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The role of innovation parks in shaping modern urban landscapes: a socio-economic and environmental perspective

Роль інноваційних парків у формуванні сучасних міських ландшафтів: соціально-економічна та екологічна перспектива

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Abstract

Policies and the creation of innovation parks have become a major global phenomenon significantly influencing the economic, societal, and ecological environments of urban centers. However, problems of housing accessibility or social equity in innovation park development are still underdeveloped in the literature. To pursue this research objective, this article integrates systematic, comparative, and critical analyses concerning the socio-economic and environmental effects of innovation parks on urban infrastructure. Studies show that innovation parks can decrease CO_2 emissions by 25 % in Europe and 15 % in Ukraine by introducing new approaches to using renewable energy and utilizing the green zones of innovation parks. In the economic perspective, they promote growth by bringing investments that are almost €10 billion across Europe and contributing to creating more than 5,000 startups. On the social level, innovation parks enhance the policy of social inclusion and help create favorable conditions for the growth of small and medium-sized enterprises; however, such positive trends as an increase in housing costs (for instance, in Europe, housing costs have increased by 15% per five years) require a differentiated and effective policy. Implication for practice in integrating innovation parks with social equality and housing affordability is presented in the study. Future research should approve research on effective strategies for implementing social programs targeting different population types and understand the significant global environmental impacts of innovation parks.

Анотація

Політика та створення інноваційних парків стали великим глобальним явищем, яке значно впливає на економічне, соціальне та екологічне середовище міських центрів. Проте проблеми доступності житла чи соціальної справедливості у розвитку інноваційних парків у літературі ще недостатньо розроблені. Для досягнення цієї мети дослідження ця стаття об'єднує систематичний, порівняльний та критичний аналіз соціально-економічних та екологічних наслідків інноваційних парків для міської інфраструктури. Дослідження показують, що інноваційні парки можуть зменшити викиди CO_2 на 25% в Європі та на 15% в Україні шляхом впровадження нових підходів до використання відновлюваної енергії та використання зелених зон інноваційних парків. З економічної точки зору вони сприяють зростанню, залучаючи інвестиції в розмірі майже 10 мільярдів євро по всій Європі та сприяючи створенню понад 5000 стартапів. На соціальному рівні інноваційні парки посилюють політику соціальної інтеграції та сприяють створенню сприятливих умов для розвитку малого та середнього бізнесу; однак такі позитивні тенденції, як зростання вартості житла (наприклад, у Європі вартість житла зросла на 15% за п'ять років) потребують диференційованої та ефективної політики. У дослідженні представлено наслідки для практики інтеграції інноваційних парків із соціальною рівністю та доступністю житла. Майбутні дослідження повинні схвалити дослідження щодо ефективних стратегій реалізації соціальних програм, орієнтованих на різні категорії населення, і зрозуміти значний

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Keywords: Innovative entrepreneurship, innovation parks, digital transformation, urbanism, international business, competitiveness, digitalization.

глобальний вплив інноваційних парків на навколишнє середовище.

Ключові слова: Інноваційне підприємництво, інноваційні парки, цифрова трансформація, урбанізм, міжнародний бізнес, конкурентоспроможність, цифровізація.

Introduction

Recent work in modern urbanism is being pushed forward by the increasing integration of innovation driven solutions in cityscapes. Economic growth, social inclusion and environmental sustainability are increasingly difficult challenges that urban centres face as they expand and evolve. In response to these challenges, many innovative strategies have recently been adopted, including innovation parks. As hubs of technological development, these parks enable entrepreneurship and lead to solutions for urban problems through an integration of advanced infrastructure and sustainable practices.

However the establishment and expansion of innovation parks are not without drawbacks. In many cases, they are accompanied by economic disparities, rising costs of housing and social segregation. But alongside that there are concerns about environmental impact – managing the use of resources and carbon emissions in an even keel manner. In order to address these multidimensional issues, these socio-economic and environmental roles of urban innovation parks in the process of reshaping urban landscapes need to be understood in a comprehensive manner.

This study seeks to evaluate the socio-economic and environmental impacts of innovation parks in influencing their capability to foster economic competitiveness, bridge the social equity gap, and support the development in sustainable ways. To shed light on these dynamics and help contribute to an understanding of how innovation parks can be better integrated into planning for cities to minimize their risks while maximizing their potential, the paper explores.

Literature Review

Innovation parks are complex entities that affect urban landscapes in economic, social and environmental ways. For a clearer understanding of these impacts, this section reviews the key studies grouped into subtopics.

Economic Impact

Innovation parks serve as an essential element of economic development, enhancing business process as well as digital transformation. These parks can provide such financial sustainability as they drive investments and help startups grow, Desyatnyuk et al. (2024a) and Karp et al. (2024) note. In fact, advanced technologies and digital platforms are integrated by Bissell (2020) and Caprotti et al. (2022), which contribute to a higher level of regional competitiveness. In addition to this, Barnes (2019) and del Cerro Santamaría (2022) study platformurbanism from an economic perspective and connect it to innovation ecosystems.

