Smart solutions and quality of life population

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Abstract

When one first hears it, the topic of smart cities evokes technical and technological changes, associated mainly with the area of information technologies. These technologies help citizens get easier access to information and find efficient solutions to various life situations, and they enable us to save natural resources, protect the environment, improve the robustness and resistance of cities in terms of social, economic and security aspects, and satisfy the requirements for a healthy and high-quality life in all respects. The understanding of the concept of the smart city begins somewhere among the demands placed on cities by comprehensive global development with its associated trends and local possibilities. The aim of the paper is to present the importance of smart solutions and their impact on the quality of life of residents in selected cities of the Slovak Republic and the Czech Republic. The contribution is part of the solution of the VEGA project no. 1/0055/22: The importance of smart technologies in the process of mitigating the economic and socio-psychological impacts of the COVID-19 pandemic on the quality of life of population.

Keywords: smart, solutions, quality of life, cities, residents

Introduction

The concept of sustainable development (or permanently sustainable development) represents an alternative model of society development as contrasted with the dominant industrial economy. It reflects the environmental limits of economic growth; policies based on this concept try to align economic and social development with the capacities of ecosystems, preserving natural values and biological diversity for current and future generations (Daly 2006). The traditional definition from a report by the UN Commission on Environment and Development (so-called Brundtland Report) from 1987 goes as follows: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs, without this being at the expense of other nations” (Mebratu 1998). Therefore, sustainable development originally only applied to environmental protection, although now it has been expanded to cover sociology and economy (ME CR 2018). Sustainable development is also legally defined in Paragraph 6 of Act no. 17/1992 Coll. On the environment, where it is stated that it is the type of development which preserves the possibility for present and future generations to satisfy their vital needs without reducing nature’s diversity, and preserves the natural functions of ecosystems.

Member states of the European Union in their declarations emphasize and confirm the importance of sustainable development, as well as in strategic documents such as Lisbon agreement and also in the key document the Strategy Europe 2020. The Strategy due to its focus on intelligent, sustainable and inclusive growth fully respects economic, environment and social aspects of sustainable development. A permanent challenge for Slovakia is to transfer all the principles of sustainable development to everyday life, review all the planned and executed activities by criteria of sustainable development and evaluate the process of heading to sustainability by the set of measurable indicators. (http://www.tur.vlada.gov.sk/, 2020)

The issue of sustainability in the conditions of the European Union and its member states is based on three basic components. They are:

1. The **environmental component** is one of the most important components of sustainability, both in the short term and in the long term. In this area, sustainability refers in particular to the capacity of biological systems to maintain their functions and processes over time. It is a perspective that focuses on natural capital and places great emphasis on the immutability of natural resources within economic processes. In order to achieve this, the well-being of society needs to be maintained (Arrow et al. 2004). Environmental sustainability refers to the natural environment, its longevity, diversity and productivity. The state of the air, water and climate is very important, because all natural resources come from the outside environment. It is important for environmental sustainability that society designs activities that meet human needs, while these activities must maintain systems that support the life of the planet (IPCC 2014). This dimension deals with the evaluation of natural resources and the potential of the territory, i. j. their quantity and use, quality and also the action of negative factors (Merdely et. al. 2003).

2. The **economic component** perceives sustainability in terms of maximum efficiency in the use of natural and economic resources. This pillar is based on the idea that from the production resources available to the economy, as many goods and services as possible should be produced, thus achieving maximum satisfaction of needs, resp. maximum well-being of society (Šubrt et al. 2010). The main concepts describing the balance of sustainable economic activity are efficiency and stability. This fact explains the close link between economic sustainability and the environmental and social dimensions of every country's economy. The interconnectedness of economics and ecology is reflected in the economical use of resources and energy. In the area of job creation and job security, the connection between the economic and social dimensions is shown. Economic sustainability contributes to regional development, workplace protection, regional value creation, sustainable economic activity and regional economic cycles (Goodworks Innovation Agency, 2020). The goal of the economic dimension

is focused on economic assumptions of development and their evaluation, they include: economic base, employment and job opportunities, economic potential, transport and technical infrastructure (Merdely et. al. 2003).

