URBAN SUSTAINABILITY AND INTEGRATED URBAN WATER MANAGEMENT

VLADUT-SEVERIAN IACOB

1"Stefan cel Mare” University of Suceava, Universitatii 13, Suceava, 720229, Romania

Abstract: The study aims to point out the features of cities and sustainable urban development, integrated management of water resources and the relationship between them, the basic principles and the advantages of their application in future sustainable development of cities. The method is based on the analysis of bibliographical information relating to sustainable urban development.

Keywords: water, management, wastewater, urban, sustainability, environment, city

1. INTRODUCTION

Settlement with complex form and in a continuous patterning the city as economic growth pole has a great impact on the environment that incorporates both the natural biological and anthropogenic environment transformed and controlled by humans. Through the variety of its functions (administrative, commercial, cultural etc.), the city acts as an open system [1] which gives individuals more chances to employment, education, living standards in general. Activities taking place in the cities are extremely diverse. Their implementation requires resources of all kinds, and their transformation generates pollution and waste [2].

One of the significant resources to maintain the quality of life in the city is water. A new perspective on urban water management is provided by the integrated urban water management that could be considered a tool of urban sustainability.

On the general, sustainability requires integration of the economy with the environment and society. Urban sustainability should follow the same principles of integration, however, is not done overnight. It is a process of large-scale, complex aggregate requiring first vision, understanding, participation and involvement at all levels and afterwards consumption of resources.

The purpose of this paper is to highlight the relationship between sustainable urban development and integrated management of water resources, closely linked to the basic principles of management, characteristics of future cities and sustainable development.

2. URBAN SUSTAINABILITY

2.1. General process of development

Social and economic systems evolve inevitably and unrepeatable, generating improved conditions of the past properties. Changes (quantitative, qualitative and structural), are in fact even the development of these systems subjected to "directionality principles (purpose), continuity (ongoing process), aggregation (cumulative effect) and irreversibility (the impossibility of returning to the previous stage)” [3].

* Corresponding author, email: severianvladutiacob@yahoo.com
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Man is the engine of development. He traces to broaden the sphere of knowledge and to create a better living environment. Thus, human well-being may be considered an objective of development [4]. To achieve this, multiple transformations occur in the economy, in institutional structures and mechanisms, in scientific research and technology, in the way people think and act.

2.2. Conurbations
Over time under human influence, there were significant transformations that record development in urban areas. They become more important especially in the second half of the 20th century, with the technological “boom” and demographic expansion favored urban areas, areas characterized by “concentration of the resident population, the preponderance of industrial activities and commercial activities and the presence of services” [5].

2.3. What is a city?
Any of us has formed an opinion that would serve to make the definition of a city, but, searching in dictionaries, a general, valid, accurate and comprehensive definition is not found. As undeniable reality, urban space has stimulated interest of geographers, historians, economists, sociologists and other professionals for shaping and elaborating definitions related to cities and their occurrence.

Focusing on the size of the urban area and recognition of factors that have ensured the development, over time, the city was the subject of many theories: the theory of defense, geo-climatic conditions theory, decision theory, administrative, legal and political organization theory, the theory of commodity exchange and so on. Based on these theories have defined several types of urban settlements specific to each historical period: archaic, ancient city, the medieval town, the town of the industrial age [6].

Essentially, the city is a complex entity, of varying sizes and a large number of people. It influences surrounding areas economically and organizationally, being gifted with everything related to the administration or management works, with facilities for commercial, industrial and cultural purpose. Inside the city “buildings are grouped in architectural ensembles and organized in defined utility areas (industrial, commercial, administrative, housing etc.)” [7]. Communities within its territory are usually individualized and well-structured, developing multiple and complex relationships. The activities of people living in the city are mainly non agricultural.

2.4. Motivation on cities
According to experts the formation of dense populations in some areas has multiple motivations. One of them [8] argues that, at the base of cities emergence, it is the agriculture, which encouraged leaving the nomadic lifestyle. Another one [9] brings into question that the city's appearance is closely related to a surplus of resources. Considering that there are no sufficient evidences that the agriculture precedes the emergence of urban settlements [10], sees the city formation as an activity that capitalizes hunter-gatherer activities of neighboring communities. Proponent of the theory of defense [11] is convinced that people, in order to be better protected, gather in cities that provide the compensation of advantages to the disadvantages of urban living.

