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The Impact of Climate Change on National Security

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ABSTRACT

The purpose of the presented scientific work was: a historical review and identification of the main root causes of the emergence of threatening natural phenomena on the planet; outlining of key areas and sectors of the population's life; analysis of the influence of society and official authorities on the control and management of issues in the field of natural disasters; modelling of possible consequences and ways to solve the most threatening problems due to climate change. The main method of scientific cognition that was used in writing this article is the system-analytical method, with the help of which, using the processes of analysis and modelling, the causes were identified, the directions of direct impact were outlined and logical alternatives and solutions to the problems that have arisen against the background of climate change and natural disasters were provided. The main results obtained during the study of the presented topics are as follows: the main causes of the onset of irreversible climate change on the planet are identified; the most vulnerable to natural anomalies areas of public and state direction are highlighted; common methods and means of climate change control are studied. The authors conclude that future climate change impacts will intensify unless mitigation efforts are increased, thereby not only neutralizing, but also potentially benefiting, humanity and Earth's future.

1. INTRODUCTION

The problem of climate change today is one of the most serious challenges to the modern system of national security; events and situations caused by global natural phenomena directly affect human and terrestrial resources, the ecological system, health of individuals and entire nations. This trend will continue in the near future and, what is the most threatening aspect of this problem, will have many negative consequences on a global scale. Due to the low level of interest in solving climate problems among small and underdeveloped and middle-income countries, as well as countries with non-democratic governments, there is a danger of nullifying the intentions and decisions of the leading international players in the field of climate change regulation.

The relevance of this scientific work is due to the identification and summary of the main prerequisites for the onset of active climate change on the planet, as well as the identification of the most vulnerable to natural disasters areas and areas of human activity; in addition, in the characterization of measures and processes regarding the regulation of relations in the field of environmental management and in providing relevant recommendations for the structure of national and global programs and mechanisms for climate conservation.

The problem of the presented study was the need to analyse all possible root causes of climate change, to characterize the most threatening consequences of natural disasters and to develop and present specific recommendations on the specifics of climate conservation activities and prevention of new and slowing down of existing climate change on the planet.

The problem of the presented study was the need to analyse all possible root causes of climate change, to characterize the most threatening consequences of natural disasters and to develop and present specific recommendations on the specifics of climate conservation activities and prevention of new and slowing down of existing climate change on the planet [1]. Solecki et al. [2] defined the relationship between anthropogenic factors, natural processes and independent space and other phenomena as the basic components of climate change. Without an integrated approach to assessing the level of impact of certain industries on global climate change, as well as a thorough analysis of all the factors that contributed to the deterioration of the environment, according to Timilsina [3], it is impossible to predict future events and prevent environmental degradation in order to stabilize the most difficult moments.

According to Xu et al. [4], the human factor as the main condition of global warming caused by climate change is the basic challenge for modern generations; the anthropogenic factor of the rapid restructuring of the usual natural conditions must be completely transformed to preserve the ecological balance and prevent even greater disasters. The sphere of agriculture, land cultivation and cultivation of edible crops is a key area that is already suffering large-scale losses from global warming and its derivatives (droughts, prolonged rains, etc.); Abbas et al. [5], as examples, cite complex social and

economic phenomena in a number of African countries, such as Malawi, Eritrea, etc.

This paper offers a comprehensive analysis of climate change's influence on national security, illuminating how global natural phenomena can impact resources, ecosystems, and human health, with ripple effects on a nation's security. It also spotlights the lack of commitment from developing and non-democratic nations to climate change mitigation, a factor that could potentially jeopardize global efforts. Additionally, it presents an in-depth review of climate change's causes, its threatening consequences, and recommended strategies for climate conservation and slowing down the pace of global warming. The work provides a fresh perspective by linking climate change to various political, economic, and societal processes, highlighting vulnerable sectors like agriculture and identifying future trends in climate change research and policy.

The novelty of the work includes the collection, processing, characterization, and presentation of key problems in the field of climate change and the presentation of options for regulating activities in relation to natural processes caused by various factors through the prism of political, economic, and other processes that take place on the modern map of the world.

The purpose of the article includes: a brief overview of the processes and phenomena that have triggered irreversible climate change on the planet; a description of the basic areas and spheres most dependent on natural instability; a characterization of efforts at the level of society and the state in solving global problems of preserving the planet; development of possible scenarios and recommendations for preventing climate change and regulating activities in the field of life protection on Earth.

2. THEORETICAL OVERVIEW

The issue of climate change, the catastrophic consequences of the rapid transformation of habitual natural conditions began to be studied in the middle of the twentieth century. The period from the end of the twentieth century to the beginning of the twenty-first century was the next stage of the surge of new research on this topic due to the increase in the frequency of negative processes that accompany abnormal phenomena in the environment. A large number of scientific works are devoted to the topic of the origins of the environmental crisis, and the root causes of emergency and stressful events in different parts of the world. Thus, the issues of climate change and the consequences of these processes on individual countries, regions, and sectors of human activity have been studied by many European and world researchers such as Valipour et al. [6], Gusheva et al. [7], Knez et al. [8], Laurito et al. [9], Englande Jr. [10] and others.

