

Challenges to ecological security in the context of global climatic changes

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Abstract. Climate change and environmental protection are among the most complex challenges facing humanity and pose several security risks. Many strategic documents have long classified climate change as a threat to the security of countries worldwide. Environmental instability does not always create new conflicts directly, but acts as a catalyst that intensifies already existing social, economic, and political tensions. Climate change poses new security challenges, mainly related to migration, conflicts, health risks, and the deficiency of natural resources. All of these are seen as key catalysts for instability. More generally, climate change is a problem that should easily unite all countries in implementing common measures. But in reality, this is not the case. Global efforts to find a common solution face one major problem, and that is the high price that must be paid to deal with the problem. Climate change is more often connected to the problem of global environmental security, with expected negative impacts on human health, food security, economic activities, water and other natural resources, and infrastructure. The present research paper explores the thesis that global climate change, driven primarily by anthropogenic factors, is among the key challenges to environmental security.

Key words: ecological security, climatic changes, geopolitical risk, adaptation, challenges.

Introduction

In classical theory, security is viewed primarily from the perspective of military-political stability. However, in recent decades, global climate change has forced a rethinking of this concept. Ecological security is no longer an isolated environmental issue but a pillar of national stability. It is defined as a state of protection of the individual, the society, and the country from negative impacts caused by environmental degradation.

Climate change can lead to a number of security-related problems. One of them is the water shortage, which can lead to regional conflicts. Military actions lead to an increase in greenhouse gas emissions into the atmosphere.

The intensity and frequency of global climate anomalies have reached levels that exceed the most pessimistic scenarios of the Intergovernmental Panel on Climate Change (IPCC). The latest

data from the European Environment Agency show that Europe is the fastest-warming continent on the planet. Climate risks affect everything from energy and food security to ecosystems, infrastructure and public health.

Climate change increases existing inequalities, as the burden of climate change disproportionately affects communities and regions, making them more vulnerable to the impacts of climate-related disasters, food insecurity and economic instability. As a result of disasters and social injustice, threats to the country's security will increase.

In this context, climate has long been a national security issue that affects both countries and all their citizens. Global climate change does not generate isolated environmental crises, but acts as a systemic catalyst for conflicts. In countries with low institutional and adaptive capacity, the com-

bination of climate risk (e.g., prolonged drought) and existing socio-economic vulnerability leads to an escalation of internal political tensions and the risk of violence.

Climate and weather conditions influence natural and anthropogenic processes that affect the environment. High temperatures affect drainage, increase eutrophication of standing waters, and can lead to fires. Weather conditions also affect the economy, thus increasing the pressure on the environment from these sectors. Precipitation has a significant effect on agriculture. Other affected sectors include forestry and, to a lesser extent, services. Extreme weather conditions, such as floods, long-term droughts, and strong winds, can cause major damage to the national economy.

Ecological security is defined by the ability of societies to maintain sustainable management of ecosystem services that are vital for social peace. We can say that the ecological security of each country is part of the ecological security of the world as a whole, because environmental problems have no borders; they acquire a global character (Babanova, 2013).

One of the main aspects of environmental problems is climate change. It leads to permanent changes in the environment where humans and economic systems function; therefore, ecological

security is inseparable from the understanding of the significance of these changes and their impact on the world (Kitanov et al., 2015). The relevance of this study is determined by the fact that climate instability acts as a catalyst for threats. As a result of climate change, the environment is not simply changed, but the economic, social, and political situation of societies is radically transformed, accelerating the risk of institutional collapse and interstate conflicts over resources.

Materials and methods

A literature search was performed to gain an understanding of the scientific knowledge about the impact of climate change on ecological security. The initial identification of the scientific literature in the field was done by searching for articles in the most popular databases – Scopus, Web of Science, and ScienceDirect platforms. The second-stage screening of the outputs included manual removal of duplicates, and after that, checking the title, abstract, and conclusions. (Petrova & Nikolov, 2023).

Results and Discussion

Key climate-related security threats include: degradation of ecosystems, shortage of resources, and socio-economic consequences (Table 1).

Table 1. Matrix of climatic risks and effects on ecological security.

