Innovative Concepts of the "Anthropocene" Era in the Context of Restoring the Natural Balance: Sustainable Approaches

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Abstract: The article discusses new concepts in theoretical research and design and experimental developments that take into account the causes of the manifestation of dangerous factors of damage to nature as a result of human activity in the era of the "Anthropocene". The relevance of the modern strategy of environmental safety of life related to climate change and possible scenarios of consequences, general issues of environmental protection with the maintenance of bio-balance are noted. Global social projects conditioned by political and economic conditions are considered. Some of the latest trends in architecture and a concepts of solving this problem, as well as tools for the formation of a living space in conditions of environmental danger, have been identified. Strategic approaches to restoring the natural balance using technologies that control climate change or correction are disclosed. Innovative solutions to prevent the irreversible process of global warming and technological advances for managing the planet's climate change are considered and sustainable approaches to water resources management are identified. A systematic approach to protection against melting of the Arctic ice cover and a complex structure for monitoring and correcting the convection flow of ocean water considered. The methods of eliminating the consequences of the "Anthropocene" in the restoration of an ecosystem in the natural environment are revealed: the transformation of a "lifeless" ecosystem, the restoration of forests and drained swamps, and the formation of agricultural biodiversity in the context of food security.

1 INTRODUCTION

A lot of significant changes that the world has been going through lately have devastating consequences. Wars, migrations, terrorism, poverty, lack of education, climate change, environmental pollution, health problems and economic crises, which are intensifying along with the pandemic, profoundly affect human life. The significant transformations that have taken place in agriculture and industry, transport and the growth of logistics, population and military technologies have also caused global environmental crises. The destruction of well-defined structures in all spheres of life leads to disruption of current functions and rapid serious transformations in nature and society (Saprykina, 2020).

At the same time, the growing human activity, which has reached a high level, becomes the basis for a planetary change in the environment. To designate a period of time in the conditions of environmental risks for the natural and anthropogenic systems of the planet, the term "Anthropocene" epoch is used, which became widespread at the beginning of the XXI century in various fields of knowledge and activity.

The epoch of the "Anthropocene" is seen as a challenge to civilization in the face of environmental risks. Modern research highlights some of the main features that determine the shape of the future in the era of the "Anthropocene": climate change, new technologies in the field of nutrition, changes in the infrastructure of cities and dwellings, the transition to renewable energy sources, migration of species and controlled manipulation of the gene fond. As global warming becomes the defining context of our lives, it is important to reconsider our relationship with both the past and the future.

The consequences of an increase in atmospheric temperature lead to the melting of glaciers, which changes the ocean level and threatens the infrastructure of coastal cities and navigation. At the

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same time, the boundaries of climatic zones are changing, the migration of some species of fauna accelerates their extinction due to the development of new territories and poaching, which affects the spread of viruses. As a result of the changed composition of the soil, some lands become unsuitable for agriculture or even for life, and infrastructures adapted to the climate prevailing in a particular area before require serious updates.

All these tendons are already present in our lives. These features are also found in the long-term unpredictable perspective of the development of relevant events and in their global nature. This includes climate change with possible scenarios of consequences, general issues of environmental protection with the maintenance of bio-balance, as well as global social projects conditioned by political and economic conditions (Yesaulov, 2021).

In this regard, it is especially important to consider new ideas in theoretical research and design and experimental developments that take into account the causes of the manifestation of dangerous factors of damage to man and nature in the era of the "Anthropocene". This makes it possible to identify tools for the formation of a living space in conditions of environmental danger, as well as some concepts for solving this problem. In addition, this approach allows us to outline new approaches in the theory of architecture to the development of principles for the formation of living space, using fundamentally new modern scientific paradigms and methods (Travush, 2006).

The narrative "Anthropocene" is a concept focused on the future rather than the past. It touches on very topical topics and suggests certain tools for solving problems of deliberate human intervention in the geological and ecological processes of the Earth. The thesis about the epoch of the "Anthropocene" changes the idea of architecture, which contributes to the symptoms of this new era by developing new tools and mastering the knowledge necessary to prevent the consequences of environmental risks for the future of the planet.

The influence of habitat factors of this epoch here is related to the general problems of architecture in the field of optimization of artificial living environment as an alternative ecosystem. The consideration of new concepts in theoretical research and design and experimental developments, taking into account the causes of the manifestation of dangerous factors of damage to nature as a result of human activity, is becoming relevant. In this study, approach to solving this problem, taking into account the peculiarities of the "Anthropocene" are, allowed us to identify some innovative trends in architecture.