The catastrophic increase in the temperature of the surface of the globe, especially over the past twenty years, and the difficulties in fixing fluctuations in average indicators in certain geographical areas, were the subject of research by Valipour et al. [6]. According to them, it is necessary to improve the quality and speed of collecting relevant information (temperature regimes, wind speed, pressure changes) to prevent greater damage to the planet.

Full recycling of the waste with its subsequent reuse in certain industries was the main topic for the work of Gusheva et al. [7]. In the article, the authors emphasized the importance of such measures, noting that the policy of closed-loop waste recycling, namely, reduction, reuse and transformation, has the greatest potential for synergy in developing countries.

Knez et al. [8] in their publications focus on the introduction of “green” technologies in Europe, in particular in the Balkans region; in their opinion, the European Union's strategy to achieve climate neutrality by 2050 is a very promising mechanism in terms of controlling changes in natural conditions. Economic measures, social decisions, and political ideas as a response to the devastating consequences of natural disasters (the example of the 2004 tsunami in Indonesia) were studied by Laurito et al. [9]. The authors provide statistical and factual data on the results of such a response to stressful events, based on official information from open sources. Englande Jr. [10] in his works considered the most destructive natural disasters caused by global warming (for example, Hurricane Katrina in the United States of America in 2005) in terms of the number of victims, the scale of infrastructure destruction, and economic losses, concluding that, taking into account the percentage of various losses from environmental processes, it is necessary to develop appropriate methods for their prevention and neutralization.

Quite a large number of publications are devoted to individual sectors of the economy and industry of states, which, in combination with political and social aspects, form a system of national security. Climate change affects the production, storage, processing, marketing, availability, promotion, accessibility, and quality of food along the entire value chain for essential commodities. According to Tumwesigye et al. [11], all parties involved in these chains should adapt their own strategies and policies to mitigate the effects of global change on all elements of industrial and marketing structures. In other hand, King and Burnell [12] considered the lack of drinking water, as well as restrictions on access to clean water sources, as the main prerequisite for the escalation of conflicts and the outbreak of wars due to unequal conditions for citizens of one country or region; the authors predicted an increase in the number of armed clashes with the growth of the number of people who have difficulties with the free use of freshwater. Human activity, the anthropogenic factor is the main factor of "stress" for nature – this thesis was expressed by Magnan et al. [13]. The scientists assured that today it is too late to separate man and the environment, but there is a chance to reduce the negative impact on the ecological situation, provided a reasonable approach and appropriate volitional decisions.

The main aspect in the study of climate change processes and determining the consequences and long-term effects on a planetary scale is the forecasting and modelling of certain scenarios. The climate neutrality strategy until 2050, adopted by the European Union, is a very effective mechanism, a tool for achieving the goals in the field of addressing the negative effects of global warming. As Lenaerts et al. [14] defined, only an integrated approach and complete transformation of environmental legislation of all member countries of the organization will be able to bring a tangible positive impact on the situation with climate change on the planet.

Furthermore, the insufficient effectiveness of the results and practical recommendations on climate change and reduction of the negative effects of global warming, according to Mach [15], depend on the unestablished hierarchy and lack of clear methods of research and collection of statistical data on the transformation of ecological processes. The simplest and at the same time the most complicated means to regulate the situation with global warming was proposed by Schwalm et al. [16]: to significantly slow down the temperature heating of the

planet's surface, researchers propose to simply reduce the amount of carbon dioxide emissions into the atmosphere – the size and volume should be calculated based on the total damage from each individual enterprise that it causes to nature.

Today, the issue of preconditions for the emergence of the climate change problem, the negative impact on certain spheres and areas, as well as possible consequences and possible solutions to reduce the negative factors of global warming have been fully investigated: the sectors most vulnerable to catastrophic natural changes in the XXI century, as well as the relationship between the elements of the national security system through the prism of environmental instability, have been widely studied. The results obtained in the course of these studies constitute a solid basis for further scientific research on the effects of climate change on society and security on a global scale. Taking into account the trends of recent years, namely, the intensification of efforts in the field of legislative regulation of global warming, neutralization of the results of destructive processes on the planet and the development of new alternative ways of maximally neutral human activity in the environment, we can predict the emergence of fundamentally new innovative ideas and solutions in the presented fields of research.

3. MATERIALS AND METHODS

The main methods of scientific knowledge that were used in writing the presented scientific work were the following: system-analytical and political-sociological methods, as well as the method of the analytical forecast. Using the system-analytical method, based on a set of general scientific, natural, and statistical-mathematical data, the main causes of climate change were identified and characterized, the key features of the destructive consequences of global warming in certain regions of the planet were highlighted. Using the political and sociological method, the most vulnerable countries, territories, and regions to climate transformations were identified and updated; the need for priority steps in the field of preserving the ecological system by society, the state and other actors of the political system was emphasized. Using the method of the analytical forecast, the determining factors of the impact of climate change on the leading spheres of life are summarized; proposed basic steps and decisions that should be taken as fundamental measures to prevent further catastrophic events on the continents and prevent future climate transformations with the least harm to humanity and nature in the complex.

