

DOI: <http://doi.org/10.32750/2024-0110>

УДК: 332.6

JEL: R21

**Sergiy Obushnyi**

PhD in Economics, Associate Professor,  
Borys Grinchenko Kyiv Metropolitan University,  
Kyiv, Ukraine  
ORCID ID: 0000-0001-6936-955X  
*e-mail: s.obushnyi@kubg.edu.ua*

**Artem Novikov**

postgraduate student,  
Borys Grinchenko Kyiv Metropolitan University  
Kyiv, Ukraine  
ORCID ID: 0009-0004-7245-4535  
*e-mail: a.novikov.asp@kubg.edu.ua*

## INFLUENCE OF IT SOLUTIONS ON ESG REAL ESTATE DEVELOPMENT AND INVESTMENT ATTRACTIVENESS OF THE URBAN PROJECTS

**Abstract.** This article addresses the pressing issue of greenhouse gas emissions in the context of real estate development and the pivotal role of IT solutions in achieving efficient and sustainable real estate practices aligned with Environmental, Social, and Governance (ESG) principles. With a focus on the challenges posed by outdated real estate assets, particularly in terms of energy inefficiency and resource wastage, the study aims to explore the contributions of IT innovations towards addressing these issues.

Drawing upon the research of scholars who have investigated the inefficiencies of resource utilization within obsolete real estate portfolios, the article examines the extent of outdated residential properties across different countries, highlighting the urgent need for comprehensive replacement strategies. Additionally, it delves into the ESG philosophy and its significance in promoting environmentally responsible and socially conscious real estate development practices. Furthermore, the article provides an overview of key IT solutions driving resource efficiency in real estate, including smart building management systems, smart home technologies, passive house architectural designs, smart heating and energy management systems, AI-supported architecture design, and smart water management solutions. It also introduces the concept of Total Cost of Ownership (TCO) as a holistic approach to evaluating real estate investments.

Moreover, the study explores the role of smart cities in assessing the overall economic and environmental impact of IT technologies in the development of new urban projects. By evaluating the investment attractiveness of these projects and considering factors such as resource efficiency, sustainability, and economic viability, the article elucidates the potential benefits of integrating IT solutions into urban development initiatives.

In conclusion, the findings underscore the importance of leveraging IT solutions to enhance resource efficiency, reduce environmental impact, and improve the investment attractiveness of urban projects in alignment with ESG principles. The article concludes with insights into future prospects and opportunities for further research in this burgeoning field.

**Keywords:** real estate, development, Internet of Things, Information Technology, smart technologies, smart cities, investment attractiveness, sustainable development.

## INTRODUCTION

**Problem Statement.** In recent years, the rapid advancement and integration of Information Technology (IT) technologies have reshaped urban landscapes and revolutionized traditional approaches to urban development. The adoption of IT solutions in urban projects has not only transformed the way cities function but has also significantly influenced their investment attractiveness. This article aims to clarify the influence of IT solutions on the

investment potential of urban projects, highlighting their economic, social, and environmental implications in accordance with key ESG principles.

The United Nations Organization asserts that the primary drivers of global climate change are fossil fuel resources, including coal, oil, and gas, accounting for over 75 percent of global greenhouse gas emissions and nearly 90 percent of all carbon dioxide emissions.

As these greenhouse gas emissions blanket the Earth, they trap solar heat, resulting in global warming and climate change. Currently, the planet is experiencing warming at a rate unprecedented in human history. The rising temperatures over time disrupt weather patterns and disturb the natural equilibrium. This, in turn, poses numerous risks to both humans and all other forms of life on Earth [1].

The provision of energy to buildings represents one of the contemporary paramount concerns. Globally, residential and commercial buildings account for more than half of all electrical energy consumption. As a result of the continued reliance on coal, oil, and natural gas for heating and cooling purposes, they emit substantial volumes of greenhouse gases. In recent years, the upsurge in demand for energy due to the growing number of air conditioner users and the increased electricity consumption for lighting, household appliances, and connected devices has contributed to the escalation of carbon dioxide emissions generated by buildings and associated with energy supply.

