

THE RELATIONSHIP BETWEEN DEMOGRAPHY AND THE DEVELOPMENT OF SMART CITY. CASE STUDY - BUCHAREST

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Abstract

Statistics show that by 2050 there will be a doubling of the population of the globe, as the earth's surface undergoes numerous transformations that risk reducing the surface of living areas more and more (recent fire in Australia, melting glaciers, desertification, etc.). Under these conditions, the need to find intelligent solutions that contribute to solving the problems related to less and less available resources, to the needs of environmental protection, to ensuring comfort in urban agglomerations, to ensuring safety in these environments is becoming stronger, which requires ensuring an integrated management that responds to the modern demands of humanity, as well as solving these problems. This paper aims to analyze the relationship between demography and the development of smart cities. In this sense, the methodology consisted in the analysis of the specialized literature, as well as of the statistical data presented in different databases, which were the basis for the formulation of opinions and conclusions on how to modernize the cities that could thus become intelligent.

Key words: demography, urbanization, smart cities

INTRODUCTION

The notion of a smart city is no longer a new one, but the need to develop such cities appears as a necessity when the official reports show that 2050 is the year until 66% of the world's population will be an urban one. This increase generates new challenges, but at the same time it also offers new opportunities for development, given that the urban administration is currently facing problems related to social exclusion, polluted environment, migration, etc. In this sense, at the global level, measures have begun to be taken that will contribute to the increase of the well-being of the population on the one hand, and on the other hand to the protection of the limited resources available to the planet. If the SMART component seemed to me a possibility, then it became a necessity. Moreover, there is no generally valid definition or single approach to smart city,

given that each community has its cultural, historical, etc. characteristics. Each city has tried to adapt its existing means to the demands of its modernization and transformation into a smart city.

A smart city should have several components, namely: Smart People, Smart Economy, Smart Mobility, Smart Living, Smart Environment and Smart Governance. Of course, ensuring all these aspects is an ideal projection, but in practice as many of these elements can be achieved.

This could be achieved by applying the technology for the modernization of some areas related to: management of public transport, traffic and parking; the use of surveillance cameras to help ensure security (although there are quite a few contestants of this system considering that the right to intimidation of the person is violated); ensuring modern lighting systems to ensure the reduction of energy consumption;

ensuring waste recycling systems; adopting an intelligent infrastructure, both in terms of the system of buildings (residential, commercial), but also in terms of sewerage system, water, gas, garbage collection, asphaltting, public cleaning, etc.); improvement of public administration systems; improvement of interaction systems with citizens; etc.

However, the achievement of these objectives depends on the human component, the need for the inhabitants of these cities to be technologized in the sense of producing this technology, in the sense of using this technology and in the sense of being involved in the transformation of the traditional world, in solving social problems through technology [14]. A second element is related to the smart economy which is based on innovation, which works under conditions of efficiency, which is based on innovative management principles, which benefits from fiscal facilities for the purpose of developing modern practices, which transform cultural differences. , national, etc. in advantages, which supports less conventional initiatives, which accepts diversification, which attracts foreign investments and discourages unfair competition.

Smart Mobility is a component not only useful, but necessary in an age of speed. Speaking of mobility, we talk not only about the mobility of the population between urban and rural areas, but also about the mobility between countries under the conditions of globalization, but also about the movement of people, vehicles, means of transport in smart cities, about ensuring easy traffic flows, about the use of vehicles using alternative energies, about providing bicycle lanes, and then about providing functional highway systems, an optimal railway system and proper air transport [5].

Smart Living, while at the same time balanced, it refers to the human, cultural, historical values, to the way in which intelligent citizens understand to get involved in the life of the community and manage to collaborate with social partners. It also refers to health and well-being, how we have access to information and personal safety [5].

Smart Environment is closely related to notions such as circular economy or ecological economy. We find that promoting an economy based on resource consumption, increasing productivity at any price without protecting the environment has done nothing more than contribute to the degradation of the Planet. The traditional economy based on pollution, on the use of a cheap labor force, without thinking about the welfare of future generations is no longer sustainable. That is why a smart city is the one in which the reduction of pollution in all its forms (industrial, sound, light, etc.) is pursued, a city where there are sufficient green spaces, playgrounds, etc.