The empirical research methods used in the preparation of this article included such methods as observation, comparison, and measurement; they were used to collect, process, synthesize and present information on the stages, characteristics, areas of distribution and impacts of climate change on different regions of the planet. The theoretical methods that served for further development of the presented work are the methods of analysis, synthesis and modelling and the method of descent from the abstract to the concrete. Using them, the defining logical links and common intersection points of the three elements of the national security system – environment, economy, and political system – were outlined and explored on the basis of the need to unite and find common solutions to the problems of rapid climate change and the fight against the consequences.

The research on the presented topic took place in three stages:

1. At the first stage of the research work, the collection, processing, analysis and updating of basic data describing the object of study, as well as objects and phenomena related to it were carried out. This stage of scientific research was carried out using the system-analytical and observation method and included the following: organization and conduct of the main part of the study, namely, the synthesis of the main prerequisites and causes for the intensification of dangerous natural phenomena on the planet.
2. At the second stage of the research work, using the political and sociological method, as well as methods of comparison and measurement, the regions and territories that will suffer and have already suffered the greatest losses from natural anomalies were identified; The spheres and industries that will suffer the most in the new climate conditions are indicated; some methods of solving modern environmental problems that are currently implemented in practice in some countries of the world are presented.
3. At the third stage of the research work, using the methods of analytical forecast and descent from the abstract to the concrete, the directions of future scientific research on this topic were proposed; variations for further activities in the field of climate change and prevention of the negative effects of global warming were presented. In particular, based on the findings of the study, scenarios and solutions were presented to improve the quality of cooperation between the main participants of the state climate policy – society, business, and government.

The methodological approach used in this study, which encompassed system-analytical, political-sociological, analytical forecast, empirical research, and theoretical methods, successfully addressed the objectives of the research. Through the systematic analysis of causes and consequences of climate change, identification of vulnerable regions, and exploration of potential solutions, this comprehensive approach provided valuable insights into the complex issue of global warming. By integrating scientific knowledge, empirical data, and theoretical frameworks, this study offers a robust foundation for understanding and combating climate change, emphasizing the need for collective action and integrated approaches to ensure a sustainable future for humanity and the environment.

The presented scientific work has several limitations that should be considered when interpreting the findings. These limitations include potential issues related to data availability and quality, limited scope and generalizability, subjective elements in the methods used, reliance on assumptions and simplifications, lack of interdisciplinary approach, the dynamic nature of climate change, and limited consideration of socioeconomic factors.

4. RESULTS

In the context of dramatic climate change, certain natural phenomena such as prolonged rains, floods, droughts, high temperatures, etc. have begun to occur more frequently. Global warming causes the catastrophic melting of glaciers, resulting in rising ocean levels, which in turn affects the biodiversity of marine flora and fauna [17]. People suffer from unpredictable phenomena in the environment, and certain sectors of the economy suffer great losses. Failure to fully stop the processes in nature or at least slow down some threatening

phenomena poses direct risks to national security and stable global prosperity. Factors such as uneven economic development of countries, demographic crisis, shortage of raw materials and food, the threat of terrorism and wars are becoming even more acute against the background of environmental degradation and uncontrolled change of habitual natural conditions.

Many researches around the world show that the active phase of climate change began in the second half of the nineteenth century with the development of cities and towns, an increase in the number of industrial facilities, an increase in the volume of mineral extraction, and intensification of labour migration within and outside the countries [18, 19]. And even then, at the turn of the millennium, the first consequences in nature were noticeable: an increase in the area of desert areas (United States of America (USA), pollution of water bodies (industrial areas), etc. However, at that time there were no such concepts as climate change, global warming, anthropogenic factor, so no steps were taken to prevent future negative consequences of human activity.

Today, all member states of world organizations have developed and are guided by national and international legislation in the field of climate security and stability, which is a fundamental direction in the national security system [20]. State defence doctrines of many developed countries of the world regarding the essence and content of the national security structure include such concepts as threats to the environment, threats to the political system and threats to the economic component [21].

Climate change causes hazardous phenomena and processes in three main areas – environmental protection, economic stability and social equality, and the effectiveness of state institutions (political system). Thus, the above-mentioned areas together constitute the national security system of the state [22]. In situations of instability in one or more areas, there is a direct threat to this structure, to eliminate which all possible forces and resources should be directed. It is proposed to consider in detail the elements of national security of the state through the prism of climate change and the impact on them as a result of unpredictable and dangerous natural phenomena.

