
APPLYING OF GREEN BUILDING STANDARDS FOR IMPLEMENTATION OF THE CITY DEVELOPMENT STRATEGIES IN KYIV.

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ABSTRACT

The main tasks of the "Kyiv City Development Strategy until 2025" are in development and reconstruction of the city, improvement of its infrastructure and environmental protection, which perfectly correlates with the basic principles of green building. This is the modern practice in construction, reconstruction and the exploitation of buildings, in which they implement optimal architectural solutions, advanced engineering systems and materials for reducing of energy consumption and material resources, it is the process of improving the quality of buildings and the comfort of their internal environment, improving of impact of buildings on the health of people by minimizing the negative impact on the environment at all stages of life cycle of building structures. The practice of the tasks outlined in the Strategy will significantly contribute to the implementation of international environmental standards and to the application of constructive solutions of green building technologies. In particular it appeals to such urban development sectors as city development and land relations, housing

and communal services, transport and urban mobility, environmental policy and environmental protection, public space, security and civil protection, historical and architectural heritage.

1. Relevance

Ukraine is facing some difficulties today on the solving of which depends not only further historical path of the country's development, but also the stability of Europe and the overall political situation in the world. Kyiv is the center of political, economic and social activity of the state, therefore it is extremely important that the capital could provoke the pride and feeling of confidence in the future for all Ukrainian citizens, as well as become a dignified lead to other regions of our country and also could occupy its rightful place among the most prominent cities of the world. An important step towards achieving these ambitious intentions has become the "Development Strategy of the City of Kyiv till 2025" (hereinafter the "Strategy"). It was approved by the decision of the Kyiv City Council No. 824/7060 dated December 15, 2011, and improved in the new edition in 2016 in connection with the significant changes in the socio-economic situation of the country and for coordination with the new legislative documents as follows: The Law of Ukraine "On the Principles of State Regional Policy", the Procedure for the Development of Regional Development Strategies and the Action Plans for their Implementation, as well as the monitoring and evaluation of the effectiveness of the implementation of these regional strategies and action plans, the Sustainable Development Strategy "Ukraine-2020", the State Strategy for Regional Development for the period up to 2020 [1, 2, 3, 4, 5, 6]. According to the Strategy, the main objective of the long-term development of the city of Kyiv is the improvement of the citizens' quality of life, which is determined by the economic welfare and comfort of life in the city with rich historical tradition. Particular attention is being paid to the development and reconstruction of the city, to its infrastructure and environmental protection that is perfectly correlated with the basic principles of green construction. This is a modern practice of construction, reconstruction and operation of buildings, in which they use optimal architectural solutions, advanced engineering systems and materials for reducing energy and material resources consumption, the structures quality improving and the comfort of their internal environment, the minimizing of impact of buildings on the health of its users and on the environment at all stages of the life cycle of building structures [12, 13, 16].

2. Introduction.

As a rule, the documents created by state authorities are not of the specific content, with intricate and confusing forms, so it is almost impossible to understand them by ordinary people without special training. This is the case that happens not only in Ukraine, but also in the legislative practice in many countries of the world, since we also can hear complaints from the foreign colleagues that the state documents and instructions are intentionally composed in such a way as to confuse ordinary citizens and complicate as much the compliance of the legislative requirements as possible. It is believed that this tradition dates back to the ancient times when the new laws on taxation were printed in small print and posted in places where it was difficult to see and read, that greatly complicated their execution. In addition, the practice of selective punishment was widespread, so it was unclear who and when would be prosecuted, consequently, all people felt uncertain and lived in constant fear. Thus, the feeling of helplessness - the uncertainty and uncontrollability of the situation- was formed; this gave rise to the state of hopelessness and apathy. For a reason this methodology was widely and effectively used by totalitarian regimes. Instead, when laws and state documents were presented in clear and accessible form, this not only promoted the law compliance and public awareness but was also one of the important features of a democratic society.

