

SMART CITY AS A SOLUTION TO OVERCOMING CRISIS SITUATIONS

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Abstract: *In the current context it is necessary to find solutions to support the smooth running of day to day activities, specific to a modern society, an urban environment, and smart cities can respond effectively to many such challenges.*

This article presents the elements with which surveying can contribute to the development of a plan for smart city and also proposes several solutions, which can become part of a smart city in Romania, contributing to the sustainable development of cities.

The solutions presented come in response to the current challenges that people face and can continue to be used for the development of the society, especially since other countries have successfully implemented part of such solutions and the European Union supports the implementation of such project.

Keywords: *smart city, surveying, crisis, solutions*

1. Introduction

The importance of cities is given by the fact that they are considered the key to the future, because anywhere in the world they play a key role both socially and economically. This is why future development plans are being made for cities, all the more so as the planet's population is expected to be 70% concentrated in cities by 2050. [1] If we are talking about Europe, it has already exceeded this percentage by expecting to reach 80% by 2050 [2], so it is especially important for cities to keep up with population growth and the challenges it poses.

When we think about the development of a city, you inevitably come to use the term Smart City, as they are considered cities of the future, with plenty of associated technology used to make life easier for people, but also protecting the environment.

Smart city has been defined by many authors but we considered the definition given by the European Union as the most comprehensive: “A smart city is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business. A smart city goes beyond the use of information and communication technologies (ICT) for better resource use and less emissions. It means smarter urban transport networks, upgraded water supply and waste disposal facilities and more efficient ways to light and heat buildings. It also means a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population.” [3]

The components of a smart city

A smart city efficiently combines components from several areas of urban life and thus manages to provide its population with a higher standard of living, consuming less time, human or economic resources to provide lasting and sustainable services. The components of a smart city according to [4] are:

- Smart economy;
- Smart people;
- Smart governance;
- Smart mobility;
- Smart environment;
- Smart living.

Other authors present the components of a smart city grouped differently, in a smaller or larger number of domains, but the main subdomains refer to the same components of everyday life, which are areas of interest for the development of urban areas and for increasing living conditions for their citizens. Each of the components is summarized below.

Smart economy is closely linked to the business area. Thus, this component includes the areas of advertising, agriculture, entrepreneurship, logistics, transactions, GDP per capita, unemployment rate and public spending on research, development or education.

Smart people are a very important part of the smart city. It is particularly important to know their language skills or technical skills and to be encouraged to contribute to the projects development, making their needs and problems known, but also proposing viable solutions. For this component it is important to ensure comfort and safety in the areas of public transport, entertainment, tourism, but also easy access to the healthcare.

Smart governance proposes the analysis of universities and research centers in the city area, which can help develop solutions, management applications available online, automatic or semi-automatic monitoring of the city, ensuring a prompt response to emergencies. Since we are one of the countries whose population has a high percentage of access to Internet services, there is the possibility of implementing online solutions very easily at this component.

Smart mobility refers to traffic decongestion solutions, offering alternative and environmentally friendly transport solutions. This component is closely related to the environment component, which is presented below.

The smart environment focuses on projects to reduce emissions, develop environmentally friendly buildings with low energy and water consumption, provide green spaces for relaxation which help maintain clean air, projects for selective waste collection and recycling, but also policies of the urban space expansion, with the lowest effects on the environment.

The last component is the smart living that is often associated with technology and access to digital services. It is believed that the smart living should be equivalent to a high standard of living, providing relaxation areas, ensuring access to electronic educational resources, free of charge and easy access to museums, theaters or cinemas.

2. The contribution of surveying in the development of smart city projects

One of the European Union objectives is to make cities and human settlements in general safe, lasting and sustainable. Basically, the goal is to update the plans of cities and

other human settlements, providing access to basic services, energy, transportation, housing and green public spaces, while reducing the resources used and the negative impact on the environment. [2]

Therefore, the role of the surveyor is essential, laying the foundations for the development plans, he has the qualification and has the necessary technology for the development or updating the plan of every city. All elements that have a spatial reference imply the need to use the services of a surveyor.

