

**MODERN ARCHITECTURE AS A PRODUCT OF THE
DEVELOPMENT OF A TECHNOGENIC SOCIETY**¹**N.R. Kubrysh,**

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Abstract. The article discusses the characteristic features of a modern technogenic society, the reasons for the formation of an extremely urbanized human environment – the technosphere and the influence of scientific and technological progress on the development of modern architecture. The complex processes taking place in the post-industrial world lead to the blurring of the boundaries of architectural styles, giving rise to new art forms and images, degradation of the biosphere and excessive urbanization – to an increase in demand for environmental friendliness, and the development of post-industrial socio-economic conditions stimulates the emergence of fundamentally new types of buildings and structures. Achievements in computer technology make it possible to create highly complex spatial structures, along with the fact that the problems of mass construction give rise to «average» approaches to the formation of a living environment. The contradictory appearance of modern architecture requires in-depth study and analysis of the ongoing internal processes in conjunction with the latest trends in the development of technogenic society. The identification of cause-and-effect relationships should create the preconditions for understanding the role of the architect in the modern world and the formation of a new, more tolerant «socio-techno-biosphere» of the future.

Keywords: technosphere, technogenic society, society, biosphere, scientific and technological progress, globalization, architectural trends, eco-architecture, «sustainable» construction, mass culture, multifunctionality, social housing.

Introduction and statement of the problem. The mass transition from manual labor to machine labor, which took place in the leading countries of the world in the 18th-19th centuries, marked the beginning of the 'Great Industrial Revolution' and the final transition of humanity to the technogenic path of development. The subsequent series of scientific and technological revolutions formed a social system, the life of which is carried out mainly based on science, technology, technology, and production.

Analysis of recent research. The gradual replacement of the natural biospheric world by an artificial technical and technological system leads to the creation of an extremely urbanized technosphere among human habitation. «The technosphere is purposefully created by people to gain independence from adverse factors of the natural environment and, moreover, a comfortable existence, that is, to meet the socio-economic needs of the population. The development of modern society is contradictory in its essence. On the one hand, technogenic development creates favorable conditions for the socialization of a person and the social progress of society as a whole, and on the other hand, the economic, scientific, and technical-technological (technogenic) rationalization of public life is rapidly approaching the time of an eco-technological earthly catastrophe» [1].

At the same time, in its evolutionary aspirations, mankind cannot ignore the achievements of scientific and technological progress, seeking to direct the results of the impact of the

economy, science, engineering, and technology into a humane channel. «While agreeing with all the arguments of the critics of the technogenic society, we often forget about what would happen if humanity did not begin to develop the technogenic society. Firstly, this would lead to the inability to withstand natural disasters, and secondly, to the inability to overcome great distances, which means that many civilizations would never know about each other's existence. Thirdly, people would be on the verge of an endless struggle for existence and the fight against hunger, all this would eventually lead to the complete extinction of the human race» [2]. In addition to the obvious advantages, a series of scientific and technological revolutions have introduced some global problems, such as weapons of mass destruction and the growing environmental crisis on a global scale. The presence of large-scale threats does not reduce the ever-increasing dependence of society on technologies that can improve and simplify life, the development of which creates new challenges and problems. Periodically recurring environmental and anthropogenic crises require a deep analysis of the causes of their occurrence, which, in turn, necessitates a more detailed study of the phenomena occurring in modern technogenic society, including architecture, as a determining force in the organization of the human spatial environment.

The purpose of the article to analyze the impact of technogenic evolution on the development of modern architecture, to identify the most characteristic areas of interaction between the technosphere and the architect, to identify trends in attempts to create harmonious relations between man and the surrounding world on specific examples of a progressive approach to solving architectural and urban planning problems.

Main material and results. The complex processes of development and reform of the post-industrial world affect all areas of human activity, including architecture.