The consequence of this widespread reliance on fossil fuels for meeting building energy needs is the release of significant quantities of greenhouse gases, notably carbon dioxide, into the atmosphere. These emissions significantly contribute to the growing concentration of greenhouse gases, which in turn results in the greenhouse effect and subsequent global warming. The accelerated increase in global temperatures, driven in part by these emissions, leads to adverse and disruptive climate changes, including rising sea levels, extreme weather events, and shifts in regional climates.

Furthermore, the issue extends beyond climate change implications, as the depletion of fossil fuel resources not only raises concerns about energy security but also contributes to economic and geopolitical challenges. Inefficiencies in building energy consumption and the heavy reliance on finite resources present an unsustainable trajectory with far-reaching consequences for environmental, economic, and social well-being on a global scale.

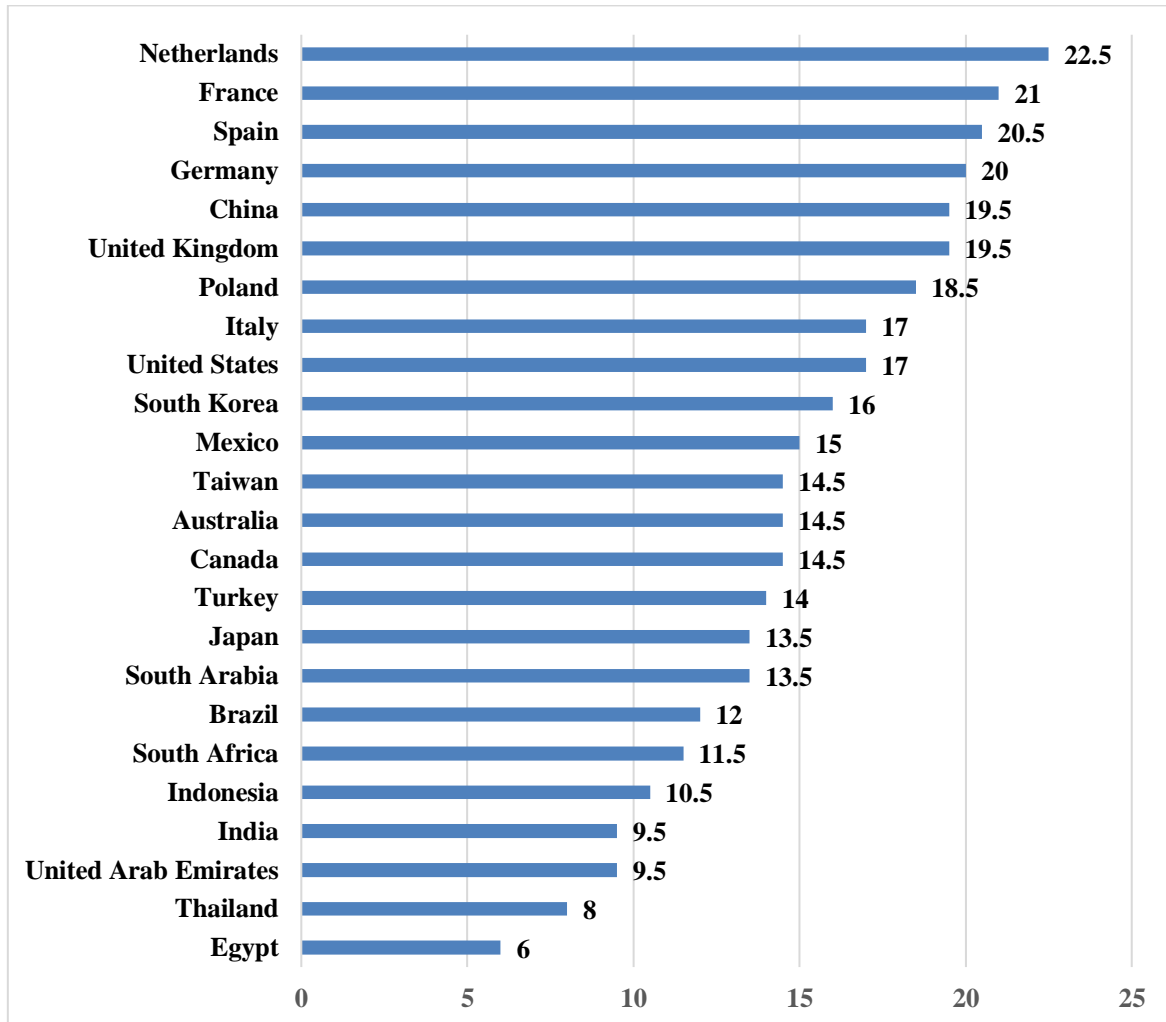
In this way, the primary objective of this article is to demonstrate the necessity of adopting IT solutions, promoting sustainable and energy-efficient building practices, integrating renewable energy sources, and developing innovative technologies designed to reduce the carbon footprint associated with buildings.