Social Impact

Innovation parks are supposed to generate social contributions such as promoting social cohesion, increasing public participation, as well as supporting local businesses. Mitlin (2021) argues that innovation parks facilitate the collaboration between government entities and community to create inclusive urban spaces. As shown by Caprotti and Liu (2019), digital platforms play an important role in the processes of social inclusion and economic growth; Whiting et al. (2022) and Gilmore (2023) demonstrate that parks add to the processes of cultural enrichment and community engagement through recreational and cultural facilities.

Environmental Sustainability

Environmentally sustainable practices are greatly advanced by the innovation parks. So says studies by Caprotti and Liu (2020) and Mohamed (2023) on how parks help reduce carbon emissions, as well as optimizing management of resources, via green technologies and renewable energy solutions. They argue that we can mitigate climate change by integrating natural elements within urban spaces (Van Ameijde et al. 2022). Moreover, Gilmore (2023) looks at efforts to sustain green space and the preservation of biodiversity, as well as contribute to sustainable development.

Urbanism and Spatial Planning

The literature has well documented the spatial design and land-use optimization of innovation parks. The role of innovation parks for the improvement of urban landscapes is studied by Balsas (2023) in relation to the integration of multifunctional and adaptive spaces. Whiting et al. (2022) and Söderström and Mermet (2020) argue for balanced development and natural area preservation along with equitable access to urban infrastructure. Like the innovation parks Van Ameijde et al. (2022) describe, many innovation parks take advantage of abandoned industrial spaces that were previously not used as well as they could have been on account of their efficacy.

Technology and Creative Contribution.

Also, innovation parks act as technological advancement hubs, as well as creative industries hubs. In the Guanyin case, Caprotti and Liu (2020) integrated big data and smart technologies in urban governance and Whiting et al. (2022) and Abellán & Ondoño (2024) stressed out the role of parks in promoting cultural initiatives and strengthening creative economy. These contributions highlight the parks capacity to integrate technological innovation with cultural development and contribute to the enhancement of urban life.

Unresolved Challenges

While they hold great promise, innovation parks have hurdles to clear, most notably in respect to housing affordability and social equality. According to Whiting et al. (2022) and Söderström & Mermet (2020), these risks of rising housing costs, as well as social segregation, frequently follow from rising demand near parks. The need to address these challenges through policies that support equitable access as well as sustainable urban planning is also considered by Katmada et al. (2023) and Arefi et al (2019).

Research methods

To assess the socio- economic and impact of innovation parks on infrastructure, this research uses a multifaceted research approach. All the methods were chosen to fit certain objectives and allowed for a comprehensive analysis of the topic.

Literature Review. Having analyzed existing scientific articles, the further evolution of innovation parks as well as their impact on the processes that occur in urban environments, spatial planning activities and socio-economic processes, was studied. The literature review was focused on presenting different kinds of approaches, recognizing major spheres of research, and defining the gaps in the existing literature. To filter the sources, only articles form peer reviewed sources were used, the case studies were from the recent years and the reports used were from recognized bodies. This method gave a basic picture of the subject and helped in the other analyses to be pursued.

Systemic Analysis. A systematic perspective was adopted to consider the innovation parks as black boxes connected with economic, social, and environmental systems in cities. It allowed to incorporate various types of data generated in urban planning guidelines, statistical overviews, and scientific works. Through exploring these relations, the study evaluated the multiple perspective effects of innovation parks on cities. For example, the discussion examined interaction between innovation parks and economic competitiveness, social integration, and environmental concerns at the same time.

Comparative Analysis. Accordingly, the results obtained in this study were compared, using the method of comparative analysis to the results of other studies. While benchmarking measures were possible investment volumes, numbers of jobs generated, CO_2 emissions, and affordability of housing. This method

let to compare and analyze the differences of development of innovation parks in different regions – European and Ukrainian – to include the context perspective.

Critical Analysis. Evaluation of negative impacts of innovation parks were made using critique analysis whereby factors including; social equity and accommodation costs were considered. This method analyzed threats like increasing costs of tenements, segregation, and unequal provision of access to parks' structures. When selecting location and evaluating the suitability of a site, socio-economic characteristics, urban policies and residents' accessibility were considered. Applying critical analysis, a more specific view on the limitations and possible challenges was developed, to make it the ground for specific proposals on how these points might be avoided or at least minimized.

The use of these methodologies provides a comprehensive and diversified examination of the effects of innovation parks both the advantages and disadvantage. It also helps in finding of workable measures towards enhanced living standards based on safe, secure, inclusive, accessible and sustainable urban environment in the context of developing countries.

Research results

Innovation parks are actively contributing to the digital transformation of urban spaces and infrastructure modernisation by implementing advanced digital solutions. For example, urban platforms and extensive data analytics systems used in these parks allow for optimised management of urban facilities, increasing the efficiency of service delivery (Caprotti & Liu, 2019; Barnes, 2019; Batsurovska & Kurylen, 2024). "Smart infrastructures developed in innovation parks provide quick access to the information needed to make informed management decisions. In addition, innovation parks promote the use of multifunctional design: as Van Ameijde et al. (2022) noted, the analysis of user behaviour allows for more efficient use of public spaces.

