SUSTAINABLE DEVELOPMENT STRATEGY OPTIONS IN URBAN ENVIRONMENT

Rainers Blums, Janis Zvirgzdins, Ineta Geipele
Riga Technical University, Latvia
blums.rainers@gmail.com , janis.zvirgzdins_1@rtu.lv , ineta.geipele@rtu.lv

Abstract. Nowadays cities and society have become close elements that interact and depend on each other on a daily basis. The current trend is for people to move more to live in cities and in this way, such global challenges as overcrowding and urbanization are gaining significance. Such problems as urbanization, population growth, rural depopulation, resource depletion, air, water and soil pollution characterise the damage which modern society has done to the planet's environmental dimension. These issues need to be tackled and the situation needs to be improved to ensure sustainable development, which will ensure the possibility of future generations fulfilling their needs. One of the most significant problems in urban environment and its development processes is the poor efficiency of using the resources. This research is aimed at identifying sustainable development strategy options in urban environment. The authors have used the literature review methodology. The results show that there is an increasing number of cities which are being developed with active support and participation of local communities. Renewable energy, new technologies and smart solutions are being increasingly used in daily urban life. The key dimensions of sustainable development are environmental, economic and social. Thus, in the context of sustainable development, people need to plan their urban development in such a way that their needs are met while making mindful use of the available natural, financial and human resources and reducing their environmental impact. According to the new paradigm of sustainable development, general economic and social development is established, primarily considering environmental aspects. The authors of the paper have provided proposals for sustainable development strategy options in urban environment.

Keywords: environmental problems, sustainability, sustainable development, urban environment.

Introduction

A city is an area with a relatively larger population than rural areas. Cities are characterised by a high concentration of buildings and infrastructure, which includes streets, squares, transport, energy, water supply, waste management and many other systems. It is a form and symbol of social relations or, according to the 20th century American historian and sociologist Louis Mumford, the city is like a temple seat. Cities also have a concentration of the most complex and common everyday problems such as social exclusion, spatial and ethnic segregation, housing shortages, insecurity, drug access, pollution, old and contaminated production areas, high transport capacity, unemployment, lack of competition, poverty, demographic change and many others.

Historically, the first cities started to form because people needed land areas to ensure their daily lives – farming livestock, plants, hunting, etc. Similarly, more and more farming and livestock farming began to develop. People were able to process bigger areas and get increasingly bigger harvests. Among the first cities in the world there are Jericho and Mycenae. The Ancient Greek Mycenae could already be seen as a well planned and protected city that could provide a certain feeling of safety for its residents. The ancient Romans, who gave great importance to architectural and urban planning, which included road building and aqueducts that provided water transport in the city, have also contributed significantly to urban development. One of the Roman masterpieces, which is also admired nowadays, is Roman settlements, or *Romanum Castrum*. Fortified camps of Roman legionnaires were usually found on a hill near a water source and a forest. They were surrounded by a moat and a rampart so that the soldiers could feel protected in the camp and could rest before the expected battles [1].

With the gradual development of cities, more and more people started settling in cities to improve their standard of living and opportunities. Urbanisation in modern understanding is the concentration of manufacturing and population in cities. It reflects the increasing role of cities in the development of society with the development of such sectors as communication, infrastructure, entertainment industry. More and more jobs were created in urban areas due to urbanisation. Hence the volume of investments, resources and money was also increasing. The main negative features of urbanisation, however, are overpopulation, pollution, diseases and poverty in individual population groups.

In order to ensure a full and orderly life for citizens today, cities should be able to meet the following needs: security, clarity, private space, social communications, mobility and identity. As a consequence,

cities have also gradually established certain functions that help meet these needs, such as administrative, manufacturing, services, management, etc.

The importance of sustainability and related issues is addressed in various researches [2-6]. The current research is aimed at identifying sustainable development strategy options in urban environment.

Materials and Methods

The present research is based on the literature review methodology aiming at identifying sustainable development strategy options in urban environment. Sources of the literature include scientific articles published in journals and conference proceedings, books, reports, statistical data and different internet resources covering the time period from 2004 to 2022.

Current research illustrates the development of transport system in industrial cities (Table 1), elements of sustainable urban environment (Fig. 1), and the use of road space in cities (Fig. 2).

Based on the literature review, the authors have distinguished sustainable development strategy options in urban environment and developed conclusions.

Results and Discussion

Any city creates space for safe and easy mobility and provides opportunities to direct contact with the surrounding population. The urban environment should be inhabited by people with different tasks and objectives, making it a living organism. Each metropolis, city or village should strive to create such living conditions as to be in line with its resources and needs. While developing cities, creating new job opportunities with a competitive salary and making urban life easier, all the key preconditions are being made for more and more residents to choose linking their daily lives to cities, leaving provincial and rural areas [7].