New version of the Kyiv Development Strategy caused a pleasant surprise with its clear structure and specific content, which had an obvious advantage over other nationally recognized documents. First of all, it should be noted that an accessible form and a convenient presentation of the Strategy indicate the realistic targeting of its effective implementation, and the specific paths and indicators for each sector are clearly described for this purpose. Obviously, the creation of such document became possible thanks to the close cooperation of the Kyiv City Council with public, business, scientific institutions and international organizations. However, no matter how clear and understandable the document is, it will not replace the real action. Therefore, the most difficult thing is ahead - it is an embodiment of the objectives outlined in the Strategy in accordance with the declared indicators. Many steps have been already taken to implement the Strategy, but for the achievement of all ambitious tasks an active participation of all stakeholders and, first of all, the citizens of Kyiv is required; they will have a unique opportunity to integrate their knowledge and skills into the prosperity of their hometown. The form, style and content of the Strategy ambiguously call for constructive cooperation all the stakeholders. To find an optimal balance between all spheres of life of Kyiv city is possible under the conditions of implementation of the best international experience in the specific Ukrainian realities. Due to this, the purpose of this analytical review is to justify the need of implementation of international environmental standards by the urban development sectors and by the use of constructive solutions of green building technologies for implementation of the objectives of the Strategy.

3. The analysis of the potential application of green building environmental standards for implementation of strategic goals by the development sectors of the city of Kyiv.

Progressive engineering solutions and international environmental standards of green building have significant potential in almost all sectors of urban development in the city of Kyiv to implement the tasks declared in the Strategy. Next, they consider the ways of the Strategy's objectives implementation by the urban development sectors with the application of green building approaches.

Industry and business development. Green building promotes the creation of innovative industrial enterprises and industrial parks which are strategically located outside of the historical center. The approaches of green construction are closely intertwined with the concept of corporate social responsibility, according to which companies integrate environmental issues of environmental protection in all aspects of their activities at the same level as the financial and social indicators. The boundaries of cooperation between enterprises and companies with scientific and educational circles are expanding by creating new areas of economic growth.

Investments. The introduction of environmental standards contributes to the implementation of the EU legislation into Ukrainian one and creates a favorable investment climate. During the previous years the difficult economic situation and the decrease in the activity of investors led to the reduction in construction volumes in the city of Kyiv and to the growth of uncompleted construction. But today we observe the recovery in the construction sector, and the projects which use green standards receive a significant competitive advantage. Application of the principles of green building promotes the interest of investors from the developed countries, where full reorientation of the entire construction industry to green technologies is planned in the coming years.

Labour market and administrative services. Green building supports the creation and development of innovative infrastructure objects, including business incubators, technology parks, start-up support programs, and co-working centers. Development and modernization of the city with the help of advanced green building technologies will create new jobs on the labor market. The process of providing administrative services can be improved and accelerated by adhering to the basic principles of green building, for example: using handy pointers, optimal planning of administrative premises with the improved lighting conditions, comfort and energy efficiency.

City development and land relations. Green building is an effective means of transforming Kyiv into the city with harmonious and balanced housing that is developed in accordance to the needs of the

