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SMART CITIES OF THE CENTRAL AND EASTERN EUROPE

│ Abstract

▸ *Goal* – the aim of this article is to discuss the essence of smart cities as one of the effects of public sector innovation. More specifically, the attention will be focused on the Central and Eastern European area, analyzing smart cities and their achievements in this region.

▸ *Research methodology* – the article contains review of the literature, an analysis of innovation and smart cities measures and indicators, on the basis of international rankings and good practices.

▸ *Score/results* – the presented statistical data and good practises indicate that the innovativeness of the public sector and a scale of smart cities is growing. Innovations play a key role in creating development and the ability to adapt to constantly changing operating conditions. The implementation of the smart cities concept can be boldly described as an effect of the innovation of the private sector. It is thanks to this type of activities that cities are able to meet the constantly changing expectations of residents, but also of potential investors. It is important to point that smart cities mean both economic and technological development, care for residents, but also sustainable development, i.e., despite striving for continuous technological development, care for the natural environment. Historical facts and belonging to the Eastern Bloc prevented countries from Central and Eastern Europe from achieving such a state of affairs. However, it is comforting to note that despite this developmental backwardness, these economies are actively trying

search for better and cheaper public services. This holds for services provided to citizens and for those delivered to business. In some respects, the imperative to innovate is even greater now for the public sector than it is for the private sector [*European Public Sector Innovation Scoreboard, 2013,* 2013: 4].

In the midst of a fragile economic recovery across the European continent and stressed public finances, many governments are faced with long-term issues such as ageing societies, increasing social security and healthcare costs, high youth unemployment and an outdated public service infrastructure that lags behind the needs of modern citizens and businesses. The ICT driven explosion of new business models, geographical dispersion of production and social media are also challenging the way governments operate and, above all, how they are perceived [*Powering European Public Sector Innovation*].

The results of the continuous research emphasize the importance of recognizing innovation in a broad perspective. This approach recognizes the essence of innovation in both sectors of modern economies, the private sector and the public one. The driving force behind today's socio-economic condition of innovation focuses on the interactive processes through which knowledge is created and exchanges its inside and outside firms and other organizations. Many countries with developed economies recorded a very significant increase in the knowledge-intensive sectors, such as the production of high technology products and business services. Furthermore, many types of production and service activities have significantly increased the use of knowledge-intensive technologies production processes and services. R&D plays an important role in the innovation process, but a significant part of innovative activity was based not so much on research and development for highly qualified personnel, but rather on the contacts with other firms and public research institutions and on the structure of the permitting processes of learning and use of knowledge. [*Podręcznik Oslo,* 2005: 20].

Table 1. Public sector innovation definitions-scope and substance

Source	Definition	Scope
Lynn [1997]	*"Innovation [in government] is properly defined as an original, disruptive and fundamental transformation of an organization's core tasks. Innovation changes deep structures and changes them permanently."*	The definition echoes Wilson's 1989 use of the concept and is aimed at differentiating any change in the public sector from deeper transformations that can be called innovations.

Source	Definition	Scope
Moore et. al. [1997]	*"Changes worth recognizing as innovation should be…new to the organisation, be large enough and durable enough to appreciably affect the operations or character of the organisation"*	General definition involving novelty and change in relation to the organisation and its overall operations. This means widespread improvements in both governance and service performance to increase public value [Moore, 1995].
Newman et al. [2001]	*PSI can be constituted as a "discontinuous or step change, as something which was completely new to a particular local authority (though which may have previously been applied elsewhere), and a change which had already been implemented rather than just an aspiration or planned initiative."*	Change-based definition that accentuates also incremental innovation and puts the focus on implementation.
Green et al. [2001]	*"[…] doing something new i.e. introducing a new practice or process, creating a New product (good or service), or adopting a New pattern of intra- or inter-organisational relationships (including the delivery of foods and services)."*	Emphasises that simple organisational change do not equate innovation. Definition originally concentrates on service innovation.
Mulgan and Albury [2003]	*"New ideas that work […] successful innovation is the creation and implementation of new processes, products, services and methods of delivery which result in significant improvements in outcomes efficiency, effectiveness or quality"*	Emphasis is put on implementation and successful innovations that have a significant impact in the public sector (this implies radical change).
Hartley [2005]	*The definitions starts from the fact that innovation is not always "a physical artefact at all, but a change in the relationships between service providers and their users. […] Consequently the public sector innovations "consider innovations, particular radical or complex ones, to be multidimensional, specifying the dimensions (and the size of the innovation in those dimensions) in the interests of systematic comparison."*	Takes note from the definition of Moore [see: 1995, 1997] and extends the public value oriented approach to include different forms of innovation: product, service, process, position, strategic, governance and rhetorical innovations. Also diffusion and dissemination – spreading good practice and adopting/adapting existing innovations – is included as a significant part of public innovation.