According to the authors, one of the most important reasons why urbanization has become such an important problem today is that it is much easier for people to live in cities. All the institutions needed on daily basis are very close, life is saturated with technology, and people gradually find themselves out of their natural environments. It is complicated, practically almost impossible, for rural areas to compare themselves to cities in terms of salary levels. For example, in Latvia, between 2015 and 2019, the average monthly income per household member in a city was by 95.61 EUR higher than that per household member in the rural area, which is a significant amount of funds per person if a relatively small region as Latvia is studied [8]. Moreover, even transport infrastructure in cities has changed over the last century to attract people and make their everyday life easier.

Cities are needed for society to get a feeling of safety, clarity regarding daily needs, private space, social communications, convenient mobility and development of identity. In order to cover these needs as successfully as possible, increasingly more attention is devoted to the deployment of urban elements in the city. Cities tend to be monofunctional or multifunctional, capable of offering different kinds of services in one place. In such cases, the functional zoning of cities plays an important role in order to perform a division of functions among different elements and parts of the city. To unite and link elements and parts of a city, the urban transport system plays a key role, being one of the cornerstones for creating a city and its successful functioning [9].

Historically, cities have developed a system where pedestrians and cyclists play a key role, gradually introducing public transport into the transport system. Until 1950, such organization of transport dominated in most cities (see Table 1). However, starting with the 1950s, cars began to take an increasingly greater role and soon became the primary way of mobility. Cars became more important also in urban development planning, and the field of transport started to be based mainly on this development direction. To make a city as a living and united organism, the planning process would need to reduce the role of cars and return the priority role to pedestrians, cyclists and public transport [9].

Reducing the role of cars would contribute to the achievement of the United Nations 13th Sustainable Development Goal and overall climate change mitigation. The study by Zvirgzdins, Plotka and Geipele (2020) [10] shows that the passenger vehicle sharing strategy applied to the European Union countries (excluding Bulgaria, Cyprus, and Malta) has a potential to cut emissions by 358.6 $MtCO_2$ eq. and save 7.64 billion EUR annually. It should be stated that a great amount of potential greenhouse gas emission reductions relies on the successful implementation of the concept of circular economy.

Table 1

Development of transport system in industrial cities [9]

Transport systems in industrial cities	
Before 1920 Walking and cycling play a dominant role in the transport system. Public transport is playing an increasingly important role.	
1920-1950 Walking, cycling and public transport are still the main modes of mobility. Cars appearing in cities needed to adapt to the current situation.	
After 1950 Cars play a priority role in urban planning. Other modes of mobility needed to adapt to the situation.	
Planning for a living Ccity To ensure urban vitality, it is necessary to give priority to other modes of mobility.	

Pedestrians are the ones who can assess the urban environment more closely and accurately, as their speed of movement is relatively low and the city is in front of their eyes. In addition, this type of movement is characterized by high mobility, as a person is not attached to any vehicle and therefore no longer needs to think about the route, stopping and parking of their vehicle. Movement as a pedestrian can be considered not only as one of the modes of mobility but also as a pretext for other activities. The main factors in this type of movement in order to attract people are route quality, street coverage, road capacity, city residents and urban mobility. If any of the elements is missing or not meeting the required quality, it will certainly reduce the number of people on the streets, as today residents need a good quality infrastructure to choose a specific mode of transport. At the same time, if one of the elements is set up at a particularly high level, such as an interesting and eye-catching route in the city, people have a desire to use it more frequently. Studies have shown that the appropriate distance for this type of movement is approximately 500 metres. Thus, in most cities, the centre is an area of approximately one square kilometre and, in principle, all the most important functions of the city are provided in this area [11]. It should be noted that walking is the environmentally friendliest mean of mobility since it does not have the associated CO_2 emissions.

As the local inhabitants are the ones who move on the streets and pathways every day, they are also the ones who can see deficiencies in a city. As a result, urban residents are increasingly involved in the planning process of their own city. One of the reasons why residents are involved in urban development is qualitative information as a basis for decisions and plans. Broad and active involvement of society can help create a general picture of processes, including knowledge, experience, needs and opportunities. Observations of residents and information on the current situation together with statistics and theoretical knowledge of researchers form the overall planning process [12].

In order to develop a sustainable urban environment, it is necessary to treat a city as a single system consisting of a number of urban elements, which need to be developed in the long term. The elements of a sustainable urban environment are infrastructure, energy and mobility, citizen, technology, health and education, security and governance (see Fig. 1).

In order to develop, expand, monitor and manage an urban environment system, it is necessary to understand the principles of each individual unit and its functioning. A qualitative analysis of the system helps to identify the interaction among the elements of the urban environment. By understanding the links and interconnectedness among the elements, it is possible to introduce changes in a way that makes the overall system more accurate. It is therefore important to obtain feedback to understand whether the

changes made are positive for development. Cities and their internal environment are more complex than a particular sector, but also, based on the interaction of elements and changes in indicators, feedback and the importance of the changes made can be observed [14].

