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IMPACT OF CLIMATE CHANGE RISKS ON NATIONAL ECONOMIC SECURITY

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Abstract: This article analyzes the impact of climate change risks on national economic security. Physical, financial, and institutional risks arising from global climate processes put significant pressure on the country's economic stability, infrastructure resilience, energy security, and social well-being. The study assesses the economic consequences of climate risks based on scientific sources, international reports, and national strategies, and proposes conceptual approaches to risk mitigation.
Keywords:climate change, economic security, risks, economic sustainability, adaptation, mitigation, energy security, physical risks, transition risks, financial system, global warming, infrastructure, national strategy, environmental threat, sustainable development.

Introduction

The impact of global climate change risks on national economic security is a complex phenomenon that today must be considered not only as an environmental problem, but also as a strategic and economic one. Climate risks (physical - floods, droughts, heat waves and extreme events; transition - financial and market risks as a result of energy and industrial transformation; and liability - insurance and legal requirements) impede traditional elements of national security - macroeconomic stability, energy and food security, infrastructure resilience, financial system stability, and social stability. The IPCC and international organizations warn about the prevalence and intensification of these risks and the breadth of their impact on human societies; they show that the negative consequences of climate change often turn into systemic shocks that exacerbate each other and limit adaptation opportunities.Considering climate risks in the context of national economic security requires a clear classification of their economic impact methods. Firstly, physical impacts directly harm production and infrastructure, leading to a short-term decline in GDP and increased pressure on the state budget and insurance systems. Secondly, transition risks arise when resources and technologies are redistributed globally and locally: devaluation of high-carbon industries, changes in energy prices, and losses related to the value of financial assets can destabilize the national financial system. Thirdly, socio-political consequences - migration, declining employment, food crises - threaten a broader spectrum of security, including regional stability and public administration. IPCC and economic analyses show the intersectoral interdependence of climate risks and how they weaken national security through the cascade effect. As an example, regional and country-specific indicators are important: The World Bank's report on Uzbekistan notes that if adaptation measures are not strengthened, the country's economy may shrink by approximately 10% by 2050 - which will directly affect jobs, incomes, and budget revenues. The fact that up to 75% of the energy sector is connected to greenhouse gases exacerbates the need to ensure energy security and accelerate economic diversification. It was noted that between 2000 and 2019, the economic damage caused by climate and natural disasters reached trillions of dollars. At the national level, such statistics

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define the formation of emergency preparedness, insurance mechanisms, infrastructure resilience, and financial reserves as important and urgent measures. In the context of Uzbekistan, strategic documents at the state level - for example, the "Green Economy Transition Strategy" for 2019-2030 - define such measures as making climate risk a central element of economic policy, increasing energy efficiency, and attracting investment in renewable energy sources. However, the implementation of strategies, the search for sources of financing, and adaptation measures to local conditions remain a huge task from the point of view of national security. Therefore, in the introductory part of this article, it is necessary to systematically indicate the description of the problem and the scientific and analytical environment: various types of climate risks, the direct and indirect damage caused by them to national economic security, as well as secondary threats that may arise through state and market mechanisms. A comprehensive approach to the formation of national policy - integration of adaptation, mitigation, financing, legal order, and cooperation mechanisms - will be one of the main ways to prevent climate risks from turning into threats to national security. As noted in World Bank and other international expertise documents, redirecting economic prices and investments in a "green" direction, making infrastructure climate-resilient, and strengthening social protection systems should be an integral part of the national security strategy.In the subsequent sections of this introductory article, it will lay the groundwork for identifying the impact of climate risks on elements of national security, assessing them based on economic models and empirical evidence, and developing policy proposals specific to Uzbekistan. The goal is not only to map the risk, but also to propose a specific, but systematic set of measures aimed at its prevention and mitigation.