In accordance with the data available on the official website of the European Commission "Collectively, buildings in the EU are responsible for 40% of our energy consumption and 36% of greenhouse gas emissions, which mainly stem from construction, usage, renovation and demolition" and "...roughly 75% of the EU building stock is energy inefficient. This means that a large part of the energy used goes to waste. Such energy loss can be minimized by improving existing buildings and striving for smart solutions and energy efficient materials when constructing new houses" [2].

In USA fossil-fuel combustion attributed to residential and commercial buildings accounts for roughly 29% of total U.S. greenhouse gas emissions [3]. According to the data from the following chart, the energy efficiency of buildings in non-European Union countries and outside United States, less developed countries is even lower in comparison. This indicates a global necessity for the renovation of real estate stocks and the implementation of modern IT solutions for energy efficiency management.

Chart 1.

**Energy efficiency score of buildings worldwide in 2022, by country**



Source: [4].

One of the most important influences on the trend of sustainable urbanization made the Professor Edward Glaeser, an American economist and urban theorist. He has played a pivotal role in advancing our understanding of urbanization, with a particular emphasis on the associated challenges and complexities. His research spans a broad spectrum, encompassing not only the environmental aspects of urbanization where he underscores the potential for cities to achieve greater environmental sustainability through economies of scale, but also the concerns related to heightened pollution and congestion in densely populated urban regions.

Also, these scientists, among others, are actively contributing to the advancement of knowledge and technology in the field of rational urbanization, building energy efficiency, aiming to create more sustainable and environmentally friendly solutions: Amory Lovins, Edwin M. Truman, Marwa Dabaieh, Anna Osborne and others.

As a result of the interaction of scientists and practitioners, new approaches to the design and construction of modern energy-efficient real estate were developed; they were called ESG. The importance of Environmental, Social, and Governance (ESG) principles in real estate

development is multifaceted and crucial for fostering sustainable, responsible, and economically viable urban environments. ESG principles serve as a guiding framework that integrates environmental, social, and governance factors into the decision-making processes of real estate development. Several key aspects underscore the significance of ESG principles in this context:

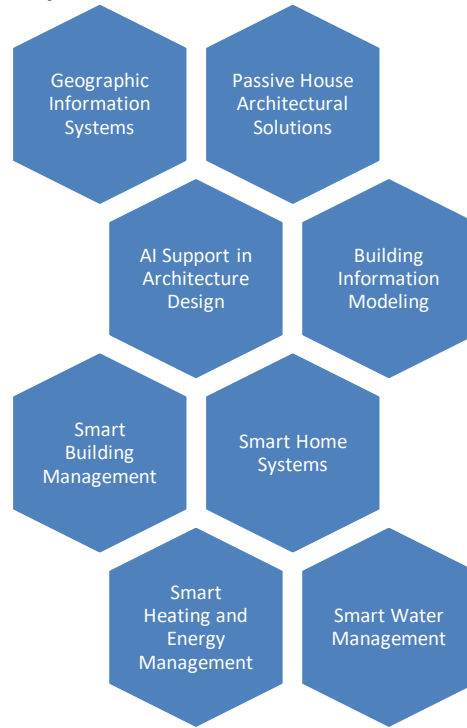
- ESG principles prioritize environmental sustainability by encouraging energy-efficient construction, green building practices, and the use of renewable resources. This reduces the carbon footprint of real estate projects, mitigates climate change impacts, and promotes resource conservation.
- As climate change-related risks become more apparent, ESG principles support real estate development that takes into account climate resilience and adaptation. Projects that consider future climate challenges, such as rising sea levels and extreme weather events, are more likely to endure and maintain their value over time.
- The social aspect of ESG principles emphasizes the well-being of local communities. Real estate development adhering to ESG guidelines aims to create safe, inclusive, and socially vibrant neighborhoods. It focuses on affordable housing, accessibility, and the preservation of cultural heritage.
- Governance principles within ESG address issues of transparency, accountability, and ethical behavior in real estate development. This helps maintain investor trust, reduces corruption, and fosters long-term financial stability.
- Incorporating ESG factors into real estate development helps in identifying and mitigating risks. Companies and investors that consider ESG principles are better positioned to avoid potential legal, financial, and reputational risks, thus safeguarding long-term value.
- In recent years, there has been a growing interest in ESG-compliant real estate investments. Many investors prioritize projects and properties that align with ESG principles, creating opportunities for developers who incorporate these principles.
- ESG principles align with an evolving regulatory landscape that often mandates responsible and sustainable real estate practices. Compliance with these principles reduces the risk of legal issues and sanctions.
- Embracing ESG principles encourages innovation in real estate development. It stimulates the adoption of advanced technologies and building methods, fostering a competitive edge in an evolving market.

