Policy environment analysis for Arctic seaport development: the case of Sabetta (Russia).

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Abstract

In this paper, a structuration model is developed to evaluate opportunities and constraints that may arise for a port authority operating a port in the Arctic. The study builds upon the new institutionalist approach to transport infrastructure policy. It argues that given the specificity of operational conditions in the Arctic, as well as the expectations of the resource-driven future transformations, the conventional port development models cannot accurately depict factors of Arctic port activity. The proposed structuration approach focuses on how four dimensions of the policy environment (physical, economic, institutional, and environmental) enable and constrain policy choices available to a port authority. Application of this model to the case of Sabetta, a deep-sea multifunctional port constructed in the Ob estuary of the Yamal peninsula (Russia), demonstrates the inextricable links between actions and institutions and pinpoints the uncertainty factors that affect Arctic port development "from scratch." The practical objective of this research is to introduce a dynamic multi-factor model for systematic evaluation of the policy environment in Arctic port development. Given that industrial activities in the Arctic region will proceed at the current speed or accelerate, lessons learned from the case of Sabetta will be relevant to other port infrastructure projects in the Arctic.

Keywords: port development, Arctic, policy analysis, structuration model, port of Sabetta, Russia.

1. Introduction

Economic development in the Arctic has been associated with maritime activities, including oil and gas exploration, fisheries and aquaculture, marine biotechnology, cruise tourism, and transit shipping (Holthus et al., 2013). The extant literature has identified three obstacles to the success of future maritime activities in the Arctic. First, maritime safety has been undermined by imperfect communication (low satellite coverage), poor navigational information, and low availability of search and rescue (Østreng et al., 2013). Second, indirect costs associated with Arctic operations (icebreaking and ice management, pilotage, insurance) in combination with the cautious attitudes of ship owners and short supply of suitable (ice-strengthened) equipment have negatively impacted financial viability (Young, 2009; Lassere, 2014). Finally, the absence of adequate onshore

infrastructure, primarily ports and terminals, has been identified as an obstacle (Buixadé Farré et al., 2014). Though there is extensive literature on port development, none of the existing models have been applied to assess the present conditions and future potential for the development of Arctic ports. To redress this knowledge gap, we introduce a model for Arctic port development and demonstrate its analytical value by applying the model to the ongoing development of the Sabetta port in Yamal peninsula (Russia).

The logic of new institutionalism embraced by the literature on port development focused the investigation on examining a dynamic interplay of internal and external factors in port development (Ng and Pallis, 2010; Notteboom et al., 2013). This scholarship provided elaborate accounts on the conditions of stability (path and place dependence) and change ("window of locational opportunity," Scott and Storper, 1987) and the interplay of culture and politics (cross-cultural studies of port authorities), and it introduced the notions of social embeddedness (the port as a community of practice) and institutional plasticity (institutional environment and port authorities).

Building upon the previous scholarship, this study has focused on inextricable links between actions and institutions by introducing the notion of structuration, or the process by which institutions pose opportunities and constraints while shaping and being shaped by actors' strategies (Giddens, 1984). We apply the structuration approach to policy formation (Aalto et al., 2012) to devise a conceptual model of port development for the Arctic region. This model suggests that actors participating in policy formation are constrained in their actions by four structural dimensions: physical, economic, institutional, and environmental. The model highlights interconnections and tensions between the dimensions of the policy environment and the specificity of port development factors in the context of the Arctic.

Based on original empirical data, this paper clarifies how the structure of the policy environment enables and constrains the port authorities in managing the port effectively and increasing its involvement in regional and global maritime trade. Being one of the most ambitious Arctic infrastructure projects, Sabetta can be considered a "critical case" in contemporary Arctic port development. Initially conceived as a component of the Yamal LNG project, Sabetta has 'outgrown' this idea and is expected to become a modern deep-sea multifunctional port serving global markets. The analytics of the structuration model show how the specificity of the Arctic as an operational environment (extreme weather conditions, seasonality, remoteness, resource-driven development, scarce population), Russian Arctic in particular (Arctic exploration used as an image in national

identity building, Laruelle, 2014), conditions port development by constraining policy choices available to port authorities. The analysis showed that the difficulty of hinterland development and questions of political and economic stability in these times of global energy restructuring, coupled with unpredictable climatic change, have created significant uncertainties for the development of Sabetta.

The practical contribution of this research is a model that can be used to diagnose factors enabling and constraining Arctic port development, as well as to explain the nature of uncertainty factors affecting ports in the Arctic. Port authorities in all Arctic states could use this structuration model for a systematic assessment of the existing policy environment. Informed port policy in the Arctic shall be able to develop a strategy that can maximize the positive effects of enabling factors, minimize the negative effects stemming from constraining factors, and plan measures for adjustment to changing conditions stemming from the uncertainty factors.

The remainder of this paper is structured as follows. Section 2 presents an overview of the existing literature on port development and introduces a conceptual model for Arctic port development based on a structuration approach. Section 3 details materials and methods. Section 4 analyzes opportunities and constraints to Sabetta's development using the structuration model. Section 5 discusses the results of the investigation, and Section 6 offers conclusions.

2. Port development and Arctic ports

There is extensive literature on port development. Early models studied the relationships between economic advancement and infrastructural change (Taaffe et al., 1963; Rimmer, 1977). Later, specific models for port development were formulated. The UNCTAD model, first proposed in 1992, outlines port development in discrete steps and defines four generations of port development in terms of temporality (from the 1960s until today). This model has been criticized for being overly simplistic and thus inaccurate (Beresford et al., 2004). Building upon the UNCTAD model, the WORKPORT model demonstrated that development stages are not fixed in time (Pettit and Beresford, 2009). In addition to the principles included in the UNCTAD model, WORKPORT embraced operational and developmental port issues. As a result, WORKPORT showed that ports developed in accordance with need or policy, and that port function (ability to provide certain services) was closely related to port development.

Another widely used conceptual perspective on port development is the Anyport model proposed by Bird (1980), which identified three major steps in the port development process: setting, expansion, and specialization. This evolutionary model suggested that the initial small port usually starts with a few quays adjacent to the town center, then further develops and grows as shipping and cargo handling technology evolve. Notteboom and Rodrigue (2005) claimed that while Bird's model held until the present, it poorly explains contemporary port development—the rise of port terminals as transshipment hubs. Neither does the model include the inland dimension as a driving factor. Thus, Notteboom and Rodrigue (2005) suggested a revised model that features the forth step in port development—regionalization, a phase that leads to logistic integration and makes ports adapt to the imperatives of distribution systems and global production networks.