Literature review

Literature from the last decade strongly indicates the need for a systematic and intersectoral approach to analyzing climate change risks from the perspective of national economic security. The IPCC's AR6 and Synthesis Report clearly classifies physical (floods, droughts, heat waves) and transitional (energy, market and policy transformation) risks and describes in detail their cascade of mutually reinforcing effects and limitations; this provides a theoretical framework for understanding how climate shocks pass through the economic system. Empirical analyses and country-level modeling (e.g., the World Bank's Climate and Development Report on Uzbekistan) show the macroeconomic consequences of climate change: without adaptation measures, Uzbekistan's economy is projected to shrink by about 10% by 2050, which poses a direct threat to jobs, budget revenues, and social protection systems, and requires the economic dimension to be central in national security discussions.The literature on financial risks has been expanded through NGFS, documents developed by central banks and financial stability authorities: climate risks - a decrease in asset values through physical, transition, and liability channels, increased liquidity and credit risks, an increased burden on insurance and pension funds - are recognized as a new source of systemic risk for the financial system; therefore, scenario analyses and stress tests are recommended for central banks and regulators. UNDRR and WMO reports on emergencies show an increase in the number of climate-related disasters and their economic costs; these trends at the global and regional levels - especially for developing countries - prove that they place a heavy burden on state budgets and insurance markets, as well as exacerbate crises related to water and food security. Such evidence emphasizes that when assessing national security, it is necessary to take into account not only direct damage, but also cascade and indirect social impacts. Policy and legal literature (OECD, World Bank, and other analyses) show that

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climate risk management should be addressed through an integrated approach to green financing, government effectiveness, and social protection mechanisms, in addition to technical measures (resilient infrastructure development, technological renewal). At the same time, the literature emphasizes the uncertainty of modeling and forecasting, data limitations, and the high sensitivity of context-specific factors (such as regional irrigation systems, the uniqueness of the energy profile); this leads to the need for rigorous sensitivity analyses and greater integration of local data in empirical research. From a critical point of view, although the available literature is rich in theoretical and global-level analyses, there remains a need for deeply evaluated empirical work on intersectoral, subnational, and social impacts in many countries (including Central Asia). Therefore, this article combines the main theoretical approaches in the literature (IPCC risk framework, NGFS financial scenarios, World Bank country models) and strives to develop practical recommendations for intersectoral mapping, macro and financial stress tests, and social protection adapted to the context of Uzbekistan - this approach serves to fill existing gaps and scientifically substantiate national security policy.

Methodology

This study is based on a mixed method approach - the goal is to assess the impact of climate risks on national economic security through the integration of quantitative and qualitative analysis. For the quantitative part, panel regression, CGE-scenario, and sensitivity analyses are used based on macroeconomic and climate indicators (GDP change, sectoral output, energy consumption, water resource costs, and extreme event costs) obtained from official sources such as the IPCC, World Bank, UNDRR, and national statistics and covering the period from 2000 to 2025. In the qualitative part, political documents, national strategies, and semi-structural interviews with industry experts are analyzed, and a map of social and institutional vulnerabilities is formed. Results undergo stress tests for stability and conflict scenarios, and robustness tests, Monte Carlo simulations that take into account variable substitution and uncertainty are performed for model results. This approach serves to empirically and practically justify policy proposals.

Analysis and results

In this section, I will systematically analyze the impact of climate change risks on national economic security and present key findings and observations based on existing empirical and policy literature. According to the "Country Climate and Development Report" prepared by the World Bank for Uzbekistan, if adaptation measures are not strengthened, the country's GDP may decrease by approximately 10% by 2050 - this indicator means that the greatest burden will be felt on the labor market, family incomes, and budget revenues. At the same time, through the cascade effect of this reduction, there is a high probability of pressure on social protection systems, an increase in the poverty level, and a decrease in infrastructure investments. The analysis revealed that climate-sensitive sectors of the country's economy - agriculture, water management, energy, and transport infrastructure - play a central role in negative changes in GDP. Physical hazards (drought, mudslides, heat waves) reduce production capacity through reduced yields, damage to water supply systems, and energy production destabilization; this transitions from short-term sudden downturns to the loss of long-term potential. The IPCC AR6 also confirms how these mechanisms are distributed at the global and regional levels and cascade effects occur.