Nature, the outside world, the environment – these terms describe the conditions in which humanity exists, the processes related to all spheres of life of the population and the work of state and organizational structures. Any changes caused by global warming certainly cause and will cause significant and often irreversible changes in the environment; these changes will have a major impact on natural resources and the ecological system as a whole, which, in turn, will have a negative effect on the well-being and stable existence of both individuals and entire states [23]. Reducing the amount of food and other essential products or limiting access to them will lead to the emergence or increase of shortages, poverty, and general instability in a number of regions; this situation is especially threatening for territories with massive migration processes that directly affect a number of other geographically adjacent states [24].

The environment is a fundamental element of the national security of all developed countries; other systems of human life – health care, economic development, food supply, etc. depend on it [3]. The main threats to nature now include global warming, ozone layer thinning, increase in desert areas, deforestation, air and water pollution, and uncontrolled population growth in some parts of the planet [25]. Due to the interconnectedness of all elements of national security, the above phenomena harm not only the world around us, but also affect people's lives, causing much more serious problems and threats in the field of infrastructure, social security, health care, etc.

Thus, in the report of the US National Security Council of 2021, it was noted that a sharp climate change will lead in the near future to an increase in the shortage of basic and necessary products and systems for life support, which will cause a large number of deaths from hunger and the struggle for food, water, and electricity [26]. In the United Nations (UN) Environment Programme 2022, three basic processes were identified that will affect the national security system through the prism of climate change: mass migration, depletion of areas suitable for agriculture and shortage of drinking water [23].

It can be concluded that the rapid transformation processes of natural conditions will have a direct impact on areas rich in land resources [13]; due to the replacement of the usual working conditions and conditions for agriculture, crops will be “replaced”, traditional chains of processing and growing plants will be transformed [27]. However, it should be noted that in such conditions, not only negative consequences for the population and the economy as a whole are possible; but in some cases, there are chances for a quick and adequate reorientation of the regions to new natural conditions and, as a result, avoidance of crisis phenomena and improvement of the quality of grown products [28].

Most researchers clearly state that Africa and some Asian countries remain the most vulnerable regions to environmental change [29]. Thus, the 2020 report of the Group of Military Experts and Intelligence Services on National Security provides data on the reduction of agricultural land in these areas: a decrease of 50% compared to 2000 [30]. There is also a threat of a 90% reduction in cultivated areas in the African region by 2100 due to persistent droughts and increasing desertification [29]. Due to the inability of a number of states in this region to adequately counteract natural challenges (mainly due to the immaturity of political systems that are in transition), the problem of increasing national instability and socio-economic turmoil is growing [31].

Annual reports by representatives of the United Nations Development Programme (UNDP) show a steady increase in the number of people who do not have access to clean drinking water or are severely short of it [32]. The UN report for the first half of 2022 says that 1.5 billion people in the world do not have access to clean water; more than 3 billion people have difficulties in finding and accessing fresh water [33]. These facts indicate a catastrophic situation that is already gradually turning into a natural phenomenon that threatens massive clashes and wars.

Recent scientific works on the topic of global warming and its consequences on the structure of the world indicate that the greatest risk for the island and coastal countries is the rise of the ocean level and, as a result, flooding of large areas, which will lead to an increase in migration from these areas, especially from less developed countries [6, 34]. In order to save their lives, the population from the affected areas will be forced to move chaotically to safer areas, trying to gain a foothold there, thus creating a social and economic burden and causing competition among local residents. For example, a 50 cm rise in sea level in the Bangladesh region would result in flooding of about 10% of coastal areas, displacing about 6 million people [35]. One of the causes of the Darfur conflict,

which has been going on since 2003, besides religious and political ones, was the food crisis; the drastic climate change led to the loss of half of the agricultural land, which deepened the existing problems and caused an even greater economic crisis in western Sudan [34].

According to research conducted in 2020, the Republic of North Macedonia is one of the most polluted countries in Europe [36]. The main climate problems of the country include air and water pollution, deforestation, and drainage of agricultural areas [7]. The main reasons for this are considered to be the following: the destruction of garbage and waste by burning, a large number of cars with high gas emissions, and high population density in certain regions (in particular, the Tetovo area and its surroundings) [7]. The public is quite active in advocating for environmental protection and nature conservation, but the speed of making relevant legislative decisions [36] does not meet the requirements of the time and the current situation.

The XXI century has become a period of important industrial and production changes: a large number of powerful enterprises and world giants at the international level are transferring or have already transferred the entire production cycle to resource-saving and economical innovative technologies [4]. However, due to the uneven development of the countries of the world, different approaches to the concept and understanding of climate change and nature conservation, the attempts of a number of powerful producers to significantly reduce harmful emissions into the atmosphere do not seem to be effective enough against the background of continued environmental pollution by other producers [25]. China, Russia, and a number of other countries still have contradictions in the issues of reducing harmful emissions into the atmosphere and changing the logistics chains of production, because in some cases it carries significant financial costs that these countries cannot agree to [37].

