DOI: 10.15201/hungeobull.74.1.5 Hungarian Geographical Bulletin **74** 2025 (1) 71–91.

How to develop the creative milieu and physical resources of the university campus into a sustainable innovation zone – The case of Morasko-Poznań, Poland

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Abstract

This article evaluates the development of the Morasko Campus of Adam Mickiewicz University (AMU) in Poznań, one of Poland's leading academic centres, in relation to its alignment with the Sustainable Innovation Zone (SIZ) concept. This concept refers to urban districts that concentrate sustainable innovation activities within an attractive, creative milieu. The study draws on model solutions from the literature on creating city innovation districts, focusing on some physical assets considered to be sustainable innovations. The findings indicate that the Morasko Campus has begun to integrate elements of the SIZ concept, particularly in selected public spaces and university building courtyards. Initial pilot projects have been launched to incorporate sustainable innovations, such as green roofs, green walls, and solar energy photovoltaic panels, into the campus buildings. As sustainability becomes a central focus of the University's development policy, it is anticipated that these initiatives will increase in the near future.

Keywords: Sustainable Innovation Zone (SIZ), university campus, creative milieu, innovation district, sustainable innovation, Poznań, Poland

Received December 2024, accepted March 2025.

Introduction

In today's turbulent economic, political, and social landscape, academic institutions face new challenges. They play a crucial role as driving forces in the knowledge economy, fostering intellectual growth, driving innovation, and addressing societal changes. Amidst climate challenges, universities have an emerging role in educating and developing new solutions to mitigate these changes. Their efforts should focus more on developing clean and green technologies, digital solutions, academic creativity, entrepreneurship, and start-up creation (Fastenrath, S. *et al.* 2023). The physical space of the university, where all knowledge functions are generated, is the university campus. Some of these campuses are anchors for the development of innovation districts. They help create flourishing, sustainable and creative milieu, social inclusion, good quality of space, and fostering of innovations (Tremblay, D.G. and Battaglia, A. 2012). They are also key elements of global strategy for cities wanting to become leaders in the knowledge-based economy (Oinas, P. *et al.* 2018). Finally, they reflect the development of urban geography

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and place-making associated with the generation of innovations in cities (Fastenrath, S. *et al*. 2023). In turn, these innovation districts are mainly developed in the vicinity of university campuses that concentrate high-quality human capital and scientific research infrastructure, and green spaces that stimulate the exchange of information, knowledge development, and the creation of innovations while maintaining high environmental standards (Finlay, J. and Massey, J. 2012; Turk Cerovečki, M. and Stiperski, Z. 2024).

A concept that well describes the way of shaping university campus is the Sustainable Innovation Zone (SIZ), that was proposed by Weiss, M.A. *et al*. (2015) for the economic growth and development strategy of the state of Rio Grande do Sul in Brazil, known as the Leapfrog Economic Strategy. This term was related to the idea of a technological leap for companies located in this region, and the goal of the strategy was to create the most sustainable and innovative place in Latin America by 2030 (Weiss, M.A. *et al*. 2015; Weiss, M. 2016; Angoneze-Grela, E. 2021; Męczyński, M. *et al.* 2024). The author of the concept assumes that in SIZs, research and academic institutions generate innovations, including so-called sustainable innovations that help conserve and reuse renewable resources much more efficiently (Weiss, M. 2016, 2023). In this case, the term sustainable innovation refers to the development of products and services to meet the goals of sustainable development, considering economic, social, and environmental factors (Mazaheri, M. *et al.* 2022). This theoretical concept enabled the continuation of research by Meusburger, P. (2009), and Amcoff, J. (2020), related to the quality of the university environment, but also defining a new path of research on developing a creative milieu at the university campus in the face of sustainable development challenges, and implementing policies focused on the mitigating climate change and reducing GHG emissions. This new approach builds upon previous research related to the Morasko Campus of Adam Mickiewicz University (AMU) in Poznań, one of the leading academic institutions in Poland (e.g. Konecka-Szydłowska, B. 2020; Kulczyńska, K. *et al.* 2020).

The article focuses on identifying and analysing the physical resources that influence the development of a SIZ, using the Morasko Campus as a case study. The campus, recognized as one of the most modern and dynamically evolving in Poland, serves as an example to evaluate how its design, resources, and creative milieu align with the principles of SIZs and their role in promoting sustainable innovation and inclusive prosperity. The research questions of this study are as follows: 1) What are the possibilities for adopting the SIZ concept at university campuses in Central and Eastern Europe? 2) How do physical resources and the built environment influence the development of a creative milieu at Morasko Campus and contribute to the creation of an SIZ? 3) What type of the university campus-based SIZ is developing at the Morasko Campus? 4) What are the key elements of the SIZ concept identifiable at Morasko Campus?

The analysis emphasizes physical (material) resources, such as public spaces, buildings, and the campus's connectivity to the broader Poznań metropolitan region. The findings aim to verify a concept originating in the 1970s, observed in both capitalist and communist countries, that advocated for constructing new campuses in city outskirts. At Morasko Campus, the original architectural vision by Fikus, M. and Gurawski, J. (1978) sought to create a space fostering integration across university activities and life, both within the campus and its interaction with the city. Today, this idea aligns with the global trend of higher education institutions becoming experimental "living laboratories" for sustainable development. Examples include the University of California campuses (San Diego and Irvine), which focus on creating sustainable infrastructure, reducing carbon emissions, and advancing green initiatives. The authors highlight the critical role of higher education in driving societal transformation, using campuses as prototypes for green infrastructure transformation (Arnaud, B.St. *et al.* 2009).

The structure of this article reflects the achievement of its stated goal. The introduction presents the research problem, outlining its purpose and scope. The second section focuses on the evolving role of university campuses, based on a literature review. This is followed by a review of the literature on the formation of innovation districts and the development of a creative milieu, with particular emphasis on the new approach introduced by the SIZ concept. Next, the article provides an overview of the innovative potential of AMU in Poznań, including key faculty building characteristics on the Morasko Campus. The subsequent section presents research findings about the campus, assessing buildings and land use in relation to the creative milieu and SIZ development. Finally, the article concludes with a discussion and key findings drawn from the research.