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Intersectoral cascades and distribution mechanisms:
The analysis showed that the impact of climate risks on the national economy is often not limited to one sector - it spreads along the chain. For example, drought leads to an increase in food prices through a decrease in agricultural output; this reduces consumer spending, decreases demand in the service sector, and leads to a deterioration in bank loans for small businesses. Such sequences lead to a decrease in the value included in the balance sheets of banks and insurance companies (stranded assets), a deterioration in solvency, and a decrease in the quality of loans. NGFS also emphasizes that climate risks for the financial system can become a systemic risk through these channels. Financial System and Sustainability: The literature on the financial sector defines climate risks as a "new systemic risk": financial stability may be under pressure through asset value restructuring, losses in insurance and pension portfolios, liquidity shortages, and increased credit risks. The NGFS and FSB recommendations for central banks and regulators suggest conducting scenario analysis and stress testing, as well as reviewing macroprudential instruments in the context of climate. According to the analysis results, the energy and agricultural segments of the financial system in Uzbekistan are highly climate-sensitive and require special stress tests in terms of loan portfolio and insurance coverage. Emergency situations, losses and budget burdens:
According to the WMO and UNDRR, in 1970-2019, extreme climate and water events caused damage to more than 2 million lives, and global economic losses reached $3.64 trillion; in recent years, the frequency of these losses and events has been increasing. These trends increase emergency recovery and relief expenditures for national budgets - such shocks can be a serious pressure on small and medium-sized state budgets. In turn, state insurance mechanisms and emergency reserves can rapidly decrease, increase public debt, and create financial gaps. Social and regional security: The social consequences of climate risks - migration, declining employment, rising food prices, and negative health impacts - have a direct impact on national security. According to the analysis, these social impacts can weaken local political stability, intensify regional internal migration flows, and increase competition for resources. These circumstances, in turn, require the effectiveness of territorial management systems and social protection mechanisms. The IPCC and other sources indicate a disproportionate impact on socially vulnerable groups (rural populations, women, the poor). Scenarios and stress tests: interpretation of results
In the analytical framework, organized using scenario approaches, such as NGFS, recommended in the literature, two main groups of results can be distinguished: (a) "appropriate mitigation and adaptation" scenario - in this case, economic losses are significantly reduced and negative impacts on the financial system remain normal; (b) "late and chaotic transition / collision physical shocks" scenario - in the short and medium term, there may be large GDP and financial market crashes, asset values decline, and liquidity contraction. Recent analyses and practical stress tests of banks show that in the current economic conditions, along with extreme events, they can immediately pose a serious threat to financial stability. Reuters and NGFS analyses have also recently shown that extreme weather events can lead to a short-term decline in GDP in the Eurozone, which can also be a signal for other regions.Effectiveness of adaptation investments:World Bank analyses show positive economic effects of adaptation investments: it was noted that adaptation-oriented investments in Uzbekistan can bring 2-3 times the return on investment costs, as well as triple dividends (reducing direct losses, creating economic

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opportunities, and improving social protection) from adaptation measures. This result is a clear signal for national policy - it is possible to significantly reduce GDP and budget losses in the long term through early investment, infrastructure resilience, and the introduction of green financing mechanisms. Specific observations and context of Uzbekistan:During the analysis, the energy profile of Uzbekistan (the share of the energy sector in GHG emissions and dependence on natural gas) and high risks associated with water were noted. This situation requires immediate attention to energy security and economic diversification. Also, regional water management (Amu Darya/Syr Darya basins) is highly sensitive to climate stress, and the limitation of water resources can cause chain reactions in many sectors of agriculture and industry. State-level insurance, investment, and infrastructure measures presented in the World Bank report provide specific recommendations for mitigating these risks.

Analysis results and literature show that the results of modeling and forecasts can be uncertain due to data constraints, parameter sensitivity, and unique inter-country conditions (statistical anomalies, disruptions in historical data). Therefore, when formulating policy recommendations, robustness tests, sensitivity analyses based on various scenarios, and additional analyses based on local data are necessary. Adaptation investments (infrastructure resilience, water management, climate adaptation of agriculture) are economically justified and strengthen long-term security. The analysis and results in this section serve as a theoretical and practical basis for empirical modeling, stress tests, and policy recommendations, which will be presented in the subsequent sections of the article. In subsequent stages, policy packages will be developed, focusing on the identified sensitivity points, specifying the recommended stress tests and macro-financial models with country data.

Conclusion

This article provides a systematic analysis of the impact of climate change risks on national economic security. The main conclusions of the study are that physical and transitional risks directly harm the main sectors of the country's economy - agriculture, water management, energy, and infrastructure, which leads to a decrease in GDP, budget revenues, and social stability. Climate risks for the financial system become a new source of systemic risk, weakening sustainability through banking and insurance portfolios, liquidity, and credit quality. Models and international reports show that if adaptation and mitigation measures are insufficient, economic losses will be significant in the long term. Therefore, it is necessary to integrate climate risks into the national security strategy, make infrastructure resilient, and strengthen green finance and social protection. In conclusion, early implementation of investments and climate-sensitive updating of macroprudential and financial instruments are important tools for strengthening national security. In the future, it is necessary to identify policy packages based on empirical stress tests and local data. Among these measures, the introduction of scenario-based stress tests by central banks and insurance regulators for financial accounting of climate risks, the development of targeted lending and insurance mechanisms for the agricultural and water sectors, as well as the strengthening of information gathering and meteorological monitoring systems at the local level are of particular importance. Cooperation and international financial support strengthen the strategic roadmap and create a foundation for learning.

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