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Urbanization and New Tasks in Architecture

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Abstract

Worldwide trends and strategies of cities development, creation of cities of tomorrow and renovation of current global fond of general plans. The scale of development and rate of population increase in cities, forecasted and existing changes in the global economy, examples and analysis of available approaches to sustainable design, ideas and resources to ensure a comfortable environment for a smart city for a habitant. Architecture and novel designs as well as new concepts of living in the city.

Keywords: *Urban planning, industrial revolution, social ability, mixed-use*

1. Introductions

The approaching of The Fourth Industrial Revolution was predicted by the scientists and businessmen as early as in 2011. It is evidence that humanity will have to adapt to the new industry 4.0, which will lead to changes in the areas of production, labor, life, and leisure. These changes will cover all kinds of life aspects: the labor market, the living environment, political systems, technological mode, human identity and many other facets. Calling into being by economic efficiency and the attractiveness of improving the quality of life, the Fourth Industrial Revolution carries the risks of increasing instability and a possible collapse of the world system, based on the principle of peaceful coexistence and economic cooperation of states with different social structures. In connection therewith, the approach of the concerned revolution is understood as a challenge, to which humanity will have to answer.

Materials and methods of the study

The researches of «An Approach for Promoting Urban and Architectural Potentials for Supporting Knowledge Economy, Case Study: Brisbane» were used for the study and indication of topics [1], indicative of the economic development strategies of the city of the tomorrow. «The NOW dilemma in Energy. The possibilities for Architecture and Urbanism» [2], affecting social problematics of the awareness on the existence and scales of environmental issues, «An Urban Oriented and Multilayered Experience on Architectural Education in (The Global World)» [3], which point at a new approach to training an architect, with a focus on concentration of sustainable principles in construction.

Theory / Calculation / Analysis

The founder and permanent president of the World Economic Forum in Davos, Klaus Schwab, characterizes the scale of changes as unprecedented for the history of mankind. The more tightly the physical world is connected to the digital, the more opportunities will appear for the universal control and monitoring of any changes and phenomena of the physical world [4]. On the one hand, there exists an opinion that this provokes an assignation from a person of his inner world, the lack of freedom to form his own personality, the segregation of humans, based on their identity, and, as a result, the polarization of human communities. On the other hand, the possibility of individual choice from a variety of new various affirmations and points of view can stimulate the development, disclosure of the characteristics of the inner world of a person, expanding the range of personality formation, including thank to the further growth of diversity and ease of creating human communities.

2. Urbanization

Modern ways and strategies of cities development, creation of cities of tomorrow and renovation of current global fond of general plans. Population growth in cities, examples and analysis of current urbanization models, ideas and resources to provide a comfortable environment for a smart city for a habitant. Architecture and new approaches to projection of habitation, new concepts of living in the city [5].

Urbanization is the growth of the urban population, which is due to technological advancement and creates new challenges in all areas of human life, in particular in architecture.

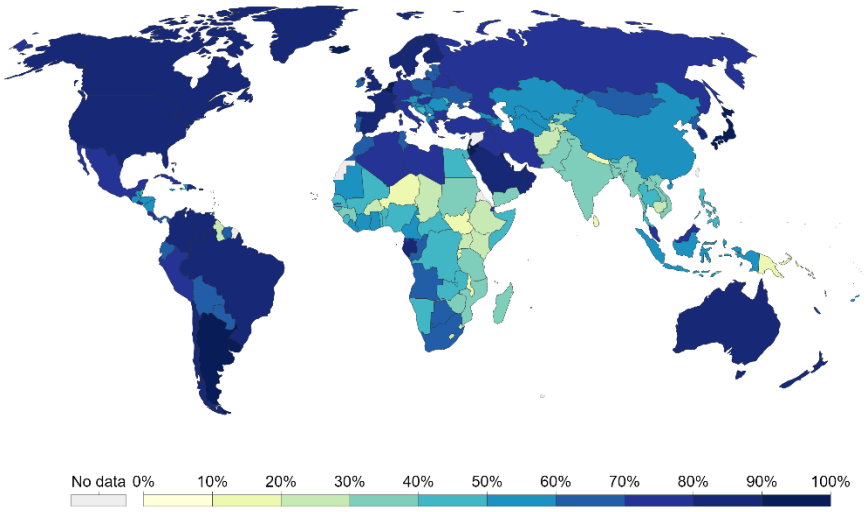

Fig.1 Current world population density, 2017

More than 55% of the world's population lives in an urban environment and this index is increasing year by year. It is predicted that the number of urban residents will increase to 68% by 2050. Such a large urbanization index points out that there will be a serious shift of residents from rural areas in favor of big cities. What is more, in 30 years, 2.5 billion people are expected to grow on Earth, and about 90% are in the population of Asia and Africa, according to the UN [6].