Changing role of university campuses

Intensive research on the role of university campuses in the local economy has gained momentum in academia over the past quarter century. Studies have highlighted significant variations in the impact of university campuses on local economies and societies, depending on: a) the university's location (e.g. rural campuses with a strong social role vs. full-service research universities in core regions, see Benneworth, P. 2019), and b) the university's characteristics (e.g. innovative university, see Clark, B.R. [2001]; engaged university, see Breznitz, S.M. and Feldman, M.P. [2012]; entrepreneurial university, see Guerrero, M. *et al.* [2014]; or civic university, see Goddard, J. *et al*. [2016]). Research by Benneworth, P. *et al.* (2022) shows that university campuses in rural areas play a crucial role in local socio-cultural infrastructures, mobilizing local social capital and fostering community development. Meanwhile, university campuses with a regional role – both urban and metropolitan – are not just passive knowledge brokers but actively contribute to economic development through knowledge spill-overs and partnerships with regional and local stakeholders (e.g. spin-offs). Korotka, M.A. (2015) emphasizes that university campuses help develop new infrastructures through spill-over effects, while Cooke, P. (2005) highlights their role in advancing regional innovation systems. Additionally, university campuses can host firms that collaborate with universities, particularly those with research and development centres, as well as other public research institutions. However, their influence extends beyond shaping the hard factors of the local economy (e.g. new firm creation based on innovative ideas); they also significantly impact soft factors (e.g. cultural and creative development), enhancing regional attractiveness and quality of life (Boschma, R. 2015).

University campus activities can be grouped into three main areas: 1) research (e.g. technology transfer and innovation), 2) teaching (e.g. lifelong learning/continuing education), and 3) university engagement in the economic, social, cultural, and environmental development of the region (Mora, J.G. *et al.* 2015). Over the past decade, the third mission of universities – their role in societal engagement – has grown in importance (Trencher, G. *et al.* 2014; Compagnucci, L. and Spigarelli, F. 2020). As a result, the traditional view of university campuses as solely educational institutions is fading, while their role as hubs for creativity and cultural development is becoming more prominent. A key question in our study is how university campuses are transforming into institutions that foster a creative milieu and support sustainable development and innovation. This is not a new debate – since the 1960s, scholars have examined how universities adapt to societal expectations and evolving needs (Kerr, C. 1963). According to Jäger, A. and Kopper, J. (2013) this transformation depends on three interrelated factors: 1) the configuration of activities within a university, 2) the degree of its territorial embeddedness, and 3) the institutional frameworks in which it operates. Corresponding to these factors, it is critical to assess the role of university

campuses in sustainable local economic development and in creating a creative milieu that fosters sustainable innovations. In light of climate change and shifting stakeholder priorities, universities must also contribute to climate mitigation policies and support the development of SIZs.

The role of the creative milieu in fostering sustainable innovation zones at university campuses

The new challenges the university campuses have to face are the problems among other of the climate changes, rapid technological changes and social exclusion. The creation of a SIZ should be analysed as a multi-stage process in the evolution of university campuses that includes these challenges *(Figure 1).* This transformation begins with a shift in focus: beyond location and accessibility, the *quality of place* becomes essential (Boix, M. *et al.* 2015; Mateos-Garcia, J. and Bakhshi, H. 2016). The concept of "quality of place" emphasizes that living and working environments significantly impact quality of life. Thoughtful design and planning can enhance it, yielding environmental, social, and economic benefits (Burton, M. 2014). Richard Florida's creative class theory (2002) aligns with this idea, linking quality of place to quality of life and economic growth. He highlights key social and cultural factors – such as diversity, vibrancy, creativity, tolerance, aesthetics, and safety – as crucial for attracting the creative, educated individuals who drive the growth and competitiveness of places (Trip, J.J. 2007).

Moreover, in creating attractive, high-quality public spaces, Gehl, J. (2010) emphasizes supporting both necessary activities (e.g. commuting) and optional ones (e.g. strolling, sitting, pausing). He argues that the liveability of public spaces extends beyond aesthetics to include scale, safety, sensory engagement, comfort, and functional diversity. As a result, these spaces tend to attract a broader range of users participating in diverse activities and encourage more extended visits (Gehl, J. 1986; Carmona, M. 2019). Likewise, on university campuses, people gravitate toward spaces that foster social interaction, academic pursuits, and creative activities. Such environments should offer comfort, protection from the elements, shaded seating areas, options for dining, and spaces dedicated to cultural and artistic experiences (O'Rourke, V. and Baldwin, C. 2016). Most aspects of the quality of place refer to tangible (e.g. buildings, pathways, benches) and intangible (e.g. social interactions, emotions) assets of public spaces. These assets create a vibrant, liveable, and creative atmosphere for knowledge and information exchange.

The role of the place in the creation and exchange of information is well presented by Törnqvist, T. (1983) creative milieu idea. He

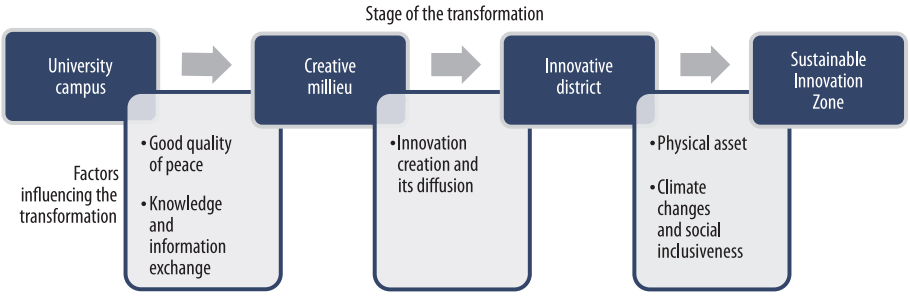

Fig. 1. The process of the university campus transformation into a sustainable innovation zone.
Source: Authors' own compilation.

argued that a creative milieu emerges when four key features are present: 1) information, which must be exchanged and shared, 2) knowledge, including bodies of work and databases, 3) competence in specific activities, and 4) creativity, which integrates with the first three features to generate new products, ideas, and processes. Törnqvist, G. (2004) emphasizes the role of various relationships in knowledge creation, including formal and informal networks of individuals and connections between local and regional institutions. In light of these concepts, university campuses are supposed to offer an ideal setting to provide a creative milieu.

