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ARCHITECTURAL AND ECONOMIC APPROACH TO LOW-RISE HOUSING TO ACHIEVE ECONOMIC STABILITY AND SUSTAINABLE DEVELOPMENT

АРХІТЕКТУРНО-ЕКОНОМІЧНИЙ КОНЦЕПТ МАЛОПОВЕРХОВОЇ ЗАБУДОВИ ЯК ЗАСІБ ДОСЯГНЕННЯ ЕКОНОМІЧНОЇ СТАБІЛЬНОСТІ ТА СТАЛОГО РОЗВИТКУ ДЕРЖАВИ

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Sustainable construction, in the context of sustainable development at economic, social and environmental levels, is a proven strategy that responds to the challenges of the modern construction industry. It is an approach that focuses on balanced development, taking into account the needs of the present without compromising the needs of future generations. At the economic level, sustainable construction contributes to the creation of efficient and energy-saving buildings, which helps to reduce heating and cooling costs. It also reduces the impact of construction on financial resources through the use of more cost-effective materials and technologies. This research aims at identifying theoretical concepts and practical ways of economic, environmental and construction development of architectural and economic concept of low-rise buildings for achieving economic stability and sustainable development of the country. In order to create the concept of sustainable development, it is recommended to base it on the circular economy model. This model provides for the reuse of materials. The unacceptability of using materials that cannot be reused is the main principle of this model. This means that, without producing waste or polluting the environment, resources should be used efficiently and in a circular manner. It should be noted that the cost of building houses and apartments in this type of development needs to be identified in detail when analysing the cost of low-rise development. The cost of developing infrastructure such as engineering and transport, and the cost of maintaining engineering networks and transport communications must also be considered. In general, the feasibility study also

includes the cost of land and legal regulation. According to the authors, maximum economic efficiency can be achieved by concentrating on developing two to four-storeyed buildings. In low-rise residential buildings, there are two ways to save energy. Firstly, by reducing energy consumption from external sources through the installation of autonomous or local technical systems. Secondly, by using energy-efficient buildings that use alternative energy sources, energy savings can be achieved. One of the key concepts of modern housing is considered to be the active house. This means that modern economic concepts need to be applied. For example, the principle of "zero waste" and the model of a circular economy based on this principle require that the generation of waste be reduced or avoided as much as possible. In the case of old buildings, the principle of zero waste means that these buildings should be easy to dismantle without generating a significant amount of waste. One of the possible uses of these materials is to create new building materials or to produce other goods. The conclusions show that economic resilience, sustainable development and improved quality of life in the country can be achieved by using the architectural and economic concept of low-rise buildings. This has great potential to create a sustainable and prosperous society in the future, but requires an integrated approach and collaboration between different stakeholders.

Keywords: housing, architectural and economic approach to low-rise housing, circular economy, sustainable development, zero waste, profitability, use of energy-efficient housing.

Доведено, що стале будівництво є стратегією, що відповідає на виклики сучасної будівельної галузі в контексті сталого розвитку на економічному, соціальному та екологічному рівнях. Цей підхід, який акцентує увагу на збалансованому розвитку, де враховуються потреби сьогодення, не компрометуючи потреби майбутніх поколінь. У сфері економіки, стале будівництво сприяє створенню ефективних та енергоефективних будівель, що допомагає знизити витрати на опалення та охолодження. Додатково, цей підхід спрямований на використання більш економічно вигідних матеріалів та технологій, що зменшує вплив будівництва на фінансові ресурси. Мета дослідження – визначити теоретичні концепти та прикладні шляхи економічного, екологічного та будівельного розвитку архітектурно-економічного концепту малоповерхової забудови як засобу досягнення економічної стабільності та сталого розвитку держави. Для створення концепції сталого розвитку рекомендується базуватися на моделі кругової економіки, яка пропонує повторне використання матеріалів. Основним принципом цієї моделі є неприпустимість використання матеріалів, які неможливо повторно використати. Це означає, що ресурси мають бути використані ефективно і циклічно, без утворення відходів або забруднення довкілля. Звертається увага на те, що аналізуючи вартість малоповерхової забудови, необхідно детально виявити витрати на будівництво будинків та квартир у цій формі забудови. Також потрібно врахувати витрати на розвиток інфраструктури, такої як інженерна та транспортна, а також затрати на підтримку інженерних мереж та транспортних комунікацій. Загалом, техніко-економічна оцінка включає в себе також вартість земельної ділянки та правову регламентацію. На думку авторів, максимальна економічна ефективність може бути досягнута за допомогою сконцентрованої забудови двох-чотириповерховими будинками. Збереження енергоресурсів на території житлової малоповерхової забудови можна досягти двома способами. По-перше, встановлення автономних або локальних інженерних систем, що дозволяють знизити споживання енергії зовнішніми джерелами. По-друге, економія енергоресурсів може бути досягнута завдяки застосуванню енергоефективних будівель з використанням альтернативних джерел енергії. Підтримується думка, що активні будинки є однією з ключових концепцій сучасного житлового будівництва. Важливим аспектом є застосування сучасних економічних концепцій на практиці. Наприклад, принцип «нульових відходів» і оснований на ньому кругова модель економіки вимагають максимального зменшення або уникнення утворення відходів. У випадку зі старіючими будівлями, принцип «нульових відходів» означає, що ці будівлі повинні бути легко розбираємі без значного утворення відходів. Одна з можливих доробок цих матеріалів полягає у використанні їх для створення нових будівельних матеріалів або виробництва інших товарів. У висновках зазначено, що використання архітектурно-економічного концепту малоповерхової забудови може сприяти досягненню економічної стійкості, сталого розвитку та покращенню якості життя в країні. Це потребує інтегрованого підходу і співробітництва різних зацікавлених сторін, але має великий потенціал для створення сталого та процвітаючого суспільства у майбутньому.