community. Modern principles of development and planning of the city's territories provide the infrastructure of high-quality in each district. All essential infrastructure elements (hospitals, kindergartens and schools, shopping malls, sports and residential complexes, etc.) should be located within a maximum of 20 minutes walking distance. Order of priority is given to creating of new jobs in remote areas of the city, to unload a transport network that helps to reduce air pollution due to automobile emissions. Green construction initiates changes to the state building codes in order to ensure their compliance with modern requirements and international standards. It promotes the implementation of information and analytical tools for the adoption of managerial city-developing solutions and of interactive tools for analyzing the effectiveness of urban areas. The "bottom-up" approach, where all the plans for territorial change are discussed primarily with the citizens of the districts in social networks, demonstrates excellent effectiveness. For this purpose, they have provided on-line monitoring of housing with reflection in social networks of the current state and dynamics of infrastructure development, 3-D modeling of the urban development situation, etc. Innovative technologies of green building are tightly connected with modern information technologies. The increasing of the quality of city planning considering the needs of society and modern European practices are also based on the principals of green building. In particular, it is planned to implement a strategic environmental assessment procedure in the development of Kyiv Master Plan, which should be based on international green building standards. In particular, the development of a modern standard and regulatory framework for planning city spaces with a separate Strategy of spatial development of the city of Kyiv includes modern principles of city development, its connections and recreation areas organization. The inventory of landscapes with the development of a city landscape plan have been already drawn up, as well as the establishment of boundaries of the territories for special use, in particular, nature reserves, protected areas, coastal protective bands, etc. The "Center nearby" Strategy Initiative is closely connected with the green building concept "a stable city", which includes the transition to a polycentric model of the city planning and containment of the city's territorial expansion. [7, 9]

Tourism As a result of the policy of tourism industry stimulating, the number of tourists arriving to the capital has increased by a quarter in the recent period, which has a positive impact on local budget revenues. This is a direct consequence of the modern approaches introduction that has stimulated tourism activity in the city of Kyiv in response to increasing of duration and improving of the comfort for tourists. In accordance with the international green building practices, there is a necessity to continue the setting up of green pedestrian zones, tourist attractions and comfortable recreation areas.

Utilities. Today, the most part of communal infrastructure of the city of Kyiv needs modernization in connection with the high level of deterioration and the need of urgent reconstruction with the use of innovative green building technologies. Although there is a tendency to reducing of electricity, water and

heat consumption in recent years, it is possible to achieve a significant increase in energy efficiency indicators only on condition of compliance with the principles of green building. The Strategy plans to modernize the existing communal infrastructure and its efficiency, to reduce energy consumption, in particular, to implement the energy saving measures of communal and budgetary sectors in order to provide residents of Kyiv city with affordable public utilities of high-quality. The implementation of effective mechanisms of management of the heat energy economy in Kyiv is in increasing of energy consumption efficiency, as well as in the use of energy saving technologies, modernization of electrical equipment and lighting. Effective measures of energy saving in the housing sector include the establishment of remote monitoring and energy consumption control systems, the equipment of buildings with the tools for energy resources measurement, the implementation of heat consumption regulation systems, the creation of individual thermal points, the integrated thermo-modernization and thermo-sanitation. The energy economy requires modernization of electric and heat generating capacities and the elimination of inefficient ones, the repair, renovation and development of electric and thermal engineering networks, including the city power supply scheme optimization. The creation of favorable conditions for the development and use of alternative and renewable energy sources is facilitated by the introduction of intelligent mechanisms for energy consumption forecasting in order to reduce excessive generation, the information and analytical systems and software systems for consumption forecasting. To improve water supply and drainage in the city of Kyiv the Strategy provides with the reconstruction of the existing treatment facilities at Desnianska and Dnipro water intake stations and Bortnytska aeration station. Optimization of the water supply scheme of the city includes the replacement and sanitation of the worn out networks, as well as the development of new water supply networks, the development of urban centralized sewage system through the further construction and reconstruction of collectors and networks, the reconstruction of sewage pumping stations with the introduction of energy saving technologies. The owners of apartments are involved into the management of the housing stock in order to improve the quality of service and the self-regulatory control system in the area of housing and communal services. The complex programs of major repairs of housing stock are implemented with the use of energy-saving technologies and equipment on the principle of co-financing with home owners. Increasing awareness of the population of Kyiv is significantly contributed by the creation of the energy efficiency center and by the introduction of a system of training and information on energy saving, co-financing with citizens, the introduction of a system of energy-saving technologies crediting. The improvement of the communal services quality assessment system is closely connected with the introduction of the EU standards in the field of protection of the rights of consumers of housing and communal services, which is inextricably linked with the standards of green building. [8, 10, 15]