However, creative places on university campuses combine characteristics that usually take a long time to evolve and develop. Building up libraries, archives, databases, and traditional skills takes time. Such places come to have a recognized set of creative specializations, which act as a magnet to attract talented and creative people. Therefore, in creating the *university's creative milieu,* it's vital to combine the perspective of the separated area with the broader viewpoint of more considerable structures such as the surrounding district and the entire city. Moreover, in the minority of research, especially related to the university public spaces, authors underline the tangible creative outcome of the university-built environment (Soares, I. *et al*. 2020; Rafiei, S. and Gifford, R. 2023). Therefore, it is important to focus on the university campus as a part of the city district and its role in urban transformation. Innovation districts are an example of such areas, with universities serving as anchor institutions that stimulate innovation. They are well-accessible places for generating innovations and providing a good quality place that reflects the idea of a creative milieu. For cities seeking to transform and repurpose aging industrial buildings, innovation districts present a valuable opportunity (Katz, B. and Wagner, J. 2014). They are increasingly integrating into the urban fabric, developing alongside nearby enterprises (including start-ups), institutions that support entrepreneurship and knowledge transfer (such as innovation and technology transfer centres), and research and development units that drive innovation (Katz, B. and Wagner, J. 2014).

According to Morrison, A. (2022) the development of innovation districts represents a place-based urban strategy aimed at transforming underperforming, centrally located neighbourhoods into vibrant hubs for innovative and creative companies and professionals. Within this framework, innovative districts serve as a catalyst for urban regeneration. However, it must also tackle pressing contemporary challenges, including climate change, social exclusion, the demand for sustainable innovations, and the pursuit of new avenues for economic growth (Vanolo, A. 2017). One of the responses to the new challenges that meets the criteria of a well-designed innovation district and creative milieu that effectively addresses sustainable development challenges and advances social inclusion is the SIZ concept founded by Weiss, M. (2023). It provides a specific example of the functionality of innovation. The SIZ is the one of the successful outcomes of introducing sustainable economic development strategies for cities and regions that drive new employment creation and economic growth, fostering sustainable businesses and communities.

These strategies also promote renewable energy, clean technologies, environmental quality, and climate change mitigation in cost-effective ways defined by the "Four Greens" approach: 1) Green Savings; 2) Green Opportunities; 3) Green Talent; 4) Green Places (Cristophers, B. and Riofrancos, T. 2024). According to Weiss, SIZ should emerge at university campuses around technology parks and business incubators, where renewable resources are reused. This new type of innovation district creates an urban "Innovation Ecosystem" focused specifically on sustainable innovations. All of the products, services, technologies, and talent within an SIZ are designed to make the area more environmentally sustainable and climate-resilient within a circular

economy that dynamically save money and grows businesses, jobs, incomes, and assets. Additionally, SIZ is inclusively oriented, actively involving social entrepreneurs, sustainability activists, creative design experts, and others, all empowered by a grassroots movement, in addition to actively involving technologists and investors. SIZs essentially are a model for community economic development (Fitzgerald, H.E. *et al.* 2019), with a greater focus on business and employment development than related community sustainability initiatives such as Ecodistricts, or Transition Towns (Barry, J. and Quilley, S. 2008). The essential principles on which the development of SIZs can be based are included in this general slogan: "Getting Richer by Becoming Greener" (Weiss, M. 2016).

In many aspects, the concept of SIZ also refers to other contemporary approaches to the sustainable development of innovation districts, i.e. creative districts (Richards, G. 2020), ecological districts (Ecodistrict – Reynolds, J. 2019), or transition towns (Transition Towns – Kenis, A. and Mathijs, E. 2014). Most of these concepts point to the functioning of scientific or educational institutions, e.g. universities, around which it is possible to "anchor": start-ups, international enterprises, or public institutions supporting innovative activities. In this approach, the university campus becomes not only a place for creating and transmitting knowledge, but also a place for concentrating business activities (e.g. Cambridge Research Park, University of Sheffield Innovative District).

The creation of a creative milieu on a university campus, as a key element of the SIZ, requires high-quality public spaces, mixed land use, sustainable transportation systems, urban greenery, and functional urban layouts with sustainable architecture (see e.g. Jenks, M. and Jones, C. 2010). In particular, the development of renewable energy resources follows principles aligned with green infrastructure – defined as an interconnected network of vegetated areas that preserve natural ecosystems while benefiting residents (Benedict, M.A. and McMahon, E.T. 2006; Barrios-Crespo, E. *et al*. 2021). Regarding layout and architecture, Weiss's concept of SIZ is closely linked to sustainable construction, which emphasizes the use of environmentally friendly materials and construction technologies, natural ventilation and heating systems, as well as green facades and roofs (Besir, A.B. and Cuce, P.M. 2018).

The characteristics discussed in relation to the creation of SIZ at university campuses can be summarized into three spatial models of the SIZ, reflecting the typology of innovation districts of Katz's and Wagner's (2014): 1) Anchor Plus Zone – this area is centred around leading institutions in the city, usually large economic entities, along with a public institution that "anchors" other economic entities; 2) Re-imagined Urban Zone – this area often features historic waterfronts or degraded post-industrial/warehouse spaces, as these types of older and neglected urban areas are transformed into new growth hubs based on innovations; 3) Urbanized Science Park – this type of zone integrates isolated, autonomously functioning suburban science and technology parks into the urban fabric by providing public transport and multi-family housing developments.

