Editorial: What is GLASS? And what prospects does it open for sustainable urban development?

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Abstract. Modern cities are encountering a large number of challenges - from accelerating urbanization and population growth to increasing human impacts on the environment. To solve these challenging problems, an integrated approach is required. In the article, we introduce the GLASS (Green, Liveable, Amiable, Smart, Sustainable) system as such a comprehensive approach. Firstly, we describe each of the five components in the system, and analyse their interaction to create a progressive urban space. Then, we specify the content of the five components, clarify the limitations, assumptions and applicability of GLASS. We explain how green technologies (Green), favourable living conditions (Liveable), friendly social environment (Amiable), intelligent technologies (Smart) and sustainable practices (Sustainable) can jointly provide a higher quality of life for urban citizens. To show how the principles of GLASS can be integrated into urban planning practices and policies for sustainable urban development, we make an overview of the selected articles presented at the 7th International Regional Economics Conference (REC-2023) "Cities of New Age: GLASS". The review of these publications provides insight into those aspects of GLASS that are currently being explored in modern cities research.

Key words: City; Green; Liveable; Amiable; Smart; Sustainable.

1 Introduction

Due to accelerating urbanization and the increase in urban population, many cities around the world are facing with a set of global challenges [1-3]. Population growth, increasing human impacts on the environment, social polarization and technological dynamism require new solutions in the management of urban space. This becomes especially relevant in the context of global climate change, an unstable economic situation and increased sociocultural

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tension. Traditional static approaches to urban planning and administration often fail to effectively address these issues, requiring an integrative approach [4-7]. In this context, the GLASS (Green, Liveable, Amiable, Smart, Sustainable) system is considered as an advanced concept, aiming at creating a sustainable, adaptive and human-centric urban environment (Fig.1). This system integrates various aspects of urban development - from environmental and technological to social and cultural ones.

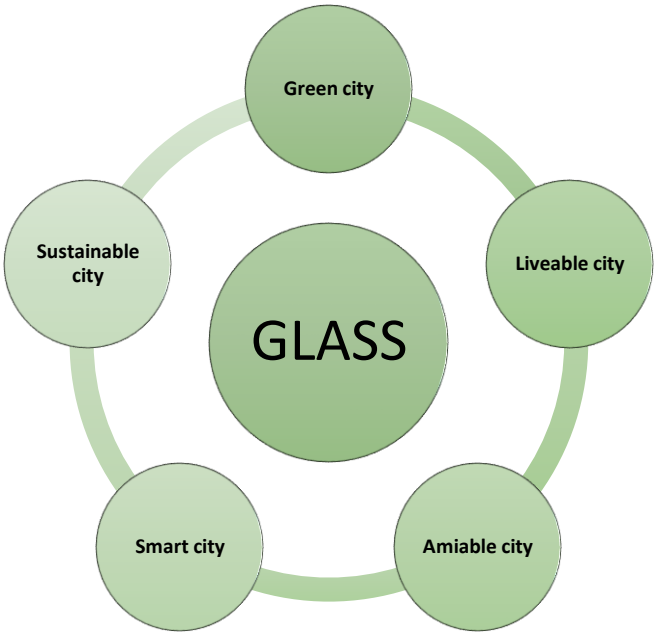

Fig. 1. GLASS concept (Green, Liveable, Amiable, Smart, Sustainable)

This article provides a brief overview of the GLASS concept and explores the potential and prospects for its application in modern cities. The objective is to demonstrate how the synthesis of these five key components can serve as the basis for creating a new generation of cities that are in harmony with nature, being responsive to the needs of their citizens and adapt to a rapidly changing world. Regarding this objective, we will consider selected scientific articles of the 7th International Regional Economics Conference (REC-2023) “Cities of New Age: GLASS”. We will analyse how GLASS principles can be integrated into urban planning practices and sustainable development policies, and determine what advantages and limitations exist when implementing this approach.

The following sections introduce the details of the five components in the GLASS system and their role in creating sustainable and progressive urban environments.

