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THE ARCTIC REGION IN THE SYSTEM OF INTERNATIONAL ECONOMIC DEVELOPMENT: SUBREGIONAL ANALYSIS OF MARITIME INFRASTRUCTURE AND RESOURCE EXTRACTION IN THE CONTEXT OF ECONOMIC SECURITY CHALLENGES

The article's hypothesis is that contemporary geopolitical dynamics in the Arctic region are shaped more by the growing control over economic routes, energy resources, and infrastructure projects, which form a new model of geoeconomic competition. The purpose of this article is to conduct a comprehensive analysis of the key trends in the geopolitical transformation of the Arctic, assess the role of new actors and institutional mechanisms, and identify potential points of conflict between different models of the region's economic development. In the course of the research, the following tasks were accomplished: the main megatrends of international economic development influencing the Arctic were characterized; a subregional analysis of maritime infrastructure and resource extraction potential was carried out; the factors of geoeconomic competition were systematized; the role of traditional and new actors in shaping the regional architecture was defined; and institutional constraints and economic security risks were analyzed. This made it possible to identify the structural asymmetry of interests, the uneven economic potential of subregions, and the growing importance of economic instruments in the strategic behavior of states.

The study emphasizes that climate warming creates new opportunities for shipping and resource extraction, yet does not eliminate the constraints of the polar environment and generates high uncertainty for investors. Institutional and

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geopolitical factors create an environment characterized by a combination of cooperation and conflict, where the 15- to 30-year duration of major infrastructure projects intersects with the challenges of the energy transition.

The main results of the study highlight that the Arctic is divided into two key zones: the Arctic Ocean, with its five coastal states, and the broader Arctic region. Three types of Arctic economic systems, which generate conflicts of interest among actors, are analyzed in detail: subsistence, mixed, and market economies. A key conclusion is that the economic opportunities offered by the market model can pose an existential threat to traditional communities. Particular attention is devoted to the specific characteristics of Arctic maritime infrastructure, which significantly lags behind traditional transport corridors in terms of port density, navigational windows, emergency response times, and capital expenditure.

It is emphasized that the Arctic is shifting from a classical model of military deterrence to one based on geoeconomic instruments, such as investment policy, energy strategies, sanctions regimes, and financial leverage. The coexistence of economic systems, asymmetry of interests, and the emergence of new actors shape a complex geoeconomic architecture that requires the reform of institutional governance mechanisms.

Key words: Asia, Arctic, geopolitical risks, economic interest, economic sanctions, energy transition, energy policy, energy resources, Europe, integration, infrastructure, infrastructure economy, coopetition, logistics corridors, maritime infrastructure, North America, Northern Sea Route, resilience, sanctions policy, sanctions, cooperation, sustainability, fragmentation

JEL Classification: D33, D72, E25, E65, O15

АРКТИЧНИЙ РЕГІОН У СИСТЕМІ МІЖНАРОДНОГО ЕКОНОМІЧНОГО РОЗВИТКУ: СУБРЕГІОНАЛЬНИЙ АНАЛІЗ МОРСЬКОЇ ІНФРАСТРУКТУРИ ТА ВИДОБУТКУ РЕСУРСІВ У КОНТЕКСТІ ВИКЛИКІВ ЕКОНОМІЧНІЙ БЕЗПЕЦІ

Гіпотеза статті полягає в тому, що сучасна геополітична динаміка Арктичного регіону визначається не стільки територіальними суперечками, скільки посиленням контролю над економічними маршрутами, енергетичними ресурсами та інфраструктурними проєктами, що формує нову модель геоекономічної конкуренції. Мета статті полягає в комплексному аналізі ключових трендів геополітичної трансформації Арктики, оцінці ролі нових акторів і інституційних механізмів, а також виявленні потенційних точок конфлікту між різними моделями економічного освоєння регіону. У процесі дослідження вирішено такі завдання: охарактеризовано основні мегатренди міжнародного економічного розвитку, що впливають на Арктику; здійснено субрегіональний аналіз морської інфраструктури та потенціалу видобутку ресурсів; систематизовано фактори геоекономічної конкуренції; визначено роль традиційних і нових акторів у формуванні регіональної архітектури; проаналізовано інституційні обмеження та ризики економічної безпеки. Це дозволило встановити структурну асиметрію інтересів, нерівномірність економічного потенціалу субрегіонів та посилення ролі економічних інструментів у стратегічній поведінці держав.