In such a way, ESG principles have evolved into an indispensable framework for real estate development, providing a holistic approach that addresses environmental, social, and governance considerations. By embracing these principles, real estate development not only contributes to a more sustainable and resilient urban landscape but also attracts investors and ensures long-term value while mitigating risks and fostering community well-being.

One of the primary ways for the efficient implementation of ESG principles into the real estate sector involves leveraging IT solutions for the effective development and management of existing real estate stock. In the face of global challenges such as climate change and resource scarcity, the real estate sector has increasingly turned to IT solutions to promote sustainability and efficient resource utilization.

*Scheme 2.*

**Key IT solutions in the real estate sector.**



*Source: author's personal insights.*

Geographic Information Systems (GIS) technology enables the capture, storage, analysis, and visualization of spatial data, providing valuable insights into geographic features and land use patterns. In real estate development, GIS helps identify suitable sites for construction, assess environmental impacts, and optimize infrastructure planning by analyzing factors such as terrain, proximity to amenities, and transportation networks.

Passive house design principles emphasize energy efficiency, thermal comfort, and indoor air quality through strategic building orientation, insulation, airtightness, and high-performance windows. IT solutions such as building simulation software and energy modeling tools help architects optimize passive design strategies to meet rigorous performance standards. By minimizing heating and cooling loads, passive house architectural solutions reduce reliance on mechanical systems and contribute to resource conservation.

Artificial Intelligence (AI) is revolutionizing architecture design by automating complex tasks, generating design alternatives, and optimizing building performance. AI-powered tools such as generative design software, parametric modeling platforms, and virtual reality simulations enable architects to explore innovative design solutions that prioritize sustainability and resource efficiency. By leveraging AI-driven insights and predictive analytics, architects can optimize building layouts, materials selection, and environmental performance criteria to align with ESG principles.

Building Information Modeling (BIM) is a collaborative process that utilizes digital representations of physical and functional characteristics of buildings to facilitate efficient design, construction, and operation. Building Information Modeling (BIM) revolutionizes real estate development by leveraging IT solutions for streamlined processes and improved resource efficiency. Through cloud computing and interoperability standards like Industry Foundation

Classes (IFC), BIM integrates diverse data sources and facilitates collaboration across disciplines, enhancing accuracy and usability. Advanced visualization tools, such as VR and AR, enable immersive experiences for design review and simulation, while automation and machine learning optimize workflows and support informed decision-making. By seamlessly transitioning BIM data into facility management systems, IT facilitates proactive maintenance and real-time monitoring of building performance metrics, ensuring sustainable operations throughout the lifecycle. Embracing IT-enabled BIM approaches drives innovation, efficiency, and resilience in the built environment, promoting more sustainable and environmentally responsible real estate developments.