2 GLASS components

2.1 Green city

This component relates to the creation of cities with a minimum ecological footprint [8]. Recently, the environmental sustainability of cities is one of the major challenges. Increasing of industrial activity, road transport and energy consumption enhances the human impacts on the environment. Research in this issue focuses on developing technologies to reduce carbon dioxide emissions and waste, and improve energy efficiency [9-10]. Modern cities are

actively integrating green technologies into their infrastructure. This includes not only the use of renewable energy sources, but also the creation of green park areas [11], public gardens [12], vertical gardening, green roofs [13-14], the introduction of a waste collection and recycling system [15], smart houses with automated resource management [16-17]. It is obvious that cities with an environmentally oriented development model should be better adapted to the corresponding man-made risks [18]. Promoting such solutions can significantly improve the quality of air, water and soil, which will benefit the health of citizens. Moreover, this impacts public health costs. Green technologies can reduce the cost of waste disposal or recycling, clean water, and can promote the development of local domestic agricultural practices to improve food availability [19-21]. Despite all the benefits of the green component in the GLASS system, it is important to recognize that the implementation of environmental initiatives can require significant capital investments, which complicates its practical implementation. Moreover, some green technologies can make a city dependent on certain resources or equipment that can be expensive to maintain or replace [22-23]. The need for new skills and knowledge to maintain and operate green systems may create a need for additional training [24-27]. The mentality of city residents and their cultural characteristics is gaining importance, because the introduction of environmental practices may face opposition to new ways of city management and a new way of life. Therefore, it is important to carefully analyse possible risks and threats to ensure the sustainability and effectiveness of green initiatives.

2.2 Liveable city

This component concerns creating a comfortable urban environment that meets basic living requirements and ensures a high quality of life. This includes a number of aspects, including safe environmental and accessibility infrastructure. First, the urban environment must be safe for all citizens, which includes both physical safety and social well-being [28-31]. Second, cities should have high-quality roads, transports and utilities [32]. Third, cities must provide easy access to housing, transports, jobs, education, healthcare, and other basic services [33]. Fourth, cities should create spaces for social activity and places [34-35] that contribute to socialization and cultural exchange, which accelerate social integration of different population groups into a united community. At the same time, the life satisfaction of citizens will increase due to the expansion of cultural coverage, the accessibility and diversity of cultural events, arts and entertainment. Fifth, architectural and planning solutions should be aimed at creating a comfortable urban environment (pedestrian-friendly zones, recreation areas and other elements) [36-37]. Such transformations require significant investments in infrastructure, which in some cases can cause increased social inequality when infrastructure improvements are targeted at selected groups of the population (infrastructural imbalances). This can lead to the risk of gentrification. Upgrading urban environments can increase the cost of living, making "renewed" areas unaffordable for low- and moderate-income citizens. Excessive attractiveness of the city can exacerbate the problem of overcrowding, which in turn may again lead to difficulties with transports, housing and utilities. At the same time, comfortable cities can become centres of attraction for investors, tourists and talented professionals, which stimulates economic growth. Therefore, the Liveable component is key to ensuring a high quality of urban life. It requires a comprehensive and thoughtful implementation that takes into account the needs and interests of all city residents.

2.3 Amiable city

This component focuses on creating friendly, welcoming and inclusive urban environments. This is achieved through a number of tools that aim at developing human capital, creating an

open and accessible culture, stimulating social inclusion and social responsibility of citizens [38-43]. The aspects of Amiable and Liveable components partly overlap. It is important to ensure accessibility and quality of public services that make everyday life convenient and enjoyable, and to diversify leisure time through cultural events, because cities with an active cultural life demonstrate their diversity and preserve the history of local communities. This cohesion results from the social interaction of residents and strengthens social ties. The emerging social cohesion is expressed in inclusion.

Mutual understanding and interaction between different social, cultural and age groups ensure equal access to city resources, services and opportunities for all groups of the population, regardless of status, age, gender, nationality and other factors. Promoting positive interpersonal relationships and psychological well-being through educational programs, cultural events and public initiatives create the effects of personal and collective social responsibility of citizens.