Source	Definition	Scope
Osborne and Brown [2005, 2013]	*"The introduction of newness into a system is usually but not always conducted in relative terms and by the application (and occasionally invention) of a new idea. This produces a process of transformation that brings about a discontinuity in terms of the subject itself (such as a product or service) and/or its environment (such as an organisation, market or a community)."*	Emphasises 'newness' and discontinuity of change in the public sector.
Albury [2005]	Public sector innovation is *"the creation and implementation of new processes, products, services and methods of delivery which result in significant improvements in outcomes efficiency, effectiveness or quality."*	Emphasises implementation, significant improvement and creativity.
Koch and Hauknes [2005]	*"Innovation is a social entity's implementation and performance of a new specific form or repertoire of social action that is implemented deliberately by the entity in the context of the objectives and functionalities of the entity's activities."*	Functional distinction of public sector innovation that is shaped within the context and environment of the agent is activity/agent specific. Deliberate action is emphasized.
Halvorsen et al. [2005]	Public sector innovation as *"the change in behaviour".*	Very broad definition concentrated on change.
Mulgan [2007]	*"The simplest definition is that the public sector innovation is about new ideas that work at creating public value. The ideas have to be new, at least in part (rather than improvements); they have to be taken up (rather than just being good ideas); and they have to be useful."*	The definition makes an additional requirement implementation – of being 'taken up' –, meaning that also in terms of measurement some time lap before change and impact is required.
European Commission 2013; EU Expert Group on Public Sector Innovation 2013	*"We therefore structure this inventory along two lines: initiatives that would be readily considered innovations inside the public administrations, such as the shift to ICT tools and HR management (innovation IN); and initiatives that foster innovation elsewhere in society, such as the public procurement of innovation, the unitary patent or support to social entrepreneurship (innovation THROUGH)."*	This definition tries to separate different modalities in public sector innovations rather define in detail what innovations are. Differentiating modalities is methodologically helpful.

Source: *Can We Measure Public Sector Innovation? A Literature Review*, p. 5, http://lipse.org/userfiles/uploads/kattel%20et%20al%20egpa%20version.pdf [date of access: 21.06.2018].

The current scenario requires cities to find ways to manage new challenges. Cities worldwide have started to look for solutions which enable transportation linkages, mixed land uses, and high-quality urban services with long-term positive effects on the economy. For instance, high-quality and more efficient public transport that responds to economic needs and connects labor with employment is considered a key element for city growth. Many of the new approaches related to urban services have been based on harnessing technologies, including ICT, helping to create smart cities [Albino, Berardi, Dangelico, 2015: 3].

Smart city is an innovative mind focused on the city (urban areas) and managed using modern technical means which offer the latest technology (including IT), in accordance with the principles of ecology, while maintaining the trend of saving resources, and achieve the expected results. The development of innovative technologies which are used in various spheres of human activity, especially information and communication, can increase the functionality of cities [Stawasz, Sikora-Fernandez, 2015: 23].

Smart city is a recent phenomenon, but its diffusion has been rapidly developing in the latest few years. Smart cities are nowadays widespread all over the world; in all the continents, cities are moving towards smarter urban spaces, using high technologies to face the crucial problems linked with the urban life like traffic, pollution, city crowding, poverty. However, a clear and sound definition of a smart city is still incomplete, not only in the academic studies, but also in empirical applications of smart concepts and projects. Indeed, a large literature survey shows what follows: the smart city concept is used to identify a large spectrum of heterogeneous solutions and city programs, involving different types of technologies and aiming to reach a very large set of different and not well-defined goals; in the meantime, several different words are used to define similar projects and solutions, even if each of them could easily be attributed to the idea of a smart city. For example: wired city, intelligent city, digital city, technocity, and so on. The similarities and the differences between all these "cities" are generally not clear [Dameri, 2013: 545].