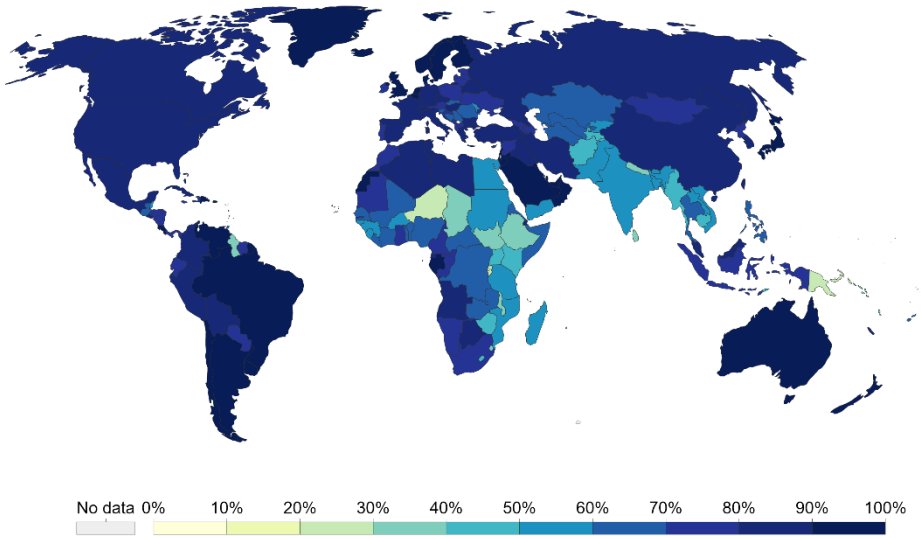

Fig.2 Predicted population density by 2050 according to UN information

Recently, in some cities located in Asia and Europe with low birth rates, the decrease in population has been observed. In these countries, the total population holds steady or slightly decreases. Two of these factors led to population loss in some of these countries: economic slack and natural disasters. The economic slack and the growing number of natural disasters around the world in the twenty-first century have a constant growth trend.

2.1 Sustainable urbanization

The principle of sustainable development is the key to the advancement of the environment. One of the overarching aims of urban analysts is to understand not only how people behave, but also how the interaction of many people leads to large-scale results in the urban system. This is the so-called "social science." The context of social sciences is quite extensive, covering almost all types of urban phenomena, from segregation in the neighborhood to changes in the world cover. Understanding the key urbanization trends that are likely to become unwrapped in the coming years is crucial for the implementation of the 2030 Agenda for Sustainable Development, including efforts to create new urban development frameworks. As long as the world continues to urbanize, sustainable development is increasingly dependent on successfully managing urban growth, especially in low- and middle-income countries, where, according to the forecasts, the pace of urbanization will be the fastest [7]. Many countries will face challenges in meeting the needs of a growing urban population, including housing, transportation, energy systems and other infrastructure, as well as employment and essential services such as education and health service. An integrated policy is needed to improve the lives of both urban and rural population, while at the same time strengthening ties between urban and rural areas, relying on their existing economic, social and environmental ties. In 2018, the capital of Japan - Tokyo - had the largest number of population among the capitals of the world - more than 37 million people. Delhi (India) followed with over 28 million; Mexico City (Mexico) - 21 million; and Cairo (Egypt) - 20 million. Around the world, the largest number of population composed of 1 to 5 million people. Over the past 50 years, many cities in the world have grown rapidly in terms of total population. For example, in 1950, 1.7 million people lived in Beijing. By 2015, the number of inhabitants increased 10 times, and composed more than 18 million. By 2035, a further increase of up to 25 million people is expected.