Digital modelling of urban infrastructure, implemented through innovation parks, provides practical solutions for creating sustainable urban spaces, as confirmed by Mohamed (2023) and Balsas (2022). This makes the city more attractive to investors and contributes to the region's socio-economic development. Thus, innovation parks act as a catalyst for digital transformation and modernisation of urban spaces, creating conditions for developing a comfortable, environmentally sustainable and economically viable urban environment.

Table 1 shows the impact of innovation parks on spatial planning and urban land use optimisation.

Table 1.
The impact of innovation parks on spatial planning and optimisation of land use in cities

Impact aspect	Description	Examples and sources
Optimising the spatial arrangement	Innovation parks are often strategically located with access to transport hubs and infrastructure. This reduces the need for additional transport networks and promotes the rational use of territories (Balsas, 2023).	Example: Cambridge Science Park in the UK, which uses areas near significant transport networks to connect to the city and reduce traffic effectively.
Preservation of natural areas	In the planning process, innovation parks consider the need to preserve natural resources and green areas. This allows them to combine innovative infrastructure with an environmentally friendly environment that supports sustainable development (Van Ameijde et al., 2022).	An example is the Zhongguancun Ecopark in Beijing, where significant areas of green space have been preserved for recreation and leisure.
Modernisation of abandoned areas	Innovation parks are often created on the site of old industrial or abandoned facilities, which helps to renew urban infrastructure without the need to develop new areas. This reduces the pressure on green spaces and prevents urban sprawl (Whiting et al., 2022).	An example is the innovation park in the Neukölln district of Berlin, located on former industrial land, which avoids building on green space.
Multifunctional use of space	Innovation parks are designed as multifunctional spaces that allow commercial, residential, and social integration. This saves space and reduces the need for additional land for development (Caprotti & Liu, 2022).	An example is Songdo International Business District in South Korea, where office, commercial, and residential developments are implemented simultaneously.
Creating inclusive spaces	Innovative parks promote social inclusion by providing recreational areas, cultural facilities, and public spaces,	Example: Campus Diagonal-Besòs in Barcelona, where various recreational

	contributing to social cohesion and a better quality of life (Mitlin, 2021).	and interactive spaces have been created for students and the community.
Reducing the burden on transport	The well-thought-out location of innovation parks close to residential centres and reduced transport distances reduces the burden on public transport and pollution (Caprotti et al., 2022).	An example is the One-North Innovation Park in Singapore, which provides easy access to key transport routes, reducing the need for private transport.
Support for mixed land use	Innovation parks promote mixed land use, allowing residential, commercial and educational areas to be combined in one space, which contributes to the efficient use of resources and reduces infrastructure costs (Söderström & Mermet, 2020).	Example: Hudson Yards in New York City, which includes residential complexes, offices, retail areas and entertainment spaces in a limited area.
Supporting local businesses	Innovation parks create a favourable environment for small and medium-sized businesses located in them, providing them with opportunities for development without the need for additional land leases (Gilmore, 2023).	Example: Silicon Docks in Dublin, where numerous startups are located alongside large technology companies, creating opportunities for collaboration and support for local businesses.

Source: developed by the author based on Balsas (2023), Van Ameijde et al. (2022), Whiting et al. (2022), Caprotti & Liu (2022), Mitlin (2021), Caprotti, Chang, & Joss (2022), Söderström and Mermet (2020), Gilmore (2023), Wagner, (2021), Desyatnyuk et al. (2024 b), Cardullo & Kitchin (2018).

Innovation parks significantly impact the socio-economic development of urban environments by stimulating economic growth, supporting local businesses and engaging the community. They contribute to the regional economy by creating new jobs and supporting entrepreneurship. Studies by Gilmore (2023) and Whiting et al. (2022) show that innovation parks provide SMEs with opportunities for growth through proximity to large corporations, facilitating the exchange of knowledge and resources and promoting joint projects. Socially, innovation parks integrate the community by creating public spaces, recreational areas and cultural facilities, which increases accessibility and social cohesion. This contributes to forming new social ties and cultural enrichment, as highlighted in Mitlin's (2021) study, where innovation parks promote social inclusion and citizen engagement in urban initiatives.

Innovation parks play a key role in shaping modern urban spaces, promoting the development of high-tech sectors, and creating environmentally sustainable solutions. Their functioning ensures economic growth, support for local businesses, and integration of the latest technologies into urban infrastructure, which increases cities' competitiveness in the international arena. Let's look at examples of innovation parks in Europe and Ukraine and their contribution to urban development (Table 2).