Transport and Urban Mobility. Green building contributes to reducing the negative impact of transport on the environment by optimizing the street and road network and by reducing excessive mileage. Optimization of transport demand and reducing of the excessive use of the resource of existing engineering and transport infrastructure will be provided by the logistics center. For this, we will use the systems that have long been proven to be effective in the developed countries of the world. For example, the creation of intercepting parking lots near the key transport interchange nodes (Park & Ride), the introduction of car-pooling, car sharing services (Carsharing), short-term bike rentals (Bikesharing). The Strategy foresees an increase of electric vehicles among the passenger transport, autonomous trolleybuses, electric buses and the development of the necessary infrastructure. The control of the motorization level growth by increasing the comfort and popularity of public transport, as well as the use of individual cycling transport for daily work trips. These are the effective mechanisms for stimulating the use of public transport and bicycles, as well as for increasing the existing fleet of vehicles operation intensity and the low filling of private motor vehicles. Green building, just like the Strategy, aims to improve the system and order of parking by using sustainable methods of the territorial resources optimizing for the creation and improvement of parking spaces. The practice of green building involves the planning of pedestrian areas and cycling paths that combine different areas and allow you to travel around the city without the use of individual and public transport. Planning of high-density buildings provides citizens with the pedestrian reach to the objects of everyday public service and distimulates non-labour trips during peak hours, which helps to unload the central part of the city and in general the transport routes of Kyiv. The Initiative of the "Center nearby" Strategy suggests that a percentage of the population, who are taken no more than 60 minutes to get to the city center by public transport, should not exceed the 35% limit. The Strategy provides for the development of pedestrian space and the promotion of cycling, which doubtless meets the objectives of green building. This includes the creation of a barrier-free, comfortable and safe pedestrian space for all the categories of users and non-motorized vehicles. The bicycle infrastructure is taken into account during the planning, construction and reconstruction of the objects of transport infrastructure and urban landscaping. It is planned to create a barrier free, safe and interconnected remote network for daily work trips and recreation. The development of cycling space is expanding through the construction of intercepting cycling paths near the high-speed railways stations and in the transport-transfer nodes. Green building standards include the temporary storage of cycles before the buildings of enterprises, institutions and educational establishments, as well as places the permanent storage of bicycles in residential complexes. International norms of green building are aimed at the reducing of road accidents, deaths and injuries by modernizing and expanding the street lighting networks, highways, sidewalks and adjoining areas, increasing the number of regulated and equipped pedestrian crossings. The implementation of modern green standards provides an effective mechanism for monitoring noise pollution

regulations compliance during the repair and transport infrastructure operation. International certification systems for green building provide the introduction of mechanisms of independent quality control of works during the construction, repair and operation of the transport infrastructure. [1]

Social support and assistance. Increasing of social safety of the citizens of Kyiv will be accelerated significantly due to the widespread implementation of the concept of corporate social responsibility, according to which the companies integrate social and environmental issues into their commercial activities on a voluntary basis. Progressive construction companies are focused on the systematic improvement of the quality of solutions of technology and design that prevent environmental pollution and provide increased comfort for all segments of the population. According to the principles of green building, the construction of a network of social housing and facilities is planned, as well as the major repairs and reconstruction of buildings that need to be improved in accordance with modern construction standards. First of all, it concerns the most vulnerable groups of people, for example, the improvement of the accessibility and comfort of the city for disable people, improvement of the ramps at social service institutions, safe facilities for children's playgrounds, completion of the problematic residential houses and delayed constructions, etc.