Starting with the establishment of the positioning of parcels, continuing with the integration of point clouds resulting from scans or photogrammetric flights, the surveyor can combine the data so to provide a product that can represent the basic model on which analyzes can be made and subsequently test various scenarios. By combining data from different departments of the city hall, including utility atlases, already implemented development projects and future plans for urban area expansion, a database can be created that can be used in a smart city for surveillance and monitoring. The role of the surveyor is vital in accurately determining the data and is an important member of the smart city project development team. [6]

Currently all projects developed are digital therefore GIS projects for different purposes, plays a particularly important role to create transformation projects of cities in smart cities.

One of the big problems of urban overcrowding is traffic, which is why people want fast and efficient solutions to this problem. City traffic is one of the most time consuming problems for the city's citizens, but also an important source of pollution. People need smart cities not only to give them digital access to as many services as possible, but to improve their lives both physically and mentally. It is necessary to create a relaxing, healthy environment that offers effective solutions to people so that they benefit from as much free time as possible. In order to reduce traffic, it is necessary to improve public transport, and this means a fleet that is as little as possible polluting but also special lanes for them. Alternative transport requires also a dedicated space so that people will be attracted to use it, feeling safe and also reducing travel times. For both traffic flow solutions it is necessary to have measurements made and updated, so that it is possible to analyze which are the spaces where they can be implemented with ensuring continuity throughout the city and without hindering other services. This product can only be supplied by a surveyor.

After the implementation of such special lanes, for public transport to be efficient it is necessary to be well organized and the frequency of means of transport be closely related to the number of passengers on that route, but also to traffic so that travel times not to fluctuate too much for the citizens of the city. Thus, they trust a transport system that supports them to get to work or to meet various needs. To achieve this goal, the surveyor can provide geospatial data.

Another important component for a smart city is the permanent access to utilities for its inhabitants. The municipal utility networks in many cities in Romania are outdated and often need repair work. Also on the basis of a GIS product, the critical areas can be identified, representing the highest priority for the replacement of defective elements, and a prioritization will be made later for the rest of the areas. As smart cities rely heavily on open access data, but also on the involvement of residents, such a graphical and textual database should also include complaints from residents with possible failures.

Similarly, a graphical and textual database for waste collection can be created. Defective selective waste collection and low recycling rate (Fig.1) lead to a high level of pollution, creating possible outbreaks of infection and ultimately affecting the city's inhabitants.

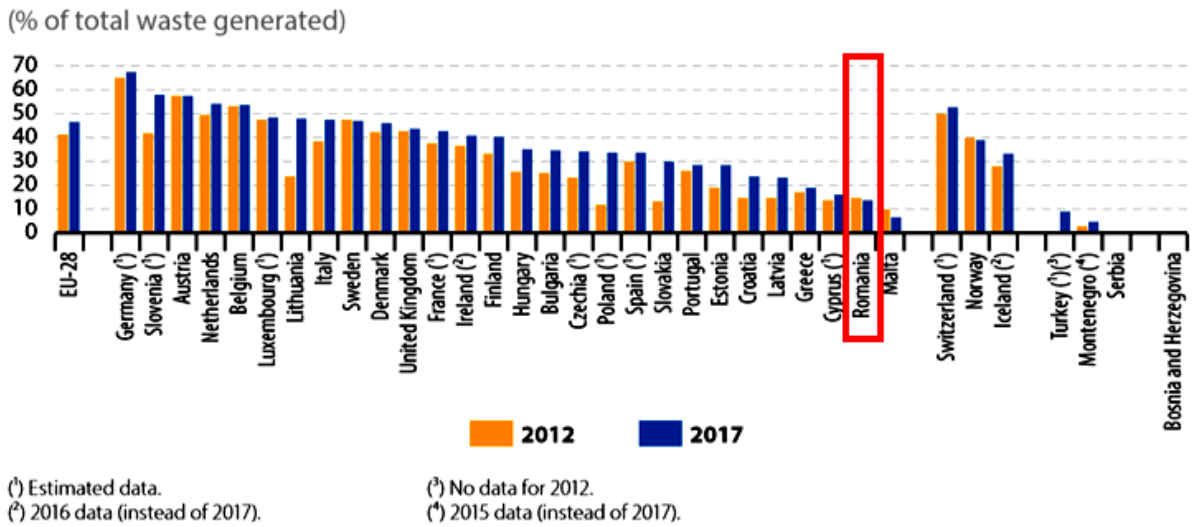


Fig. 1 Municipal waste recycling rate in the European Union

Source: Sustainable development in the European Union – Monitoring report on progress towards the SDGs in an EU context

Through products resulting from the scanning, but also through other tools, the surveyor can provide 3D products. Their use in smart cities changed the traditional way of managing and decision-making methods and promoted the harmonious development of the city. 3D models are also the solution of complex problems of overlapping spaces with different utilities, where 2D models no longer meet the requirements.