The above models indicate the formation of SIZs at university campuses, based on the presence of three types of resources: 1) physical, 2) economic, and 3) networking (Katz, B. and Wagner, J. 2014). Physical assets constitute public and private spaces with buildings, parks, streets and information and communication infrastructure that stimulate cooperation based on modern technologies (including those beneficial from the point of view of environmental protection) and serve to generate innovations. Economic assets are *companies, institutions* and *organizations* that drive, cultivate or support the innovation environment. Finally, the third type of resource is networking, based on relationships between actors (e.g. individuals and companies), enabling the transformation of ideas into inventions and innovations. In our study, we focus on analysing the physical (built) environment that serves as the foun-

dation for a creative milieu and a SIZ at the Morasko Campus, part of AMU in Poznań – one of Poland's leading academic institutions. In light of these concepts, the following key questions arise: What is the process of SIZ development at the Morasko Campus? How does this process differ from that of other university campuses in Western Europe?

Source materials and research methods

This article attempts to use the SIZ concept to analyse the Morasko Campus of AMU in Poznań. In this respect, reference was also made to the model solutions proposed in the work by Katz, B. and Wagner, J. (2014). The research process consisted of two stages.

In the first stage of the research, the method of analysing existing data (desk research) was used to collect and analyse information from secondary sources. In this way, data on the conditions and directions of spatial development of the Morasko Campus, included in strategic documents prepared by the municipal authorities and the university were studied. The focus was primarily on the spatial plans for the development of the Morasko Campus. Separate attention was given to the university's innovation reports, which gathered information on the current status and plans in this area. The conclusions drawn from the analysis of the above data were supported by qualitative content analysis, which envisages drawing inferences based on certain features of the message and involves extracting from the sources written extracts, quotes or examples to support an observation or relationship (Buttolph Johnson, J. *et al.* 2010). The second stage of the research incorporated the urban inventory method to gather background information on the current state of land use and development.

The above research at the Morasko Campus was carried out as part of student work in the academic year 2022/2023 and then collected, aggregated and completed by the authors of this article in early 2024. The urban inventory work concerned in particular: 1) assessment of the implementation of sustainable development principles conducive to innovation in the Morasko Campus space, 2) assessment of the introduction of ecological solutions in the Campus buildings, 3) transport connections of the Campus with the rest of the city and the entire metropolitan area.

The article uses the case study method, which involves an in-depth characterization of a selected example, the analysis of which allows concluding as to the causes and results of a given phenomenon (Stake, R.E. 1995). Thanks to the use of this method, it was possible to relate the theoretical concept of SIZ to real phenomena that develop in practice (Flyvbjerg, B. 2006). The empirical case study method is used mainly in descriptive research issues (Fidel, R. 1984). The research area chosen was the Morasko Campus, because of its physical conditions. It is a compact complex of academic buildings belonging to one of the most prestigious universities in Poland. An attempt was also made to verify the original idea of building a campus from the 1970s *(Figure 2).* It assumed that the Morasko Campus would be well connected to the rest of the city, via fast-track roads and high-speed rail. Internally, however, pedestrian traffic would dominate, which would be surrounded by greenery. This will promote the integration of students and academics from all Poznań universities (Fikus, M. and Gurawski, J. 1978).

Physical resources at the Morasko Campus important for sustainable innovation zone development

The Morasko Campus covers an area of approximately 300 hectares and includes over 20 buildings, and its spatial structure comprises two locations for research and teaching buildings. These are the western areas, where most of the faculties and buildings associated with them are located; and the north-eastern areas, which include two faculties and the buildings of the Physical Education and Sports Centre. The dominant

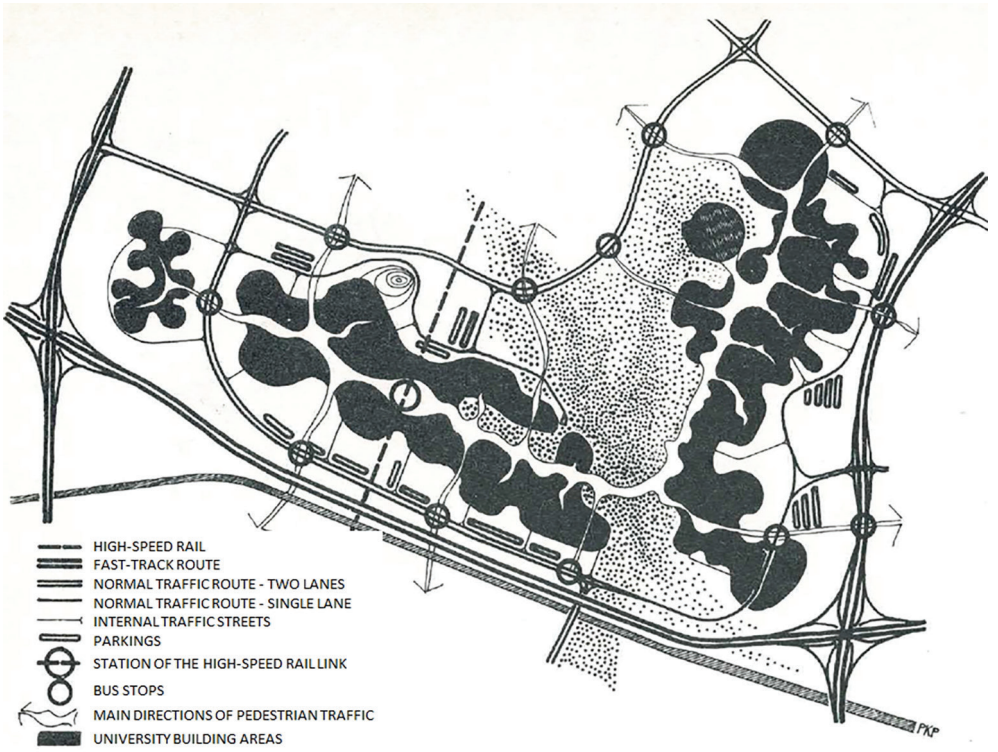

Fig. 2. Original concept for the construction of the Morasko Campus. *Source*: Authors'own compilation based on Fikus, M. and Gurawski, J. 1978.

academic function of the campus is complemented by recreational, sports, and residential functions.

