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The Smart City Concept in the 21st Century

Mircea Eremia[a,b,*], Lucian Toma[b], Mihai Sanduleac[c]

[a]*Academy of Technical Sciences of Romania, 26 Bd. Dacia, Bucharest 010413, Romania*
[b]*University Politehnica of Bucharest, 313 Spl. Independentei, Bucharest 060042, Romania*
[c]*ECRO SRL, 6 Precupetii Vechi, Bucharest 020685, Romania*

Abstract

The quality of life was significantly improved in the last century mainly as regards the access to services. However, the heavy industrialization and the increasing population in the urban areas has been a big challenge for administrators, architects and urban planners. This paper provides a brief presentation of the evolution of the "smart city" term and the most representative characteristics of it. Furthermore, various alternative terms that were proposed to describe the multiple characteristics of the future cities are analyzed. A connection between smart city and smart grid is also presented.

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1. Introduction

The urban development has resulted in a change of paradigm in the 21st century, and the research activities for smarter cities became priority task with direct participation from industrial and political entities, practitioners, and the scientific community. Although the information technology and communication has advanced exponentially, and the smart cities become real, this concept is still under development.

The United Nations estimates that between 2015 and 2050 the world population will increase by 32%, i.e. from 7.2 to 9.7 billion inhabitants, while the urban population will increase by 63%, from 3.9 to 6.3 billion inhabitants. The current estimations suggest that until 2030, over 60% of the world population will live in cities, and the significant growth will be in Africa, Asia and Latin America [1][2].

* Corresponding author. Tel.: +40-744-371171; fax: +40-21-4029446.
E-mail address: eremia1@yahoo.com

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The need for urbanization is due on one hand to the migration of population from rural areas to cities – in hope for a better life (for jobs, education, medical care, access to culture, etc.), and on the other hand to the migration from poor countries or under social and military conflicts toward the industrialized countries. Under these conditions, in 2050, India will reach 1.7 billion inhabitants, with its mega-cities Mumbai (42 millions) and New Delhi (36 millions), China will be steady at ~1.34 billion inhabitants, with the city of Shanghai (21 millions), while Nigeria and Indonesia will reach up to 399 million and 321 million inhabitants, respectively [1].

As our planet becomes more "urban", the cities have to become smarter. The extended urbanization requires new methods and ways, innovative, to administrate the complexity of the urban life: overpopulation, energy consumption, resources management and environment protection, etc.

The first mega-cities in the world (with over 10 million inhabitants in 1970) were New York and Tokyo; these cities owned necessary infrastructure and resources to ensure the needs of their citizens. However, most of the new mega-cities are located in developing countries, having a large number of poor people and limited resources, infrastructures or systems that cannot satisfy the increasing demand. These mega-cities, wide in surface, are not capable of appropriately develop to meet the rate of increase of the number of inhabitants, are chaotic and dangerous, having limited health and education services. Under these conditions, the competition for food, water and energy resources will rapidly increase. The number of mega-cities in 2014 was 28, three times bigger than in 1990, and for 2030 the estimation is for 41. Of the 28 mega-cities, 16 are located in Asia, 4 in Latin America, 3 in Africa and Europe each, and 2 in SUA, respectively [2].

While in 2015, the urban population in the European Union was 72% of the total population, it is estimated that in 2050 this percentage will increase to 80%. In Romania, for instance, where urbanization degree is only 55%, the municipalities are looking for solutions to develop the business environment and ensure the best living conditions for their citizens.

Although the cities occupy only 2% of the planet's surface, they accommodate about 50% of the world population, consumes 75% of the total generated energy, and are responsible for 80% of the greenhouse effect [3]. This is the reason why the urban development and its associated problems have been intensively discussed in the last years at many international and national conferences. Some of the most important events are *Shanghai World Expo* (2010), *Ecocity World Summit Montreal* (August 2011), *Smart City Expo World Congress in Barcelona* (November 2011), *International Conference on Smart Grids for Smart Cities/ Smart City 360 Summit 2015 in Toronto* (October 2015), *World Smart City Forum in Singapore* (July 2016), *IEEE International Forum on Smart Grids for Smart City at Paris* (October 2016). As a conclusion, the preoccupation for smart development of cities is a hope for reducing poverty, inequality and unemployment, and also for efficient management of energy resources.

2. Evolution of the smart city concept

The preoccupation for sustainable development of the urban settlements has been a major preoccupation since ancient times for both architects and administrators. In the book "Garden Cities of To-morrow" published in 1898 by the British urban planner Ebenezer Howard, the *urbanism* is treated as a distinct category, which is the way of transforming the slums into neighborhoods capable of providing opportunities and comfort. The Frenchman Eugène Hénard, who was one of the first urban planners who influenced the development of the future European cities, said in his speech at his Royal Institute of British Architects: "My purpose is to inquire into the influence which the progress of modern science and industry may exercise upon the planning, and particularly upon the aspect, of the Cities of the Future. The Cities of Tomorrow will be more readily susceptible to transformation and adornment than the Cities of Yesterday" [4].

The aspects that characterize the cities of the future have been adopted over the years. In the interwar period, the modernist planners and architects have launched ideas with the intention of alleviating the mistakes generated by the industry strategy and transform the cities into green ones. Among them we mention Le Corbusier in the work "The City of Tomorrow and its planning" (1929) [5] and Gottlieb Eliel Saarinen in the book "The City: its growth, its decay, its future" (1943), both having a long lasting influence on the architecture of cities from Europe and Northern America. Subsequently, the French urbanist Raymond Lopez has revised the meaning of the urbanism term in the book "L'avenir des villes" stating that the urbanism is "indispensable instrument for life and the vitality of men",