Ключові слова: житлове будівництво, архітектурно-економічний концепт малоповерхової забудови, кругова економіка, сталий розвиток, принцип нульових відходів, економічна ефективність, використання енергоефективних будівель.

Problem statement. One of the most important aspects of economic and social policy in any country has always been housing. The main task is to provide every family with a comfortable place to live in the form of an apartment or an individual house. This is a large-scale programme. The aim is not only to increase the number of homes, but also to improve their quality. Architects have a variety of tools at

their disposal to solve these problems, from the correct location of housing developments in the city to the choice of building types and enclosure structures. All the money spent on housing should be a contribution to the creation of a healthy living environment.

For some time now, developed economies have been building not only comfortable homes, but also new cities, neighbourhoods

and residential complexes with minimal or even zero energy consumed by external networks. These countries use energy-efficient, resource-conserving and low-waste technologies in construction. This has a much lower impact on the environment and ultimately benefits everyone. A good example of such practices is low-rise buildings and developments designed and built to meet environmental requirements.

It is also important to consider the sustainable use of natural resources in housing. The use of green technology and energy-efficient solutions is an integral part of any housing programme at a time when climate change is one of the world's major challenges and many homes are energy-inefficient. It is also important to consider and respond to the needs of different populations. Housing should be accessible to all categories of citizens, regardless of their social status or their level of income. Social equity and inclusion, regional development and the fight against homelessness will be enhanced by a sound housing policy.

Ukraine should pay due attention to housing as a priority area of economic and social policy, as any other country. This will improve the quality of life of the Ukrainian population as a whole, in addition to contributing to economic development, attracting investment and creating jobs. Housing is supposed to become a real means of achieving socio-economic development, improving the lives of citizens and developing the whole country.

We believe that a change of attitude and the adoption of a priority concern for people and the environment are necessary for the development of building design and construction. Modern low-rise buildings, especially those that take environmental requirements into account, have a much lower negative impact on the environment. They also improve the quality of life for people. Economically developed countries have long been building comfortable homes. They have also been building cities, neighbourhoods and residential complexes that consume little or no energy through the use of renewable energy sources and energy-efficient technologies.

Analysis of recent research and publications. In the works of Ukrainian and foreign scientists various aspects of this problem have been studied and presented, e.g: Kiselyova G. V., Kiselyov V. M. [1]; H. V. Shpakova [2]; E. Y. Molchanova [3]; O. I. Tereshchuk, E. Y. Sakhno, D. V. Margasov, M. M. Korzachenko [4]; I. L. Tatomyr, L. G. Kvasniy [5]; O. S. Savytska, T. S. Rumilets,

V. O. Bogdanova [6]; B. T. Pushkar, Z. M. Pushkar [7]; K. Y. Bobrovnikova, E. V. Tovstukha [9]; S. O. Kudria [10]; I. A. Kolodiychuk [11]; M. Brongart [12].