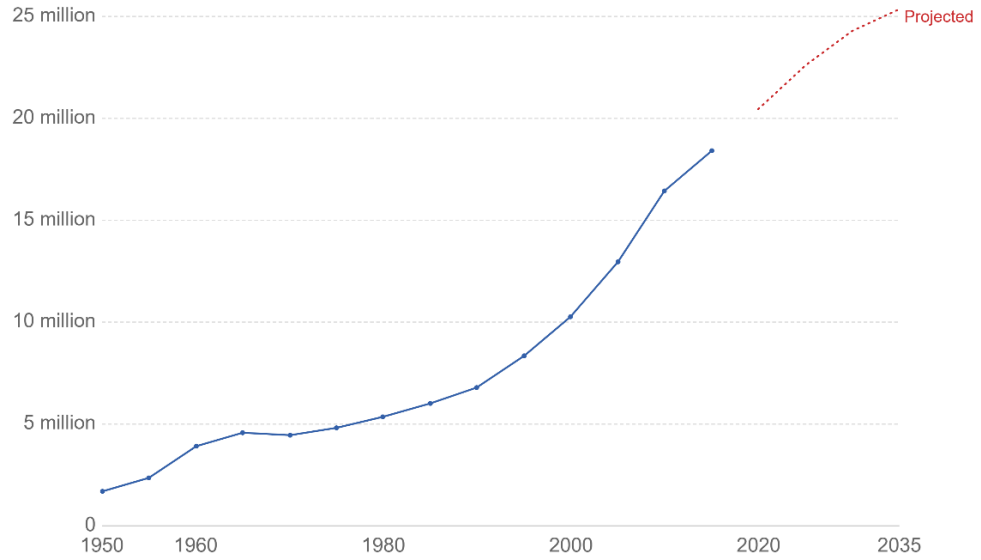

Fig.3 The current and predicted growth of the urban population, Beijing

Dhaka (the capital of Bangladesh) increased from less than half a million in 1950 to almost 18 million inhabitants in 2015 (and according to projections it will reach 31 million by 2030).

«The 2018 World Urban Renewal Review», prepared by the Population Division of the United Nations Department of Economic and Social Affairs (UN DESA), notes that in the future, an increase in the world's urban population will be vastly concentrated in only a few countries. Countries such as India, China and Nigeria will compose 35% of the predicted urban population growth between 2018 and 2050. It is supposed that by 2050, India will increase by 416 million urban residents, China by 255 million, and Nigeria by 189 million.

The world's urban population has grown rapidly from 751 million in 1950 to 4.2 billion in 2018. Asia, despite its lower level of urbanization, is a house for 54% of the world's urban population, followed by Europe and Africa, each of them has 13%.

Today, the most inhabited regions include North America (82% of whose population lives in urban areas in 2018), Latin America and the Caribbean countries (81%), Europe (74%) and Oceania (68%). The urbanization rate in Asia is now approaching 50%. In contrast, most people living in Africa are rural people, and only 43% of its population lives in urban areas.

In several cities in Japan and the Republic of Korea (for example, Nagasaki and Busan), during the period from 2000 to 2018 there was a decrease in population. Some cities in the countries of Eastern Europe, such as Poland, Romania, the Russian Federation, and Ukraine, have lost population since 2000. Apart from low birth rates, emigration has contributed to the

depopulation in some of these cities. Globally, according to projections, the number of cities will decrease from today to 2030, compared with the growth over the past two decades.

The rural population of the world has been growing slowly since 1950, and is expected to reach its climax in a few years. The world's rural population is currently approaching 3.4 billion. In 2018, almost 90% of the world's rural population lived in Africa and Asia. India has the largest number of rural population (893 million), followed by China (578 million).