3. The **social component** is the third, no less important, pillar of sustainability. The goal of social sustainability is human life, which can be achieved in various ways, in particular by sharing social pressure, tasks, work, combating unemployment and equal opportunities. Work plays a crucial role in this dimension by facilitating material participation and ensuring existence through income (Littig and Grießler 2004). Evaluation of human resources and their quality (population and demographic potential, educational structure, social status - real income of the population, unemployment, social infrastructure) belongs to the social dimension (Merdely et. al. 2003).

The above three basic components of sustainability are extended by many experts, supplemented by two more pillars. They are:
1. **Institutional component**. National, transnational and local institutions play an essential role in realizing the social, economic and environmental pillars of sustainability. The institutional level is not a separate dimension because independent institutional objectives are lacking and the specific characteristics of the institutional system are neglected (Hák, Moldan and Dahl 2007). This dimension deals mainly with the evaluation of the quality of local and regional self-government and other institutions, the position of municipalities and regions within higher territorial units and the participation of citizens in the administration and management of public affairs (Merdely et. Al. 2003).

2. **The component of culture** is an important and decisive factor that influences aspects of community life (Edmunds et al. 2013). Cultural sustainability is the transformation of dominant monocultural globalization into diverse cultures of sustainability. Sustainable cultural diversity is existential and protective for society as a whole, and it is therefore important to talk about cultural sustainability (Kagan and Kirchberg 2008).

Research part

The definition of the studied sample is based on generally applicable legislation in the Slovak Republic, namely Act 369/1990 Coll. on municipalities, which, among other things, defines the concepts of municipality and municipal authority. The Act, together with its definitions of original and transferred municipal areas of competence, became one of the bases for defining the research sample. According to the Act, a municipality is a separate territorial self-governing and administrative unit in the Slovak Republic; it groups together persons with

permanent residence in its territory. A municipality is a legal entity which, under the conditions specified by law, manages its own property and revenues. The basic role of a municipality in performing its administration is to ensure comprehensive development of its territory and to take care of the needs of its inhabitants.

The Act characterises municipal authorities as follows: "A municipality makes independent decisions and performs all acts associated with the administration of the municipality and its property, and arranges all matters assigned to it by a special law, unless such acts are performed, according to law, by the state or other legal or natural person."

Municipal administration is performed by its inhabitants:

- Through municipal authorities,
- A local referendum,
- or assemblies of the inhabitants of the municipality.

For the purposes of this contribution, based on the research topic, only those activities of municipality authorities will be mentioned which directly and substantially affect the achievement of the research objective and the formulation of research questions. The following table presents the tasks of municipal authorities under Act No. 369/1990 Coll. and assigns them to the individual characteristics of smart cities. It follows from this that the role of a municipality is already specified in the legislation so as to enable optimisation of its administration within the principles and procedures of smart cities.

Table 1: Smart City and local authority areas of competence in the Slovak Republic and the Czech Republic

Characteristics Smart City	Areas of competence of a municipal authority in the Slovak Republic	Areas of competence of a local authority in the Czech Republic
Economy and administration	• performs acts related to the proper management of movable and immovable municipality property and state-owned property used by the municipality; • prepares and approves municipality budgets and the municipality's final accounts; • makes decisions in matters related to local taxes and local fees and administers them; • guides economic activities in the municipality; • issues approvals, binding statements or statements on	• performs acts associated with the management of the municipality's investment and non-investment property, and state property available for its use; • prepares and approves municipal budgets and the municipality's final accounts; • makes decisions on local taxes and local fees and administers them; • establishes and closes the municipality's contributory organisations and organisational units, and approves their establishing documents;