The purpose of the study is to define theoretical concepts and applied ways of economic, environmental and constructional development of the architectural and economic concept of low-rise buildings as a means of achieving economic stability and sustainable development of the state.

Presentation of the main research material. The concept of sustainable development meets the needs of the present without compromising the ability of future generations to meet their needs. This means that we need to find ways to reduce the impact on the environment and resources, to preserve and protect biodiversity, and to ensure that social development is achieved. Reducing greenhouse gas emissions and energy consumption is one of the main areas of activity in sustainable development. This requires promoting the use of renewable energy sources, energy efficiency and environmentally friendly technologies. It is also necessary to manage waste efficiently and ensure its recycling and reuse. This will help reduce environmental impact and help conserve key resources. In order to achieve sustainable development, it is also necessary to ensure the participation of citizens in decision-making, the development of education and the raising of awareness of environmental issues. International cooperation must be strengthened. This will help to tackle problems together and develop strategies for sustainable development. It is also important to ensure equity and social justice. Sustainable development should ensure that all people have access to basic needs, including clean water, housing, education and health care.

It should be noted that in today's world, the development of cities and human settlements is an extremely important issue. The principles of sustainable development of territories have been established. In planning cities, various approaches are taken into consideration, including environmental ones. These are based on historical experience and consider the impact of human society on the environment. As cities developed, environmental problems arose and needed to be addressed. At each stage of urban development, new problems and their solutions have also emerged, contributing to the development of environmental and urban planning knowledge. This knowledge has been used in urban planning in the past and will be

used in the development of cities in the future. As a result, more sustainable and environmentally balanced urban development can be achieved by understanding the harmonious relationship between man and the environment and by developing and using economic, architectural and environmental urban planning knowledge [1, p. 21].

There are several important aspects to the sustainable development of the architecture and construction industry. The first stage is to introduce scientific approaches to creating environmentally friendly invested and built projects. An important part of this process is the practice of sustainable construction, which is gaining popularity in developed countries. This includes using the architectural and economic concept of low-rise buildings based on sustainable development.

According to G. V. Shpakova [2], sustainable construction is the construction industry's response to the challenges of sustainable development in socio-economic and environmental terms. It involves using a number of practices that promote environmental protection, energy efficiency and responsibility. One of these practices is the use of local building materials, which reduces the need for long-distance transportation of materials and thus carbon dioxide emissions. Consideration is also given to the use of alternative sources of energy to provide power for buildings, such as solar panels or wind turbines. Installing ventilation systems for responsible water use on construction sites and controlling indoor air quality are also part of sustainable construction. Other important aspects of sustainable construction include material quality control, waste management and the use of recycled materials. Restoring green spaces, using bio-based materials in building structures and minimising the use of plastics are other sustainable building practices. Water consumption in buildings is also reduced by using efficient water distribution fittings. By conserving resources and reducing negative environmental impacts, incorporating these practices into the construction industry helps to create a sustainable and environmentally responsible environment.

To build a sustainable development approach, it is recommended to build on the circular economy model, which involves re-using materials. The principle of never using nonreusable materials is the basis of such a model. This means that, without generating waste and polluting the environment, resources

should be used efficiently and cyclically. Instead of uncontrollably extracting new resources, we should maximise the use and reuse of existing materials and products. This model accelerates the transition to a more sustainable and environmentally friendly economy by conserving resources and reducing waste and negative environmental impacts.

The Ellen MacArthur Foundation describes the circular economy as a system based on renewing and using resources in a way that preserves the environment. Its primary aim is to replace "end-of-life" thinking with renewing and using natural resources [3, p. 243]. This is achieved by introducing innovative technologies and approaches that enable businesses to minimise or eliminate waste. The idea of using all resources in a closed cycle, where they are constantly renewed and used without loss of quality, is the basis of the circular economy. Special attention is given to developing resource-saving and waste-free technologies.

In the resource-intensive construction sector, resources currently used in existing buildings and structures need to be returned to the industrial cycle. One of the key factors shaping the value of new construction assets is the concept of "recycling" of construction materials, which should form the basis for the development of a new market for recycled materials. In addition, the idea of "sharing" natural resources, proposed by M. Bronhart [12], can ensure a more efficient use of these resources through the cooperation between all companies in this sector.