Дослідження підкреслює, що потепління клімату створює нові можливості для судноплавства та видобутку ресурсів, проте не усуває обмежень полярного середовища та зумовлює високу невизначеність для інвесторів. Інституційні та геополітичні фактори формують середовище зі змішаними характеристиками співпраці та конфліктності, де тривалість інфраструктурних проєктів у 15-30 років накладається на виклики енергетичного переходу.

У межах основних результатів дослідження наголошено, що просторово функціональна структура Арктики поділяється на дві ключові зони: Арктичний океан з його п'ятьма прибережними державами та ширший арктичний регіон. Детально проаналізовано три типи арктичних економічних систем, що зумовлюють конфлікти інтересів між суб'єктами: натуральна економіка, змішана та ринкова. Важливим висновком є те, що економічні можливості ринкової моделі можуть становити екзистенційну загрозу для традиційних спільнот. Значну увагу приділено особливостям морської інфраструктури Арктики, яка істотно поступається традиційним транспортним коридорам за щільністю портів, наявністю навігаційних вікон, швидкістю реагування аварійних служб та капітальними витратами.

Підкреслено, що Арктика переходить від класичної моделі силового стримування до моделі геоекономічних інструментів, таких як інвестиційна політика, енергетичні стратегії, санкційні режими та фінансові важелі. Співіснування економічних систем, асиметрія інтересів і наявність нових акторів формують складну геоекономічну архітектуру, що потребує реформування інституційних механізмів управління.

Ключові слова: Азія, Арктика, геополітичні ризики, диверсифікація енергетичних поставок, економічний інтерес, економічні санкції, енергетичний перехід, енергетична політика, енергетичні ресурси, Європа, інтеграція, інфраструктура, коопетиція, логістичні коридори, морська інфраструктура, Північна Америка, Північний морський шлях, резильєнтність, санкційна політика, санкції, співпраця, сталість, фрагментація

Introduction. The Arctic region is undergoing an unprecedented transformation in its geopolitical landscape. The events of 2025 vividly illustrate this new reality: the sale of a large land plot, approximately 6,000 hectares, on the Svalbard archipelago for € 300 million has attracted the attention of international investors and the states that are parties to the 1920 Svalbard Treaty [1]. The Norwegian government emphasized the need for strict monitoring of the deal in terms of national security, as this territory may be used to expand cargo routes and energy reserves. This case demonstrates how the economic opportunities of the Arctic intersect with issues of national security and geopolitical competition.

Climate change presents new opportunities but remains geographically uneven and does not eliminate the fundamental constraints of extreme polar climates. Technological progress in developing specialized fleets is accompanied by substantial gaps in mapping, forecasting, and technologies for cost-effective deepwater extraction. Economic factors create a cost structure that is 1.5 to 3 times higher than comparable activities in temperate latitudes, with an added risk premium due to uncertainty. Institutional and geopolitical factors create a complex environment marked by elements of cooperation through the Arctic Council and conflict through territorial disputes and sanctions.

Policy choices aimed at strengthening resilience in adapting to the megatrends of international economic development in the Arctic focus on eliminating vulnerabilities and reinforcing capabilities. This opens new opportunities for managing economic security risks across the socioeconomic, geopolitical, green, and digital dimensions. The timelines of major projects range from 15 to 30 years, from discovery to commercial extraction, which creates significant uncertainty for investors in the context of the energy transition and economic decarbonization.

A subregional approach shows significant differentiation of potential between the Russian Arctic, which has the largest resources and infrastructure but faces sanctions restrictions, the Norwegian Arctic, which demonstrates a successful model of sustainable development but has limited resource potential, the Canadian and Alaskan Arctic with large reserves but insufficient infrastructure, and Greenland, which serves as a potential gateway for non-Arctic actors.