The valuable natural environmental resources existing in the university's surroundings and the climate protection measures taken by the university's authorities have resulted that in 2023 AMU in Poznań was ranked 339th in the GreenMetric World University Rankings, and third among all Polish universities. AMU's high position in the university's environmental and climate rankings makes the development of an SIZ on its premises both feasible and attractive. However, this development should not only be based on the application and imitation of innovative solutions but also on their creation. For the Morasko Campus, this is made possible by technology transfer through the University Centre for Innovation and Technology Transfer (UCITT), and the particular purpose vehicle of AMU innovations, established in 2023. The latter venture enables the university to hold its shares in spin-off companies based at the university, and the first spin-off companies with university participation already have been established. Examples of such spin-offs at the university are in artificial intelligence, Laniqo, and the area of biotechnology, SpinBionic (Banaszak, M. 2023). Other important innovation development facilities located on campus are: Greater Poland Centre for Advanced Technologies, and NanoBioMedical Centre *(Figure 3)*. These ventures are good examples of linking scientific activity with the economy and creating relationships through which the SIZ can be developed.

Fig. 3. Selected spaces for Innovation Development in Poznań. *Source*: Authors' own elaboration.

In their work, Katz, B. and Wagner, J. (2014) divided the physical resources present in innovation districts into: 1) those occurring in public space, 2) those occurring in private space, and 3) those connecting innovation district to other parts of the city. With regard to the Morasko Campus, private resources were omitted from the analysis as they were not considered to be essential for developing the SIZ. Our attention was focused on the two remaining physical resources, i.e. 1) those occurring in public spaces, and 2) those connecting the zone to other parts of the city.

Physical resources present in public space

With regard to the first resources present in public space, they were analysed, taking into account the impact on the sustainability of the Morasko Campus and the possibility of creating innovation based on: 1) the green public spaces occurring between the buildings, and 2) the courtyards of the university buildings *(Figure 4)*. In both cases they can be regarded as those tangible assets that will have a major influence on promoting a creative milieu at the Morasko Campus.

In relation to the first of the highlighted public spaces, namely the green spaces that occur between buildings, only part of them have been developed in a way that promotes interaction, making connections, where "people collide with each other" (Katz, B. and Wagner, J. 2014). This is fostered by well-developed areas that provide variety and richness of experience, encourage walking or cycling, and invite people to linger longer in the space by shielding them from noise and other unpleasant sensations. As a result, social balance and a sense of security can be achieved (Gehl, J. and Svarre, B. 2013). Among the

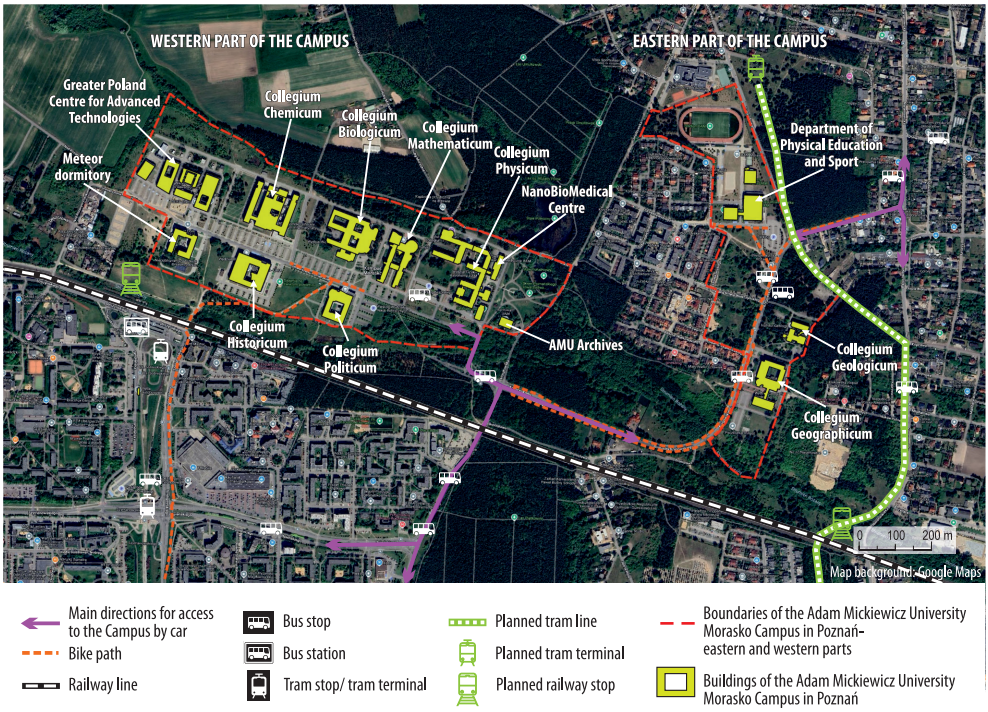

Fig. 4. Physical resources in public space influencing sustainable development of innovation at the Morasko Campus in Poznań. *Source*: Authors' own elaboration based on results of field inventory.

inventoried areas, the Skwer Poznański Towarzystwa Przyjaciół Nauk (Square of the Poznań Society of Friends of Science) located in the western part of Morasko Campus, fits best into these assumptions. It is a place with varied terrain height, isolated by greenery from the surrounding traffic areas, where there are both shaded and open spaces possible to use for more active recreation. It is an example of a modern solution and proper natural development combining nature with neighbouring facilities belonging to the university.

