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ПРЕДПОСЫЛКИ РАСШИРЕНИЯ УЧАСТИЯ РЕСПУБЛИКИ КОРЕЯ В ОСВОЕНИИ СЕВЕРНОГО МОРСКОГО ПУТИ И ДЕЯТЕЛЬНОСТИ В АРКТИКЕ: ГЕОЭКОНОМИЧЕСКИЕ ПРЕИМУЩЕСТВА И ПЕРЕДОВЫЕ ТЕХНОЛОГИИ СУДОВ ЛЕДОВОГО КЛАССА ARC7

КЛЮЧЕВЫЕ СЛОВА

Северный морской путь; Республика Корея; Специальный закон об Арктическом маршруте; Пусан; суда ледового класса Arc7; вторичные санкции; российско-корейское сотрудничество

FOUNDATIONS OF KOREA'S GROWING ENGAGEMENT IN THE NORTHERN SEA ROUTE AND ARCTIC OPERATIONS: GEOECONOMIC ADVANTAGES AND ADVANCED ARC7 ICE-CLASS SHIP TECHNOLOGY

KEY WORDS

Northern Sea Route; Republic of Korea; Arctic Route Special Act; Busan; Arc7 ice-class vessels; secondary sanctions; Korea-Russia cooperation

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АННОТАЦИЯ

Республика Корея перешла от деклараций к законодательному закреплению своего участия в освоении Северного морского пути (СМП). В статье рассматриваются основания этого сдвига через три группы факторов. Во-первых, законодательный поворот: принятый в 2026 году Специальный закон о содействии использованию Арктического маршрута и развитию связанных с ним отраслей рассматривает СМП не как регулируемую судоходную линию, а как интегрированную промышленную экосистему, координируемую на общегосударственном уровне. Во-вторых, геоэкономический потенциал Пусана как вероятного базового порта в рамках многопортовой модели. В-третьих, сохраняемые корейскими верфями компетенции в строительстве судов ледового класса Arc7, использование которых в настоящее время ограничено риском вторичных санкций. В статье дана аналитическая оценка благоприятствующих условий, структурных рисков и последствий для арктической стратегии Республики Корея.

ABSTRACT

The Republic of Korea has moved its engagement with the Northern Sea Route (NSR) from policy declarations to legislative institutionalization. This article examines the foundations of that shift through three interrelated dimensions. First, the legislative dimension: the 2026 Special Act on the Promotion of the Utilization of the Arctic Route and the Fostering of Related Industries frames the NSR not merely as a shipping route but as an integrated industrial ecosystem coordinated at the whole-of-government level. Second, the geoeconomic dimension concerns Busan's potential role as a hub port within a multi-port model. Third, the technological dimension is represented by the Arc7 shipbuilding capabilities retained by Korean shipyards, whose application is currently constrained by exposure to secondary sanctions. The study provides an analytical assessment of enabling conditions, structural risks, and policy implications for the Republic of Korea's Arctic strategy.

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Introduction

For two decades, the Republic of Korea approached the Arctic primarily as an observer: a non-Arctic state maintaining scientific research activities, operating an icebreaking research vessel, and holding observer status in the Arctic Council since 2013. In 2026, this approach underwent a qualitative change. With the enactment of the Special Act on the Promotion of the Utilization of the Arctic Route and the Fostering of Related Industries, Korea institutionalized the Northern Sea Route (NSR) as an object of national industrial policy rather than episodic diplomatic engagement [1]. The Act establishes standing coordination mechanisms, five-year planning, budgetary provisions, and reporting obligations intended to provide continuity across successive administrations. This article therefore asks: how does the 2026 Arctic Route Special Act transform the Republic of Korea's approach to the NSR, and what geoeconomic and technological factors determine the prospects for its implementation?

Materials and methods

This analytical study is based on primary legal and regulatory documents and open-source policy materials. The principal primary sources are the Special Act and the Prime Minister's Decree establishing the Arctic Route Promotion Headquarters [1; 2]. Secondary evidence is drawn from specialized maritime and Arctic policy publications and from records of previous NSR transits [3–15]. The study employs qualitative document analysis, policy analysis, and comparative analysis. Statutory provisions are examined in relation to the operational and geopolitical context in which they are expected to function, while claims in policy and media narratives are compared with verifiable documentary evidence. Where such narratives diverge from the documentary record — for example, regarding the identity and date of a significant commercial NSR container transit — the documentary record is given priority. The scientific novelty of the study lies in conceptualizing the Republic of Korea's emerging NSR strategy through the interaction of three foundations: legislative, geoeconomic, and technological.