Literature review. Theoretical approaches to international specialization and their potential application at the regional level, outlined by Yu. Orlovskaya, V. Chala and O. Varlamova [2], provide an important methodological basis for analyzing subregional economic processes in the Arctic. Research on civilizational transformations and global economic shifts that influence the redistribution of interests in northern regions [3], together with the analysis of economic challenges and conflicts of interest in global interaction that shape the external and internal determinants of state economic security [4], is complemented by theoretical and methodological approaches to examining economic dependence within the global economic structure [5].

Institutional and regulatory foundations of Arctic development are reflected in the documents of the Arctic

Council [6; 7], which emphasize the importance of international coordination, scientific cooperation, and compliance with environmental and maritime safety standards. The economic benefits of the Northern Sea Route are assessed by E. Bekkers, J. Francois, and H. Rojas-Romagosa [8], while the growing geopolitical competition among states in the region is analysed by M. Blunden [9]. Issues of economic security and methodological approaches to its assessment are expanded in the study by O. Bulatova, O. Zakharova, and co-authors [10], while the economic potential of the Arctic macro-region and its resource opportunities are examined by F. Chrestansky and Z. Kriz [11]. European strategic approaches to sustainable and peaceful development in the Arctic are outlined in the European Commission document [12].

Climatic, infrastructural and socio-economic dynamics of the Arctic are addressed in the work of L. Heininen, H. Exner-Pirot and J. Plouffe [13]. Regulatory requirements for safe navigation in polar waters are set out in the materials of the International Maritime Organization [14]. Geo-economic interests of China and Russia in developing new transport routes are analyzed by B. Jaeger and L. Pedernheiras [15]. Structural models of Arctic economies, combining subsistence, mixed, and market systems, are examined by L. Johannsdottir and D. Cook [16]. Challenges of Arctic regionalism and mechanisms of regional cooperation are discussed by S. Knecht [17]. Governance constraints and the paradoxes of Arctic development are analysed by M., Luszczuk, J. Gotze, K. Radzik-Maruszak, A. Riedel and D. Wehrmann [18]. Maritime infrastructure and comparative characteristics of major Arctic sea routes are systematically presented in the fundamental work by W. Ostreng, K.M. Eger, B. Floistad and co-authors [19].

Resource opportunities, extraction challenges, and strategic infrastructure solutions in the Arctic are explored by E. Quillerou, M. Jacquot, A. Cudennec, and D. Bailly [20]. The macroeconomic effects of the circular transition and their implications for energy policy and economic resilience are analyzed in the publication [21]. Strategic aspects of shifting the paradigm of economic dependence, relevant to the global economy, are examined in the study [22]. Subregional infrastructural processes of the Arctic and their relationship with global fragmentation are detailed in the analysis [23].

The role of the Arctic in global economic and transport processes is explored by R. Rosenkranz [24]. International legal frameworks regulating maritime zones are defined in the Convention on the Law of the Sea [25]. Strategically important assessments of undiscovered hydrocarbon resources in the region are presented in reports of the United States Geological Survey [26]. Security dynamics and the rapidly evolving geo-economic landscape of the Arctic are synthesized in the work of B. Zellen [27].

Despite the growing body of research, the need arises to rethink the geopolitical architecture of the Arctic in the context of the transition from bipolar confrontation to multipolar geoeconomic competition, where traditional military strategic deterrence instruments give way to economic mechanisms of influence.

