resources. Movement for sustainability of cities allows you to create a Habitat, not Environment destroys natural resources.

4.9. The new paradigm of *sustainable urban metabolism* (the city as a complex system of metabolic processes) will require profound rethinking cities and their regions, as well as the planning and how to manage them. This will require new forms of cooperation and interaction between municipal agencies, as well as the need to create appears in various organizations to carry out joint activities.

4.10. **Mega-policies as environmental re-urbanization.** This concept involves the construction of a new, much more capacious and a rich city on minimum territory, leaving intact the monuments of culture and providing enough room to recreate natural landscapes [15].

Example re-urbanization of the city using individual high-rise volumes is a project of the city of the future *HYDRO-NET* for San Francisco-is a network of underground "arteries" for the collection, storage and distribution of water and electricity, uses existing aquifer and geothermal sources. Architectural company Iwamoto Scott Architects, speaking with the idea of translating "Ecotopia" in San Francisco, to the year 2108 offers *HYDRO-NET* project, solving global warming by actively seeking alternative sources of electricity [16].

One of the projects, focused on the latest scientific and technical achievements developed by the Dutch architectural Studio MVRDV for South-East Asia - the *Town Center project for Gangue* (Gangue Power Centre). The draft of the new "green" city located in 20 km to the South of Seoul is a series of high hills of different shapes, around which a new city will grow. Centre Gangue offers homes, offices, cultural, shopping, leisure centers, educational zone. [17].

In the following example, in the context of the problem is the project "*Seoul commune 2026*", performed for South Korea (architects Mass Studies). Here are six options used cells ranging in size from 28 to 33 m in diameter, linked in a fully landscaped volume and evenly spread over the vast territory of the city [18]. Project ideal city of the future - *Beijing Boom Tower*, is part of Beijing 2020 year (architect Neville Mars, the Netherlands). Here you are trying to create Wednesday, where will the separation of transport and human flows on levels and eliminating traffic jams [19].

The same approach is evident in *Masdar Eco-City* project in Abu Dhabi (architect Norman Foster) - first city in the world without carbon dioxide emissions. This is achieved through the use of "ecology" cars and recycling of waste [20]. In the construction materials will be used from recycled waste, certified wood, etc. in town foreseen shaded sidewalks and created favorable atmosphere for pedestrian movement.

Considered by the eco-sustainable concept formation Environment habitats offer a radical rethinking of the urban functions in the system of the planet, as well as to consider not only the technological component of achieving a positive balance between the city and the surrounding natural Wednesday, but also of socio-psychological factors is impossible without harmony in the "man-nature-architecture". They do not prescribe specific design decisions, and only priority directions of urban planning where each concept is the step to follow.

5. Practical the significance of the

The basic idea of sustainable development is to integrate the environmental factor in the development of human society, so when compiling the federal targeted programmers priority should be given to environmental policy. This refers to the purposeful activities to ensure the sustainable use of natural resources and preservation of the quality of the Environment. The concept of the formation of the eco-space should be based on vital for inhabitants of the regions and the planet factors maintain the necessary balance between old and natural territories, as well as achieve ecological balance between the urban and natural Environment.

It is advisable to use architectural sustainable development objects that consume minimal power and water, effective use of raw materials (eco-friendly renewable energy materials, long life cycle, the possibility of dismantling), produce the minimum amount of waste and pollution during their lifetime (durability, reuse), use a minimum the amount of land and integrates well with the natural Environment to meet user needs for life (flexibility, adaptability, quality of construction site), creating a healthy internal Environment.

6. Conclusion

As a result of consideration of the article problems of resource-saving spatial Environment identified eco-concept of sustainable architecture:

1. Sustainable city.
2. City is without carbon.
3. Saving and planting trees.
4. Photo-synthetic city.
5. Photo-synthetic city.
6. Organic farming (as the rehabilitation of urban space).
7. Autonomous energy-efficient objects (as a new paradigm for survival).
8. Eco-efficient city.
9. Sustainable urban metabolism
10. Mega-policies as environmental re-urbanization.