Born in the last century on the idea that «creative expression should be free from historical baggage and generally accepted dogmas», modern architecture has rather quickly shed the bonds of classical techniques, subordinating architectural forms devoid of excessive decoration to functionality. Exploring the rapidly expanding markets of new socio-economic and industrial relations, it had to look for innovative ways of expressing herself, more accurately reflecting first the ruthless processes of industrialization, and after that also the globalization of the world community. The accelerated pace of technological progress has led to the emergence of many architectural trends (modernism, brutalism, constructivism, deconstructivism, minimalism, hi-tech, neomodernism), as a natural response to the ongoing reassessment of worldviews in the field of perception of the surrounding world and the corresponding change in the ideological foundations of creativity. The expansion of the technosphere, its integration with society and the biosphere, assimilating once incomparable concepts, blurs the boundaries of styles, giving rise to new art forms and images. Subtly plastic and, at the same time, ascetically pure, 'minimalist' outlines in the work of Zaha Hadid, 'brutal' fractures of D. Libeskind, 'modernism' of the intricate combination of forms by the Dane Bjarke Ingels, are just a small fraction of examples of the integration fusion of architectural styles and trends.

The degradation of the biosphere and the excessive urbanization of the habitat stimulate an appeal to nature-integrated architecture, declaring a «sustainable» direction in construction based on the use of energy-efficient, environmentally friendly technologies and materials. «Society's demand for environmental friendliness as a paradigm of recent decades forms the standards of eco-architecture and the requirements for a building to cause minimal damage to the environment, be inscribed in it, be a continuation of the natural environment – not only externally, in design, but also at the level of energy-saving technologies» [3]. The need to artificially reproduce the natural conditions of life within the tight boundaries of established megacities has led to the emergence of 'green buildings». One example of such a movement is the 'Vertical Forest' residential complex in Milan, consisting of two towers of 19 and 27 floors, on the balconies of which large-sized trees and shrubs were planted during the construction process. As a result, the artificially created area of green spaces is 5.5 times larger than the building area.

'Green' buildings are equipped with smart systems for saving energy resources, collecting rainwater. Solar panels are often installed on them. And there are always separate waste collection systems inside that do not interfere with the comfort of the inhabitants of the house. The category of structures based on the principles of sustainable construction includes structures of various types, combining seemingly incompatible functions in their purpose. So, the 'Copenhill' park in Denmark, which was created on the roof of a waste-burning power plant, is an example of the efficient use of urban space. On one side, you can ski on the roof of the building. And, on the other side, there is a park with 7,000 bushes and 300 trees.

Largely based on energy efficiency, green building has become one of the key current trends. The need to identify and validate the benefits of such construction led to the development of special assessment systems and, as a result, – to the emergence of 'green standards': BREEAM, LEED, DGNB, etc. The existence of several international green certification systems that determine the compliance of a property with certain criteria, such as electricity and water consumption, quality of management, provision of indoor and outdoor comfort (lighting, noise, etc.), territorial location, waste management, etc., is used primarily to prove the quality of the real estate. At the same time, this is comparative testing of new technologies for subsequent implementation in new construction projects. With its rating for investors, the expediency of certification for commercial real estate objects aims to increase the competitiveness of the object in the market, reduce investment risks, reduce operating costs, increase capitalization and reputational qualities. At the same time, the characteristics of the indoor environment, such as high quality of premises, good daylight, low noise level, are significantly improved. In addition, 'green' buildings contribute to the people's health living or working there. In general, the development and implementation of green building standards, rationally using material and financial resources at all stages of implementation, is an instrument of a reasonable economy, stimulates business, the development of innovative technologies, improves the environment, and, as a result, the quality of life of society.

The principles of universal democracy and social equality that prevailed with the development of new, post-industrial socio-economic conditions significantly expanded the circle of consumers of architecture, and a sharp increase in public demands led to the need to rethink traditional construction objects and the emergence of fundamentally new types of buildings and structures in terms of their functional purpose. The emergence of ultra-modern transport and transshipment hubs, large and small industrial complexes, technology parks, shopping and entertainment, sports, concert, exhibition centers, administrative and office buildings, skyscrapers, etc., the increased demand for the multifunctionality of structures, put forward many new requirements for the organization spaces. This is how the «Gardens of Eden» by British architect Nicholas Grimshaw appeared – an indoor botanical garden that became part of the Millennium program. It was designed in purpose to demonstrate the global connection between man and the plant world. The original design of «Gardens of Eden» was inspired by soap bubbles that easily adapt to any surface they land on. One of these 'bubbles', although not much heavier than the air inside, contains the largest rainforest outside the tropics. Inspired by the prints of Dutch graphic artist Maurits Cornelis Escher and public spaces like the Spanish Steps in Rome, the «Heatherwick Studio» architects behind the «Vessel» project have created one of the most complex and large-scale architectural structures in steel. New York City's unique staircase maze looks like a giant honeycomb, with 154 staircases and 80 platforms that house restaurants, retail space, and entertainment areas. The first in Europe and the largest underwater restaurant in the world opened its doors to visitors in Lindesnes, Norway. «Being in 'Under», you can be both: under the water and above its surface, which gives you the opportunity to look at the world from different points of view» – states the author of the project from the architectural firm «Snøhetta». There are a lot of similar structures that profess new standards of thinking and, as a result, combine previously incompatible functions and spaces in the modern world.