However, compared to the economic consequences for business in terms of consciously reducing the negative impact on the environment, much more significant damage will be suffered by individual countries and regions in situations arising from catastrophic climate change. Loss of life, destruction of infrastructure, decline of agriculture – all this causes huge economic and financial consequences that are extremely difficult to solve without a total revision of existing approaches to the problem [38]. One of the consequences of changes in natural conditions, as a result of direct and indirect impact on production processes, may be an increase in the gap between the rich and the poor [39]. The reduction of the middle class in any country automatically leads to the depreciation of the local currency, the fall of the gross domestic product (GDP), the deepening of social problems and, as a result, the emergence of new canters of conflict and clashes [38].

For example, in the north of China, since the end of the twentieth century, there has been a shortage of clean drinking water; the state leadership has always tried to solve this problem, but without much success – this was largely due to the lack of desire to engage in this task at the initial stage [40]. However, when the crisis became threatening and several hundred million people were in danger, the country's authorities developed a project worth $59 billion (as of 2007) to transfer drinking water from the south to the north [40]. It was a grand development that created hundreds of thousands of jobs, which had a positive impact on the economy of the region. But, at the same time, there was a threat to change the natural conditions in the south of China – due to the intensive pumping of fresh water; what will be the result of this activity is still unknown [37].

The consequences of the most large-scale natural disasters of the XXI century (the 2004 tsunami in Asia, Hurricane Katrina in the USA in 2005 [10], etc.) include multibillion-dollar losses for entire regions. Thus, financial losses from the 2004 tsunami in Asia and Africa amounted to more than 11 billion dollars (as of 2004): this amount does not take into account the number of dead or displaced people, it indicates the size of economic consequences in the field of infrastructure and production [31]. Hurricane Katrina caused more than $125 billion in damage to the city of New Orleans and surrounding communities in the state of Louisiana (USA) in the social and private sectors [9]. Losses from the most catastrophic natural events of the last 20 years are shown in Table 1.

Table 1. Total losses from the most destructive natural disasters of the XXI century

Location	Reason	Human Casualties	Economic Losses
2004, Indonesia	tsunami	over 230 000	11 billion USD
2005, New Orleans (USA)	storm	almost 2 000	125 billion USD
2010, Haiti	earthquake	over 220 000	over 5 billion USD
2011, coast of Honshu Island (Japan)	earthquake, tsunami	over 16 000	over 300 billion USD
2012, 26 US states	dryer	unknown	over 30 billion USD
2019, Siberia (Russia)	forest fires	unknown	over 40 million USD

The data in Table 1 show that economic losses from the vast majority of natural disasters are in the billions of dollars; in some cases, the exact number of victims is very difficult to calculate, either due to the lack of official information or the inability to physically be at the site of the disaster.

Numerous typhoons that cause abnormal tsunamis annually bring serious destruction to some small island states (Kiribati, Marshall Islands, etc.) [31]. According to the World Bank's Climate Change Strategy for 2021-2025, the size of the financial implications for individual regions, in particular for the South Pacific countries, by 2050 could reach about $20 million, which is from 20 to 40% of the GDP of the region [41]. The devastating floods in Mozambique in 2019 led to economic losses of $5 million, which is a very large amount for the country, and most importantly, significantly slowed the economic growth of the state – from 9% to 1.3% [29].

Examples of the economic consequences of abrupt climate change clearly demonstrate the direct dependence of uncontrolled processes in nature on various structures and sectors of human activity. The economy and production chains are the first to suffer, and it is the solution to problems in these areas that should be paid close attention to in the processes of preventing global natural changes and reducing their negative impact.

In the annual report of the UN Security Council for 2021, the problem of catastrophic natural phenomena caused by human activity is considered one of the main topics of the political issue of the global agenda at all levels of international cooperation [42]. In the European Commission's 2021 report

on public support for climate action, global warming is the key cause of all disasters in the coming years [43]. Earlier, in the presented study, examples were given when the migration of the population due to natural hazards caused serious economic problems. Financial instability, poverty, and restrictions in access to the simplest things encourages the population to take decisive action, namely, the beginning of protests and armed confrontations, the main purpose of which is to overthrow the existing government, which, in the opinion of the majority, is to blame for the critical situation [43].

Data from a number of governmental organizations (in particular, the US National Intelligence Council) indicate that negative economic processes are usually observed in places where migrants congregate, leading to political instability in the respective territories [44]. Inter-ethnic confrontations, clashes between representatives of different religions, and clashes between members of different groups based on other characteristics and peculiarities lead to a surge of tension in the political environment both within a certain region or country and between countries or regions. Together with such phenomena as poverty, imperfect foreign policy, absence or low level of democratic institutions and free access to weapons, unresolved ethnic issues add to the overall picture of national security even more scenarios for further intensive deterioration of the situation in the field of politics and state regulation [20].

The most vulnerable in this regard, again, are a number of countries in Africa and Asia. In Western Sudan, local conflicts have been going on for more than twenty years, caused by a number of problems, including social and religious ones [34]. Environmental challenges that have pushed the food crisis and, as a result, hunger, and migration, have become an additional basis for new armed confrontations under political slogans. Currently, the unstable situation in the sphere of state governance in Sudan is in a state of uncertainty; its solution depends on the overall situation on the economic, social and, above all, environmental front [29].