A last component is the Intelligent Governance which is based on e-Governance on transparency, collaboration, thinking about coherent strategies, respecting the citizen and his rights, ensuring access to data in real time, exchange. of quick information, of making available to citizens some systems for collecting information on their dissatisfaction, collecting suggestions, involving them in intelligent management.

In these circumstances, the European Union has expressed its wish to financially support the projects of smart urban development, initiating the process of identifying such solutions. Thus, the report entitled Mapping Smart Cities in the European Union was elaborated, which highlighted that out of the 468 cities with a population of over 100,000 inhabitants in the European Union (as of the report, 2011), 240 cities could be considered smart cities, they have at least one characteristic that fits them in this category [6].

Within this report Romania is in the middle category, which includes a range of 4-10 cities that can be considered to be smart. The case study exemplified the model of the city of Targu Mures.

In fact, an IDC study by Oracle shows that as far as Central and Eastern European states are concerned, they are behind Western Europe, with the digital transformation process taking place in 35% of organizations, with different

systems being different. implemented in another 34%.

Another smart city initiative belonged to the European Economic and Social Committee, which in 2015 laid the foundation for a strategy published in the report entitled Smart Cities as the engine of a new industrial policy in Europe, through which it pursued the development and support of Smart projects. City, by providing financial support from European funds for the purpose of investing through such projects. Between 2014 and 2020, the Innovation and Network Executive Agency, for example, had a budget of 33.4 billion euros [11].

And globally, more and more countries have initiated programs, strategies, action plans for smart development, making joint efforts and exchanges of information.

MATERIALS AND METHODS

Considering the ones presented above, we proposed that through this paper we analyze the relationship between demography and the development of smart cities, exemplifying for Bucharest, the capital of Romania.

The working methodology involved the analysis of bibliographic resources, the collection, processing and interpretation of data published in the statistics of the National Institute of Statistics, as well as statistics published by the City Hall of Bucharest. The processed results were analyzed and presented through the tables and graphs, based on them being formulated conclusions regarding the case study.

RESULTS AND DISCUSSIONS

In a study by Oracle on the advantages that the Internet of Things has over the development of smart cities, a study conducted for 100 cities in the world, Bucharest was ranked 66, which includes it in the category of advanced cities, due to the fact that progress has been made on the one hand, on the interconnection of the urban ecosystem, and on the other hand on accessing smart projects.

Starting from this fact in the present paper we want to analyze some of the indicators that can lead to considering a city as smart.

The city of Bucharest, is a city that is currently facing problems related to an old infrastructure, an increase in population fluctuation over the last 30 years and which has to adapt both this infrastructure to current needs, but which has to adapt to it local services for demographic changes and population modernization.

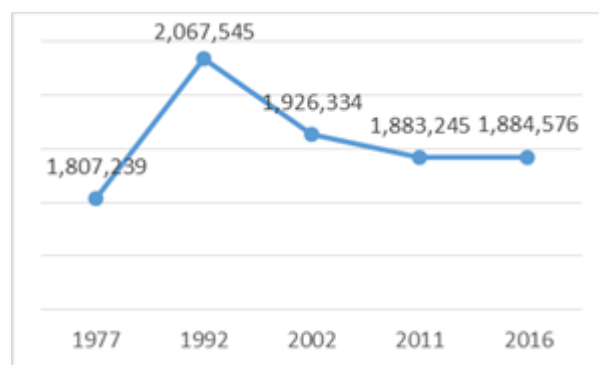


Fig. 1. Evolution of the resident population in Bucharest

Source: INSSE [3] - Own processing.