Climatic risk	Affected sector	Quantitative indicator / Prognosis (to 2050)	Dimension in the security sector
Prolonged droughts and heat waves	Agricultural sector and water resources	River flow in Southern Europe drops by 20%; Drinking water supply in the Middle East drops by 40%	Water crises; Collapse in the legitimacy of governments; Ethnic clashes
Sea level rise	Demography and territorial sovereignty	Expecting around 150 - 200 million climate displaced people on a global scale	Humanitarian crises; Unregulated migratory pressure; Border conflicts
Extreme storms and floods	Critical infrastructure	Physical damage to 15% of energy networks and transport corridors	Power blackout; Disruption of defense force logistics
Information attacks against the Green Transition	Political system and society	Growing polarization in the EU; Increasing protest activity related to energy prices	Internal destabilization; Political halt of climate actions

Degradation of ecosystems

Environmental changes caused by climate change are disrupting natural habitats and have a strong impact on plant and animal species. Cli-

mate change is expected to have different impacts on various ecosystems and to affect biodiversity and ecosystem services in a number of ways, including sudden and even catastrophic ones.

Climate change is one of the main causes of deterioration in the quality of the natural environment. Ecosystems have a natural capacity to recover, but the speed of modern change exceeds their capacity. This leads to irreversible consequences for nature and people.

There is evidence in nature that biodiversity responds to climate change, which has direct and indirect impacts on species and ecosystems. Direct impacts include changes in the appearance of plants, the abundance and distribution of plant and animal species, the structure of habitats and the nature of ecosystem processes.

The projected annual increase in average temperatures could contribute to adaptation by extending growing seasons and through species migration into natural ecosystems, or by controlled introductions of species for agriculture, green infrastructure or other adaptation purposes. Rising global temperatures are capable of changing ecosystems for longer periods of time. Many plants and animals that are unable to adapt quickly to a changing environment are at risk of extinction. Changes in land use and other natural resources, such as habitat fragmentation and loss, overexploitation, air, water and soil pollution and the spread of invasive species, are defined as indirect impacts on biodiversity.

Climate change is putting additional pressure on water resources. The impact of climate change is felt most strongly through water – either when there is too little (drought) or when there is too much (floods). For example:

- Seasonally across Europe, river discharges have decreased in summer and increased in winter.
- The annual discharge of many rivers, especially in Southern Europe, has decreased significantly in recent decades.
- The projected climate changes in the 21st century may further strengthen the trends of acceleration of the hydrological cycle.
- Extreme floods and increased rainfall.

The rise in the World Ocean level and changes in atmospheric circulation are expected to lead to a redistribution of moisture on land. Specifically for our country, the forecasts are for drought, which requires us to think now about a more rational use of water resources, as well as the adaptation of agriculture to more drought-resistant crops.

Around the world, the reduction in the area of glaciers, especially mountain glaciers in low latitudes, could cause a water crisis in a number of countries with arid or semi-arid climates, where mountain water basins are the main source of water supply, especially considering the large population growth in these countries.

World development in the near future will be such that water, namely fresh water for drinking, will probably become the most valuable resource and the most expensive good. Access to drinking water and the distribution of transboundary water resources are among the most serious geopolitical challenges of the 21st century. The growth of the global population and the intensification of climate change are reasons to turn water from a natural resource into a strategic tool for influence and a potential source of conflicts. They arise when sources cross their borders and provide the population of two or more countries with drinking water, water for irrigation, and for industrial purposes.

In 2026, water is emerging as one of the most contested shared resources in the world. Water is becoming one of the main causes of global risks and conflicts. Frequent droughts can escalate into diplomatic crises, threatening the food security of countries. Local shortages of fresh water can lead to national security problems. The most frequently cited example is the conflicts between the Middle East countries, where 5% of the world's population is forced to cover their needs with 1% of the world's water reserves. According to UNESCO, the main places where conflicts over its distribution exist are the Tigris and Euphrates rivers between Turkey, Syria and Iraq and between Israel, Lebanon, Jordan and the Palestinian territories over the use of the waters of the Jordan River (Velev, 2015).

According to Professor Richard Seager, countries in the Middle East and North Africa are at particularly high risk, as water shortage there is combined with rapid population growth.

For millennia, water has determined whether civilizations will thrive or fail, whether conflicts will escalate or make peace. Understanding that water can be used as a weapon should remind leaders in geopolitics, security, and business that in an interconnected world, power may lie not only in who controls water, but also in who manages, shares, and conserves it wisely.