Statement on the use of AI technologies. Artificial-intelligence tools were used only for preliminary technical tasks, including language editing, reference formatting, and support for source retrieval. No AI system generated substantive scientific content, arguments, or conclusions for this manuscript. Full responsibility for the content rests with the author, in accordance with the journal's policy.

The Legislative Foundation: Rationale and Institutional Design

The Special Act may initially appear to be primarily a promotional measure; however, a closer reading reveals a broader institutional purpose. The law does not regulate navigation on the NSR — navigation and transit are governed within the applicable legal framework of the Russian Federation — but instead organizes Korean state institutions and industry for participation in NSR-related activities and associated industrial value chains. Article 1 identifies the strengthening of national competitiveness through the development of technological and human-resource capacities in anticipation of expanded Arctic-route activity as a central objective [16]. The Act defines «Arctic Route-related industries» broadly, encompassing shipping and ports, marine environmental monitoring and surveys, marine science and ICT, artificial intelligence and data, shipbuilding and materials-parts-equipment, fisheries, overseas resource development and energy, insurance and specialized finance, maritime safety, and environmentally friendly vessels [16]. This broad definition indicates that the NSR is conceptualized not simply as a shipping route but as a complex industrial system involving ice navigation, shipbuilding, cold-climate infrastructure, crew training, ice and climate data, insurance, finance, interstate cooperation, cargo aggregation, and sanctions-risk management.

Two institutional features indicate the priority assigned to implementation. First, coordination is elevated to the central-government level: the Act establishes an Arctic Route Commission under the Prime Minister, chaired by the Prime Minister and composed of relevant economic and security ministers, to deliberate on national strategy, monitor implementation, and coordinate financing and international cooperation [16]. This arrangement places NSR-related policy within Korea's established whole-of-government approach to major industrial initiatives. Second, the Act combines a five-year Basic Plan with annual implementation proposals and a permanent Arctic Route Promotion Headquarters within the Ministry of Oceans and Fisheries, further specified by a dedicated Prime Minister's Decree [16; 17]. This institutional architecture is designed to provide continuity, budgetary authority, and clearly assigned administrative responsibility.

The broader legislative context supports this interpretation. During the same session, Korean lawmakers advanced parallel measures concerning hub-port designation and Arctic governance, empowering the Ministry of Oceans and Fisheries to designate regional hub ports and support port infrastructure, logistics complexes, and icebreaker-related systems, while extending financial and tax incentives to participating firms [18]. The initiative can therefore be understood as a broader legislative package whose principal orientation is industrial policy rather than maritime regulation.

Government Support for NSR-related Industries rather than Regulation of Navigation

Three factors help explain the timing of the legislation. The first is the vulnerability of the existing east–west maritime transport system. Major chokepoints on which Asia-Europe trade depends — including the Suez Canal, the Red Sea, the Strait of Hormuz, and the Panama Canal — have experienced disruptions associated with conflict, drought, and attacks on shipping. For a trade-dependent economy, concentrated exposure to a limited number of vulnerable passages creates strategic risks. A northern corridor connecting Asian supply chains with Europe may therefore provide an additional element of route diversification even if it does not become the principal shipping lane.

The second factor is the recognition, reflected in the statute's definitions, that the NSR constitutes an industrial ecosystem rather than only a maritime corridor. Economic value may accrue not only to shipping operators but also to shipyards producing ice-class vessels, suppliers of cold-climate infrastructure and equipment, insurers assessing polar risks, providers of ice and weather data, and institutions responsible for polar crew training and certification. Participation across several segments of this value chain may therefore allow Korea to benefit from Arctic economic activity irrespective of the nationality of the vessels engaged in transit.

The third factor concerns domestic regional development. The Act does not designate a single gateway. Although Busan is a leading candidate for a hub-port role, the framework allows Ulsan, Pohang, Gwangyang, and Incheon to participate according to functional specialization in areas such as energy and heavy industry, steel, petrochemicals, and northern-oriented logistics. Distributing functions among several ports may broaden the domestic economic base of the initiative and reduce dependence on a single hub, although it also increases the need for effective central coordination — the function assigned to the Commission.

The Geoeconomic Foundation: Busan as a Potential Hub Port

Busan's potential hub-port role rests on its scale and geographical position. It is among the world's busiest container ports and a major transshipment hub, with the terminal capacity, feeder connectivity, and hinterland industrial base required to aggregate northbound cargo. Its location may also facilitate the consolidation of transit cargo originating in Japan, northern China, and Southeast Asia and destined for Europe, thereby combining volumes that may exceed those generated by the Korean market alone.