2 MATERIALS AND METHODS

2.1 Technologies that control climate change or correction in connection with the restoration of the natural balance

Climate migration of people who voluntarily move due to sudden hazards is associated with situations such as floods, storms, forest fires or extreme temperature conditions. Thousands of people are leaving their homes due to gradually advancing dangers, such as drought or coastal erosion associated with rising sea levels. It is assumed that millions of people will face migration movements and, as a result, expand the occupied territories and eventually may damage wild untouched areas of the world, destroying the habitat. Society is trying to solve these problems by using innovative technologies that allow for changes or adjustments to the climate on the planet or in certain areas (Saprykina, 2021).

Innovative solutions to prevent the irreversible process of global warming.

Recently, there has been increased attention to the problem of global warming and its tragic consequences, which often become catastrophic. The irreversible process of global warming causes natural disasters all over the planet. Some experts believe that to solve this problem, it is necessary to adopt only a "global strategy".

In this regard, to reduce the temperature on the planet, a solution is proposed in the form of creating a huge greenhouse skyscraper between the sun and the earth "Global Cooling" (architects Paolo Venturella, Cosimo Scotucci) 2016 (Italy). The developed unique and continuous structure over the entire surface of the Earth has consoles on both sides. Due to the accumulation of warm in the glazed structures, the air naturally passes from hot to cold, creating fast and strong flows. These streams carry hot air far away from the Earth's surface, cooling the temperature of the entire globe.

Air flows restore favorable climatic conditions and, in addition, generate renewable energy sources by wind turbines located inside the structure. The grandiose structure, according to the authors, makes it possible to solve the acute issue of maintaining ideal climatic conditions, as well as obtaining clean energy (Venturella, Scotucci, 2016).

Another concept is related to the consequences of global warming, when many coastal cities on the planet will be under water after the melting of the polar ice caps. To save such cities, many architects offer various ideas. In the project "Global Warming City" (architects Sinan Gunay and Mustafa Bulgur) 2010 (Turkey) it is proposed to create a number of structures attached to existing skyscrapers to create a second above ground level. The idea is to use the infrastructure to form a secondary city at an altitude of 70 meters above sea level instead of preventing flooding (Gunay, Bulgur, 2010).

Technological advances for managing the planet's climate change.

The natural balance is changing at a rate exceeding most scientific forecasts due to warming oceans, air pollution, climate change and others. The effect of using some of the latest innovative technological advances from around the world is not only to counter current environmental problems, but also to provide a living environment for people affected by climate change. The solution to this problem is carried out by the creation of independent complexes designed to stop the process of climate change and its impact on the environment.

Global cooperation and unity of nations aimed at these global circumstances through the exchange of technologies and knowledge led to the creation of the "Heal-Berg" project (authors Luca Beltrame, Saba Nabavi Tafreshi) 2017 (Italy, Iran). The concept of the project consists in the formation of independent complexes from the point of view of energy supply and mobility, designed for the process of restoration and climate change and being a source of clean energy, which completely frees the environment from pollution. (Beltrame, Tafreshi, 2017).

According to the authors, the technologies used in this complex function in four procedural directions: purification as the conversion of carbon dioxide into oxygen by laser treatment and ocean water cooling; energy generation by disbanding electricity from wind energy by two streams of water with a difference in salinity (a specific aerodynamic design is proposed for directing wind flow through turbines); the use of the most durable and lightweight construction material graphene; fast transportation and connection using drones, as well as the mobility of residential units between different complexes.

2.2 Sustainable approaches to global management of water resources and marine currents

A systematic approach to protection against melting of the Arctic ice cover

The problem of melting Arctic ice is associated with the intensive reduction of the northern ice cover of the mainland and the melting of permafrost, which provides easier access to natural resources. This leads to an increase in human activity, which can threaten fragile ecosystems and wildlife (Bezhan, 2020). The solution to this problem is proposed in the project of the "Earth Umbrella" system (authors Hatton Sun, Zonghao Wu, Fan wei Jia) 2018 (China), consisting of three system structures. In order to reduce reflected solar radiation, a shading system has been developed that can play a role in preventing further melting of glaciers. Replacing disappearing glaciers with equivalent artificial ice can also contribute to glacier regeneration by re-melting it.

The frozen earth cooling system consists of a metal tube buried in the ground and a long vertical pipe in the tower, as well as a radiator with a high location. Liquid ammonia is supplied to the pipeline system, which evaporates to absorb heat, is transported up by air and liquefied, and then sent back through the pipeline to the permafrost. At the top of the tower there is a huge cleaning system for coal ash (soot), which is a climate pollutant and is considered the cause of warming due to a decrease in the area of the reflecting surface of ice and snow, making it dark. This reduces the ability of these to reflect sunlight (Sun, Wu, Jia, 2018).