Additional measures are needed to implement the principles of sustainable development based on the circular economy model, according to the authors of the collective monograph [5]. One of these areas could be the use of environmentally friendly materials in construction. These materials have less negative impact on the environment and can be reused in the future. Developing and implementing technologies that promote energy efficiency and reduce resource consumption in building construction and operation is also important. Furthermore, the recovery and recycling of construction materials should be promoted and the management of construction waste should be regulated to ensure its efficient disposal and minimisation of its negative impact on the environment.

The approach adopted, the use of the architectural and economic concept of low-rise development based on sustainable development, was based on international practice. A detailed consideration of the costs of houses and flats

in this form of development is required for the expansion of low-rise construction and the creation of low-rise buildings in various urban conditions. The cost of building a house or apartment (in a block), the cost of engineering and transport infrastructure, the cost of operating the building and maintaining engineering and transport networks, the cost of land and legal regulation are all components of the technical and economic assessment of low-rise development.

Concentrated development of two to four storey buildings can achieve maximum economic efficiency. The use of central heating systems can reduce costs by 10% in large and major cities and by 8% in small and medium-sized cities. However, the abandonment of central heating systems in favour of individual or local heating systems and the reduction of public transport costs are also important factors in reducing the costs of low-rise development, as such development allows for a more convenient organisation of the transport infrastructure.

There are two ways to save energy in low-rise residential buildings. First, by reducing energy consumption from external sources through the use of autonomous or local technical infrastructure. For example, installing solar panels to generate electricity or using heat pumps for heating and hot water. Second, by using energy-efficient buildings that use alternative energy sources, energy savings can be achieved. This means designing and constructing buildings to be as energy efficient as possible, including insulation, energy efficient heating and cooling systems, energy efficient lighting and the installation of energy efficient appliances. Both of these approaches contribute to a more sustainable and environmentally friendly lifestyle by reducing energy consumption and greenhouse gas emissions [6, p. 42].

It is necessary to take into account the principles of environmentally friendly development of territories, which include the following basic provisions, when formulating architectural and planning solutions for development [8]: 1. Efficient use of natural resources, in particular reduction of energy and water consumption, rational use of land and vegetation. 2. Preserving biodiversity and green spaces, providing areas for developing natural ecosystems and continuity. 3. Ensuring a healthy and safe environment in which to live, work and recreate, including reducing noise, air and water pollution and impacts on human health. 4. Sustainable construction principles, including energy efficiency, renewable energy, use of secondary materials and waste.

5. Ensuring accessibility and comfort for people of different ages, mobility and inclusiveness. 6. Principles of efficient use of transport infrastructure, including promoting public transport, developing cycling infrastructure and pedestrianised areas. 7. Consideration of the potential for social and economic development of areas, including the location and accessibility of key infrastructure facilities, educational and health facilities and employment opportunities. 8. Promoting sustainable development and quality of life through the use of smart technologies and innovative approaches in planning and managing territories.

According to researchers [7], residential buildings should not exceed four storeys to provide a comfortable living environment for occupants. Moreover, they are located in convenient locations with transport infrastructure providing easy access to administrative, business, shopping and social facilities. In particular, the principle of designing business districts with high-rise office buildings and “green” residential areas involves locating them separately. In other words, the business district will be in a separate zone from the residential area. This approach creates optimal conditions for the functioning of businesses and the professional environment in business districts. It provides a high level of infrastructure, access to services and pedestrian comfort. Residential green areas, in turn, are designed to meet residents’ needs for comfortable living, recreation and entertainment, and everyday infrastructure. An important area is the creation of innovative technical infrastructure for sustaining life, which includes the development of heating systems based on using local energy sources, as well as the use of renewable energy sources in heating and electricity supply systems. In addition, the use of energy-efficient technologies within buildings, such as heat recovery in ventilation systems, devices for natural ventilation, natural lighting and others, is mentioned [4, p. 231]. It should also be noted that the architectural style of the buildings considers the characteristics of the landscape and is based on national (regional) traditions. Through architectural design, buildings can be organically integrated into the natural environment. They can also reflect and reproduce local culture and identity.

There is a particularly innovative trend in the field of architecture and construction. One of the key concepts in modern housing is the active house. Active houses are homes that have a high level of energy efficiency in their design

and construction. The use of renewable energy sources, energy-saving technologies and control systems that allow maximum optimisation of energy processes in the house are among the main principles of active houses.

In Europe, buildings account for about 40% of the total energy consumption. The volume of construction is on the rise and so is the appetite for energy. Active houses will be part of the solution to the problem of resource scarcity. Providing maximum comfort for occupants while minimising energy consumption is the main goal of active houses. At the same time, active houses can be highly dependent on external conditions such as the climate, the location and the activity of the sun. Therefore, the design of active houses pays great attention to the analysis and use of local resources.