Table 2.
Examples of innovation parks in Europe and Ukraine and their contribution to urban development

Innovation Park	Country	Main areas of activity	Features and achievements
Cambridge Science Park	United Kingdom	High technology, scientific research	One of the oldest innovation parks in Europe, it develops high-tech startups and supports scientific research
Sophia Antipolis	France	Information technology, biotechnology, environmental research	An innovation centre in the south of France that supports science and technology companies and sustainable development projects
Technopolis	Belgium	Digitalisation of business, development of technology startups	Creates an innovative ecosystem for startups focused on digital solutions and technologies
UNIT.City	Ukraine (Kyiv)	Technology, creative industries, educational programmes	Ukraine's largest innovation park; integrates startups, international companies and educational initiatives
LvivTech.City	Ukraine (Lviv)	Information technology, support for the IT sector	Promotes IT business by providing an environment for the development of technology companies
Ecopolis HTZ	Ukraine (Kharkiv)	Environmental technologies, industrial innovations	Focus on environmental technologies and industrial innovation; combines business, science and education

Source: compiled by the authors.

Innovation parks also contribute to developing highly skilled personnel due to their location near universities and research centres. This creates opportunities for cooperation between education, science, and business, which helps to improve the skills of local professionals and stimulates investment in the region. Caprotti and Liu's (2019) study shows that innovation parks are a platform for human capital development. Thus, they not only promote economic growth and support business but also ensure social inclusion by engaging the community in the development of urban space (Figure 1).

Innovation parks actively implement environmentally sustainable solutions that help reduce negative environmental impact and support sustainable development. Here are the leading practices and their impact:

1. ***Preservation and development of green areas***. Innovation parks often integrate large green spaces that improve air quality, promote biodiversity, and provide natural recreation areas. This allows them to combine industrial development with environmental sustainability. For example, the Zhongguancun Park in Beijing has preserved large green spaces, improving the urban ecosystem and reducing the city's heat island effect.
2. ***Energy efficiency and use of renewable energy sources***. Many innovation parks use renewable energy sources, such as solar and wind power plants, to reduce carbon dioxide emissions. Energy-efficient lighting and heating systems are also used to optimise resource consumption. These practices significantly reduce the parks' environmental footprint and support energy independence (Razi & Ziminski, 2022).
3. ***Water resource management***. Innovation parks actively use rainwater collection and treatment systems and water reuse in technical processes. This helps reduce the cost of water supply and the negative impact on natural water resources. Some parks have even created water-saving landscapes, contributing to the rational use of water.
4. ***Recycling and waste reduction***. Implementing recycling and waste minimisation practices can reduce the amount of waste going to landfills and promote material recycling. Parks often have particular areas for waste sorting and enterprises that recycle industrial waste.
5. ***Use of environmentally friendly building materials***. Many innovation parks use recyclable materials with a lower environmental impact, including energy-efficient glass, wood from controlled sources and environmentally friendly paints. This reduces the impact on the ecosystem and creates a greener environment for employees and visitors (Sadeghi et al., 2022).
6. ***Promoting sustainable transport***. Innovative parks encourage public transport, bicycle paths and electric vehicles, which helps reduce greenhouse gas emissions and noise levels. This is done by creating convenient bicycle parking, electric vehicle charging stations and pedestrian areas.

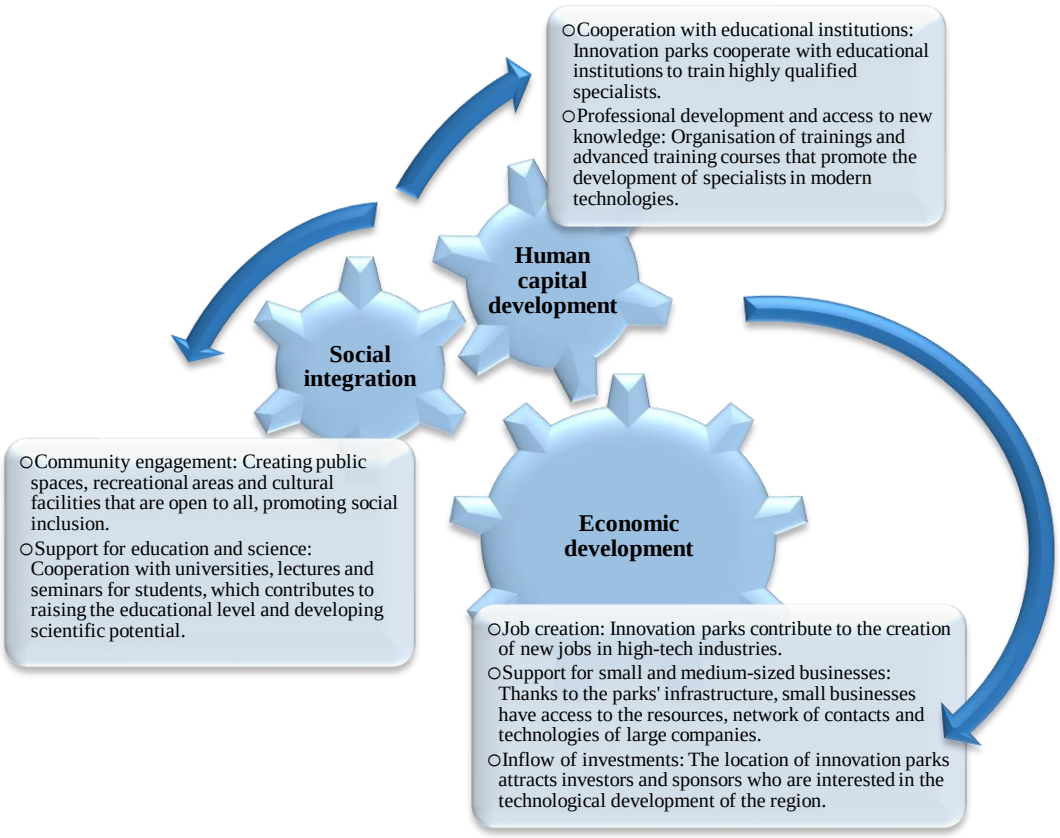

Figure 1. Socio-economic aspects of innovation parks functioning.
Source: compiled by the authors