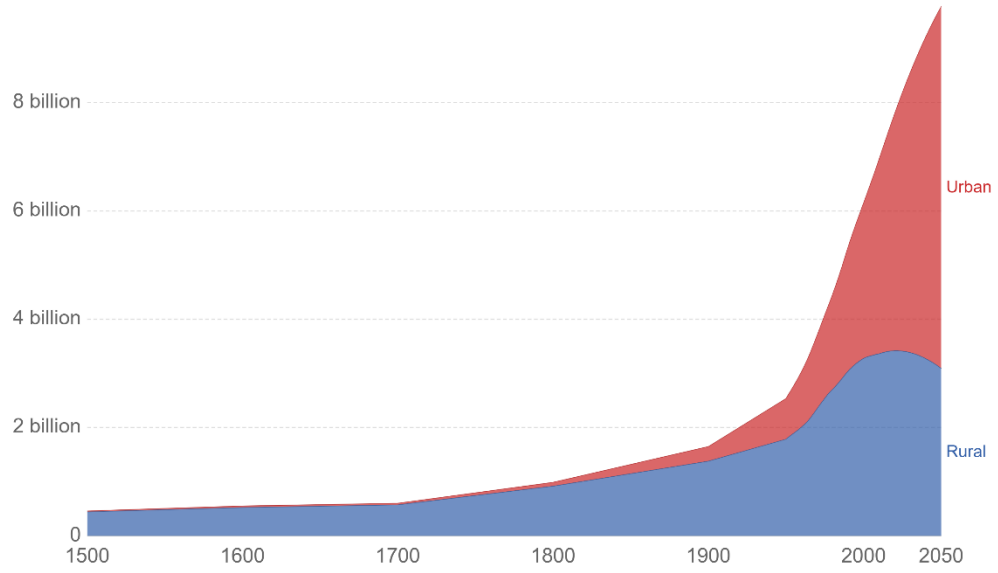

Fig.4 Comparative current and predicted characteristics of the ratio of urban to rural population until 2050, based on the UN database

2.2 Rating of cities and megalopolises

Tokyo is the largest city in the world with an agglomeration of 37 million inhabitants, followed by New Delhi with 29 million, Shanghai with 26 million, and Mexico City and Sao Paulo, each of which has about 22 million inhabitants. Today, about 20 million people live in Cairo, Mumbai, Beijing and Dhaka. By the year 2020, according to the forecasts, Tokyo's population will start to decrease, while Delhi will continue to grow and will become the most populated city in the world by 2028. By 2030, there will be 43 megalopolises with a population of more than 10 million people, most of them in developing regions. Although, some fast increasing urban agglomerations are towns with populations of less than 1 million people, many of which are located in Asia and Africa. While one in eight people lives in 33 megalopolises around the world, about half of the world's urban residents live in much smaller settlements with populations of less than 500,000.

In order to ensure the benefits of urbanization are fully shared and inclusive, urban growth management policies should provide access to infrastructure and social services for everyone, catering to the needs of the urban poor and other vulnerable groups in housing, education, healthcare service, decent work and a safe environment [8].

The urbanization is applicable to the increase in the number of people who live in urban areas. This predominantly leads to the physical growth of urban areas, whether horizontally or vertically. The United Nations predicted that half of the world's population will live in urban areas at the end of 2008. By 2050, according to estimates, 64.1% and 85.9% of the developing and developed countries of the world, respectively, will be urbanized. Urbanization is closely related to modernization, industrialization and the sociological process of rationalization. Urbanization can describe a specific condition at a given time, in other words, the proportion of the total population or territory in cities or towns, or it may describe an increase in this proportion over time. Thus, the term urbanization can represent the level of urban development in relation to the population as a whole, or it can represent the rate at which the proportion of urban population is increasing. Urbanization is not just a modern phenomenon, but a rapid and historical transformation of social roots on a global scale, when a predominantly rural culture is quickly replaced by a predominantly urban culture. The recent major change in the structure of settlements was the accumulation of hunter-gatherers in villages many thousands of years ago. Rural culture is characterized by common genealogical, close relationships, and community behavior, while urban culture is characterized by long-distance related lines, unfamiliar relationships, and competitive behavior. According to estimates, this historically unparalleled movement of people will continue and intensify over the next few decades, changing cities into dimensions incomprehensible a century ago. Indeed, more than 20 million people live in Asia in the urban agglomerations of Dhaka, Karachi, Mumbai, Delhi, Manila, Seoul and Beijing, while the Pearl River Delta, Shanghai-Suzhou, and Tokyo are projected to approach or exceed 40 million people each over the next decade. Outside of Asia, Mexico City, Sao Paulo, New York, Lagos and Cairo there are about or more than 20 million people.

3. Smart cities

Even now the architects face the tasks, requiring complicated solutions. Primary issues are global warming problems, predicting an increase in population up to 9 billion people by 2050, as well as the inevitable proximity to the exhaustibility of the most important natural resources, such as water. The situation is critical, as evidenced by the G7 summit, which took place in August 2019 in France. The following situation points up the fact that the architect has to pay attention to solving larger problems than ever. Society must be knowledgeable in sustainable development as well as in environmental friendliness. And in order to avoid collapse the urgent plan of actions is needed. It is quite difficult to predict what will happen on Earth in 30 years, but provisional hypotheses are frightening. In connection with urbanization, a lot of questions arise before a city planner, for example, how to provide potential residents of the city with the necessary quantity and quality of housing accommodations?