The models presented above are helpful in the understanding of port development, yet all of them were developed from the experiences of "traditional" European ports, i.e., those ports emerging "naturally" at an interface with a city. Lee et al. (2008) claimed that Western-based models have been unable to fully reflect the regional essence of port–city development in Asia. They clarified that "inland transportation and its corollaries are of central concern to European and American ports, but this is not the case in Asia" (Lee et al., 2008, p. 374) and proposed a unique model of port development specific to Asia and other post-colonial hubs. The development of Arctic ports cannot be accurately depicted with Western-based or Asian models. Arctic ports have been mostly specialized facilities constructed within the framework of large resource-driven infrastructure projects, rather than having evolved naturally from the community needs (there are often no communities prior to port construction). Thus, there is a need to revise the existing approaches in order to provide a model that holds for the Arctic cases.

Ng et al. (2013) proposed that the development of transport nodes, including ports, happens in correspondence with institutional frameworks. The port development process can thus be regarded as simultaneous "responses to tackling exogenous forces and the interactions between stakeholders within existing institutional frameworks" (Ng et al., 2013, p. 2). The understanding of port development as a process conditioned by multiple formal and informal rules stemming from both internal (related to the port) and external (related to the port's operational environment) contexts is a starting point for a port development model informed by the institutional theory. Such a model shall operate at a structural level and define how different aspects of operational environment appear as constraining and enabling factors for policy planning and implementation.

In order to formulate an analytical model for Arctic port development, we drew upon the policy structuration model developed by Aalto et al. (2012), which was an adaptation of structuration theory (Giddens, 1984) to the analysis of policy formation. Aalto et al. (2012) suggested that strategies envisaged in policy design as a means to secure actors' core economic and political interests were vulnerable to structural uncertainties. Each actor with an interest in a particular policy outcome "navigates" the policy environment in their own way and seeks to influence the structure to attain their policy goals. The analytical model of Arctic port development presented in Figure 1 conceptualizes institutional theory in terms of structuration.

FIGURE 1 HERE

Following Aalto et al. (2012), we hold that the policy environment can be characterized by four structural dimensions: Physical (location and materiality), Economic (finance and competition), Institutional (politics and administration), and Environmental (natural conditions and anthropogenic influences). These four structural dimensions are the sources of rules and resources—in other words, the factors that determine port activities. Rules are considered to be both formal (written) and informal (tacit) (North, 1990). Resources, or means to accomplish an activity, are assumed to be allocated asymmetrically (Giddens, 1984).

The actors central to the policy formation process belong to public (federal, regional, and local authorities) and private (mainly the energy and maritime industries) sectors, as well as international and domestic non-governmental organizations. Actors follow the rules, but they also have a capacity to influence the rules and redesign them by using the available authoritative and allocative resources. As a result, the process of policy formation is a process in which actors seek to overcome structural constraints to attain their goals by using resources provided within the policy environment. This model of port development underpins a dynamic view on policy formation as a multi-actor process where the state is not the only decision-maker but has a stake in the policy process along with commercial and non-governmental actors.

This study applied an inductive approach to specify the dimensions of the policy environment relevant to Arctic port development. The works of Baird (1999) and Alderton (2013) were reviewed to identify the general factors of port development, while the Arctic Marine Shipping Assessment (2009) was used to account for the Arctic-specific factors. Baird (1999) analyzed key factors that influenced the successful development of the port of Felixstowe, currently the UK's busiest

container port (handling over 40% of Britain's containerized trade) and historically a private, insignificant dock in rural southeast England. This model includes four groups of factors: physical and locational factors (infrastructure, berths depth, inland infrastructure connections, shortsea transshipment traffic, physical constraint to expansion), competitive environment (type and value of cargo moving through the port, port choice by shipping companies), role of the public sector (port authority, local government, national government), and capital cost recovery (large scale capital investments vs. revenues extracted from port users). This model devised from an in-depth case study did not take any ecological or social aspects into consideration, which is a significant omission. Alderton's (2013) model suggested demand (combination of changes in trade patterns and competition) as the main driver of port development. Another five critical factors presented in Alderton's model were inland transport, water depth (ship size—dredging), environmental pressures, cargo handling technology, and port management (different ownership and labor unions). Alderton's model thus serves as a complement to Baird's list of factors, adding two important dimensions: environmental and social. We incorporate all factors enlisted by both Baird and Alderton when specifying the dimensions of the policy environment, and we add Arctic-specific factors based on the situational analysis of the Sabetta case and the assessment of challenges to Arctic maritime infrastructure provided by the Arctic Council (AMSA 2009).

3. Materials and methods

The empirical material analyzed in this paper stems from two sources: archival (desktop) research and fieldwork. Archival research exploited existing repositories of publically available data, including media, companies' websites, public documents (legislation and strategies), and figures and maps contained in above mentioned materials. Fieldwork consisted of qualitative expert interviews with a flexible structure built on topics rather than pre-specified questions. The mixed character of the data is a part of the complementary research design implemented in this study. Since any given type of data can give only certain kind of information, a combination of different types of data allows them to complement each other (Brewer and Hunter, 2006). We used previous research to complement the empirical sources.

The main goals for invoking archival materials was to define the actors involved in the development of Sabetta port, establish the event chronology in port development, and specify the dimensions of the policy environment. We concentrated on the period of January 1, 2012 through December 31, 2015 and extracted data using search term 'Sabetta': 214 news articles from the widely circulated

newspaper from the Yamal region *Krasnyi Sever* accessed through *Integrum* database; 49 news articles from the regional web portal *Barents Observer* (from late 2015 transformed into *The Independent Barents Observer);* 301 news stories from the Russian online information portal *PortNews,* specialized in port and maritime industry information. The use of two Russian sources (one communicating at the regional, and one at the national level) and an international source allowed us to cross-check the information and provide a more balanced picture of the policy environment. Among the websites we used are chiefly the RF Ministry of Transport, Rosmorport, Seaport Administration, Novatek, Yamal LNG (see Annex I). All materials were downloaded in full length and used for information extraction.

The interviews were conducted with ten industry experts in Yamal (Arctic region), St. Petersburg and Riga (Baltic region), including researchers and industry actors (port and shipping sector) between September 1, 2015 and December, 31, 2015, who were assured anonymity (see Annex I). According to Gläser and Laudel (2009), experts are "people who possess special knowledge" of a phenomenon under investigation). The experts interviewed in the Baltic region were relevant to the case of Sabetta for two reasons. First, the Sabetta port project was developed by the St. Petersburg-based joint stock company *Lenmorniiproekt*, one of the three largest Russian companies that design seaports, terminals, and transport systems. Second, St. Petersburg is considered a preeminent maritime scientific research center in Russia. In addition, the ports from the Baltic region are relevant for the investigation as a strong competition for the cargos transshipment between Baltic ports and Sabetta is expected. The topics raised in the interviews concerned the current state and future expectations for the Sabetta's development (Annex I). We followed the conversational strategy to interviewing that seeks to reproduce a natural flow of an interaction (Patton, 2002), an approach generally used when interviewing experts and elites (Thomas, 1993; Berry, 2002). The interviews were analyzed in a form of written notes taken by the authors of this article.