Making a smart city development plan involves combining information from several areas, it involves the help provided by the inhabitants of the city and the support of the administration for its implementation. All these steps involve large human, financial and time resources, but after the implementation of the project it is expected that the lives of residents will be significantly improved at all levels, and communication between local administration and city residents becomes much easier.

Transforming the city into a smart one involves the full use of information technology, by building information and communication technology infrastructure, certification, security platform and accelerating the approach to key technology issues. It also involves building an intelligent environment for urban development and the formation of new lifestyles, industrial development and social management, and finally the establishment of a new urban form.

3. Solutions for urban development in Romania in the current context

Each component of a smart city can be developed through many existing solutions, whose effectiveness has been proven in other countries or new solutions can be developed according to the needs of each city, depending on its size, involvement and needs of the population, respecting national laws.

In the current context of global health crisis, whose effects are felt strongly in Romania as well, there is a more acute need to turn cities into smart cities. The field of smart cities is extremely vast, the development of such a project involves time and human resources specialized in various fields, but the prospect of a new similar crisis in the near future, as predicted by medical specialists, or the emergence of another crisis, requires the start of urban development projects, so that society can respond more promptly and efficiently to such challenges. The proposals presented below for each component of the cities are solutions

designed for the prompt solution of some challenges in Romania, solutions already applied in other countries, adapted to daily needs.

Smart economy is the city component that felt a strong impact since the crisis, so the entrepreneurs and farmers found themselves forced to find ways to earn income and to give people the food and products they need and which they could only purchase under certain conditions. For this situation there should be platforms to provide the products and services that people need, so that they can be found on a single platform, on which are registered people who meet certain conditions, so that those who request services or products to buy them safely. There are businesses that already existed in the online environment, but many of them did not exist, so the crisis situation strongly affected them, especially if they did not have the resources or knowledge to develop this area for their business. To such platforms can be attached graphics products with geographic data at their core so buyers can acquire products from entrepreneurs or farmers near them, especially as mobility has been greatly restricted.

Also unemployment rate has also risen sharply, and solutions should be found to facilitate retraining so that people who are no longer active can work in another area where human resources are needed, either on limited term, or for a longer period of time. An open database, as smart cities have, with available jobs grouped by locality could be a starting point for people who do not know what to look for.

Smart people are the key to the development of smart cities. In Romania there is a huge number of people with access to the Internet and smart devices that can therefore be encouraged and stimulated to use online options for paying taxes, requesting or sending documents. This was implemented during this period, with a fairly high efficiency for certain activities related to the payment of taxes and the transmission of documents and it can be taken into account to maintain this practice further. What is not yet regulated is the transmission of documents for obtaining identity documents, which could easily be done on a secure platform, reducing bureaucracy and interpersonal contact.

Smart governance and administration is closely linked to the development of solutions for smart people. They can benefit from administration services available online and can benefit from safety in public transport areas, if they are well organized. Especially in crisis situations, people should be able to rely on public transport services correlated with their needs, avoiding long waiting times and congestion in means of transport.

Smart mobility is a component of the city whose development is mandatory for the sustainable smart city project of which it is a part. Some of the solutions have been proposed, others implemented in the context of smart travel. Most solutions are based on IT solutions and include high-performance navigation systems, e-parking and e-ticket systems, electronic mobility assistance systems, demand-related transport, car sharing, bicycle rental systems, live tracking systems of public transport. [9]

For Romanian cities, an interactive map with the available means of public transport could help people to plan their trips more easily and efficiently. In order to be able to efficiently track which means of public transport are most used, the frequency of which should be higher, online systems related to ticket validation can be used. Smart mobility also involves the use of alternative means of transport, and these are a very efficient solution, especially in low traffic conditions, until the moment of benefiting from special lanes for them.