The growing economic rationalization of the technogenic society with the development of market forms and methods of management inevitably leads to the strengthening of commercial approaches in construction. Increasingly, the architecture of buildings and structures is evaluated from the standpoint of its marketing qualities, and the expressiveness of the appearance of streets, squares, urban areas – from the side of influence on the formation of the value of the real estate. «The criteria for the marketing evaluation of architectural objects are becoming increasingly important for architects. At the same time, the context is rarely taken into account - cultural and historical traditions, the style of the surrounding buildings, its scale, features of landscape conditions» [4]. Architectural fashion, as a temporary predominance of tastes in society, is increasingly defined not by professionals, but by realtors, as proof of the positive qualities of real estate. The Internet is primarily used to form public opinion, while the architectural idea and the logic of building a three-dimensional composition are often ignored. And the main attention is focused on the appearance of buildings as the main measure of their architectural merits. Increased attention to the aesthetic component of the real estate market stimulates additional investment in architectural developments, which has a positive effect on the development of architecture as a branch of economic relations at the same time.

The commercialization of construction along with practicality and economy has increased the need for extraordinary, frankly defiant architectural images as an advertising component of the real estate market. «The original architectural structures are an effective advertisement which is actively used by manufacturers of luxury goods, banks, and other customers of exclusive architectural objects» [5]. This approach is especially widespread in the field of industrial architecture. Waste recycling plant 'MOR' by the famous architect Friedensreich Hundertwasser on Mishima Island, Osaka, Japan; McLaren Manufacturing Center designed by Foster Partners; the factory for the furniture manufacturer Vestre in the Norwegian forest, designed by the Danish architectural studio BIG - all of them is a vivid example of an extraordinary approach to creating the appearance of industrial buildings taking into account the initial advertising load. Also, while promoting investors' trademarks project, authors advertise themselves, demonstrating to the architectural community additional opportunities for self-realization in such mutually beneficial cooperation. The ongoing processes of commercialization of social relations have significantly complicated the design process and led to a rethinking of the creative foundations of architectural shaping. At the same time, the growing synthesis of the arts, based on the latest achievements of science and technology, reformed the usual views on the art world and its aesthetic principles. Several software projects have appeared that systematize the new possibilities of architecture and offer fundamentally different approaches to its formation. Modern architecture is replete with many original buildings – the iconic embodiment of the innovative ideas of the CCTV headquarters (architects – Rem Koolhaas and Ole Scheren); the concert hall in the Spanish city of Santa Cruz de Tenerife (architect Santiago Calatrava); the Guggenheim Museum in Bilbao (architect Frank Gehry), etc. Kinetic architecture is becoming more and more widespread along with traditional types of buildings. Thus, the project of the 'The Dancing Pavilion' is based on the results of Estudio Guto Requena's decades of research in the field of architectural space transformation through the integration of real and virtual worlds, the use of sensors, and interactive technologies. The received information was transformed into the movement of facade panels and the building «dances» with the same rhythm as the visitors. Arising at the beginning of the new millennium at the intersection of architecture, sculpture, biology, mathematics, and high technology the direction of «parametric» architecture allows you to create forms as close to organic ones as possible. A prominent representative is the Heydar Aliyev Center in Baku, Azerbaijan by Zaha Hadid Architects, which combines architectural and symbolic components surprisingly harmoniously. Or «Smart City» – a city similar to an organism with all the senses and a mind capable of improving, accumulating, and analyzing information. The concept of a «smart city» was discussed in the 90s for the first time, when it was understood

that the future is in the development of IT technologies. Designed by Italian architect «Stefano Boeri Architetti», «Smart Forest City Cancun» in the suburbs of Cancun, Mexico will produce independently food, energy, and fresh water. The 'smart city' will provide housing for 130,000 people, and the typology of houses will cover various categories of residents. The future settlement is intended to become a center for advanced research in six areas that solve the leading problems of modern society – bio-health; astrophysics and planetary science; restoration of coral reefs; agriculture and regenerative technologies; and mobility and robotics.