	business and other activities of legal persons and natural persons, and on the establishment of operations in the municipality; • issues binding statements on investment activities in the municipality; • implements an effective inspection system; • establishes, closes and inspects, according to special regulations, its budgetary and contributory organisations and other legal persons and establishments;	• makes decisions to establish or terminate the business activities of legal persons, approves their establishing documents, social contracts, establishing contracts and statutes, and makes decisions to participate in existing legal organisations and appoint municipal representatives for the general meetings of companies in which the municipality is a stakeholder, appoints municipality representatives for other bodies of companies in which the municipality is a stakeholder, and proposes their removal from their posts, • issues generally binding municipal decrees, makes decisions to call local referenda; • establishes and closes municipal police, etc.
Mobility and services	• ensures the construction, maintenance and administration of the local transport infrastructure, public areas, the municipal cemetery, cultural, sports and other municipal facilities, and the municipality's cultural and historical monuments;	• implements municipal development programmes, ensures the construction and maintenance of the local transport infrastructure, public areas, the municipal cemetery, cultural, sports and other municipality facilities, cultural monuments, etc.
Environment	• ensures the provision of public services, especially municipal and small construction waste management, maintenance of cleanliness in the municipality, management and maintenance of public greenery, water supply, waste water disposal, management of waste water from cesspits, and local public transport; • ensures the protection of cultural monuments according to special regulations and the protection of natural sites;	• ensures the provision of public services (municipal waste management, etc.), maintains cleanliness in the municipality, ensures the management and maintenance of public areas, public lighting, waste management, water supply, etc. • ensures the provision of local public transport services; • ensures the protection of the municipality's cultural monuments and natural sites, etc.
People	• creates and protects healthy conditions for the municipality's inhabitants and their healthy lifestyle and work life, protects the environment, and creates conditions for the provision of healthcare, education, culture, outreach activities, leisure art	• creates conditions for the municipality inhabitants' healthy lifestyle and work life, protects the environment, and creates conditions for the provision of medical care, education, culture, outreach activities, leisure and arts activities, and physical activities and sport;

	activities, and physical activities and sport; • performs tasks through the social assistance section according to special regulations;	• performs tasks through the social assistance section; • makes decisions to call local referenda, etc.
Quality of life	• provides and approves territorial planning documentation for municipalities and zones, and development programmes for the individual areas of life in the municipality; • provides and approves housing development programmes, and cooperates in creating suitable housing conditions in the municipality; • carries out own investment and business activities to satisfy the municipality's development needs and the needs of its inhabitants; • ensures public order in the municipality.	• proposes changes to the cadastral areas of the municipality's residential areas, approves agreements to change municipality borders and to merge municipalities; • establishes and closes municipal police, ensures public order in the municipality; • makes decisions to engage the municipality in cooperation with other municipalities, and takes decisions on the form of such cooperation; • approves housing support programmes; • carries out own investment and business activities to ensure development of the municipality and to satisfy the needs of its inhabitants; • ensures public order in the municipality, etc.

Source: own work based on Act (Slovak Republic) 369/1990 Coll. and Act (Czech Republic) 128/2000 Coll.

Another reason why the research conducted in Slovakia is focused only on cities with populations of over 50,000 is as follows: Local administration in Slovakia currently consists of 2,929 municipalities, of which 2,661 are municipalities with populations of 3,000 or lower, which are inhabited by 38.7% of the population. 1.5% of inhabitants live in municipalities with 250 or fewer inhabitants. 4.2% live in places with 251–500 inhabitants and there are 608 municipalities in this category. Even more municipalities, i.e. 766, are in the size category of 501–1,000 inhabitants, with 10% of the population. 22.4% inhabitants live in cities with over 50,000 inhabitants, and the total number of such cities is 11. 85% of municipalities in Slovakia have a population of less than 2,000. 1.2 million inhabitants live in cities with populations of over 50,000 inhabitants.

What is paradoxical about the division of tasks in Slovak municipalities is the requirement for them to provide the same public services for their citizens. However, it is apparent that a municipality with 100 inhabitants can hardly find sufficient resources and suitably educated people to provide birth records registry services, construction office services, municipal waste collection, or provide social services in an optimal and efficient way as required by law. Some Slovak municipalities have a difficulty filling the post of mayor. The

municipalities are aware of this problem, so they try to merge and transfer the agenda to combined municipality offices. It is clear from this that every municipality's having the same original areas of competence regardless of its size cannot be optimal or efficient. At the same time, the probability that municipalities with populations of under 50,000 would significantly contribute to the implementation of the new technologies and procedures directly related to the creation of smart cities is relatively low. On the other hand, there are exceptions, i.e. municipalities which, despite the aforementioned fact, are capable and their representatives actively participate in the implementation of smart solutions.