Climate as a factor exacerbating existing socio-economic and ethnic tensions

The consequences of climate change do not affect everyone equally – in most cases, the most vulnerable and poorest in society are those who suffer these consequences. These groups include people with low incomes and in a disadvantaged economic situation, minorities, indigenous peoples, and often even women and children. Although these people are the least responsible for greenhouse gas emissions and other factors that lead to climate change, they are the ones who suffer the most. Specialized analyses are gradually concluding that global warming and drought will have an increasing impact on migration.

Climate change and its consequences are worsening existing poverty, inequality and political instability. In this context, climate change has long been more than an environmental problem. It acts as a “threat multiplier” – a factor that does not always create new conflicts out of thin air, but drastically exacerbates and accelerates already existing socio-economic, political and ethnic tensions.

The impact of global climate change on security rarely manifests itself in the form of a direct, isolated conflict. Much more often, climate change is more of a structural destabilizing tool that is superimposed on already existing lines of socio-economic stratification, poverty, ethnic opposition and weak state institutions. In the specialized security literature, this process is described as “cascading destabilization”. The pressure on the economy is increasing, which is associated with the relatively high level of poverty. The result is negative consequences for agriculture, prolonged droughts, and destroyed crops because of soil erosion. Rural areas lose their main source of income. Food and water shortages lead to an increase in prices on a global scale. This affects the poorest segments of the population.

In the context of climate alteration, the fastest-growing crisis is the so-called climate change. It is a product of global warming, which, in turn, is a product of the ecological nihilism that has been spreading for decades, and of the low levels of ecological awareness and ecological culture. No part of planet Earth is protected from its consequences, and in turn they are the source of various ecological crises. For example, rising temperatures are a prerequisite for a number of natural disas-

ters, extreme weather conditions, and deterioration of environmental quality, which in turn leads to food and water crises, economic shocks, conflicts, and even terrorist and military actions. All these phenomena lead to mass and large-scale migration processes.

Climate change and its consequences affect vulnerable social groups the most, those who have the least capacity for recovery. Climate change has a specific role in increasing poverty and social inequalities and causes large-scale waves of migration from poor and/or disaster areas. These are processes that are a prerequisite for high social and political tension. A stable climate can be considered a major factor in the stability of our societies. The destruction of livelihoods in rural areas forces millions of people to migrate to large cities (internal migration), which leads to the exacerbation of ethnic tensions. In turn, poverty, lack of prospects, and lack of resources become a breeding ground for radicalization, social unrest, and an increase in crime. (A similar mechanism was observed in Syria before the civil war, when a historic drought drove over 1.5 million farmers to the cities). When fertile land and drinking water decrease, different ethnic groups begin a direct struggle for control over them. The loss of pastures forces nomadic groups to enter the lands of settled agricultural communities. This often leads to ethnic and religious violence (e.g., in the Sahel region of Africa).

High temperatures due to climate change are reinforcing water shortages in already affected regions and are increasing the number of areas with shortages of freshwater resources. Higher temperatures are changing global rainfall patterns, making water availability less reliable and predictable. Subtropical regions, such as the Mediterranean and North Africa, are expected to continue warming and to experience more frequent and longer droughts. Rainfall is expected to be more intense, increasing the risk of flooding and severe storms. Weather in tropical regions is becoming increasingly variable, climatologists predict.

Critical risks and system instability

Climate refugees are evidence of how environmental security directly impacts global stability. As international law (including the 1951 Geneva Refugee Convention) still lacks a formal “climate refugee” status, these people often remain

without legal protection, further complicating their humanitarian and political situation. The lack of an international legal status for “climate refugees” creates administrative and social pressure on host countries, enhancing populism and internal political tensions. The mass arrival of people in neighboring areas, which often also suffer from water or food risks, contributes to intensifying local shortages of drinking water, arable land and food. Host communities face sudden pressures on health systems, education infrastructure, labor markets and housing. Most of the “ecological migrants” are heading to the outskirts of big cities, where they create huge neighborhoods (ghettos) with poor sanitary conditions, which is a prerequisite for humanitarian crises and epidemics. Areas with a high concentration of vulnerable migrants become a source of recruitment for radical groups, cartels, or human traffickers. When a country experiences socio-economic difficulties due to climate factors, its instability can be transferred to neighboring countries through uncontrolled migration waves, turning a local problem into a regional security crisis.