For the development of the smart environment within a smart city project, it would be necessary to implement first of all solutions to reduce traffic, because the effects of the resulting pollution are reflected in the health problems of the inhabitants of large cities with a high degree of pollution. In addition to these measures, it is necessary to develop waste

recycling solutions, as improper storage or incineration also contributes greatly to pollution. Romania is one of the countries with the highest values of pollution at European level as seen in Fig.2.

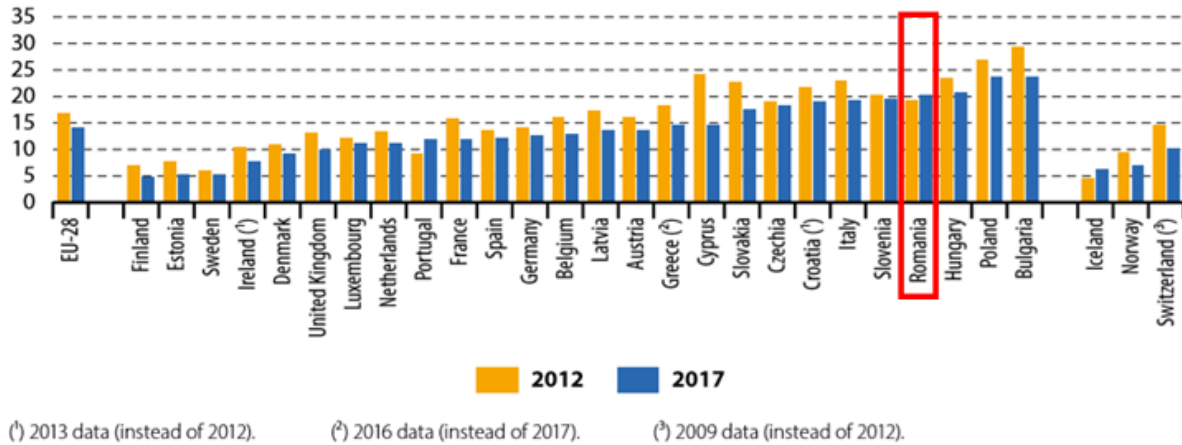


Fig. 2 Situation of European Union countries on exposure to air pollution by particulate matter PM_{2.5}

Source: Sustainable development in the European Union – Monitoring report on progress towards the SDGs in an EU context

A positive effect of this crisis situation was felt by the environment, which recorded lower values of pollution and reduction of energy and water losses usually brought by large industrial consumers.

Lifestyles will be profoundly changed by this crisis and there is the prospect of a new wave so it is expected that people will be more receptive to digital solutions brought by a smart city in its implementation. Also, the education area will have to be rethought to face the new requirements and challenges, because such crises urge us to be flexible, but in this area the solutions depend on several variables.

4. The situation of smart cities in Europe

At European Union level several policy projects, that focus on the concept of smart-city were initiated, thanks to community-wide initiatives and funding opportunities. The European Commission has created a specific platform dedicated to this purpose called the "European Innovation Partnership on Smart Cities and Communities (EIP-SCC)".

The countries that have implemented the largest number of individual initiatives for smart cities are: Spain, the United Kingdom, Germany and Italy. The projects were developed closely related to the objectives set at the European Union level, but also with the evolution of the smart cities concept itself, so that in 2005-2007 and after 2010 the projects were more environmentally and energy oriented, and in 2008-2010 they were closely related to information and communication technology. [10]

Depending on the local situation, some projects focused on the hard infrastructure, which refers to the implementation of fast internet connection solutions, installation and monitoring of sensors in construction, creation and operation of open databases, and others were focused more on soft infrastructure, which refers to the human and social capital of each city or the development of local government and governance policies.

In Fig. 3 can be seen the situation at European level of the countries that have so far been concerned with the development of projects for smart cities.