2.5. Urban development
Urban development as a complex, interactive economic, social and behavioral transformation, is synonymous to the concept of urbanization [7]. This refers to quantitative and qualitative changes in existing cities but also the expansion and development of new urban areas correlated to socio-economic and political development of the country.

Qualitative transformations arise due to formulation of strategies, policies and development plans, and especially as a result of their application. Urban development policies are embodied in integrated institutional measures (environmental, socio-economic, cultural, security) that are intended to improve the status quo, reducing and eliminating dysfunctions, foreshadowing of new directions for development, the strengthen of existing ones.

They refer to the governance of resources (land, living spaces, natural resources or footer area), the management of public services (water supply, electricity, and gas, transport, telephone and internet etc.), environmental, socio-economic (social insurance, health and jobs).

In the vision of [12], city development requires: modernization, renovation, reconstruction, urban regeneration, which, after [13] does not primarily mean to search for new technical solutions, but to identify the cities already set ones and capitalize them. Focusing on the potential of human capital [14], notes that "cities amplifies the strengths of humanity” and considers that a successful city is the one that "may attract smart people” that enable
them to work collaboratively. In this way, through encouragement of the entrepreneurial spirit, of social and
economic mobility, competition and innovation are stimulated and it could be generated the prosperity for the
city.

2.6. The level of urbanization

Cities and urban development policies have an important role in territorial development and socio-economic
development of nation states. Between the degree of urbanization and the development level of a country there is
a close and direct connection.

The lowest degree of urbanization is typical to the poorest countries in the world while the most developed
countries are urbanized. This reality is confirmed by the reports of the United Nations. This report, UN-DESA [15] shows the distribution of the urban population of the world in major geographical areas, Figure 1.

According to its North America is the most urbanized region in the world with 82 % urban population in 2010,
compared to 64 % in 1950. The projection for 2050 brings up an urbanization rate of 98 %. A second region with
a high degree of urbanization is Latin America, registered at a rate of 79 % in 2010, compared to 41 % in 1950.
For half 21st century Latin American urban population is projected at 87 %. European population living in urban
areas in 1950 was a little over 50 %. Urbanization of Europe by 2010, reached about 73 %, the percentage of
urbanization projection for 2050 being at 77 %. The low urbanization in 1950 was recorded in Africa, less than
15 % and Asia 17%. In Asia, in 2010 the urbanization is about 44 %, it is estimated that by mid-century, the
urban population to be approximately 64 %. In Africa recorded the lowest percentage of the urban population -
slightly more than 39 % in 2010. However, by 2050, the percentage areas will rise rapidly to approximately
58 %. Oceania is the only major region, the urbanization level of stagnant (or decreased), by the mid-1970’s - all
at a level of more than 70 %. It will not change much in the coming decades.

For Romania, from the same source [15], the situation of the urbanization level is shown in Figure 2. In the
1950’s the urban population (1) of the country was situated at a rate 28 %, reaching in 2011 to 55 %,
(11,778,195 inhabitants, of which 34 % in metropolitan structures [16]). The estimate for 2050 is 65 %.
The proportion of urban population in Romania compared to the European and Eastern European countries (2), is present below (Figure 3).

For middle of the 21st century, both the number of people of the urban and in rural areas will decrease as the study noted.

2.7. Agglomeration effects on the environment

The city, regarded as a "territorial body well populated, with a high degree of concentration, production and social organization, cultural, formed under certain conditions of space and time" [7], has now, at the beginning of 21st century, the most complex and unsuspected effects on the existence of individuals, but especially on the environment.

Major challenges of the millennium: changing the climate, population growth, food security are the city’s main problems. Considering that the economic policies of regional, national and local level, the quality of life is taken as a strategic objective, those that provides urban management must take into account the coherent,
homogeneous development of national economies, the judicious and efficient use of natural human and material resources, according to the requirements of society, but relative to the global economy.