Climate change has a direct impact on global health. It poses a fundamental threat to human health. It affects the physical environment, all aspects of natural and human systems – including social and economic conditions, and also the functioning of health systems. As climate conditions change, extreme weather and climate events, including storms, extreme heat, floods, droughts and wildfires, are becoming more frequent and more intense. These weather and climate dangers affect human health both directly and indirectly, increasing the risk of deaths, non-communicable diseases, the emergence and spread of infectious diseases and emergencies in the health system. Rising temperatures are expanding the geographical range of vectors such as mosquitoes and ticks. Diseases such as dengue, malaria, West Nile fever, and Lyme disease are moving to regions where they were previously not present. Droughts and floods are destroying crops, shortening the growing season of crops, and contaminating water sources. This leads to widespread intestinal infections and malnutrition. Increased wildfires are saturating the air with fine dust particles and toxic gases, which worsens chronic lung diseases and prolongs allergy seasons. These climate-sensitive health risks are felt disproportionately

tionately by the most vulnerable and disadvantaged groups, including women, children, ethnic minorities, poor communities, migrants or displaced persons, older populations and people with chronic health conditions.

Achieving environmental security requires a shift from reactive to proactive governance. This requires countries and international organizations to stop reacting to crises that have already occurred and start building systems for long-term resilience. The EU serves as an example of how environmental security is being translated into real policies and legislation:

- *EU Climate Change Adaptation Strategy*: It requires all Member States (including Bulgaria) to develop long-term climate change mitigation strategies. The National Climate Change Adaptation Strategy and Action Plan of the Republic of Bulgaria sets a framework for climate change adaptation (CCA) actions and priority areas until 2030, identifying and confirming the need for CCA actions both at an economic and sector level.

- *Water Framework Directive (WFD)*: This is one of the main legal acts in Europe for the management of transboundary water resources. It requires water management at the river basin level, rather than at political borders. The 2020 EU WFD requires Member States to achieve good qualitative and quantitative status for all water bodies. Citizens, conservation organisations, nature and water-using economic sectors need cleaner seas, rivers, lakes, bathing waters and groundwater. Water quality is essential for promoting sustainable development in the blue economy, as well as for protecting the marine environment and citizens' health.

- *The Union Civil Protection Mechanism (UCPM)* is a system for coordinating disaster response and civil protection among EU Member States and ten non-EU countries, supported by the European Commission. In an area where Member States have the primary responsibility, the role of the UCPM is based on three pillars: prevention, preparedness, and response to disasters. The UCPM is the EU's strategic reserve of disaster response capabilities. The reserve includes aircraft and helicopters for firefighting and medical evacuation, as well as several essential supplies, including field hospitals, power generators and shelter equipment, medical supplies and equipment for response to chemical, biological, radiological and nu-

- clear emergencies. It is designed as an additional layer of protection so that the EU can respond with this last measure when available national capabilities or pre-agreed capabilities of the Member States cannot provide an effective reaction.

Nature-based Solutions (NbS) represent a fundamental shift in the concept of national and global security. They replace traditional concrete dams, canals, and massive sewage treatment plants with approaches that restore, protect, and sustainably manage natural ecosystems to simultaneously address climate, social, and economic challenges. From a proactive management and systemic stability perspective, NbS offer three advantages: they are self-healing, dynamically adapt to changing conditions, and bring multiple co-benefits such as air purification, biodiversity, and economic alternatives for local populations.

Conclusions

Environmental security, and in particular the equitable distribution of resources, can no longer be considered as isolated environmental challenges. They are fundamental pillars of national and global stability in the 21st century.

Climate change acts as a threat multiplier. It turns the drinking water deficit into a catalyst for systemic instability - from internal migration and the collapse of urban infrastructure to deep health crises and cross-border geopolitical conflicts. Traditional reactive models of governance, relying solely on traditional approaches and outdated international treaties, no longer have the necessary capacity to deal with these complex risks to the security of countries.

The need for effective adaptation to climate change is growing. Energy, economic, and cultural systems are likely to face increasingly frequent challenges in this regard. If not adequately addressed, these challenges can become a source of tension and conflict. The analysis of the relation between climate change and conflict is still being developed. Both, from a scientific perspective and at the level of public debate, the aim should be to:

- Considering socio-economic, political and demographic factors that may be relevant to the analysis;
- Avoiding the risk of confusing the correlation between climate change and conflict;

- Extending the in-depth analysis to more world regions beyond Africa and East Asia;
- Investigating not only the effects of resource shortage due to climate change, but also of abundance.

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