SMART city is a concept of the city that uses various information technologies for more efficient functioning and meeting the needs of its residents. SMART is the abbreviation of the first letters of English words:

S- specific

M- measurable

A- attainable

R- relevant

T- time-bounded

The basic characteristics of Smart city include:

1. A balanced management system in housing and municipal services (especially in water distribution and power delivery systems);
2. An automated and ecologically clean waste management system - the so-called "smart trash";
3. Sustainable mobility of citizens in the city - improvement of efficiency of the use of road network by both personal and public transport, the introduction of modern green transport and smart parking lots;
4. Digitalization and provision of reliable communications - creating an environment for easy interconnection and information sharing between citizens;
5. Citizen participation in urban management - electronic government;
6. Environmental protection - control of contamination and noise, the creation of "green" quarters;
7. Provision of commercial security in all directions of their living abilities – to form a "safe" city.

In the field of education and health service, to mainstream the so-called “smart” health care service, on the basis of the common use in medical industry, and to apply affordable e-learning in education.The area of architectural research for urban conditions of functioning of localities has a highly complex and comprehensive interdisciplinary orientation. This is due to the fact that they must simultaneously take into account all social and human aspects in a dynamically developing environment, with consideration to the spatial and temporal interaction between a large number of participants (from individuals, groups and to large formations, organizations and institutions). The most striking example of the development of the Smart city in the existing conditions is Barcelona. Thanks to modern technologies and the introduction of new management systems, residents can be proud of their progression and develop together with the city. Among key features of a Smart city are intelligent traffic management systems, an ecological approach to street lighting and stimulation of smart home technologies development, the introduction of urban Wi-Fi networks, smart public transport, the use of solar panels, etc.

4. The basic approaches in the design of Smart cities in Ukraine

Today the urbanization rate in Ukraine is 69.5%. According to the forecasts of “World Urbanization Prospects: The 2014 Revision”, by 2050 this index will reach 79%. This indicates that only one in five Ukrainians will live in rural areas. The current urbanization rate for Ukraine outweighs the world level. At the same time, experts predict a significant decrease in the population of our country by 2050. The total number of urban population of Ukraine, according to experts, will decline from 31.2 to 26.6 million. The same tendency is expected with a reduction in the number of rural population: from 13.7 to 7.1 million. The largest cities are Kyiv (the capital, 2.95 million inhabitants according to data as of January 1, 2019), Kharkov (1.44 million),

Odessa (1 million 13 thousand people), Dnipro (998 thousand people) and Lviv (756 thousand people). The main design solutions in this direction in Ukraine are as follows: reorganization of the existing environment; new construction on the scale of small residential areas, towns; the designing predominantly takes place in the conditions of existing building systems. Ukraine is a post-Soviet country that actively developed during the period of industrialization, through this process it is characterized by the problem of shuttle migrations, the lack of the necessary amount of environment improvement, unsteady transport loads, abandoned industrial areas and other objects requiring renovation. Sustainable development approaches are becoming increasingly relevant and require the introduction of global changes in regulatory and reference documentation.

Seeking for the creating trust relationships between the state and citizens, the Prozorro system was created, which opens up the access to money transfers from city budgets and the possibility of participation and competition in tender bids.

4.1 Kyiv

The capital of Ukraine is the largest city in the country, which was one of the first to experience problems in connection with the annual population growth. It was Kiev, which was among the first began to adopt the experience of other smart cities in the world in order to create an urbanized environment favorable to urban residents. Smart technologies operate in the service system in the subway, new transport interchanges are being repaired and laid, a large number of bicycle roads are laid in the city, new construction provides variability of comfortable housing with provision of urban amenities, new parks are laid, trees are planted and green areas for pedestrians are created.

4.2 Dnipro

Smart technologies for this city are following: WIFI trees; information display for tracking public transport and programs for their tracking, video monitoring that works swiftly along with emergency services. Public transport is actively developing in the city; in 2019, the city's transport scheme was overviewed and evaluated, according to which, no more than 19% of the population is planned to be transported by individual transport.