Integrated structure for monitoring and correcting the convection flow of ocean water

As a result of the melting of the ice sheet in Greenland, the salinity of the water becomes lower, which is an obstacle to the convection flow of ocean water in the north direction. Therefore, the North Atlantic current is in danger of stagnation. In this regard, the project "Re-Fluxing: Skyscraper in Greenland Aids Recovery Of Ocean Currents" is proposed (architects Zhou Luqing, Tian Runjia, Xu Ziyi, Zhang Yaxuan, He Chuyue, Cai Yanqi, Zhu Sunqi, He Run) 2018, (China). It is a complex structure that is designed to monitor and adjust the difference in salinity of water at any depth of the ocean. The complex is located in the Atlantic Ocean in the south of Greenland, where water circulation has problems with energy exchange, and the zone itself is a sinking area. This contributes to maintaining a stable course of water flow, restoring cracks and protection the ice sheet, and in the future, saving water.

The object consists of two ring structures relatively connected in space, along which seawater continuously circulates. The large ring is designed to

separate mixed sea water, and the smaller ring is for obtaining fresh water. Fresh and salt water is separated by using a desalination process during freezing, using a low temperature. Salt water with a high concentration is drained through antenna pipes into the sea. Part of the fresh water is transported to a small ring for storage as drinking water; the other part is transferred to an ice shell for its processing. The low temperature at the North Pole and the height of the giant structure provide a natural advantage for seawater liquidation (Luqing, Runjia, Ziyi, Yaxuan, Chuyue, Yanqi, Sunqi, Run, 2018).

2.3 Elimination of the consequences of the "Anthropocene" in the restoration of the ecosystem in the natural environment

The most important reaction of the epoch of the "Anthropocene" is the idea of organizing a common space for man and nature in the context of coordination between the acceleration of scientific and technological development and the economy of natural resources. To maintain a balance between human needs and natural processes in nature, it is necessary for society to strive for its lean production in an environmentally oriented technological development (Gasanov, Kolotov, Demidenko, Podgornaya, Kadnikova, 2017).

Transformation of a "lifeless" ecosystem and recreation of forests.

Due to the increasing intensity of fires caused by human activity and climate change, a big environmental problem arises. In the case of large and severe forest fires, the complete destruction of the ecosystem and, in some cases, the impossibility of its restoration is characteristic. The project of the skyscraper "Regenera Skyscraper" (author Alberto Roncelli) 2020 (Italy) is designed to implement the process of restoring ecosystems and recreating forests.

Located in the center of the burned ecosystem, the facility, aimed at spreading nutrients and seeds to the wind, accommodates a temporary shelter for birds and small animals. The skyscraper will accompany the surrounding ecosystem at all stages - from the burned forest to its complete restoration. It is through the destruction of its own structure and, consequently, due to its decay, this skyscraper can transform and develop, spreading in the ecosystem.

At the initial stages, the skyscraper laboratory, located on the lower level, is engaged in experimentation, monitoring and research of the current process and development of the ecosystem. At the next stages, scientists leave the skyscraper, which allows it to be repopulated with small and medium-sized animals and plants. In the process of regrowth of the forest, the skyscraper self-destructs.

The new concept proposed in this project makes it possible to carefully program and diversify each part of the structure, defining its life cycle in order to understand the needs of each "lifeless" ecosystem. In the end, according to the author, the constantly transforming object "Regenera" is trying to become a manifesto for a new possible way to connect architecture and nature, structure and ecosystem, time and erosion, skyscrapers and forests (Roncelli, 2020).

Solving the problem of restoring areas of drained swamps.

The massive development of swamps, which began in the middle of the last century by draining them, led to irreversible consequences, such as fires, drought, soil degradation and the complete destruction of some species of animals and plants. Swamps are the "lungs of the planet" - they absorb carbon dioxide and constantly release oxygen. In this regard, the purpose of the proposal "The Floating Tower" (authors Piotr Yurchanka, Alexey Kunko, Vladislav Sidorenko, Dmitry Tkachuk) 2019 (Belarus) is the restoration of drained swamps by abundant irrigation of these lands.

The resuscitation object in the form of a spherical structure floating in the air can develop and form depending on the specific task. The structure consists of two spheres connected by a system of cables. The upper sphere, which is responsible for the movement of the entire structure through the air, is a high-tech ball covered from the outside with a membrane fabric in which condensate accumulates. This allows you to collect thousands of liters of water per day. The lower sphere is a reservoir for the accumulation of this water and irrigation of future swamps. From the upper sphere, water moves to the lower part using a special system of pumps and cables. In addition, inside in the upper and lower parts of the structure there are research centers, laboratory rooms and wards for short-term stay of people (Yurchanka, Kunko, Sidorenko, Tkachuk, 2019).

Formation of biodiversity of ecosystems and agro-cultures in the context of food security.