Sustainable development implies the creation of conditions conducive to the needs of today without compromising the ability of the Environment to maintain life in the future, i.e., without compromising the ability of future generations to meet their requirements [21]. Thus, sustainable and lasting development is seen not as an unchanging State of harmony, but rather as a process of change in which the use of natural resources, the direction of investments, the orientation of technological development consistent with the current and future needs.

References

- [1] Vladimirov V A and Izmalkov V I 2000 *Katastrofy i ehkologiya*. M. p 74
- [2] Kulikov D A 2011 *Principy organizacii resursosberegayushchego arhitekturnogo prostranstva Avtoreferat diss. na soisk. uch. st. kand. arh., Nizhnij Novgorod* – pp 24
- [3] Anikeev V V 2002 *Ekologicheskie orientiry strategii ehkonomicheskogo razvitiya Rossii «Ustojchivoe razvitie. Nauka i Praktika»* 1 pp 126
- [4] Makarskaya T.V. 2011 *Ustojchivaya arhitektura – ehko-gumanitarnyj vyzov civilizacii // Sbornik tezisev Mezhdunarodnogo simpoziuma «Ustojchivaya arhitektura: nastoyashchee i budushchee»*, Moskva. p 75.
- [5] Goroda bez ugleroda Available: <http://www.wakeup.ru/articles/18/126/>
- [6] Ekozdaniya BedZED Available: <http://telemachy.chisto-gorod.ru/BedZED.html#>
- [7] Ekologicheskoe zhil'e v Evrope <http://www.wildlife.by/node/2432>
- [8] Vertikal'naya ferma Dragonfly <http://www.tech-life.org/articles/63-dragonfly.html>
- [9] Dragonfly Available: <http://www.novate.ru/blogs/070509/11991/>

- [10] Biotoplivo. Toplivnaya revolyuciya Available: <http://www.ecology.md/section.php?section=tech&id=2340>
- [11] Ferma - neboskreb Harvest green project v Vankuvere. Koncept kompanii Romses architects Available: <http://www.novate.ru/blogs/070509/11991/>
- [12] Podvodnyj neboskreb budushchego http://spaces.ru/diary/?r=diary/read&BP=1&id=2027443435&link_id=50853879134
- [13] Lilypad – arhitekturnyj proekt plavayushchih gorodov <http://21region.org/news/hitech/15383-lilypad-arkhitekturnyj-proekt.html>
- [14] Novaya bionika. Proekty http://www.asadov.ru/intellarch/2002_dissertation/ecopolis1rus.htm
- [15] Kalashnikov M Puteshestvie v mechtu: Geliotektura Sergeya Nepomnyashchego <http://forum-msk.org/material/region/2698035.html>
- [16] Proekt hydro-net ehkologicheskaya utopiya http://www.intelligent.lv/ru/proekt-hydro-net-ekologiceskaja-utopija/83_20041.html
- [17] Novyj gorod v Seule. Yzuhnaya Koreya <http://www.arhinovosti.ru/2008/12/04/arkhitekturnaya-studiya-mvrdv-mvrdv-pridumala-nachalo-novogo-goroda-seul-koreya/>
- [18] Proekt sovremennoj kommuny - Seoul Commune 2026 http://architektonika.ru/2007/03/13/seoul_commune_2026__proekt_sovremennoj_kommuny.html
- [19] Ideal'nyj gorod budushchego - Beijing Boom Tower http://users.livejournal.com/_transparencies/108525.html#cutid1
- [20] Samyj chistyj gorod v mire: Mazdar Siti <http://greenword.ru/2008/02/masdar-city.html>
- [21] «Nashe obshchee budushchee» 1989 *Doklad mezhdunarodnoj komissii po okruzhayushchej srede i razvitiyu (MKOSR)*. - M. «Progress» p 58.