The combination of a number of elements and components described above form the national security system of any developed state. Negative phenomena in one or several structures of this system lead to the crisis of a single mechanism, which causes general instability and stressful situations. Currently, the results of numerous studies show that the reduction of human activity in the field of natural processes will directly affect the phenomena that accompany climate change [4]. First of all, the primary task of the governments of all countries without exception is to significantly reduce greenhouse gas emissions [17]. For example, the main objective of the Republic of North Macedonia in the field of climate policy in the long term, in accordance with the paragraphs of the Climate Strategy and Action Plan, is to build a strong low-carbon economy, following sustainable and resilient climate development paths, increasing competitiveness and promoting social cohesion by combating changes in natural conditions and their consequences [45].

The issue of reducing the scale of harmful emissions into the atmosphere falls within the competence of the state authorities, executive bodies and relevant specialized structures and institutions. However, without adequate pressure from society, it usually takes a long time to expect quick decisions from officials. Public pressure on decision-making processes and control over their implementation is entirely the sphere of the national community and every responsible citizen of their state. And the issue of climate security and control is the protection of all humanity from threats and challenges that have already been caused or will be caused in the future due to climate change.

Other measures to control and prevent natural disasters to be taken in the near future include the following:

1. Strengthening cooperation between representatives of the active part of the local population, public organizations, science, business, and government in order to better understand the essence of the problem, to convey all aspects and components of the issue to each participant. Jointly developed solutions should become a solid basis for further steps to reduce the rate of climate change and stabilize the consequences of this process.
2. Leadership of business structures in reducing the negative impact on nature. Conscious enterprises have long been using the element of innovation in their activities; the introduction of the latest solutions in production processes significantly improves the situation to reduce the rate of ozone layer thinning. Responsible business leaders should set an example by their actions and deeds because today this sector plays perhaps the most important role in ensuring the stability and economic growth of all developed countries.
3. Activation of authorities on climate security issues at the national level. To do this, it is necessary to develop and improve the relevant legislation, taking as an example the best international practices that work well or at least have clearly developed and prescribed plans, strategies, and mechanisms to address issues in this area.
4. Increasing pressure on a number of states that have not signed the Kyoto Protocol of 2005 [46]. Means of influence should be the introduction of sanctions, tax increases and reduction of certain payments, prohibition to manufacture or purchase certain types of goods and products, etc.
5. Expanding international cooperation at the level of individual states, as well as organizations and alliances to attract greater support for nature conservation and the stability of the ecological system. Summits, roundtables, and conferences should become a loud voice for the whole world, which will always emphasize the global problems caused by climate change due to human negligence and convince to unite efforts in the struggle to restore the natural balance.

According to the paragraphs of the Climate Strategy and Action Plan of the Republic of North Macedonia, the main tasks in the direction of stabilization of the climate change situation and neutralization of its consequences are as follows:

1. Reduction of harmful emissions by 34, 64, and 2% respectively in the energy, agriculture, and waste sectors by 2050 compared to 1990.
2. Creation of reliable systems for regular and periodic data collection and analysis for the production and dissemination of scientific and technical knowledge.
3. Increasing the resilience of key socio-economic sectors and ecosystems vulnerable to climate change.
4. Development of comprehensive tools for policy planning, coordination, and implementation of activities to combat climate change.
5. Inclusion of climate change aspects in future national strategic planning documents (in particular, in the field of education, science and innovation, social inclusion and gender opportunities).
6. Promoting the transition to green technologies through capacity building, new skills and awareness raising [45].

Policy recommendations based on the information above include strengthening international cooperation to address

climate change collectively, reducing greenhouse gas emissions through renewable energy and sustainable practices, investing in adaptation and resilience-building measures, promoting sustainable consumption and production patterns, enhancing disaster preparedness and response, increasing education and awareness on climate change, mobilizing international financial support for developing nations, strengthening international agreements and frameworks, integrating climate change considerations into policy planning, and fostering collaboration with the private sector for sustainable innovation and investment. These recommendations aim to mitigate the impacts of climate change, promote sustainability, and ensure a resilient future for communities and ecosystems.

Limitations to consider include challenges related to global cooperation, such as differing priorities and interests among countries, which may hinder effective implementation of international climate agreements. Additionally, transitioning to renewable energy sources and adopting sustainable practices often requires significant financial investments, posing economic challenges for some nations. There may also be concerns about the reliability and scalability of certain renewable technologies. Adapting to climate change and building resilience can be complex and resource-intensive, particularly for vulnerable communities with limited resources. Furthermore, policy implementation and enforcement may face political and bureaucratic barriers, potentially hindering the effectiveness of climate change mitigation and adaptation measures.