Health care and healthy lifestyle. Green building is aimed to popularize a healthy lifestyle by integrating the necessary physical activity into the daily activity of people. The Strategy also provides for the promotion of social responsibility of business, government bodies and public organizations in support of a healthy lifestyle of their workers and citizens. The development of infrastructure and material and technical resources for physical culture and sports, outdoor activities and health improvement are foreseen. Green building contributes to the creation of sports areas in places of public amusement in Kyiv (parks, squares, beaches, etc.), as well as the equipment of modern multifunctional training, sports and recreational complexes. The green building standards make the health facilities meet the needs of modern society; they develop and rehabilitate the network of children's health and recreation facilities, update the material and technical base of health care institutions.

Ecological policy and environmental protection. The strategy is focused on sustainable development of Kyiv as an environmentally friendly and green city, in response to the balance of economic, social and environmental components. Green construction provides a reduction of negative impact on the environment and increasing of the environmental safety level. In particular, the key tasks of the Strategy include reducing of pollutant emissions into the atmosphere and optimizing of waste utilization and recycling. Implementation of modern environmental technologies of green building at enterprises and in the residential sector of the city of Kyiv will provide with the development of modern system of control on the environmental status, improvement of solid waste processing methods and the limitation of their landfilling. The

propaganda and explanatory work conducting among the population about the separate collection of resource-consuming components of household waste is a prerequisite for preventing the formation of spontaneous accumulation of waste and the establishment of a system for separate collection and recycling of waste, in particular, the solid waste utilization and vegetable waste disposal. There are local incentive schemes for promotion of the enterprises, which move to renewable energy sources. The most effective result in the ratio cost / efficiency is in overall increase of environmental awareness by integrating the environmental component into the education of the city and by the conducting of information campaigns. The establishment of a regional center for environmental monitoring and updating of the environmental certificate in Kyiv city are included into the list of tasks of the Strategy. Protection and rational use of the environment of the city of Kyiv envisages an increase of green public areas and landscaping, including the green plantations cultivating on the building surrounding grounds. The creation of effective system for managing the objects of nature reserve fund on the territory of Kyiv provides for the development of network of such territories with the establishment of boundaries with special arrangements for using, the development of the geographic information system and patronage from research institutions and non-government organizations (NGOs). The most remarkable pieces of landscape architecture require immediate measures for their conservation and, in some cases, for the creation of museums on environmental studies. The procedure of defining of green areas, fixing of the boundaries of urban forests, forest parks, buffer parks, hydroparks, as well as the preventing them from urbanization, will require general improvement of legal and regulatory framework in accordance with the international construction standards. The Strategy creates organizational, administrative and economic conditions for ensuring world ecological and economic standards in the activity of business entities in Kyiv city. The improvement of rules and regulations involves the development of proposals, together with industrial enterprises of Kyiv, regarding the updating and approximation of the existing emission standards to the European ones. The Strategy creates the background for implementation of the requirements of the EU Water Framework Directive on protection and use of water facilities. The concept of green building involves the development of urban planning documentation to ensure the further implementation of the development of the valley of the Dnipro River, ensuring strict control of pollutants release into the water objects and improving the status of major water objects in the city of Kyiv (rivers, lakes, ditches etc.). Improvement of the environmental monitoring system in Kyiv with the use of modern information and communication technologies and tools of control will help to provide with fulfillment of obligations in the field of energy efficiency and counteraction to climate change in accordance with the "Covenant of Mayors".

Public Space. According to the plans of the Strategy, the calculated index of life comfort in Kyiv city must be raised almost twice by 2025. Organization and development of public space in Kyiv is based