Smart Cities should be treated as systems of interacting and utilizing the flows of energy, materials, services and finance to accelerate sustainable economic development, flexibility and high quality of life. These flows are intelligent and interactive through the use of strategic information and the communication infrastructure and services in a transparent process of urban planning and management, which are adapted to the ever-changing social needs and economic society [*European Innovation Partnership on Smart Cities and Communities,* 5].

Table 2. The dimensions of the functioning of smart cities

Smart City		
Co-Government	Economy	Environment

• cooperation	• innovation and innovation
	• creativity
	  entrepreneurship
	• high productivity
	• cooperation
	• flexibility and openness
	• the ability to transform
	• image
		• optimization of energy
		  consumption
		• renewable energy sources
		• reduction of CO_2
		  emissions

Human capital	Mobility	Quality of life

• a learning society
• initiation of changes
• high level of qualification
  and continuing their lifting
• flexibility and creativity
• openness to the world
• active participation in
  public life
	• intelligent transport
	  systems
	• digitization of public
	  administration
	• advanced communication
	  technologies
		• a high level of public
		  services
		• the integration of the
		  public sector
		• efficiency of infrastructure

Source: the authors' own elaboration on the basis of: D. Stawasz, D. Sikora-Fernandez (eds.), *Zarządzanie w polskich miastach zgodnie z koncepcją SMART CITY*, Warszawa 2015, p. 23; www. smart-cities.eu; D. Gotlib, R. Olszewski (eds.), *SMART CITY. Informacja przestrzenna w zarządzaniu inteligentnym miastem*, Warszawa 2016, p. 23.

3. Smart cities of Central and Eastern Europe

Historical events have caused the eastern bloc of European countries to struggle with constant developmental backwardness and to compete with the much faster and more efficiently developing Western Europe. Innovations can certainly be considered one of the most important factors of socio-economic development. Taking into account various innovation rankings, taking into account both the private and public sectors, it can be noted that in this respect, the countries of Central and Eastern Europe have a lot to catch up on.

Rankings presenting smart cities from around the world include, among others, IESE Cities in Motion Index, The Arcadis Sustainable Cities Index, IMD Smart Cities Index and the European Smart Cities Ranking. The list of leaders among smart cities is presented in Table 3.

Table 3. Top 10 of the smartest cities in the world

Rank	IESE Cities in Motion Index 2022	The Arcadis Sustainable Cities Index 2022	IMD Smart Cities Index	European Smart Cities Ranking
	City – Country	City – Country	City–Country	City–Country
1	London – United Kingdom	Oslo – Norway	Zurich – Switzerland	Luxembourg – Luxembourg
2	Paris – France	Stockholm – Sweden	Oslo – Norway	Aarhus – Denmark
3	Tokyo – Japan	Tokyo – Japan	Canberra – Australia	Turku – Finland
4	Berlin – Germany	Copenhagen – Denmark	Copenhagen – Denmark	Aalborg – Denmark
5	Washington – USA	Berlin – Germany	Lausanne – Switzerland	Odense – Denmark
6	Singapore – Singapore	London – United Kingdom	London – United Kingdom	Tampere – Finland
7	Amsterdam – Netherlands	Seattle – USA	Singapore – Singapore	Oulu – Finland
8	Oslo – Norway	Paris – France	Helsinki – Finland	Eindhoven – Netherlands
9	Copenhagen – Denmark	San Francisco – USA	Geneva – Switzerland	Linz – Austria
10	Munich – Germany	Amsterdam – Netherlands	Stockholm – Sweden	Salzburg – Austria

Source: the auhors' own elaboration on the basis: *IESE Cities in Motion Index 2022*, https://me-dia.iese.edu/research/pdfs/ST-0633-E.pdf [date of access: 23.09.2023]; *The Arcadis Sustainable Cities Index 2022*; https://images.connect.arcadis.com/Web/Arcadis/%7Be08e5cda-768d-46a3-91ce-4efe16cbfc05%7D_The_Arcadis_Sustainable_Cities_Index_2022_Report.pdf [date of access: 23.09.2023]; *IMD Smart Cities Index 2023*, https://imd.cld.bz/IMD-Smart-City-Index-Report-20231/6 [date of access: 23.09.2023]; *European Smart Cities*, https://www.smart-cities.eu/ranking.html [date of access: 23.09.2023].