The research materials were investigated following the method of qualitative content analysis to provide a thorough empirical investigation of multiple data points (Gläser and Laudel, 2010), also outlined by Silverman (1993). A qualitative content analysis of the interviews and written sources (newspaper, magazine, website material) was conducted to characterize the factors of port development identified in our model (Figure 1). The essence of this method is in bringing all the data together in a written form and analyze it in two steps: first, we categorized all the information in accordance with four dimensions of the policy environment, and, second, we scrutinized the

patterns emerging in relation to the factors characterizing each dimension. Using two methods of data collection (interview and desktop) and a variety of material sources allowed us to triangulate our findings and add methodological robustness (Denzin, 1978). The calculation of hinterland projection was performed based on the data from the Federal Statistical Service and transport data provided by the Russian Railways, seaport administrations, and logistic companies. The use of multiple complementary sources of research material enabled verification of research results vis-à-vis different sources (triangulation), and contributed to internal (close fit to data, conceptual density) and external (applicability of conceptual apparatus outside concert studies) validity.

4. The development of Sabetta port: Policy environment analysis

This section details the application of the analytical model developed in Section 2 (Figure 1), first explaining the features pertaining to the functioning of the port authorities in Russia before describing the main factors of each structural dimension of the policy environment. We analyze the process of Arctic port policy formation from the perspective of the choices for the port authority, and demonstrate how structural factors enable and constrain their available strategies.

4.1. Port Authority

The port governance system in Russia is currently highly centralized. In 2007, the federal law "On Maritime Ports of Russia Federation" was adopted, establishing formal rules for the functioning of Russian ports that were absent from the RF legislation (Federal Agency of Sea and River Transport, 2015). In contrast to the port governance models typical of the EU and North America, in Russia the functions of a port authority are performed by two bodies: Rosmorport and the Seaport Administration. Such a system allows the federal government to control the majority of issues related to port activities and governance.

The Federal State Unitary Enterprise Rosmorport, in the case of Sabetta, its Arkhangelsk Branch, is a federal body responsible for organization and maintenance of the efficient use of state property in seaports and at their approach, as well as other property belonging to the state. In addition, Rosmorport is in charge of the development, maintenance, and modernization of port infrastructure, the safe exploitation of hydrotechnical equipment, the technical safety of navigation systems, and maritime security issues. It also performs a number of commercial activities in the port.

The Seaport Administration (and in the case of Sabetta, the Arkhangelsk Branch of the Administration of Western Arctic Seaports) manages the federal property in the port, creating the organizational, material, technical, and financial basis for the functioning of the port as a commercial entity. The Seaport Captain division is responsible for the regulation of navigation and maintenance of maritime safety in the seaport, as well as pollution prevention, ice management, emergency response and rescue operations, mobilization training, and the like. The Captain cooperates with border, customs, and immigration authorities, ensures state control, issues permits for dredging, and exercises other forms of administrative supervision, thereby acting as a main contact point for the issues related to port calls. The Seaport Captain division performs its functions independently; the Seaport Administration cannot interfere with its activities.

This system of port governance has had an effect upon the formulation of port development strategy and the policy choices available to the port authority. The existence of two bodies that jointly operate the port can be regarded as an unnecessary duplication of functions that increases administrative costs and complicates onsite operative decision-making. In fact, the Seaport Administration and Rosmorport need to work in close cooperation in order to minimize the constraints and maximize the opportunities stemming from the policy environment. According to the Russian law, ports are considered objects of strategic importance and are defined in legal terms as public institutions. This results in limitations on foreign ownership in ports and a requirement to obtain a special government approval for foreign investment, narrowing down the scope of potential investors.

4.2. Physical dimension

4.2.1. Opportunities

The Arctic port of Sabetta (71° North, 72° East), constructed on the western shore of the Ob estuary in Yamal peninsula, is located within the Northern Sea Route (NSR) structure, a network of shipping routes in the Russian Arctic between Novaya Zemlya and the Bering Strait. Yamal is currently a sparsely populated and barely industrialized area, thus the port is relatively unconstrained. In 2015, Sabetta was enlarged to include four land plots near the Mys Kammenyi settlement as well as an additional waterfront. The maximum berth depth reaches 15.1 m (compared to 12.5 m in Murmansk, 12 m in Dudinka, 11.5 m in Churchill, and 8.5 m in Kirkenes). This creates a unique competitive advantage as the largest LNG carriers require a draft over 12 m, and the carriers currently under construction for the Yamal LNG project will have a freshwater draft of 12 m. Sabetta

includes berths for customs inspections of foreign ships; a border checkpoint for maritime cargo was opened on July 1, 2014, which will allows foreign port calls.

FIGURE 2 HERE

Sabetta is considered well positioned to serve the trade flows to and from Europe, America, and Asia (Figure 2). At the initial stage, Sabetta is expected to specialize in LNG export by functioning as the outlet for Yamal LNG plant, engage in destination traffic and intra-Arctic cabotage, and ensure regular supply to Russian marine bases in the Arctic. Due to its locational characteristics and functional orientation of berths, Sabetta can receive both "river-sea" vessels from the Ob River and multifunction seagoing vessels traversing the NSR. A 103-km-long oil pipeline with a capacity 40,000 tonnes daily, connects Novoport oilfield to the oil terminal in Mys Kamennyi. Sabetta also benefits from being a part of the Yamal LNG project, that includes also an international airport (operational since 2014), enabling a good connection for port workers and other specialists.

4.2.2. Constraints

Construction in Sabetta has been conducted in complex geological, climatic, and hydrological conditions. Construction began in 2013 "from scratch" (the coastal transport infrastructure was completely missing) and is expected to be finalized in 2017. Shallow waters have been a significant obstacle to Sabetta's development: Depth is crucial to receiving large seagoing ships (primarily, LNG carriers) with drafts of over 12 meters. Substantial dredging has been conducted (ca. 70 mln tonnes), increasing the cost and compromising environmental security. Inland infrastructure connections are poor at present (Figure 2). Approximately 175 km of railway connecting Sabetta to Bovanenkovo (planned capacity 35 million tonnes) is needed to turn Sabetta from a specialized port into a multifunctional one. From Bovanenkovo there is currently a 525-km-long railway to Labytnangi (owned by Russia's largest state gas company, *Gazprom*), which links to further railways operated by the Russian railway company (*RZhD*). There is only a limited possibility for building automobile roads in Yamal due to permafrost conditions (those that currently exist are only functional during the winter).

