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Review Article

The evolution of cities and the issues related to Sustainability

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Abstract

This research aims to analyze the evolution of cities regarding the problems that have emerged over time. After all, cities are dynamic and constantly changing, so urban management must keep pace with these changes and adapt to new realities. However, many problems sometimes accumulate, and finding a solution can be more challenging. Population concentration can lead to issues related to health, education, unemployment, and poverty, among others, affecting the economic level and quality of life. As cities become the economic centers of nations, housing the highest productivity rates, there are challenges to face when considering the goals for 2030. The city as a whole plays a central role in achieving sustainable development. It is the responsibility of the population and municipal managers to work together towards the goals of sustainable development. This research concludes that it is necessary to analyze each city individually to consider sustainability. Checking local culture, geography, and economy, and adopting actions that effectively benefit residents and the environment.

Introduction

There is an effort to adapt the concept of sustainability to urban development. In this attempt, various concepts have been created, such as sustainable urban infrastructure, sustainable urbanism, eco-city, zero-carbon city, sustainable cities, ecological urbanism, green urbanism, resilient cities, and eco-municipalities [1].

Sustainability is a process that aims to make choices using common sense, intuition, and ethics to consider the long-term consequences of these choices [2]. Considering that throughout the development of cities, they often grew in an unorganized and unplanned manner, leading to sustainability problems, this research aims to analyze the evolution of cities regarding the problems that have emerged over time. Because of their dynamic and constantly evolving nature, it is essential for urban management to be attentive to these changes and adapt to the new realities present in cities.

This research contributes to understanding how some sustainability problems arose, and what the historical fact generator was. As cities are at different levels of development and have different characteristics, it is possible to understand what generates a particular problem in time to avoid it or prepare for when the problem arises and thus adapt urban management.

The evolution of cities and sustainability problems

Humanity appeared on Earth about 500,000 years ago, during the geological period known as the Pleistocene. During this period, people lived by gathering food and seeking shelter without profoundly and permanently altering the environment [3]. Humans spread from East Africa to the Middle East, Europe,

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Asia, Australia, and the Americas, still depending on gathering wild plants and hunting wild animals [4]. Archaeologists refer to this period as the Paleolithic. Until this time, the impact of humans on the environment was still small.

The last profound transformation in the terrestrial environment occurred approximately 10,000 years ago, during the glacial thaw, marking the transition from the Pleistocene to the Holocene. During this period, other transformations occurred. Inhabitants of temperate regions developed agriculture, learning to plant and cultivate, raise animals, and establish stable settlements. This gave rise to the first villages, usually located near workplaces. This period is called the Neolithic and came to an end with European colonization [3]. During this time, humans learned to manipulate the lives of certain plant and animal species, leading to the Agricultural Revolution [4].

The Agricultural Revolution brought the advantage of large-scale production but also had negative aspects, making life more challenging for farmers. Previously, people engaged in diverse and stimulating activities, with less exposure to hunger and disease [4]. So, at this point, people are already beginning to be more exposed to hunger and disease. The population is already larger, and food production needs to be larger as well.

This new organization invents writing, thus beginning civilization. From now on, humanity becomes dependent on the quantity and distribution of surplus, influencing other important subsequent historical events. In the Bronze Age, metals were rare and held by few. In the Iron Age, around 1200 B.C., with a more economical metal, alphabetic writing and coined money spread, allowing for a new population increase [3].

The initial component of the city is the family home, encompassing relatives such as parents and children. Additionally, there are houses of lords and houses of servants. Thus, daily needs led to the proximity of these houses, forming villages. Several villages together formed cities. Cities encompass smaller communities and are self-sufficient [5].

However, it was about 5,000 years ago that some villages transformed into cities in the alluvial plains of the Middle East. At this point, there were many specialists in settlements, such as craftsmen, traders, priests, and warriors. Thus, food producers had to generate a surplus to sustain these specialists. These more complex settlements, with social organization, gave rise to cities [3]. And the larger the population increase, the more challenging it becomes to maintain environmental sustainability, as there is a need for more food, housing, infrastructure in general, and investments in health, and hygiene. Urban management becomes more complex.

Therefore, the formation of cities began, and these are a kind of association, formed with a specific purpose, as societies aim for some profit, especially cities. The city is composed of small and diverse parts, possessing all the means to sustain itself, and fulfilling its intended purpose. It arose out of the necessity of living and persists with the aim of achieving a happy life. The city integrates with nature, with nature being the ultimate goal of all things. Therefore, the city is part of nature [5].