As you can see from Fig. 1, the population residing in Bucharest reached a maximum in 1992 when it registered 2,067,545 inhabitants. However, the number of those who lived in Bucharest on January 1, 2016 was 2,107,399, and on January 1, 2017, 2,102,912 were distributed as follows on the 6 sectors of the Municipality of Bucharest:

Table 1. The situation of the population of Bucharest in 2016-2017

Resident population	2016	2017
Total	2,107,399	2,102,912
Sector 1	246,738	247,580
Sector 2	374,754	372,149
Sector 3	474,162	472,693
Sector 4	321,873	321,917
Sector 5	298,929	298,924
Sector 6	390,943	389,649

Source: INSSE [2] – Own processing.

From the data of the National Institute of Statistics published in 2017 regarding the design of the population of Romania in territorial profile, it follows that according to

some scenarios, in the next 40 years, the population will decrease by 10% in the optimistic scenario (under the conditions in which "the decrease in Romania will be of 16%), with 15% in the average version (in the conditions where in Romania the decrease will be 21%), with 28% in the intermediate version in the conditions in which in Romania the decrease will be of 15%) and with 29 % in the pessimistic scenario (in the conditions in which the decrease in Romania will be 35%)".

Table 2. The projection of the resident population of Bucharest municipality on the horizon of 2060

Year	Alternative			
	Optimistic	Medium	Intermediate	Pessimistic
2020	1,843,913	1,838,680	1,842,470	1,838,447
2030	1,806,981	1,771,419	1,796,374	1,765,145
2040	1,731,658	1,647,515	1,706,446	1,628,331
2050	1,691,839	1,524,920	1,628,913	1,487,043
2060	1,658,793	1,384,622	1,501,507	1,310,277

Source: INSSE [3] - Own processing.

We find that in the future, the city of Bucharest will have a population decline as the population grows globally. This will happen, however, against the backdrop of the decline of the total population of Romania, but still attracting a significant percentage of it. The specialists consider that in the future the transformation into smart cities will spread, however, among the urban settlements of rank 2 and 3, but also in the rural areas.

Analyzing the situation of the population of the city of Bucharest by age groups, it is found that at the level of 2016 and 2017 "its highest share (67.1% in 2016 and 66.5% in 2017) was between 20-64 years old, while the population with the age between 0-19 years held the share of 16.9% in 2016 and 17% in 2017". The population over the age of 65 represented 16% of the total population in 2016 and 16.5% in 2017. What you can see is the weight reduced number of young people among the population of Bucharest.

Analyzing the population in relation to the average age in the 6 sectors of the Municipality of Bucharest in 2016 we find that this is on average 41.8 years for the total population, 40 years for men and 43.4 years for women (Fig. 2).

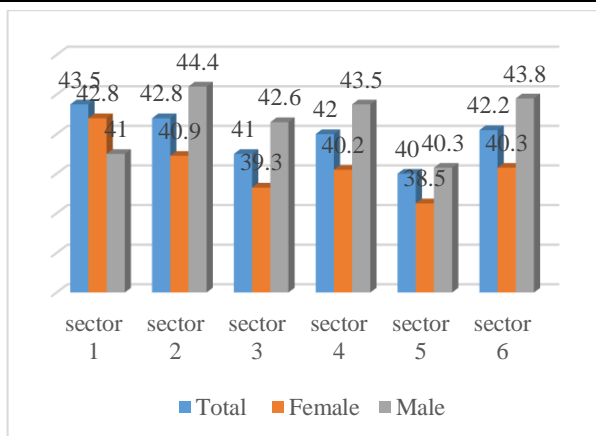


Fig. 2. Medium age of population by home, by sectors, in 2016

Source: INSSE [3] - Own processing.

At the level of 2017, the medium age for total sectors increased to 42.1 years, with 40.2 years for men and 43.7 years for women (Fig. 3).

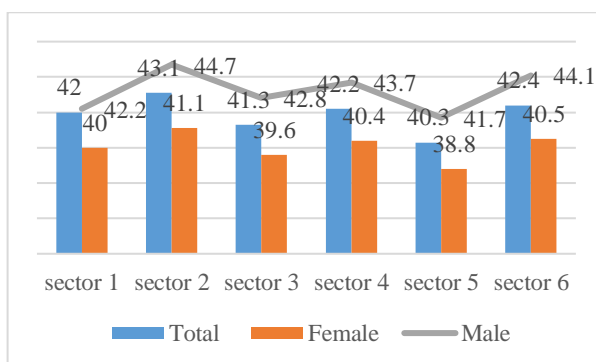


Fig. 3. Medium age of population by home, by sectors, in 2017

Source: INSSE [3] - Own processing.