Inland waterway connections through the Ob River are viable, yet the navigation season only lasts for about five months (late May to late October). Severe weather conditions also require ice-breaking support to ensure the safety of navigation in icy conditions. Sabetta does not yet have its own ice-breaking fleet: Diesel icebreakers *Tor* and *Kapitan Dranitsyn*, operated by Rosmorport's

Northwestern Basin Branch, are relocated from the Baltic Sea, and the nuclear icebreaker *Taymyr,* operated by *Atomflot*, can be deployed. However, their capacity will not be sufficient to accommodate traffic growth. Harsh ice conditions in the eastern part of the NSR will force seasonal routing of LNG logistics. According to the investors' plan, during the summer season, LNG produced in the Yamal LNG plant will be exported to the Asia-Pacific markets (China, South Korea, Japan, India) via the eastern part of the NSR using the special ice-strengthened LNG carriers (ARC7). During the winter season, the western part of the NSR will be used to deliver LNG to the Asian markets through the conventional Suez Canal route via the Zeebrugge LNG terminals.

4.3. Economic dimension

4.3.1. Opportunities

Sabetta is the key component of Yamal LNG, an integrated project encompassing natural gas production, liquefaction and shipping. Yamal LNG is developed by Novatek, the largest private gas company in Russia, in cooperation with the CNPC, Total and Silk Road Fund, and will become the largest LNG production facility behind the Arctic Circle, with a production capacity of 16,5 mln tonnes per year. The success of Yamal LNG project largely depends on the reliability of LNG transport to the end customers, and this is why development of modern port infrastructure has been a priority. Being a part of a large energy project has secured finance for Sabetta. In the beginning of 2015, Yamal Trade (100% subsidiary of Yamal LNG) signed two long-term contracts (over 20 years) to ensure year-round delivery of 10.9 mln tonnes LNG produced in the Yamal peninsula to the markets of the Asia-Pacific region. This commitment induced that port construction shall be on schedule to fulfil the contractual obligations on the long-term deliveries from 2018.

The projected operational capacity of Sabetta is up to 30 mln tonnes of cargo. Besides LNG, cargo that can be shipped through Sabetta includes gas condensate (an expensive product used for high quality fuel and kerosene) and polyethylene produced in YNAO, coal from the Komi Republic, grain from Tyumen, and wood from the Ural regions. The Sverdlovsk, Chelyabinsk, and Tyumen regions as well as the Perm Krai have strong manufacturing industries that require logistics systems specialized in the transport of engineering products, which need careful handling and machinery of nonstandard dimensions. Moreover, the area is industrially well developed, so that on the one hand, it imports raw materials and intermediate products, and on the other, provides finished goods that require interregional and international shipment (Arctic-info, 2016). Thus, projected hinterland can provide a significant cargo base for the port of Sabetta (Table 1).

TABLE 1 HERE

Sabetta's locational advantage as a part of the NSR, can turn into an economic benefit, since the NSR has recently seen a raise in activity (Figure 3). Sabetta can not only attract import flows, but also become a bunkering center for the ships using NSR for all kinds of voyages. In addition, it can play an important role in providing refuge and repair for ships in distress, thereby improving the overall conditions for Arctic navigational safety.

FIGURE 3 HERE

Growing cargo turnover, both import and export, will increase the income from port users and ensure capital resources for the further development of port activities (port dues for Arctic ports are presented in Table 2). Despite the comparatively high tariffs, Sabetta can provide conditions for handling large vessels that cannot call at other ports in the Arctic region.

TABEL 2 HERE

Since ports tend to generate wider social and economic benefits, conditions related to human capital are expected to improve in the Yamal region. It has been estimated that in summer 2015, Sabetta employed 9000 people (Snegirev, 2015), and upon completion, Sabetta will directly provide 1400 jobs. Yamal LNG and Sabetta are expected to add 300 billion RUB in tax to the budget of the YNAO through 2030 (Istomin, 2013). In addition, Sabetta is expected to become an engine of regional economic development. The development of railways that will ensure the multifunctionality of the port would provide up to 20,000 new workplaces. These benefits have motivated the federal and regional governments to make large-scale investments.

4.3.2. Constraints

According to expert estimations, full capital cost recovery (CCR) through port duties and fees is not viable in the Arctic (Interview VI and VII). Also previous research argued, that the revenues extracted from a port's commercial activity will be insufficient to fully repay the very large-scale capital investments (Baird, 1999). This limits the input of private investment into the development of Sabetta. Being a joint venture between a large producer of natural gas (Novatek) and the Russian government, Sabetta was estimated to cost approximately 73.3 billion RUB (2.3 billion USD, RF Central Bank weighted exchange rate for 2013 was 31.85 RUB to 1 USD), the federal government's total share amounting to 47.3 billion RUB. In summer of 2014, the total cost of the Sabetta port

increased due to extensive dredging works, and the project deficit of 22.3 billion RUB increased the share of public finance required for project completion to 69.6 billion RUB (Frolova, 2014). The budget deficit coincided with the introduction of Western economic sanctions against Russia over the conflict in Ukraine, limiting access to capital and Arctic offshore technology (Aalto, 2015). While Novatek managed to secure partnerships with CNPC and Silk Road Fund to continue with Yamal LNG, the public partners were forced to cover the deficit by cutting funding to other federal transport projects, including the development of Baltic maritime infrastructure and the port of Murmansk development program.

At present, Sabetta can be expected to be constrained by the limitations of the NSR traffic which concentrates on bulk export of natural resources (oil, gas, and minerals), import of construction materials and equipment to the extraction sites, as well as supplies for the communities (Kiiski, 2017). The sparsity of population and lack of non-extractive industries limit the supply capacity of the NSR maritime system (Kiiski et al., 2016). Regarding other revenues, Sabetta is not likely to engage in deep logistics due to the extreme weather conditions. Furthermore, the absence of cost-efficient and reliable hinterland connections is a major obstacle to the development of liner shipping along the NSR.

According to the both interview and media material, the construction of the Severnyi Shirotnyi Khod (Northern Latitudinal Link, NLL), a railway connection between the Severnaya (Northern) and Sverdlovskaya railways, has been seen as a critical infrastructure project to enable Sabetta's functioning as a multifunctional rather than a specialized LNG port as it will attract cargo flows from the Tyumen region. In addition, a link between Labytnangi and Polunochnoe (Sverdlovskaya region) is required to ensure exploitation of the port at its maximal capacity. Still, funding for construction and maintenance of railways that will ensure that multiple users can reach the port is not easy to confirm, particularly with the ongoing economic crisis in Russia. More, due to increased seasonal variability and the thawing of permafrost caused by the increase in global temperatures, railway construction on Arctic soil poses certain engineering challenges.

TABLE 3 HERE

Although Sabetta does not have significant competitors within the port range, as other ports within the NSR are either specialized or built in shallow waters, the port may experience multi-modal competition from Arctic ports outside the NSR. Table 3 demonstrates potential port choice decisions

in case both the Northern Latitudinal Link and the Sabetta-Bovanenkovo link are constructed. The port of Ust Luga, where some of the cargo owners from the Urals, Siberia, and Komi Republic already have logistic and transport capacities, appears to have potential as a competitor with Sabetta.