It is encouraging to know that the need to be innovative is already present in numerous places around the world. The same fact applies to the implementation of the smart city concept, therefore cities that fall into the smart city groups can also be found in certain parts of Europe. Figure 1 presents the smartest cities in this part of the European continent according to the ranking in question, with the rank in last ranking.
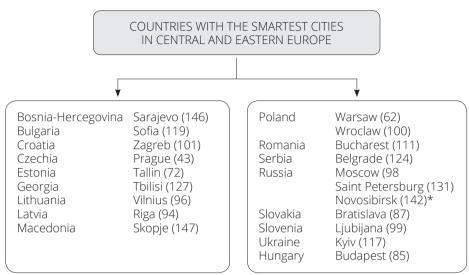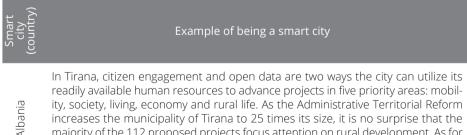
Figure 1. Countries with the smartest cities in the Central and Eastern Europe
(rank in the ranking 2022)

COUNTRIES WITH THE SMARTEST CITIES IN CENTRAL AND EASTERN EUROPE	
Bosnia-Hercegovina	Sarajevo (146)
Bulgaria	Sofia (119)
Croatia	Zagreb (101)
Czechia	Prague (43)
Estonia	Tallin (72)
Georgia	Tbilisi (127)
Lithuania	Vilnius (96)
Latvia	Riga (94)
Macedonia	Skopje (147)
Poland	Warsaw (62)
	Wroclaw (100)
Romania	Bucharest (111)
Serbia	Belgrade (124)
Russia	Moscow (98
	Saint Petersburg (131)
	Novosibirsk (142)*
Slovakia	Bratislava (87)
Slovenia	Ljubijana (99)
Ukraine	Kyiv (117)
Hungary	Budapest (85)

* Novosibirsk is a city located in the Asian part of Russia, so it should not be included in this analysis

Source: the authors' own elaboration on the basis of: *IESE Cities in Motion Index 2022*, https://media.iese.edu/research/pdfs/ST-0633-E.pdf [date of access: 23.09.2023].

The above lists also include representatives of the Central and Eastern European group. Among the smart cities in this region there are cities such as Warsaw, Prague and Budapest. But that is not all. Taking into account various criteria for being a smart city, many more can be included among the cities implementing the discussed model. Table 4 will show this in more detail.

Table 4. Smart cities in the Central and Eastern Europe – manifestations of being a smart city. Selected examples

Smart city (country)	Example of being a smart city
Albania	In Tirana, citizen engagement and open data are two ways the city can utilize its readily available human resources to advance projects in five priority areas: mobility, society, living, economy and rural life. As the Administrative Territorial Reform increases the municipality of Tirana to 25 times its size, it is no surprise that the majority of the 112 proposed projects focus attention on rural development. As for how to fund these projects, the city is looking at innovative financing schemes such as crowdfunding. With the help of open data, the UN in Albania discovered that out of

Smart city (country)	Example of being a smart city
Albania [cont.]	With the help of open data, the UN in Albania discovered that out of 22 playgrounds managed by the municipality, only one is suitable for children with special needs. Through social media, crowdfunding platforms and advocacy initiatives, the #Crowdfunding4Children campaign raised its goal of $20,000 to construct the country's first all-inclusive playground for children with special needs, offering a safe and healthy environment for them to interact with their peers. The city is also looking into reward-based crowdfunding models that allow citizens to contribute to certain projects that get private service providers involved, as well. For example, while paying an electric bill, citizens may have the option to contribute to a social project that aligns with Tirana's smart city goals.
	While these projects are still in their early development stages, Tirana has already unveiled one way it plans to step up citizen engagement with its new mobile application, Tirana Ime. In addition to accessing information on bus stations, cab companies and real-time traffic reports, the app allows citizens to report any neighbourhood issues they may be aware of, receiving a quick call for action from the municipality. With the introduction of these types of projects and inventive financing schemes, Tirana is already on its way to becoming a self-started smart city with models that others in the country may be able to easily follow in the future.
Grodno, Minsk (Belarus)	Transport: share of journeys taken by private vehicles, public transport, walking, cycling, or paratransit; public transport network access; dynamic public transport information; amount of shared vehicles; and amount of shared bicycles.
	ICT infrastructure: public Wi-Fi spots; 3G and 4G wireless broadband coverage; wireless broadband subscriptions; and household internet access. // Employment: tourism industry employment and youth unemployment rate. // Buildings: integrated building management systems and public building sustainability. // Environment dimension: Air quality, especially through the online monitoring of PM10 and PM2.5 emissions and greenhouse gas emissions // Energy: public building energy consumption.
	Public space and nature: recreational facilities and green area accessibility // Environmental quality: exposure to noise and to electromagnetic fields. Society and culture dimension // Safety: violent crime rate; police service staff count; population at risk of disasters; resilience plan implementation; disaster-related economic losses; and natural disaster-related deaths // Health: life expectancy // Social inclusion: childcare availability, poverty rate, and Gini coefficient // Education: adult literacy rate and number of higher education degrees // Housing: housing expenditure // Culture: number of cultural institutions and cultural expenditure. The prevalence of local food production.
	Bike city: creation of the production of smart bicycles based on MotoVelo, as well as urban infrastructure and financial instruments for the convenience of bike using // Smart tourist: development of a mobile application for tourism in Minsk with elements of augmented reality and fintech (payment for services through the application) // Smart citizens: automation of city life, including: city transportation,