The Greco-Roman and Chinese civilizations developed this organization, and cities, despite going through a series of crises. Feudal and bourgeois civilizations are responsible for new historical transformations, such as the development of production through scientific methods, characterizing industrial civilization. The surplus becomes increasing, unlimited, and widely distributed, allowing for population growth to reach and surpass the limits of natural environmental balance [3].

So, although there have always been people leaving rural areas (countryside) and going to urban areas, this movement became increasingly prevalent, and urban centers grew as well. The form and changes faced by cities depend on the needs of each period. For example, when cities ceased to be fortified, they could grow on all sides until territorial limits were established [3].

Descartes (1578-1637) considers the city, which was once just a village but now a large center, poorly planned. The arrangement of buildings makes it clear that the streets are curved and uneven, indicating that they are formed by chance and not by planning [6].

In the mid-18th century, the Industrial Revolution impacted the world, resulting in numerous consequences for the built environment, such as population growth, increased production of goods and services, and the development of transportation means [3]. The effects of these transformations became increasingly severe over time.

In the post-war period, from 1815 onwards, various urban planning projects emerged to improve cities, some implemented and others not. With the French Revolution of 1848, a new city model emerged. The freedom given to private initiative was limited, and regulations were established for construction, allowing for the reorganization of cities, changes that continue to influence cities to this day [3].

According to Sachs [7], the use of coal was responsible for modern civilization through the invention of the steam engine and the explosion of fossil fuels for motive power. However, "coal is now used on such a large scale and with negative effects that it endangers civilization itself."

The diffusion of steel (1856) allowed for the construction of unprecedented structures, such as suspension bridges and skyscrapers. The use of electricity (1869) further accelerated development. The invention of the internal combustion engine (1885) allowed for the use of oil in ships, cars, and airplanes. Cities worldwide began to develop at an accelerated pace [3].

This led to the modern city. The process of urbanization is challenging because economic activities generate jobs but also degrade the environment, producing waste and pollutants [8]. Additionally, natural resources are relevant for social development but have been exploited in a predatory manner [9].

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According to physicist West [10], cities have negative aspects, but they also generate a good quality of life, being the center of wealth creation, innovation, creativity, and invention. Therefore, cities are the origin of many problems but also the source of solutions. However, according to the author, if it is true that each city is unique, then there is no science of cities because each case is special.

Cities change, urban management changes and a renewal of the environment becomes necessary. In the 20th century, from World War I onwards, city models were dictated based on the research of technicians and scientists, separating technical work from artistic work. A new goal emerged: the balance of the built environment. The idea of Garden Cities, promoted by Howard as early as 1898, was an important initiative but had limited effects; there were still issues to be resolved [3].

The 20th century was characterized by rapid and often uncontrolled urban growth. This resulted in sprawling and expansive cities, unlike the compact cities of the 19th century [11]. Population concentration can lead to problems related to health, education, unemployment, and poverty, among others [8], affecting the economic level and quality of life [9].

Extreme poverty is one of the global problems to be faced; however, a country may be so poor that it cannot solve this reality alone, regardless of its leaders. They lack cash flow (financing and public revenues). External assistance is needed for development [7]. Economic, technological, and sustainable development depends on investment. There is economic development when there are roads, railways, ports, energy networks, fiber optics, and developing industries. Investment in infrastructure provides physical capital. But there are also other needs, such as education and health; these investments are in human capital [7].

Discussion

Humans depend on nature for vital needs such as water, food, protection against epidemics, and natural disasters. However, despite human dependence on nature, little is done to protect it. Human activities are altering the planet's climate, freshwater reserves, and water and carbon cycles, marking unprecedented changes in 10,000 years of human civilization [7].

Cities are often built in biodiverse areas, but over time, there is a reduction in species. In some cities, biotic homogenization can occur, meaning cities where the species community becomes more similar. There is a correlation in cities between the number and size of green areas and biodiversity. However, small green spaces such as neighborhood commons, yards, and business parks can also serve as habitats for various species [12].

The city as a whole plays a central role in achieving sustainable development [13], acting as a platform for economic development through connectivity, creativity, and innovation [14]. Besides being where a significant part of the population resides, it is also where there is the highest consumption of resources and production of waste. However, urban conditions vary depending on the city, so both quality of life and environmental damage depend on a variety of factors such as economic, environmental, and cultural ones. Municipal managers need to deal with these local conditions, attitudes, and traditions [13].