By implementing these environmentally sustainable practices, innovation parks significantly reduce greenhouse gas emissions, water and air pollution, biodiversity and the sustainable use of natural resources. These measures improve the environmental situation in the cities where the parks are located, create favourable conditions for sustainable business development, and promote an environmental culture among local residents and employees (Krysovatyy et al., 2024; Cowley & Caprotti, 2018).

Innovation parks in Europe and Ukraine play an essential role in developing the economic, environmental and social environment, influencing employment, the investment climate and residents' quality of life. Table 3 shows the number of innovation parks and jobs created in these regions, highlighting their importance for economic growth. Table 4 presents the amount of investment and the number of startups fostered by innovation parks, highlighting their role in supporting entrepreneurship. Table 5 shows the impact of these parks on environmental sustainability and the housing market, indicating a growing demand for sustainable solutions and housing near innovation centres. This data demonstrates the significant contribution of innovation parks to the development of urban processes and support for a sustainable urban environment.

Table 3.
Number of innovation parks and jobs created in Europe and Ukraine (as of 2024)

Region	Number of innovation parks	Jobs created
Europe	1,500	400,000
Ukraine	77	3,850

Source: compiled by the authors based on Ministry of Economy of Ukraine (2024).

Europe is demonstrating an active development of innovation parks, which create around 400,000 jobs. This is due to a developed infrastructure, stable investments and support from government programmes to stimulate innovation. In Ukraine, the number of innovation parks and jobs is much smaller but is also growing due to the implementation of business and investor support programmes. Ukraine's innovation parks have the potential for further development, especially in the IT and engineering sectors, which will help to increase employment in these areas.

Table 4.
Investment in innovation parks and the number of startups in Europe and Ukraine (2024)

Region	Investments (billion euros)	Number of startups
Europe	10	5,000
Ukraine	0.5	150

Sources: Startup Genome (2024)

Europe is actively attracting investment in innovation parks, with a total of around €10 billion, which has helped to create around 5,000 new startups. This growth is due to a stable economic situation and support for innovative sectors through grants and financial instruments. In Ukraine, investments amounted to €0.5 billion, which enabled the launch of around 150 startups. Although the volume of investment is minor, Ukraine is showing growth thanks to support for IT clusters and initiatives to develop the startup ecosystem.

Comparisons of the effects of innovation parks on environment sustainability involving Europe and Ukraine reveal differences in the extent of CO_2 emission reduction due to technology application and policy adaption. The paper attributed Europe's realization of the 25 percent cut on its CO_2 emissions reduction through greater tendency towards utilization of renewable energy sources, funded and encouraged by investment and incentive programs. In addition, EU Waste Framework Directive legal requirements, as well as initiatives for sustainable cities, have continued to be effective in encouraging energy efficiency and low carbon outcomes.

On the other hand, Ukraine has successfully reduced its CO_2 emission by 15%, which may, again, be due to a slow shift to green technologies coupled with lower capital for green projects. Initiatives have been directed toward making existing industrial systems more efficient, and changing from coal to natural gas. But a minute flow of investments in renewable energy generation, limited availability of high technologies, and less strict observance of environmental standards have compromised the process of attaining sustainable development objectives.

These differences prove that there is a need to up the policies provided by the government together with the need to get more support from the international community in order to increase the use of unique environmental interventions in Ukraine.

Table 5.
Impact of innovation parks on environmental sustainability and housing costs

Indicator	Europe (%)	Ukraine (%)
Reducing CO_2 emissions	25	15
Housing price growth over 5 years	15	10

Source: compiled by the authors based on European Investment Bank (2023); International Monetary Fund (2022).

Innovation parks in Europe can reduce CO_2 emissions by 25%, achieved through environmental technologies and energy-efficient solutions. In Ukraine, the emission reduction rate is 15% due to the gradual transition to renewable energy sources and the implementation of environmental initiatives. At the same time, the development of innovation parks leads to increased housing costs: in Europe - by 15% over 5 years, and in Ukraine - by 10%. This is due to increased demand for housing near parks, which are attractive to employees and businesses.