The purpose of the study is to analyze the key trends

in the geopolitical transformation of the Arctic, assess the role of new actors and institutional mechanisms, and identify potential sources of conflict between different models of the region's economic development. A systemic approach was employed in the study, enabling the examination of the geopolitical and geoeconomic processes of the Arctic region in relation to its spatial, institutional, and resource characteristics. To achieve the stated objectives, *the following methods were used*: comparative analysis to identify subregional differences in maritime infrastructure and resource extraction potential; analysis and synthesis to generalize theoretical concepts and trends in international economic development; content analysis of materials issued by international organizations, official documents, agreements and analytical reports to determine regulatory, institutional and geoeconomic factors; systematization and generalization of empirical data to reveal structural asymmetries of interests and key economic security risks. The application of these methods ensured the integrity of the analytical interpretation, allowing for the identification of potential points of conflict between different models of economic development in the Arctic region.

Main results of the research. E. Quillérou et al. [20] define the Arctic as an oceanic space with two distinct zones: the Arctic Ocean, which includes the five coastal states of the United States, Canada, Denmark, Norway, and the Russian Federation, and the wider Arctic region, which additionally comprises Iceland, Finland, and Sweden. The population of the region is estimated at between four and ten million people, depending on the geographical boundaries applied. The United Nations Convention on the Law of the Sea [25] serves as the foundation for regulating access to resources, maritime traffic, and pollution control. The Convention formalized the two-hundred-nautical-mile Exclusive Economic Zone and made it possible to extend maritime claims to three-hundred-fifty-nautical miles from the baseline if the coastal state provides geomorphological evidence that the seabed is a natural extension of its land territory [24]. The Arctic Council, established in 1996, brings together eight Arctic states but lacks regulatory authority; instead, it functions as a platform for scientific cooperation. A notable event was the First Arctic Ocean Conference held in May 2008 in Western Greenland, where the five coastal states convened. The decision not to invite representatives of Indigenous peoples of the North or the other Arctic states of Finland, Iceland, and Sweden generated substantial criticism [24].

L. Johannsdottir and D. Cook [16] present a distinctive framework for analyzing the Arctic economy through the coexistence of three types of economic systems. Subsistence economies rely on hunting, whaling, fishing, and reindeer herding, aiming to ensure a minimum standard of living for families and communities and playing a critical role in shaping the cultural and communal identity of Indigenous peoples. Mixed economies combine subsistence practices with market activities, such as reindeer herding, that simultaneously support household needs and provide income from sales. Market economies operate through investment-driven production and distribution that depend on price signals and are closely linked to the global

economy. A key conflict arises from the fact that what constitutes an economic opportunity for market economies, such as resource extraction or maritime transport, may pose an existential threat to subsistence and mixed economies. This highlights the necessity for a multilayered institutional system that regulates economic activity at local, regional, national, and international levels.

The maritime infrastructure of the Arctic differs fundamentally from that of traditional sea routes because of extreme climatic conditions, remoteness from major population centers, and specific technological requirements. Understanding these characteristics is essential for a realistic assessment of the region's economic potential and the development of effective risk management policies. Researchers highlight systemic differences between Arctic and conventional maritime infrastructure. Port density in the Arctic is one port per more than one thousand kilometers of coastline, compared with one port per two hundred kilometers along the Suez Canal route. The accessibility of Arctic routes is limited to three to six months a year, whereas traditional shipping routes operate year-round. Emergency response times in the Arctic range from 24 to 96 hours, compared with 2 to 6 hours on conventional routes [18]. Consequently, Arctic ports require specialized structures capable of withstanding ice pressure, which increases capital costs by two to three times compared with standard ports. Authors [1, 2, 3] identify several types of ice ports, including all-season ports with capital expenditures of five hundred to eight hundred million dollars for a medium-sized facility, seasonal ports requiring one hundred to two hundred million dollars, hub ports, and transit ports with limited transshipment capacity. Studies [17, 18, 24] also highlight the problem of shallow Arctic shelf seas, where depths often reach only about ten meters, restricting vessel size and making it impossible for the largest container ships and tankers to operate in the region.

First, according to estimates by the United States Geological Survey [26], the region contains 22 percent of the world's undiscovered hydrocarbon resources, amounting to ninety billion barrels of oil and 1.669 trillion cubic feet of natural gas [11, 20]. Second, the melting of sea ice is opening up the Northern Sea Route (NSR), which is approximately ten thousand kilometers shorter than the Suez Canal route on the Rotterdam–Yokohama corridor [15]. Third, the emergence of new geopolitical actors, particularly China with its concept of the Polar Silk Road, is fundamentally reshaping the regional balance of power.