In common with notions of environment and urbanization are, on the one hand, material aspects and, on the other hand, the ensembles of social relations, beliefs, opinions of different human communities. The environment and urbanization refer to public goods not covered by any pricing mechanism, just having social cost component impact on welfare.

Exponential increase due mainly to population needs and numerical growth due to the concentration in urban areas give an accelerated multiplication and diversification processes that ensure the supply placed on the market's demands. These new dimensions exert an enormous pressure on the environment both by resource consumption and the account by the amount of waste and pollution they generate, far exceeding the capacity of self-defense.

Adverse consequences of city development on space and the environment are obvious. The price of urbanization is expressed by the presence of "disturbing phenomena" [16]: reconfigurations of ecosystems by eating space (deforestation, drainage, habitat changes, anthropogenic barriers) unfair exploitation of resources (water, wood, raw materials etc.), changes in climate, pollution (soil, water, air), deterioration of the health of people.

2.8. Sustainable urban design
Durable design is a philosophy of physical objects projection, the built environment, and services in order to comply with the principles of sustainable development. With a wide applicability (architecture, landscape, urbanism, industry, clothing etc.) sustainable design intends to "eliminate negative environmental impact by designing complete forms, adapted and sensitive approach to human nature" [17].

2.9. Sustainable planning
The urban planners, in their efforts to create sustainable cities, turn to different design principles and techniques to project the cities and their infrastructure. Such a principle is that of "smart growth" according to which through urban planning it is considered the "filling" of existing infrastructure and keeping it compact to avoid urban sprawl, a wide range of housing, establishing pedestrian areas and those intended for bicycles, extension, distribution and quality of green areas, achieving energy efficiency of buildings, provision of utilities, maximize access to public transport (to reduce travel by cars).

Of sustainable urban planning keeps natural pattern analysis of land in order to avoid environmental damage: landslides, floods and pollution, etc. stagnation flows. An important issue is water management: water transport capacity assessment in river basins, fresh water, blue water, riparian zone restoration, other opportunities and problems related to water and the environment.

2.10. Sustainable architecture
Sustainable design of buildings is the way to do sustainable architecture aiming at reducing the environmental impact by: waste management, proper placement of buildings, incorporating alternative energy systems (solar, wind, thermal), heating and cooling of water, rain water collection for gardening. A building designed in sustainable vision aims at indoor environment (thermal conditions, acoustics and lighting, including air quality.

In other words, sustainable architecture must satisfy the aesthetic and practical requirements of individuals that inhabit. The urban planning and buildings should be attractive and induce "enthusiasm for life" to all social categories [18]. Putting the question to reduce consumption and minimize resource wastage [19], called attractiveness and individual commitment to an "emotional design".

The relationship design - users is also supported by [20], as "a way to develop more sustainable attitudes". Thus, the vision of architects and designers must be based on principles of sustainability, the outcome of their work affecting tens of generations.

2.11. Sustainable space planning
Important for the cities formation is the management and the design of public space. In the context of sustainable urban design, planning and green back means more than "to fill the empty spaces between buildings with rocks, grass, flowers and trees. Landscape architecture means to organize, harmonize and discipline plant forms, flower
color and leaf growth, water mobility, textural contrast and topography of surfaces with different constructions and facilities" [21].

To encourage biodiversity, through this type of design, different areas of gardens and the vegetation can be allowed to grow wild. To conserve water in arid areas are made creative arrangements with drought resistant plants (xeriscaping).

2.12. Financing Sustainable Urban Development within the EU

Even if the cities of the world are true catalysts of innovation and creativity, constantly they face poverty, air pollution, mobility, water scarcity, isolation, unemployment etc. Urban Sustainability concerns restoring relations between the economic, social, political and environmental city life and only an integrated approach can lead to a successful development. Therefore, policies and measures to promote environmental protection, education, social inclusion and economic development for urban areas are important to the world.

Considering that within the EU urban population is about 73 % of the population, the sustainable approach to urban development is a goal of seriously attainable through dialogue and partnerships between civil society, local citizens, the various levels of government and the local economy.