Smart building management systems (or smart BMS) integrate IT infrastructure with building operations to optimize energy usage, enhance occupant comfort, and streamline maintenance. These systems utilize sensors, IoT devices, and data analytics to monitor and control building systems such as HVAC, lighting, and security. By dynamically adjusting settings based on occupancy patterns and environmental conditions, smart building management minimizes energy waste and operational costs while maximizing efficiency and sustainability [8].

Smart home technologies empower residents to monitor and manage their energy consumption, enhance security, and improve comfort through interconnected devices and applications. These systems include smart thermostats, lighting controls, automated blinds, and intelligent appliances that can be controlled remotely via smartphones or voice commands. By providing real-time insights and enabling personalized settings, smart home systems facilitate energy savings and promote sustainable living practices.

Smart heating and energy management systems employ algorithms and machine learning algorithms to optimize energy consumption and reduce carbon emissions. These systems analyze historical data, weather forecasts, and occupancy patterns to schedule heating and cooling operations for maximum efficiency. By dynamically adjusting temperatures based on real-time demand and preferences, smart heating and energy management minimizes energy waste while maintaining occupant comfort.

Smart water management technologies monitor, control, and optimize water usage in buildings through IoT sensors, leak detection systems, and water-efficient fixtures. These systems track water consumption patterns, detect anomalies, and enable real-time adjustments to minimize waste and ensure water conservation. By promoting efficient irrigation, greywater recycling, and leak prevention, smart water management contributes to sustainable water stewardship and mitigates the environmental impact of real estate developments [9].

The concept of the total cost of ownership (TCO) of a building plays an important role from an economic point of view for developers, investors and final owners of real estate. IT solutions allow to effectively implement the use of this concept for optimal property management of the value of a real estate asset. The TCO concept considers not just the initial cost of acquiring and implementing a solution, but also all the costs associated with owning and operating it over its entire lifecycle. Integrating a smart IT building management system (BMS) into this framework can be highly beneficial for controlling and reducing utilities and maintenance costs.

Firstly, a smart BMS facilitates efficient resource management by monitoring and regulating crucial building systems like HVAC, lighting, and security. Through the optimization of resource usage based on factors such as occupancy patterns and external conditions, it effectively curtails energy consumption and, consequently, utility costs. Moreover, predictive maintenance capabilities inherent in smart BMS solutions play a pivotal role in cost reduction. By continuously assessing equipment health and performance metrics,

these systems can preemptively identify potential issues, preventing them from escalating into costly disruptions. This proactive maintenance approach not only minimizes downtime but also extends the lifespan of equipment, thereby reducing maintenance expenses.

Another significant advantage lies in the realm of data-driven decision-making. By integrating with smart IT systems, BMS solutions can gather and analyze vast troves of operational data. Leveraging advanced analytics and machine learning algorithms, organizations can gain invaluable insights into energy usage patterns, equipment efficiency, and occupant behavior. Armed with this knowledge, stakeholders can make informed decisions to further optimize energy efficiency and slash costs. Furthermore, remote monitoring and control capabilities inherent in smart BMS solutions offer a boon to operational efficiency. By allowing facility managers to oversee building operations from any location, these systems enable swift responses to emerging issues, mitigating the risk of expensive emergencies and minimizing maintenance outlays.

The integration of BMS data with financial systems is another crucial aspect. This integration facilitates comprehensive cost tracking and analysis by correlating energy usage data with utility bills and maintenance expenditures. Through this approach, organizations can accurately gauge the true cost of building operations, pinpoint areas ripe for optimization, and allocate resources judiciously.

Lastly, smart BMS solutions streamline compliance with energy regulations and reporting obligations. By automating data collection and organization, these systems simplify the process of demonstrating compliance, potentially shielding organizations from penalties and fines associated with non-adherence.

Thus, integrating a smart IT building management system into the TCO framework offers a multifaceted approach to controlling and reducing utility and maintenance costs. Through resource optimization, predictive maintenance, data-driven decision-making, remote monitoring, financial integration, and compliance streamlining, organizations stand to reap substantial benefits in terms of cost savings and operational efficiency.

The principles described above and their practical implementation with the help of IT solutions and various solutions allow us to achieve a new level of development of real estate projects and the quality of the living environment in general, not only at the level of an individual building or residential zones, but at the level of an entire city and change the idea of sustainable development and comfortable living thanks to the implementation of modern IT solutions.