The analysis of the contemporary Arctic requires a synthesis of classical geopolitical theories and modern geoeconomic approaches. B.C. Jaeger and L.C. Pederneiras [15] apply geoeconomic theory to explain Arctic dynamics. The core premise of this approach is that the primary drivers of current activity in the region are the economic interests of states, manifested in their efforts to secure control over material resources and transportation routes. Geoeconomic instruments in the Arctic include trade policy (mutual benefits and coercive measures), investment policy (capital flows between states), economic sanctions, national energy policy, financial and monetary tools, and economic assistance such as loans from Chinese banks to

Russia.

R. Rosenkranz [24] adapts Carl Schmitt's classical geopolitical theory on the opposition between maritime and continental powers to the Arctic context, highlighting the natural asymmetry of the poles: the North Pole is located in an oceanic environment with melting ice that connects the two largest water systems on the planet, whereas the South Pole is a continental landmass encased in ice. This asymmetry defines the region's unique geopolitical character.

The United States places significant emphasis on military capabilities in the region, adhering to a traditional geopolitical approach. Notably, the U.S. remains the only superpower and NATO member that has not ratified the United Nations Convention on the Law of the Sea, thereby attempting to operate outside the framework of the international community [24]. Russia, by contrast, focuses on the commercial potential of the region. The country positions itself as the Arctic's "gatekeeper" due to its geographic advantage, possessing the longest Arctic Ocean coastline (Jaeger & Pederneiras, 2022). Russia's strategy includes the development of the Northern Sea Route as a national transportation artery, the exploration of energy fields (including the Shtokman field with reserves of 3.8 billion cubic meters of natural gas), and restructuring its gas strategy by shifting from pipeline dependency toward liquefied natural gas trade. Western sanctions following the 2014 annexation of Crimea restricted Russia's access to technology and investment, making China its primary partner [15]. The Scandinavian countries demonstrate the redistributive model of Northern Europe, emphasizing sustainable development and the interests of Indigenous peoples [20]. Canada highlights its sovereignty over the Northwest Passage and the rights of Indigenous communities, even blocking the EU's application for observer status in the Arctic Council [24].

Two approaches shape territorial competition in the Arctic:

(1) The sector principle (1920s) divides Arctic territory by extending lines from a state's coastline to the North Pole. Each sector becomes a national territory and falls under the sovereignty of the respective state [24].

(2) The extended 350 nautical mile Exclusive Economic Zone under UNCLOS allows claims beyond two hundred nautical miles if a state provides geomorphological evidence that the seabed is an extension of its land territory. The most valuable Arctic territories lie on the periphery of the region, close to Arctic states, and these areas are not contested.

China's emergence as a key actor has fundamentally reshaped the Arctic geopolitical architecture. In 2017, China and Russia agreed on the concept of the Polar Silk Road (PSR), extending China's Belt and Road Initiative into the Arctic [15]. The key elements of China's strategy include: (1) long-term investment, as reflected in the 2021–2025 Five-Year Plan, with extensive funding aimed at achieving strategic milestones by 2030; (2) logistical expansion, particularly through COSCO SHIPPING, which has increased its operations along the Northern Sea Route annually since 2016, alongside involvement from Chimbusco and Poly

Group; (3) infrastructure financing, with the Export-Import Bank of China and the China Development Bank providing loans for the development of Russian Arctic infrastructure; (4) energy contracts involving extraordinarily long-term agreements (in some cases up to one hundred years) and the acquisition of entire national resource outputs [24].