5. New approaches to the design of housing accommodations

The most global project is the design of new cities, such as Songdo. The urban design began in 2003, its estimated cost is approximately $ 40 billion, with an approximate number of population of 300 thousand inhabitants. Now only 70,000 people live in the city, but this does not prevent the city from gradually supplementing its functions and moving towards sustainable development [9]. The city is designed in such a way that it is not yet possible to project changes in the existing urban conditions. Effective and safe solutions for transport and pedestrians are taken into account, the distance from one remote point of the city to another can be covered in 20 minutes, thanks to public transport, the waste recycling systems are as automated as possible and these processes are not visible from the outside [10]. A sufficient number of public buildings have also been designed, each of which is an architectural landmark in the city and apparently creates its own intraregional "Bilbao effect". As far back as 2003, designers realized that remoteness from other developed cities is no longer a problem, thanks to high-speed transport and convenient highways, and then the scale of urbanization gradually absorb these distances and so that grow huge territorial agglomerations [11]. It seems that in a free territory it is more convenient to develop a concept for comfortable housing for residents, because literally there are no restrictions for designers. The main restriction is forecasting and implementation time. Now the city has the potential, attracts new residents and its development can no longer be stopped. In particular, Simpson (2001) has provided a comprehensive literature review of the application of virtual reality and simulation models in urban studies. As ambitiously as he has put it: "The combination of virtual reality, spatial modeling, and GIS, integrated into a real-time urban simulation, will allow questions to be asked that were not possible before, and better yet, answers to those questions."

What is happening in cities which arrangement and zoning has already historically developed, but does not function properly? Can the creation of objects and spaces change the situation for the better? For a start, let us consider the global possibilities of creating a new comfortable space in terms of the development of a residential area. Today, the design strategy for residential areas is changing dramatically. The one-time hot in the Soviet Union model for the arrangement of dormitory districts, distant from workplaces, which causes the phenomenon of "shuttle migration", is recognized as relevant. What is more, it causes traffic congestions and enormous environmental damage due to CO2 emissions [12]. The advanced model of the new residential area provides a structure of a sole organism; it will provide residents not only with housing accommodations, but also with job opportunities and a wide range of service functions. This model is no longer monofunctional .

Building height also extends away from previous stereotypes of "more is better". The percentage of the required area of improvement for each resident is increasing. A number of floors up to 7-8 shall be considered as comfortable. Each house is designed with a variety of content plans. Even counsel housing supposes facilities for the variability of space for different families; a model in which rich people live separately from the poor has long been recognized as utopian, it is believed that in order to create a truly comfortable environment, it is necessary to combine it. The design of large irrational areas or the design of non-ergonomic and small housing is no longer applied. The social areas in the communes of Paris are a good example of cost-effective and affordable housing, whereby they arouse admiration. Considering the courtyards of multistorey houses, they are no longer designed to be enclosed, they try to intertwine the landscaping of neighboring courtyards in such a way as to arrange a large green recreational area, parking lots are designed primarily underground, or moved outside the residential area as separate buildings [13]. Such changes in design help create favorable conditions for the coexistence of neighbors. In such a friendly environment, a person more often has a desire to take a walk with his family, where he or she feels protected while surrounded by greenery.

With ever-increasing frequency in order to satisfy social functions, a need arises for Mixed-use architecture. "Mixed-use" in translation from English means the combination, mixing and interaction of several functions in one object. Thus, it is possible to combine housing accommodation and public space in one building (offices, shops, maintenance rooms and premises of providing services). A frequent and global example is the combination of a huge shopping center on the ground floors and the construction of residential multistorey towers with direct connection. The philosophy of this design method provides for the construction of an independent complex that can satisfy all the needs of a person without leaving home. The towers create comfortable living conditions, offices provide job opportunities, the shopping center provides for the provision of services to people and access to all necessary resources. Such global projects also include multi-level underground parking and landscaping devices on the roofs of shopping centers. Through this process, you can get the highest efficiency coefficient and rationality of the building area.

6. Conclusions

Mixed-use architecture is one of the global examples of sustainable development, and in modern conditions it is implemented with the help of innovative environmental materials using renewable energy sources. Such a decision is quite inspiring and updated. However, will a human feel comfortable in such an environment ? In such a case, the architect start to work as a psychologist and try to predict the behavior of future residents of the area, so that during the implementation process it does not appear that it will not be effective in use. It is necessary to estimate all aspects of the life of a modern human [14]. Now there is a development not only of smart cities, but also of smart inhabitants, each of which is an active user of advanced technologies and every day strives to move and be present in the society: both in real and virtual. However, will a person feel locked in the system if to reduce his or her functioning during the day and to minimize the long ways to a minimum? How will he or she be influenced by limited number of neighbors, employers, colleagues, surrounding him/her every day? [15]

Topics in urban and architectural research are perhaps the most complex and comprehensive cross-disciplinary problems as they involve social and human aspects and are also both spatial and temporal interactions among different participating institutions. To continue the research, the authors intend to apply the methodology for assessing the quality of the living environment for reconstruction Projects of Ukrainian existing cities into smart cities, considered in [16,17].

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