According to the Busan Port Authority, in 2025 the port handled approximately 24.9 million TEU of container cargo, of which roughly 14.1 million TEU was transshipment traffic; the port was reported as the world's second-largest transshipment hub, with a 2030 throughput target of 28.8 million TEU [19]. This handling capacity suggests that Busan possesses the infrastructure required to aggregate and dispatch substantial cargo volumes for a potential NSR service without displacing its existing trade flows.

The potential efficiency gains of the northern corridor should be stated with appropriate qualifications. Korean trial-voyage planning estimates that a Busan — Rotterdam voyage via the Arctic could be reduced from roughly 20,000 km and about 40 days via the Suez route to approximately 13,000 km and about 30 days [20]. This represents a significant potential saving in distance and time, but it does not by itself establish commercial viability. A frequently cited operational precedent — the 2018 transit of Venta Maersk, which carried containers from the Russian Far East via Busan through the NSR to northern Europe — was explicitly described by Maersk as a one-off trial intended to gain operational experience; the company subsequently stated that it did not regard the NSR as a commercially viable alternative to established east-west routes [21].

Busan's geoeconomic advantages are therefore a necessary but insufficient condition for the development of regular NSR services. They provide Korea with a credible platform for cargo aggregation and dispatch, but do not resolve the constraints associated with seasonality, insurance costs, schedule reliability, and geopolitical dependence that have limited the route's commercial use to date.

Economic Prospects and Constraints

The strategic rationale must also be assessed against the economic constraints of Arctic navigation. Three variables are particularly important: the duration of the navigable season, the cost of ice navigation, and the pricing of operational risk. Available evidence suggests that each constrains the prospects for year-round commercial service. The NSR's navigable window remains limited and varies from year to year; because liner shipping depends heavily on schedule reliability, a seasonal corridor is structurally difficult to integrate into regular container services [22]. Bulk and project cargoes, which can accommodate less regular sailing schedules, may be better suited to the route than the high-frequency container trades in which Busan specializes.

The additional cost of Arctic navigation can be quantified. Modelling of a 4,000-TEU containership on the NSR estimates summer transit costs at roughly USD 349 per TEU when ice-navigation requirements and icebreaker assistance are included, rising to about USD 587 per TEU under winter conditions [23]. These costs reflect icebreaker escort, ice-strengthened tonnage, reduced speeds, and higher insurance premiums. Marine insurers also price Arctic risks above those associated with Suez routing because search-and-rescue coverage, salvage capacity, and ports of refuge along the route remain limited [24]. Consequently, the distance advantage of the NSR may be partly offset by higher operating and risk-related costs.

This economic assessment reinforces the article's central argument. If transit remains seasonal and only marginally competitive, the more durable economic benefits for Korea may arise from supplying NSR-related industries rather than from operating regular transit services. Relevant sectors include ice-class shipbuilding, escort and salvage capabilities, ice and weather data services, specialized insurance, and crew training. From this perspective, the Special Act's broad definition of «related industries» implicitly recognizes that a substantial share of potential value lies in the wider industrial ecosystem rather than in transit operations alone [25].

The Technological Foundation: Retained Arc7 Ice-class Shipbuilding Capabilities

Korea's third foundation is its retained capability to construct Arc7 ice-class tonnage, which differentiates it from many other non-Arctic states. Hanwha Ocean's Geoje shipyard constructed a series of Arc7 icebreaking LNG carriers for the Arctic LNG 2 project, including vessels designed for astern icebreaking and operation under severe Arctic conditions [26; 27]. Such capabilities are concentrated in a limited number of shipyards worldwide and position Korea within a technologically advanced segment of the Arctic maritime industrial chain [28; 29].

Beyond the existing Arc7 carriers, Korea's shipbuilding industry may have the capacity to undertake additional orders for NSR-adapted vessels. A future NSR container service would require vessels designed for the route's navigational constraints, including shallow-draft requirements in some straits. Some sections of the NSR have depths of approximately ten metres, which can limit vessel dimensions. The planned pilot vessel, with a capacity of about 2,700 TEU, is therefore substantially smaller than a mainline HMM containership of roughly 24,000 TEU. Any projection of large-scale fleet requirements, however, should be treated cautiously and linked to demonstrated demand and service frequency.

The application of these technological capabilities is currently constrained by geopolitical and sanctions-related factors. Following the substantial expansion of Western sanctions against Russia since 2022, completed carriers intended for Russian projects could not be delivered and remained at Geoje. The United States Office of Foreign Assets Control (OFAC) sanctioned Cyprus-based special-purpose entities associated with the Sovcomflot-linked vessels, creating potential secondary-sanctions exposure for delivery to Russian end users [30; 31]. Reported alternatives have included resale and transfer to third-country entities; however, each option is affected by the vessels' project-specific design and the applicable sanctions framework [32]. Sanctions affecting ice-class shipping capacity have also contributed to constraints on the Arctic LNG 2 project [33].