B.C. Jaeger and L.C. Pederneiras [15] warn of a potential economic trap for Russia. Several asymmetry factors can be identified: China finances the majority of joint projects; Russia risks becoming indebted to Chinese banks; Chinese state-owned companies gain substantial advantages in negotiations; and China increases its control over strategic routes through financial leverage. In the long term, Russia may lose effective influence over the region while formally retaining sovereignty. Authors [15–17] argue that the China–Russia partnership carries inherent risks of economic inequality, largely favoring China. R. Rosenkranz [24] highlights a key shift in Russia's energy strategy: the transition to liquefied natural gas trading provides Russia with new pricing flexibility, enabling it to sell gas on global markets at spot prices instead of relying on distribution hubs and long-term fixed contracts.

India, Japan and South Korea are also showing growing interest in the region. Their engagement includes obtaining observer status in the Arctic Council, participating in scientific research, investing in ice-class shipbuilding, and diversifying energy supply routes. F. Chrastansky and Z. Kriz [11] describe them as "exotic" actors, emphasizing their geographical distance from the region but considerable economic interest. The European Union long neglected the Arctic in its foreign policy; only in November 2008 did the EU issue its first dedicated communication on the Arctic ("The EU and the Arctic"). However, the application for observer status in the Arctic Council has still not been approved due to pressure from Canada [24]. L. Johannsdottir and D. Cook [16] note that the EU's Arctic policy stresses the importance of regional and multilateral cooperation, as well as the connection between the renewed EU Arctic policy and the European Green Deal.

Conclusion. The geopolitical transformation of the Arctic demonstrates a transition from the bipolar military confrontation of the Cold War to the multipolar geoeconomic competition of the twenty-first century. The study confirms the hypothesis that contemporary Arctic geopolitics is driven not so much by territorial claims as by control over economic routes, energy resources, and infrastructure projects. We observe a fundamental shift in the geopolitical paradigm. The melting of Arctic ice, which decreased by 3.6 million square kilometers between 1980 and 2007, is opening new economic opportunities and transforming the region from a peripheral zone into a global center of competition for resources and routes. Geographic and climatic conditions, however, tend to encourage cooperation rather than conflict.

The asymmetry of the China–Russia partnership has become increasingly evident. The concept of the Polar Silk Road demonstrates China's growing role as a key financial actor. Western sanctions after 2014 accelerated Russia's reorientation toward China, creating risks of economic dependence. China finances most joint projects and gains

control over infrastructure, while Russia retains only formal sovereignty. The analysis shows that geoeconomic instruments are replacing military ones. Modern competition in the Arctic relies on investment policy, trade agreements, economic sanctions, control over energy routes, and financial mechanisms.

The coexistence of economic systems becomes an inherent source of conflict. More than one million Indigenous people consider the Arctic their home and face the pressures of the global market economy. Subsistence, mixed, and market economies operate simultaneously, creating a structural conflict in the distribution of benefits and risks. Systemic consequences of industrial accidents may pose an existential threat to traditional communities.

In the contemporary geoeconomic dynamics of the Arctic, the phenomenon of co-competition is gaining increasing relevance, reflecting the simultaneous interplay of competition and cooperation among states and corporations. The specific conditions of the Arctic make full confrontation economically inefficient and full cooperation strategically unrealistic, forcing actors to adopt hybrid models of interaction. These models combine shared use of

infrastructure, technological exchange, or coordination of scientific research with intense rivalry over control of resources, logistical routes, and investment flows. Such logic of co-competition forms a new type of regional interdependence that significantly influences the configuration of risks and opportunities for economic security.

Institutional architecture requires clear reform. The Arctic Council, lacking regulatory authority, is insufficient for governing the region. UNCLOS provides the legal foundation, but territorial disputes, such as those concerning the Lomonosov Ridge, remain unresolved. The role of so-called exotic actors, including China, India, Japan, and South Korea, continues to grow and requires new formats of regional dialogue. The 2025 Svalbard case illustrates the central dilemma: how to balance the region's economic potential, including 22 percent of the world's undiscovered hydrocarbon resources and a ten-thousand-kilometer reduction in transport routes, with geopolitical challenges such as national security, environmental risks, and the rights of Indigenous peoples. Existing scenarios reveal two opposing perspectives: large-scale development versus limited and cautious exploitation.

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