It follows from the above that the second reason for selecting the research sample, i.e. cities with populations of over 50,000, was deliberate. The researchers suppose that especially large towns in Slovakia will have both an interest and sufficient financial and human resources to implement smart solutions. It can also be supposed that the procedures for implementing smart solutions, and the technical, financial and administrative procedures that must be implemented if a municipality wants to be a smart municipality can be adapted, over time and with certain limitations, for smaller municipalities.

Table 2: Analysed cities in Slovakia

The name of the city	The population of the city in 2019	Land area (in sqKm)
Bratislava	437 725	367,66
Košice	238 593	237,05
Prešov	88 464	70,43
Žilina	80 727	80,03
Banská Bystrica	78 084	103,38
Nitra	76 533	100,48
Trnava	65 033	71,54
Trenčín	55 383	82,00
Martin	54 168	67,74
Poprad	51 235	63,11

Source: Statistical Office the Slovak Republic, 2019

For the sake of comparing the research results with the relevant research conducted in the Moravian-Silesian region. Table 3 presents the analysed cities in the Czech Republic, in the Moravian-Silesian Region.

Table 3: Analysed cities in the Czech Republic

The name of the city	The population of the city in 2019	Land area (in sqKm)
Ostrava	289 128	214,22
Havířov	71 903	32,08
Opava	56 638	90,61
Frýdek – Místek	55 931	51,59
Karviná	52 824	57,52
Bruntál	16 408	29,34
Nový Jičín	23 496	44,71

Source: Statistical Office the Czech Republic, 2019

Another problem we encounter in the case of Slovak cities is a high number of municipal councillors on municipal councils. Based not just on theory but also on practical examples in the area of implementing smart solutions, it needs to be stated that every smart solution requires approval by a majority of municipal councillors. A high number of municipal councillors are not symptomatic of small municipalities only. Bratislava's different boroughs have 317 municipal councillors, and Košice has 22 municipalities, which is the highest number in Slovakia, with 221 municipal councillors. For comparison, Copenhagen, which is similar in size to Bratislava, only has 55 municipal councillors, and is among leading sustainable cities. In this case, the team of researchers supposes that the speed and willingness to implement smart solutions depends on the actions and attitudes of municipal councillors. It is supposed that the more councillors a municipal council has, the more complex and longer the process of implementing smart solutions is.

Sources of funding for implementing smart solutions also play an important role in the process. The division of powers between the state and municipalities was introduced based on Act No. 416/2001 Coll. on transferring certain powers from government authorities to higher territorial units. This Act provides for the transfer of powers from ministries, regional offices and district offices to municipalities and HTUs (higher territorial units – the elected regional administrations). A transfer of powers is a transfer of the powers exercised by government authorities to municipalities and self-governing regions and a transfer of powers, within the scope specified by law, from government authorities to the self-governing authority of municipalities and self-governing regions. Municipalities exercise their transferred areas of competence using funds from the national budget.

Generally, the powers transferred to municipalities are in the following sections:

- Land transport infrastructure.
- Birth records registry.
- Social assistance.
- Territorial planning and the construction code – under the authority of the construction office.
- Nature protection.
- Education.
- Sport.
- Drama activities.
- Healthcare and regional development.
- Tourism.

Original areas of competence are funded by municipalities from their own budgets. If the law does not specify that an area of competence is transferred from government authorities, then the an area of competence is exercised by the municipality or HTU. Generally, the original areas of competence of municipalities mainly include:

- Management of own or state-owned property.
- Decision-making on local taxes and fees.
- Guiding the municipality's economic activities.
- Guidance and maintenance of local transport infrastructure and public areas.
- Public services.
- Ensuring public order.
- Provision of care services.
- Ensuring the operation of school establishments belonging under the authority of municipalities and HTU (school canteens, children's and youth clubs, kindergartens, leisure centres, etc.).

Original areas of competence are funded from local authorities' own revenues, a substantial part of which consists of the share of natural persons' income tax received by municipalities and HTU.