Governance and the Korea-Russia Interface

Because the implementation of a Korean NSR strategy necessarily involves navigation within the Northern Sea Route water area, where navigation is regulated by the Russian Federation in accordance with its national legislation and applicable international law, it requires a functioning bilateral channel while remaining subject to the sanctions environment affecting relations with Russia. Korea's planned trial voyage illustrates the government's effort to manage these considerations. Under the coordination of the Korea Ocean Business Corporation and the Korea Shipping Association, the Busan-based operator PanStar Line was selected to operate an ice-class containership of approximately 2,700 TEU from Busan through the Russian Arctic, with a call at Tromsø, Norway, onward to Rotterdam, and a return via the same route [34; 35; 36]. The use of a controlled, state-supported pilot rather than an immediate commercial service suggests a phased approach: acquiring operational experience and data, strengthening the domestic industrial base, and retaining policy flexibility while postponing decisions on full commercialization and sanctions-related constraints.

The governance design of the Special Act is broadly consistent with these requirements. A commission chaired by the Prime Minister provides an institutional forum in which trade, industry, foreign affairs, and finance considerations can be coordinated and in which decisions concerning assets such as the undelivered fleet can be assessed at the whole-of-government level rather than by a single ministry or company [37]. The effectiveness of the initiative will therefore depend not only on the existence of the statute but also on the quality of its implementation.

Korea's Potential Role as a Logistics Bridge between Asia and Europe

Korea's approach can be assessed comparatively alongside those of other non-Arctic Asian states. Korea, China, and Japan share an interest in northern access but differ in policy instruments and strategic emphasis. China has promoted the «Polar Silk Road» within the broader Belt and Road framework, combining scientific activities and infrastructure initiatives with investment in Russian Arctic energy projects. Japan has emphasized scientific research, LNG participation, and cautious assessment of commercial opportunities. Korea's approach is distinguished by the combination of industrial capabilities and legislative institutionalization: it is incorporating existing shipbuilding capacity into a statutory national programme [38; 39].

This specialization creates both opportunities and vulnerabilities. Korean shipyards possess Arc7 construction capabilities that provide a significant technological advantage in the non-Arctic Asian context. At the same time, these capabilities are directly affected by sanctions-related restrictions, as discussed above. China can address some sanctions-related constraints through a larger state-directed economic system, while Japan has pursued a more diversified approach to LNG supply. Korea's relatively concentrated emphasis on ice-class shipbuilding therefore makes the commercial use of these capabilities particularly sensitive to the political and regulatory environment surrounding the undelivered vessels.

The comparative analysis suggests that Korea's most distinctive contribution lies in the Arctic industrial ecosystem, whereas the economics of regular transit services remain uncertain. A middle-power Arctic strategy may therefore be more sustainable when it develops specialized industrial and technological niches rather than seeking to reproduce the scale of great-power presence [39].

Conclusion and Policy Implications

Korea's NSR initiative is institutionally more developed than its status as a non-Arctic state might suggest. Its legislative foundation provides mechanisms for sustained coordination and financing; its geoeconomic foundation gives Busan and a supporting port network a credible platform for aggregating Arctic cargo; and its technological foundation places Korean shipyards among the limited number capable of constructing advanced ice-class vessels. The constraints are equally significant. The route's commercial viability remains uncertain and seasonally limited; potential efficiency gains do not eliminate cost and reliability challenges; and the Arc7 shipbuilding capability is currently constrained by the sanctions environment.

Three policy implications follow. First, Korea may derive more durable benefits from developing the NSR-related industrial ecosystem — including shipbuilding, specialized equipment, data services, insurance, and crew certification — than from prioritizing regular transit operations in the near term. Second, the sequencing of trial voyages before large-scale commercial commitment provides an opportunity to accumulate operational experience and data. Third, decisions concerning the undelivered fleet require whole-of-government coordination, including careful assessment of secondary-sanctions exposure and broader foreign-policy considerations. Taken together, the legislative, geoeconomic, and technological foundations identified in this study provide a coherent framework for assessing Korea's emerging Arctic strategy. Their practical significance, however, will depend on implementation, commercial demand, navigational conditions, and the wider geopolitical environment. The broader macroeconomic effects of expanded NSR activity on Russia and the Republic of Korea require separate empirical assessment and should not be assumed in advance.

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