Smart city (country)	Example of being a smart city
Grodno, Minsk (Belarus) [cont.]	food, administrative procedures, emergency care // UP Platform: development of a universal entrepreneurial platform to facilitate the accompanying business processes and the process of investment attracting // Digitalizaton of instruction industry: development of an electronic database (made on blockchain) of engineering networks and other elements of buildings, as well as digitization of the construction process // Transport solutions: solutions to improve the convenience of transportation, including interactive stops, traffic regulation // Environmental monitoring: sensors for determining the level of pollution, for the purpose of the safety of citizens and the subsequent cleaning of territories // Housing soltions: solutions to improve the convenience of receiving and paying for utility and maintenance services // City safety: ensuring public safety through surveillance cameras, smart lights and an emergency call system // Bonus system: bonus system for rewarding citizens and guests for socially useful activities for the city of Minsk // Smart municipality: automation of the city management system, administrative procedures, work with citizens' appeals, and local referenda
Sofia (Bulgaria)	Unified ePlatform for citizen participation & communication: Integrated approach and creation of a unified platform for citizen participation and communication with citizens, which includes digital tools and also enables data processing of information from citizens and/or businesses // Data Policy. Data Access & Open Data: As set in PSDTS: Preparation and implementation of a comprehensive data policy - guidelines for standardization, processing, sharing, data security in the Municipality and municipal companies, including definition of the processes for generation, exchange, storage, so that they are in the appropriate scope and format for full use. Processes for opening appropriate datasets and providing access for citizens and businesses to them. // Tech solutions for informing and involving citizens: Implementation of new and upgrading of already existing digital tools in order to: inform citizens about latest developments in the city; collect feedback from citizens – for example, via surveys in Viber; to collect and analyse information of interest to citizens (collection of data to support the city, for example through a chatbot search); well-planned inclusion of new digital tools for interaction with citizens making optimal use of and upgrading already existing ones (e.g. chatbots; Sofia Municipality's Viber Community, etc.) // "Living" solutions for informing and involving citizens: Developing 'living solutions' (not digital solutions per se) with the aim to: 1) promote civic participation and offer solutions to different challenges, developed by the business, academia and citizens; 2) promote innovation and the transformation of the city into a testing ground for innovation; 3) encourage innovative and entrepreneurial thinking and activities.
Rijeka, Dubrovnik (Croatia)	Rijeka stands out in particular in the results in the field of Availability and quality of e-Services to citizens, and also in the field of Service Information and Unified Payment Systems, which includes the availability and good quality of the service information that cities offer to their residents and presence and possibilities of unified payment services provided by companies and institutions in the territory of the City of Rijeka and its wider area via the RCC website.