Table 6.
Unresolved issues related to social equality and housing affordability in the context of innovation park development

Problem	Description	Consequences	Possible solutions
Increase in housing costs	Innovation parks are often located in attractive urban areas, which leads to higher housing prices due to demand from employees and businesses.	The cost of renting and purchasing housing is becoming unaffordable for low—and middle-income local residents, leading to their displacement from the area.	Developing affordable housing within the innovation park or providing financial benefits and subsidies for residents.
Social segregation	The emergence of innovation parks can lead to the creation of closed communities with higher socio-economic standards, making it difficult for other groups to integrate.	The emergence of social inequality between employees of innovation parks and residents of nearby areas can lead to increased social tension and a sense of exclusion among residents.	Creating open public spaces, cultural centres and areas for interaction between different social groups.
Limited access to infrastructure	Innovation parks often concentrate on high-quality infrastructure, but residents may not have access to these facilities due to high prices or restrictions.	Residents who do not work in the park have limited access to medical, educational, and cultural services, which creates barriers to using innovation parks' infrastructure.	Creating conditions for residents to access the park's infrastructure, such as reduced tariffs or open access during certain hours.
Inequality in economic opportunities	The benefits and opportunities provided by innovation parks can only be accessed by qualified professionals, which creates barriers for people with low qualifications or insufficient education.	Social inequality arises as low-skilled workers do not have access to the career opportunities and financial benefits available to professionals, widening the economic gap.	Developing retraining and professional development programmes for residents, providing internship and work opportunities for students and employees from the local community.
Transport problems	Due to the large influx of workers to innovation parks, surrounding roads and public transport can become congested, making it difficult for residents to get around.	Congestion, air pollution, and increased noise levels can negatively impact the quality of life in the area, especially for people who do not work in the park but live nearby.	Investing in developing public transport, bicycle paths, and pedestrian areas will provide transport benefits for residents, facilitating movement and reducing the burden on infrastructure.
Lack of affordable housing	Most of the residential properties located near innovation parks are targeted at highly paid employees, which limits the opportunity for less affluent residents to live close to their place of work.	This limits access to work for low-paid workers forced to seek housing in more remote areas, making their daily commute more difficult and reducing their quality of life.	We support the construction of affordable housing near innovation parks and establish mandatory quotas for the construction of housing for different socio-economic groups.

Source: compiled by the authors.

Thus, developing innovation parks significantly benefits the economy, technological progress, and challenges related to social inequality and housing affordability. It is essential that the planning and implementation of such parks consider the interests of local communities and contribute to creating accessible opportunities for all residents (Hordieieva et al., 2024). To overcome these challenges, it is advisable to develop policies that ensure the integration of different social groups, improve access to infrastructure, and support the construction of affordable housing.

Discussion

An analysis of the socio-economic aspects of innovation parks shows that they have a significant potential to influence the development of the urban environment. However, different opinions exist on how these parks can address inequality and accessibility issues, particularly in housing and social inclusion. According

to Mitlin (2021), innovation parks provide a platform for engaging local communities in planning processes, promoting social inclusion and access to infrastructure. However, other researchers, such as Gilmore (2023), point out that despite these opportunities, parks often create elite spaces inaccessible to the general population, which can reinforce social inequalities. Caprotti and Liu (2020) highlighted the role of digital platforms in creating interactive spaces in innovation parks, which could facilitate access to services and promote infrastructure development. However, due to economic factors, other authors (Whiting et al., 2022; Arefi et al., 2019; Katmada et al., 2023) note that such initiatives primarily focus on highly skilled professionals, leaving the needs of less well-off citizens unaddressed.

Much of the literature also points to the potential adverse effects of rising housing costs around innovation parks. For example, a study by Whiting et al. (2022) shows that developing innovation parks can increase the cost of rent and housing in the surrounding areas, making it unaffordable for middle- and low-income residents. This tendency contributes to social segregation when high-income park employees can afford to live nearby while residents are forced to move to distant areas. In this context, social initiatives to provide affordable housing near innovation parks could contribute to the sustainable development and maintenance of a diverse social composition in these areas.

In addition, it is worth noting the impact of innovation parks on the transport infrastructure and the city's ecology. Some researchers, such as Söderström and Mermet (2020), emphasise that the increased flow of employees to innovation parks can cause traffic congestion and increase environmental pollution. However, other authors, including Caprotti et al. (2022), note the potential of such parks to develop alternative transport solutions, such as pedestrian areas, bicycle paths, and electric vehicle charging stations, which could reduce the burden on transport infrastructure. Coordinating these approaches in urban planning can contribute to more harmonious and sustainable development. However, additional research and careful regulation by local authorities are required to ensure an even distribution of transport resources and reduce environmental impact.

Our findings confirm the importance of innovation parks in the context of increasing the competitiveness of cities and attracting investment, which is in line with the studies of Balsas (2023) and Mohamed (2023), who point to the possibility of reducing environmental burden and developing infrastructure through sustainable practices. However, insufficient attention to housing affordability and the integration of different social groups may negatively affect the overall success of such initiatives. Therefore, further research is needed to develop policies that ensure social equity and support the availability of infrastructure for all region residents.

Conclusions

This paper supports the proposition that innovation parks are essential components of urban development that may boost city competitiveness by nurturing new generation technologies and sustainable business models. The outcomes prove that innovation parks impact positively to economic development and conform to the research goals set at the beginning of the study. Yet, this research extends the existing debate regarding the impacts of innovation parks on the social domain, focusing on problems of social justice and housing accessibility in this context. The study's practical implications are specific suggestions for city administrations and developers on how to incorporate innovation parks into cities most suitably. These recommendations focus on the establishment of programmes that promote the construction of cheap and accessible housing, playgrounds, and electric or bicycle means of transport which have been found to be suitable for transformation to other city settings.