4.4. Institutional dimension

4.4.1. Opportunities

The current political regime's emphasis on the Arctic as a base for natural resources stated in the Russia's strategic documents, Arctic Policy (2008) and Arctic Strategy (2013), is indicative of the federal government's strong commitment to Sabetta's development. In 2012, the federal strategy "Maritime Port Infrastructure Development in Russia until 2030" was introduced. This was the first document since the Russian Federation was established in 1991 that specifically targeted port infrastructure. It set ambitious goals for the construction and reconstruction of ports with the aim of increasing Russia's capacity to participate in the world maritime trade. In early 2015, Rosmorport projected that the capacity of the Arctic ports would reach 115 mln tonnes over the next 15 years (Pettersen, 2015). The construction of Sabetta is expected to increase the share of Arctic ports in hydrocarbon transportation (in particular, natural gas) from the current 7.7% to 11.5% by 2030 (Port Strategy 2012). Thus, Novatek's interests to enhance and optimize sales channels, and extend its presence in the global LNG market are will aligned with the government's strategic plans (Novatek, 2015).

Sabetta has also received both rhetorical and financial support at the regional level. Sabetta is seen as a new powerhouse in Yamal, together with the Yamal LNG creating jobs and contributing to regional budget and welfare. In particular, local administration has taken a proactive stance in creating attractive conditions for the development of railroad infrastructure in the region to ensure that Sabetta can function as a multifunction port in the future. Finally, Sabetta has been a matter of discussion with local indigenous peoples to help ensure local support. The usual strategy includes local representation during the planning phase and the promise of compensations, medical services, and social benefits from the development of the project (Novikova, 2014).

4.4.2. Constraints

International law and intergovernmental organizations are of minor importance to Arctic port development because ports fall under national jurisdiction. Moreover, there is no Memorandum of Understanding on Port State control in the Arctic. The International Code for Ships Operating in

Polar Waters (Polar Code, entered into force on January 1, 2017) does not allocate any special role to Arctic ports, nor does it define their role in maritime safety and environmental security. This weakness of global rules may have an effect upon the criteria adopted by insurance companies. Underwriters base risk assessments for shipping companies on criteria related to ports (Østreng et al. 2013); restrictive insurance criteria may reduce the attractiveness of the port and thereby affect port choice. There are also currently no special legal provisions that regulate operations of the Russian Arctic ports. Thus, the existing legal system does not account for the harsh operational conditions, and does not provide special support for port development in the Arctic.

Public–private partnership (PPP), the model of finance used in Sabetta to spread the heavy financial burden of this capital-intensive project, involves difficulties for both public and private parties (van Ham and Koppenjan, 2001), chiefly, with regard to the alignment of private partners' (energy companies) profit interests with the interests of their public partners (federal, regional, and local authorities), particularly fiscal revenue. The political primacy of the public partners, who see wider socio-economic and security benefits in having a multi-functional modern hub in the Arctic, is weighing over the interests of Yamal LNG investors, who are looking for the most cost-effective models to deliver their cargo and have minor interest in diversification of port activity. The different orientations can limit the capacity of the PPP to adequately assess and manage uncertainties and risks. The recent volatility of global commodity prices and the ongoing debate on political change in Russia have created an unfavorable environment for mid- and especially long-term planning, for public and private sectors alike. Signed contracts for LNG delivery assume that large-scale LNG transport to Asia shall commence in 2018, yet multifunctional cargo handling requires further development of the hinterland (especially railway construction), which requires more time and a more favorable investment climate. In this regard, the long-term view of the Russian government on Arctic industrialization contrasts with the cash-flow orientation of private partners.

4.5. Environmental dimension

4.5.1. Opportunities

Decreasing sea ice is expected to open large areas of the Arctic Ocean for navigation (Lindstadt et al., 2016). Increase in shipping activity requires technologies that allow mitigation of maritime safety and pollution risks. Sabetta is expected to play a role in search and rescue and oil spill response, thereby contributing to emergency relief. Adequate port facilities, particularly designated places of

refuge, airports, and shore-side transportation systems, are all under construction or already in place in Sabetta. Though industrial activity in the Arctic is a source of environmental distress, the development of new technologies and best practices allows minimizing adverse effects on the Arctic ecosystem and increasing efficiency of resource use.

The procedure of environmental impact assessment (EIA) has been initiated in Sabetta in accordance with the legal requirements. Port construction started in 2013 after a positive opinion was issued by the state environmental review committee. In 2015, a detailed project of environmental monitoring and impact mitigation was prepared for the port of Sabetta by Eco-Express-Service, a private consulting company based in St. Petersburg. The plan takes into account both the construction and operation phases of the project and pays special attention to estimating the negative environmental impacts, as well as strategies for their minimization (Eco-Express-Service, 2015). This precautious approach to port development allows for taking adequate and timely measures. For instance, to compensate the environmental damage from dredging conducted in Sabetta, several fish factories are under construction in Yamal that will breed and release endangered fish species back into the waters.

4.5.2. Constraints

There are several environmental factors that have made the Arctic Ocean difficult to navigate: the presence and movement of sea ice, icebergs and ice ridges, low air and water temperatures, frequently changing weather, extended daylight/nighttime, magnetic variation, and polar lows. Furthermore, due to sea ice melting, the amount of drifting ice that is potentially hazardous to shipping is expected to increase. As climate change is associated with the increasing unpredictability of weather conditions and heavy winds/storms, it may make the Arctic less, rather than more, navigable. Increase in shipping will increase the risks of polluting accidents, as well as the amount of harmful air emissions. Thus, it is not quite clear how climate change will affect conditions for Arctic shipping.

One of the major environmental controversies connected to the construction of Sabetta is the amount of dredging required for port construction (ca. 70 mln^3 of soil), which is expected to negatively affect the local fish stock. The mobile and stationary diesel engines necessary to conduct port activities are among the largest sources of black carbon emissions in the Arctic. When deposited on snow or ice, black carbon reduces the reflection of sunlight, causing further warming

and increasing the rate of melting. “Green” infrastructure, such as waste water treatment facilities and efficient energy management supports, can be deployed in order to maintain a low level of pollution throughout the port’s operational cycle. No information is currently available on the status of such facilities.

Port development will also attract more people, who will bring along waste and will influence the Arctic food chains (Rodnikova et al., 2011). Newcomers attracted by jobs created in Sabetta will be exposed to health and safety risks, as the port is located in an area with extreme weather conditions.