In connection with the growing demands of the technogenic society, it is difficult to overestimate the importance of the latest information revolution when mankind received a computer and the Internet. The use of electronic networks and technologies has fundamentally changed the course of history, opening up new horizons for the development of technogenic society. In the field of practical architecture, computerization has made it possible to carry out virtual modeling of objects under development, to optimize and improve the design process, bringing it to a qualitatively new level. Advances in computer technology have made it possible to develop designs for super-complex fractal structures, nature-like objects, high-rise structures, and the use of the latest building construction technologies, ultra-modern structural and finishing materials, their implementation in nature. So, designed for architects, designers of load-bearing structures and engineering systems, the principle of building information modeling BIM (Building Information Modeling) provides the possibility of three-dimensional modeling of building elements and flat drawing of design elements, creating custom objects, organizing joint work on the project, starting from the concept and ending with the release of working drawings and specifications. The high-tech organization of labor in the construction industry made it possible to implement inaccessible previously ideas and plans in the form of structures. The latest scientific and technical developments are involved for the successful construction and trouble-free operation of them. Together with a purely applied use, computer technology and the Internet make it possible to expand the educational qualification of the population in terms of the perception of architectural creativity as an art. This is especially important in the emerging «consumer society» where the criteria for evaluating architecture by professionals, investors, and users differ significantly.

It seemed that the totality of the processes of the technical and sociological genesis that took place led to a revision of the fundamental foundations of aesthetics itself. As the science of the objects of sensual contemplation of the world by a limited circle of the elect, incorporating the concept of «mass culture», – the cultures of the majority – cultures of everyday life, entertainment, and information. The mass culture, including the mass media (television, radio, internet), sports, cinema, music, mass literature, fine arts, etc., using the undeniable quantitative advantage of its supporters, is aggressively attacking the elite positions of the underground, winning more and more frontiers. It soon became the predominant direction (mainstream), as opposed to the simultaneously existing underground dictates its simplified views of the world. At its core, mass culture is designed for the «average» level of development of the mass consumer, formed through the cultivation of its stereotypes. In architecture, this complex social phenomenon actively manifested itself in the 20th century, as a response to the shortage of housing in Europe destroyed by the Second World War. The necessity to provide the population with affordable housing has brought to life the massive construction of prefabricated multi-story residential buildings from prefabricated products based on reuse projects. As a result, the industrialization of the construction industry has led to the appearance of inconspicuous, serial buildings, with the same type of social facilities (kindergartens, schools, clinics, etc.). Over time, the socially and economically ineffective type of construction was replaced by other, more flexible design schemes and technologies that required a return to individual design methods. The changes that have taken place have contributed to a change in the architecture of the residential environment in the direction of diversity. However, its 'averaging' principles of formation do not

allow them to overcome the standardized nature of the approach as a product of a mass culture with assembly-line production. The emerging trend towards the loss of ensemble building only emphasizes the imperfection and inferiority of the consumer approach to mass architecture.

Along with the dynamic growth of mass construction, the number of buildings where the architecture is of an elitist nature is increasing, marking the degree of the prestige of certain parts of society in a complex social hierarchy of consumption. Some of them, taking advantage of the unlimited budget and the ability to attract leading architects, are conceptual models that predetermine the direction of future architecture. The existing antagonism between satiety and simplification leads to the inevitable interpenetration of the two approaches, as a result giving rise to the prerequisites for the formation of a new, more tolerant cultural ecosystem in general. The emerging trends are confirmed by the emergence of many public and residential buildings, the principles of accessibility, and social equality of which are put at the forefront. So, the public park 'Superkilen' in the multi-ethnic district of Copenhagen is conceived as a giant exhibition of the best urban practices of 60 different nationalities and countries of immigrants they came from; the residential complex «Arches of Boulogne» built in the western suburbs of Paris is a project that declares a new approach to social housing. As conceived by the architect Antonini Darmon, the principle of placing such buildings next to elite houses and their appropriate appearance should prevent the emergence of new ghetto districts. Vivid examples of tolerance also include modern skyscrapers, where ordinary shopping and entertainment centers, fast food and luxury hotels, prestigious restaurants coexist in one building; public viewing platforms coexist with fabulously expensive apartments.