In areas on the north-eastern side of the Campus, in the vicinity of some faculty buildings, the Demonstration Climate Garden was built *(Photo 1)*. It is isolated from traffic, which reinforces its social function. This construction is a good example of sustainable innovation. It not only represents a new eco-product, but also the inclusive process of designing that involved many representatives of academia. Because it is open to the public people from nearby neighbourhoods, visitors can rest on the sun-chairs, feel fresh air, chat and laugh together, exchange information, or simply relax. This sustainable innovation is the result of the international project TeRRIFICA – Territorially Responsible Research and Innovation Fostering Innovative Climate Action (Horizon 2020). The Climate Garden is located in the vicinity of the sports hall and swimming pool belonging to the University, in the eastern part of the Campus. This sports complex area provides welcoming inclusiveness for the students and people living nearby. Unfortunately, the remaining public spaces of the Morasko Campus hardly meet the criteria for sustainable public spaces.

Photo 1. Demonstration Climate Garden located between Collegium Geographicum and Collegium Geologicum

They are dominated by spaces designed for motor vehicle traffic, including car parks. They will require a strategic plan for future development, including the introduction of sustainable innovations.

The second of the distinguished public spaces that can influence the development of innovation, which was taken into account in our research, is the space of the courtyards of university buildings. This represents a unique idea for the development of social life. Courtyards are found in the vicinity of almost all buildings located on the Campus, but only in individual cases do they fulfil the main role assigned to them, that of meeting places (Wittmann, M. *et al*. 2018). According to the research carried out, the courtyards of the Meteor dormitory, as well as those of the Collegium Politicum building *(Photo 2),* were found to be particularly suitable for social interaction. These are areas where benches and other elements of small architecture (including fountains) and greenery activate the local academic community. The enhancement of 'urban furniture' with good local materials, and the humanly adapted height of the walls enclosing these spaces, help make them places that stimulate creativity (Askarizad, R. and He, J. 2022). The courtyards of the buildings seem to offer great potential for the development of academic life that has not yet been fully utilized on the Morasko Campus. The space of these courtyards supports the creation of creative milieu, for the exchange of knowledge and information among students and academics. Eventually, it creates new possibilities for developing sustainable innovations (Törnqvist, G. 1983).

Physical resources connecting innovation district with the city

The second physical resource analysed, based on Katz, B. and Wagner, J. (2014), pertains to its role in connecting the innovation district with other parts of the city. Accord-

Photo 2. Courtyard of the Collegium Politicum (Faculty of Political Science and Journalism building) in the western part of the campus. (Photos taken by Ciesiółka, P.)

ing to development plans drawn up in the 1970s, the Morasko Campus area was to form part of the so-called Northern Development Belt of Poznań. The planning assumption for the area of the current Morasko Campus was to create just a university cluster, bringing together Poznań's universities. However, during the 1980s. due to economic challenges, excessively high construction costs, and inflated demographic forecasts for the city, plans for the strip development were abandoned. As a consequence, the route of the fast tram, which was intended to run through the Morasko Campus, was shortened. Accordingly, the Morasko Campus has become a peripherally located area, spatially separated from other parts of the city by a railway line and by forests and green space. The Campus has been isolated from the central fabric of city life. It is worth noting that the location of the Morasko Campus on the periphery of the city shows some similarities with the recent American model of a university campus development as newly designed districts far from the central urban area (Caldenby, C. 2008). In addition to the Morasko Campus, the key example of locating this type of university activity in Poland on the outskirts of a city is the Pychowice Campus of Jagiellonian Universit in Kraków (Rewers, R. 2016), and the Campus of the Kielce University of Technology (Pachowski, J. 2014).

Good transport links in the SIZ concept are an important development incentive for the university campus (Banet, K. 2018; Nayum, A. and Nordjærn, T. 2021). However, the Morasko Campus *still suffers from the problem of isolation* from the rest of the city. Currently, the main public transport connection for the area with other parts of Poznań and the metropolitan region is provided by bus lines. This is particularly true of the north-eastern

part of the Campus. The nearest tram line, on the other hand, is located a few hundred metres from the western part of the Campus. The inconvenience of the distance from the tram line, as well as the need to change means of transport, and its limited capacity, make the car the dominant means of getting to this part of the city, especially for university employees (Zhou, J. 2012). Evidence of the dominance of this mode of transport can be seen in the extensive parking areas that predominate in the public spaces around the Morasko Campus. In recent years, however, initiatives have been implemented to improve the transport accessibility of the Campus. Pedestrian and bicycle paths are being built, linked to the tram lines. There are plans to extend the tram line in the eastern part of the city. In addition, an extension of the metropolitan railway is currently underway, two stops of which will be located relatively close to the Morasko Campus (Poznań-Piątkowo and Poznań-Naramowice) (Bul, R. 2016). This should enhance accessibility to the area for both the residents of Poznań and the entire metropolitan region. The development of a metro train station near the University Campus could have a similar economic impact to that of the NoMa–Gallaudet U station in Washington (Green, M.N. *et al.* 2014; Weiss, M. 2016).

Discussion

Both the research presented in the literature review and our own empirical results show that the development of creative milieu and sustainable innovation zones are processes that can be understood at the level of space and place. According to the seminal work of Tuan, Y.E. (1977), space can be described primarily in abstract and objective terms, while place can be described in concrete and subjective terms. Space creates the framework of human existence in the form of physical and virtual space allowing something to exist, accommodate or represent itself. At the same time, the inseparable attributes of place are human actions and human connections, thoughts, emotions and feelings. Thus, for a place to exist, there is need for a space and a human being attached to it (Relph, E. 1976; Mierzejewska, L. 2015; Wideström, J. 2020). The creative milieu can be understood at both the physical and virtual levels, encompassing both the built environment and the social sphere (Kotus, J. 2024).

Although our study focuses on the physical aspects of the creative milieu (i.e. the physical environment and resources), we cannot overlook the social and economic dimensions of the process (i.e. the local community, academia, and business networks as part of the virtual space and place). Given the complexity of a university campus – where tangible elements (e.g. faculty buildings, commuting infrastructure) intertwine with intangible aspects (e.g. knowledge exchange, information flow, and formal and informal relationships) – this integrated perspective seems particularly relevant. In the discussion section, we will examine some of the spatial and place-related determinants of this issue in the context of SIZ development at the Morasko Campus.