As part of the implementation of smart technologies in local authorities, it is very important to address the issue of its funding. The team of researchers supposes that cities with populations of over 50,000 will able to address the issue of funding the introduction of smart technologies more flexibly, not just from their own resources but also from government sources, such as funds from the EU's Cohesion Fund or by involving the private and public

sectors. This supposition and examples of European cities implementing smart technologies led the researchers to select the research sample, i.e. the examined cities with populations of over 50,000. The research was focused on obtaining information regarding the use of smart solutions in the examined cities. The respondents' task was to indicate the smart technologies stated in the questionnaire that they see as a priority for their city. As for the range and possibilities of the graphical presentation of the respondents' answers, two diagrams were created. The results of the examined cities in Slovakia are shown in diagrams 1 and 2.

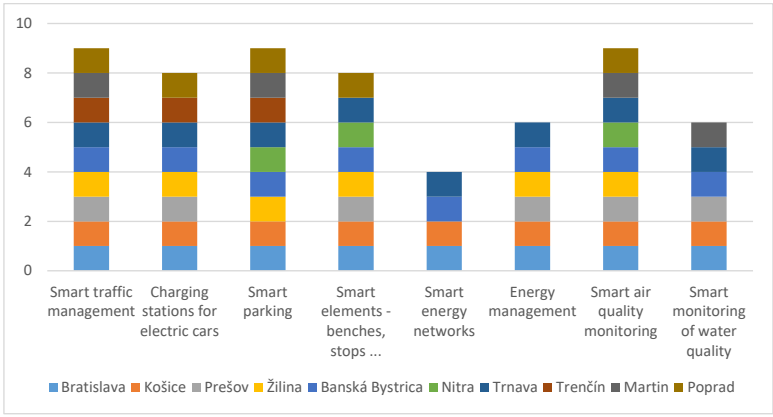

Diagram 1: Priorities of the cities in terms of smart technologies
Source: Own processing

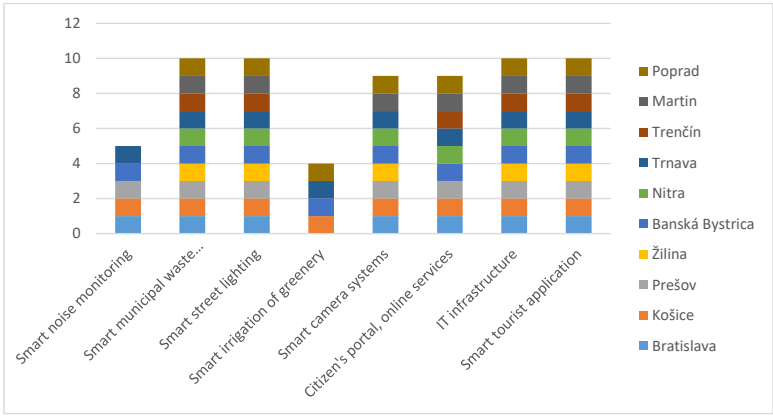

Diagram 2: Priorities of the cities in terms of smart technologies
Source: Own processing

The findings in the analysed cities in Slovakia based on the answers to the question "Priorities for your city in the area of smart solutions include:" are as follows: The questionnaire listed 16 most commonly used smart technologies in the European Union's cities. According to the answers, the following were the four most commonly used smart technologies that had become a priority for all of the examined cities (stated by 100% of respondents): smart municipal waste collection, smart public lighting, IT infrastructure, and smart tourist applications. Second in the order of importance for the cities (90% of respondents) was smart mobility, such as smart traffic control, smart parking, and the related smart monitoring of air quality; the respondents attributed an equal level of priority to the use of camera systems to improve the safety of its citizens when using public areas. What also needs to be seen positively is the implementation of changes to improve decision-making by local authorities to bring them closer to their citizens. Of equal importance for the respondents was the creation of a web portal to improve the availability of information and speed up the processing of requests from residents. On the other hand, the implementation of smart technologies for building a smart energy network and urban greenery irrigation were seen as a priority by the lowest percentage of respondents (40%). The following cities considered all of the smart technologies stated in the questionnaire to be a priority: Košice, Banská Bystrica and Trnava.