Due to the modern capabilities of IT solutions and Internet of Things (IoT) technologies, contemporary society can afford the creation of whole smart cities. A smart city is a modern urban development concept that integrates various technologies and data-driven solutions to enhance the efficiency, sustainability, and livability of cities. At its core, the idea is to leverage advancements in technology to improve the quality of life for citizens while also addressing urban challenges such as congestion, pollution, inadequate infrastructure, and resource management [10].

One of the key elements of a smart city is the use of information and communication technologies (ICT) to gather, analyze, and utilize data in real-time. This data can come from various sources, including sensors, mobile devices, social media, and other digital platforms. By collecting and analyzing this data, city authorities can gain valuable insights into various aspects of urban life, such as transportation patterns, energy consumption, air quality, and waste management. In a smart city, this data-driven approach is used to optimize various urban systems and services. For example, smart transportation systems can use real-time traffic data to manage traffic flow, reduce congestion, and improve public transportation services.

Similarly, smart energy grids can optimize energy distribution, reduce waste, and promote the use of renewable energy sources.

Another important aspect of smart cities is the use of technology to enhance citizen engagement and participation in urban governance. Digital platforms and mobile applications can enable citizens to access information, provide feedback, and participate in decision-making processes. This can lead to more transparent and responsive governance, as well as empower citizens to take an active role in shaping the future of their cities.

In addition to improving efficiency and governance, smart cities also focus on sustainability and environmental stewardship. By promoting the use of clean energy, reducing carbon emissions, and implementing green building practices, smart cities aim to minimize their environmental footprint and create healthier, more sustainable urban environments for future generations.

Overall, the concept of a smart city represents a holistic and forward-thinking approach to urban development, one that embraces technology, data, and innovation to create more efficient, livable, and sustainable cities for all residents. However, it's important to recognize that the implementation of smart city initiatives requires careful planning, investment, and collaboration between government, industry, and community stakeholders to ensure that the benefits are realized equitably and inclusively [5].

In the realm of urban development and technological advancement, Singapore stands out as a shining example of what a truly smart city looks like. Renowned for its forward-thinking policies, meticulous planning, and relentless pursuit of innovation, Singapore has firmly established itself as a global leader in implementing smart city solutions.

At the heart of Singapore's smart city journey lies a commitment to leveraging technology and data-driven solutions to address urban challenges and enhance the quality of life for its residents. From transportation and infrastructure to sustainability and governance, Singapore has implemented a wide range of smart solutions aimed at improving efficiency, connectivity, and sustainability across various aspects of urban life [12].

Singapore's transportation system is a prime example of smart city innovation in action. The city-state boasts an extensive network of efficient public transportation options, including buses and trains, complemented by smart mobility solutions such as real-time tracking, predictive analytics, and contactless payments. These initiatives have not only reduced congestion and improved accessibility but have also enhanced the overall commuting experience for residents and visitors alike [11].

In the face of growing environmental challenges, Singapore has also made significant strides in promoting sustainability and green initiatives. The city-state has implemented smart solutions for energy management, water conservation, waste reduction, and green building practices, earning it recognition as one of the most environmentally sustainable cities in the world. These efforts have not only mitigated environmental impact but have also positioned Singapore as a global leader in sustainable urban development.

Singapore's government has been quick to embrace digital technologies to enhance governance and public service delivery. The city-state's Smart Nation initiative aims to harness the power of data and technology to create a more efficient and responsive government, with initiatives such as digital identity, e-government services, and data-driven decision-making processes. This has streamlined bureaucratic processes, improved transparency, and empowered citizens to engage more effectively with their government [6].

The implementation of smart city solutions has had a profound impact on Singapore, shaping the city-state into a vibrant, efficient, and livable metropolis. From improving transportation and infrastructure to enhancing governance and sustainability, these initiatives



have transformed Singapore into a model smart city that others aspire to emulate. The benefits are evident in the form of reduced congestion, increased productivity, better resource management, and an overall higher quality of life for residents.

