Eco-city and Technopolis: Pros & Cons

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Abstract. The article analyzes the essence and features of the formation and development of two types of urban settlements – technopolis and eco-city. The reasons and prerequisites for their formation are presented. A number of common tasks that are set between these two systems have been identified. The ever-growing dependence of mankind on technology leads to various kinds of abuses that affect people both directly and indirectly – we are talking about the environment. Given the fact that in recent decades there has been a process of increasing and expanding urban settlements (both in terms of territory and population, and the increasing complexity of various socio-economic relations and spheres) in many countries, the following points are inevitable: 1) the development of man-made manifestations and the increasing use of technological progress; 2) the impact on the environment and increasing environmental problems; 3) the need to find the most harmonious coexistence of these processes within a particular large urban settlement.

1. Introduction

The scientific and technical revolution of the 40-50s of the XX century led to such technical development that provided scientific and technical progress in many countries and affected all spheres of society. As a result, mankind has received a lot of new knowledge and additional opportunities in various industries and fields [1], but not all of them were aimed at ensuring solutions to world problems and promoting the stability of human life [2].

It is possible to distinguish both pros and cons of scientific and technological progress and the process of technology development and their large-scale use (table 1).

You can name other pros and cons. However, according to the authors, disadvantages dominate this comparison. And the disadvantages already mentioned are enough to conclude that the disadvantages are more global in content and more extensive in performance, which can have:

- temporary nature – for example, to solve environmental problems, the account often goes for centuries;
- quantitative character: thus, almost the entire surface of the Earth bears negative traces of man-made activity.

At the same time, we can formulate 2 main problems of scientific and technological progress:
A person has become dependent on technology, using it not only where it is really needed, but also in cases where it could be dispensed with. As a result:

- people began to suffer from hypodynamia (they are too lazy to walk a street block to the store, they go there by car);
- skills of live communication are lost (often communication is reduced only to communication through social networks and messengers; a predilection for virtual communication and virtual acquaintances develops);
- there is a compulsive search for information by accessing ready-made (but not always truthful) answers on different sites, which leads to a distortion of information perception,
- game addiction increases (as a special form of involvement in the virtual world);
- unreasonable expenses increase (unnecessary purchases in online stores, constant participation in online auctions, etc.); and others.

One of the results of this is the emergence of new diseases and the growth of mental disorders.

The development of technology has led to an increase in environmental problems, which is facilitated by: emissions into the atmosphere, man-made disasters, changes in the appearance of the planet, uncontrolled extraction of raw materials. And all these are the factors that affect the health of mankind and the prospects for its survival. Man allows them to exist for the sake of progress, without understanding (or understanding, but not reacting systematically and seriously to this) what long-term consequences these phenomena may have, catastrophic for all of humanity.

Table 1. Pros and cons of scientific and technological progress and the process of technology development.

| Advantages                                      | Disadvantages                                      |
|------------------------------------------------|----------------------------------------------------|
| Simplification of everyday life                 | Environmental degradation                          |
| Application of new types of energy, materials,  | Depletion of natural resources                     |
| and technological processes                    |                                                    |
| Development of education                        | Inactive lifestyle of mankind (the development of diseases) |
| Development of science                          | A source of danger to humanity (harmful radiation, man-made accidents, etc.) |
| Work simplification                             | Technological dependence of the people             |
| Access to a variety of information               | Risks of "leaving" for virtual reality             |

2. Technopolises as an inevitable result of technology development

First of all, it should be noted that Technopolis means:

1. cities that are fully equipped with technology – technograd (but they practically do not exist in this sense). Industrial cities were the forerunners of technopolises, which were the result of the fact that during the XX century, especially in its second half, the industrial order of industrial (or any other) production, which was formed initially in Western societies, quickly spread and introduced into the social, economic, and political life of many societies that initially had completely different ways of life. Significant influence on the development of the city in the industrial era had:

- a sharp increase in the attention of entrepreneurs to the achievements of scientific and technical thought and a fairly vigorous introduction of its latest products;
- development and intensive use of technical, technological, social, economic, political, urban and other mechanisms and institutions in the life of urban settlements;
- high concentration of labour, capital, science and technology in one place;
- an increasing role of cities.
As a result, there is a close connection between industrial implementation of technical innovations with economic efficiency and social context in specific urban settlements [3], which allowed us to talk about a new level of city, a new generation, not just an industrial city, but a technopolis.