Smart city (country)	Example of being a smart city
Rijeka, Dubrovnik (Croatia) [cont.]	Dubrovnik will officially become the first innovation, testing, development and sales Smart City Center of Croatian Telecom. Citizens and numerous tourists will be significantly facilitated, and traffic safety and energy efficiency will be improved. This HT project is at the very top of the regional and European technological leaders in promoting, presenting and implementing the Internet of Things / Smart City Technology Framework. They introduced 9 investments in the development of mobile and fixed infrastructure, as well as increased the capacity for broadband internet access and IP transformation.
Prague (Czechia)	Data Area: A single transparent and safe platform // Attractive Tourism: Data-controlled and tourism-friendly // Smart Buildings and Energy, Sustainable energy and intelligent public buildings // People and the Urban Environment: Safe and modern urban space // Waste-free City, Responsible and intelligent waste management.
Tallinn (Estonia)	Tallinn's way to become a smart city revolves around three keywords: accessibility, interoperability, and user-friendliness. In this respect, our capital has managed to harmonize its urban and digital development with the evolution of Estonia as a digital society. A nation and its main city, hand in hand, providing efficient and convenient digital services for citizens, tourists and companies, particularly by employing common infrastructures to exchange data and avoid redundancies – as well as integrating the national e-ID system into its authentication mechanisms.
Tbilisi (Georgia)	Mobile applications: Tbilisi mobile application – "Tbilisi. Loves you" – with a guide on tourist attractions, restaurants, hotels information (text, photos and GPS) is an application for iOS and Android mobile phone owners. Users can easily view and choose the suitable object from the provided list and receive the contact information, find map location and routes. // Bus route indicators: Electronic indicator boards at the bus stops display bus route information. With bus arrival time indicated, this facility is a helpful item to manage time properly as you plan one's route throw the city. The information is available on Tbilisi Transport Company web-site as well. // Tbilisi The Internet City: Tbilisi The Internet City project is launched by the unicipality of Tbilisi. Up to the end of the year the entire territory of Tbilisi will be equipped with free Wi-Fi facilities // Construct easily: Architecture of Tbilisi Service introduces 100% online proceeding for construction permits. Each application is displayed on the interactive map. // Purchase without risk: The Property Agency of Tbilisi City Hall invites persons interested in purchasing movable or real property to participate in electronic auction along with providing the electronic application forms. // Hermes: The online applications for ritual (funeral) services include the online choice of the proper items (grave, catafalque, ritual accessories) and the online payments. // Civil Registry Online services: Civil Registry, one of the leaders in the field of development IT based services, produces in electronic form the ID cards, the passports, etc. // Revenue Office: The objective of Revenue Office is to create business friendly environment in Georgia, in order to develop the existing business and launch new ones, by forming fair, simple and secure tax system. The electronic services for the customers are available.

Smart city (country)	Example of being a smart city
Budapest (Hungary)	The aims of the vision's strategic areas: Budapest shall become a centre of international innovation thus a target for knowledge transfer; Budapest shall protect its environment by the sustainable utilization of resources and waste generated; Budapest shall establish a sustainable mobility system enhancing the livability of the city; Budapest shall become capable of responding to the environmental and technologic changes of the 21th century; people in Budapest shall live in an open and cooperative society; Budapest shall continue to progress based on the development of sustainable and local economy; Innovative city; Regional brain drain; Increasing energy efficiency; Reducing emissions; Increasing the use of alternative energy; Reducing the quantity of generated waste; Increasing the proportion of waste recovery; Pedestrian-friendly Budapest; Interconnected city for cyclists; Attractive public transport; Environmentally sound car transport; Intelligent mobility; Enhanced transport security traffic calming; Efficient city logistics; Increasing green spaces by alternative solutions; Smart technical environment; Sustainable rainwater management; Mitigation of the urban heat island effect; Open data usage; Initiative urban development; Active society; Preserving the diverse and lively nature of Budapest; Community economy; Sustainable food supply; Supporting local business.
Vilnius (Lithuania)	Vilnius is a strong believer in open data. The city council offers free access to financial procurement, real estate, transport, and other data to all. And it's not just for curious citizens! Tech developers are encouraged to help create smarter urban solutions using all the swathes available. This collaborative approach helps the city to rapidly grow in such areas as financial technology, IT, biotechnology, electronics and optical systems. And the ripple effect is already visible. Trafi, a global mobility problem-solver that grew out of Vilnius' open data, has built one of the world's largest urban transport platforms, used by the residents of Berlin, Munich, Prague, Zurich, and other cities, and offering solutions which have been adopted by such companies as Google and Lyft. Vilnius has introduced several smart management solutions, including a website which allows citizens to communicate with the city council members, express opinions in polls, and submit electronic petitions and proposals. Responding to mobility challenges, the city developed a traffic monitoring system, connecting all traffic lights across the city into one centrally-managed network. The new system allows the city to cut average travel times, despite the fact that the number of cars in Vilnius increased 40% over the last decade.
Warsaw, Wroclaw (Poland)	Many projects are currently being implemented in Warsaw to improve the conditions of everyday functioning in the city. These are mainly investments in infrastructure and the digital layer, which result in the better quality of services provided by the city, including e-services. The basis for them are the digital platforms implemented by Warsaw: communication platform (Warszawa 19115), e-services platform (Moje 19115), open data platform (API), as well as the analytical BigData platform. // Several dozen electric buses are already in operation in Warsaw and 140 more