Europe 2020 Cohesion Policy aims to strengthen the role of cities with the aim of creating a society smart, sustainable and inclusive growth. European Commission proposes to Member States to achieve integrated investment strategies that should support sustainable urban development through projects funded by the European Social Fund (ESF), synergistically with the European Regional Development Fund (ERDF) to support measures in employment, education, social inclusion and institutional capacity.

Thus, from ERDF resources, at least 5 % will be allocated to each Member State to be invested in integrated actions for sustainable urban development [22]. In order to encourage new and innovative solutions concerning sustainable urban development, the funds are made available to the Joint Strategic Framework (CSF) and the cities are called to promote strategies for low-carbon urban areas, improve the urban environment, and promote sustainable urban mobility and social inclusion by supporting the physical and economic regeneration of deprived urban areas.

3. INTEGRATED MANAGEMENT OF URBAN WATER (IUWM)

As part of the Integrated Management of Water Resources "urban water management requires local application of an integrated management which aims to provide people access to water and sanitation services" [23]. IUWM adoption is a way to urban sustainability. Thus, spatial planning with all urban services of water components are integrated into a unified policy designed to enable proper communication between civil society, government and various stakeholders to improve quality of life and environmental protection, Figure 4 [23].

Degradation of water resources, industrial or domestic wastewater discharges pollutants, rainwater, congestion, poor growth, etc., are among the major problems facing the city. All this entails risks and uncertainty, and their reduction cannot be done only through an integrated approach to water management and space in the spirit of new trends coming from the knowledge and information technology.

Referring to water-related risks (landslides, foundation movements, droughts, floods, liquefaction of sand layers, diseases and epidemics) [23], argues that towards urban sustainability, "urban water aligning to power rural water sector, agriculture, industry, energy and environment" cannot be done without putting into practice integrated management of urban water as conventional strategies for urban water management cannot cope with deteriorating water quality and water scarcity.

This new approach is not a goal in itself but rather a way to harmonize water resources, water-related service providers, consumers and management rules in their mutual influence and in relation to the principles of sustainable governance. Integrated management of urban formal and informal practices on water, alignment of all stakeholders towards sustainable water management and alternative water sources, water management cycle complete (storage, distribution, treatment, recycling and disposal), different qualities and potential uses of water resources, the interest of users in other areas that depend on the same source of water, use of water source protection and conservation.
IUWM has as support community-based governance and management. Integrated management measures may concern all resources in this case is not about the water. For a better understanding of this type of management shall be bring into question the creative interaction of people within the community even more as more efficient water use should remain a top priority.

For instance, talking about alternative sources of water (atmospheric water, surface water, groundwater [24]) there are under consideration global climate changes, namely the occurrence of prolonged droughts or flooding from changing patterns of rainfall. By applying of integrated urban water management the Community has a number of obligations:

- To identify all water sources and surrounding of the community;
- To calculate the costs that would be used for many technological alternatives available in the given present moment;
- To analyze attitude of the community members regarding the costs of using;
- To outline strategies that establishes the lines of action for all stakeholders and all members from the community.

Usually, the water from alternative sources is less pure being suitable for industrial uses (irrigation, lawn watering for cooling towers, heat, flushing toilets etc.). Some of these sources, with additional treatment and with a relatively low cost, can be made drinkable and usable for drinking, cooking and bathing. So, the community can benefit from these new non-conventional water resources that can be used in and around buildings. The integrated management of urban water assumes the task of identifying, designing, proposing and deciding on the best options in this regard.

A component of alternative sources of water is the atmospheric water (rainwater). Using this resource primarily involves giving up sewer system and implements a separate system for collecting and storing rainwater. A special network of canals and retention basins / storage of large volumes of water can be controlled permit the forwarding water into the sewage system, especially if heavy rains or flooding. In Europe's largest modern retention basin is located in West Munich's implementation costs of 47 million EUR [25].