2. Cities that are among the national leaders in the development of new technologies, which is aimed at solving national problems of an applied nature, allowing not only to determine the existing thematic priorities and potential of cities, but also to predict the trajectory of future technological development, to assess their vulnerability in the event of crisis events. For example, in Russia, the ENO Tomsk project is being implemented, located in the Tomsk agglomeration, which already contains factories and universities, and which is focused on the development of petrochemicals, electronic instrumentation, nuclear technologies, renewable natural resources, pharmaceuticals and medical equipment, etc. As part of this project, it is also planned to build several more factories, optimize the transport network, and create a network of city parks. [4]

The analysis of technological specialization is carried out at various levels: by individual types of organizations [5, 6], branches of production [7], regions and countries [8,9].

In this kind of research, cities are not often used as objects. In this regard, the work of Cortright J., Mayer H. [10], which analyzes more than ten cities in the United States where the development of appropriate high-tech is concentrated and concludes that despite the fact that all these urban settlements are focused on the development of high-tech industries, each of them has its own and very narrow specialization. For example, developers from Atlanta specialize in creating databases, from Boston specialize in computer technology, medical equipment, software, from Denver specialize in data storage technology, hardware and telecommunications software, and so on.

Noting this in their 2019 work, Streltsova E. and Kuzmin G. emphasize the importance of a clear understanding of the specialization of regions and cities for:

- determining the place of the region and country in the structure of regional, national and global technology markets;
- determining the future direction of knowledge development (technopolises are characterized by inertia towards new areas of scientific activity with the existing specializations);
- forecasting risks of technological crises [11].

Technoparks can be called a type of technopolises. The first technology park appeared in 1951 in Palo Alto (California, USA): Stanford University, in view of the difficult situation with state funding after World War II, leased part of the territory to enterprises that worked in various scientific fields, but mainly for the defense complex of the country, which provided them with profitable orders and state support. As a result the University received income and employment opportunities for its graduates, and enterprises were able to attract highly qualified specialists in various scientific fields, get specialized equipment, convenient transport and other location at low rents (later this was transformed into the world-famous Silicon valley). And by the end of the 50s of the XX century, there were already 12 technoparks in the United States, located in different States of America.

In the mid-50s, the first technology parks in Europe were created. By the mid-1980s, there were 21 technology parks operating in the UK, employing about 3,000 people. Another 30 were at the design stage. In France, by this time there were only 3 technoparks. The first German innovation and technology center was established in 1983. Then technoparks were created in other European countries – Italy, Switzerland, Austria, Denmark, and Portugal. And by the end of the 80s they appeared in other countries – Canada, Japan, China, etc. [12]

It should be understood that the strategy for creating technoparks should be related to creating competitive advantages for the regional economy. For this purpose, the technopark should form commercial, social, macroeconomic and political goals of its organization and further development. In order to create a technopark, the goals of its creation must be defined, the concept of its activity developed, political priorities and economic guidelines developed, and so on. [13].

Technoparks can be:
research (they conduct research, scientific and technical work, create prototypes; their main task is to create technologies to manufacture innovative products, commercializing them in the future);

- industrial (they lease production areas, lease equipment, etc.).

However, both technoparks can pose a threat to the ecology, as they often have an impact on the environment by carrying out scientific activities and conducting various studies.

Technologies, equipment, various types of production carry 2 risks:
1. on the one hand, all these processes are aimed at providing people's lives with a more convenient format;
2. impact on the environment is possible, and it often causes harm to it.

As a result, a natural question arises: what is more important for humanity, a comfortable life or life itself in general.

3. Eco-city as an unavoidable means of reducing environmental problems
The emergence of the eco-city concept was an inevitable response to the increasingly industrial type of urban settlements, which began to become an environmental, social, economic, etc. threat to their population.

As a result of the awareness of the variety of threats to themselves, as residents of cities, their population is quite expected to act in the direction of their neutralization. Therefore, it was quite expected that a new direction appeared in the development of urban areas — the construction of eco-cities (which has now become a separate strategy for urban development).

Violation of the principle of "peaceful coexistence" of man and nature in cities takes place simultaneously in two directions:

- on the one hand, the high concentration of residents, urban infrastructure and a number of other factors that distinguish urban settlements leads to significant pollution and degradation of the natural environment in the city;
- on the other hand, urban residents who are in an artificial environment themselves lose the skills to coexist with the natural environment, which, according to scientists, has a harmful effect not only on health, but also on the psyche of people. [14]

This became the basis for understanding the problem and forming a new concept of understanding the tasks and functions of cities – both for humans and for their natural environment.