One of the most important elements of an active house is the use of solar panels. They use solar energy for electricity generation and water heating without the emission of harmful substances into the atmosphere. A convenient rainwater harvesting system for gardening and other uses can also be installed in active houses. Intelligent systems and automation manage energy consumption in active houses. For example, a smart home system can control light levels, temperature and humidity, and optimally manage a building's energy systems. This ensures the best balance between comfort and energy efficiency. One of the main benefits of active houses is a significant reduction in heating and cooling costs. At the same time, harmful emissions into the atmosphere are reduced to a minimum. Using energy-efficient technologies and control systems ensures minimal energy consumption and reduces the environmental impact of buildings [9, pp. 54–55]. In our view, active houses are the future of energy-efficient housing, as they are a combination of comfort, environmental friendliness and cost-effectiveness. Developing these technologies and approaches to building is an important part of tackling climate change and sustainable development.

Monographic studies [10] and practice show that some modern buildings already achieve zero energy consumption today. They use renewable energy sources such as the sun, wind, biofuels, rivers and tides. These buildings produce more energy than they consume. This is due to the use of energy-saving technologies and high-quality insulation. In the event of a shortage of their own energy, the buildings can be connected to the general grid and receive energy. They can then

return the surplus to the grid. At the end of the year, the price advantage of such buildings can be an additional benefit.

It is important to implement modern economic developments. In particular, the principle of “zero waste” [11] is based on the model of the circular economy. This means reducing or avoiding the generation of waste as much as possible. In the context of active buildings that have already reached the end of their useful life, the principle of zero waste means that these buildings should be easy to dismantle without generating the majority of the waste. This can be achieved by using demountable and recyclable materials to construct buildings. Such materials can be easily disassembled, recycled and reused. This helps to reduce the amount of material sent to landfill. It also reduces the environmental impact of construction. Further processing of these materials can include using them to make new building materials or other goods. In this way, resources are conserved, energy consumption is reduced and greenhouse gas emissions are lowered. Zero waste in construction thus helps to create a more sustainable and environmentally responsible infrastructure, where the remains of demolished buildings help to produce new materials instead of ending up in landfill.

Conclusions. The analysis of the experiences of different countries shows that housing policy is one of the most important directions of economic and social policy in modern conditions, as it largely determines the quality of life in the territory of not only individual cities, but also metropolises. Housing policy includes not only economic but also social aspects. Therefore, its effectiveness should be considered not only in economic but also in social terms. Economic stability and sustainable development of the state can be achieved with the right development vector.

In order to improve the quality and environmental safety of the living environment and to overcome housing problems, it is necessary to widely apply energy-efficient, resource-saving and low-waste typologies of housing development in Ukraine, considering landscape and environmental factors, local conditions and urban planning situation when designing the architectural and economic concept of low-rise development. It is also recommended that priority be given to using low-cost housing. Furthermore, innovative engineering systems and life-support technologies are recommended.

A contemporary architectural and economic approach, low-rise development can be a

powerful means of achieving economic stability and sustainable development. This approach contributes to balancing the economic and social needs of society, ensuring efficient use of land and resources, and moving to more sustainable and resilient development. Reducing the density of buildings and increasing the space between buildings is one of the key principles of this approach. The aim is to improve the quality of life for residents, create comfortable living and development conditions, and ensure the preservation and regeneration of the ecological system of the urban area. This approach contributes to the reduction of energy consumption, the efficient organisation of the transport infrastructure, the access to natural resources and their rational use. Furthermore, low-rise buildings can be a source of economic development and foreign investment. Small and medium-sized enterprises, restaurants, cultural

and entertainment facilities can be developed in low-rise buildings. This will help to create new jobs, increase tax revenues and develop the local economy. In particular, social stability and living standards can be maintained through low-rise buildings. By reducing tensions in urban areas, public resources and services can be more evenly distributed. Access to health, education and cultural infrastructure can be improved. This ensures greater social justice and equality of opportunity, and improves the quality of life for residents.

Thus, economic stability, sustainable development and improved quality of life in the country can be achieved by applying the architectural and economic concept of low-rise development. This has great potential for shaping a sustainable and prosperous society in the future, but requires an integrated approach and cooperation between different stakeholders.

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