Smart city (country)	Example of being a smart city
Warsaw, Wroclaw (Poland) [cont.]	have been ordered. In the coming years, the capital will replace the public transport fleet with electric and gas ones and will install public chargers for individual drivers. // Warsaw residents and tourists have at their disposal many mobile applications that facilitate, among others: buying a ticket, paying for a city parking lot, checking the departure time, planning a route, or estimating the actual arrival time of a bus or tram based on vehicle location data provided by Warsaw. // Veturilo is one of the largest city bike systems in Europe. It is an important element of Warsaw's transport ecosystem. // USB chargers appear on Warsaw buses, and over 1,000 city buses already use Wi-Fi. // Recently, the city purchased two special drones to fight smog, which monitor buildings where garbage and other harmful substances are burned. One of the drones is equipped with two cameras._x000D_Smart Trip; MOBILL application; VOZILLA – city electric car rental; SMARTFLOW; Wroclaw electric vehicle charging system; Smart parking; LoRaWan (Wireless Communication System); Smart lighting
Riga, Sigulda, Valmiera, Jurmala (Latvia)	Latvia has been developing its Smart City strategy since 2018, building an ecosystem between the industry, the government, municipalities and academia. The Smart City ecosystem is a framework that is predominantly composed of ICT and Smart energy to develop, deploy and promote sustainable development practices to address growing urbanization challenges. Smart City looks across every aspect of a city's operations to use technology to improve outcomes and boost citizen well-being. // Latvian cities strive to become the leader of Smart City solutions in the Baltic Sea region by breaking down the unnecessary bureaucracy and closing the gap between the legal framework and new technologies. It is the capital city Riga where we test Smart city solutions; however, other Latvian cities and towns are also starting to implement various Smart City solutions, for example, Sigulda, Valmiera, Jurmala, Jelgava, and many more. We trust in Smart Cities, and luckily many of us live in one.
Alba Iulia (Romania)	Alba Iulia, the city of the Great Union, is the first intelligent city in Romania, which becomes more and more "smart" every day. It is the most ambitious IT infrastructure project and not only in Romania, which will take place on December 1, 2018, at the Centenary of the Great Union in Alba Iulia. Energy consumption has been streamlined, and local government controls the intensity of light from public posts. Buses are more welcoming for travel (WiFi), monitoring the air;there are projects to digitize education, and interact with public institutions. The e-album iulia, a kind of digital guide, tells you the story of the goals, but also where you find them. Also, in Alba Iulia, you can talk to the authorities, without an appointment or waiting for hours in front of the office, when you want to signal a dissatisfaction and follow the stage of solving the problem.
Bratislava (Slovakia)	The Slovakia's capital of Bratislava has already introduced a slew of smart technology pilot projects such as solar benches that charge mobile phones and offer Wi-Fi.

Smart city (country)	Example of being a smart city
Moscow, Saint Petersburg (Russia)	Implementation of a unified Intelligent Transportation System (ITS) that integrates various modes of transportation, including public transport, private vehicles, and bicycles, to provide an uninterrupted and efficient travel experience for citizens // Deployment of a network of smart sensors and devices that collect and analyze data on traffic flow, air quality, noise pollution, and other environmental factors to help the city officials to inform about their decisions and to improve the quality of life for residents // Creation of digital platforms and services, such as e-government portals, online payment systems, and mobile apps that enable citizens to access information and services quickly and easily, anytime and anywhere // Yandex, the leading Russian search engine and technology company, has developed a number of smart transportation solutions in Moscow, including a ride-sharing service called Yandex.Taxi, a car-sharing service called Yandex.Drive, and a public transport planning tool called Yandex.Transport // Huawei, the Chinese tech giant, has partnered with Moscow authorities to deploy 5G networks and other advanced technologies to support the city's smart city initiatives. The company has also established a research and development center in Moscow to focus on AI and other emerging technologies.
Ljubljana (Slovenia)	Environmental monitoring; Water and energy networks; Traffic management; Sustainable tourism; Free wireless network; Public electric train in the inner city; Circular economy initiatives; Electronic displays of bus timetables; Urbana tourist and city card; Bicycle and electric vehicle sharing; Street lighting upgrade; Shared public space.
Kyiv (Ukraine)	Open Data Portal, Official portal of Kiev, Participation budget, Online petitions, Open Budget, Electronic purchase – Digital services