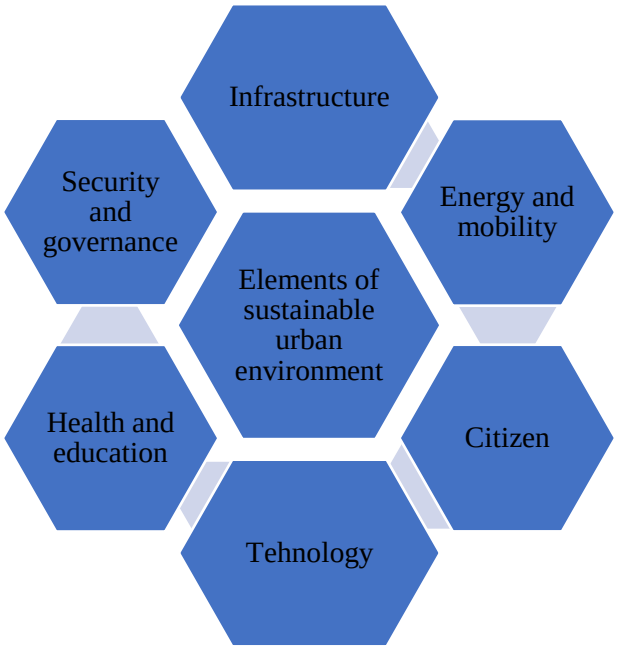

Fig. 1. **Elements of sustainable urban environment [13]**

The sustainable development of a city and its management require continuous monitoring, particularly when changes are made which could potentially affect the development of the city. If urban planners or site developers follow the parameters that have been modified in the city's infrastructure, they can also understand what depends on them and what can still be changed to maximise the benefits of the city's development. [14].

Community involvement in the planning process is one of the cornerstones of successful territorial development [15]. The involvement of the local inhabitants in the planning process is mainly decided by the local municipality, as it will take decisions on the development of the city and can determine how far the involvement of the local inhabitants is needed. In order not only to ensure the development of the urban environment in accordance with the strategy but also to take action, the involvement of planning professionals is necessary as well. The municipality should consult and listen to the opinions of the local inhabitants, but it does not necessarily have to play a major role in the decision-making process. The planning process can be considered successful if local inhabitants have reasonable expectations for benefits from the participation. In the event of successful planning processes, the level of confidence of local authorities is also increasing, and this will increase support for the participation of local inhabitants in spatial planning [16]. The greatest advantage of the involvement of local inhabitants in the planning process is that the use of this resource has minimal costs and is therefore available in almost every city in the world.

In order to choose the most appropriate solution for improving the transport infrastructure, it is necessary to carefully choose what type of solution will best fit the existing structure of the city. The solution should meet the requirements that ensure equal coverage of all road users and improve safety. Clearly, solutions should not be chosen in such a way as to allow only one type of mobility in the streets. Therefore, the best development options in the urban environment are those where as many different types of transportation as possible are integrated into the system. Transport infrastructure is one of the most important elements of the urban environment in terms of urban sustainability [7]. It is transport, together with industrial production, energy supply, water and waste management, that are key elements in the overall system, as they consume large amounts of resources and energy. Therefore, pedestrian and cycling traffic is of increasing value, as these means of transport consume significantly less resources and do less damage to the environment.

An increasingly significant part of the total traffic flow can be replaced by an efficient pedestrian and cycling system. Global examples show that investments in small-scale projects such as cycling infrastructure projects are undervalued and actually add greater contribution than reflected in financial indicators. There are cases observed in cities where huge investments in major transport infrastructure projects, such as the construction of railways or highways, are likely to make a huge contribution to the growth of the country or particular area, creating new jobs and stimulating the economy. Cycling is considered to be a healthy, favourable and efficient mode of mobility. Moreover, research studies have shown that cycling can also contribute positively to the national economy. A study ordered by Cycling UK found that by maintaining existing traffic volumes, while increasing the use of bicycles to 25%, the country could potentially earn around 248 billion GBP additionally, which would be 200 billion GBP more than without introducing changes [17].

All cities around the world operate according to a universal law: attracting more cars to the city creates more traffic jams and cities need to think on how to fix them through the permitted territory and available infrastructure. This way new roads, streets, flyovers, traffic nodes and other elements are created aiming to reduce traffic jams. However, new, modern and high-quality roads and other infrastructure elements are attracting additional vehicles to cities (see Fig. 3.) [9].