Data analysis of the answers about priority areas in the examined cities in the Czech Republic is shown in Diagram 3.

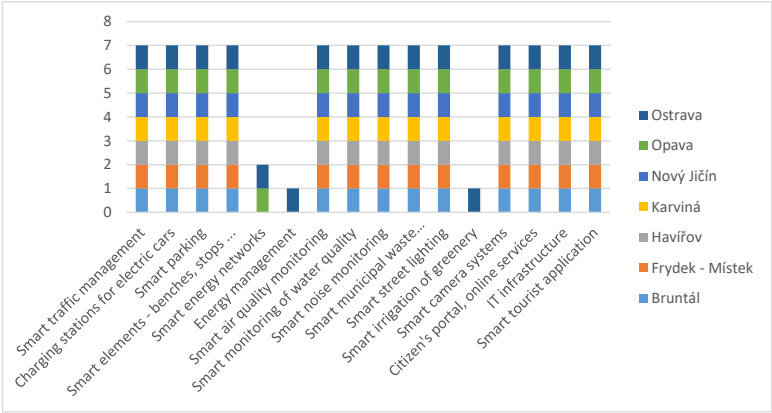

Diagram 3: Priority smart solutions in the selected cities in the Czech Republic
Source: Own processing

The respondents in the selected cities stated that among the most important projects focused on smart solutions were projects focused on solutions in transport, for improving the quality of life for inhabitants, and for environmental protection. They marked all of the included options as important for improving the quality of life for their citizens. Despite the fact that the energy sector is key for sustainability and that energy saving affects cities' finances, the selected cities do not pay increased attention to the implementation of projects focused on building smart energy networks, nor do they focus on creating jobs in energy management to propose suitable and long-term measures aimed at energy saving. The Moravian-Silesian Region has a strategic material presenting the regions' territorial energy concept, which defines plans for sustainable energy policy and climate protection. The region's contributory organisation, the Moravian-Silesian Energy Centre, provides professional consulting services in the area of smart region development not just for the contributory organisations it establishes, but also for municipalities, and prepares strategies in the area of mobility in the region.

Diagram 4 presents the reasons considered to be important by the managers of the analysed cities. In other words, it presents the reasons that motivate city representatives to pay attention to the problems of smart cities and to make the concept a part of everyday reality.

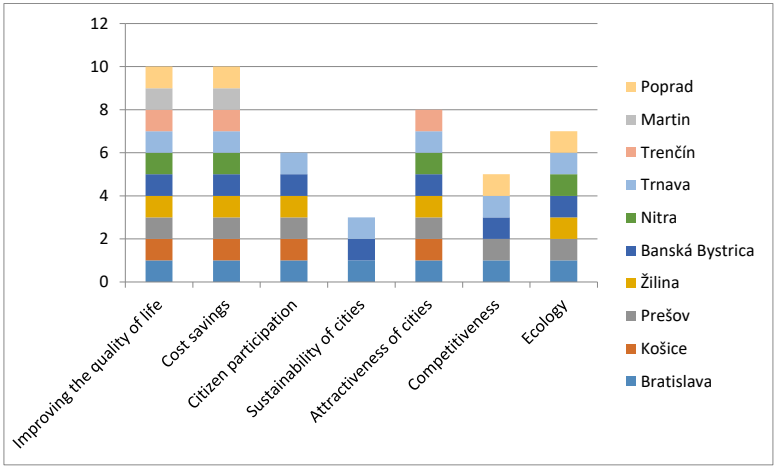

Diagram 4: Reasons for building smart cities
Source: Own processing

Based on the respondents' answers, it can be stated that among the most significant reasons why Slovak cities should be smart are improvement in the residents' quality of life and cost-saving (100% of the respondents). The least important reason why a city should be smart was sustainability. Only the following three respondents considered sustainability to be

important: Bratislava, Banská Bystrica and Trnava. From the perspective of the theory and practice in other relevant smart cities in Europe, the answers given by these respondents should be seen in positive light. The question that remains is whether the representatives of the other examined cities are aware of the fact that smart technologies ultimately lead to city sustainability. Table 4 presents a simple example that confirms this fact, stating the causes and consequences leading to sustainability through smart solutions.

