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## SUSTAINABLE DEVELOPMENT IN CITIES DESIGNED IN ACCORDANCE WITH THE SMART CITY CONCEPT

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### ZRÓWNOWAŻONY ROZWÓJ W MIASTACH PROJEKTOWANYCH ZGODNIE Z IDEAŁ SMART CITY

#### Abstract

The situation of cities, related to a rapid increase in the number of their inhabitants, stimulates the search for solutions counteracting the adverse consequences of this phenomenon. In order to improve the quality of life – both now and in the future – the idea of sustainable development was created, which is reflected in various visions of the twenty-first century cities. The concept of Smart City implemented in the revitalization project of Arabianranta district in Helsinki is a successful example of an action consistent with these concepts.

*Keywords: Smart City, sustainable development, Arabianranta*

#### Streszczenie

Sytuacja miast związana z gwałtownym wzrostem liczby ich mieszkańców, skłania do poszukiwania rozwiązań przeciwdziałającym negatywnym konsekwencjom tego zjawiska. W trosce o poprawę jakości życia – obecnie jak i w przyszłości – powstała idea zrównoważonego rozwoju, która zapisywana jest w wielu różnych wizjach miast XXI wieku. Koncepcja Smart City, zaimplementowana w projekcie rewitalizacji dzielnicy Arabianranta w Helsinkach, jest przykładem działania zgodnego z tymi koncepcjami, zakończonego sukcesem.

*Słowa kluczowe: Smart City, rozwój zrównoważony, Arabianranta*

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## 1. Introduction

The subject of the study is presentation of the principles of sustainable development for planning issues in design assumptions, functioning in accordance with the concept of Smart City. The subject was taken up based on the analysis of the revitalized Arabianranta residential district located in Helsinki, where the designers used the concept of Smart City in order to create a comfortable living space that would respect its identity. The author will demonstrate the validity of the thesis that through the use of advanced technologies, which are widely available and used in the infrastructure of modern cities like Smart City, it is possible to effectively implement the principles of sustainable development.

## 2. The current situation of European cities

It can be observed that currently around 70% of Europe's population live in urban areas, and it is expected that this number will continue to grow over the next few years. A rapid development of metropolis, which took place in the past few decades, contributed to the expansion of the areas which they occupy. This process frequently proceeded in an unplanned and uncontrolled manner. Such urban sprawl has adversely affected urban composition of the cities – a rapid creation of monofunctional districts, badly communicated with the rest of the city, have had a direct impact on the deterioration of the quality of life in cities and on the poor air quality there. Currently, cities consume 75% of world energy for their functioning, and emit 70% of global carbon dioxide emissions [1]. The increasing urbanization processes led urban designers and scientists to search for solutions to the problems related to them. This resulted in the emergence of new urban doctrines over the past decades, seeking a way to ensure a comfortable life. A common feature of the concepts such as Compact City, Urban Village, Eco City, New Urbanism, Green Urbanism, Smart City, Sustainable City [2] is their subordination to the **idea of sustainable development**.

## 3. What is sustainable development?

The assumptions of the idea of sustainable development were presented in the 1987 report Our Common Future, prepared by the World Commission on Environment and Development (the so-called Brundtland Commission): “At the current level of civilization, sustainable development is possible, which is such a development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [2]. The implementation of the concept in urban areas is to create good living conditions for their citizens – the space which is both functional and healthy. It refers both to the design (of the whole city, its individual districts and specific buildings), as well as the subsequent management. The idea encourages the rational, efficient and economical management of resources, which include not only **raw materials**, but also **space, energy, human capital and time**. The assumptions of the idea of sustainable development are currently included into numerous development strategies and political declarations, becoming regulations and

guidelines imposed by municipalities. The great role of the users (both entrepreneurs and residents) throughout the process has been emphasized. According to the president of the Responsible Business Forum, Mrs. Mirella Panek-Owiańska, “the city is a special area of business influences. It is a place where the majority of customers are, where employees live. Therefore, the business here should interact with residents and local authorities for sustainable development. Sustainable development is in the interests of both business and citizens” [3].