The development of information technologies and quick access to real-time information has significantly changed the approach to assessing the economic feasibility and investment attractiveness of real estate projects. It has become possible to model the assessment of the development of projects for ten or more years ahead and to understand the forecasted positive and negative economic impacts due to the implementation of a project of a particular scale. In fact, technologies make it possible to create a virtual city and, having determined the composition of its agents, as well as the model of their behavior, in fact, to study possible scenarios for the development of a new habitat and develop the most effective development solutions that maximize the value of assets in the future and ensure a relatively high return on investment both from an economic point of view and in the context of social and environmental effects that can be achieved through the implementation of such a project.

The integration of AI-powered investment analysis and data-driven insights into urban projects has revolutionized the investment landscape. By leveraging IT solutions, such as advanced analytics and predictive algorithms, investors can make more informed decisions regarding property selection and achieve more accurate valuations. This enhanced risk management capability not only increases the attractiveness of urban projects but also ensures a higher level of confidence among investors, leading to greater investment inflows and sustainable urban development [7]. These advancements in the real estate industry can achieve greater resource efficiency, reduce environmental footprint, and create healthier, more resilient built environments for future generations.

In general, it should be noted that thanks to IT solutions in recent decades, the ability to process large volumes of data and model them in a virtual environment has emerged. This allows us to rely not only on individual expertise or creative teams but also on precise calculations that determine the efficiency of resource utilization both during real estate construction and subsequent operation. While scientists of the past century could only envision such possibilities, today's IT solutions significantly accelerate design processes, provide more accurate calculations, reduce risks related to economic, social, environmental, and other aspects of real estate projects, and offer broader opportunities for comprehensive control of all business processes at any stage of project development. Previously, creating new cities often involved numerous project errors and the challenging transformation of such projects into comfortable living environments. It could take decades for people to adapt the initially conceived project into a city that suits their needs. However, today, at least the possibility exists to model the future environment and consider potential issues during the design and construction phases. The question remains: Are professional experts fully ready to rely on these results, or will personal judgment still take precedence, with all the resulting consequences?

## REFERENCES

1. United Nations official web site. Climate Action. Retrieved from URL: <https://www.un.org/ru/climatechange/science/causes-effects-climate-change> (date of application: 15/10/2023).
2. European Commission official web site. In focus: Energy efficiency in buildings. Retrieved from URL: [https://commission.europa.eu/news/focus-energy-efficiency-buildings-2020-02-17\\_en](https://commission.europa.eu/news/focus-energy-efficiency-buildings-2020-02-17_en) (date of application: 16/10/2023).
3. C2ES's Climate Innovation 2050 initiative. Jessica Leung. Decarbonizing U.S. Buildings. Retrieved from URL: <https://www.c2es.org/document/decarbonizing-u-s-buildings/> (date of application: 16/10/2023).

4. Statista. Energy efficiency score of buildings worldwide 2022, by country. Published by Statista Research Department, Apr 17, 2023. URL: <https://www.statista.com/statistics/1344494/energy-efficiency-score-of-buildings-worldwide-by-country/> (date of application: 16/10/2023).
5. United Nations official web site. Smart cities programme. Retrieved from URL: <https://www.undp.org/policy-centre/singapore/smart-cities-programme> (date of application: 17/10/2023).
6. World Economic Forum official web site. 3 reasons why Singapore is the smartest city in the world. Sharmishta Sivaramakrishnan. Nov 14, 2019. Retrieved from URL: <https://www.weforum.org/agenda/2019/11/singapore-smart-city/> (date of application: 17/10/2023).
7. Navian. Transforming Real Estate Investment Strategies with AI-Driven Tech. Nov 8, 2023. Retrieved from URL: <https://naviangroup.com/blog/transforming-real-estate-investment-strategies-with-ai> (date of application: 12/11/2023).
8. I. Kuzminykh, et al., Investigation of the IoT Device Lifetime with Secure Data Transmission, Internet of Things, Smart Spaces, and Next Generation Networks and Systems, vol. 11660 (2019) 16–27. doi:10.1007/978-3-030-30859-9\_2
9. Z. Hu, et al., Bandwidth Research of Wireless IoT Switches, in: IEEE 15th International Conference on Advanced Trends in Radioelectronics, Telecommunications and Computer Engineering (2020). doi:10.1109/tcset49122.2020.2354922
10. V. Sokolov, et al., Method for Increasing the Various Sources Data Consistency for IoT Sensors, in: IEEE 9th International Conference on Problems of Infocommunications, Science and Technology (PICST) (2023) 522–526. doi: 10.1109/PICST57299.2022.10238518
11. O. Shevchenko, et al., Methods of the Objects Identification and Recognition Research in the Networks with the IoT Concept Support, in: Cybersecurity Providing in Information and Telecommunication Systems, vol. 2923 (2021) 277–282.
12. B. Zhurakovskiy, et al., Secured Remote Update Protocol in IoT Data Exchange System, in: Workshop on Cybersecurity Providing in Information and Telecommunication Systems, vol. 3421 (2023) 67–76.