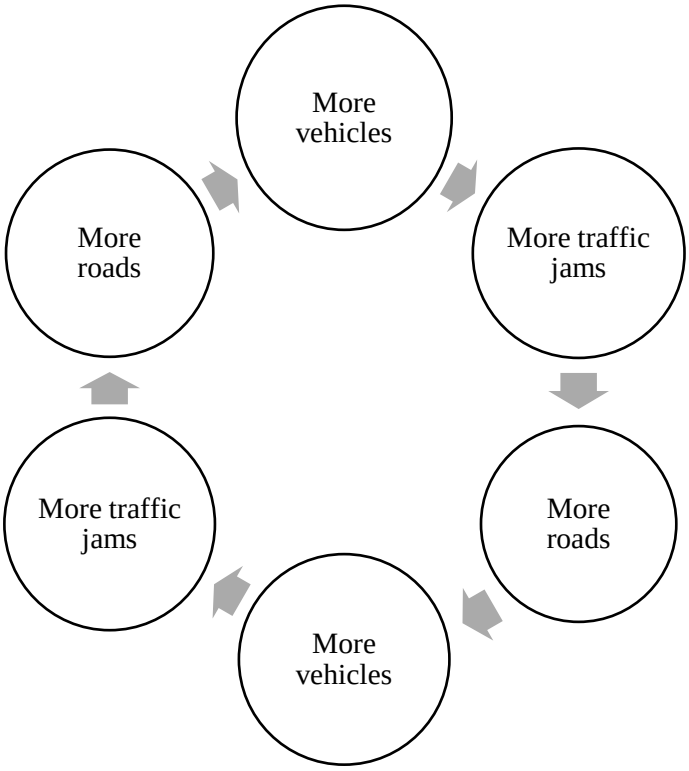

Fig. 2. **Use of road space in cities [9]**

Increasing the focus of sustainable development on the transport system and local inhabitants will improve not only the environment, but also the health of local inhabitants, and will contribute to the creation of a society with sustainable thinking. Changes in modern traffic infrastructure can also serve as a call for more active daily activities [7].

As Europe is one of the most populated and urbanised regions, urban development also has a strong impact on the overall economic, social and territorial development of the European Union. If there is a significant density of people and services in cities, they also have significant potential to introduce innovations that could help saving energy resources and reducing environmental damage. There is a consensus on the key principles of future urban and territorial development in Europe. One of the most important principles, on which future development needs to be based, is the growth of a balanced economy and the organisation of territorial activities with a polycentric urban structure. Moreover, this development should be based on well-organised and high-quality urban areas that are competitive both in their own country and in the region as a whole. Future urban development is also linked to the

increasing population in urban areas, which means that cities will tend to expand and increase their areas. However, in order to ensure sustainable urban development, it is necessary to gradually reduce the size of these areas, thereby increasing the density of urban population structures and increasing the focus on the development of existing areas [18].

The authors have identified potential directions for sustainable urban development: 1) industrial city; 2) smart city; 3) environmentally friendly city; 4) tourist city; 5) student city with developed educational infrastructure. Each of these directions is based on a central element, such as production, technology, environment, tourism and education, but this does not mean that these development directions must be separated from one another. The sustainable development strategy for the urban environment should include and combine as many directions of sustainable urban development as possible, contributing to the development of their central elements. In addition, urban development based on the principles of sustainable development is possible in any city in the world, regardless of its history, national importance and functionality.

Conclusions

The authors have developed the following conclusions:

1. People need urban environment that has been set up considering geographical location of cities, cultural traditions and customs of the population, climate conditions, economic and social situations;
2. Historically, the development of cities and territories was not based on certain principles governing development processes and enabling areas to be developed in environmentally friendly manner;
3. Transport infrastructure is one of the most important elements of the urban environment in terms of urban sustainability;
4. In any city, it is necessary not only to create an area where it is possible to move safely and conveniently but also to promote opportunities for interaction among inhabitants;
5. The most important elements in the creation of a living city are compactness, straight and logical routes, which are potentially based on the historical flow directions of the population, as well as small spatial dimensions and a clear hierarchy of urban spaces;
6. The participation of local inhabitants in urban planning is one of the prerequisites for sustainable urban development;
7. Potential directions for sustainable urban development are: 1) industrial city; 2) smart city; 3) environmentally friendly city; 4) tourist city; 5) student city with developed educational infrastructure. Synergy among potential directions for sustainable urban development can serve as the basis for a sustainable development strategy for the urban environment.

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Author contributions

Conceptualization, R.B., J.Z. and I.G.; methodology, R.B., J.Z. and I.G.; validation, R.B., J.Z. and I.G.; formal analysis, R.B., J.Z. and I.G.; resources, R.B., J.Z. and I.G.; data curation, R.B., J.Z. and I.G.; writing – original draft preparation, R.B.; writing –review and editing, R.B., J.Z. and I.G.; visualization, R.B.; supervision, I.G.; project administration, J.Z. and I.G.; funding acquisition, I.G. All authors have read and agreed to the published version of the manuscript.

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