These initiatives are supported through various forms of public participation and volunteering, including social support programs aiming at helping poor, migrants and other vulnerable groups of population. Safe environment is an important consequence of social responsibility, and at the same time a condition for the successful implementation of the Amiable component [44-50]. The city should be a safe place where people can move and communicate freely without fear or threat to health. Infrastructural solutions and social friendliness make the city attractive to everyone - from residents to tourists and investors. A favourable atmosphere retains residents and visitors to the city. The visual aesthetic appeal of the city enhances this effect. Extraordinary architectural forms, well-chosen colours, ergonomics in all elements of urban space, cleanliness and order create the idea of a convenient and comfortable “beautiful” city [51-53]. Beautiful urban spaces stimulate socialization as they become places of meeting, recreation and cultural exchange [54-57]. Amiable component adds a soft element to a city's engineering, and moreover it emphasizes the importance of the human element in an urban context, based on the idea that a friendly and inclusive city will contribute to the well-being of its residents and overall economic prosperity. However, all residents may be not in favour of such transformations of the city into a more friendly environment, especially if this leads to significant changes in infrastructure or daily life. This creates a risk of social isolationism and marginalization of certain population groups. At the same time, the concepts of friendliness and hospitality are highly dependent on cultural and social norms, and what is considered friendly in one culture may not be acceptable in another [58-62]. Amiable city therefore requires a deep understanding of local culture and community needs, as well as flexibility in applying social engagement methods and tools to achieve desired results.

2.4 Smart city

Smart city in the context of the urban environment refers to the use of information and communication technologies and other innovations to improve the quality of life of citizens, to improve the efficiency and reliability of urban infrastructure [63-65]. Research in this topic is often related to the creation of smart infrastructure solutions, the use of massive data to predict urban processes and the development of intelligent approaches to city management [66-70]. Smart cities use digital technologies to optimize city services [71], from transports and energy consumption to health care and law enforcement. Smart solutions are based on automation, robotization and the use of artificial intelligence, electronic control, BigData analytics and digital infrastructure (which includes broadband Internet, sensors, cameras and other IoT devices for data collection). In general, the Smart component in the GLASS system implies a harmonious combination of technology and innovation in an urban context, designed to provide a high level of comfort and quality of life for all citizens. However, a

high intellectualization of the city creates an obvious dependence on the technologies [72]. Primarily, vulnerabilities result from the technical reliability of smart systems and their susceptibility to cyber-attacks. Moreover, wide coverage of the territory by monitoring tools also raises issues of personal data security and privacy. The sustainability of urban development here is achieved by the co-responsibility (jointly mutual responsibility) of citizens, their trust in government bodies and, in turn, the transparency of city management [73-74]. A smart city listens to the opinions of its residents and is responsive to their requests [75]. Civic engagement in city governance is realized through various platforms of feedback, voting and decision-making. This ensures openness and meeting the goals of sustainable development. One of the risks of the transition to a smart city is the lack of soft competencies among various groups of the population. Readiness for transformation is achieved by teaching the skills needed to effectively use digital technologies and training specialists in this field. Applying smart technologies not only increases the efficiency of urban processes, but also contributes to the environmental cleanliness of urban space by minimizing waste and saving resources [76-78]. Thus, Smart component actively interacts with other elements of the GLASS system. The Smart component emphasizes how modern technologies can serve as a powerful tool for achieving the goals of sustainable urban development [79]. This component encourages innovations in cities and ensures greater efficiency, adaptability and resilience to future challenges [80].

2.5 Sustainable city

Numerous studies focus on long-term urban sustainability [81-82]. Research in this direction represents strategic guidance that takes various aspects of urban life into account [83-84]. The Sustainable component highlights the need for a multifaceted approach to urban development. It focuses on the long-term ability of cities to maintain environmental, economic and socio-cultural balance [85]. Environmental sustainability includes the effective management and rational use of natural resources, the introduction of renewable energy sources, reducing pollution and waste, protecting the city's bio-environment, etc. Economic sustainability involves creating jobs and ensuring permanent employment, maintaining economic growth and developing the local innovation economy, which can adapt to rapidly changing external conditions.