on the concept "Comfort city" and "Smart city", which are aimed at optimal solutions for life improving in the city with the use of modern technologies and innovations in the ecological, social, economic and cultural spheres. The creation of comfortable public space with accessible and reliable infrastructure is carried out in accordance with the developed "Rules of improvement of Kyiv city" and "The Manual on Street Design in Kyiv". The rules and regulations of green building will help to further development of urban environment standards. The public, volunteers and charitable organizations are involved in the monitoring of the compliance of the rules on public space organization and its development. The development of building surrounding grounds is carried out by attracting and supporting the initiatives of the residents, providing them with consultations and legal assistance. Improvement of normative and legal provision on issues of Approval Documentation, dismantling of objects, regulation of trade, conducting of entrepreneurial activity, conducting of open competitions for the economic entity definition, the application of fines and public participation in control. Modernization of the city space infrastructure, of highway lighting systems, sidewalks, ground pedestrian crossings, the introduction of a single street navigation in Ukrainian and English, including numbers of houses. The realization of the program "The Parks of Kyiv" provides for the creation of comfort in the existing city parks, as well as the arrangement of new recreation areas. Arrangement of urban space objects for business activity, mobile and seasonal shopping areas, markets, gas stations, and external advertising. The popularization of the mechanism of transfer of the residential premises on the ground floor to the non-residential ones for conducting business activities and the introduction of the green construction concept of multifunctional use of premises.

Education. The Strategy provides for the formation of a single informational and educational space and for the development of new educational forms, stimulation of innovative and research activities in educational institutions, raising the level of educational infrastructure and its improving in accordance with the requirements of time. Green building provides the support for the development of alternative forms of education through the construction, reconstruction, overhaul and restoration of non-working facilities. Modern needs of the labor market require the creation of innovative centers for vocational education, the modernization of laboratories and computer classes, providing modern equipment and tools for the development of practical skills. In the specialized higher education and vocational schools they suggest introducing a Green Building course using the best international certification programs, such as: British BREEAM (Building Research Establishment Environmental Assessment Methodology), American LEED (Leadership in Energy and Environmental Design), German DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen), the French HQE (Haute Qualité Environnementale system) and others.

Security and Civil Protection. In recent years, the crime situation in the city of Kyiv has been aggravated, as evidenced by the increase in the number of detected crimes and the decrease in the numbers of

the solved cases. The significant increase in the number of serious and especially grave crimes committed in the city of Kyiv in recent years has caused the necessity to increase the level of safety and protection of the residents and visitors of the city. Aesthetics of green building contributes to the reduction of crime, as evidenced by the Broken Windows Theory. According to the practical confirmation of this theory, if there is one broken window that is not replaced on time in the area, then the "epidemic of disorder" inevitably will be extended over the territory - there will be rubbish, broken lights in the streets and it will end with crimes increasing. Infrastructure of residential areas, which are planned according to the concept of green building, provides pleasant design, cleanliness, street lighting and safe walking routes that can prevent the occurrence of criminal situations.

Historic and Architectural Heritage. Historical and cultural identity of the city of Kyiv has been forming for many centuries, therefore, it is extremely necessary to preserve its historical identity and to develop the cultural heritage of Kyiv basing on the best international practices of green construction. At the same time, with the restriction of construction in the historic center and by taking into account call of the times, there is an urgent need for the restoration and development of objects of cultural heritage, as well as the creation of conditions for their use for tourism and museum activities. In particular, we should note that the development of the potential of historic and architectural territories of Kyiv is possible only when complied with the relevant requirements of green construction, when increased responsibility for violating the legislation on protection of monuments due to construction work.

Culture. At present, there are 20 theaters and 27 museums in communal property of Kyiv, and most of them require complex repair and modernization of their material and technical base. It is necessary to use modern green building technologies to update the existing cultural objects in accordance with the requirements of the time, The Strategy provides for the creation and development of specialized cultural clusters, the support of alternative cultural space and the transformation of cultural objects into the cultural and information centers. The practice of green building allows to create cultural quarters, free theater stages, as well as cinema, visual and musical creative centers with modern infrastructure on the basis of state and municipal facilities and abandoned enterprises.