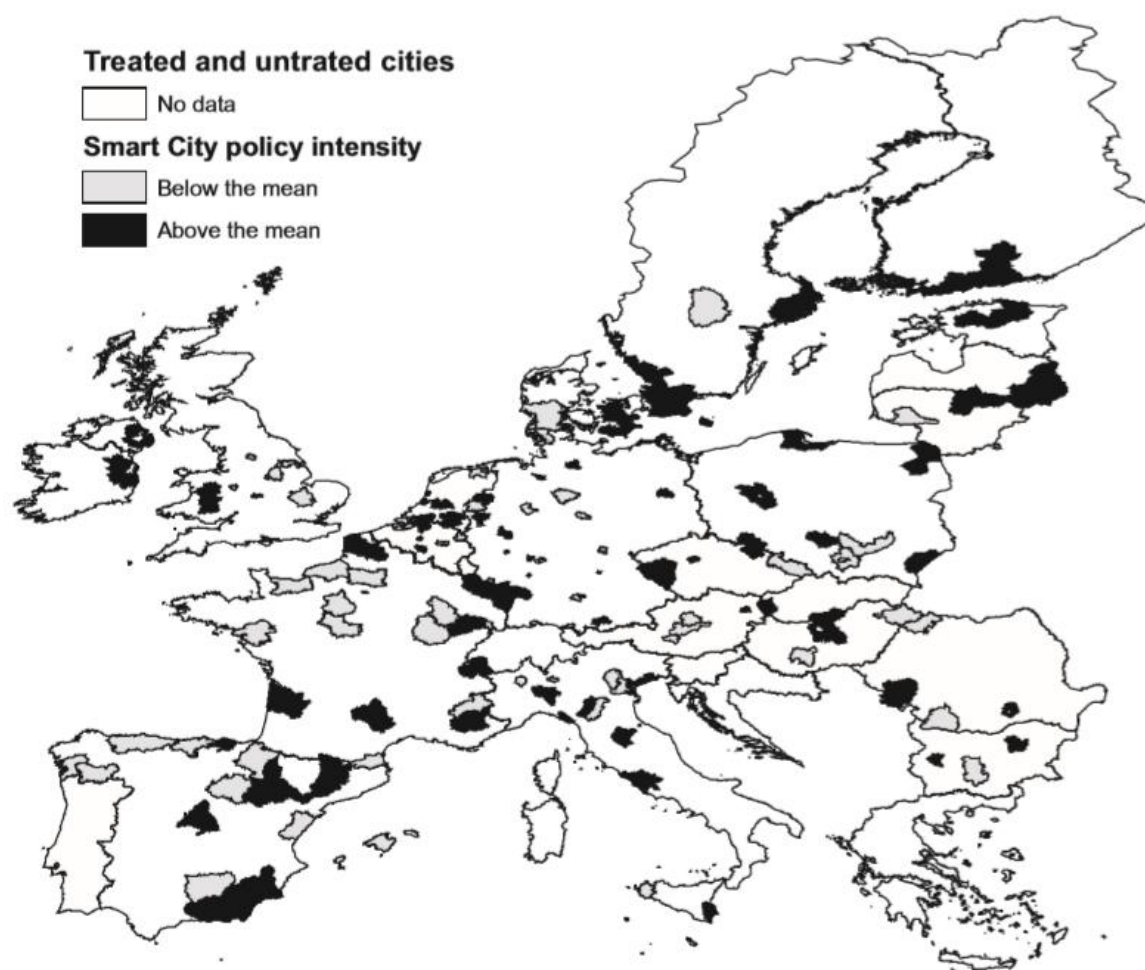


Fig. 3 Status at the European Union Level regarding the development of smart cities projects
Source: Smart innovative cities: The impact of Smart City policies on urban innovation

5. Conclusions

The analysis of the situation at European and international level shows that smart city development projects stimulate innovation and increase the degree of access of a city's inhabitants to its data, to the problems it faces.

In order for people to accept digital solutions more easily, transparency is needed from the local administration and it is necessary to advertise the benefits they can get as a result of their city becoming a smart one.

Of course, the implementation of such a project is much easier when there is the legislative support from the competent institutions, when there are funds allocated for them, but especially when there is collaboration between the inhabitants of the city and the local administration.

It is not possible to create a universal model valid for all cities in a country, but by involving the private sector and funding such projects, research can be done for each city in various forms to find out what problems need immediate resolution, what are the interests of the inhabitants of the cities and what are the initiatives they support.

In terms of financial resources, the European Union supports the implementation of such projects, providing funding for a wide range of areas, which can turn the city into a smart one, with a pleasant living environment for its inhabitants and why not, attractive for tourists.

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