But what has to be taken into account is the number of tourists who put pressure on the infrastructure of a city. Or according to the Global Mastercard Index of Urban Destinations 2019, which includes 200 cities, Bucharest was in 2017 and 2018 in the top of the European cities, considering that it has a great development potential. Thus the growth potential was over 10% in 2018, the number of tourists who resorted to accommodation services was over 1.4 million, compared to 1.1 million in 2017. The average length of accommodation, which for 2018 and reached 4.9 nights (Fig. 4). The same study also forecasts the increase in the number of foreign tourists for the next period, for both Bucharest and Romania [1].

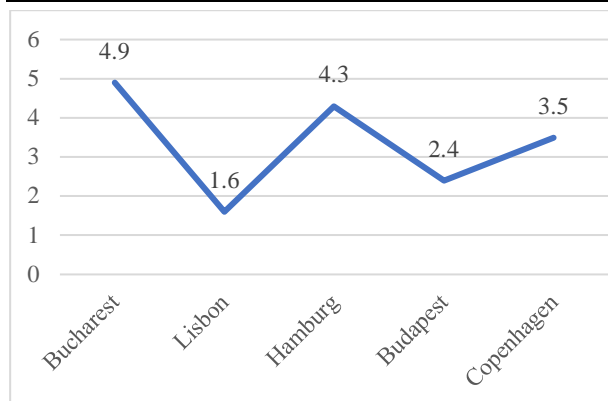


Fig. 4. Average length of stay for foreign tourists in 2018

Source: INSSE [2] – Own processing.

Next we will address issues related to what makes a city smart.

The public transport in Bucharest is realized through the network of trams, trolleybuses, buses and subways. According to the data provided by the Bucharest Transport Company [8] in 2018 the total number of public transport means was 1,930 vehicles increasing by 2% compared to 2017. Of these 25% were trams (486), 15% trolleybuses (297) and 60% buses (1,147). Currently in Bucharest there are 26 tram lines, 16 trolley bus lines and 121 bus lines that total 141 km of trams, 71 km for trolley buses and 471 km for buses. The length of the routes, expressed in double lines, is 268 km for trams, 146 km for trolleybuses and 1,342 km for buses [13].

In terms of communication with Bucharest travelers, an important aspect of smart cities, at the level of 2018 were registered a number of 10,981 messages, of which 7,622 (62%) were notifications, 1,002 (8%) requests for information, 609 (5%) proposals and suggestions, the difference being represented by returns, classifications, miscellaneous.

The Bucharest subway network, although it represents only 3.7% of the city's transport network, provides over 20% of the transport volume with a double track length of 69.5 km. [7].

Regarding the number of cars registered in Bucharest, the statistical data show that at the level of 2017 their number was 1,320,356, increasing by 4.64% in 2018. Forecasts show that although the number of inhabitants of the Municipality of Bucharest will decrease, the

number of cars will be increasing. A forecast related to ensuring the connection between the capital of Romania and the airport area, shows that in 2040 the travel time (expressed in hours / day) could reach 3,000 thousand hours for cars, that of freight vehicles over 444 thousand hours, that of taxis at over 135 thousand hours and public transport at over 1,255 thousand hours. The data for 2050 shows the values could be 3,450 thousand hours for cars, for goods vehicles of 490 thousand hours, for taxis of 150 thousand hours, and for public transport over 1,303 thousand hours. The need for smart solutions appears to be a must again.

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The Master Plan of the Bucharest City Hall shows that in Bucharest and the surrounding areas, they produced, at the level of 2018, an amount of 1.1 million tons of garbage, which represents about 20% of the amount of garbage produced at the level of the whole country. 50% of it is household waste, and only 15% of the amount is recycled [9]. Of this quantity only 3% is represented by separate collection. It is thus found that the sorting objectives established at European level were not met, the quantity being exceeded by 25% in 2017. This is determined

by the weak existing infrastructure, but also by the lack of education of the inhabitants.