5. DISCUSSION

Investigating the problem of climate change, the impact of this process on the life of mankind and ensuring stability and peace on the planet, as well as analysing the main consequences and options for solving urgent tasks to regulate activities in the field of environmental security, in particular at the level of legislation and international cooperation, we can state: in the foreign segment of scientific literature on the subject of work there is a very large number of specialized publications for various purposes: analytical articles, critical reviews, statistical and mathematical reports, etc. Ukrainian literature on the subject of this work is sufficiently represented, with the study of all key elements of climate change, focusing, however, on the problems of Ukraine and the transformation of natural conditions on its territory. The works of the authors from North Macedonia cover a wide range of studies that relate primarily to national plans and strategies for climate policy. Summarizing all of the above, it can be noted that the theoretical basis of the presented work formed a powerful basis for the organization and conduct of this study, equally thanks to the works of European and world experts, and using the achievements of Ukrainian specialists in this field of scientific knowledge.

The results obtained in the course of this work were obtained in the process of studying the statistical data presented in the research in the field of physics, climatology, earth sciences, etc.; in particular, the main causes and characteristics of the first, threatening to nature, stages of human activity were outlined in this article, based on the conclusions of D.J. Hughes in the work "Climate Change: History of Ecological Knowledge" [18], in which the author noted that in fact the processes that initiated climate change on the planet began at the end of the nineteenth century – with intensive industrialization, the development of heavy industry and an increase in the rate of population mobility.

The statement about the social sphere, as well as economic and public policy, as key components of national security, which are the most sensitive to global transformations of natural processes, was voiced and thoroughly analysed in the presented article, based on the convictions of Markkanen and Anger-Kraavi [47] in the publication "Social impacts of climate change mitigation policies and their implications for inequality". The researchers emphasized that ambitious goals of economic, political and social progress can be achieved by taking more stringent action to prevent and stabilize the results of climate change.

The role, place, level of influence and quality of activity of the basic actors of the ecological process in any developed country of the world is the main issue that should be considered and presented as a logical system or mechanism for ensuring national security; similar theses were voiced by Steagall in the report "Resilience of military facilities to climate change: best practices of public-private partnership" [48], in which the author emphasized the development and implementation of the best scenarios and ways of interaction between the civil and military communities in the field of protection of the ecological structure of the planet.

The theses on the adaptation of climate legislation, strengthening of international cooperation and increasing the level of civil society involvement in the control of activities in the field of catastrophic natural changes were voiced as recommendations based on the conclusions of A. Sikora made in her analytical note "European Green Deal – Legal and Financial Challenges of Climate Change" [49]. The author emphasized that the European Union Climate Agreement of 2019 has all legal grounds to expect a significant improvement in the situation with natural processes on the European continent.

Among the Ukrainian researchers of climate change, the consequences of these changes on various spheres of life and ways to improve climate policy, whose conclusions became the basis for the study of some aspects of the presented article, it is worth noting S. Stepanenko and I. Khomenko and their work "On the concept of the development of the climate service system in Ukraine" – about the general environmental and climatic situation in the country, existing problems and possible ways to solve them [50]. Shevchenko and Snizhko and their work "The impact of climate change on the economy" – about the main factors and factors that shape the economic system of the state against the background of critical processes of environmental and climatic nature [39]. Rudenko and his publication "Assessment of the impact of climate on human health" – on the interdependence of natural transformations on the state and general condition of the human body against the background of an unfavourable environmental situation [27], etc.

This scientific work was based on the assertion that global warming, intense precipitation, and rising ocean levels simultaneously carry huge economic losses for all regions of the planet without exception and open up fundamentally new opportunities for further activities; a similar opinion was voiced by Hamza et al. [51] in the article "Review of evidence and reality of climate change". However, the researcher noted that it is impossible to adapt to the new conditions that have arisen and will continue to arise on Earth, given the unsuitability of modern man to new living and working

conditions.

The role of society, the scientific community, and business in the sphere of control over the activities aimed at solving global environmental problems [52, 53], on the example of poor countries of the world (African region, some Asian countries) was emphasized as the key in the presented work. Such opinions were expressed by Kanu and Ndubisi [29], noting, however, in the review "Climate Change in Africa: Problems, Prospects and Prospects", that without external influence, financial revenues and economic levers, the activity of society and the political community in these territories cannot have any global scale.

The political and economic factor as one of the reasons for the emergence of a number of negative consequences for the world's population as a result of global natural changes was considered as an example of the interconnectedness of the elements of the national security of the state; this thesis was also voiced by Bayu et al. [32] in their work "The contribution of water resources management to equitable access to water and sanitation in developing countries", at the same time noting that these factors are the only "culprits" of the crisis in access to drinking water, and the environmental situation does not play any significant role here.