**Обушний Сергій Миколайович**

кандидат економічних наук, доцент,  
Київський столичний університет імені Бориса Грінченка,  
Київ, Україна  
ORCID ID: 0000-0001-6936-955X  
e-mail: s.obushnyi@kubg.edu.ua

**Новіков Артем Вікторович**

аспірант,  
Київський столичний університет імені Бориса Грінченка,  
Київ, Україна  
ORCID ID: 0009-0004-7245-4535  
e-mail: a.novikov.asp@kubg.edu.ua

## ВПЛИВ ІТ-ТЕХНОЛОГІЙ НА ДЕВЕЛОПМЕНТ НЕРУХОМОСТІ СТАЛОГО РОЗВИТКУ ТА ІНВЕСТИЦІЙНУ ПРИВАБЛИВІСТЬ УРБАНІСТИЧНИХ ПРОЕКТІВ

**Анотація.** У статті розглядається нагальна проблема викидів парникових газів у контексті розвитку нерухомості та ключова роль ІТ-рішень у досягненні ефективних і сталих практик у сфері нерухомості, що відповідають принципам охорони довкілля, соціальної політики та управління (ESG). Зосереджуючись на проблемах, пов'язаних із застарілими об'єктами нерухомості, особливо з точки зору енергоефективності та марнотратства ресурсів, дослідження має на меті вивчити внесок ІТ-інновацій у вирішення цих питань.

Спираючись на дослідження науковців, які вивчали неефективність використання ресурсів у портфелях застарілої нерухомості, у статті проаналізовано масштаби застарілої житлової нерухомості в різних країнах, підкреслено нагальну потребу в комплексних стратегіях її заміни. Крім того, вона заглиблюється у філософію ESG та її значення у просуванні екологічно відповідальної та соціально свідомої практики девелопменту нерухомості. Крім того, у статті представлено огляд ключових ІТ-рішень, що сприяють підвищенню ефективності використання ресурсів у сфері нерухомості, зокрема інтелектуальні системи управління будівлями, технології "розумного будинку", архітектурні проекти пасивних будинків, інтелектуальні системи опалення та енергоменеджменту, архітектурне проектування з підтримкою штучного інтелекту та інтелектуальні рішення для управління водними ресурсами. У ньому також представлено концепцію загальної вартості володіння (ТСО) як цілісного підходу до оцінки інвестицій у нерухомість.

Крім того, дослідження досліджує роль розумних міст в оцінці загального економічного та екологічного впливу ІТ-технологій на розвиток нових міських проектів. Оцінюючи інвестиційну привабливість цих проектів і беручи до уваги такі фактори, як ефективність використання ресурсів, стійкість та економічна життєздатність, стаття висвітлює потенційні переваги інтеграції ІТ-рішень в ініціативи міського розвитку.

Насамкінець висновки підкреслюють важливість використання ІТ-рішень для підвищення ефективності використання ресурсів, зменшення впливу на навколишнє середовище та покращення інвестиційної привабливості міських проектів відповідно до принципів ESG. Стаття завершується аналізом майбутніх перспектив і можливостей для подальших досліджень у цій швидкозростаючій галузі.

**Ключові слова:** нерухомість, девелопмент, інтернет речей, інформаційні технології, смарт-технології, розумні міста, інвестиційна привабливість, сталий розвиток.

*Стаття надійшла до редакції 07.01.24*

*Рецензовано 03.02.24*

*Опубліковано 21.03.2024 р.*



This work is licensed under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.