In the context of the continuous development of building technologies aimed at reducing construction time, increasing the period of operation of structures, saving labor costs, and working time, the progressive focus of 3D printing technology should be highlighted. '3D printers are used in many industries such as medicine, mechanical engineering, foundry, radio engineering, and electronics. Their main advantages are the creation of objects with high accuracy and speed without the use of manual labor, as well as the ability to create objects and structures from a 3D model. The construction industry is no exception to the application of 3D printing. The technologies and devices for printing both small architectural forms and the whole buildings, in general, exist nowadays.' [6]. New technology expands the boundaries of possibility in architecture. With the help of a 3D printer, an architect can model the facade of a building or even a city; 3D printers are indispensable in areas that often suffer from natural disasters and where it is required to provide a large number of people with new housing in the shortest possible time. At the same time, it should be noted that the scope and possibilities of this type of construction have not yet been sufficiently explored by architects, of course. But they open up new horizons for new technology, especially taking into account the space expansion of mankind where traditional construction methods are simply unsuitable.

Conclusions and research prospects. The complex processes of development and reform of the post-industrial world affect all areas of human activity, including architecture as a determining force in the organization of the spatial environment. The ongoing changes are ambiguous, often contradictory. Under the influence of the scientific and technological process, the language of modern architecture has become much more diverse and inventive in the choice of means and methods for expressing creative ideas over the past decades. 'The concept of sustainability (die Nachhaltigkeit) is becoming increasingly important in the creation of modern architects and urban planners, engineers, and technologists, working in various fields of design and construction activities, the creation and production of new materials, structures, and technologies. Every year the number of projects and buildings called sustainable, «green», eco-sustainable, environmentally friendly, energy-efficient, and other similar terms are growing [7]. Along with many positive transformations, the development of technogenic society raises many new questions and challenges, the solution of which depends on the success of the integration of

the developed architectural and urban planning formations with the natural environment, the creation of a balanced system of harmonious relations between man and the surrounding world. The globalization of modern technogenic society, the result of the mutual influence of bio and technospheres, requires careful analysis and study with the identification of cause-and-effect relationships that affect the development of modern architecture.

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**СУЧАСНА АРХІТЕКТУРА, ЯК ПРОДУКТ РОЗВИТКУ
ТЕХНОГЕННОГО СУСПІЛЬСТВА**¹**Н.Р. Кубриш,**

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Анотація. У статті розглянуті характерні риси сучасного техногенного суспільства, причини формування гранично урбанізованого середовища проживання людини, – техносфери і вплив науково-технічного прогресу на розвиток сучасної архітектури. Складні процеси, що відбуваються в постіндустріальному світі призводять до розмивання меж архітектурних стилів, народжуючи нові художні форми і образи, деградація біосфери і надмірна урбанізація, – до зростання попиту на екологічність, а розвиток постіндустріальних соціально-економічних умов стимулюють появу принципово нових типів будівель і споруд. Досягнення комп'ютерних технологій роблять можливим створення надскладних об'ємно-просторових структур, поряд з тим проблеми масового будівництва породжують «усереднювальні» підходи до формування житлового середовища. Суперечливий образ сучасної архітектури вимагає поглибленого вивчення і аналізу внутрішніх процесів, що відбуваються, у взаємозв'язку з останніми тенденціями розвитку техногенного суспільства. Виявлення причинно-наслідкових зв'язків має створити передумови до розуміння ролі архітектора в сучасному світі і формуванні нової, більш толерантної «соціо-техно-біосфери» майбутнього.

Ключові слова: техносфера, техногенне суспільство, соціум, біосфера, науково-технічний прогрес, глобалізація, архітектурні течії, екоархітектура, «стале» будівництво, масова культура, мультифункціональність, соціальне житло.