For the first time the concept of "eco-city" was proposed by R. Register in 1987 [15] This is a city that consumes natural resources only in minimal quantities, commensurate with its needs, without draining the ecosystem. Eco-city is maximally independent from the environment, it receives energy and a number of necessary resources from renewable sources. The main way to achieve this is to create appropriate infrastructure, provided that the population will have a new way of life (walking, extensive use of public transport, concern for the environment, a rational approach to the formation of their lifestyle, etc.).

Voloshinskaya A. and Komarov V. allocate 2 stages of development of eco-cities [16]:
1. the concept of territorial and transport development (1980-1990). It is based on the ideas of improving environmental problems by reducing the direct use of various types of nature pollutants (fuel, harmful emissions into the atmosphere, garbage waste, etc.). As a solution to the problem, it was proposed to create a new environment for the population, focused on a correct, healthy lifestyle while reducing the use of transport, industrial facilities and resources, etc. One of the most famous examples of implementing territorial and transport approaches to sustainable urban development was the new urbanism movement that emerged in the United States in the 1980s as a counterbalance to growing motorization and uncontrolled urban sprawl [17]
2. eco-city concepts of the 2000-2010s. In the 2000s the problems that were caused by the scientific and technological revolution were partially solved; urban development already began to take into account the mistakes of the past. At the same time, new problems of cities appeared for the population: property stratification of urban areas, social inequality, loss of self-identity, dissolution
into an intensive urban lifestyle, etc. And the ecological development of the city began to be viewed through the prism of human life, when urban environmental problems were considered through the details of everyday life and the self-perception of the individual in the city.

However, like cities in the technograd format, eco-cities carry the threat of escaping from reality in their quest to find harmony with nature.

4. City of the future – smart eco-city (sustainable city)
The solution to the problems of technopolises and eco-cities can be their merging into one general concept based on an integrated approach, which should result in cities of the future in the format of a "smart eco-city". And they should be formed at the present time. Although there are already examples of such cities (Masdar city, Todmorden, Christchurch, Dongtan (Duntan), Tianjin, etc.), there are very few of them to start a systematic approach to implementing this concept on a global scale.

So, smart eco-cities are focused on:
1. the presence of parks and park areas (since, on the one hand, trees growing in them improve the air of the metropolis, absorbing carbon dioxide, on the other hand, they create a comfortable environment for recreation and leisure of citizens).
2. an efficient public transport system (public transport is a more environmentally friendly means of transport compared to a private car)
3. application of "green" technologies in the construction of buildings and residential buildings. In order to reduce the total consumption of water, heat and electricity in the construction of private and public buildings significantly, it is necessary to use eco-friendly, economical and energy-saving technologies.
4. a sound policy of the city authorities for disposal of garbage and other waste (it is necessary at the level of authorities to shape and control the implementation of policies for the efficient collection, disposal and recycling, the promotion of the secondary recycling development, the formation of ecological culture of the population, etc.).
5. a guide to the process of constant use of old and unused buildings to the needs of the city, which will allow better use of the existing area for some or other needs of the residents and the city without invading new territory, disrupting their ecological balance.
6. development and implementation of environmental programs and initiatives at the state and city levels with real support of people's initiatives from the authorities to improve life by holding various competitions, issuing grants for the development of technologies using renewable energy sources, supporting environmental initiatives for landscaping, cleaning territories, etc., contributing to the promotion of more environmentally friendly and socially responsible ideas [18]
7. development and use of new safe technologies and implementation of environmental principles in different spheres of activity [19]

5. Conclusions
Humanity is developing, and along with it, its idea of the way of life is changing. The tendency for people to live in cities leads to an outflow of residents from rural areas, to the emergence of new cities, to the expansion of existing cities to the level of megacities, and more recently to urban agglomerations.

All this cannot but lead to a negative impact on nature, given the strong concentration of a number of factors of anthropogenic impact on it, located within a particular city.

This understanding has led to the fact that in many countries the authorities have become aware of many issues related to urban development. And the result is the conclusion that the problem is not in progress, but in how to use it.

Therefore, it is necessary to:
1. use preventive methods when carrying out anthropological activities of a technological, technical or industrial nature, realizing and calculating the possible consequences of this activity on nature before it is implemented.
2. periodically consciously abandon technology (more often communicate "live", rather than by phone or other means of communication, walk to the destination on foot, reduce the presence in virtual space, and more actively explore real space, etc.);
3. put social values and joys above technological ones, using the results of technological progress to ensure maximum results of the former ones;
4. arrange the days of limited use of equipment and so on.

While the most important condition for ensuring the achievement of these and other similar postulates [20] will be the mentality change of the population itself. Until people learn to respect the world around them and understand that technological advances are a means, not an end, forcing numerous people to do all this will be very difficult.

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