Social sustainability focuses on promoting social justice; ensuring equality, quality education, health and cultural diversity; guarantee for availability of basic services and infrastructure for groups of the population, and involving citizens in decision-making. Cultural sustainability is expressed in respect for the historical and cultural heritage, preserving the identity of the city and creating conditions for cultural exchange and integration, promoting and popularizing the cultural traditions of the city. Sustainable management combines all these aspects, based on the primacy of democracy, openness and transparency, responsibility of the parties and participation of citizens in city management. The Sustainable component involves the integration of sustainable principles into every aspect of city life. It emphasizes the need for harmonious coexistence between man and nature in the urban environment. It doesn’t only mean protecting the environment, bur also creating the conditions for the prosperity of the city over the long term. Sustainable city results from a desire to create a balanced system that ensures the well-being of the population, conservation of resources and maximum adaptation to changing external conditions without harm to future generations. Sustainable transformation is a long and capital-intensive process [86-88]. Not everyone will be ready for sharp and immediate change, and it is obvious that there will be some resistance and opposition to innovation. This is partly due to uncertainty surrounding the results, as some sustainability practices may either not produce the expected outcomes or take a long time to implement. Therefore, sustainable development of the city

requires long-term planning that carefully concerns current challenges and future needs. Sustainable city is a structure-forming component in the GLASS system; it requires an integrated and multi-level approach to ensure long-term prosperity and development.

3 Limitations and assumptions of GLASS

GLASS (Green, Liveable, Amiable, Smart, Sustainable) system provides strategic guidelines for sustainable urban development. However, as any other theoretical approach, it has certain limitations and assumptions that must be taken into account. This system combines economic, sociocultural, environmental, political and legal, infrastructural and technological aspects together.

In any case, all GLASS initiatives involve high initial capital investment, especially in established urban structures and in developing countries [89]. Despite this limitation, many researchers agree that, in the long term, investments in the urban environment will provide the expected returns through reduced resource costs and improved quality of life [90-93].

We have repeatedly noted that GLASS transformations may encounter resistance from some groups of the population. Not all city residents may be ready for change, especially if it is perceived as a threat to their traditional way of life. There are significant differences across cultures in values and views on innovation, which may slow the adoption of GLASS. Moreover, the widespread introduction of modern technologies has shifted the boundaries of privacy, creating concerns regarding the protection of privacy and personal data. However, the overall benefits of GLASS are expected to outweigh the emerging threats. The population will be motivated to actively adapt to new changes in the hope of a qualitative improvement in their standard of living. The positive message behind the GLASS components is to encourage communities to support sustainable initiatives, for creating clean, comfortable, attractive and friendly urban environments.

The environmental aspect realizes the important assumption that the use of GLASS will significantly reduce the negative impacts of cities on the environment. However, even with the Green and Sustainable components, any urban development has some impact on the environment, both negative and positive. Therefore, the environmental feasibility of implementing GLASS should be determined based on the cumulative impact. However, given the long-term nature of the changes, this impact is difficult to fully and accurately evaluate.

Some GLASS initiatives may face legal and regulatory barriers. The openness declared within the framework of sustainable management can become an obstacle to internal changes in city governance structures, especially for developing countries. Emerging political risks may hamper or slow the implementation of sustainable practices. At the same time, the sustainable development benchmark obliges governments to publicly support the implementation of GLASS at all levels and create appropriate legislative and regulatory frameworks.

Infrastructural and technological aspects are closely related to each other when implementing GLASS. On the one hand, there are objective limitations associated with the integration of new technologies into outdated or incompatible infrastructure. Obviously, this raises the question of the safety and reliability of infrastructure systems. At the same time, the wide coverage of smart solutions and digital technologies in urban infrastructure causes the dependence of the functionality of the infrastructure on certain technologies. They may be inaccessible or difficult to implement for many cities for various reasons. On the other hand, the solutions must take into account the available resources and capabilities of cities, their current infrastructure level, so that existing urban infrastructure can be adapted or upgraded to meet the requirements of the GLASS concept.