The analysis of the policy of transition to new standards of collection, sorting and recycling of organic and inorganic waste was one of the areas of study in this work during the development of fundamentally new mechanisms for regulating climate activities – this position was held by researchers from the Republic of North Macedonia [7]. However, the authors expressed doubts that the re-education of the population in accordance with new environmental requirements for environmental clean-up can take place in the coming decades. The doubts expressed by the authors regarding the re-education of the population within the coming decades raise valid concerns. Changing established behaviors and habits related to waste management can be a complex and time-consuming process. Implementing new environmental requirements and ensuring widespread compliance require robust education and awareness campaigns, infrastructure improvements, and supportive policies [54-56]. It would have been helpful if the analysis provided more information on the specific challenges identified by the researchers, as well as any proposed strategies to overcome these obstacles.

The ideas of Knez et al. [8], who considered green technologies and innovative solutions based on them as a basis for the emergence of new forms of relations and interaction in environmental issues, were used in the presented work as primary sources for the development of their own proposals and recommendations; at the same time, Balkan scientists are convinced that such a policy will never work in countries with slow democratic development and a stagnant economic system [57]. The utilization of the ideas put forth by Knez et al. [8], who emphasize green technologies and innovative solutions, is commendable. Exploring and incorporating innovative approaches in environmental problem-solving is crucial for addressing complex challenges effectively. However, the assertion that such policies will not work in countries with slow democratic development and stagnant economic systems, as suggested by the Balkan scientists, raises some questions. While political and economic contexts can influence the implementation of environmental policies, it is important to recognize that each country faces unique circumstances and challenges [58, 59]. It would be valuable to have a deeper understanding of the specific reasons behind the Balkan scientists' skepticism to make a more informed assessment.

In conclusion, the extensive exploration of climate change and its implications on various aspects of human life and global stability has provided valuable insights into the urgent need for action. The examination of the social, economic, and policy dimensions has underscored the significance of stringent measures to mitigate climate change's social impacts, enhance resilience, and promote collaboration between civil and military sectors. Recommendations have been put forward, including the adaptation of climate legislation, strengthening international cooperation, and increasing civil society participation in addressing environmental challenges.

The role of society, scientific community, and business in addressing global environmental problems, particularly in underprivileged regions, has been emphasized. However, the interplay of political and economic factors cannot be overlooked in shaping the outcomes of climate change [60]. The analysis of waste management policies has highlighted the importance of transitioning to new standards, although challenges remain in terms of public education and implementation. While green technologies hold promise, their success may vary depending on a country's democratic development and economic circumstances [61, 62].

6. CONCLUSIONS

In the process of preparing the presented scientific work, a sufficient number of sources and relevant literature – scientific publications, analytical and statistical reports, critical reviews, etc. were selected, analysed and studied; during the processing of this array of information, significant results were obtained, on the basis of which substantive conclusions and practical recommendations on the subject of the presented article were formed. During the work, the features that characterize the preconditions and determine the causes of the beginning of the active phase of climate change on the planet were established; in particular, it was determined that the key event that caused the most damage to nature was industrialization, the development of heavy industry and active migration of the population.

The study showed: global warming, high temperatures, increasing desert areas, lack of drinking water, etc. threaten security and stability in all sectors of the economy; intensification of migration, the threat of political and economic turmoil, an increase in the number of local clashes, confrontations and wars are a direct result of the negative impact of climate anomalies on the social sector in different regions of the planet. Analysing some scientific facts, it can be emphasized that, despite the speed and increasing stress phenomena in the environment, the states of the world still have a chance to correct the overall situation and prevent serious events in the future – first of all, through coordinated joint actions in the legal, social, and private sectors.

The presented scientific work offers new insights by establishing a link between industrialization and climate change, emphasizing the social impacts of climate anomalies, highlighting the potential for leveraging negative effects for positive outcomes, and emphasizing the importance of assessing climate legislation. These insights provide a deeper understanding of the causes and consequences of climate change, emphasizing the need for collective action to mitigate its effects. By recognizing the role of industrial activities, social implications, and legal frameworks, this research

contributes to shaping effective strategies for addressing climate change and its multifaceted challenges.

The research highlights the need to address industrialization and heavy industry as key contributors to climate change, suggesting the implementation of regulations and incentives to transition towards sustainable and low-carbon alternatives. It underscores the social impacts of climate anomalies, calling for policies that prioritize resilience, adaptation, and equitable solutions to protect vulnerable communities. Additionally, the insights on leveraging negative effects for positive outcomes can inform innovative approaches to climate action, such as promoting renewable energy and sustainable land management. Lastly, the emphasis on assessing climate legislation urges policymakers to evaluate and strengthen legal frameworks at national and international levels to support comprehensive climate strategies.

Future research should focus on several key areas to further advance our understanding of climate change and guide effective actions. Firstly, investigating the long-term impacts of industrialization and heavy industry on the climate system, including the exploration of sustainable alternatives and technologies, can help inform policies and practices for a transition to a low-carbon economy. Secondly, there is a need for in-depth research on the social dimensions of climate change, including the equitable distribution of impacts and the development of adaptive strategies for vulnerable populations. Additionally, studying the effectiveness of different climate change mitigation and adaptation measures, as well as evaluating the impact of climate legislation and international agreements, can provide valuable insights into the most efficient and impactful actions.

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