Table 4: Simplified model of an example of smart solutions and sustainability

Cause ⟺	Consequence
city population growth	increased amount of municipal waste
increased amount of municipal waste	greater need to implement smart technologies in waste separation and collection
greater need to implement smart technologies in waste separation and collection	optimisation of waste collection and separation
optimisation of waste collection and separation	introduction of underground municipal waste containers
introduction of underground municipal waste containers	Improved cleanliness in the city, reduction in municipal waste costs for households
Improved cleanliness in the city, reduction in municipal waste costs for households	Reduction in the production of solid and municipal waste in the city
reduction in the production of solid and municipal waste in the city ⟹	***TUR agenda; Economy, Indicator 47 – Solid industrial and municipal waste***

Source: Own processing

The data analysis of the answers to question, which focused on surveying the reasons for implementing smart solutions in the examined cities in the Czech Republic, is shown in Diagram 5.

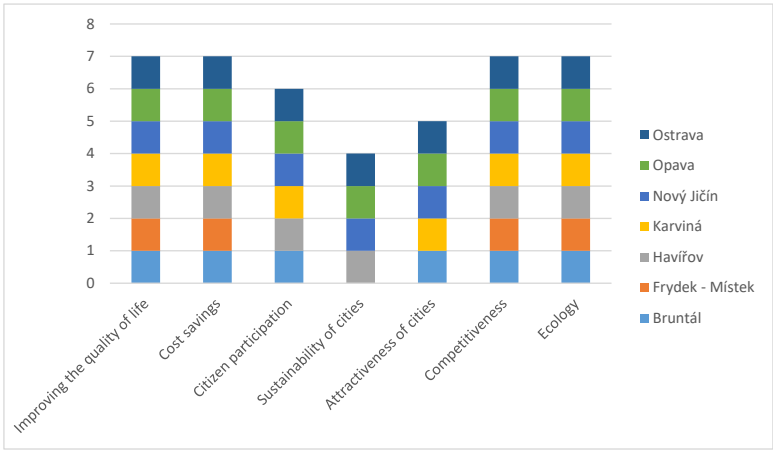

Diagram 5: Reasons for the implementation of smart cities
Source: Own processing

The analysis of the stated reasons why smart solutions are important clearly showed that the most important reasons are the following: improvement in the quality of life, focus on saving, ensuring competitiveness, and environmental improvement. The respondents are aware that the implementation of smart solutions needs time and financial resources, which affect the whole process, so it is important to prioritise. Despite the fact that cost-saving is important for them, 80% of them are not aware that this can be addressed by means of a suitable energy management strategy. What is also of interest is electronic services for citizens in the selected cities, which certainly improve the quality of life for their inhabitants, providing them with functions for better understanding of the given areas primarily related to security, sport, culture and environmental protection, improving awareness among inhabitants of activities planned by the municipal management, and giving them an opportunity to engage in matters concerning their city, which provides municipal representatives with feedback on what worries their citizens.

Conclusion

The question whether Slovak cities will be clever, bright, wise or smart is no longer a relevant question. It is necessary to create solutions and procedures that will address a problem when it happens, because this goal, i.e. to be a smart city, has been embraced by many cities in Europe and in the world. The question that remains for Slovak cities are what path and what method they will choose to ensure further growth. Examples of best practice abroad can serve as inspiration for implementing the characteristics of smart cities in Slovakia, but with respect for the uniqueness of each city. Smart city solutions have major positive

effects, both internal and external. These are positive externalities (such as economic growth, innovations in services, engagement/mobilisation of citizens), economic aspects (cost-saving and more efficient profits gained across implemented projects), and individual benefits from smart city solutions (effects of investment in ICT such as smart buildings, transport system, digitization, etc.). For the implementation of technologies in city administration to deliver the desired effect, it must be supported by a well-thought-out implementation concept, which means efficient city administration management with an emphasis on economic efficiency and effectiveness. Deployment of information technologies must address the causes rather than the consequences of problems faced by cities and their inhabitants. The concept of smart cities needs to be understood not only at the technological level, it must be understood in a broader sense. It means smart city management aimed at improving quality of life for its inhabitants.

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