When considering the GLASS approach for urban planning, it is important to consider both its potential limitations and assumptions to ensure its successful applications. The noted aspects show in part of the barriers that stand in the way of sustainable development. Our assumptions are quite arbitrary, and what works for one city may not work for another due to differences in culture, infrastructure, geography and other factors. Finally, both the limitations and assumptions provide an overview of the potential for sustainable urban environments in the context of GLASS.

4 Research coverage of GLASS

Below we will consider selected articles submitted to the 7th International Regional Economics Conference (REC-2023) “Cities of New Age: GLASS” to overview current research on this issue.

It is important to demonstrate how the key GLASS components (Green, Liveable, Amiable, Smart, Sustainable) have been analysed and how the GLASS principles have been integrated into urban planning practices and sustainable development policies.

Selected studies, which were presented at the International Regional Economics Conference, can be classified by thematic sections. The first section consists of articles concerning sustainable development and the application of ESG (Environmental, Social, Governance) principles in cities. They discuss environmental, social and governance aspects. The implementation of these principles is examined on the example of large cities. The environmental agenda in this research is mainly developing from the perspective of the circular economy and the ESG approach. The second section includes articles that focus on the social component of sustainable development. Problems of the labour market, labour migration, household income inequality, and psychological health of the population are addressed. In the papers of this section, the authors analysed the relationship between labour market and educational potential, as well as factors influencing the quality of human capital in industrial cities. The third section summarizes the experience of innovative development of cities and regions with a special emphasis on reindustrialization. Agglomerations that can concentrate the potential for economic growth are considered. The authors emphasised the importance of a creative approach in the context of innovative development. This section is complemented by research into the impression and sharing economy, which clearly refers to the use of the Amiable component of GLASS. The fourth section consists of articles that concern the use of modern technologies to improve the urban environment. They consider Big Data, social media analytics and remote sensing technologies for evaluating urban dynamics, and discuss the role of smart cities and their technological development. The fifth section addresses various aspects of urban development, from tourism and urbanization to social inequality and the quality of services in the urban environment.

The scope of topics covered by these articles is very wide. These are the ESG agenda, green urban areas, circular economy, urbanization and energy efficiency, monitoring of the urban environment, issues of urban transformation, local labour market and migration flows, education, cooperation between cities and universities, single-industry cities, agglomerations, government participation in smart city projects , sharing economy, quality of services in the urban environment, territories for the integrated development of residential areas, pedestrian comfort, psychological health of citizens, the experience economy and reindustrialization, issues of social inequality, etc. All of them have obvious relation to the GLASS concept.

These topics and studies highlight the importance of integration in urban development. A deep understanding of these issues, as well as their implementation into the practice of urban planning and management, can become decisive in the creation of cities of the future that comply with the principles of GLASS.

5 Conclusion

In recent decades, the topic of sustainable urban development has become increasingly relevant. The population in cities is growing, while the corresponding environmental, social and economic problems are exacerbating. The search for harmony in urban space was expressed in the GLASS (Green, Liveable, Amiable, Smart, Sustainable) concept. A large number of fragmentary studies indicate that they need to be systematized, and sustainable urban development requires an integrated approach. While each of the components/principles is important, their integration creates synergy, transforming cities in a fundamental way. It is the interaction of these components that leads to the creation of sustainable and prosperous urban environment.

The GLASS system not only provides a new perspective of how we understand the meaning of the city and its role in human life, but also clarify potential opportunities for improving the quality of life, preserving the environment and adapting to the global challenges of our time. The principles of GLASS provide a strategic framework for rethinking of how cities can grow and develop. In the future, the GLASS system could be the key to creating a new urban model, where every element of urban infrastructure and every decision will be aimed at achieving sustainability, comfort and environmental friendliness.

Author Contributions

A.S. conceived of the presented original idea. E.K., A.S., and Y.L. co-wrote sections 1, 2, and 3 of the manuscript. Y.S. wrote section 4. The authors jointly wrote section 5 of the manuscript. All authors discussed the results and contributed to the final manuscript.

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