Previous studies on the emergence of innovation have highlighted their concentration in specific places and time periods. University campuses, particularly those with a well-developed academic environment and strong ties to the economic sector, have been identified as key places for fostering innovative activity (e.g. Finlay, J. and Massey, J. 2012). In such areas, innovation districts – or specific forms such as the SIZ proposed by Weiss, M. (2023) – can emerge. A potential example of this development is the Morasko Campus of AMU in Poznań.

The social, economic and, more recently, climate changes taking place in large cities are triggering transformations of the university campus functions and spatial structures (Gasper, R. *et. al.* 2011). These processes are conducive to the emergence of innovations, which is due to their nature and their appearance in moments of socio-economic turbulence (Schumpeter, J.A. 1960). In the face of accelerating climate change, sustainable innovations play an increasingly

crucial role in socio-economic development. Their emergence depends not only on human creativity, existing knowledge resources, and entrepreneurship, but also on the specific environment in which they are created. Törnqvist, G. (1983) refers to such an environment as a "creative milieu" (Męczyński, M. 2021).

This article examines how the creative milieu and physical resources at the Morasko Campus of AMU in Poznań contribute to its transformation into a SIZ. The conclusions are based on an analysis presented in part four, which explores the Campus's origins and contemporary development, and part five, which examines its physical resources. The study evaluates the extent to which the Campus can evolve into an SIZ, applying the assumptions of Weiss's concept *(Table 1)*.

One of the key assumptions of the SIZ concept is the creation of a physical environment that fosters the development and implementation of sustainable innovations within the area. An analysis based on the GreenMetric World University Rankings revealed a high level of environmentally friendly technological solutions in the buildings of the Morasko Campus. In this regard, a crucial prerequisite for SIZ development has been met. Moreover, it is important to note that this progress is driven by the creation of sustainable innovations rather than merely adopting outsourced solutions. This approach aligns with successful international examples, such as the Eindhoven High Tech Campus (HTCE), which relies on geothermal energy for heating and is nearly self-sufficient in electricity production. Notably, many of these innovations were developed on-site at HTCE itself (www.hightechcampus.com/sustainablecampus/).

Table 1. Development of the Morasko University Campus towards the Sustainable Innovation Zone (SIZ)

Assumptions of the SIZ concept	Demonstration of the fulfilment of the SIZ concept at the Morasko Campus
Sustainable innovation and modern technology	– Third place for Adam Mickiewicz University in Poznań among Polish universities in GreenMetric's World University Rankings. – Creating green walls and roofs (buildings: Collegium Geographicum, Collegium Biologicum, Collegium Phisicum, AMU Archives). – Installation of PV panels (Collegium Chemicum). – Planned installation of special roof windows to absorb solar energy and produce electricity from it (Collegium Geographicum).
Public transport operating based on the principles of sustainable development	– Transport peripherality of the Campus. – Planned and partially implemented solutions to improve transport connections with the city centre.
Creative milieu fostered by the business environment and technology transfer	– University Centre for Innovation and Technology Transfer. – Special-purpose company AMU Innovations. – Spin-offs in areas such as: artificial intelligence – Laniqo, biotechnology – SpinBionic. – Greater Poland Centre for Advanced Technologies. – NanoBioMedical Centre.
Creative milieu development based on the local (academic) community engagement in pro-environmental activities	– Extensive public spaces can promote social integration and communications. – The partially enclosed spaces found in the vicinity of the Meteor dormitory and faculty buildings play an important role in the innovation process: Collegium Biologicum, Collegium Geographicum (Climate Garden) and Collegium Geologicum (Lapidarium).

Source: Authors' own elaboration.

In the process of development of the creative milieu there is a clear link between the level of innovation and entrepreneurship. Pre-entrepreneurial academic activity is increasingly developing on the Morasko Campus. Numerous AMU employees work in spaces specially prepared for scientific and research activities geared towards commercialisation (e.g. the Greater Poland Centre for Advanced Technologies, and the NanoBioMedical Centre). It should be noted that the formation of entrepreneurial attitudes among scientists is progressing quite dynamically, not only at AMU but also on a national scale in Poland. Participation in special programmes aimed at learning how to commercialise research plays an important role in this respect. An example of such a programme is Top 500 Innovators, thanks to which representatives of Polish science, including AMU employees, were able to participate in workshops and several-week internships expanding the commercialisation of knowledge. These classes took place, among others, at Stanford University and the University of California, Berkeley, in the USA (www.top500innovators.org/).

The development of SIZs and creative milieus requires strong institutional support. The University Centre for Innovation and Technology Transfer, located on Morasko Campus, serves as a bridging institution, fostering a business-friendly environment and promoting a high management culture that facilitates the transfer of technology from academia to business and the economy. However, despite the growing intensity of knowledge and technology transfer at the Morasko Campus, it has not yet reached the scale observed at leading Western European universities, such as those in Copenhagen, Eindhoven, and Helsinki. These universities operate within innovation districts featuring so-called living labs (https://edisonda.pl/wiedza/living-lab-czym-jest-laboratorium-innowacji/). Although innovation activities at AMU are not yet based on a living lab model, the university's support for entrepreneurial development has already yielded results. In 2023, the first spin-off companies were established through AMU Innovations, a special-purpose vehicle created to facilitate commercialization efforts.

As Weiss, M. (2023) points out, the efficient use of physical resources is essential for establishing the SIZ. One key example is the development of public transport within such zones. In this regard, the original planning assumption from the 1980s – to create a functional link between the Morasko Campus and the neighbouring city to the south – has not been fully realized. This has led to both external and internal isolations from the city, as the significant distance between the western and eastern parts of the Campus hinders connectivity. This challenge is not unique to Morasko Campus. Even renowned innovation districts like Silicon Valley, developed around Stanford University, have been criticized for their relative isolation from the surrounding urban environment (Katz, B. and Wagner, J. 2014). A similar situation exists in innovation hubs such as Sophia Antipolis in France, where employees typically reside in surrounding municipalities like Antibes, Nice, Grasse, Cannes, and Mougins. While the technology park is regarded as a prestigious workplace, it lacks the urban amenities needed to attract permanent residents (Barbera, F. and Fassero, S. 2013).