The use of alternative water sources in Romania was regarded with interest until you have felt the effects of climate change in recent decades. The management of urban areas the tendency to build separate systems for rainwater and wastewater manifested more pronounced in recent years, as the price of water increased significantly. Review of the concerns of individuals and communities towards more efficient water use by holistic view of water management has been stimulated, in addition to the global trend of new concepts by positive experiences in some cities [25] and the ability to obtain financing through European programs.
However, integrated management must ensure the Community in a sustainable manner the complete cycle of water management. Here it brings into question the fact that water is not a free good and bringing it into the community generates costs. These start from the time of procurement of gaining consistency envoy to recycle water damage due to the consumption process. Damage highlights the influence of human activities (anthropogenic) and transforming water into gray water and black water. In accordance with the level and type of contamination remediation waste water quality to be average is eliminated by treatment (treatment/cleaning). Wastewater treatment process is the most expensive process of those who are subject to special attention in order to ensure sustainable urban development.

Thus, depending on regional characteristics, local councils together with the citizens will have to find solutions to community adoption of integrated urban water which can manage other processes related to water resources of the cost: treatment initial storage, distribution, maintenance and collection systems provision etc. With the objective of sustainable development of the localities new type of management will consider harmonization of solutions given by the urban and economic operators the management providing or consuming water as well as the immediate and future community members. Promoting the principles of the integrated management of water resources in the community will have an important role in changing the behavior of recipients. It will thus stimulate thrift and conservation of water resources becoming more limited.

Alignment with the requirements of Directive 91/271/EEC concerning urban waste water by the end of 2018 and the European Directive 98/83/EC on the quality of water makes 2015 of integrated water resources management model that can provide support decision to put into practice the necessary investments adoption of European indicators of drinking water (turbidity, ammonia content, aluminum, pesticides, nitrates etc.) and European requirements for the collection, treatment and discharge of urban waste water. As for Romania to comply with these requirements [26] it is assumed that by 2015, to achieve wastewater collection and treatment of a number of 263 settlements with more than 10,000 population equivalent and by 2018 in 2346 settlements with population equivalent between 2,000 and 10,000.

4. CONCLUSIONS

In carrying out their urban functions, cities became the key players of the economy. Cities provide good support to entrepreneurial environment stimulating initiative, concentrating population, economic and cultural activities. They influence and are influenced by the surrounding areas.

People, as part of social organisms that live in urban areas, through the way they are engaged in economic activities, through manner in which they use land, although having the right to a dignified life, are responsible for many environmental problems that humanity confronts. Remediation of the negative effects to the environment of mankind has long become a concern for a growing number of people (scientists, politicians, etc.) as well as various international organizations (UN, EU, WHO etc). Thus, it developed the concept of sustainable development that puts greater emphasis on the environmental protection.

For the city, sustainable development refers to the development community in ways that are equitable and have a sense economically and ecologically. Urban sustainability requires harmony, consensus and determination for all stakeholders in achieving the highest possible quality of life in urban areas.

Climate change in the planet's water crisis emphasizes the idea and the need for solutions to mitigate their effects. Continuous degradation of drinking water, population growth and pollution from human existence, unplanned expansion urban settlements, increasing the volume of wastewater, changing patterns of precipitation by the appearance of long droughts brass are clear signals on future water and sanitation. Therefore it was necessary to create a new vision of how water should be managed. Thus was born the concept of integrated management of water resources. This formulation, as seen from the passage text is deemed comprehensive specialists, and basically all the processes water entering the discussion.

Whether it is about agriculture, industrial processes, water from lakes and rivers by water for the population, or that from unconventional sources, the integrated management of water resources is trying to generate an involvement of all relevant stakeholders, by nation level to the individual to find viable solutions to provide people a decent living with convenient access to water, especially in urban areas.
For developing and increasing of cities it is very important water resource management and its supply. One of the instruments that can work to achieve urban sustainability is integrated urban water management. Its implementation would allow cities to search the best solutions to reduce water waste, water quality control from entry to exit, from the emissary to the receiver of the wastewater collection and rainwater and wastewater treatment, many possibilities occupancy, increased recreational opportunities, green spaces etc reconfiguration.

Along with urban planning, integrated management of urban water can induce sustainability of urban lifestyle through individual consumption and more efficient models accounted for the success to the future of cities and providing quality services to a growing urban population. Thus, by presenting elements that underlie sustainable urban development, on the one hand and the role that it may have of integrated urban water the management within the community, on the other hand, makes it possible to highlight the close link between the two.

REFERENCES