5. Discussion

The conceptual model developed in this paper has allowed for the analysis of four structural dimensions of the policy environment and for the definition of those factors that will enable and constrain the development of the Sabetta port. Opportunities have been identified that port authorities could seize to increase future benefits, as well as constraints that should be taken into account to minimize potential losses. A number of factors have also been identified for which the future effect upon port development is uncertain (Table 4). For port authorities, it is crucial to be aware of the uncertainty factors and to include options for partial adjustment when devising and revising future development strategies.

TABLE 4 HERE

Uncertainties related to the inland connections have underpinned the tensions between the local and global dimensions of port functioning. The critical importance of the hinterland highlights Sabetta as a node for the consolidation of cargos originating from certain territories. The role assigned to institutional stability has emphasized the political economy dimension of port development. The uncertainties related to climate change have revealed the port’s vulnerability in the face of global environmental challenges. Thus, the uncertainty factors stem from natural conditions, interests of the main port stakeholders, and the broader socio-political situation. In the sections that follow, we will discuss three questions that were frequently raised in the research interviews and that relate to the uncertainty factors in the development of the Sabetta port.

5.1. Can inland connections guarantee the enlargement and diversification of hinterland?

The size of the hinterland is directly related to port choice. Wiegmans et al. (2008) identified that the availability and performance of inland connections were one of the key criteria applied by

container shipping lines when deciding on port calls. In cases of general cargo, inland and port logistics require specialized equipment for cargo handling, which may limit the cargo base in Arctic conditions.

Sabetta was initially conceived as a specialized LNG port in the framework of Yamal LNG project. The emphasis of the public partners on the benefits of building a multifunctional deep-water port in the Arctic highlighted the need for improved inland connections. However, the improvement of inland infrastructure does not translate into diversification of the hinterland. Obviously, the absence of railways cuts Sabetta off from the projected hinterland. The climatic and geographic conditions also limit the use of road transport and inland waterways. The cargo owners are aware of the limitations stemming from the logistics associated with use of the Northern Sea route. Moreover, extreme temperatures can be damaging for certain types of cargo (especially fine machinery), limiting the cargo categories suitable for transportation through the Arctic. Navigational risks and indirect costs (such as insurance and ice-breaker assistance) associated with Arctic shipping further reduce the competitiveness of Sabetta.

In addition to the limited cargo base, the construction and maintenance of railways and roads in the High North is currently very expensive. Also, the price associated with the use of Arctic railways can be substantial. In the case of construction on terms of public-private equity, private beneficiaries may avoid the additional expenditures inflicted by tariffs for use of inland transport infrastructure. However, this creates a situation wherein a company acting as a private partner can establish tariffs based on true costs, which may potentially be unfavorable for other railway users. Currently, the cost of using Bovanenkovo-Labytnangi railway, owned by Gazprom, almost equals the cost of transportation from Labytnangi to St. Petersburg (Interview III). Thus, depending on the future railway tariff, Sabetta may not be capable of offering significant benefits in comparison to the Baltic ports, in particular St. Petersburg and Ust Luga, accessible via the state-owned railways.

5.2. Does institutional stability ensure a favorable environment for port authorities?

Institutional stability refers to permanence of structure and process in public policy-making as well as balance in civil, market, and economic spheres. Institutional stability ensures the solidity of structure, providing actors with clear rules of the game and continuity in access to resources. In the past 25 years, energy has been among the key Russian political priorities (Oxenstierna and Tynkkynen, 2014). Currently, hydrocarbon energy development is the main driving factor behind

Russian industrial activity in the Arctic (Gritsenko, 2016). The development of Arctic port infrastructure is tightly connected to the ambition to develop the Arctic as Russia's primary "natural resource base" (RF Arctic Policy 2008). As a result, port authorities can benefit from the fact that Sabetta can serve both the internal Russian market (the growing NSR destination transport resulting from increased industrial activity in the Arctic region) and foreign markets (LNG transport to the Asia-Pacific markets, and other cargo transshipment in the future).

Energy infrastructure projects, including the port of Sabetta, are an essential part of the political setup and national strategy in Russia (Laruelle, 2012). Russian transport minister Maxim Sokolov emphasized that the significance of the Sabetta project goes far beyond oil and gas development, and rather marks a new state policy in the Arctic (Istomin, 2013). The role of Sabetta as a strategic logistical node in Arctic energy transportation underpins its nature as a politically driven infrastructure project. Yet, the volatility in the world oil and gas markets, the rapidly decreasing price of renewables, and the political tensions between Russia and the West have tempered the expectations regarding the scale of Arctic resource development. While Yamal LNG is executed in accordance with the prior schedule, the vulnerabilities of international trade regime and the political underpinning of the state policy priorities highlight that the future prospects for the port of Sabetta are uncertain.

The energy sector development in the Russian Arctic, like any other large-scale infrastructure project, shall be examined from a political and geostrategic point of view (Aalto and Forsberg, 2015). Projects can qualify for state subsidies even though their commercial viability may seem to be weak. With the decreasing demand for hydrocarbons in Europe, the Russian government has sought a foothold for both mature and emerging markets in the South Asia and Asia-Pacific regions. The current plan for the development of the Sabetta port is meant to support the increasing role of maritime transport as the relevance of Asian energy markets for Russian exports is expected to grow. However, the ambitious Russian energy projects may not be well aligned with the market realities. Despite a significant increase in construction cost, caused by the scarcity of essential technologies and investments due to Western economic sanctions, the port of Sabetta will have to be built on time, potentially imposing additional commercial pressure on the port authorities.

5.3. Will climate change improve or complicate operational conditions in the Arctic?

The complexity and unpredictability of the impacts of global climate change on the Arctic region have led to applied limitations on the long-term planning of Arctic operations, including port development. Trends of decreasing ice extent, increasing presence of thinner first-year ice, and lengthening ice-free periods (Maslanik et al., 2011; Stroeve et al., 2012) have suggested that a seasonally ice-free Arctic Sea could be a reality within this century (Boé, Hall, and Qu, 2009; Overland & Wang, 2013). At the same time, changing circulation patterns of the Gulf Stream may alter the general thawing pattern (Rahmstorf et al., 2015). Thus, the overall course and speed of climate change remain unknown.

Recent scholarship has been positive about the potential of the climatic changes to unlock the Arctic shipping routes and make them popular among international shipping companies (Ho, 2010; Hong, 2012). However, the ship owners have been reluctant to actively invest in Arctic shipping routes (Lassere et al., 2016). The reasons are twofold. First, even if melting continues at the present speed, Arctic navigation will not be comparable to sailing in non-polar regions. Chircop (2009, p. 359) emphasized that navigation can be expected to remain hazardous over the summertime, as there would still be limited amounts of ice. The rest of the year would remain non-navigable to all but higher polar class vessels. Second, climate change is expected to lead to the increase of extreme weather events, making navigation more hazardous (Vihma, 2014). The prospect that common open-water ships, which comprise the vast majority of the world's fleet, will enter the Arctic Ocean remains speculative. This creates an uncertainty for the port authorities with regard to future directions and amount of shipping traffic. The fewer the vessels that can safely navigate in the Arctic waters (and with the introduction of the Polar Code, certain restrictions have been put in place), the less attractive the Arctic ports remain.