Source: the authors' own elaboration on the basis of: *Smart Sustainable Cities Profile GRODNO*, *BELARUS*, https://unece.org/sites/default/files/2023-01/ECE%20HBP%20216_SSCP%20 Grodno_E.pdf [date of access: 23.09.2023]; *Smart City Minsk*, http://smartcountry.club/images/Smart_City_Minsk_V4_eng.pdf [date of access: 24.09.2023]; *Sofia: Intelligent City Transformation. Overview*, https://www.intelligentcitieschallenge.eu/sites/default/files/2023-04/ ICC_Final%20deliverable_Sofia.pdf [date of access: 24.09.2023]; *112 ways Tirana. Albania is getting smarter*, https://www.smartcitiescouncil.com/article/112-ways-tirana-albania-getting-smarter [date of access: 24.09.2023]; *For the third time Rijeka declared the smartest big city in Croatia, winning the title Smart City*, https://www.rijeka.hr/en/third-time-rijeka-declared-smartest-big-city-croatia-winning-title-smart-city [date of access: 23.09.2023]; *The smart city sector in Croatia*, https://www.flandersinvestmentandtrade.com/export/sites/trade/ files/market_studies/2017-Croatia-Smart-Cities.pdf [date of access: 23.09.2023]; *Smart Prague*, https://smartprague.eu/about-smart-prague/mobility-of-the-future [date of access: 24.09.2023]; *Tallinn – the smart capital of a digital nation*, https://e-estonia.com/tallinn-smart-capital-digital-nation [date of access: 23.09.2023]; http://msdp.undp.org.ua/data/publications/%D0%A2%D0%B0%D0%BB%D0%B0%D1%85%D0%B0%D0%B4%D0%B7%D0%B5.pdf [date of access: 24.09.2023]; *Smart Budapest*, https://budapest.hu/Documents/V%C3%A1ros%C3%A9p%C3%ADt%C3%A9si%20F%C5%91oszt%C3%A1ly/Smart_Budapest_summary_ENG.pdf [date of access: 26.09.2023]; *Smart city solutions*, https://lithuania.lt/governance-in-lithuania/smart-city-solutions [date of access: 26.09.2023]; *Is Vilnius a smart city?*, https:// lithuaniatribune.com/is-vilnius-a-smart-city [date of access: 26.09.2023]; *Smart city*, https://

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Table 4 shows only selected examples of implemented smart city activities and strategies. Certainly, the level of advancement of many activities compared to the leaders of the smart cities group leaves much to be desired, but it seems to be a success that any and various activities prove openness and growing awareness of this type of activities.

4. Conclusions

As already noted, the current innovations play a key role in creating development and the ability to adapt to the constantly changing operating conditions. This innovation applies to both the private and public sectors. The implementation of the smart cities concept can be boldly described as an effect of the innovation of the private sector. It is thanks to this type of activities that cities are able to meet the constantly changing expectations of residents, but also of potential investors. Smart cities mean both economic and technological development, care for residents, but also sustainable development, i.e., despite striving for continuous technological development, care for the natural environment.

It is obvious that smart cities go hand in hand with the innovation capacity of individual regions. The leaders in innovation and achievements in smart cities are countries such as Switzerland, Sweden, Norway, the USA, Great Britain, Japan and Australia.

Historical events and belonging to the Eastern Bloc prevented countries from Central and Eastern Europe from achieving such a state of affairs. However, it is comforting to note that despite this developmental backwardness, these economies are actively trying to follow the path of innovation leaders, climbing up the innovation and smart city rankings. There is still a long way ahead of them, but with small steps they can also achieve a lot, because "(...) not to introduce

innovations means to die" [Freeman, 1973: 21]. Therefore, pro-innovation activities should be constantly promoted, and the smart city concept should be implemented and developed with strong commitment.

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