Limitations: Nevertheless, this research argues some limitations to include the following. One common drawback is that studies that investigate the effects of innovation parks are often not able to draw from a large data set that includes comparable data from many years after the setting up of the innovation park, thus limiting the possibility of measuring the sustainable impacts of the setting up of such zones. Furthermore, the following limitations can be noted: potential endogenous biases stem from the use of secondary data sources and use of regional case studies may not reflect impacts heterogeneity. It is for these reasons that more empirical work is required in order to understand the various ways that innovation parks exert an impact, especially in the longer term.

Implications for Urban Planning and Public Policy: These results stress the need regarding the inclusion of relevant innovation parks into wider spatial policies to generate desired sustainable development

patterns. It follows that for urban planning, the choice of policies lies in providing for growth while attending to the needs of society; examples of policy goals thus are policies meant to encourage mixed income housing, or the availability of park infrastructure to the population. Specifically for public policy, the research suggests the introduction of specific subsidies for innovation parks and development of green technologies, the formation of public-private partnerships for sustainable transport systems and development of frameworks for risks management, particularly emerging social segregation or housing affordability problems.

Future Research Directions: Based on these results, it is crucial for further research to target the design and testing of concrete social programmes relevant to different population groups in the area of innovation parks, thus investigating the efficiency of decreasing social segregation. Furthermore, the research methods to analysis the environmental changes within and by the Innovation Parks should be established to assess more precisely the firms' and overall contribution towards sustainable urban systems. Further analysis of the relationships between social and economic components of innovation parks and how emerging technologies support sustainable development of cities will add to the richness of research on the topic.

Bibliographic references

Arefi, M., Greywoode, M., Fritz, A., Bagheri, F., Finney, A., Schermerhorn, S., Johnson, M., & Nimery, S. (2019). Reflection-in-action in land use planning: Can we do better? *Planning Practice & Research*, *34*(5), 573-587. https://doi.org/10.1080/02697459.2019.1645412

Balsas, C. J. L. (2022). Sustainable urbanism: An evolving field of scholarship and professional practice. *Urban Design & Planning*, *175*(2), 67-71. https://doi.org/10.1680/jurdp.21.00036

Balsas, C. J. L. (2023). Improving land-use-based urbanism through award-winning planning practice and scholarship: A North American case study. *Socio-Ecological Practice Research*, *5*, 275-291. https://doi.org/10.1007/s42532-023-00161-x

Barnes, S. (2019). Discussion of platform: From digital systems of participation to infrastructures of everyday life. *Geographical Compass*, *13*(9), e12464. https://doi.org/10.1111/gec3.12464

Batsurovska, I. V., & Kurylen, V. M. (2024). Perspectives of using wind power stations: Advantages and ecological safety. *In Traditions and new scientific strategies in the context of global transformations of ecology* (pp. 35-62). Baltija Publishing.

Bissell, D. (2020). Affective platform urbanism: Changing habits of digital on-demand consumption. *Geoforum*, *115*, 102-110.

Caprotti, F., & Liu, D. (2019). Emerging platform urbanism in China: Reconfigurations of data, citizenship, and materialities. *Technological Forecasting and Social Change*, *151*, Article 119690. https://doi.org/10.1016/j.techfore.2019.06.016

Caprotti, F., & Liu, D. (2020). Platform urbanism and the Chinese smart city: The co-production and territorialisation of Hangzhou City Brain. *GeoJournal*, *87*. https://doi.org/10.1007/s10708-020-10320-2

Caprotti, F., Chang, I. C. C., & Joss, S. (2022). Beyond the smart city: A typology of platform urbanism. *Urban Transformations*, *4*, Article 4. https://doi.org/10.1186/s42854-022-00033-9

Cardullo, P., & Kitchin, R. (2018). Smart urbanism and smart citizenship: The neoliberal logic of 'citizen-focused' smart cities in Europe. *Environment and Planning C: Politics and Space*, *37*(5), 813-830. https://doi.org/10.1177/0263774X18806508

Abellán, F., & Ondoño, I. (2024). Governance and urbanism in the revitalisation of the city centre of Albacete. In R. C. Lois-González & J. A. Rio Fernandes (Eds.), *Urban Change in the Iberian Peninsula*. The Urban Book Series. Springer, Cham. https://doi.org/10.1007/978-3-031-59679-7_25

Cowley, R., & Caprotti, F. (2018). Smart city as anti-planning in the UK. *Environment and Planning D: Society and Space*. https://doi.org/10.1177/0263775818787506

del Cerro Santamaría, G. (2022). Urbanism, megaprojects, and the world economy. In R. Baikady, S. Sajid, V. Nadesan, J. Przeperski, M. R. Islam, & J. Gao (Eds.), *The Palgrave Handbook of Global Social Change.* Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-87624-1_189-1