The world's food production is largely dependent on an extremely small number of types of crops and livestock. Along with changes in the use of land and water resources, population growth, urbanization and changing food culture, the lack of agricultural diversity poses a threat to global food security in the context of a new paradigm of nutrition. The proposed project of the agro ecological skyscraper "New

Spring: Agro-ecological Skyscraper" (authors Michał Spólnik, Marcin Kitala) 2022 (Austria, Poland) is a large-scale structure, consisting of proto-garden modules. Each module belongs to a specific biome, containing a special flore, soil, microorganisms, small animals and micro climate.

Modules can be freely added, removed or replaced. Behind the shell of the modules and their wooden supporting structure is hidden a core filled with hardware functions: seed and plant tissue banks, laboratories, lecture halls, data processing centers, warehouses and high-tech compost. Capsules are made of cross-glued wood, which provides flexibility in their manufacture and a relatively easy repetitive assembly and disassembly process. Following the principles of agroecology, each proto-garden is experimental from the very beginning, combining plants that do not occur in the natural environment. This is especially important in the fight against climate change, when some losses cannot be eliminated, and new solutions and adaptation techniques are needed. This project, according to the authors, will stimulate biodiversity and cross-pollination of ecosystems and agricultural crops (Spólnik, Kitala, 2022).

3 DISCUSSIONS OF THE RESULTS

The globalization of the world economy has led to the fact that in many countries there is a policy of unrestrained mining and the so-called "seizure" of agricultural land. Significant changes in agriculture and industry, transport and the growth of logistics, population and military technologies have caused global environmental crises. The rapid increase in the level of greenhouse gases in the atmosphere has an impact on the climate and leads to a reduction in biodiversity, and excessive consumption of fossils resources causes irreparable harm to nature.

The most acute environmental problems of the "Anthropocene", despite the fact that the future of all mankind depends on them, do not receive due attention. The emergence of the concept of "Anthropocene" imposed on science the obligation to study and explain how human society was able to provoke changes in the functioning of the Earth's ecosystems on such a scale as: natural disasters, depletion of natural resources, desertification, ecocide, widespread environmental pollution, migration, social and environmental injustice, and much more. In this regard, it is necessary to develop and master new tools and knowledge necessary to find answers to the pressing questions of the new era of the "Anthropocene" and what consequences these changes may have for the future of the planet.

4 CONCLUSIONS

We As a result of the conducted research, innovative concepts of the "Anthropocene" era in the context of restoring the natural balance are identified, set out in the following directions discussed in the article:

1. Technologies that control climate change or correction in connection with the restoration of the natural balance:

• Innovative solutions to prevent the irreversible process of global warming. The competent opinion of experts who believe that the problem of temperature reduction for the whole planet can be solved by developing a unique and continuous structure located at one point of the Earth is presented. Another idea is to use spatial infrastructure instead of flood prevention to form a second above ground level of the city.

• Technological advances for managing the planet's climate change. The urgency of using the latest innovative technological achievements from around the world, designed for the process of recovery and climate change, is emphasized. The proposed approach is not only to confront current environmental problems, but also to provide a living environment for people affected by climate change.

2. Sustainable approaches to global management of water resources and marine currents:

• A systematic approach to protection against melting of the Arctic ice cover. The problem of reducing the northern ice cover is considered and a system of sequential measures to reduce reflected solar radiation is proposed: shading and cooling of the frozen earth, as well as its purification from ash coal, which is a climate pollutant and is considered the cause of warming.

• Integrated structure for monitoring and correcting the convection flow of ocean water. The importance of ocean water circulation is revealed, which has problems with energy exchange and maintaining a stable course of water flow in the region. A complex spatial structure is proposed designed to separate mixed seawater and obtain fresh water through a freezing process using a low temperature.

3. Elimination of the consequences of the "Anthropocene" in the restoration of the ecosystem in the natural environment:

• Transformation of a "lifeless" ecosystem and recreation of forests. A large ecological problem associated with the increasing intensity of fires caused by human activity and leading to the complete destruction of the ecosystem is considered. An object with regeneration technology is proposed, designed to carry out the process of restoring ecosystems and recreating forests through the destruction of its own structure, which allows it to transform and develop, spreading in the ecosystem.

• Solving the problem of restoring areas of drained swamps. A method of resuscitation of drained swamps by abundant irrigation of these lands is proposed. The proposed high-tech structure floating in the air can be developed and formed depending on the specific task. In addition to collecting condensate and accumulating thousands of liters of water per day for irrigation of the swamp, the structure accommodates research centers, laboratory facilities and wards for short-term stay of people.

• Formation of biodiversity of ecosystems and agro-cultures in the context of food security. The problem of the lack of diversity of agricultural crops, which poses a threat to global food security in the context of a new paradigm of nutrition, is revealed. A large-scale structure consisting of proto-garden modules combining plants that do not occur in the natural environment is proposed. According to the authors, this approach will stimulate biodiversity and cross-pollination of ecosystems and agricultural crops.

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