The idea of sustainable development should be implemented during the work related to the search for tools to solve the problems related to the major challenges which modern cities face. They can be divided into the following 4 groups:

- **Environmental** (carbon dioxide emissions into the atmosphere, biodiversity, waste, clean water)
- **Social** (social polarization, unemployment, migration, homelessness, poverty, meeting the needs of residents, social participation).
- **Economic** (competitiveness of the city, its profitability, lack of jobs for the people coming to live in the cities)
- **Planning** (urban sprawl, development of public spaces, public and individual transport).

#### 4. What is Smart City?

One of the responses to the deteriorating quality of life in cities, based on the principles of sustainable development, is the concept of **Smart City**, which uses the development of advanced technologies. The presence of ICT (Information and Communication Technologies) and the widespread digitization of all areas of life, in the concept of Smart City constitute a tool to create a safe, friendly, convenient, diversified and efficient environment. This idea uses a network and advanced software to prompt, collect and analyze data, and to support urban infrastructure (networks providing media, transportation system) as well as administrative processes. Additionally, free access to broadband Internet is used by the users of the concept (residents, entrepreneurs and public authorities) to communicate with each other. Their dialogue is essential for the effective functioning of public participation, which is essential to the smooth functioning of this type of a concept.

In order to improve the quality of life in cities, the Smart City concept involves:

- development based on network connections between such elements as access to knowledge, technology, human resources, infrastructure and the environment,
- multidimensional development based on ICT and network systems with integrated measurement devices,
- smart city development in the field of economy (smart economy), management (smart governance), humans (smart people), quality of life (smart living), transport and communication (smart mobility) and the environment (smart environment).

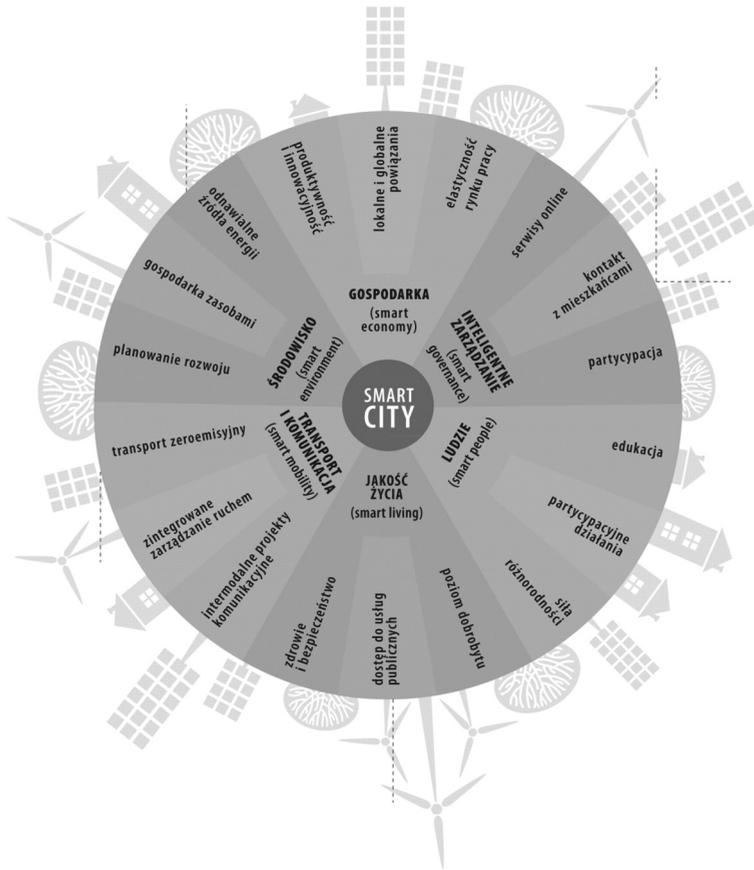


Fig. 1. Fields of development in Smart City

## 5. The tools used in Helsinki's district of Arabianranta, designed according to the concept of Smart City, used to achieve the objectives of sustainable development

