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Design of Student Campuses and its Ecological Properties

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Abstract: *The article aims to consider the stages of the ecological properties and formation of such a device for organizing the life of students as a dormitory or a campus. The method of conducting a comparative analysis between Uzbekistan and foreign analogues reveals common and regular features. As a result, it is possible to identify individual signs of the most successful design solutions and draw conclusions about the feasibility of applying them directly in our current situation.*

Keywords: *campus; urban complexes; large-scale reconstruction; full-fledged campus; green campus; eco-technologies.*

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A campus as a university campus is the most promising and effective way to organize the educational process. Campuses, as a rule, are located outside the city and have significant advantages over other types of buildings (urban complexes of the distributed type, urban local complexes of the integrated type). Let's consider the specifics of implementing projects for creating green campuses within the framework of the concept of energy-efficient architecture. A significant part of the university complexes operated in our country today were built in the second half of the twentieth century, so most of these buildings have a high level of wear and tear, both physical and moral. To increase their comfort and energy efficiency, large-scale reconstruction and renovation works are required.

It should be noted that most Uzbek universities and campuses are the result of a typical design designed for a much smaller number of students, a more primitive scientific and sports infrastructure. This explains the lack of startup platforms for young professionals in most universities.

The fragmentation of educational and residential buildings, the initial shortcomings of the adopted architectural and planning solutions, explain the problems of further architectural development of the campuses.

Principles of creating a modern campus

A modern campus is not only a complex of buildings, but also educational projects that change the educational space. Therefore, it is necessary to have a clear development program that provides for the transformation of the architecture and spatial structure of the landscape. These ideas are reflected in the layout and functional zoning, as well as in the architectural appearance of buildings and structures.

A modern system of engineering and transport support is necessary for the full functioning of the campus space. This assumes that there is fast transport access from the city center – by public and private transport (car, tram, metro, railway transport).

There is an obvious need to create a comfortable and accessible environment for activities. The main directions of the reconstruction of university cities in order to reformat them into a full-fledged campus should be based on the principles of implementing resource-saving technologies and ensuring environmental safety.

Integration into the natural landscape – "green campus". The landscape of the campus is almost mandatory to include park areas, forests, and water areas. The "green campus" concept uses buildings that serve recreational purposes while also serving as reserves for further expansion.

Certification of environmental construction projects

The growing need for environmentally friendly objects: housing, industrial buildings, offices-determines the need to develop special standards that can be used to assess their environmental effectiveness. To date, there are more than thirty certification systems for environmental construction in the world, taking into account the different characteristics of each country (socio-economic situation, climate, etc.).

The most well-known and popular international standardization systems are BREEAM (UK), LEED (USA) and DGNB (Germany). In accordance with these standards, any building is evaluated according to the following criteria:

- ✓ Resource efficiency,
- ✓ Health, comfort of consumers,
- ✓ Transport,
- ✓ Water and air quality,
- ✓ Materials used,
- ✓ Waste management,
- ✓ Land management and environmental management,
- ✓ Pollution control,
- ✓ Innovative potential of the project.

Architecture sustainability issues

At the turn of the XX–XXI centuries, such a concept as "sustainable architecture" appeared in architecture, i.e. the desire to design buildings that would be in balance with nature and man. The term was first used at the UN Congress on Sustainable Development in Rio de Janeiro in 1992. Sustainable architecture is based on the priority of an ecological approach to the construction and operation of buildings. It uses environmentally friendly building materials, energy-saving and resource-saving technologies, landscaping of roofs and facades of buildings, arrangement of winter gardens inside buildings, etc.

In our country, the construction of "green" buildings is regulated and encouraged by legislative acts. This invites architects to start looking for new ideas for the development of large educational and scientific complexes at the intersection of architecture and nature.

Today, new innovative technological processes are emerging that allow us to find solutions to many environmental problems. The latest developments in this field are also used in the design of university campuses. The modern sustainable architecture of the campuses is designed to "function"

according to the laws of nature, to be a component of the ecosystem, without disturbing the natural balance.

Self-sufficiency of the campus

A self-sufficient university campus is one that implements the ideas of nature-equivalent architecture: buildings are one of the components of nature and do not pollute the environment. Such campuses, according to the principle of attitude to the consumption of natural resources, can be described as self-sufficient. The self-sufficient model of campus architecture corresponds to the idea of the university as a center of intellectual activity and a generator of scientific discoveries in the field of modern eco-technologies. The main trends of increasing energy saving is considered to be:

- introduction of fundamentally new types of building structures,
- The use of effective thermal insulation materials, the use of energy from the sun, wind, earth.
- using the heat of the earth to heat and cool the building with heat pumps,
- heat recovery of ventilation emissions,
- gardens included in the ventilation system of buildings,
- energy-efficient external enclosing structures, such as windows with increased thermal protection and sun protection characteristics.

Since the customer of university campuses are scientists and students and they also design these objects, many new university buildings built in different countries of the world use the latest construction technologies and modern design techniques.

Repsol Student Campus in Spain

The new Repsol student Campus, located in Madrid (Spain), can rightly be called an example of the introduction of energy-efficient technologies. The complex was built in 2013 on an area of 123 thousand m2 (Project architect Rafael de La Os). The facility has been awarded the prestigious Green Building Council (USGBC) Green Building Award. The LEED NC certificate is obtained, which means that the building is designed and built in accordance with the highest energy efficiency requirements.

Repsol Campus, Spain

Water consumption for garden maintenance is minimized due, first, to the selection of plants that are ideally suited to the Madrid climate, and, secondly, to the use of rainwater collected in an underground reservoir for their irrigation.

Solar panels and heat pumps (for the production of hot water) are used to serve the campus.

The comfortable temperature inside the rooms of the complex is maintained by the most modern climate control systems, which also control the quality of the air for breathing.

Environmental safety issues

The use of environmentally friendly materials and materials with the possibility of their reuse or environmentally safe recycling has become the norm in the construction of new university buildings. One of the features of modern architecture has become a sign of "environmental safety". Among the criteria for evaluating "green" universities:

- ✓ general attitude to the natural environment,
- ✓ energy consumption,
- ✓ climate impact,
- ✓ rational use of water resources,
- ✓ availability of transport on campus – public, private cars and bicycles,
- ✓ Organization of training courses and scientific research on environmental issues.

However, today, after studying the experience of a sufficient number of projects designed and built under the slogan "green architecture" or ecological architecture, we can assume a crisis in this direction. Often, the goal of being in line with the fashion trend led to the creation of formal, environmentally unthinkable examples of architectural thought, for example, the Anara Tower project in Dubai (UAE) with a huge non-rotating windmill playing a purely symbolic, decorative role. Most of the "green architecture" projects turned out to be excessively expensive and could not compete with traditional examples, as a result of which they were not widely used, especially during the economic crisis.

Environmental requirements in architectural design and construction should become a necessary norm, as well as energy-saving technologies, fire safety, convenience for low-mobility groups of the population. But the examples of "green architecture" will most likely remain only experimental illustrative examples, and will not have mass implementation.

Today, our country needs to update the structure of higher education, which would lead to a leap in the field of new technologies and scientific developments. Major Uzbek universities are now actively trying to either create their own campuses in a new place, or fundamentally reconstruct them.

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