Discussion

According to the Strategy, the main objective of long-term development of Kyiv is to improve the quality of life of its citizens, which is determined by the economic welfare and comfort in the city with rich historical traditions. A particular attention is paid to the development and reconstruction of the city, its infrastructure and environmental protection, which perfectly correlates with the basic principles of green construction. The Strategy sets ambitious targets for Kyiv; that is to enter the "World's TOP-50" of liveable

cities and to get closer to the developed capitals of the Eastern Europe in terms of the economic development level and living comfort. At first glance, such goals seem to be unrealistic and inaccessible, especially for those who know the Ukrainian realities and problems, both external and internal. However, the positive changes that are constantly occurring in our society give hope, especially the increase in the activity of Kyiv citizens, not only in social networks, but also in real life. The capital of Ukraine is a unique ancient city with powerful potential to organize a comfortable city environment, with rich historical and cultural heritage, and a developed system of green areas, including the nature conservation [11, 17]. The city can be characterized by rapid rates of territorial and housing growth, by rapid population increase, and therefore, by new higher demands for the quality of the habitat, so it needs modern standards of green construction.

The concept of green building emerged in the 1970s as a reaction to the crisis in the use of natural resources and to the growing concern of the population about the deterioration of the environment. This is a modern practice of construction, reconstruction and operation of buildings, which is used to make optimal architectural solutions; the advanced engineering systems and materials for reducing consumption of energy and material resources, improving the structures quality and the comfort of their internal environment, the improving of impact of buildings on their occupants' health by minimizing the impact on the environment at all stages of the building structures life cycle. This is the practice of construction and operation of buildings, which purpose is to reduce the consumption of energy and material resources throughout the life cycle of the building. In general, green building is aimed to minimize the overall impact of the construction industry on the environment.

Kyiv National University of Construction and Architecture has sufficient potential for effective implementation of green building in Ukraine. Firstly, the teaching staff of the University includes the best specialists who are engaged in the scientific and practical developments at the national and international levels. Secondly, the University has established and continues to expand its cooperation with the leading organizations that form international standards for green building and possess the advanced innovative practical technologies in this field. Thirdly, the University operates an extensive network of specialists from construction organizations, administrative institutions, research institutes, commercial companies, which includes not only the graduates, employees and students of KNUCA, but also a wide range of individuals and organizations interested in green building development. And, most importantly, there are people studying at the University who will ensure the prosperity of our country tomorrow, the specialists who are talented for creation of comfortable environment for people basing on the best achievements of science and green building practices, which are among the most progressive and innovative achievements of the construction industry in all developed countries of the world. That is why a Center for Scientific and Educational Devel-

opment of Green Building was created on the basis of Kyiv National University of Construction and Architecture; it is based on the best achievements of Ukrainian scientists and practitioners with the involvement of leading world trends of construction industry. The main goal - educational, scientific, practical and communication activities with the involvement of all stakeholders for implementation of the best Ukrainian and international achievements in green building. The specialists and organizations involved into the development of green building in Ukraine follow the principle "We create a better living environment for people". It is a platform for interaction, intellectual communication, implementation of research projects with the international standards of green building adaptation to the conditions of Ukraine. The use of constructive solutions for green building technologies in cooperation with public authorities, business, academic institutions and international organizations is a key to realizing the objectives of the Strategy in all urban development sectors of Kyiv.

Conclusions

1. The main tasks of the "Kyiv City Development Strategy until 2025" are the city's reconstruction, improvement of its infrastructure and environmental protection, which correspond to the main objectives of green building, that is to minimize the negative impact at all stages of construction on the environment and to increase comfort; therefore the application of innovative environmental technologies and the adaptation of green building standards are suggested for the Strategy realization.
2. The applying of constructive solutions of green building technologies is particularly relevant for the following sectors: urban and rural development, housing and communal services, transport and urban mobility, environmental policy and environmental protection, public space, security and civil protection, historical and architectural heritage.
3. The implementation of green building principles that use optimal architectural solutions, advanced engineering systems and materials for reducing the consumption of energy and material resources, the improving the structures quality and the comfort of their internal environment, the improving of influence of buildings on their occupants' health by minimizing negative impact at all stages of the life cycle of building structures in Kyiv will become a positive example for other cities and will initiate the development of green construction in Ukraine.
4. Effective implementation of the objectives of the "Kyiv City Development Strategy" is possible only under the conditions of cooperation between public authorities, business, scientific institutions and international organizations with the involvement of specialists from the "Green Building Development

Center" of Kyiv National University of Construction and Architecture, where the scientific and laboratory research is carried out with the application of advanced innovative green building technologies based on the best international achievements and standards.