The Global Alliance of Health and Pollution report shows that in Europe, over 60% of pollution-related deaths are due to air pollution. Worldwide Romania ranks 45th in terms of pollution deaths, while Bucharest is the most polluted city in Romania.

Regarding the emissions of pollutants that are generated by the activities in the Bucharest area, the data show that for 2017 road traffic is the one that pollutes with NO_x and benzene in proportion of 66.31%, respectively 64.46%. The pollution with PM₁₀ and PM_{2.5} emissions is due to traffic in the proportion of 58.6%, respectively 47.3%, the rest being due to residential heating. Industry and services have a 25.5% contribution in terms of NO_x pollution [10]. There are many other materials that are polluting, such as plastic masses, which have to be eliminated even if they have advantages [13].

According to the European Union by 2050, the apartment plants, which, as noted, are an important source of pollution, must be eliminated.

Regarding the green spaces, a directive of the European Union stipulates that the surface of green spaces will be of 26m²/inhabitant. At the level of 2017 in Bucharest the area was 23m²/inhabitant. Even though we are approaching the stability threshold, however, compared to 270m² /inhabitant in Prague for example, the distance is very large.

Speaking beyond smart technology, in Bucharest there are 4 applications: infoSTB, Traffic alert Bucharest, Parking Bucharest and Social alert Bucharest, which have the role of increasing the quality of the services offered to the inhabitants and visitors [12].

Thus we find that in Bucharest many aspects have been improved that can bring him closer to a smart city, but there are still many steps to be taken.

Among the measures taken and listed are: Sustainable urban mobility plan, which aims to achieve a sustainable and efficient transport system, which has foreseen about 7 billion euros, half of which will be devoted to the development of the metro network; extension

of the water supply network, public lighting, sewerage (an increase of 35% of the lighting network in 2017, compared to 1997, of which 48% is underground; reducing electricity consumption and implicitly CO₂ emissions by 33.5%; reducing CO₂ emissions due to network losses by 71.46%; 8.7% use of LED lighting; use of Telemangement software); ensuring efficient management in terms of public management; development of quality services; etc. [4].

Other measures involved improving the road system, intelligent traffic lights, traffic management; construction of underground and underground parking; rehabilitation and modernization of hospitals, educational institutions, etc.

In 2013 Bucharest was selected for the award of the scholarship "Challenging Smart Cities" by IBM. In 2018 the Bucharest City Hall has assumed the objective of transforming the city into a smart one, assuming the encouragement of the use of intelligent technologies in the life of human communities for the purpose of their sustainable development, in harmony with the nature and the environment. Furthermore, in 2018, the initiative to develop the Strategy for the development of a smart city Smart City Bucharest was launched.

By 2035 the municipality of Bucharest has proposed other measures to transform the city into a smart one. Of these we mention: the reduction by 2025 of the quantity of food wasted by 50%; preventing the occurrence of waste from printed paper; increasing the amount of separate collected waste to reach 75% by 2025 and 85% by 2035; separate collection of bio-waste will reach 65% by 2035; Thermal scaling installations of energy value wastes will be put into operation.

CONCLUSIONS

In conclusion, a smart city will have to be one that will provide efficient services, have good mobility, ensure safety and security, have a good image, be sustainable, all based on economic development.

Although in recent years in Bucharest progress has been made related to its

transformation into a smart city, it is still necessary to find solutions for the transformation of the Romanian capital and its proximity to the other European capitals.

In the same vein, one cannot talk about smart cities, without talking about inhabitants who must become smart themselves, before requesting this from the municipality. In these conditions, the relationship between demography and smart cities is a direct one.

Although the population of Bucharest will decrease in the coming decades, the need for modernization, the use of technology will be increasingly necessary.

Although we consider that this article has touched on important aspects regarding the transformation of Bucharest into a smart one, there are still many elements that have remained undisputed and will certainly be the subject of a future article.

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