The changing climate will demand additional services to support the operations in the Arctic ports. For the decades to come, safe and secure Arctic shipping will require special equipment (including ice-class vessels, ice management/ice breakers, SAR infrastructure) and skills (crew, salvors). The volatile ice conditions will require close monitoring and up-to-date meteorological forecasting. For Sabetta, the port authorities will need to order ice-breaking services well in advance, which can inflict losses in case the deployed ice breaker capacity does not match the demand for ice management.

6. Concluding remarks

The existence of adequate and reliable port infrastructure is crucial to providing safe, secure, and environmentally responsible maritime operations in the harsh Arctic climate (AMSA, 2009). Yet the opportunities for and the obstacles to port development in the Arctic have not been systematically studied. This article has analyzed the policy environment for Arctic port development by developing a model based on a structuration approach to policy formation. The application of policy environment analysis to the ongoing development of the port Sabetta in Yamal peninsula has demonstrated the underlying structural factors that condition the development of the port. We have also outlined uncertainty factors that can be used for scenario work to identify alternative future states of the policy environment.

The paper illustrated how the structural dimensions of the policy environment have affected Sabetta's development as a commercial transport hub in world trade, demonstrating that the capacity of a port authority to realize their interests in port development is conditioned by the allocation of resources in the physical, economic, institutional, and environmental dimensions of the policy environment. The analytics of the structuration model highlighted the dynamic character of port development as a multi-actor and multi-factor process, drawing attention to the temporal and spatial uncertainties. In accordance to our model, to overcome structural constraints, port authorities shall not only take into account enabling and constraining factors, but also monitor the uncertainty factors closely to devise options for adjustment to changing operational conditions.

The empirical analysis of the Sabetta case has demonstrated the direct and indirect interrelations between the uncertainty factors. The development of adequate inland infrastructure connections to provide for the port hinterland and to allow the diversification of port activity requires complex decision-making that involves a broad range of actors from public and private sectors. In the short term, missing inland connections will undermine successful development of Sabetta as a multifunctional port. In the long term, the port requires large investments that are unlikely to be repaid due to the high cost of Arctic infrastructure maintenance. Whereas cost recovery in the private sector means regaining the investment's value, the public sector considers a broader set of socioeconomic gains from port investment. Thus, state involvement and enduring political support are crucial to securing long-term large capital investment, in particular due to the highly hierarchical port governance in Russia. Whether the Russian state can create conditions that will attract investors, support new business models, and guarantee the role of ports as centers of a new Arctic transport cluster will affect the future port development. The consistency of policy priorities, in turn,

requires and upholds institutional stability. Finally, the impact of climate change is noteworthy. Its unpredictable and still ill-understood consequences complicate the operational conditions and create both political and economic ambiguity, adding to the first two uncertainty factors.

The analytical model proposed in this paper is foremost to support decision-making with regard to the opportunities and constraints for development of ports in the Arctic, an operational environment distinct from other maritime areas. For port authorities operating ports in the Arctic region, policy environment analysis can be a tool to evaluate future uncertainties, as demonstrated in the Section 5, and devise measures of adjustment to changing conditions. For the partners of the Yamal LNG project, the model can be applied as a risk assessment element. This model can also be useful for shipping and logistics companies interested in expanding their operational activities into the Arctic region.

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Figure 1. Analytical model for Arctic port development.

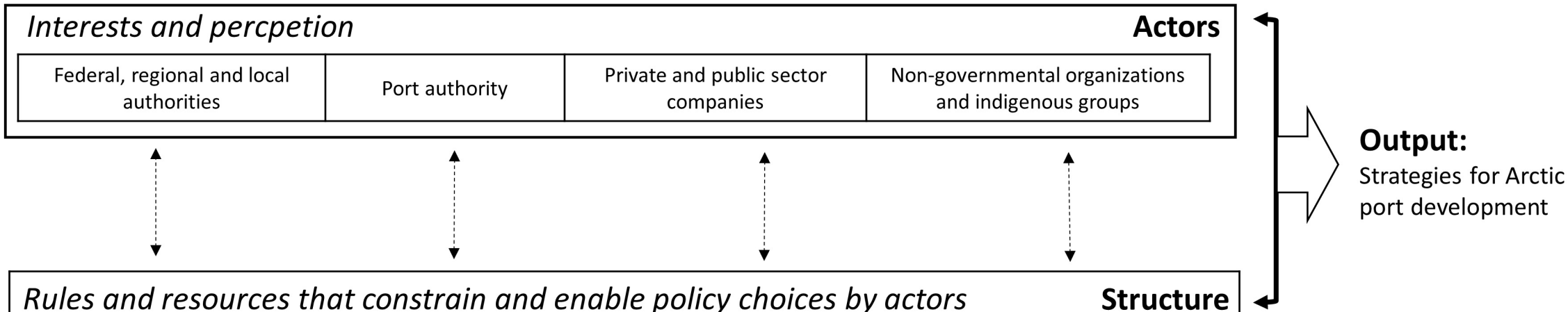
Source: Authors based on Aalto et al. (2012).

Figure 2. Infrastructure development in Yamal peninsula.