Desyatnyuk, O., Krysovatyy, A., Ptashchenko, O., & Kyrylenko, O. (2024a). Financial security in the conditions of globalisation: Strategies and mechanisms for the protection of national interests. *Economic Affairs*, *69*(Special Issue), 261-268. https://ndpublisher.in/admin/issues/EAv69n1z1.pdf

Desyatnyuk, O., Naumenko, M., Lytovchenko, I., & Beketov, O. (2024b). Impact of digitalisation on international financial security in conditions of sustainable development. *Problemy Ekorozwoju/Problems of Sustainable Development*, *1*, 104-114. https://ph.pollub.pl/index.php/preko/article/view/5325/4341

European Investment Bank. (2023). *EIB Group Activity Report 2023: A Blueprint for Sustainable Living*. Luxembourg: European Investment Bank. Retrieved from https://www.eib.org/en/publications/20230300-eib-group-activity-report-2023

Gilmore, A. (2023). Municipal care: Public parks and the governance of place. In *Culture, Participation and Policy in the Municipal Public Park*. Palgrave Studies in Cultural Participation. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-44277-3_5

Hordieieva, I., Omelyanenko, V., Krysovatyy, I., Oprysok, M., & Kostin, I. (2024). Project management in complex technical infrastructure projects: Challenges and strategies. AD ALTA *Journal of Interdisciplinary Research*, *14*(1), 88-93. https://doi.org/10.33543/1401398893

International Monetary Fund (IMF). (2022). *People's Republic of China: Selected Issues: Household savings and its drivers—Some stylized facts.* IMF Country Report 22/022, International Monetary Fund, Washington, DC. https://doi.org/10.5089/9798400201486.002

Karp, V., Krysovatyy, I., Oliinyk, K., Nazarova, S., & Semenenko, Y. (2024). Reengineering business operations within the digital economy. AD ALTA *Journal of Interdisciplinary Research*, *14*(1), 164-168. https://www.magnanimitas.cz/ADALTA/140142/papers/A_32.pdf

Katmada, A., Katsavounidou, G., & Kakderi, C. (2023). Platform urbanism for sustainability. In N. A. Streitz & S. Konomi (Eds.), *Distributed, ambient and pervasive interactions* (Vol. 14037). Springer, Cham. https://doi.org/10.1007/978-3-031-34609-5_3

Krysovatyy, A., Ptashchenko, O., Kurtsev, O., & Arutyunyan, O. (2024). The concept of inclusive economy as a component of sustainable development. *Problemy Ekorozwoju/Problems of Sustainable Development*, *1*, 164-172. https://ph.pollub.pl/index.php/preko/article/view/5755/4346

Ministry of Economy of Ukraine. (2024). *Industrial parks: A guide for investors*. Retrieved from https://www.kmu.gov.ua/news/industrialni-parky-haid-dlia-investoriv

Mitlin, D. (2021). Editorial: Citizen participation in planning: From the neighbourhood to the city. *Environment & Urbanisation*, *33*(2), 295-309. https://doi.org/10.1177/09562478211035608

Mohamed, D. A. S. Y. (2023). Sustainable urbanism through city information modelling. In M. Casini (Ed.), *Proceedings of the 2nd International Civil Engineering and Architecture Conference* (CEAC 2022), Lecture Notes in Civil Engineering, vol 279. Springer, Singapore. https://doi.org/10.1007/978-981-19-4293-8_51

Razi, L., & Ziminski, D. (2022). Physical and digital placemaking in a public art initiative in Camden, NJ. *Cultural Creative Spaces Journal*, *14*(2), Article 2. https://doi.org/10.5130/ccs.v14.i2.8201

Sadeghi, A. R., Shahvaran, F., Gholami, A. R., & Feyzabi, T. (2022). Towards behaviour-based placemaking: The evolution of place concept in urban design knowledge. *International Journal of Human Capital in Urban Management*, *7*(3), Article 3. https://doi.org/10.22034/IJHCUM.2022.03.05

Söderström, O., & Mermet, A.-C. (2020). When Airbnb sits in the control room: Platform urbanism as actually existing smart urbanism in Reykjavík. *Frontiers in Sustainable Cities, 2, 15*. https://doi.org/10.3389/frsc.2020.00015

Startup Genome. (2024). *Global Startup Ecosystem Report 2024.* Retrieved from https://startupgenome.com/report/gser2024

Van Ameijde, J., Ma, C. Y., Goepel, G., Kirsten, C., & Wong, J. (2022). Data-driven placemaking: Public space canopy design through multi-objective optimisation considering shading, structural, and social performance. *Frontiers of Architectural Research*, *11*(2), Article 2. https://doi.org/10.1016/j.foar.2021.10.007

Wagner, J. R. (2021). Circulating value: Convergences of datafication, financialisation, and urbanisation. *Urban Transformations*, *3*(4). https://doi.org/10.1186/s42854-021-00022-4

Whiting, S., Barnett, T., & O'Connor, J. (2022). 'Creative city' R.I.P.? M/C *Journal*, *25*(3). https://doi.org/10.5204/mcj.2901