References

- [1] D. Varavin "Complex analysis of legal documents for ensuring the environmental safety of the reconstruction objects of the housing sector of Ukraine and the leading countries of the world." USEFUL online journal, vol. 1, no. 1, pp. 43–51, September 2017. DOI: <https://doi.org/10.32557/useful-1-1-2017-0005>
- [2] The development strategy of the city of Kyiv until 2025. Approved by the decision of the Kyiv city council №824 / 7060 of December 15, 2011, a new edition of 2016. (in Ukrainian)
- [3] Law of Ukraine "On the Principles of State Regional Policy". – Kyiv, Ukrain, 2015. (in Ukrainian)
- [4] The procedure for the development of regional development strategies and action plans for their implementation, as well as monitoring and evaluation of the effectiveness of the implementation of these regional strategies and action plans, approved by the decision of the Cabinet of Ministers of Ukraine dated 11.11.2015 No. 932. – Kyiv, Ukrain, 2015. (in Ukrainian)
- [5] The Strategy for Sustainable Development "Ukraine-2020". Approved by the Decree of the President of Ukraine dated January 12, 2015 № 5/2015. – Kyiv, Ukrain, 2015. (in Ukrainian)
- [6] State Strategy for Regional Development for the Period up to 2020. Approved by the Resolution of the Cabinet of Ministers of Ukraine dated August 6, 2014 No. 385. – Kyiv, Ukrain, 2014. (in Ukrainian)
- [7] Kyiv Smart City 2020. Web: <https://www.kyivsmartcity.com/initiative/>
- [8] T. Kryvomaz, D. Varavin, "Improving the level of environmental safety in the process of the ecoenergoefficient reconstruction of the housing stock in Kiev." USEFUL online journal, vol. 1, no. 2, pp. 19–29, December 2017. DOI: <https://doi.org/10.32557/useful-1-2-2017-0003>
- [9] Rules of improvement of the city of Kiev. – Kyiv, Ukrain, 2008. (in Ukrainian)
- [10] The Covenant of Mayors is a commitment to energy efficiency and climate change. – Kyiv, Ukrain, 2015. (in Ukrainian)
- [11] DSTU - N B.2.2-31-2011 "Guidelines for the installation of buildings and facilities for civilian use as accessibility elements for visually impaired and hearing-impaired persons". – Kyiv: Ukrahrbudinform, 2011. (in Ukrainian)
- [12] BREEAM (Building Research Establishment Environmental Assessment Methodology). Web: <https://www.bre.co.uk>

- [13] USGBC, “Reference guide for interior design and construction LEED ID+C” v.4, Washington, DC. 2016. – 489 p.
- [14] DSTU B ISO 21542:2013 Buildings and structures. "Availability and ease of use of the built environment" (ISO 21542:2011, IDT). – Kyiv: Ukrahrbudininform, 2013. (in Ukrainian)
- [15] D. Varavin “Algorithm of the system approach to estimation of environmental processes during the reconstruction of housing in the city of Kyiv.” USEFUL online journal, vol. 2, no. 1, pp. 30–40, March 2018. DOI: <https://doi.org/10.32557/useful-2-1-2018-0004>
- [16] DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen). Web: <http://www.dgnb.de>
- [17] Kyiv street design guide 2015. – Kyiv, Ukrain, 2015. (in Ukrainian)