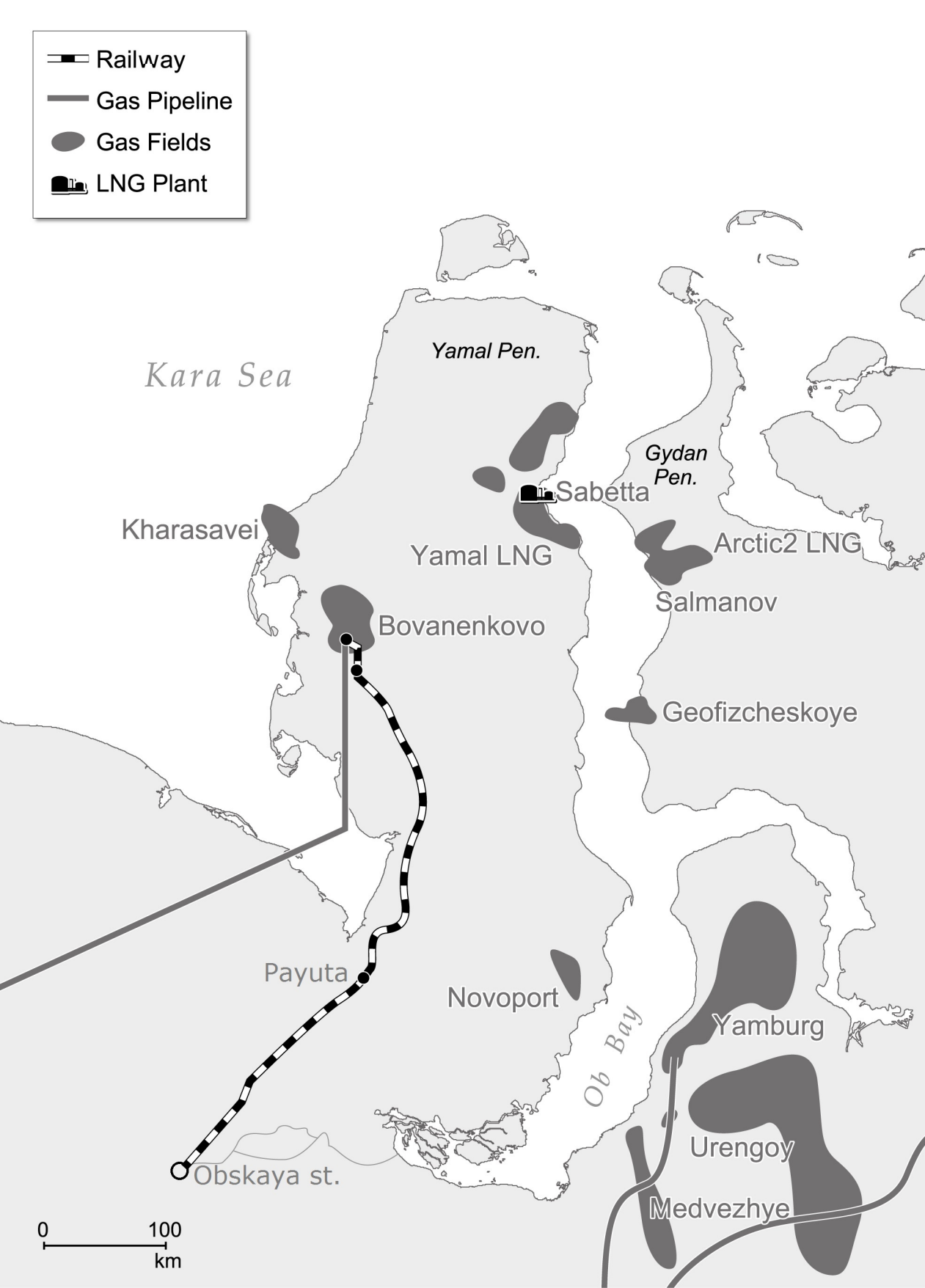
Source: Japan Oil, Gas and Metals National Corporation (JOGMEC), 2017.

Figure 3. Dynamics of cargo transportation along the Northern Sea Route.

Source: Authors based on Gritsenko and Kiiski (2016) and Northern Sea Route Information Office (www.arctic-lio.com).



Physical	Economic	Institutional	Environmental
Locational and Material Physical location; Berths depth/water depth; Inland infrastructure connections; Shortsea transshipment traffic; Physical constraint to expansion; Port infrastructure (berths, terminals, quays); Cargo-handling technology; Logistics activities (cargo-support and information provision); Ice management/navigation support; Industrial and commercial infrastructure (value-add).	**Finance and Competition** Size and evolvement of markets; Changes in trade patterns; Large scale capital investment; Port income (duties and fees); Other revenues extracted from port users; Capital cost recovery ; Type and value of cargo moving through the port; Port choice by shipping companies; Port competition within the port range; Size of hinterland; Port ownership and managerial structure.	**Political and Administrative** International relations, intergovernmental organizations and agreements; Regime stability; Formal rules and legal framework for port development; National port policy; Local government; Port authority; Managerial culture; Informal norms and subversive institutions; Strategic planning horizon; Corporate social responsibility; Labor unions; Working culture.	**Natural conditions and Anthropogenic influence** Climate change; Region-specific pollution (e.g., black carbon); Pollution from increased shipping; Effects of dredging; Effects of pollution from port operations; Waste water treatment; ‘Green’ infrastructure; Energy management in port; Health and safety; Emergency response; Awareness-building by environmental NGOs; Public attitude/protest.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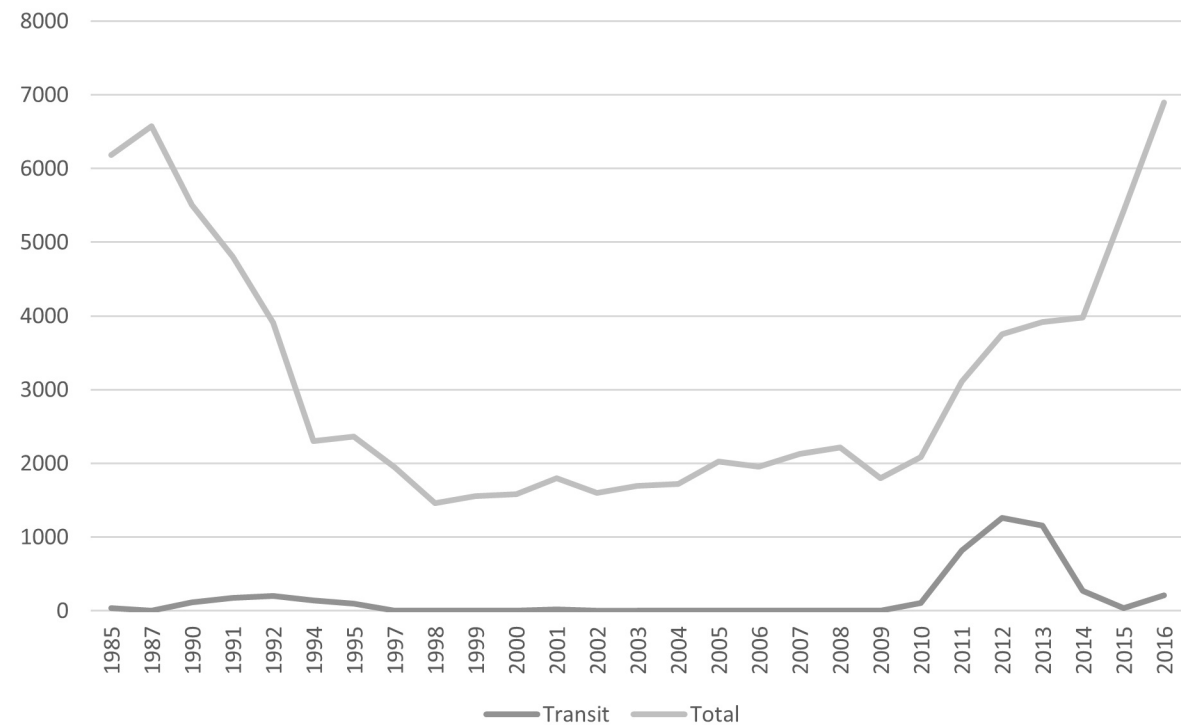
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