In Poland, the links between the Morasko Campus and its surrounding neighbourhoods are not so long-lasting, and they may limit the possibility of developing a SIZ at Morasko. The resource identified by Weiss, M. (2023) on the SIZ is the local community, which is made up of faculty, staff, and students engaging in pro-environment and sustainable economic and community development activities. On the Morasko Campus, mainly, the enclosed spaces in the vicinity of the Meteor dormitory and the faculty buildings have a positive impact (Collegium Biologicum, Collegium Geographicum with the Climate Garden, and Collegium Geologicum with the Lapidarium). Positive "people clashes" (Katz, B. and Wagner, J. 2014) can occur in these spaces, which contribute to the creation of new and fertile ideas. In this respect, it is worth noting the example of the Milla Digital neighbourhood in Zaragoza, Spain, where a space

was created based on historical squares and buildings for the interaction of employees of ICT companies (Joroff, M. *et al*. 2009). As a conclusion, we have collected information on the most important linkages between the Morasko Campus and the SIZ-concept, especially the factors and developments that play a crucial role in the transformation of the campus into a SIZ.

Conclusions

In our study, we have identified and analysed the physical resources that influence the development of creative milieu and a SIZ, using the Morasko Campus as a case study. In this sense we explored how the university campus and its associated initiatives contributes to its transformation into a creative milieu and, ultimately, a SIZ. The concentration of creative knowledge and workforce on a university campus plays a key role in triggering this process, as it facilitates the development of a creative milieu and is generally open to the adaptation of innovative architectural and technological solutions (see the role of place). In addition to the presence of a creative milieu, the physical environment and the physical characteristics of the campus play a crucial role in the development of Weiss's SIZ strategy, and, in the longer term, in the development of a sustainable and high-quality environment (see the role of space). Previous research has also shown that a creative milieu and high-quality (working) environment clearly contribute to the development of the creative economy and local economies and clusters (Egedy, T. and Kovács, Z. 2010).

Our pilot research aimed to examine the relevance of the SIZ theory in a Central and Eastern European context by analysing the creative milieu, physical resources and innovations development at the Morasko Campus of the Adam Mickiewicz University in Poznań. specifically exploring the potential role of sustainable and innovative solutions in urban development. Examples from North America and Western Europe show that this idea can indeed contribute to improving a creative and innovative milieu for cities. Our empirical results demonstrate that the SIZ theory's methodology provides a good starting point for developing sustainable innovation zones in Central and Eastern Europe. The investments and innovative developments on the Morasko Campus can be well identified and classified according to the key elements of the Katz-Wagner idea.

Based on the Katz and Wagner's concept of innovation district and its types, we defined our own classification of the Sustainable Innovation Zones (SIZ) concept. We distinguished three models of zones: 1) Anchor Plus Zone; 2) Re-imagined Urban Zone; 3) Urbanized Science Park. These models indicate the formation of SIZs at university campuses, based on the presence of three types of resources: 1) physical, 2) economic, and 3) networking (Katz, B. and Wagner, J. 2014). The research carried out in this article concludes that the development of the Morasko Campus seems to meet the requirements of the anchor-plus zone model. The innovation zone develops around the city and is linked with major academic institutions. In addition, the Morasko Campus fulfils selected aspects of the urbanised science park model. The area has been isolated from the rest of the city for years and has functioned autonomously. The initiatives taken recently and planned for the coming years to improve public transport should connect the campus much more closely with city centre in the future.

The analysis of the creative milieu and physical resources has shown that these factors actively contribute to the development of the social and economic environment, facilitating the transformation of the area into a SIZ. The physical resources provide the necessary infrastructure for technology and knowledge transfer. Key institutions driving this process include the University Centre for Innovation and Technology Transfer, the Wielkopolska Centre for Advanced Technologies, and the NanoBioMedical Centre. Additionally, AMU Innovation – a special-purpose vehicle established by AMU to support indirect commercialization

through the creation of employee spin-off companies—plays a crucial role. These elements lay the foundation for attracting additional business entities in the future and fostering a network of relationships that will enhance the area's potential as a hub for sustainable innovation and inclusive prosperity. Moreover, the possibility of social integration between students and academics is supported by the physical infrastructure of the relatively modern AMU faculty buildings. Adequate infrastructure related to enhancing creative human interaction ('people clashes'), including the new dormitory building and consumption spaces, is gradually being created. The complexity of the built environment at the Morasko Campus is being completed by the good landscape and proximity to the natural environment of the green belts in the northern part of Poznań. Further research should be concentrated on the network development and the inclusiveness of the campus, which will provide evidence that implementing the SIZ concept is possible at one of the leading academic institutions in Poland.

The added value of our study in the context of Central and Eastern Europe is mainly to highlight the links between the creative milieu and the development of a high-quality, sustainable and innovative environment. Through the creation of these development links, university campuses can step out of their role as mere educational institutions and successfully fulfil their so-called third mission, i.e. to promote local social, cultural and economic development.

The methodology and results presented in the article and pilot study can also serve as a good starting point for a comparative study of university campuses in Poland, and Central and Eastern Europe. The research results can be used to further analyse how university campuses can become SIZs supporting sustainable, innovative, inclusive, and prosperous urban development in the medium and long term. They also highlight the importance of developing an innovative and creative milieu over the long term to help transform these campuses into truly sustainable and innovative districts.

This study provides a good example of a modern university campus that reflects the transition to a new and more advance way of thinking about these vital elements. Starting out as a remotely isolated campus, the result of political decisions taken by the central government during the communist years, then evolving through the moderated development during the country's socio-economic transformation in the 1990s, until the recent times when concerns related to climate change started to play an essential role in the redesign and redevelopment of the city's urban structure.

***Acknowledgement*:** The research was partly supported by the National Research, Development, and Innovation Fund of Hungary under Grant No. K-135546.

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