Models of sustainable cities emerge as an option to improve life in urban areas, seeking to reduce energy and material consumption, avoid waste, and promote social equity and human well-being [15]. Different contexts expand city models to diverse realities and applicabilities. In this sense, research has proposed models of sustainable cities in various countries, such as China [16,17], Egypt [2], India [18], Saudi Arabia [19], United States [20], among others.

The technologies present in smart cities have the potential to improve communication and collaboration among various stakeholders. Cities prioritizing sustainability and intelligence seek to establish collaborative systems, promoting the connection between businesses, educational institutions, citizens, and government [21,22].

This research is aligned with various Sustainable Development Goals (SDGs), including health and well-being (SDG 5), clean water and sanitation (SDG 6), and clean and affordable energy (SDG 7). It particularly emphasizes the direct relation with SDG 11 - sustainable cities and communities, aiming to make urban environments inclusive, safe, resilient, and sustainable [23].

It is also worth noting the importance of the United Nations Conference on Climate Change (COP21) held in December 2015 in Paris, where the Paris Agreement was adopted by 196 countries, a legally binding international treaty on climate change.

The Paris Agreement reinforced the responsibility of developed countries to lead financial assistance to the most vulnerable nations while encouraging voluntary contributions from other countries. Climate financing is crucial for emissions reduction, as the actions necessary to achieve these reductions require substantial financial resources [24]. Climate financing was a highlight of COP28.

Municipal governments globally seek to build sustainable cities to address environmental and population challenges. However, funding for this transition is limited, although some cities are exploring innovative financial mechanisms for energy efficiency (Bai, 2021).

Financing is crucial to make cities healthy, smart, and sustainable. Financing programs revitalize the city, improve living conditions, and are considered socio-political measures and long-term investments in urban planning [25].

Khan, et al. [26] concluded, in their empirical research covering 26 Asian economies, that green financing reduced ecological footprints, highlighting its importance for policymakers. Kampelmann [27] notes that nature-based solutions often depend on public financing, while robust

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business models can generate their own revenue. On the other hand, Jonek-Kowalska and Wolniak [28] discuss the evolution of smart cities, emphasizing the inclusion of residents' quality of life as a relevant part. They also advocate comprehensive public consultations to define the population's needs during urban planning.

Zabel and Kwon [25] provided an overview of financing programs implemented in Germany for urban regeneration, all focusing on sustainability and measures against climate change, including the "Future City Green" program launched in 2017.

On the other hand, Blanck and Ribeiro [29] examined the financing system of smart cities in Europe, analyzing 66 cities from 2008 to 2014. They found that innovation financing had a significant effect on the evolution of Smart Urban Development (SUD), with investments coming from venture capital, higher education institutions, and the private sector, while public funding and Public-Private Partnerships (PPP) did not show significant influence on SUD.

Finally, the evolution of cities has brought about a series of urban transformations, improving the quality of life but also presenting numerous challenges for municipal managers and the population in general. However, new concepts of cities are offering alternatives for sustainable, smart, and healthy development. It is the responsibility of the population and municipal managers to work together towards the goals of sustainable development.

Conclusion

This research aimed to analyze the evolution of cities regarding the problems that have emerged over time. It was observed that at various points in history, city planning was not the main priority. Sometimes, the priority was to generate food, other times it was trade and local economy, with many people moving from rural areas to urban centers in search of new opportunities and comfort. Thus, sustainability challenges have been accumulating.

Today, there is research demonstrating options for sustainable development, there is technology, a focus on smart cities, and, most importantly, there is direction. The Sustainable Development Goals (SDGs) provide a series of indicators and sub-indicators to be followed. Nevertheless, there are challenges to be faced by municipal managers, and one of them is financing sustainability.

It is the responsibility of the population and municipal managers to work together towards the goals of sustainable development because each city has its specific characteristics, geography, and economy. Therefore, joint efforts between the population and municipal managers can be beneficial in seeking alternatives for the city's sustainable development.

For future work, it is suggested to conduct case studies on the history of certain cities, especially if they have any characteristics that challenge sustainability, such as a tourist city or an industrial city. This is to analyze at what point certain problems arose, what could have been done, and what can be done today to mitigate sustainability issues and improve the quality of life for the population.

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