The area, currently occupied by Arabianranta residential district, was associated with the industry since the sixteenth century, when a settlement was founded here. In 1992, the city authorities decided to relocate production plants and alter the profile of the district with its vast potential for a multifunctional complex of residential and service buildings, a campus of the Faculty of Art and Design of Helsinki University, as well as recreation areas. The creators of the Masterplan for this site, characterized by complex issues, decided not to treat the heritage of this place as a problem or a barrier to its development. The Arabia ceramics factory, existing since 1874, which is associated with the place and has built its climate, has been treated as an opportunity and inspiration to create an attractive and diversified district. The designers of this assumption have decided that “the starting point of the neighborhood revitalization project is to honor the identity of the place in

which the city was established, and of the culture that was born in this area. The birthplace of the city and the manifestation of technical and industrial culture, including art and music, offer a unique synergy” [4].

The implementation of the settlements of the Masterplan for the district designed according to the concept of Smart City, is to ensure its functioning in accordance with the principles of sustainable development. The area of 85 hectares was developed into 3 zones:

- **green**, located just at the waters of the bay, consisting of both arranged gardens and parks, as well as pristine areas of nature reserves, thus ensuring biodiversity. From the west, the area borders with residential areas and integrates developed sites with open recreational areas and green ecological precincts.
- **residential**, compact development of high intensity and varied forms (collective accommodation, multi-family and single-family housing), thus ensuring a diversified local community. The development of various **form standard and ownership** ensures varied users, who contribute to maintaining a healthy, open local community.
- **universities, office and service buildings**, providing access to services, jobs and education to the residents, allowing them to reduce transportation needs. These facilities also allow to carry out activities related to education and research, making the district an attractive and competitive research center, positively influencing the economic level of the entire unit.

The residential district is well connected with the center of Helsinki, located at a distance of 10 km, thanks to both the low-carbon efficient network of public transportation and the system of cycle lanes. In addition to the compact and varied development, filled with diverse functions, it is a method to minimize the need to use own cars by the residents, by not generating the necessity to travel. Another principle of sustainable development is implemented through the project settlement, which requires that 2% of the financing of each of the implemented investments is assigned for the activities related to art and design. The result was a good system of public spaces, diversified with the works of art that provide cohesion of the district and a friendly neighborhood for both pedestrians and cyclists. The organization of public space and its decoration with the elements associated with the historic porcelain factory Arabia, is conducive for the local community to building attachment to their place of residence and create its identity. The Masterplan required the use of ecological materials, durable and of high quality, which is one of the principles of sustainable development. Another of its objectives is gaining, processing and propagating knowledge, which is accomplished by using modern technology. Telecommunication network enables effective communication, not only within academic institutions and companies having their headquarters here, but also between these organizations.

In order to ensure diversity of the district, the designers marked in the project that it was necessary to design both developed areas and open spaces, attracting private and public investors, as well as effective combination of different functions, including residential, service, educational, and recreational ones. Avoiding monotonous and unidirectional space is conducive to raising the attractiveness of the area and its proper development.

## 6. Conclusions

In 2012, the city of Helsinki announced the completion of the Masterplan for the revitalized district of Arabianranta. The implementation of this complex design made it possible to create a friendly place of residence for approximately 10 thousand people, 15 thousand students and 4 thousand workers employed in 300 enterprises located in this area. The district uses benefits of the twenty-first century, such as modern technologies, to effectively fulfill the principles of sustainable development. With an extensive telecommunication infrastructure, the Helsinki Smart City is a healthy, economical and sustainable environment.

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